EAS

EUROPEAN AEROBIOLOGY SOCIETY

7th *Virtual Edition*

EUROPEAN SYMPOSIUM ON AEROBIOLOGY

Bioaerosols and Environmental Impacts

from 16 to 20 Nov 2020

CÓRDOBA, SPAIN

7th *Virtual Edition*
EUROPEAN SYMPOSIUM ON AEROBIOLOGY

Welcome

Dear colleagues,

With this 7th European Symposium on Aerobiology, focused on "Bioaerosols and Environmental Impacts", we are delighted to provide you the opportunity to update all together the state of the art in Aerobiology, a multidisciplinary science that study the airborne microorganism and biological particulate matter. This Symposium is organized by the European Aerobiology Society (EAS), Working Group for European Symposium, and the local organization is held by the University of Córdoba, Spain. This symposium has been supported by different institutions and associations dedicated to air quality and the impact on different ecosystems and human health.

The symposium has coincided with the impact of the COVID spreading all the world, being many countries in Europe under Health Alert, as epicenter of the pandemic, as says the World Health Organization (WHO). For this reason, the Local Organizing Committee and the EAS Board have decided to organize a virtual symposium. However, even all inconveniences due to important changes for presenting a virtual program, we wish it would be a success. We present a total of 167 abstracts; 91 oral communication and 76 posters. Different sessions are related to: Basic Aerobiology, Plant Phenology, Climate Change, Green Urban Spaces, Ragweed, Fungal Spores, Indoor Aerobiology, Bioaerosols and Molecular Aerobiology, Forecasting and Modeling, Environmental Pollution, New Methods for Detection and Analysis, Health Impact and other Aerobiology Application.

Welcome to the virtual European Symposium on Aerobiology. We wish you all the best during your participation, and in the future, when you implement the new aerobiology ideas.

Ingrida Šaulienė, President of the EAS

Michel Thibaudon, Past-President of the 6th EAS

Carmen Galán, President of the 7th ESA

COMMITTEES

Bioaeroso

Environm

Im

LOCAL ORGANIZING COMMITTEE

| University of Córdoba |

President

Carmen Galán

Vice-Presidents

Purificación Alcázar
Herminia García-Mozo

Members

Carmen García-Llamas
Moisés Martínez-Bracero
Jose Antonio Oteros
María Pilar Plaza
María José Velasco-Jiménez
Rocío López-Orozco
Carmen Moreno
University Hospital Reina Sofía
Michel Thibaudon
Past-President of the EAS and 6th EAS organizer

ADVISORY COMMITTEE

| EAS WG on European Symposium |

Célia Antunes
University of Evora, Portugal

Maira Bonini
Service of Hygiene and Public Health, Milano, Italy

Moisés Martínez Bracero
University of Córdoba, Spain

Nicolas Bruffaerts
Scientific Institute of Public Health, Brussels, Belgium

Sevcan Celenk
University of Uludag, Turkey

Agniezsca Grinn- Gofron
University of Szczecin, Poland

Roy Kennedy
Warwickshire College, UK

Barbara Majkowska-Wojciechowska
University of Lodz, Poland

Olga Ritenberga
University of Latvia, Latvia

Helena da Costa Ribeiro
University of Porto, Portugal

Aycan Tosunoglu
University of Uludag, Turkey

Letty A. de Weger
Leiden University Medical Center, The Netherlands

SCIENTIFIC COMMITTEE

Jordina Belmonte
Autonomous University of Barcelona, Spain

Bernard Clot
Federal Office of Meteorology and Climatology MeteoSwiss, Payerne, Switzerland

Giuseppe Frenguelli
University of Perugia, Italy

Ángel Moral De Gregorio
Health Service of Castilla-La Mancha, Spain

Dorota Myszkowska
Jagiellonian University, Krakow, Poland

Javier Rodríguez-Rajo
University of Vigo, Campus Ourense, Spain

Ingrida Šaulienė
University of Šiauliai, Lithuania

Branko Sikoparija
University of Novi Sad, Serbia

Carsten Skjoth
University of Worcester, UK

Matt Smith
University of Worcester, UK

Mikhail Sofiev
Finnish Meteorological Institute, Finland

Michel Thibaudon
French Aerobiology Network (RNSA), France

PROGRAM

Bioaeroso

Environm

Im

November 16th 2020

*TIME ZONE: (UTC +1)

11.00 – 11.30 h. | **IRS Committee Meeting**

11.30 – 13.00 h. | **IAA Executive Committee**

14.00 – 14.30 h. | **Welcome**

14.30 – 15.00 h. | **Lecture**
The use of aerial platforms in Aerobiological Studies: sixteen years later. (The Drones Invasion)
Eugenio Domínguez, University of Córdoba, Spain

15.00 – 15.30 h. | **Keynote**
Bioaerosols and health impacts
Michel Thibaudon, Réseau National de Surveillance Aerobiologique (RNSA), Brussieu, France

15.30 – 16.00 h. | **Keynote**
Agriculture and forestry
Giuseppe Frenguelli, Department of Agricultural, Food and Environmental Sciences, University of Perugia, Italy

16.00 – 16.30 h. | **Break**

16.30 – 17.00 h. | **Keynote**
Real time monitoring: beyond measurements
Bernard Clot, MeteoSwiss, Switzerland

17.00 – 17.30 h. | **Keynote**
Emerging methods of bioaerosol detection and their challenges in a pandemic era: good vs. bad bioaerosols?
Carstern Skjoth, University of Worcester, UK

November 17th 2020

*TIME ZONE: (UTC +1)

09.00 – 09.30 h. | *Lecture*
Six caps of an aerobiologist
Ingrida Šaulienė (President of European Aerobiology Society), Šiauliai University, Lithuania

09.30 – 10.30 h. | *Phenology*

10.30 – 11.30 h. | **Break / Posters Session 1**

11.30 – 13.00 h. | *Climate Change*

13.00 – 13.30 h. | **Break**

13.30 – 15.30 h. | *Green Urban Spaces*

15.30 – 16.30 h. | **Break / Posters Session 2**

16.30 – 18.30 h. | *Basic Aerobiology*

18.30 h | **EAS Committee Meeting**

November 18th 2020

*TIME ZONE: (UTC +1)

09.00 – 09.30 h. | *Applications*

09.30 – 10.30 h. | *Ragweed*

10.30 – 11.30 h. | **Break / Poster Session 3**

11.30 – 13.00 h. | *Indoor*

13.00 – 13.30 h. | **Break**

13.30 – 15.30 h. | *Bioaerosols and Molecular*

15.30 – 16.30 h. | **Break / Poster Session 4**

16.30 – 18.30 h. | *Forecasting*

November 19th 2020

*TIME ZONE: (UTC +1)

09.00 – 09.30 h. | Lecture
Pollen-induced allergic diseases in Europe – in the shadow of climate change
Christian Bergman, German Pollen Information Service Foundation, Allergy-Centre-Charité, Charité – Universitätsmedizin Berlin, Germany

09.30 – 10.30 h. | ***Fungal Spores***

10.30 – 11.30 h. | Break / Poster Session 5

11.30 – 13.00 h. | ***Health Impact***

13.00 – 13.30 h. | Break

13.30 – 15.30 h. | EAS General Assembly

15.30 – 16.30 h. | Break / Posters Session 6

16.30 – 18.30 h. | ***Pollution***

November 20th 2020

*TIME ZONE: (UTC +1)

08.30 – 09.30 h. | EAS New Committee Meeting

09.30 – 10.30 h. | ***New Methods for Detection and Analisys***

10.30 – 11.30 h. | Break / Posters Session 7

11.30 – 12.30 h. | Sponsors time

12.30 – 13.30 h. | ***New Methods for Detection and Analisys***

13.30 – 14.00 h. | Closing Ceremony

14.00 – 16.00 h. | WG39 Meeting

ORAL SESSIONS

Bioaeroso

Environm

Im

Plant Phenology

November 17th, 2020 | 09.30 – 10.30 h (UCT +1)

Moderators: Ingrida Šaulienė and Moisés Martínez Bracero

O.001 | Phenological changes in Europe are still attributable to climate change induced warming
Menzel Annette, Yuan Ye, Matiu Michael, Sparks Tim, Scheifinger Helfried, Gehrig Regula, Estrella Nicole
ID: 200

O.002 | Phenological phases of pollination and climate change
Michel Thibaudon, Jean-Pierre Besancenot, Charlotte Sindt, Gilles Oliver, Samuel Monnier[1]
ID: 015

O.003 | Phenological trends of Poaceae family over the recent 20 years in Córdoba, Spain
Moisés Martínez-Bracero, Carmen García-Llamas, Rocío López-Orózco, Manuel Sánchez-Ostos, Laura Raya-Ruiz, Herminia García-Mozo, Purificación Alcázar, Carmen Galán
ID: 162

O.004 | Aerobiology of Cupressaceae pollen in Portugal
Elsa Caeiro, Cláudia Penedos, Pedro Carreiro-Martins, Pedro Carreiro-Martins, Pedro Carreiro-Martins, Carlos Nunes, Carlos Nunes, Mário Morais-Almeida, Mário Morais-Almeida, Elisa Pedro, Elisa Pedro, Rodrigo Rodrigues-Alves, Rodrigo Rodrigues-Alves, Manuel Branco-Ferreira, Manuel Branco-Ferreira, Manuel Branco-Ferreira
ID: 043

O.005 | Spatial and temporal variations of Poaceae pollen concentration at rural and urban sites in Ingolstadt, Germany
Johanna Jetschni, Susanne Jochner-Oette
ID: 029

Climate Change

November 17th, 2020 | 11.30 – 13.00 h (UCT +1)

Moderators: Regula Gehrig and Jesús Rojo

O.006 | Impacts of climate change on birch pollen load in Southern Germany
Jesús Rojo, Jose Oteros, Antonio Picornell, Matthias Werchan, Karl-Christian Bergmann, Claudia Traidl-Hoffmann, Athanasios Damialis, Annette Menzel, Carsten B. Schmidt-Weber, Jeroen Buters
ID: 069

O.007 | Fifty years of pollen monitoring in Basel (Switzerland) demonstrate the influence of climate change on airborne pollen
Regula Gehrig, Reto Stöckli
ID: 091

O.008 | Early flowering of *Alnus* and *Corylus* in January: the first registered case in Ukraine
Olha Kaminska, Maryna Yasniuk, Victoria Rodinkova
ID: 173

O.009 | Influence of climate variations on Quercus aerobiological trends (1995-2019) in South Spain
López-Orozco, R., García-Mozo, H., Oteros, J., C. Galán
ID: 188

O.010 | Temporal trends of allergenic pollens and pollen seasons in the city of Rome
A. Di Menno di Bucchianico, G. Cattani, R. Gaddi, M.A. Brighetti, A. Miraglia, A. Travaglini
ID: 206

Green Urban

November 17th, 2020 | 13.30 – 15.30 h (UCT +1)

Moderators: Michel Thibaudon and Paloma Cariñanos

O.011 | Allergenicity of the urban green areas in the city of Córdoba (Spain)
María José Velasco-Jiménez, Purificación Alcázar, Paloma Cariñanos, Carmen Galán
ID: 013

O.012 | Allergenic potential of urban green spaces and changes across scenarios: a case-study in Brussels, Belgium
Aerts Raf, Bruffaerts Nicolas, Demoury Claire, Nawrot Tim S., Hendrickx Marijke
ID: 014

O.013 | The air we breathe: The influence of pollen sources in urban green spaces. The example of Lyon (France)
Nhân Pham-Thi, Michel Thibaudon, Samuel Monnier, Jean-Pierre Besancenot
ID: 016

O.014 | Breathing in the Parks: an initiative for the allergenic characterization of Urban Green Infrastructure
Paloma Cariñanos
ID: 022

O.015 | Density and crown size of trees producing allergenic pollen in relation to pollen concentration: integrating wind conditions, high-resolution LiDAR data and machine learning approach
Pawel Bogawski, Małgorzata Nowak, Agata Szymańska, Łukasz Kostecki, Łukasz Grewling
ID: 132

O.016 | Preliminary study on green areas in rome to elaborate a new pollen risk index
Miraglia A., M.A. Brighetti, Travaglini A.
ID: 204

O.017 | Scholastic garden: from a potential dangerous environment to a green chance
Travaglini A., Brighetti M. A., Miraglia A.
ID: 205

O.018 | Urban flora to increase animal biodiversity in cities
Pau Cardellach, Concepción De Linares, Jordina Belmonte
ID: 116

Basic Aerobiology

November 17th, 2020 | 16.30 – 18.30 h (UCT +1)

Moderators: Branko Sikoparija and Antonio Picornell

O.019 | Investigations on pollen deposition and transport of Fraxinus *excelsior* L. at a small spatial scale
Anna Katharina Eisen, Barbara Fussi, Susanne Jochner-Oette
ID: 049

O.020 | Co-occurrence of the allergenic pollen and fungal spore seasons against a background of the climatic zones in Europe
Dorota Myszkowska, Katarzyna Piotrowicz, Paweł Bogawski, Agnieszka Grinn-Gofroń, Uwe Berger, Maira Bonini, Valentina Ceriotti, Carmen Galan, Bjorn Gedda, Nicoleta Ianovici, Gilles Oliver, Sanna Pätsi, Rosa Pérez Badia, Małgorzata Puc, Victoria Rodinkova, Elena Severova, Carsten Skjoth, Michel Thibaudon
ID: 172

O.021 | Determining spatial representativeness of pollen traps for siting the stations of a monitoring network
G. Lieberherr, R. Gehrig, B. Clot, B. Crouzy, A. Pauling, F. Tummon
ID: 169

O.022 | Added value to monitor pollen at street level compared to stationary roof top level
Letty A de Weger, Frank Molster, Kevin de Raat, Jeffrey den Haan, Johan Romein, Marijke Mostert, Willem van Leeuwen, Pieter S Hiemstra
ID: 020

O.023 | Interlaboratory proficiency test in aerobiology using virtual slides – feasibility study
Matt Smith, Branko Šikoparija
ID: 119

O.024 | An improved understanding of uncertainty in Hirst-type pollen trap measurements
Fiona Tummon, Natalie Lemonis, Regula Gehrig, Bernard Clot, Benoît Crouzy, Gian Lieberherr, Marie-José Graber, Christine Sallin
ID: 120

O.025 | Grass pollen morphology in Ukraine: three categories are established
Maryna Yasniuk, Olha Kaminska, Victoria Rodinkova
ID: 174

O.027 | Overview of the first year of the new pollen monitoring network in Navarra
Mónica González-Alonso, Anabel Pérez de Zabalza, Arturo H. Ariño
ID: 126

O.028 | The impact of environmental factors and tree cover density on allergenic Cupressaceae and *Platanus* pollen exposure in urbanized region: Ankara case
Aydan Acar Şahin, Mustafa Üstüner, Nur Münevver Pinar
ID: 147

O.029 | Intradiurnal variations of atmospheric pollen in natural and urban-rural environments in southern Spain
Antonio Picornell, Marta Recio, Rocío Ruiz-Mata, Baltasar Cabezudo, María del Mar Trigo
ID: 061

O.030 | Airborne pollen in different biogeographical areas
I. Helfman-Hertzog, C. Galán, C., E. Levetin, E., H. Kutiel, T. Hefer
ID: 057

Applications
November 18th, 2020 | 09.00 – 09.30 h (UCT +1)

Moderators: Herminia García-Mozo and Letty A. De Weger

O.031 | Airborne pollen and spores' deposition in alveolar tissues as a tool in drowning forensic diagnosis
Herminia Garcia-Mozo, Cristina Beltrán-Aroca, Eloy Girela
ID: 009

O.032 | Relationship between olives harvest, olive oil production and olive tree pollen concentrations in Toledo area (1995-2018)
Raúl Guzmán Rodríguez, José Alejandro Lemus Calderón, Ángel Moral de Gregorio, Carlos Jesús Senent Sánchez
ID: 053

P.077 | A contribution to the botanical characterization of forest honeys from the Middle-West of the Iberian Peninsula (Salamanca, Spain)
David Rodríguez de la Cruz, Estefanía Sánchez-Reyes, Alfredo García-Sánchez, Silvia Sánchez Durán, Eva Lahuerta-Otero, Libia Santos-Requejo, José Sánchez-Sánchez
ID: 129

Ragweed
November 18th, 2020 | 09.30 – 10.30 h (UCT +1)

Moderators: Carsten Skjoth and Maira Bonini

O.033 | Biological weed control to relieve millions of allergy sufferers in Europe
Urs Schaffner, Sandro Steinbach, Yan Sun, Carsten Skjoth, Letty de Weger, Suzanne T. Lommen, Benno A. Augustinus, Maira Bonini, Gerhard Karrer, Branko Sikoparija, Michel Thibaudon, Heinz Muller-Scharer
ID: 019

O.034 | Health impact of Ambrosia artemisiifolia in Auvergne-Rhône-Alpes: analysis of medico-economic data
Lucie Anzivino, Abdoul Sonko, Pierre-Jean Chambard, Hervé Bertrand
ID: 136

O.035 | Is there a new rise of both ragweed pollen levels and ragweed allergy in relation to the reduction of *Ophraella communa* in Northern Italy?
Maira Bonini, Valentina Ceriotti, Daniela Carcano, Giuseppe Cislaghi, Paola Colombo, Susanna Dellavedova, Riccardo Asero, Filomena Vecchio, Elisabetta Elena Re, Barbara Bramè, Paolo Bottero
ID: 028

O.036 | Features of ragweed allergy: symptoms and drug consumption related to airborne ragweed pollen concentrations in Northern Italy
Maira Bonini, Gianna Monti, Valentina Ceriotti, Elisabetta Elena Re, Barbara Bramè, Paolo Bottero, Anna Tosi, Adriano Vaghi, Alberto Martelli, Giovanni Maria Traina, Loredana Rivolta, Federica Rivolta, Claudio Maria Ortolani
ID: 082

O.037 | The duration of ragweed pollen season in Sherbrooke, Canada, is stable but concentrations are increasing
Elisabeth Levac
ID: 090

Indoor Aerobiology

November 18th, 2020 | 11.30 – 13.00 h (UCT +1)

Moderators: Roberto Albertini and Helena Ribeiro

O.038 | Indoor air fungal contamination in a university building
Albertini R., Capobianco E., Colucci ME., Viani I., Affanni P., Zoni R., Veronesi L., Pasquarella C.
ID: 167

O.039 | Monitoring of pollen-related allergenic potential present in an indoor environment
Helena Ribeiro, Catarina Pereira, Bruno Silva, Maria Fernández-González, Sónia G. Pereira, Ilda Abreu
ID: 106

O.040 | Quantification of indoor pollen concentrations of mountain cedar (*Juniperus ashei*) during rainy episodes in Austin, Texas
Susanne Jochner-Oette, Johanna Jetschni, Darren Cattle, Petra Liedl, Annette Menzel
ID: 018

O.041 | Humans' invisible companions in their residences
Ioanna Pyrri, Asimina Stamatelopoulou, Dimitra Pardali, Thomas Maggos
ID: 108

O.042 | House Dust Mites are an external source of pro-inflammatory HODEs that contribute to HDM allergenicity
Nestor González Roldán, Petra Behrens, Sylvia Düpow, Regina Engel, Katharina Jakob, Uta Jappe, Katarzyna Anna Duda
ID: 134

Bioaerosols and Molecular

November 18th, 2020 | 13.30 – 15.30 h (UCT +1)

Moderators: Łukasz Grewling and Jordina Belmonte

O.043 | Pollen production of genetically identical birch trees in a seed plantation
Surendra Ranpal, Miriam Sieverts, Verena Wörl, Johanna Jetschni, Stefani Gilles, Kira Köpke, Maria Landgraf, Franziska Kolek, Daria Luschkova, Claudia Traidl-Hoffmann, Carmen Büttner, Athanasios Damialis, Susanne Jochner-Oette
ID: 039

O.044 | Is there a relationship between the meteorological conditions, bioaerosol dispersion and the largest Legionnaires' disesase outbreak ever occured in Italy?
Maira Bonini, Marino Faccini, Antonio Giampiero Russo, Serafina Cammarata, Eros Santo Barrese, Valentina Ceriotti, Sabrina Senatore, Anna Lamberti, Giorgio Ciconali, Sara Tunesi, Rossella Murtas, Monica Sandrini, Sonia Vitaliti, Marina Foti, Gabriella Gentili, Elisabetta Graziano, Maria Gramegna, Danilo Cereda, Gianuario Aulicino, Silvana Castaldi, Antonietta Girolamo, Maria Grazia Caporali, Maria Scaturro, Maria Cristina Rota, Maria Luisa Ricci
ID: 026

O.045 | Species-specific traits affecting the local exposure to *Artemisia* allergens
Łukasz Grewling, Paweł Bogawski, Łukasz Kostecki, Agata Szymańska, Małgorzata Nowak, Agata Frątczak
ID: 075

O.046 | Airborne microarthropods in Catalonia (NE Spain)
Víctor Sarto i Monteys, Concepción De Linares, Jordina Belmonte
ID: 127

O.047 | Not only pollen: fine particulate emissions from early flowering trees
Julia Burkart, Jürgen Gratzl
ID: 199

O.048 | Molecular detection of airborne fungi
C. Pogner, V. Unterwurzacher, J. Strauss and M. Gorfer
ID: 081

O.049 | How to increase the sensitivity of a biosensor based on a nanowire field-effect transistor to virus bioaerosol samples
Aleksandr Safatov, Vladimir Generalov, Konstantin Generalov, Galina Buryak, Anastasia Cheremiskina, Olga Naumova, Elza Zaitseva, Alexander Aseev
ID: 008

O.050 | High-Throughput DNA Sequencing Defines Spatiotemporal Shifts In Airborne Grass Pollen Communities At Species Level
Gareth Wyn Griffith, Caitlin Potter, Georgina L. Brennan, Carsten A. Skjøth, Matthew Hegary, Nicholas J. Osborne, Ben W. Wheeler, Francis M. Rowney, Adam Barber, Helen M. Hanlon, Yolanda Clelow, Rachel N. McInnes, Charlotte Armitage, Alexander Kurganskiy, Geoff M. Petch, Beverley Adams-Groom, Simon Creer
ID: 032

Forecasting and Modeling

November 18th, 2020 | 16.30 – 18.30 h (UCT +1)

Moderators: Andreas Pauling and Alexander Kurganskiy

O.051 | Different approaches for interpolating missing pollen data in aerobiology
Antonio Picornell, Jesús Rojo, Jose Oteros, María del Mar Trigo, Rocío Ruiz-Mata, Baltasar Cabezudo, Marta Recio
ID: 042

O.052 | Main factors affecting pollen abundance within cities in the Iberian Mediterranean region
Jesús Rojo, Stella Moreno-Grau, Beatriz Lara, José María Moreno-Grau, Jorge Romero-Morte, Belén Elvira-Rendueles, Rosa Pérez-Badia
ID: 198

O.053 | Tracking birch and grass pollen levels in Belgium
Willem W. Verstraeten, Nicolas Bruffaerts, Rostislav Kouznetsov, Marijke Hendrickx, Mikhail Sofiev, Andy W. Delcloo
ID: 017

O.054 | Predicting the severity of the upcoming grass pollen season and the effect of climate change in Northwest Europe
Alexander Kurganskiy, Simon Creer, Gareth W. Griffith, Nicholas J. Osborne, Benedict W. Wheeler, Rachel N. McInnes, Yolanda Clewlow, Adam Barber, Georgina L. Brennan, Helen M. Hanlon, Matthew Hegarty, Caitlin Potter, Francis Rowney, Beverley Adams-Groom, Geoff M. Petch, Catherine H. Pashley, Jack Satchwell, Letty de Weger, Karen Rasmussen, Gilles Oliver, Charlotte Sindt, Nicolas Bruffaerts, Carsten A. Skjøth
ID: 117

O.055 | Clustering hourly patterns of Olea pollen concentrations along the pollen season
Santiago Fernández-Rodríguez, Rafael Tormo-Molina, José María Maya-Manzano, Inmaculada Silva-Palacios, Alejandro Monroy-Colín, Raúl Pecero-Casimiro, Jeroen Buters, Jose Oteros
ID: 118

O.056 | Application of the pollen-SILAM CTM for aphid migration forecasts
Pilvi Siljamo, Matti Leskinen, Erja Huusela-Veistola, Seppo Neuvonen
ID: 067

O.057 | Quantifying the uncertainty of the numerical pollen dispersion model COSMO-ART: first experiences using ensemble simulations
Andreas Pauling, Daniel Leuenberger
ID: 109

O.058 | Air mass trajectories and land cover map reveal cereal crops as major local sources of Alternaria spores in Worcester and Leicester, UK
Godfrey. P Apangu, Carsten. A Skjoth, Beverley Adams-Groom, Carl. A Frisk, Catherine. H Pashley, Jack Satchwell
ID: 070

O.059 | Incorporation of pollen data in source maps is vital for pollen dispersion models
Alexander Kurganskiy, Carsten Ambelas Skjøth, Alexander Baklanov, Mikhail Sofiev, Annika Saarto, Elena Severova, Sergei Smyshlyaev, Eigil Kaas
ID: 112

Fungal Spores

November 19th, 2020 | 09.30 – 10.30 h (UCT +1)

Moderators: Athanasios Damialis and Estefanía Sánchez

O.060 | Long-term Trends in the Tulsa Air Spora
Estelle Levetin, Josh McLoud
ID: 040

O.061 | A walk in the park: Exposure to fungal spores changes the nasal mycobiome and increases nasal inflammatory responses to grass pollen
Denise Rauer, Selina Herrmann, Franziska Kolek, Vera Schwierzeck, Fiona Skottke, Vivien Leier-Wirtz, María Pilar Plaza, Claudia Traidl-Hoffmann, Athanasios Damialis, Stefanie Gilles
ID: 179

O.062 | *Alternaria* spores behaviour in the atmosphere of Salamanca (MW Spain)
Sánchez Reyes E., Rodríguez de la Cruz D., García Sánchez A., Dávila I., Sánchez Sánchez J.
ID: 078

O.063 | Seasonal behaviour of *Alternaria* airborne spores in Santiago de Chile, Chile (2005-2015 period)
Estefanía Sánchez Reyes, Alicia Córdova Jara, José Sánchez Sánchez, Pedro Mardones Precht
ID: 151

O.064 | Comparison of *Alternaria* spore concentrations between two zones within the same city in Salamanca (Middle West of Spain)
Fuentes Antón, S., Rodríguez de la Cruz D., Sánchez Sánchez, J., García Sánchez A., Dávila I., Sánchez Reyes E.
ID: 146

Health Impact

November 19th, 2020 | 11.30 – 13.00 h (UCT +1)

Moderators: Sevcan Çelenk and Maria Pilar Plaza

O.065 | The relationship between *Platanus* sp. pollen and the pollen allergen Pla a1 in the atmosphere of Northwest Turkey
Sevcan Çelenk, Matt Smith, Hulusi Malyer, NIhat Sapan
ID: 202

O.066 | Personal pollen monitoring and symptom scores by grass pollen allergic patients
Letty A de Weger, Peter Th. W van Hal (4), Bernadette Bos, Frank Molster, Raheel Gill, Marijke Mostert, Pieter S Hiemstra
ID: 023

O.067 | Inhalant Allergen Sensitization and Symptoms in Istanbul
Franziska Zemmer, Cenk Evren, Åslög Dahl Dahl, Carmen Galán, Fatih Özkaragöz
ID: 092

O.068 | Delivery of the allergy-related information to a target audience: Ukrainian case
Victoria Rodinkova, Danylo Tovstyk, Serhii Yuriev
ID: 171

O.069 | An overview of airborne pollen distribution and allergenicity in the Philippines
Maureen Sabit
ID: 193

O.070 | Health impacts of long-distance transport of aeroallergens? A new perspective based on a real-life human cohort on the alps
Maria P. Plaza, Daniela Bayr, Franziska Kolek, Vivien Leier-Wirtz, Stefanie Gilles, Claudia Traidl-Hoffmann, Athanasios Damialis
ID: 102

O.071 | Comparative study of airborne concentrations of Ole e 1 and pollen from the Oleaceae family in Barcelona (Catalonia, NE Spain)
Jordina Belmonte, Concepción De Linares
ID: 135

O.072 | Thunderstorm-related respiratory symptoms in pollen allergics: a personalised biomonitoring approach
Stefanie Gilles, Franziska Kolek, Daniela Bayr, Maria Pilar Plaza, Vivien Leier-Wirtz, Annette Straub, Stefanie Seubert, Michael Gerstlauer, Christoph Beck, Andreas Philipp, Claudia Traidl-Hoffmann, Athanasios Damialis
ID: 096

O.073 | New methodology for the measurement of airborne allergens
Concepción De Linares, Jordina Belmonte, Rosario Delgado
ID: 115

Environmental Pollution

November 19th, 2020 | 16.30 – 18.30 h (UCT +1)

Moderators: Dorota Myszkowska and Celia Antunes

O.074 | Traffic related pollution in urban environments enhanced Platanus hybrida pollen allergenicity
Celia M. Antunes, Marta Otílio, Ana Galveias, Beatriz Lara, Mª João Costa, Jesus Rojo, Ana R. Costa, Rosa Perez-Badia
ID: 145

O.075 | Possible relationship between the physiological conditions of Betula pendula and physico-chemical properties of its pollen at selected sites in Lesser Poland
Monika Ziemianin, Andrzej Skoczowski, Jakub Oliwa, Diana Saja, Magdalena Ryś, Iwona Stawoska, Dorota Myszkowska
ID: 176

O.076 | Bioaerosol monitoring in the study of the impact of air pollution on building stones in the Pò Valley urban site (Italy)
Paola De Nuntiis, Alessandro Sardella, Giorgia Vidorni, Adelaide Dinoi, Daniele Contini, Carmela Vaccaro, Delia Fernandez Gonzalez, Alessandra Bonazza
ID: 195

O.077 | Modification of lipids of allergenic pollen grains by ozone
Nicolas Visez, Jinane Farah, Sylvie Gosselin, Marie Choël
ID: 137

O.078 | Pollution of Birch Catkins and Pollen Grains by Atmospheric Particulate Matter
Marie Choël, Karine Deboudt, Xavier Secordel, Nicolas Visez
ID: 055

New Methods for Detection and Analysis I

November 20th, 2020 | 09.30 – 10.30 h (UCT +1)

Moderators: Fiona Tummon and Jeroen Buters

O.079 | Artificial Intelligence - enabled system for automatic detection of airborne pollen
Danijela Tešendić, Danijela Boberić Krstićev, Predrag Matavulj, Branko Sikoparija
ID: 006

O.080 | Approaches to utilization of the real-time pollen observations in pollen dispersion modelling
Mikhail Sofiev, Andreas Uppstu
ID: 201

O.081 | Swiss automatic pollen network: deployment of first devices and rethinking pollen at MeteoSwiss
Crouzy Benoît, Clot Bernard, Tummon Fiona, Lieberherr Gian, Pauling Andreas, Gehrig Regula, Graber Marie-José, Sallin Christine, Konzelmann Thomas, Calpini Bertrand
ID: 187

O.082 | Real-time Automatic Pollen Recognition: Know-How in Lithuania
Ingrida Šaulienė, Laura Šukiene, Gintautas Daunys, Gediminas Valiulis, Lukas Vaitkevicius, Mikhail Sofiev
ID: 045

O.083 | Assessing automatic pollen monitoring systems using controlled chamber measurements
Benoît Crouzy, Bernard Clot, Fiona Tummon, Gian Lieberherr, Konstantina Vasilatou, Eric Sauvageat, Thomas Konzelmann, Bertrand Calpini
ID: 189

O.084 | Validation of an operational automatic pollen monitoring network based on image recognition
Jeroen Buters, Jose Oteros, Alisa Weber, Susanna Kutzora, Jesus Rojo, Stefanie Heinze, Caroline Herr, Robert Gebauer, Carsten Schmidt-Weber
ID: 050

New Methods for Detection and Analysis II

November 20th, 2020 | 12.30 – 13.30 h (UCT +1)

Moderators: Bernard Clot and Mikhail Sofiev

O.088 | Sensitivity and efficiency of Rapid-E calibrations
Julia Palamarchuk, Olga Sozinova, Laura Šukiene, Sanna Pätsi, Maria Louna-Korteniemi, Lukas Vaitkevičius, Gintautas Daunys, Evgeny Kadantsev, Reto Abt, Yanick Zeder, Lucie Fortova, Benoît Crouzy, Branko Sikoparija, Ingrida Šaulienė, Mikhail Sofiev
ID: 181

O.085 | Data prefiltering in calibrations of Swisens Poleno air-flow cytometer
Evgeny Kadantsev, Yanick Zeder, Reto Abt, Yuliia Palamarchuk, Olga Sozinova, Laura Šukiene, Sanna Pätsi, Maria Louna-Korteniemi, Lukas Vaitkevičius, Gintautas Daunys, Lucie Fortova, Benoît Crouzy, Branko Sikoparija, IngridaŠaulienė, Mikhail Sofiev
ID: 192

O.086 | What's really in the air? A season of pollen counts from automatic instruments
Fiona Tummon, Bernard Clot, Benoît Crouzy, Gian Lieberherr, Shigeto Kawashima, José Manzano, David O'Connor
ID: 093

O.087 | Digitization of Samples and Automated Evaluation of Its Microscopic Particles
Lars Hildebrand, Juliana Kaup, Georg Meinardus-Hager
ID: 139

O.089 | An automatic sensor for cypress pollen identification: Preliminary results from PS2
Sevcan Çelenk
ID: 203

O.090 | Automatic bioaerosol identification with Swisens Poleno System and system reliability
Reto Abt, Philipp Burch, Elias Graf, Erny Niederberger, Yanick Zeder
ID: 143 and 143

POSTER SESSIONS

Bioaeroso

Environm

Im

POSTER SESSION 1

Phenology Climate Change and Basic Aerobiology

November 17th, 2020 | 10.30 – 11.30 h (UCT +1)

Moderators: María Fernández and Carl Frisk

P.001 | The European Aerobiology Society: an association in action for multidisciplinary research on aerobiology
Ingrida Šaulienė, Jordina Belmonte, Letty de Weger, Regula Gehrig, Gilles Oliver, Michel Thibaudon
ID: 034

P.002 | Analysis of distance range characteristics of Castanea pollen
Herminia Garcia-Mozo, Rocio Lopez-Orozco, Miguel Angel Hernandez-Ceballos, Carmen Galan
ID: 186

P.003 | First phenological and aerobiologial assessment of olive orchards at the Northern limit of the Mediterranean bioclimatic area
Garrido A., Álvarez-López S., Piña-Rey A., González-Fernández E., Fernández-González M., Aira M.J., Rodríguez-Rajo F.J.
ID: 085

P.004 | Floral phenology trends in a Mediterranean Natural Park during the last two decades
Herminia Garcia-Mozo, Rocio Lopez-Orozco, Alejandro Morales, Jose Oteros, Galan Carmen
ID: 077

P.005 | Phenological and aerobiological grapevine trends in the Ribeiro D.O. area
Alba Piña-Rey, Maria Fernández-González, Sabela Álvarez-López, Alejandro Garrido, Estefania González-Fernández, M. Jesús Aira, F. Javier Rodríguez-Rajo
ID: 086

P.006 | Extreme precipitation and climate change in the Iberian Peninsula: possible aerobiological consequences
M. Carmen Casas-Castillo, Raúl Rodríguez-Solà, Amanda García-Marín, Xavier Navarro, Cristina Periago, Marta Alarcón
ID: 122

P.007 | Analysis of changes in the start of the *Betula* pollen season in Lublin (Poland) in 2001-2019
Agnieszka Kubik-Komar, Krystyna Piotrowska-Weryszko, Izabela Kuna-Broniowska, Elżbieta Weryszko-Chmielewska, Bogusław Michał Kaszewski
ID: 210

P.008 | Long-term airborne pollen monitoring in southern Bavaria: time series analysis with implications for land use and climate
Stephan Jung, Ye Yuan, Annette Menzel
ID: 123

P.009 | Aerobiology of olive pollen (*Olea europaea* L.) in the atmosphere of Portugal
C. Penedos, E. Caeiro, B. Tavares, J. Fonseca, P. Carreiro-Martins, R. Rodrigues-Alves, M. Branco Ferreira
ID: 211

P.010 | Pollen production and androsterility in olive cultivars
María de las Mercedes Rojas-Gómez, Rocío López-Orozco, Diego J. Cabello Pozo, Concepción Muñoz Díez, Diego Barranco Navero, Carmen Galán Soldevilla
ID: 125

P.011 | Spatial flowering patterns in *Dactylis glomerata* populations
Carl A Frisk, Beverley Adams-Groom, Carsten A Skjøth
ID: 099

P.012 | Comprehensive study of the phylogenetic and environmental characteristics involved in the flowering timing of grass species
Jorge Romero-Morte, Jesús Rojo, Ana Costa, Beatriz Lara, Ana Galveias, Alicia Serrano, Celia Antunes, Rosa Pérez-Badia
ID: 165

POSTER SESSION 2
Green Urban Spaces Pollution and Basic Aerobiology
November 17th, 2020 | 15.30 – 16.30 h (UCT +1)

Moderators: Santiago Fernández-Rodríguez and Emma Markey

P.013 | Study of the correlation between the precipitation ETCCDI and airborne pollen in the NE of the Iberian Peninsula
Raúl Rodríguez-Solà, M. Carmen Casas-Castillo, Jiang Ji Ho Zhang, Ricard Kirchner, Marta Alarcón, Cristina Periago, Concepción De Linares, Jordina Belmonte
ID: 140

P.014 | Potential contribution of distant sources to the airborne *Betula* pollen transport over NE Iberian Peninsula
Marta Alarcón, Cristina Periago, Jiang Ji Ho, Concepción De Linares, Jordina Belmonte
ID: 110

P.015 | Proposal of LIDAR applied in ISTRAM BIM for Environmental Impact Assessments based on urban green infrastructure and aerobiological air quality
Santiago Fernández-Rodríguez, Juan Francisco Coloma-Miró, Marta García-García, Eva Quevedo-Martínez, Marta Fernández-Ramos, Raúl Pecero-Casimiro, Roberto Cintas-Leal, Juan Jesús Hidalgo-Barquero, José María Maya-Manzano
ID: 074

P.016 | Light Detection and Ranging on Building Modelling Information as tool for urban planning by green infrastructure of Cupressaceae spp
Eva Quevedo-Martínez, Santiago Fernández-Rodríguez, Juan Pedro Cortés-Pérez, José María Maya-Manzano, Marta García-García, Juan Francisco Colomá-Miró, Raúl Pecero-Casimiro
ID: 073

P.017 | Airborne pollen flora of Manila, Philippines
Maureen Sabit
ID: 196

P.018 | Effect of meteorological parameters on *Cupressaceae* pollen prevalence in southwestern Iberia
Ana Galveias, Maria João Costa, Juan Luís Guerrero-Rascado, Paloma Cariñanos, Ana Rodrigues Costa & Célia M. Antunes
ID: 177

P.019 | Airborne fungal spore monitoring: between analyst proficiency testing
Carmen Galan, Matt Smith, Anasthasios Damialis, Giuseppe Frenguelli, Regula Gehrig, Agnieszka Grinn-Gofroń, Ingrida Kasprzyk, Donat Magyar, Jose Oteros, Ingrida Šaulienė, Branko Sikoparija, Michel Thibaudon
ID: 182

P.020 | Preliminary Findings of the Irish Pollen Monitoring Network
Emma Markey, Jerry Hourihane Clancy, Jose María Maya-Manzano, Eoin McGillicuddy, Paul Dowding, David O'Connor
ID: 164

P.021 | Urban real allergenic load on the atmosphere of Ourense NW Spain
Sabela Álvarez-López, Alejandro Garrido, Alba Piña-Rey, Estefania González-Fernández, Maria Fernández-González, M. Jesús Aira, F. Javier Rodríguez-Rajo
ID: 083

P.022 | Effect of temperatures on different adhesive sampling efficiency of Hirst-type traps
Sabine Fürst, Joana Cadeias, José Oteros, Susanne Jochner-Oette, Jeroen Buters
ID: 209

P.023 | Urban atmospheric levels of allergenic pollen: comparison of two samplers located in Salamanca (Middle West Spain)
Sergio Fuentes Antón, Estefania Sánchez Reyes, David Rodríguez de la Cruz, Asunción García Sánchez, Ignacio Dávila, José Sánchez Sánchez
ID: 152

POSTER SESSION 3

Indoor and Basic Aerobiology

November 18th, 2020 | 10.30 – 11.30 h (UCT +1)

Moderators: Matthias Werchan and Jose M. Maya-Manzano

P.024 | *The Investigation of Particulate Matter and Microfungi in Public Indoor Environments*
Ilona Keriene, Audrius Dagelis
ID: 031

P.025 | ALIX as a possible marker for pollen-released nanovesicles
Chiara Suanno, Elisa Tonoli, Enzo Fornari, Maria Pia Savoca, Iris Aloisi, Luigi Parrotta, Elisabetta Verderio Edwards, Stefano Del Duca
ID: 157

P.026 | Evolution of *Cladosporium* sp. and *Aspergillus/Penicillium type spores* in Jaén cathedral (Spain)
Ruiz-Valenzuela L., Aguilera-Padilla, F., Montejo-Palacios, E.
ID: 128

P.027 | Diversity and seasonality of fungal propagules in the museum of the Cathedral of Jaén (Spain)
Fátima Aguilera Padilla, Luis Ruiz Valenzuela, Elena Montejo Palacios
ID: 130

P.028 | Does the pollen of *Ailanthus altissima* (Tree-of-heaven) need more attention in Central Europe?
Matthias Werchan, Barbora Werchan, Karl-Christian Bergmann
ID: 170

P.029 | Influence of meteorological parameters and air quality on *Alternaria* spore concentration
Alberto Rodríguez-Fernández, Sheila Díez-Casado, Ana María Vega-Maray, Tibor Molnár, Rosa María Valencia-Barrera, Delia Fernández-González
ID: 154

P.030 | Removal of House Dust Mite allergens from homes using air purifiers
Maya-Manzano, J.M, Pusch, G, Ebner Von Eschenbach, C, Karg, E, Scheja, M.M, Schmidt-Weber, C, Buters J.
ID: 213

P.031 | Airborne Pollen Composition and Pollen Load during the Vegetation Season in Lithuania
Laura Šukiene, Ingrida Šaulienė
ID: 035

P.032 | Late exposure to grass pollen in September: The case of *Phragmites* in Burgenland
Maximilian Bastl, Katharina Bastl, Lukas Dirr, Thomas Zechmeister, Uwe Berger
ID: 037

P.033 | Application of quantitative TaqMan PCR to monitor airborne fungal spores with impact on crop performance and human health
M.D. Campos, E. Caeiro, M.R. Felix, B. Tomero, A. Peixe, C. Nunes, E. Pedro, M.B. Ferreira, H. Cardoso
ID: 047

P.034 | Air fungal contamination in hospital operating theatres and cleanrooms
Roberto Albertini, Simonetta Turchi, Pietro Vitali
ID: 094

P.035 |*Alternaria* spores behaviour in the atmosphere of Salamanca (MW Spain) and Tulsa (Middle South USA) during 2014-2016 period
Estefanía Sánchez Reyes, Asunción García Sánchez, Ignacio Dávila, José Sánchez Sánchez, Josh McLoud, Estelle Levetin
ID: 104

POSTER SESSION 4

Ragweed and Basic Aerobiology

November 18th, 2020 | 15.30 – 16.30 h (UCT +1)

Moderators: Elena Severova ang Gilles Oliver

P.036 | Evolution of ragweed pollination in France
Samuel Monnier, Michel Thibaudon, Gilles Oliver, Charlotte Sindt
ID: 012

P.037 | Ragweed Finder App – A useful citizen science approach to contain the spreading of ragweed in Austria
Katharina Bastl, Johannes M. Bouchal, Maximilian Bastl, Lukas Dirr, Uwe E. Berger
ID: 068

P.038 | IRS (International Ragweed Society), an international tool to help Ambrosia management
Michel Thibaudon, Roberto Albertini, Maira Bonini, Sevcan Celenk, Sandra Citterio, Laszlo Makra, Gilles Oliver, Olivier Pechamat, Uwe Starfinger
ID: 011

P.039 | Monitoring of Ambrosia pollen in Southern and Central Russia
Elena Severova, Dmitry Britsky, Ella Churyukina, Elena Goloshubova, Vera Karaseva, Nadezhda Milchenko, Anatoly Moroz, Ivan Pavlyuchenko, Yulia Selezneva, Olga Ukhanova, Irina Zheltova
ID: 142

P.040 | Exposure to ragweed pollen in Slovenia
Anja Simčič, Andreja Kofol Seliger, Tom Koritnik
ID: 156

P.041 | Extreme Pollen Episodes: criteria for typifying and effect of atmospheric conditions
Paloma Cariñanos, Juan Luis Guerrero-Rascado, Rubén de la Torre, Juan Manuel Leyva, Inmaculada Foyo-Moreno, Inmaculada Alados, Lucas Alados, Consuelo Díaz de la Guardia
ID: 021

P.042 | Are Aerobiology and Anemophily two faces of the same reality?
Tiana Custodio, Paul Comtois
ID: 056

P.043 | Intradiurnal dynamics of grass pollen occurrence in Kraków, Poland
Piotrowicz Katarzyna, Stępalska Danuta, Myszkowska Dorota
ID: 095

P.044 | Relationship between cereal harvest and concentration of grass pollens in Toledo area in the period from 1995 to 2019
Jose Alejandro Lemus Calderón, Raúl Gúzman Rodriguez, Angel Moral de Gregorio, Carlos Jesús Senent Sanchez
ID: 054

POSTER SESSION 5

Health Impact

November 19th, 2020 | 10.30 – 11.30 h (UCT +1)

Moderators: Pia Viuf Ørby and Timo Hugg

P.045 | Pla a 1 allergen and Platanus pollen in the atmosphere of Porto
Maria Fernández-González, Helena Ribeiro, Javier Rodríguez-Rajo, Ilda Abreu
ID: 163

P.046 | Health Behaviour of Lithuania's Residents during the Airborne Pollen Season
Ingrida Šaulienė, Gintautas Daunys, Laura Šukiene
ID: 036

P.047 | How to do a clinical trial? Recommendation from the aerobiological point of view
Katharina Bastl, Maximilian Bastl, Lukas Dirr, Uwe Berger
ID: 038

P.048 | Chamber study of co-exposure to ozone and allergen
Pia Ørby, Jakob Bønløkke, Bo Martin Bibby, Peter Ravn, Ole Hertel, Torben Sigsgaard, Vivi Schlünssen
ID: 064

P.049 | Early warning system application (APK) for patients with severe asthma
Alicia Armentia, Sara Fernández Cortés, Ángela Moro Simón, Sara Martín Armentia, Blanca Martín Armentia, David Astruga, Mariano Garuz, Alberto Rodríguez-Fernández, Delia Fernández-González
ID: 159

P.050 | Is Pla a 1 overexpression a feature of polluted environments?
Ana Rodrigues Costa, Beatriz Lara, Ana Galveias, Marta Otílio, Jesus Rojo, Célia M Antunes, Rosa Pérez-Badía
ID: 194

P.051 | Allergenic effects of Air-Liquid-Interface exposures to natural whole pollen with or without diesel particles
Joana Candeiras, Elias Zimmermann, Christoph Bisig, Sebastian Öder, Ralf Zimmermann, Carsten Schmidt-Weber, Jeroen Buters
ID: 208

P.052 | Effect of the airborne *Betulaceae* pollen and Bet v1 content in the symptomatology of sensitized patients
Rodríguez-Rajo F.J., Estévez-Valencia L., Fernández-González M., Sánchez-Sánchez N.J., Alves-Pérez M.T., Hernández-Gómez M.A.
ID: 087

P.053 | Ole e 1 detection in three varieties of *Olea* pollen in different regions of Portugal
Fernández-González, M., Ribeiro, H., Rodríguez-Rajo, F.J., Abreu, I.
ID: 131

P.054 | Comparison of Poaceae pollen and Phl p 5 allergen concentrations in the bioaerosol of two monitoring stations in Bratislava (Slovakia)
Jana Ščevková, Zuzana Vašková, Regina Sep šiová, Janka Lafférsová
ID: 168

P.055 | Personal symptom forecasting vs allergy risk: longitudinal and cross-sectional approaches to predicting pollen allergy
Mikhail Sofiev, Julia Palamarchuk, Olga Sozinova, Rostislav Kouznetsov, Uwe Berger, Jean Bosquet
ID: 150

P.056 | Personal and regional exposure to birch pollen and the risk of allergic and asthmatic manifestations
Timo T Hugg, Qianlai Luo, Taina K Lajunen, Maritta S Jaakkola, Jouni JK Jaakkola
ID: 114

POSTER SESSION 6

Forecasting and Basic Aerobiology

November 19th, 2020 | 15.30 – 16.30 h (UCT +1)

Moderators: Cristina Periago and Nicolas Bruffaerts

P.057 | Influence of weather types and meteorological conditions on pollen concentration in NW Spain
F. Oduber, C. Blanco-Alegre, A.I. Calvo, A. Castro, D. Fernández-González, R.M. Valencia-Barrera, A.M. Vega-Maray, A. Rodríguez-Fernández and R. Fraile
ID: 079

P.058 | A hazel density distribution over Europe for numerical pollen modelling
Kalcher, M., Scheifinger H.
ID: 178

P.059 | Preliminary results from the Irish Fungal Monitoring Network, Fungal mOnitoring NeTwork ANd Algorithm (FONTANA)
Jerry Hourihane Clancy, Emma Markey
ID: 175

P.060 | Below cloud scavenging of pollen during rainfall events (2012-2018) in NW Spain
Carlos Blanco-Alegre, Ana Isabel Calvo, Fernanda Oduber, Amaya Castro, Delia Fernández-González, Rosa María Valencia-Barrera, Ana María Vega-Maray, Alberto Rodríguez-Fernández, Tibor Molnár, Roberto Fraile
ID: 025

P.061 | Variations in *Corylus* pollen exposure in Lombardy (Northern Italy)
Maira Bonini, Valentina Ceriotti, Daniela Carcano, Giuseppe Cislaghi, Paola Colombo, Susanna Dellavedova, Elena Chiodini, Daniele Berra, Marco Maggi, Anna Molinari, Simona Vercelloni, Paolo Mascagni, Elena Ferraioli, Maria Cristina Tacca, Antonio Meriggi, Ezio Bellinzona, Alberto Pini, Barbara Paganoni, Cristina Somenzi, Attilio Bertolotti, Nicoletta Cornaggia, Agostina Panzeri, Maria Gramegna
ID: 027

P.062 | Pollen spread in Mediterranean Basin
M.A. Brighetti, A. Travaglini, P.M. Matricardi, A. Miraglia, S. Dramburg
ID: 207

P.063 | Influence of extreme winter temperatures on the airborne pollen parameters in NE Iberian Peninsula
Cristina Periago, Marta Alarcón, Jiang Ji Ho, Concepción De Linares, Jordina Belmonte
ID: 113

P.064 | Trends of airborne fungal spore concentrations in Belgium: a multi-site analysis on almost four decades
Nicolas Bruffaerts, Lucie Hoebeke, Caroline Verstraeten, Andy Delcloo, Marijke Hendrickx
ID: 184

P.065 | A methodological approach to estimate the relationship between pollen producing sources and their atmospheric content: The case of the chestnut tree in Castilla y León (Spain)
David Rodríguez de la Cruz, José Ángel Sánchez Agudo, Iván Barbero-Bermejo, Laura Núñez Crespo, Rosa María Valencia-Barrera, Ana María Vega-Maray, Delia Fernández-González
ID: 088

P.066 | Seasonal priming estimated by non-linear regression model
Pia Ørby, Jakob Bønløkke, Bo Martin Bibby, Peter Ravn, Ole Hertel, Torben Sigsgaard, Vivi Schlünssen
ID: 062

P.067 | Pollen production of Poaceae species in Central Russia
Elena Severova, Yulia Selezneva, Vera Karaseva
ID: 141

POSTER SESSION 7
New Methods and Bioaerosols and MolecularAerobiology
November 20th, 2020 | 10.30 – 11.30 h (UCT +1)

Moderators: Laura Šukiene and Susanne Jochner-Oette

P.068 | Fluorescence Peculiarities of Ozone-Exposed Pollen
Laura Šukiene, Ingrida Šaulienė, Gintautas Daunys, Gediminas Valiulis, Alfredas Lankauskas
ID: 033

P.069 | Applying LiDAR technology in bioaerosol sensing over Athens, Greece
Stephen Constantine Richardson, Michalis Mytilinaios, Romanos Foskinis, Christina Kyrou, Alexandros Papayannis, Ioanna Pyrri, Eleni Giannoutsou, Ioannis Dimosthenis Adamakis
ID: 133

P.070 | Biotic and abiotic effects on pollen production and allergenicity of birch and related health impacts: a European study
Susanne Jochner-Oette, Surendra Ranpal, Maria Landgraf, Carmen Büttner, Daria Luschkova, Franziska Kolek, Kira Köpke, Miriam Sieverts, Verena Wörl, Stefanie Gilles, Athanasios Damialis, Claudia Traidl-Hoffmann
ID: 148

P.071 | Comparison between airborne pollen concentrations collected with Hirst type traps using different sampling inlets
Gordan Mimic, Branko Sikoparija
ID: 005

P.072 | Defining pollen and spore counts using metabarcoding
Mary Hanson, Beverley Adams-Groom, Godfrey Apangu, Carl Frisk, Carsten Skjoth
ID: 153

P.073 | Pollution of the urban atmosphere by non-native allergenic oak pollen originating from parks and gardens
Maria Grundström, Beverley Adams-Groom, Mary Hanson, Geoffrey Petch, Carsten Skjoth
ID: 185

P.074 | Comparison of biological components concentrations in an aerosol sampled over Vasyugan marshes and over the Karakan forest
Aleksandr Safatov, Irina Andreeva, Galina Buryak, Olesya Ohlopkova, Sergei Olkin, Irina Reznikova, Nadezhda Solovyanova, Boris Belan, Alexander Fofonov, Denis Simonenkov, Tatyana Alikina, Marsel Kabilov and Dmitrii Pysnyi
ID: 212

P.075 | Detecting and measuring *Botrytis cinerea* spores using recombinant antibody binding fragments (Fabs) in air samples
Roy Kennedy, Rachel Osborn, Alison Wakeham, Andrew Bentham, Eithne Brown
ID: 103

P.076 | Preliminary study on immunodetection of Botrytis cinerea germinative material recorded in a vineyard atmosphere
Estefanía González-Fernández, Roy Kennedy, Rachel Osborn, María Fernández-González, F. Javier Rodríguez-Rajo
ID: 111

KEYNOTES LECTURES

Bioaeroso

Environm

Im

KEYNOTE LECTURE | Bioaerosols and health impacts

Michel Thibaudon, Jean-Pierre Besancenot
RNSA, BRUSSIEU France

Keywords: bioaerosol, aerobiology, heath impact

A bioaerosol is usually defined as a suspension of tiny particles that are composed of or derived from living organisms. These particles are small enough or sufficiently volatile to achieve aerial dispersion along with non-biological material. They range in size from several nanometres to approximately hundred micrometres in aerodynamic diameter; however, they frequently agglomerate in clusters. Categories include bacteria and archaea, fungal spores, pollen grains, viruses, algae and cyanobacteria, and some derivatives such as endotoxins, glucans, allergens, and mycotoxins. Their atmospheric residence times range from hours to weeks and even to a near indefinite time frame. Impaction, filtration, and impingement are the techniques most commonly used for bioaerosol sampling. Then identification and quantification of the various bioaerosol compounds require physical, chemical and biological techniques such as cultivation, microscopy, immunological methods, chemical tracers, DNA/RNA analysis, fluorescence detection, as well as optical and mass spectrometry.
The interest in bioaerosol exposure has increased in recent times. This is largely because it is now recognized that exposures to biological agents in both the outdoor and indoor environments are associated with a wide range of adverse health effects, including contagious infectious diseases, acute toxic effects, and allergies. There also is renewed interest in bioaerosols for their potential use for bioterrorism.
For bioaerosols to be infectious, they must be viable and thus they must have the potential to multiply. These include airborne bacteria (as for tuberculosis or Legionnaire's disease), fungal spores (aspergillosis) but, first of all, viruses (influenza, measles, and novel coronavirus disease 2019…). Most of the agents responsible for respiratory infections are spread through the air and their concentration is one of the main factors determining the infectious potential. Relative humidity, temperature, and ultraviolet irradiation also modulate the dissemination and infectivity of bioaerosol agents.
Non-viable components of bioaerosols can induce toxic or hypersensibility reactions causing very many diseases, especially asthma, chronic bronchitis, organic dust toxic syndrome and farmer's lung.
It is well known that pollen and fungal spores are important sources of aeroallergens. IgE-mediated allergies, mainly leading to rhino-conjunctivitis, dry-cough and asthma, have shown a substantial increase in prevalence since the early 1960s.
Lastly, it must always be borne in mind that bioaerosol exposure is usually to a heterogeneous mixture of agents that need to be considered together. On another note, one should be clear that, if some of the bioaerosols that we inhale are clearly unhealthy, the vast majority of them are harmless or even essential for good health. As such, early exposure to microorganisms may, to a certain degree, protect children from atopy and asthma.

KEYNOTE LECTURE | Agriculture and forestry

Frenguelli G.
Department of Agricultural, Food and Environmental Sciences, University of Perugia, Italy

Keywords: agriculture, aerobiology, pollen, spore

The airborne particulate considered important in agriculture includes above all pollen, and spores; thus, when aerobiology is spoken of as being applied to agriculture and forestry, we understand the involvement of many sectors such as agronomy, plant pathology, forestry, mycology, botany, urban planning, palynology, biodiversity, spread of alien species and, more extensively, unwanted gene flow.
One major use of aerobiology is on airborne fungal spores relates to diseases of cultivated plants and forest resources, the dynamics of spread, appearance and recurrence of phytopathogenic with serious damage to agricultural areas. Their collection, isolation and rapid identification and knowledge about environmental factors that favor the development, allows to make predictions about their effects on the soil and then promptly intervene with programs aimed at optimizing plant protection. Effective management of many plan diseases requires the development of efficient and durable strategies to optimize fungicide application timings and amounts, taking into account the effect of climate variability on disease development and pathogen dispersal.
A second point is that the pollen monitoring and the analysis of their viability are extremely useful instruments to forecast the harvest for many cultivated wind-pollinated species, first of all olive, but also hazel, pistachio, oak, chestnut, vine, and other. We can accept that there is a relationship between the quantity and quality of pollen released by anthers, and therefore present in the atmosphere, and the percentage of fertilization. This measurement can give us in advance some information concerning fruit and seed production, and therefore enable the planning of the market and the mechanisms necessary to attenuate the effects of annual variation of the production.
One of the major problems that has always characterized the aerobiological studies is related to the difficulty of sampling the particulates and its recognition and quantification. Over the years, the means of capture have evolved considerably but for the future we need new monitoring systems, that allow us to study not only the presence of particulate matter at the soil level, but also an interest of the highest layers of the atmosphere, i.e. to obtain three-dimensional data of the vertical "clouds" of pollen or spores as, on the other hand, it is necessary to arrive to identify the thresholds of particulate which indicate the levels of risk to plant health or an optimal yield. We believe that this is an essential condition for adopting the use of automatic systems to create more opportunities for new discoveries and, above all, new applications of aerobiology in agriculture and forestry.

KEYNOTE LECTURE | Real time monitoring: beyond measurements

B. Clot, B. Crouzy, G. Lieberherr, F. Tummon and the AutoPollen consortium
MeteoSwiss, Chemin de l'Aérologie 1, 1530 Payerne, Switzerland

Keywords: pollen, real time information, automatic measurement, networks, infrastructure, collaboration

BACKGROUND AND OBJECTIVES

Recent developments in measurement technologies have paved the way to monitoring airborne biological particles automatically and in real time. The paradigm has shifted from counting and identifying a relatively small number of particles with labour intensive manual methods to high sampling rates achieved with automatic measurements that deliver data rapidly. The door is thus open for a much finer understanding of aerobiological processes, both on temporal and spatial scales.

MATERIAL AND METHODS

Since the 1960's, Hirst-type pollen and spore samplers have been used around the globe in pollen monitoring networks, with counting and identification of pollen grains being performed manually. Over the past decade, several automatic systems have been developed based on various technologies, which sometimes have been combined: light scattering, induced fluorescence, microscope imaging, and holography. In most systems, identification of particles is performed by artificial intelligence. These systems present very different characteristics and capabilities.

RESULTS

Recent research has shown that automatic systems are able to count and identify several pollen taxa, and in some cases, a small number of spore types. Depending on their technical characteristics, some instruments may be able to monitor a wide range of different bioaerosols; the full potential of many instruments has not been entirely explored.

CONCLUSIONS

The availability of high resolution aerobiological data means a much more detailed understanding of the factors influencing variations of airborne bioaerosol concentrations. However, to transform this technological breakthrough into real services of benefit to society and to ensure a success story for the community, work remains to assess the quality and reliability of the new measurements under different environmental conditions, to develop standards and quality control measures, and to enlarge the spectrum of taxa identified. Above all, there needs to be investment in the whole information chain, from measurement to interpretation, from real-time to forecasts, from raw data to end-user applications. As usual in aerobiology, these developments will only be possible through the collaboration of research groups from many different disciplines. These developments will only be possible through the collaboration of research groups from many different disciplines, for example, through the EUMETNET AutoPollen programme or the COST action ADOPT.

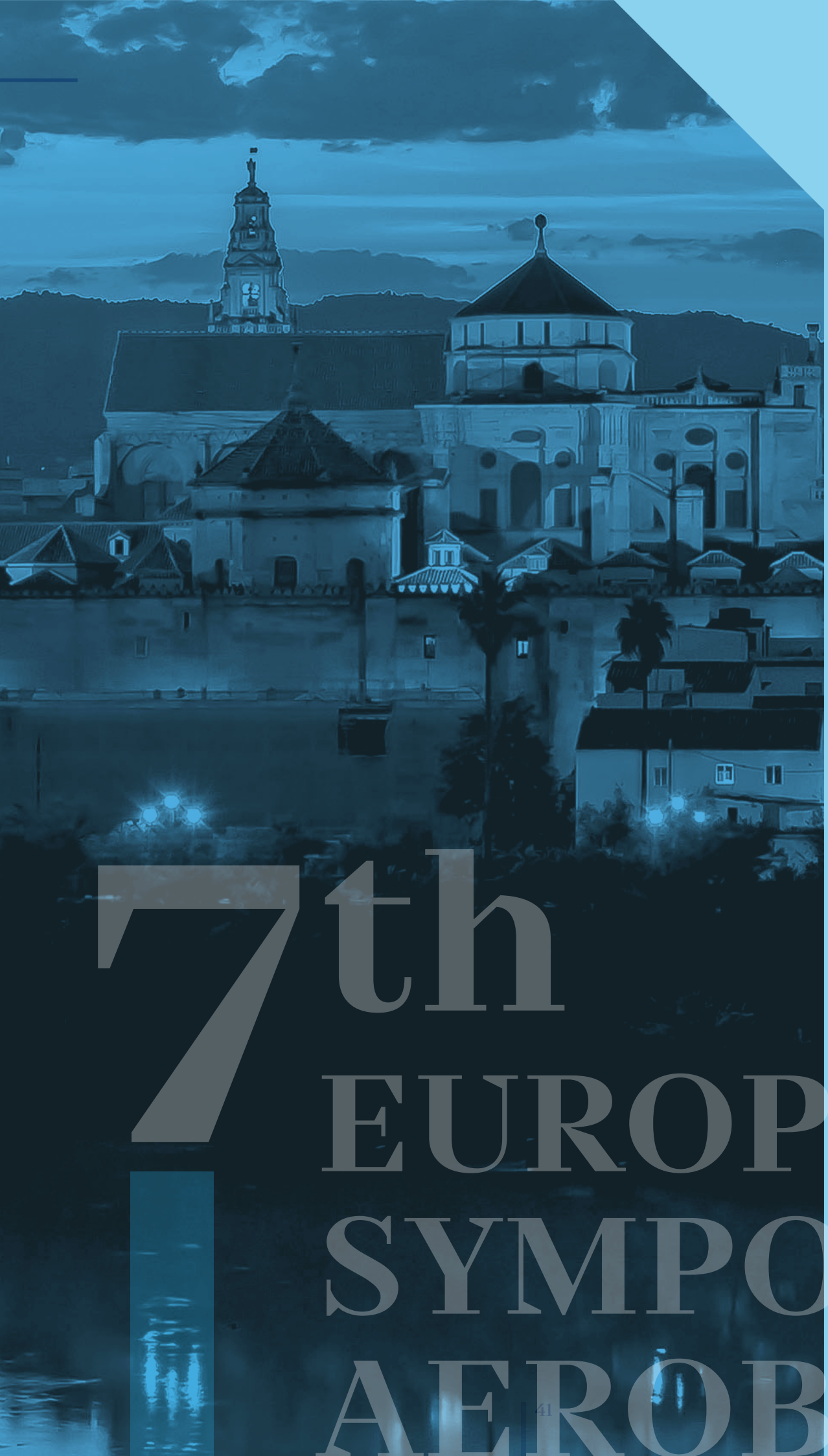
KEYNOTE LECTURE | Emerging methods of bioaerosol detection and their challenges in a pandemic era: good vs. bad bioaerosols?

Carsten A. Skjoth[1], David O Connor[2], Thanos Damialis[3], Lukasz Grewling[4], Maria Grundström[5], Lenka Hajkova[6], Clara Pogner[7], Francis Pope[8], Andreja Rajkovic[9], Tina Santl-Temkiv[10], Olga Sozinova[11], Branko Sikoparija[12]

[1]University of Worcester, UK; [2]Technological University Dublin, Ireland; [3]Technical University of Munich, Germany; [4]Adam Mickiewicz University, Poland, Poland; [5]University of Gothenburg, Sweden; [6]Czech Hydrometeorological Institute; [7]AIT Austrian Institute of Technology, Austria, [8]University of Birmingham, UK; [9]Ghent University, Belgium; [10]Aarhus University, Denmark; [11]University of Latvia, Latvia; [12]BioSense Institute, Serbia

Bioaerosols are among the most complex components in the atmosphere. They may consist of pollen, fungal spores, viruses, bacteria and small plant matter. Some are harmful while others may be vital for life as we know it. Collection and analysis of the bioaerosol has never been more important. Many countries are these days in lock-down due to the Covid-19 pandemic. SARS-CoV-2 and other virus may be transmitted in three main ways: 1) contact, 2) droplet transmission within a few meters and 3) airborne transmission. Airborne transmission is expected to be particular important in indoor environment as well as selected outdoor environments related to public transport. Recent knowledge (29 Oct 2020), suggests that airborne transmission may, in some circumstances, be a main route of transmission. SARS-CoV-2 containing aerosols is not the only important harmful bioaerosol to humans. Many bioaerosols have different important properties affecting processes such as climate change, crop security or human health. Common for the entire bioaerosol is that the detection and understanding of this is a cornerstone of aerobiology and the key aspect of the COST Action ADOPT: New approaches in detection of pathogens and aeroallergens.

This lecture will illustrate the most important existing and upcoming detection methods used in aerobiology for the detection of bioaerosols in Europe. For decades, the backbone in the European monitoring network of bioaerosols in relation to crop and human health has been impactors that trap the bioaerosols on a sticky surface followed by manual identification by optical microscopy. This approach is time-consuming, expensive and not specific enough to detect a number bio-aerosols of interest. The last five to ten years a range of new techniques have become available that enable a number of scientific breakthroughs in the general understanding of bioaerosols and how they interact with the environment such as the weather. The lecture will illustrate typical examples from the different areas, mainly on pollen and fungal spores but also draw in recent examples in from other areas such as the detection of virus. It will contrast the different approaches, their strengths and weaknesses in relation to their application in human health, crop security and climate change. It will discuss which approaches that are most likely to be successful in the detection of the fraction of very harmful bioaerosol relevant to human health such as SARS-CoV-2 virus. This will illustrate why working on new approaches in sampling and detection of pathogens, aeroallergens and virus is vital to advance knowledge and enabling timely and important information to a world currently under lockdown caused by an unprecedented acellular microorganism with considerably health impact on humanity.



7th EUROPEA SYMPOSIU AEROBIO

LECTURES

Bioaeroso

Environm

Im

LECTURE | The use of aerial platforms in Aerobiological Studies: sixteen years later. *(The Drones Invasion)*

Prof. Dr. Eugenio Domínguez-Vilches
University of Córdoba, Spain

As Benjamin R. Dingus, pointed out in 2007, seeds, insects, pollen, plant pathogens, etc. may be transported over long distances in the atmosphere. The long-distance transport of biota takes place primarily in the planetary boundary layer of the atmosphere. Researchers have identified and characterized pollen, seeds, and fungi in it. One of the attractive techniques for characterizing specific airborne particles is to collect samples at different altitudes under a variety of environmental conditions (day/night, temperature, humidity, and wind conditions). One method that enables aerobiological sampling at various altitudes is the use of aerial vehicles and lately remotely controlled aircraft designed to fly specific patterns and collect aerobiological samples at an altitude of interest.

At this speech we make a historical review of the use of aerial platforms for use in aerobiological studies. From the use of kites, balloons, airships, aircraft heavier than air, and remotely controlled vehicles (drones). Drones are RPA (Remotely Piloted Aircraft), UAV (Unmanned Aerial Vehicles), or ROA (Remotely Operated Aircraft), an aerial vehicle operating without a pilot on board and controlled by remote control, or by autonomous navigation by a pre-programmed system. Therefore, neither a rocket flying in ballistic orbit, nor a missile, artillery shell, etc., belongs to this category. Nor are unmanned airships supported by the help of a gas enclosed in a flexible structure.

The advances in control of these vehicles and the importance of miniaturization, the increasing of range due to the use of batteries of long-life storage, and also the use of hybrid propulsion systems. At the same time a review is made of the evolution of sampling equipment used in these aerial platforms.

LECTURE | Six caps of an aerobiologist

Ingrida Šaulienė
President of European Aerobiology Society
Šiauliai University, Lithuania

Keywords: cooperation, headway, bioaerosols

The position of aerobiology in the modern world of fundamental and applied sciences is unique. Compared with the classical branches of science, aerobiology is a young branch of biological sciences. But maybe it is not part of biology at all? If we look at the international scientific journal "Aerobiologia", we will find an abundance of parallel and criss-cross themes analysing climate change and changes in land use, associating atmospheric phenomena with personal or environmental health, comparing bioaerosol change in the forest and inside buildings, and many other variants. Generation of ideas under the umbrella of aerobiology results in the implementation of the most unexpected interdisciplinary cooperation projects and formation of international teams of scientists.

It is fascinating to be in aerobiology not only due to close collaboration of researchers working in different fields of science but also due to the endless opportunity for growth. There are different ways to come to aerobiology, but collaboration enables to experience stunning transformations: engineers achieve progress in cytology, while the biologist recognising cells under the microscope voluntarily-compulsively studies artificial neural networks to understand measurements done by modern devices.

This is just part of what can be said about aerobiology. How does flexibility of methods cope with challenges or how do new methods become an inevitable routine? Why and in what direction is aerobiology changing? What are the ways of becoming aerobiologists and to what do the leading professionals bid farewell? What is the cutting edge and state-of-the-art in aerobiology? What is the paradigm of modern aerobiology? Thus, there is much to talk about. Let us meet in the lecture.

LECTURE | Pollen-induced allergic diseases in Europe – in the shadow of climate change

Karl-Christian Bergmann
German Pollen Information Service Foundation, Allergy-Centre-Charité, Charité — Universitätsmedizin Berlin, Germany

Keywords: allergic rhinitis, allergic asthma, epidemiology, climate change, air quality

Airborne allergenic pollen induces the most common disease in Europe: the pollen-induced allergic rhinoconjunctivitis, formerly known as hay-fever. Hay-fever is a disease of modern times; it has only existed since the 19th century, but has become very common in the industrialised countries. Changes in the microbiome are thought to be the cause of the more frequent occurrence of the disease, caused by less contact with bacteria in the first two years of life and/or less contact with beta-globulin.
Precursor of the disease is the appearance of sensitization, i.e. the formation of allergen-specific IgE antibodies. The presence of antibodies in the skin or blood without clinical symptoms is called „clinical-silent sensitization" and is not yet an allergic disease.
The frequency of sensitization and hay-fever is only slightly increasing in some countries in Europe now or has reached a high plateau, e.g. in Germany and Switzerland.
The increase in CO2 in the air and the average annual temperature as an expression of climate change leads – slowly – to changes in the beginning and end of the pollen seasons, especially the saison of tree, lower of the grass and herb pollen. The number of days with high pollen concentrations may increase. Statistically significant changes are not often detectable even over decades, as pollen flight is already subject to strong annual fluctuations.
The type and strength of pollen-triggered symptoms on the eyes, nose and bronchi are individually shaped. Apparently, every sufferer has a maximum of perceived symptom strength, which is no longer exceeded by a further increase in time or number of pollen during exposure.
In addition to the strength of pollen exposure, the air quality plays an additional role in the symptom strength. With an increased concentration of e.g. fine dust particles, stronger symptoms are perceived, which lead to the intake of anti-histamines as with the same pollen load but low concentrations of fine dust particles. Air pollution cooperates with pollen in the induction of allergic symptoms.
The strength of the symptoms depends not only on the current pollen load, but also on the exposure levels of the last 3-5 days.
The management of pollen allergy includes medications including immunotherapy, informations on possible pollen prevention strategies, including data-based forecasts of pollen flight, symptoms, and a proposal of meaningful drug therapy based on documented symptoms by the hay-fever sufferer.

ORAL ABSTRACTS

Bioaeroso

Environm

Im

O.001 | Phenological changes in Europe are still attributable to climate change induced warming

Menzel Annette[1], Yuan Ye[1], Matiu Michael[2], Sparks Tim[5], Scheifinger Helfried[3], Gehrig Regula[4], Estrella Nicole[1]

1 Technical University of Munich
2 Eurac Bozen
3 ZAMG Vienna
4 Meteoswiss Zurich
5 Institute of Zoology, Poznan

Keywords: Fingerprints of climate change

BACKGROUND AND OBJECTIVES

During 1971-2000 phenological responses of wild species in spring and summer matched the warming pattern in Europe, whereas timing of farming activities as well as autumnal leaf colouring did not mirror climate change to the same extent (Menzel et al. 2006, doi 10.1111/j.1365-2486.2006.01193.x). However, new phenological findings suggest that especially a lack of chilling and/or increasing influence of photoperiod may have lowered the phenological temperature response and that adaptation in agricultural management takes place. We therefore updated the GCB2006 study by asking three questions: What drives the inherent variation of trends? Can we now detect a warming signal in "false" agricultural and autumn phases? Is there still an attributable warming signal?

MATERIALS AND METHODS

The complete phenological dataset of Germany, Austria and Switzerland (1951-2018, ~97.000 series) was analysed. We determined linear trends, studied their variation by plant traits, across season and time, and followed IPCC methodology for attributing phenological changes to warming patterns.

RESULTS

For spring and summer phases of wild plants we found more (significantly) advancing trends (~90% and ~60% sign.) which were stronger in early spring, at higher elevations, but smaller for non-woody insect-pollinated species. Although mean trend strength decreased, changes in spring were strongly attributable to warming in spring and winter. We had similar but less strong findings for agricultural crops in these seasons. In contrast only ~75% of phenological phases set by farmers' decisions were advancing, however this was the only phenological group for which the mean advance increased, indicating adaptation. Equally trends in farming phases in spring and summer were attributable to warming in winter and summer, respectively. Leaf coloring and fall was now predominantly delayed (57%) which was attributable to winter and spring warming, too.

CONCLUSIONS

Thus, this update (Menzel et al. 2020, doi 10.1111/gcb.15000) demonstrates that there is still a significant and attributable phenological change pattern in Europe, in which number of (significant) trends pointing into the direction of warming increased, but mean trend strength mostly decreased, probably due to a lack of chilling and smaller forcing trends.

ID: 200
Session: PLANT PHENOLOGY
Topic: PLANT PHENOLOGY

O.002 | Phenological phases of pollination and climate change

Michel Thibaudon, Jean-Pierre Besancenot, Charlotte Sindt, Gilles Oliver, Samuel Monnier
RNSA, Brussieu, France

Keywords: phenology, pollen, climte change

BACKGROUND AND OBJECTIVES

Rising CO2 levels and climate change may be resulting in some shift in the geographical range of certain plant species, as well as in increased rate of photosynthesis. Many plants respond accordingly with increased growth and reproduction and possibly greater pollen yields, that could affect allergic diseases among other things.
The aim of this study is the evolution of aerobiological measurements in France for 25-30 years. This allows to follow the main phenological parameters in connection with the pollination and the ensuing allergy risk.

MATERIAL AND METHODS

The RNSA (French Aerobiology Network) has pollen background-traps located in more than 60 towns throughout France. These traps are volumetric Hirst models making it possible to obtain impacted strips for microscopic analysis by trained operators. The main taxa studied here are birch, grasses and ragweed for a long period of more than 25 years over some cities of France.

RESULTS

Concerning birch but also other catkins or buds' trees pollinating in late winter or spring, it can be seen an overall advance of the pollen season start date until 2004 and then a progressive delay, the current date being nearly the same as it was 20 years ago, and an increasing trend in the quantities of pollen emitted.
For grasses and ragweed, we only found a few minor changes in the start date but a longer duration of the pollen season.
Discussion:
As regards the trees, the start date of the new production of catkins or buds is never the 1st of January but depends on the species. For example, it is early July for birch. For breaking dormancy, flowering, and pollinating, the trees and other perennial species need a period of accumulation of cold degrees (Chilling) and later an accumulation of warm degrees (Forcing). With climate change these periods may be shorter or longer depending of the autumn and winter temperature. Therefore, a change in the annual temperature may have a direct effect on the vegetal physiology and hence on pollen release. It may also explain why the quantities of pollen produced are increasing.
The Poaceae reserve, from one place to another and without any spatial structuring, very contrasted patterns which make it impossible to identify a general tendency. This is probably due to the great diversity of taxa grouped under the generic term Poaceae, which are clearly not equally sensitive to climate change.

CONCLUSIONS

Trees with allergenic pollen blowing late winter or early spring pollinate since 2004 later and produce amounts of pollen constantly increasing. Grasses and ragweed have longer periods of pollination with either slightly higher or most often lower pollen production.

ID: 015
Session: PLANT PHENOLOGY
Topic: CLIMATE CHANGE

O.003 | Phenological trends of Poaceae family over the recent 20 years in Córdoba, Spain

Moisés Martínez-Bracero, Carmen García-Llamas, Rocío López-Orózco, Manuel Sánchez-Ostos, Laura Raya-Ruiz, Herminia García-Mozo, Purificación Alcázar, Carmen Galán
Department of Botany, Ecology and Plant Phisiology. Cordoba University

Keywords: trends, grasses, phenology, Cordoba, climatic change

BACKGROUND AND OBJECTIVES
Phenology has been defined as the study of the recurrent biological events on the live cycle of plants and animals, especially their synchronization and relationship with weather and climate. Climate change is affecting plants and animals worldwide, changing biological seasons, species distribution, and ecosystems. Those changes are prompting variations in some grass phenology, which are better explained by phenological trends. The main goal of this study has been to investigate the trends of some species of Poaceae over recent 20 years in different land covers at different altitude.

MATERIAL AND METHODS
This study was carried out from 2000 to 2019 at the north of the province of Cordoba, Sierra Morena. The climate is Mediterranean with some continental features, template-cold winters and hot dry summers. In this study have been considered 11 species presents in 3 land covers: pasture, riverbank and shrub. Phenology was conducted weekly from late February to the end of May in 10 different sites. Phenological observations were based in the Barbieri system adapted to the BBCH scale. Trends were calculated using the Sens analysis.

RESULTS
Considering studied grasses in different land cover, it has been observed a general advance on flowering phenology in riverbank species and a delay in pasture ones; in shrub land cover it depends on how each species respond to changes on weather and climate. Differences have been also observed among species, with different trends between species flowering in early or late spring. The early spring species shown a delay on pre-flowering and flowering start at lower altitudes; however, fructification trends shown an advance in lower altitudes and a delay in higher ones. Late flowering species shown clear trends with an advance from the full flowering to the fructification.

CONCLUSIONS
These results support the importance of both, temperature and water availability on grass phenological trends. I.e., grasses in pasture respond more to the lack of water, and the phenology delays occur to accumulate minimum water to ensure pollination; in riverbank respond more to temperature. Altitude also play an important role, with shorter flowering phenological stages at lower altitude.

ID: 162
Session: PLANT PHENOLOGY
Topic: INDOOR AEROBIOLOGY

O.004 | Aerobiology of Cupressaceae pollen in Portugal

Elsa Caeiro[1,2], Cláudia Penedos[1], Pedro Carreiro-Martins[1], Pedro Carreiro-Martins[3], Pedro Carreiro-Martins[4], Carlos Nunes[1], Carlos Nunes[5], Mário Morais-Almeida[1], Mário Morais-Almeida[6], Elisa Pedro[1], Elisa Pedro[7], Rodrigo Rodrigues-Alves[1], Rodrigo Rodrigues-Alves[8], Manuel Branco-Ferreira[1], Manuel Branco-Ferreira[9], Manuel Branco-Ferreira[10]

1 SPAIC – Sociedade Portuguesa de Alergologia e Imunologia Clínica, Lisboa, Portugal
2 MED – Mediterranean Institute for Agriculture, Environment and Development, IIFA, Universidade de Évora. Évora, Portugal
3 Centro Hospitalar Universitário de Lisboa Central, Lisboa, Portugal
4 NOVA Medical School/Comprehensive Health Research Center -CHRC, Lisboa, Portugal
5 Centro de Imunoalergologia do Algarve, Portimão, Portugal
6 Centro de Alergia, Hospitais CUF-Descobertas e CUF Infante Santo, Lisboa, Portugal
7 CHLN - Centro Hospitalar Universitário Lisboa Norte, Lisboa, Portugal
8 HDES - Hospital do Divino Espírito Santo, Ponta Delgada, Açores, Portugal
9 Clinica Universitária de Imunoalergologia - Faculdade de Medicina, Universidade de Lisboa, Lisboa, Portugal
10 Serviço de Imunoalergologia, Centro Hospitalar e Universitário Lisboa Norte, Lisboa, Portugal

Keywords: aerobiology, airborne pollen, Cupressaceae, meteorological factors, pollen season, Portugal

BACKGROUND AND OBJECTIVES
Cupressaceae pollen type is considered a cause of pollen allergy in winter, throughout the world, mainly in the Mediterranean countries.
Objective: To analyze the prevalence and aerobiological behavior of Cupressaceae pollen (Cupressaceae pollen type) in Portugal.

MATERIAL AND METHODS
This study used Cupressaceae pollen data of the Portuguese Aerobiology Network (RPA-SPAIC) and meteorological data, from 2002 to 2017, of 9 monitoring centers (mainland and islands). The influence of meteorological factors on Cupressaceae airborne pollen concentrations was analyzed by Spearman's correlation.

RESULTS
Cupressaceae pollen type is one of the most abundant pollen types in the atmosphere of Portuguese cities with a representation in the pollen spectrum ranging from 5% (Portimão) to 24% (Coimbra and Vila Real). This pollen type was recorded during all year but, in average terms, Cupressaceae pollen season was of medium duration: in general began in December/January and ended in March/April, depending on the region and the year. The highest pollen levels were observed in Vila Real, Évora and Coimbra. It was observed a clear influence of the meteorological variables on the Cupressaceae pollen counts, in particular of the temperature followed by global radiation and sunshine.

CONCLUSIONS
Given the predominance of this pollen in the air over a long period of time and its allergenic potential, the dissemination of the information from this study is useful and relevant in order to correlate with possible sensitization and symptomatology of pollinosis. It should be noted that in Portugal, the highest levels of airborne Cupressacea pollen occur in winter and early spring and that allergy to this pollen type will certainly be more frequent during this period.

ID: 043
Session: PLANT PHENOLOGY
Topic: HEALTH IMPACT

O.005 | Spatial and temporal variations of Poaceae pollen concentration at rural and urban sites in Ingolstadt, Germany

Johanna Jetschni, Susanne Jochner-Oette
Physical Geography/ Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, Germany

Keywords: urban-rural differences, personal volumetric air samplers, spatial and temporal variations

BACKGROUND AND OBJECTIVES
Impacts of climate change could already be observed in relation to the pollen amount, pollen allergenicity, start and duration of the pollen season as well as pollen distribution. Especially in cities, the number of people suffering from pollen allergies is increasing. In order to adapt to climate change and its influence on airborne pollen concentration, detailed knowledge about spatial and temporal variations of pollen exposure in urban and rural areas is required.

MATERIAL AND METHODS
Pollen were sampled using Personal Volumetric Air Samplers at 11 different sites in June 2019 during the Poaceae pollen season on seven consecutive days. Four sites were located in a rural setting, three sites in a residential area and four sites in the city centre resp. old town of Ingolstadt. Measurements at each site lasted 25 minutes and were carried out three times a day: between 6 am and 8 am, 12 pm and 2 pm and 9 pm and 11 pm. We calculated the daily pollen index (DPI), i.e., the sum of three pollen counts, and the campaign pollen index (CPI), i.e., the sum of all daily pollen indices. Furthermore, we examined the variation of pollen concentration between measurement sites and periods.

RESULTS
Weather conditions varied; rain after the third day of the sampling campaign reduced the airborne pollen concentration at all sites remarkably. The total pollen load at rural sites (CPI = 1641) was higher than city (CPI = 862) and residential sites (CPI = 602), partly attributable to the vegetation composition in the nearer surrounding. Concerning diurnal variations, mean pollen concentrations for city, residential and rural sites were highest in the measurement period from 12 to 2 pm.

CONCLUSIONS
Pollen measurements at ground level reflect the pollen load that people are actually exposed to. These measurements should be compared with symptom data of people suffering from pollen allergy (e.g., citizen science approach). The detection of patterns in diurnal variations of pollen loads might be beneficial for allergic people when planning their outdoor activities.

ID: 029
Session: PLANT PHENOLOGY
Topic: BASIC AEROBIOLOGY

O.006 | Impacts of climate change on birch pollen load in Southern Germany

Jesús Rojo[1], Jose Oteros[1], Antonio Picornell[2], Matthias Werchan[3], Karl-Christian Bergmann[3], Claudia Traidl-Hoffmann[4], Athanasios Damialis[4], Annette Menzel[5], Carsten B. Schmidt-Weber[1], Jeroen Buters[1]
1 Center of Allergy & Environment (ZAUM), German Center for Lung Research (DZL), Technical University of Munich/Helmholtz Center, Munich, Germany
2 Department of Botany and Plant Physiology, University of Malaga, Malaga, Spain
3 German Pollen Information Service Foundation (PID), Berlin, Germany
4 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich / Helmholtz Center Munich, Augsburg, Germany
5 Technical University of Munich, Research Department Ecology and Ecosystem Management, Ecoclimatology, Freising, Germany

Keywords: pollen, birch, modeling, climate change

BACKGROUND AND OBJECTIVES
Birch pollen is the major trigger of pollinosis caused by arboreal pollen in Northern and Central Europe. Birch is the most abundant pollen type in the region of Bavaria, Germany, representing up to 25% of the pollen total amounts. Climate change induces important biological changes in plants such as variations in the distribution of plants and alterations in the reproductive rates. This work focused on the study of the potential future changes on birch pollen load.

MATERIAL AND METHODS
Statistical models were trained using an extensive pollen database in Bavaria (1989-2019). Climate-based models focused on the abundance of the birch forests (long-term outcomes) and the annual pollen integral (mid-term outcomes) of birch pollen were constructed. Both models were integrated using a concentric ring approach which estimates the influence of the sources in pollen amounts based on the abundance and the distance of trees to the samplers. Predictions of the birch pollen load were extended to the future under the Representative Concentration Pathways proposed by the Fifth IPCC report.

RESULTS
Results showed a clear advance of the pollen season and an increasing on birch pollen emission. There was a strong relationship with late-winter and spring temperatures. The abundance of birch forests was influenced in the first place by anthropogenic causes (land-uses) and then by extreme temperatures during the warmest months and the thermal oscillation. Climate change in Bavaria would promote a displacement of birch toward Southeastern colder areas. Annual measured amounts of birch pollen were governed by the surrounding pollen sources and weather conditions since the previous summer. In this case, in addition to temperatures, water availability became more relevant, but until now precipitation does not seem to be a limiting factor in most of the Bavaria region.

CONCLUSIONS
The rise of the allergy risk in the Bavaria region has been occurring in parallel to an increase in the birch pollen load. The analysis of the potential changes in birch pollen exposure as a consequence of the climate change is very relevant in Southern Germany since approximately 15% of the German population is sensitized to birch pollen.

ID: 069
Session: CLIMATE CHANGE
Topic: CLIMATE CHANGE

O.007 | Fifty years of pollen monitoring in Basel (Switzerland) demonstrate the influence of climate change on airborne pollen

Regula Gehrig, Reto Stöckli
Federal Office of Meteorology and Climatology MeteoSwiss

Keywords: climate change, trends, long term data

BACKGROUND AND OBJECTIVES

Climate change and human impact on vegetation modify the timing and the intensity of the pollen season. The 50 years of pollen monitoring in Basel, Switzerland provide a unique opportunity to study long-term changes in pollen data.

MATERIAL AND METHODS

Since 1969, pollen monitoring has been carried out in Basel with a Hirst-type pollen trap. Pollen season parameters for start dates, end dates and length were calculated with different definitions existing in aerobiology. Intensity was analyzed by the seasonal pollen integral (SPIn) and the number of days above specific thresholds. Years with more than 5 days missing during the peak pollen period were removed. Linear trends were calculated with the non-parametric Mann Kendall method with a Theil-Sen linear trend slope.

RESULTS

During the last 50 years, linear increase of the monthly mean temperatures in Basel was 0.95 to 1.95 °C in winter months, 2 to 3.7 °C in spring months and 2.75-3.85 °C in summer months. Due to this temperature increase, the start dates of the pollen season for most of the spring pollen species have advanced, from 10 days for Poaceae to 25 days for Corylus. End dates of the pollen season depend on the chosen definition. Negative trends predominate, i.e. the pollen season mostly ends earlier. Trends in the length of the pollen season depend even more on the season definitions and results are contradictory and often not significant. The Corylus pollen season was extended, while the Fraxinus and Poaceae pollen seasons became shorter. The intensity of the pollen season of almost all tree pollen types increased significantly, while the Poaceae pollen season did not change and the pollen season of herbs decreased, except for Urtica pollen.

CONCLUSIONS

Climate change has a particular impact on the pollen season, but the definitions used for the pollen season parameters are crucial for the calculation of the trends. Further impacts on the pollen season trends will be studied in future, like the influence of the relocation of the pollen trap, the flow stability of the pump, missing data and their imputation or the area of the analyzed surface of the slide.

ID: 091
Session: CLIMATE CHANGE
Topic: CLIMATE CHANGE

O.008 | Early flowering of Alnus and Corylus in January: the first registered case in Ukraine

Olha Kaminska, Maryna Yasniuk, Victoria Rodinkova
National Pirogov Memorial Medical University, Vinnytsya, Ukraine, Pirogov Street, 56, Vinnytsia, Ukraine, 21018

Keywords: early flowering, hazel, alder, climate change

BACKGROUND AND OBJECTIVES

Global warming appears to be both irrefutable and unequivocal. More manifestations of this process become evident every year in biotic communities.
Thus, the aim of our study was to track these changes using the data of plant pollination. We registered extremely early flowering of the earliest blooming trees in Ukraine in the years 2019 and 2020.

MATERIAL AND METHODS

Observations of plant flowering behavior were carried out in the years 1999 and 2000 by gravimetric sampling and in the years 2009-2019 by volumetric sampling. At the beginning of the year 2020 gravimetric sampling was used, too.

RESULTS

In the years 1999 and 2000 plant pollination started at the beginning of March.
The same was observed for the years 2010-2018. However, in the year 2019, due to warmer weather, monitoring started on the 27th of February.
In the year 2020 gravimetric sampling was started on January 15 due to unusually warm weather. The first *Alnus* and *Corylus* pollen grains were recorded in the period between January 17 and 20. However, these grains were small and premature. Fully developed pollen of the early flowering trees mentioned above was trapped starting from the 20th of January. It is more than a month earlier in comparison with the previous years. The pollen count corresponded with current weather. It dropped down at lower temperatures and higher precipitation rates.

CONCLUSIONS

Climate change alters pollen season in Ukraine, making it longer with an earlier start and later end. In this regard, the year-round pollen monitoring should be maintained, including the one performed by using automatic devices.

ID: 173
Session: CLIMATE CHANGE
Topic: CLIMATE CHANGE

O.009 | Influence of climate variations on Quercus aerobiological trends (1995-2019) in South Spain

López-Orozco, R., García-Mozo, H., Oteros, J., C. Galán
Department of Botany, Ecology and Plant Physiology. University of Cordoba, Spain.

Keywords: Quercus, pollen, phenology, trends, climate change

BACKGROUND AND OBJECTIVES

Quercus pollen is one of the most abundant pollen types in the Mediterranean area, being the second usual one recorded in Cordoba city, South Spain. In this area, the main species that contribute to the *Quercus* pollen curve are *Q. ilex*, *Q. coccifera, Q. faginea* and *Q. suber*. All of them are perennial species except *Q. faginea*. They flower during early spring except for the case of *Q. suber* around May. In this work, trends and climate influence on a long *Quercus* pollen data series have been analyzed to determine the possible climate change influence.

MATERIAL AND METHODS

The study was carried out in Cordoba and covered 25 years (1995–2019). This city is within the Mediterranean biogeographic region. *Quercus* pollen data from a Hirst volumetric spore trap were analyzed. Pollen season is defined as: Start = 1st day of 5 consecutive days with ⩾10 pollen/m^3; end = last day of 5 consecutive days with ⩽10 pollen/m^3. Trends of the main meteorological and seasonal pollen parameters have been evaluated. Trends statistical analysis of both type of data were studied performing lineal regression and Mann-Kendall trend test.

RESULTS

A progressive delay on pollen season start and end, and peak dates was recorded. A marked rising trend on annual airborne pollen concentrations was detected supported by longer *Quercus* pollen seasons recorded at recent years. Regarding meteorological data mean temperature and rainfall in winter presented a negative trend. In contrast, during early spring rainfall was increasing.

CONCLUSIONS

The lack of rainfall and the cooler winter temperatures, including a decrease in the mean temperature at the beginning of flowering, may cause a pollen season delayed. Pollen concentrations are increasing, longer and more intense seem to compensate the general Mediterranean forest declined so affected by overexploitation, more frequent dryness period and different diseases that are increasing their mortality. Also, increased pollen and longer pollen seasons could be favoured by higher CO_2 levels.

Authors wish to thank for their support to the project CLIMAQUER, REF. 1260464, funded by the Andalusia Regional Government & UCO University through European Regional Development Funds (FEDER-ERDF).

ID: 188
Session: CLIMATE CHANGE
Topic: CLIMATE CHANGE

O.010 | Temporal trends of allergenic pollens and pollen seasons in the city of Rome

A. Di Menno di Bucchianico[1], G. Cattani[1], R. Gaddi[1], M.A. Brighetti[2], A. Miraglia[2], A. Travaglini[2]
1 Italian National Institute for Environmental Protection and Research (ISPRA), Rome, Italy
2 Department of Biology, University of Rome Tor Vergata, Rome, Italy
Presenting author email: alessandro.dimenno@isprambiente.it

Keywords: pollen, allergen, air quality

BACKGROUND AND OBJECTIVES

In this work, the status and trends of airborne pollen concentrations belonging to 7 allergenic families (Betulaceae, Oleaceae, Cupressaceae and Taxaceae, Poaceae, Asteraceae, Urticaceae) were studied, for the city of Rome (central Italy), over a period of twenty years (from 1999 to 2018).
Pollen data were also analyzed in connection with urban air pollutant concentrations (PM_{10}, $PM_{2.5}$, NO_2, O_3) and with the main climate variables (main temperature, cumulated precipitation) for the same period.

MATERIAL AND METHODS

Pollen samples were collected and measured by the Aerobiological monitoring center of Tor Vergata (University of Rome)., The concentration values of atmospheric pollutants were recorded by the air quality network of Rome (ARPA Lazio, Italian National System for Environmental Protection, SNPA). Climate variables were provided by the Italian National System for the Collection, Processing and Dissemination of Climate Data (SCIA, ISPRA).

Temporal trends of pollutants and pollens, using the Seasonal Kendall test, have been realized. The statistical analysis allowed to highlight when concomitant high levels of allergenic species and air pollution occur and the influence of meteorological parameters and of the flowering calendar.

RESULTS

Maximum air concentrations of pollen and atmospheric pollutants occur, in Rome, in different seasons: during the winter for particulate matter and nitrogen oxides, during the spring for main pollens and during the summer for ozone. The comparative analysis of the time series established that the greatest overlap period is between February and March in the study area. The analysis of concentration trends, from 1999, shows a statistically significant decrease of PM_{10}, $PM_{2.5}$ and NO_2 and an increase of Urticaceae (all other parameters were stable).

CONCLUSIONS

The Statistical analysis highlighted the periods of the with the highest levels of concomitant allergens and atmospheric pollutants. It, also, pointed out the influence of meteorological parameters and of the flowering calendar on concentration levels during the four seasons.

ID: 206
Session: CLIMATE CHANGE
Topic: ENVIRONMENTAL POLLUTION

O.011 | Allergenicity of the urban green areas in the city of Córdoba (Spain)

María José Velasco-Jiménez[1], Purificación Alcázar[1], Paloma Cariñanos[2], Carmen Galán[1]
1 University of Córdoba. 14071.
2 University of Granada. 18010.

Keywords: urban green areas, allergenic flora, ornamental flora, index of allergenicity, airborne pollen

BACKGROUND AND OBJECTIVES
Green urban areas contribute for the health of the human being. But sometimes they can present some inconveniences due to pollen allergy. An analytical study of the presence of potentially allergenic species in the city, their biological characteristics and the factors involved in their activity, as sources of pollen emission, would be very useful when creating and designing new gardens or urban parks, and a solution to redesign those already existing.

MATERIAL AND METHODS
The 8 most important green spaces in the city of Córdoba (Spain) have been analized. From each of them, the plant species were identified and their Potential Allergenicity Value (VPA) was calculated. Finally, the index of allergenicity of urban green zones (IUGZA) was calculated. An aerobiological study during 10 years (2009-2018) have also been realiced to know the periods of maximum concentration of pollen from the allergenic species. The methodology designed by the Spanish Aerobiology Network (REA), in compliance with the minimum requirements set out by the European Aerobiology Society (EAS) was used for sampling and for calculating average daily airborne pollen concentration.

RESULTS
The majority of study species are from Asian and Mediterranean origin. The results confirmed that both, native and allochthonous taxa contributed to the allergenicity index. Most abundant species were Citrus aurantium, Celtis australis, Platanus hyspanica, Melia azederach, Ulmus minor and Robinia pseudoacacia. Among used species are several listed as highly allergenic are: cypress, paper mulberry, plane tree, olive, elm and poplar. Recent urban green areas (Parque de la Asomadilla, Parque de Cruz-Conde and Parque Juan Carlos I) are the ones that have presented the highest percentage of allergenic species. This makes us see that there is still a lot to be done in this issue to raise awareness among city managers of the need to have expert advice on this subject. Most study species bloom in spring, which makes it the most adverse time for allergic people.

CONCLUSIONS
Three of the parks analyzed are susceptible to trigger allergy symptoms to the local population. The factors that have contributed most to the allergenicity index have been the abundance of individuals of allergenic species, the surface of the park and the amount of pollen that is released into the atmosphere by each species. Some of these spaces are of recent construction, this makes us see that there is a lot to be done to raise awareness.

ID: 013
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.012 | Allergenic potential of urban green spaces and changes across scenarios: a case-study in Brussels, Belgium

Aerts Raf[1], Bruffaerts Nicolas[1], Demoury Claire[1], Nawrot Tim S.[2], Hendrickx Marijke[1]
1 Sciensano (Belgian Institute of Health), Juliette Wytsmanstraat 14, BE-1050 Brussels, Belgium
2 Center for Environmental Sciences, University of Hasselt, Agoralaan D, BE-3590 Diepenbeek, Hasselt, Belgium

Keywords: airborne tree pollen, green urban spaces, scenario analysis

BACKGROUND AND OBJECTIVES
Urban green spaces may contribute to human health and well-being. However, green spaces may also emit allergenic pollen and cause allergic disease. We examined present and possible future allergenic potential of urban green spaces in Brussels, Belgium.

MATERIAL AND METHODS
We calculated area-weighted green space allergenicity (*Ig*; range 0–1, 1 worst) for 18 urban green spaces (5940 trees; 278 species) as the sum of tree allergenicity (*It*) using tree dimension data (crown surface area, tree height) and indices for allergenic potential, pollen dispersal mode and pollination duration. Changes in allergenic potential (Δ*Ig*) were calculated for two contrasting scenarios: (i) removal of the main allergenic genera (*Corylus*, *Alnus* and *Betula*); and (ii) increased sensitization of the population to *Platanus* pollen.

RESULTS
The most abundant species were *Acer pseudoplatanus* (n = 793; 13%), *Taxus baccata* (612; 10%) and *Fraxinus excelsior* (466; 8%). The most frequent species were *Acer platanoides* (in 17 of 18 green spaces), *F. excelsior* (17) and *Carpinus betulus* (16). The main allergenic species, *Corylus avellana*, *Alnus glutinosa* and *Betula pendula*, were present in respectively 6, 8 and 11 green spaces but were less abundant (1.3, 1.3 and 0.2% respectively). The average *Ig* was 0.080 (SD 0.047; range 0.002–0.17). Δ*Ig* in the tree removal scenario was –0.012 (–18% compared to baseline). Δ*Ig* in the increased sensitization scenario was +0.011 (+12%).

CONCLUSIONS
The allergenic potential of urban green spaces in Brussels is low. Removing *Corylus*, *Alnus* and *Betula* slightly reduced green space allergenic potential but is not recommended in the light of biodiversity conservation. Similarly, increased sensitization to *Platanus* pollen marginally amplified green space allergenic potential but ecosystem services of *Platanus*, such as providing shade and mitigating heat, may outweigh possible increases in pollen allergy burden.

ID: 014
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.013 | The air we breathe: The influence of pollen sources in urban green spaces. The example of Lyon (France)

Nhân Pham-Thi[1], Michel Thibaudon[2], Samuel Monnier[2], Jean-Pierre Besancenot[2]
1 Université Paris 5 René-Descartes, Paris, France
2 RNSA, Brussieu, France

Keywords: urban parks, allergenicity, pollen, tree

BACKGROUND AND OBJECTIVES
This study aimed to show how planting different plant species in cities can increase the exposure of citizens to pollen, thus leading to higher prevalence of pollinosis.

MATERIAL AND METHODS
The study was performed in four urban parks in the city of Lyon from March to June, 2018. We installed a local pollen trap (Sigma2-Like Trap, SLT) in each park and data for the four most frequent pollen-producing tree species with moderate-to-high allergenic potential were analyzed. A source index (based on the number of trees and the allergy potency of their pollen) and an exposure index (based on pollen quantities of each tree and their allergy potency) were determined for each park, either for the park alone or also taking into account the surrounding thoroughfares.

RESULTS
There are many allergy-inducing trees in and around the studied parks, although the predominant species vary widely between parks. The highest source and exposure indices were for birch in the Erevan Garden, in which this is the unique tree species, and for plane in Gerland Park and Tête d'Or Park, in the vicinity of which this tree is very abundant.

CONCLUSIONS
Our findings may be of great value when implementing measures to improve or refurbish existing urban green areas, or when designing and planning new parks or gardens, in order to reduce allergenic impact on local residents and visitors. Priority must be given to avoid single-species parks.

ID: 016
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.014 | Breathing in the Parks: an initiative for the allergenic characterization of Urban Green Infrastructure

Paloma Cariñanos
Department of Botany. University of Granada, Spain

Keywords: Value of Allergenic Potential (VAP), Allergenicity Green Areas, Allergenicity Index

BACKGROUND AND OBJECTIVES

The Breathing in the Parks initiative was established with the objective of assessing the allergenic potential of urban trees and urban green spaces. For this characterization two instruments have been created: the Value of Allergenic Potential (VAP) which is an indicator of the allergenicity of each tree species based on a series of biological and allergenic parameters or attributes specific to each species; and the Index of Allergenicity of Urban Green Spaces (IUGZA), which allows estimating the allergenic risk of any green zone based on the species of plants present in them and the design and distribution they have on the space. In this communication the main achievements and results obtained with this initiative, as well as future lines of work, will be presented.

MATERIAL AND METHODS

For the allergenic characterization of the tree species, a database of allergenicity parameters has been created (SafeCreative code 1803156149680, IPR-684), which includes the values of the different attributes that participate in the VAP of each species: pollination strategy, duration of the pollination period and intrinsic ability of pollen grains to generate allergic response in the sensitive population. The allergenic risk of urban green spaces of different types, characteristics and location has been estimated through the application of IUGZA.

RESULTS

The database of allergenicity parameters currently includes records of 350 trees of urban forests in Europe and other compatible climatic regions. The assignment of numerical values to the different attributes has allowed characterizing the allergenic risk associated with each species. The IUGZA applied to more than 100 green elements of European cities and North Africa has highlighted the typologies and landscape design that have the most allergenic impact on the population.

CONCLUSIONS

The Breathing in the Parks initiative stands out as a useful tool for the prevention and mitigation of the impact of plant allergens on the population. It can also be used as a Nature Based Solution for planning more sustainable and healthier green spaces. Future lines of work include the extension of the database to shrubs and herbaceous plants and the inclusion of other attributes.

ID: 022
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.015 | Density and crown size of trees producing allergenic pollen in relation to pollen concentration: integrating wind conditions, high-resolution LiDAR data and machine learning approach

Pawel Bogawski, Małgorzata Nowak, Agata Szymańska, Łukasz Kostecki, Łukasz Grewling
Faculty of Biology, Adam Mickiewicz University, Poznań

Keywords: LiDAR, pollen inventory, allergy risk, aerobiology, aerial laser scanning, random forest

BACKGROUND AND OBJECTIVES
Urban green spaces are beneficial to cities: they reduce the urban heat island effect, filter air pollution, limit the noise level and offer recreational sites for city inhabitants. However, trees triggering allergies may adversely affect sensitized patients by emitting allergenic pollen. The pollen amount depends on the tree density, abundance of flowers and the distance from the source plant. In this study, we aimed to detect allergenic trees by using aerial Light Detection and Ranging (LiDAR) data and assess their crown surface and crown volume as proxy variables of flower abundance.

MATERIAL AND METHODS
We geotagged and counted individuals of Betula sp. and Quercus sp. within randomly selected plots (n=100, radius= 50 m) in Poznań, Poland. LiDAR point clouds were clipped, normalised, filtered, and individual tree crowns were delineated. For each delineated tree, different characteristics were calculated based on LiDAR data: crown volume, crown, point intensity, return number, point height and colour. Then, a random forest classifier was trained to detect birch and oak trees. In addition, validation was performed on independent point cloud. Finally, hourly airborne pollen concentrations (performed using two Hirst-type, 7-day volumetric traps), wind speed and direction data were measured in years 2008-2018.

RESULTS
Birch tree was more abundant in Poznań city than oaks. Average density of birch trees was 14900 /km^2, but it markedly differed between urban, rural and forest land use types occurring in study area. The sum of birch tree crown surface, aggregated according to eight wind directions in a radius of 500 to 1500 m from pollen trap correlated significantly with pollen concentrations attributed to the same wind directions ($r = 0.728$, $p = 0.04$).

CONCLUSIONS
Significant relationship between pollen concentration and the total birch crown surface surrounding pollen trap indicates that this variable may be used as a proxy of a pollen emission in particular area. Together with automatic detection of allergenic trees, it is possible to prepare detailed maps of cities with allergenic species location and size marked which helps allergy sufferers in selecting pollen-free places for outdoor activities.

ID: 132
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.016 | Preliminary study on green areas in rome to elaborate a new pollen risk index

Miraglia A., M.A. Brighetti, Travaglini A.
Department of Biology, University of Rome Tor Vergata, Italy

Keywords: Urban green areas, pollen risk index

BACKGROUND AND OBJECTIVES

Green areas in cities are a fundamental element to measure the quality of the urban environment. Today urban green areas represent the solution for many urban criticalities thanks to their ecological multi-functionality, but often their presence is associated with a potentially dangerous impact on quality of life and health of the local population as a consequence of allergenic pollen emission. The aim of this project is the elaboration of a new quantitative index for estimating the allergic potential of tree species in urban green areas.
The index will be built on different factors: allergenic potential, pollination strategies, duration of the pollination period, tree size, number of individuals per species, surface area occupied by each tree, in order to calculate the overall percentage coverage of each allergenic species, but also it will consider additional data: seasonal, environmental and meteo-climatic data, clinical data of allergic people and aerobiological data.

MATERIAL AND METHODS

At first, it was necessary to divide the city of Rome in three macro-areas. In each of them there is an aerobiological sampler of Aerobiological Monitoring Center of the University of Rome Tor Vergata. In each macro-area three urban green areas have been identified. For each one it was registered both the number and the arboreal species of plants with their height and diameter.

RESULTS

This data collection gives a representative view of the diversity of species within selected areas. Although the analysis of vegetal specific composition of the areas resulted different for each one, the presence of allergenic species is always significative (at least 25%). In each green area the most represented family is the Pinaceae (even 50%), instead allergenicity is mainly linked to the presence of Cupressaceae, Oleaceae, Fagaceae in much varying quantities.

CONCLUSIONS

In this way we obtained the phytoclimatic characterization of these nine areas that justifies the need to elaborate a new pollen index. The data collected until now is a precious starting point.

ID: 204
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.017 | Scholastic garden: from a potential dangerous environment to a green chance

Travaglini A., Brighetti M. A., Miraglia A.
Department of Biology of University of Rome "Tor Vergata"
Presenting author email: alessandro.travaglini@uniroma2.it

Keywords: allergy, school garden, green management

BACKGROUND AND OBJECTIVES

Quality of urban environment is very important especially for great towns. Green areas, gardens, parks treelines play important role for citizen from different points of view. They can improve life quality promoting human health, reducing pollution and noise. Classifying urban green it is possible identify different categories. One of these are scholastic gardens.
In the school of Municipality of Rome, for age 0-11 years, there are about 296,285 people. Many schools have a garden. The percentage of people with allergic rhinitis is around 40% and of these 10% have asthma. So it is important well project or manage scholastic gardens.

MATERIAL AND METHODS

For this pilot study twelve schools, situated in the area of the two VPPS of aerobiological monitoring centre of Rome situated at Tor Vergata and the San Pietro FBF hospital, were chosen. Other criteria for the school choice were: the presence of a green space, the years of school buildings, the context of the surrounding vegetation.

RESULTS

After the surveys in the school 555 species were detected. The monitoring involved Pteridophytes, Gimnosperms and Angiosperms for a total of 114 families and 355 genera. The classified species are both native and allochthonous, both spontaneous and cultivated.

CONCLUSIONS

The sample of schools taken into consideration includes schools built over a 70-year period. It is therefore interesting to observe the design change. Only after 2006 municipality of Rome introduced new criteria of thinking scholastic gardens, often involving citizens in design. From cooperation between X Department of Roma Capital and university of Rome Tor Vergata emerged also the necessity to avoid allergenic species in new gardens or in remaking. Only after several years from our first experiences in Jan 2019 municipality of Rome adopted the new rule of private and public green and urban landscape in which for first time it is clearly established at article 25 that allergenic plants cannot be used.

ID: 205
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.018 | Urban flora to increase animal biodiversity in cities

Pau Cardellach[1], Concepción De Linares[1], Jordina Belmonte[1]
1 Ins. Ciència i Tecnologia Ambientals (ICTA) i Dept. Biologia Animal, Vegetal i Ecologia. Universitat Autònoma de Barcelona (UAB). 08193 Bellaterra

Keywords: urban biodiversity, urban beekeeping, flora, pollen

BACKGROUND AND OBJECTIVES

Biodiversity is one of the most important indicators of the quality and sustainability of the ecosystems. In urban spaces, the more plant diversity the more biodiversity of other organisms since the plants will provide food through their flowers and fruits.
The design of the green urban spaces can take into account the plant species and their timing of flowering and fructification to contribute to attract animal biodiversity.
The aim of this study is to provide information on the urban flora (trees and shrubs) of interest for bees that may also increase the biodiversity of other fauna thanks to the floral resources, sugary exudates, resins and fruits.

MATERIAL AND METHODS

This study combines information elaborated by Marlès Magre (2017) and the results of a melissopalynological study of 51 honeys and 26 propolis from Catalonia (NE Spain). Honeys were analyzed using the methods proposed by Louveaux et al. (1978) and propolis according to Barth (1998).

RESULTS

The more than 70 plant taxa considered, both exotic and Mediterranean, have the capacity to attract animal biodiversity. The most frequent resources used by bees from these plants are pollen (92.9% of the taxa) and nectar (from 74.3%), while sugary exudates and resins are utilized in 24.3% and 14.3%, respectively. The species that can provide food during a longer period of time (9-12 months per year) are *Buxus sempervirens*, *Eucalyptus camaldulensis*, G*revillea juniperina*, *Pyracantha* sp. pl., *Retama monosperma*, *Rhamnus alaternus*, *Salix* sp. pl., *Schinus molle*, and *Viburnum tinus*.

CONCLUSIONS

Our study shows a diversity of plants useful to increase biodiversity in urban spaces, contribute to the successful installation of urban pollinators, the development of urban beekeeping and the viability of urban agriculture.

Marlès Magre J. (2017). Biodiversitat Urbana, La Ciutat Com Un Ecosistema. El Cas De Les Ciutats De Barcelona i De Valls. PhD Thesis, ICTA-UAB.

Louveaux J Maurizio A & Vorwohl G. (1978). Bee world, 59(4), 139-157. Barth O M (1998). Grana, 37(2), 97-101.

ID: 116
Session: GREEN URBAN SPACES
Topic: GREEN URBAN SPACES

O.019 | Investigations on pollen deposition and transport of Fraxinus excelsior L. at a small spatial scale

Anna Katharina Eisen[1], Barbara Fussi[2], Susanne Jochner-Oette[1]
1 Physical Geography / Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, 85072 Eichstätt, Germany
2 Bavarian Office for Forest Genetics (AWG), 83317 Teisendorf, Germany

Keywords: *Fraxinus*, ash dieback, pollen transport and deposition

BACKGROUND AND OBJECTIVES
The ongoing fragmentation of ash populations due to ash dieback requires an effective gene flow between individuals; thus, investigations on ash pollen transport are essential. The main aim of this study was to assess the influence of meteorology (especially wind), phenology and distance to the pollen source on pollen deposition and transport at a seed plantation and its surrounding in Baden-Württemberg, Germany.

MATERIAL AND METHODS
Aerobiological pollen measurements were achieved using six gravimetric pollen traps (GPTs). Five GPTs were placed in the agricultural land surrounding the plantation with a max. distance of 500 m from the plantation and one GPT was placed within the plantation. Microscope slides were attached at each cardinal direction (i.e., horizontal pollen transport); a fifth slide was oriented horizontally under a rain shelter at 1.5 m a.g.l. (i.e., pollen deposition). The slides were changed between 18th March and 14th May 2019 in order to determine weekly pollen counts per cm^2. Meteorological parameters were obtained from one climate station located in the plantation and from two anemometers in the surrounding land.

RESULTS
The main pollen season was recorded between 9th and 23rd April. Although westerly winds prevailed, the highest cumulative pollen deposition (174 pollen / cm^2) was observed at the most distant GPT in the west and the lowest at 2 GPTs in the east of the plantation (32 and 38 pollen / cm^2). However, pollen deposition increased with distance to the pollen source and was not markedly higher within the plantation (94 pollen / cm^2). In the first half of the main pollen season, the majority of all registered pollen were transported from the north (58 %); in the second half from the east (45 %). Differences in wind speed and phenology were found to alter pollen deposition and transport at a small spatial scale.

CONCLUSIONS
The use of GPTs offers a low-cost but labour-intensive opportunity to study aerobiological processes. Pollen transport and deposition at small spatial scales is largely depended on local vegetation, its phenology, meteorology and height of the pollen source resp. pollen trap.

ID: 049
Session: BASIC AEROBIOLOGY
Topic: AGRONOMY AND FORESTRY APPLICATION

O.020 | Co-occurrence of the allergenic pollen and fungal spore seasons against a background of the climatic zones in Europe

Dorota Myszkowska[1], Katarzyna Piotrowicz[2], Paweł Bogawski[3], Agnieszka Grinn-Gofroń[4], Uwe Berger[5], Maira Bonini[6], Valentina Ceriotti[6], Carmen Galan[7], Bjorn Gedda[8], Nicoleta Ianovici[9], Gilles Oliver[10], Sanna Pätsi[11], Rosa Pérez Badia[12], Małgorzata Puc[13], Victoria Rodinkova[14], Elena Severova[15], Carsten Skjoth[16], Michel Thibaudon[10]

1 Jagiellonian University Medical College, Department of Clinical and Environmental Allergology, Śniadeckich 10, 31-531 Kraków, Kraków, Poland
2 Department of Climatology, Institute of Geography and Spatial Management, Jagiellonian University, Gronostajowa 7, 30-387 Kraków, Poland
3 Laboratory of Biological Spatial Information, Faculty of Biology, Adam Mickiewicz University in Poznań, Umultowska 89, 61-614 Poznań, Poland
4 Institute of Biology, University of Szczecin, Wąska 13, 71-415 Szczecin, Poland
5 Department of Oto-Rhino-Laryngology, Medical University of Vienna, Währinger Gürtel 18-20, 1010 Wien, Austria
6 Agency for Health Protection of Metropolitan Area of Milan (ATS), Via Spagliardi 19 - 20015 Parabiago, Milan, Italy
7 Department of Botany, Ecology and Plant Physiology, Ed. Celestino Mutis, Campus de Rabanales, University of Cordoba, 14071 Cordoba, Spain
8 Swedish Museum of Natural History, P. O. Box 50007 SE-104 05 Stockholm, Sweden
9 West University of Timisoara, Faculty of Chemistry, Biology, Geography, Department of Biology - Chemistry Pestalozzi Street, No. 16, 300115, Timisoara
10 RNSA, 11 chemin de la Creuzille Le Plat du Pin — 69690 Brussieu, France
11 Aerobiology Unit, University of Turku, FI-20014 Turun Yliopisto, Finland
12 Institute of Environmental Sciences, University of Castilla-La Mancha, Campus Tecnológico de la Fábrica de Armas, 45071 Toledo, Spain
13 Institute of Marine & Environmental Sciences, University of Szczecin, Szczecin, 71-412 Szczecin, 3c Z. Felczaka street, Poland
14 National Pirogov Memorial Medical University, 56, Pirogov street, Vinnytsia, 21018, Ukraine
15 Moscow State University, Leninskie Gory 1-12 Moscow 119234, Russia
16 University of Worcester, Campus St John's, Worcester WR2 6AJ, UK

Keywords: pollen, spores, allergens, synchronization

BACKGROUND AND OBJECTIVES

The increase in the incidences of allergic rhinitis provoked by pollen and fungi allergens has been observed in Europe. Usually, according to the region, pollen and fungal spore seasons differ with time, however they may partially overlap causing a threat of a multi-allergen exposure for allergic people. The main purpose of this study was to determine the spatial patterns of the timing and frequency of co-occurrence in airborne pollen and fungal spores in Europe.

MATERIAL AND METHODS

Daily concentrations of major allergenic pollen (birch, grass, mugwort, ragweed, olive) and fungal spores (Alternaria, Cladosporium) in 2005-2019 at 14 sites, covering the different climate types were included into the analyses. Pollen season start and end of a given taxa were calculated according to the EAACI guidelines, except at mugwort, Alternaria and Cladosporium, for which the most frequently reported threshold values were considered (30 Pollen/m3, 100 Spores/m3 and 3000 Spores/m3, respectively) with the usage of moving average method. The frequency and timing of periods with elevated pollen and spore concentrations for more than one taxon for individual years and sites was documented.

RESULTS

Generally, overlaps between at least two different pollen/spore seasons occurred at each site (excluding Kevo)

during every year. In central Europe (temperate climate) the seasons co-occurred more frequently and for more taxa, and even they overlapped for as many as four taxa in Copenhagen (82% of years), Szczecin (73%), Kraków and Vinnitsa (60%). Among the studied sites, Vinnitsa presents the earliest and longest overlapping periods (from the end of May to the beginning of July) and Milan the latest and shortest overlapping periods (several days in the middle of September).

CONCLUSIONS

The phenomenon of co-occurrence of airborne allergen concentrations is relatively common in Europe, especially in temperate climate. In contrast, in colder and in warmer regions the pollen/spore seasons occur more separately with the spore concentrations below the threshold risk values for allergic individuals.

ID: 172
Session: BASIC AEROBIOLOGY
Topic: HEALTH IMPACT

O.021 | Determining spatial representativeness of pollen traps for siting the stations of a monitoring network

G. Lieberherr, R. Gehrig, B. Clot, B. Crouzy, A. Pauling, F. Tummon
Swiss Federal Office of Meteorology and Climatology MeteoSwiss, Payerne, 1530, Switzerland
Presenting author email: gian.lieberherr@meteoswiss.ch

Keyword: pollen monitoring, siting, spatial variability, clustering

INTRODUCTION AND OBJECTIVES

MeteoSwiss is currently developing the Swiss automatic pollen network, aiming at delivering real-time information by using automated pollen monitors. On this occasion, the location of each measuring site is reevaluated, and the design of the complete monitoring network is revised. Not only technical criteria on how to take a measurement are considered. Also, good spatial coverage and the integrity of long and robust time-series are essential criteria for siting the stations. Within this work, we focus on evaluating and analyzing the spatial coverage of the pollen monitoring network sites.

MATERIALS AND METHODS

We present a method to define the spatial extent for which each single pollen monitoring site is representative. For this, we use spatial data from the pollen dispersion model COSMO-ART with 1km resolution. The available dataset contains 3 seasons of *Betula* and Poaceae pollen. Grid points with a similar seasonal course and intensity of pollen concentrations are considered to be represented by that measuring site. This allows analyzing the spatial coverage of the entire monitoring network, and also to derive the coverage of the population.

RESULTS

First, we validated the quality of the pollen dispersion model by comparing the data from the current Hirst-trap network to the modeled data. By finding very similar spatial patterns in both datasets, we could confirm the model's ability to reproduce spatial variability throughout pollen seasons.
The presented method was then applied to the current Swiss pollen-monitoring network to analyze its representativeness in space. We revealed considerable gaps in population coverage and spatial coverage. Using the introduced method as a tool to evaluate and compare siting scenarios, we were able to find a new siting design of the Swiss pollen-monitoring network. The new design significantly improves the coverage of the Swiss population without affecting the integrity of important climatological time series.

CONCLUSIONS

The results for Switzerland rely on sparse model data. Nevertheless, the method showed its potential as a useful tool in defining the monitoring sites of the Swiss pollen monitoring network. When modeled pollen dispersion data with a suitable spatial resolution is available, the method becomes a powerful tool to quantify and compare spatial coverage of different siting scenarios.

ID: 169
Session: BASIC AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.022 | Added value to monitor pollen at street level compared to stationary roof top level

Letty A de Weger[1], Frank Molster[2], Kevin de Raat[1], Jeffrey den Haan[1], Johan Romein[2], Marijke Mostert[3], Willem van Leeuwen[3], Pieter S Hiemstra[1]

1 Department of Pulmonology, Leiden University Medical Center, Albinusdreef 2, 2333ZA, Leiden
2 Leidse Instrumentmakers School, Einsteinweg 61, 2333 CC Leiden, The Netherlands
3 University of Applied Sciences, Zernikedreef 11, 2333 CK Leiden, The Netherlands

Keywords: street level, handheld sampler, birch pollen, grass pollen

BACKGROUND AND OBJECTIVES

Allergic rhinitis resulting from pollen exposure is one of the most common allergic diseases. Monitoring of allergenic pollen is relevant to help patients to manage their symptoms. Conventionally, monitoring of pollen takes place at 20-30 m above street level using stationary samplers, which is relevant to assess regional pollen levels. However, since patients are mostly exposed to pollen at street level, it is also relevant to increase our knowledge on the distribution of these allergens at street level.

MATERIAL AND METHODS

To this end, a handheld pollen sampler was developed (6 x 15 cm), in which an air flow was generated by a power bank-operated ventilator. The sampler collected the particles in the air on a cellulose strip covered with Vaseline. Pollen were collected at three locations in the city of Leiden at 3 time points a day and one day in the week. Pollen were analysed by microscopy. For comparison, daily pollen were monitored at the Leiden university Medical Center at rooftop level 25 m height) using a stationary Hirst type pollen sampler (Burkard Manufacturing Co).

RESULTS

Pollen levels at street level correlated well with the those at rooftop level. The street level measurements show significant differences during the day and between different locations in the city. Furthermore, street level measurements showed that birch and grass pollen were collected respectively 1.5 and 2-3 weeks before they were observed in the daily pollen counts at rooftop level.

CONCLUSIONS

The results from the present study indicate that patients are exposed to variable pollen levels at different locations in the city. Furthermore, at the start of the pollen season, pollen were detected 1.5 (birch) and 2-3 (grass) weeks earlier at street level compared to their detection in the daily counts at roof top level, which may explain why some patients can have symptoms before the start of the pollen season as determined by rooftop level pollen counts.

This study was supported in part by grants: Generade (2016-12) and RAAK PUB03.045.

ID: 020
Session: BASIC AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.023 | Interlaboratory proficiency test in aerobiology using virtual slides – feasibility study

Matt Smith[1], **Branko Šikoparija**[2]
1 School of Science and the Environment, University of Worcester, UK
2 BioSense Institute - Research Institute for Information Technologies in Biosystems, University of Novi Sad, Dr. Zorana Đinđića 1, Novi Sad, Serbia

Keywords: aerobiology, quality assurance, Quality Control, questionnaire, virtual slide images

BACKGROUND AND OBJECTIVES
Here we pilot the use of Virtual Slide Images of aerobiological samples with the aim of assessing their efficacy and usability in comparison to traditional microscopy with glass slides for Quality Control.

MATERIAL AND METHODS
Three glass microscopy slides containing samples collected in Serbia in 2018 were digitised. Six counters from two laboratories examined the glass slides and their data were used to calculate assigned values and acceptable coefficients of variation (CV%) for 7 pollen types. A total of 24 analysts from 12 countries examined the virtual slides using specialist OlyVIA software. Data from traditional glass and virtual slides were entered into tests for repeatability and intralaboratory reproducibility following the norm EN 16868:2019. Participants were also asked to fill in a questionnaire reflecting on the efficacy and usability of Virtual Slide Images for interlaboratory Quality Control.

RESULTS
It was found that data from traditional glass and virtual slides were comparable but coefficients of variation were generally larger for virtual slides than glass slides. Participants who examined

CONCLUSIONS
There are advantages and disadvantages of the two methods, and we recommend virtual slides are used as an adjunct to glass slides for use in aerobiology Quality Control and other aspects of palynological training and assessment.

ID: 119
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.024 | An improved understanding of uncertainty in Hirst-type pollen trap measurements

Fiona Tummon, Natalie Lemonis, Regula Gehrig, Bernard Clot, Benoît Crouzy, Gian Lieberherr, Marie-José Graber, Christine Sallin
MeteoSwiss

Keywords: Hirst-type trap, uncertainty, comparison

BACKGROUND AND OBJECTIVES
Hirst-type pollen traps are used around the globe in pollen monitoring networks. They are robust, reliable, and simple devices but are known to suffer from a range of shortcomings, including collection efficiency, errors in flowrate estimations, sampling efficiency, and quality control. Despite these issues, Hirst-type traps are often the only instruments in use or when automatic devices are available, they effectively provide the only available reference against which evaluations can be made. Understanding the uncertainty associated with these measurements, however, is essential for comparative and other related analyses of these datasets.

MATERIAL AND METHODS
Three Hirst-type traps were run in parallel on the roof of the MeteoSwiss building in Payerne, Switzerland. The instruments were placed within metres of each other and are expected to have sampled the same air mass. Comparison of daily average values from the three traps were compared for a range of pollen taxa covering various sizes and types.

RESULTS
In terms of total pollen, correlation coefficients between the three pairs of traps are all larger than 97% indicating that uncertainty is low. When considering taxa individually, correlations between the pairs of traps were generally good for most species, with correlations of greater than 80% between traps for 32 out of the 60 cases investigated. Interestingly, there were larger differences between traps for the smallest pollen taxa (diameter < 20 µm) as well as for the highest and lowest concentration classes (> 300 pollen grains/m3 and < 20 pollen grains/cm3, respectively). This indicates considerably greater uncertainty at the taxa-level, which needs to be accounted for in analyses.

CONCLUSIONS
Having an accurate estimate of the uncertainty associated with Hirst-type pollen trap measurements is essential, particularly when comparing results against new real-time devices. This work presents results from a campaign where three traps were run in parallel for an entire pollen season. For total pollen differences between traps are relatively low (between 2-3%) while at the taxa-level they are considerably higher, at least in the range of 20-30%.

ID: 120
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.025 | Grass pollen morphology in Ukraine: three categories are established

Maryna Yasniuk, Olha Kaminska, Victoria Rodinkova
National Pirogov Memorial Medical University, Vinnytsya, Ukraine, Pirogov Street, 56, Vinnytsia, Ukraine, 21018

Keywords: grass pollen, size categories, microscopic identification

BACKGROUND AND OBJECTIVES

It is important to distinguish between pollen grains of different genera of Poaceae family for exact diagnosis of the pollinosis and better understanding of the allergenic impact of the grass pollen on population. Thus, the aim of our study was to provide morphological distinction of the pollen of different genera of Poaceae family.

MATERIAL AND METHODS

We collected both herbarium specimens and pollen of the investigated plants directly in the field during May and June 2019 in Vinnytsya, Ukraine. Pollen was shaken off the anthers directly on microscopic slide, immediately stained by dye kept in thermos, and closed by cover slip. Width and length of pollen was determined and analysed using quartile method to split the obtained sizes into the categories.

RESULTS

We distinguished 3 pollen size categories – large, medium and small. Large grains had both parameters of width and length 40 μm and more, medium-sized grains laid in-between 26 and 39 μm, and small grains ranged 26 and lesser micrometres of width and length.

Category of large grains included *Hordeum murinum* (39,5-53,1 μm), *Elytrigia repens* (41-48 μm), *Secale cereale* (48,4-62,5 μm) and *Bromus arvensis* (42,2-52,7 μm) pollen.

Medium-sized grains included pollen of *Dactylis glomerata* (29,2-38,1 μm), *Poa spp.* (26,1-37,3 μm), *Panicum capillare* (33,3-39,5 μm), *Lolium perenne* (30,4-35,3 μm), *Bromus sterilis* (28,3-30,8 μm). *B. ramosus* pollen ranged from 26,1 to 39,5 μm and *B. tectorum* – from 35 to 38,4 μm. The smallest category gathered pollen of *Poa pratensis* (22,1-25,9 μm) and *Piptatherum spp.* (20,3-24,1 μm).

The only grass, which pollen size fitted every category was *Agrostis gigantea*. For different populations of this plant we found large, medium-sized and grains of 25,0 -27,7 μm, which laid between categories 2 and 3.

CONCLUSIONS

It is possible to distinguish between some Poaceae genera by size of their pollen, while in other cases pollen significantly varies. More studies are needed to better determine Poaceae pollen morphology, exact time of species flowering and coincide this with data of sensitivity to grass pollen in Ukraine.

ID: 174
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.027 | Overview of the first year of the new pollen monitoring network in Navarra

Mónica González-Alonso[1], Anabel Pérez de Zabalza[1], Arturo H. Ariño[1]
1 Dept. Environmental Biology, University of Navarra (C/ Irunlarrea, 1 31008 Pamplona. Navarra. Spain)

Keywords: pollen monitoring network, NA-Poleon app, climate change

BACKGROUND AND OBJECTIVES

As climate change progresses, airborne pollen contents profiles are expected to change. Population alerts will likely become more important as they are relevant to public health. Navarra (NA), a Spanish region sitting at the confluence of three bioclimatic areas, had a single Hirst pollen trap operating since the 80's in its centrally-located capital city of Pamplona, reporting counts during labor days of spring.
Since 2018, the LIFE NADAPTA Project aims at reducing the impacts of, and developing adaptation strategies for, climate change effects. One of its working areas seeks to improve pollen monitoring by widening the coverage in both space and time and streamlining the information to the public.

MATERIAL AND METHODS

Two new monitoring stations were installed: one in the dry Mediterranean south (Tudela, April 2019), and one in the humid north (Santesteban-Doneztebe, September 2019). All three stations now operate all year round.
Pollen stations are 7-day Hirst pollen traps. Daily pollen counts follow the Spanish Aerobiology Network (REA) method. Counts are speeded up, database keeping facilitated, and reporting automated by NA-PoleOn v.15, a custom-made application running on Excel that is also used to build the weekly forecasts.

RESULTS

We report the installation of the new network and its workflow and data handling. Pollen counts and forecasts are reported back to the Public and Labor Health Institute of the Navarra Government, who contracts the service and publishes pollen data and level alerts through e-mail, SMS, a web page, and media outlets. Also, the Spanish Society for Clinical Allergology and Immunology (SEAIC) and the REA are supplied with automatically-produced data files every few days. Two compact web sites feeding from NA-PoleOn have been developed for releasing tailored and timely information to the local medical staff and the general public.

CONCLUSIONS

The LIFE-NADAPTA Project now covers all three biogeographical areas of Navarra all year round. Increased coverage of pollen counts will lead to a better knowledge of pollen phenology and shifts, and will enable creating the first 365-day pollen calendar. NA-PoleOn greatly facilitates counts, dataflow and information release.

ID: 126
Session: BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

O.028 | The impact of environmental factors and tree cover density on allergenic Cupressaceae and Platanus pollen exposure in urbanized region: Ankara case

Aydan Acar Şahin[1], Mustafa Üstüner[2], Nur Münevver Pinar[1]
1 Department of Biology, Faculty of Science, Ankara University, 06100, Ankara, Turkey
2 Department of Geomatic Engineering, Yildiz Technical University, Esenler, 34220, Istanbul, Turkey

Keywords: Cupressaceae, *Platanus*, pollen, allergy, urban, tree cover density

BACKGROUND AND OBJECTIVES
In generally early spring, Cupressaceae and *Platanus* trees are the most important sources for the airborne allergens in Ankara province where these trees grow natively and are planted largely for ornamental purposes in gardens, parks and roadsides. Thus, it was aimed to examine the interactions of airborne *Platanus* and Cupressaceae pollen loads with a set of environmental factors and compare the pollen seasons due to tree cover densities among the years.

MATERIAL AND METHODS
Airborne pollen sampling was performed using a 7-day Hirst type volumetric spore trap for years 2012-2016. Spearman's correlation test and the multiple regression analysis were performed to determine the relations between the pollen loads, meteorological and air pollution variables. The multitemporal data of optical images (Sentinel-2 and Landsat-8) were used as input data for the generation of tree cover density maps.The reference data for the broadleaved and coniferous forest cover were provided by EEA within the Copernicus Programme.

RESULTS
As a result, the highest APIn was registered in 2015, while it was lowest in 2014 for both taxa. The average high risky day numbers were recorded as 1 day for *Platanus* (>141p/m3) and 8 days for Cupressaceae (>227p/m3) pollen allergy. Daily temperature (mean,max,min), relative humidity, total rainfall, global solar radiation and wind direction were the climatic factors influencing the daily airborne pollen concentrations. The presence of air pollutants such as ozone, PM10, CO, SO2 and NO2 were significantly related to the pollen loads in the air. However, multiple regression models could have only explained little part of the total variance. Wind direction was positively correlated with both pollen loads in only 2015. Regarding this, the greatest contribution of both pollen were given by the southwestern winds, with the support of the high abundance of broadleaved and coniferous trees in this area in 2015.Moreover, tree cover density has increased from 2012 to 2015 and this may have affected the increase in pollen sources.

CONCLUSIONS
Consequently, while evaluating the pollen release dynamics, it is important that the multidimensional approach should be taken action especially in urbanized sites.

ID: 147
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.029 | Intradiurnal variations of atmospheric pollen in natural and urban-rural environments in southern Spain

Antonio Picornell, Marta Recio, Rocío Ruiz-Mata, Baltasar Cabezudo, María del Mar Trigo
Department of Botany and Plant Physiology, University of Malaga. Spain. Campus de Teatinos s/n 29071

Keywords: intradiurnal, Natural Park, protected area, pollen

BACKGROUND AND OBJECTIVES
Local pollen sources and meteorological conditions influence the intradiurnal patterns of airborne pollen, determining the hours of the day when the highest pollen concentrations are registered. Sierra de las Nieves is a Biosphere Reserve and a Natural Park with prevalence of natural vegetation. Ronda is located near the domains of this protected area, being one of the cities situated inland Malaga province (southern Spain). The main aim of this study was to characterise the intradiurnal patterns of the most abundant pollen types in these two localities searching for differences between them.

MATERIAL AND METHODS
The study was conducted during 2017-2019 in Ronda and 2018-2019 in Sierra de las Nieves (12 km distant). Pollen was collected by means of two Hirst-type volumetric pollen traps. Samples were mounted and counted following the recommendations of the Spanish Aerobiology Network (REA). The five most abundant pollen types in both stations were studied. Only the rain-free days exceeding the daily average pollen concentration of the main pollen season (90%) were studied. Hourly pollen data were expressed as 2-hours percentages of the daily pollen counts. The data obtained from the two stations were compared by means of Wilcoxon tests. Additionally, a cluster analysis was performed for Castanea pollen. The Intradiurnal Distribution Index (IDI) was also calculated.

RESULTS
No significant differences were observed in the intradiurnal patterns between the sampling years within the same station. However, different patterns were observed between stations, highlighting the differences found in Cupressaceae, Castanea and Quercus. In Sierra de las Nieves, two different patterns were observed for Castanea.

CONCLUSIONS
The influence of local pollen sources could explain the differences registered in the IDI values between the two stations. Moreover, the highest differences between stations were detected in the case of pollen types belonging to the most abundant taxa in the surrounding areas of the stations. On the other hand, according to the patterns observed in Castanea, a common source may explain the general behaviour, while a secondary source may explain the differences observed in the Natural Park.

ID: 061
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.030 | Airborne pollen in different biogeographical areas

I. Helfman-Hertzog[1], C. Galán, C.[2], E. Levetin, E.[3], H. Kutiel[1], T. Hefer[4]
1 Laboratory of Climatology, Department of Geography and Environmental Studies
2 Department of Botany, Ecology and Plant Physiology, University of Córdoba, Córdoba, Spain
3 Department of Biological Science, University of Tulsa, Oklahoma, USA
4 Meuhedet Clinic, Haifa, Israel

Keywords: pollen concentration, phenological behavior, Meteorological parameter

BACKGROUND AND OBJECTIVES

Pollen season timing and intensity differ from area to area, being influenced by different meteorological parameters, local topography, and phenological behavior. The current study was undertaken to define the pollen seasons, intensity, and relationship with meteorological parameters in four different biogeographical areas: Jerusalem and Tel Aviv (Israel), Córdoba (Spain) and, Tulsa (Oklahoma, USA).

MATERIAL AND METHODS

Daily pollen concentrations were recorded from 2010 to 2014 using Hirst-type spore traps. Four pollen types were studied: Cupressaceae, *Quercus*, Poaceae, and *Artemisia*. The main pollen season (MPS) of each pollen type was defined and divided into pre-peak and post-peak. Pearson correlation and linear regression analysis were carried out for pollen concentrations and meteorological parameters during the MPS, pre-peak, and post-peak periods. Afterwards, multiple regression analysis was applied using significant meteorological parameters. The regressions were done also between meteorological parameters of the previous day with the pollen of the next day. The models were tested for validation through linear regression between real and predicted pollen concentrations.

RESULTS

The MPS start date mostly occurred in a range of three weeks in the different sites, except for Cupressaceae in Córdoba and *Quercus* in Tel Aviv which had a range of more than a month when compared with the other sites. The MPS end date range was longer, ranging from five weeks to four months depending on pollen type. Significant positive correlations were found with temperature while negative correlations were found with respect to rainfall and relative humidity. During post-peak, lower correlations were observed. The linear regression and the multiple regression analysis supported the results of the correlations. The models predicted Cupressaceae, *Quercus,* and Poaceae mainly in Córdoba and Tulsa. A comparison between predictions relating to pollen concentration on the same day as opposed to predictions relating to pollen concentration on the following day showed that the predictions made on the same day were more reliable.

CONCLUSIONS

The relationship between airborne pollen and meteorological parameters were uniform at all four sites. A positive correlation was found regarding the pollen concentration and higher temperatures while a negative correlation was found regarding humidity and rainfall.

ID: 057
Session: BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

O.031 | Airborne pollen and spores' deposition in alveolar tissues as a tool in drowning forensic diagnosis

Herminia Garcia-Mozo, Cristina Beltrán-Aroca, Eloy Girela
University of Córdoba

Keywords: autopsy, drowning, diatoms, pollen, spores

BACKGROUND AND OBJECTIVES

Drowning diagnosis has been highly discussed in legal medicine due to a lack of pathognomonic findings indicative of drowning in comparison with other causes of death. One of the proposed bioindicators of drowning after autopsy is the presence of diatoms algae in tissue analysis of different organs, such as lungs, muscle and even bones of corpses, due to their silica cell wall.

MATERIAL AND METHODS

A recent work proving the effectiveness of diatoms in drowning forensic diagnosis was performed at the Legal Medicine Laboratory of the University of Córdoba, by comparing tissue analyses of true drowned rats, with the results of previously sacrificed and post-mortem submerged rats' tissues. After acid digestion, drowned rats' tissues, and especially alveolar surrounding ones, showed a significant higher concentration of diatoms in comparison with the control post-mortem submerged rat group

RESULTS

We report the results of a deeper histological study of the alveolar samples where an unusual quantity of airborne pollen and fungal spores were found in drowned rats. Pollen and spores were found in lungs of drowned rats but not in the post-mortem submerged ones. Taxa coincide with those growing at the surrounding gardens flowering during the days (April 25th -May 8th) detected by the Hirst trap located at the city. The pollen observed at the lower airways' tissues were Chenopodiaceae, Cupressus, Ericaceae, Jasminum, Olea europaea, Plantago, Pinus, Poaceae, Quercus and Urticaceae. Regarding fungal spores Alternaria, Aspergillus, Cladosporium cladosporoides, Cladosporium herbarum, Leptosphaeria, Polythrincium and Phitomyces.

CONCLUSIONS

Pollen and spores' penetration into deeper regions of the respiratory tract is not a common phenomenon. Our results reveal that in lung samples of drowned animals appear in a significant number. The presence of these biological particles into alveolar spaces offer a useful forensic finding in doubtful drowning autopsies, favoured by the characteristic of the sporopollenin (pollen wall) and chitin (fungal spore wall) resistance. Moreover, the presence of these particles in alveoli areas of drowned bodies can help forensics to obtain information about pre-mortem dates and places.

ID: 009
Session: APPLICATIONS
Topic: FORENSIC SCIENCES

O.032 | Relationship between olives harvest, olive oil production and olive tree pollen concentrations in Toledo area (1995-2018)

Raúl Guzmán Rodríguez, José Alejandro Lemus Calderón, Ángel Moral de Gregorio, Carlos Jesús Senent Sánchez

Hospital Virgen del Valle. Allergy department. Toledo (Spain)

Keywords: olive tree, olives harvest, olive oil

BACKGROUND AND OBJECTIVES

The *Oleaceae* family, among which stands out the olive tree (*Olea europaea*), is one of the most relevant botanical families from the agricultural point of view in the Mediterranean area. In Spain, its pollination occurs from April to June. The objective is to check the correlation between the pollination of the olive tree, the olives harvest and the olive oil production.

MATERIAL AND METHODS

The concentration of olive pollen was measured with a Burkard collector installed on the rooftop of the Virgen del Valle Hospital from Toledo (39º 50´36´´ North Latitude, 4º 1´18´´ West Longitude) at 620 meters above sea level and following the criteria for the analysis of samples of the SEAIC Aerobiology Committee. Data on olives harvest and olive oil production in Toledo area were obtained from the website of the Ministry of Agriculture, fishing and Food (www.mapa.gob.es). The data were analyzed with the statistical program SPSS version 20.

RESULTS

From 1995 to 2018 an average concentration of olive tree pollen of 11.097 Pollen grains / m^3, an olives harvest with an average of 138.633 tons/year and an olive oil production with an average of 30.330 tons/year have been determined. The correlation between olive tree pollen concentrations and olives harvest is R = 0.748; p <0.001; the correlation increases when comparing olive tree pollen with olive oil production (R = 0.772; p <0.001). A linear regression was performed, obtaining the formula 37.226,79 + (9,13 x olive tree pollen) to estimate the tons of olives and 8.424,11 + (1,97 x olive tree pollen) for the olive oil. For the 2019 harvest, we estimate a collection of around 84.000 tons of olives and a production of 18.500 tons of oil.

CONCLUSIONS

We found that there is a clear correlation between olive tree pollen concentrations, olives harvest and olive oil production in Toledo area.

The olives harvest, as well as the oil production, could be estimated in relation to the amount of olive tree pollen obtained.

ID: 053
Session: APPLICATIONS
Topic: AGRONOMY AND FORESTRY APPLICATION

O.033 | Biological weed control to relieve millions of allergy sufferers in Europe

Urs Schaffner[1], Sandro Steinbach[2], Yan Sun[3], Carsten Skjoth[4], Letty de Weger[5], Suzanne T. Lommen[3], Benno A. Augustinus[1], Maira Bonini[6], Gerhard Karrer[7], Branko Sikoparija[8], Michel Thibaudon[9], Heinz Muller-Scharer[3]

1 CABI, Rue de Grillons, 2800 Delemont, Switzerland
2 ETH Zurich, 8006, Zurich, Switzerland
3 University of Fribourg, 1700 Fribourg, Switzerland
4 Univerisity of Worcester, Worcester WR2 6AJ, UK
5 Leiden University Medical Center, 2300 RC Leiden, The Netherlands
6 Local Health Authority, MIlano Citta Metropolitana, 20122 Milan, Italy
7 University of Natural Resources and Life Sciences, 1180 Vienna, Austria
8 Biosense Institute - Research Institute for Information Technologies in Biosystems, University of Novi Sad, 21101 Novi Sad, Serbia
9 French Network of Aerobiological Monitoring, RNSA, 69690 Brussieu, France

Keywords: Ophraella, economy and health impact, mitigation, Europe

BACKGROUND AND OBJECTIVES
Invasive alien species (IAS) can substantially affect ecosystem services and human wellbeing. However, quantitative assessments of their impact on human health are rare and the benefits of implementing sustainable IAS management likely to be underestimated

MATERIAL AND METHODS
In this study, we quantify the effects of the allergenic plant Ambrosia artemisiifolia on public health in Europe using pollen data and assess the potential impact of the accidentally introduced leaf beetle Ophraella communa on the number of patients and healthcare

RESULTS
We find that, prior to the establishment of O. communa in 2013, some 13.5 (95% confidence interval (CI) 10.9-14.8) million persons suffered from Ambrosia induced allergies in Europe, causing economic costs of approximately Euro 9.0 (CI 7.3-9.9) billion annually. Field studies in Italy proved evidence that O. communa can reduce A. artemisiifolia pollen production by 82%. By modelling the number of generations of O. communa across its suitable habitat range in Europe, we project that biological control of A. artemisiifolia will, once the leaf beetle has colonized its environmental niche, reduce the number of patients to about 11.2 (CI 8.6-12.9) million (mean reduction 16.9 %) and the health costs to Euro 7.5 (CI 5.8-8.6) billion per year.

CONCLUSIONS
Our conservative calculations indicate that currently discussed economic costs of IAS underestimate the real costs and thus also the benefits from biological control.

ID: 019
Session: RAGWEED
Topic: RAGWEED

O.034 | Health impact of Ambrosia artemisiifolia in Auvergne-Rhône-Alpes: analysis of medico-economic data

Lucie Anzivino[1], Abdoul Sonko[1], Pierre-Jean Chambard[2], Hervé Bertrand[2]
1 Observatoire régional de la santé Auvergne-Rhône-Alpes
2 Agence régionale de santé Auvergne-Rhône-Alpes

Keywords: medico-economic data, health impact, ragweed

BACKGROUND AND OBJECTIVES

Auvergne-Rhône-Alpes, is the third French largest region in France with about 7,9 million inhabitants and the most concerned with common ragweed infestation in western Europe. In 2016, according to data from ATMO Auvergne-Rhône-Alpes, 6,7 million inhabitants (86 %) have been exposed over 20 days to an allergic pollens risk index (RAEP) ⩾ 3 and about 1,5 million inhabitants (19 %) over 45 days to a RAEP ⩾ 3.
We attempt to quantify the ragweed pollinosis impact in the population of the region by carry out each year a study to estimate the sanitary costs based on the number of persons affected and the cost of medical care related to ragweed pollinosis and based on requests in the global French health public insurance database.

MATERIAL AND METHODS

- Exploitation of the database National System of health data and in the database of the Health insurance in an anonymous way;
- Identification of anti-allergic drugs being used for the treatment of allergy to ragweed with a significant peak in consumption during ragweed period;
- Definition of target population : individuals from 6 to 74 years old residing in the region and having received at least one reimbursement of these drugs during the ragweed pollination period
- Analysis of care consumption data : costs of anti-allergic drugs reimbursed, costs of biological identification tests specific immunoglobulin E (IgE), costs of desensitization products, costs of drugs for the treatment of asthma crises, costs of skin allergy tests, sick leave costs, costs of consultation proceedings.

RESULTS

More than 10% of the population are supposed allergic to ragweed. The youngest (12%) and the oldest (15%) are particularly concerned. Overall cost of care consumption relating to ragweed allergy estimated at more than 40,6 million €. Cost is mainly due to the actions of consultations with more than 40% of the total expenditure, i.e. more than 16.7 million €.

CONCLUSIONS

A fairly simple and low-cost approach to be implemented on a routine basis, but which regularly needs to be supplemented by an epidemiological study of prevalence.
The work, carried out in the region over the past ten years, allows monitoring over time the ragweed health impact.

ID: 136
Session: RAGWEED
Topic: RAGWEED

O.035 | Is there a new rise of both ragweed pollen levels and ragweed allergy in relation to the reduction of Ophraella communa in Northern Italy?

Maira Bonini[1], Valentina Ceriotti[1], Daniela Carcano[1], Giuseppe Cislaghi[1], Paola Colombo[1], Susanna Dellavedova[1], Riccardo Asero[2], Filomena Vecchio[3], Elisabetta Elena Re[4], Barbara Bramè[4], Paolo Bottero[5]

1 Agency for Health Protection of Metropolitan Area of Milan
2 Allergy Dpt., San Carlo Clinic, Paderno Dugnano, Milan
3 Allergy Unit, Asst Ovest Milanese, Magenta, Milan
4 Allergy Unit, Asst Ovest Milanese, Legnano, Milan
5 Allergy Unit Santa Crescenzia, Magenta, Milan

Keywords: Ragweed, *Ophraella communa*, Pollen exposure

BACKGROUND AND OBJECTIVES

Previous studies showed a reduction of ragweed pollen levels in the North-West Milan area since 2013 due to the spread of *Ophraella communa* LeSage (*O. communa*), an insect that preferably feeds on *A. artemisiifolia*, thus preventing pollen production. A decreased spread of *O. communa* was recently observed. The aim of this study was to see whether ragweed pollen levels were maintained or if there is a rise, seeing the reduction of *O. communa* in that area and to assess the possible impact on health.

MATERIAL AND METHODS

Pollen grains were sampled by 3 Hirst volumetric traps located in Legnano (L), Magenta (M) and Rho (R). Observation period ranged between 1995 and 2019. The Seasonal Pollen Integral (SPI), the peak value (C max) and its day, and the number of days exceeding proposed clinical thresholds were assessed. Clinical data were collected by 3 allergy clinics in the surroundings of the pollen monitoring stations, from 2005 to 2018. Pollen and clinical data trends were calculated by nonparametric means.

RESULTS

Significant SPI downtrends were observed for all stations. L and R showed significant C max decreases (p=0.019 and p=0.011). Significant downtrends for the number of days with ⩾ 100 p/m3 were observed for all stations. However, an increase of SPI and C max was detected in all three stations since 2018. A significantly reduced rate of ragweed allergic subjects (p=0.008) was observed in one allergy clinic, located in the most recent infested zone, while in the others the differences didn't reach significance and in addition an increase was observed in 2018.

CONCLUSIONS

Over the long term, the reduction of ragweed pollen levels in the Milan area was maintained. A positive impact on health was detectable only where the infestation was more recent. However, SPI and C max increased since 2018 in coincidence with a decreased presence of *O. communa*. In the same year, 2 allergy clinics recorded an increase of the ragweed allergic subjects, possibly reflecting the increase of pollen levels associated with the decrease of *O. communa* in this area.

ID: 028
Session: RAGWEED
Topic: RAGWEED

O.036 | Features of ragweed allergy: symptoms and drug consumption related to airborne ragweed pollen concentrations in Northern Italy

Maira Bonini[1], Gianna Monti[2], Valentina Ceriotti[1], Elisabetta Elena Re[3], Barbara Bramè[3], Paolo Bottero[4], Anna Tosi[5], Adriano Vaghi[6], Alberto Martelli[7], Giovanni Maria Traina[7], Loredana Rivolta[8], Federica Rivolta[8], Claudio Maria Ortolani[5]

1 Agency for Health Protection of Metropolitan Area of Milan, Milan, Italy
2 University of Milano-Bicocca, Department of Economics, Management and Statistics, Milan, Italy
3 Allergy Unit, P.O. Legnano, ASST Ovest Milanese, Milan, Italy
4 Poliambulatorio Santa Crescenzia, Magenta, Milan, Italy
5 Istituto Allergologico Lombardo, Casa di Cura Ambrosiana, Cesano Boscone, Milan, Italy
6 Pneumology Unit, P.O. Garbagnate Milanese, ASST Rhodense, Milan, Italy
7 Pediatric Unit, P.O. Garbagnate Milanese, ASST Rhodense, Milan, Italy
8 Allergy Unit, P.O. Abbiategrasso, ASST Ovest Milanese, Milan, Italy

Keywords: ragweed allergy, symptoms, drug consumption

BACKGROUND AND OBJECTIVES

Ragweed is a relevant allergenic risk factor in many countries of the world. The North-West Milan area is one of the most infested zone in Europe.
We aimed to assess: 1) the correlation between airborne ragweed pollen load and both symptoms intensity and drug consumption, 2) if this correlation was different in the ragweed Allergen-specific immunoterapy (AIT) treated compared to those not treated, 3) if there was an influence of airborne mugwort pollen on symptoms, 4) if it is possible to define specific health thresholds for airborne ragweed pollen.

MATERIAL AND METHODS

Pollen grains were sampled by 3 Hirst volumetric traps located in the above area, respectively in Legnano, Magenta and Rho.
Ragweed allergic patients, AIT treated or not, were enrolled by 5 allergy clinics close to the pollen traps. During the ragweed pollen season 2014, they compiled a daily diary of the symptoms and drugs taken. Time Series regression models were used to develop predictive models of daily symptoms and to evaluate short-term effects of time-varying pollen appearance on the onset of daily symptoms.

RESULTS

71 patients were enrolled (46 not AIT treated, 25 AIT treated).
We found a high significant correlation between ragweed pollen load and symptoms intensity in the not AIT treated ($r=0.598$, $p< 0.0001$), and a moderate significant correlation in AIT treated ($r=0.379$, $p=0.002$). The AIT treated mean symptom levels over the entire observation period were significantly lower than in not AIT treated ($p< 0.0001$). Moreover, in these patients, we observed a high positive correlation ($r=0.927$, $p<0.0001$) between the number of symptoms and drug consumption. In patients treated with AIT such correlation was slightly lower but still statistically significant ($r=0.75$, with $p<0.0001$). No significant correlation was found between symptoms and the mugwort pollen load.

CONCLUSIONS

In ragweed allergy patients, there is a significant correlation between symptoms and the concentration of pollen in the air. AIT treatment significantly reduces the mean number of symptoms, while the correlation symptoms/pollen load is no longer significant.
Based on our findings, it will be possible to define specific health thresholds for airborne ragweed pollen.

ID: 082
Session: RAGWEED
Topic: RAGWEED

O.037 | The duration of ragweed pollen season in Sherbrooke, Canada, is stable but concentrations are increasing

Elisabeth Levac
Bishop›s University

Keywords: ragweed, pollen, allergy, climate change, Quebec

BACKGROUND AND OBJECTIVES

The prevalence of symptoms from allergic rhinitis due to pollen (all types) was estimated to 17% for the Quebec population and a large proportion of individuals experiencing allergies are sensitized to ragweed pollen. Anecdotes circulate about people moving to the city of Sherbrooke, 160 km Southeast from Montreal, to avoid allergies caused by ragweed pollen. Airborne concentrations of ragweed might have been lower in the past, but they showed an increase in recent years. Ambrosia artemisiifolia is now common in vacant lots, along sidewalks and train tracks.

MATERIAL AND METHODS

Airborne pollen concentrations have been monitored at Bishop's University since 2006. A hirst-type sampler is installed from April to October on the roof of a 4 story building, to capture pollen dispersed in the regional air column and avoid bias from localized plant concentrations at ground level. Samples are prepared and analyzed with a transmitted light microsope following a standard procedure from the American Association of Allergy and Immunology. Data from the early 1980 is also used for comparison.

RESULTS

The duration of the ragweed pollen season has remained around an average of 43 days per year since the early 1980s. Results suggest that cooler conditions prior to the ragweed season cause it to start earlier, while warm and rainy weather in July cause the ragweed season to end later. Conversely, warmer August temperatures are correlated with a shorter ragweed season.

While the season length does not appear to change, the airborne pollen concentrations show an increase in recent years. We suspect that higher average daily air temperatures in July and August could have an impact on the airborne ragweed pollen concentrations, but more work is needed to assess the link between pollen concentrations and the temperature averages of previous months/years.

CONCLUSIONS

These results have important public health implications considering the projected climate change warming trends for Southern Quebec.

ID: 090
Session: RAGWEED
Topic: RAGWEED

O.038 | Indoor air fungal contamination in a university building

Albertini R., Capobianco E., Colucci ME., Viani I., Affanni P., Zoni R., Veronesi L., Pasquarella C.
Department of Medicine and Surgery, University of Parma

Keywords: air monitoring, air quality, fungal spores, public building

BACKGROUND AND OBJECTIVES

Airborne fungi can cause a spectrum of illnesses in humans; however, the burden of illness in the population attributable to fungi in private homes and public buildings is not yet known, due to the poor of studies on environmental exposure. The aim of this study was to evaluate the fungal airborne contamination in a university building. The study is the second step of a wider study aimed at evaluating fungal contamination in different environments.

MATERIAL AND METHODS

The study was performed in December 2019, on Friday 6th at the end of the week, during activity and on Monday 9th, before activity. For each of the three floors of the university building, air samples were collected in offices, laboratories, two sites in corridors (far and close to the fan coil) and on the stairway landing in front of the elevator. Air sampling was carried out both through active (colony forming units per cubic metre, CFU/m^3) and passive (Index of Microbial Air contamination, IMA) methods. 500 litres of air were sampled by DUOSAS 360 samplers and by Petri plates opened for 1 hour for each sampling point. Plates coated with Sabouraud Dextrose Agar were incubated for 120 hours at 24°C and 37°C. Colonies were stained with lactophenol blue for microscopical recognition.

RESULTS

Fungi were detected in almost all monitored environments. The CFU/m^3 median-average (standard deviation)-minimum-maximum were: 1) at 24°C 19-18 (± 9.41)- 0-28 and 8-9.38 (± 8.57)-0-36 before and during activity, respectively; 2) at 37°C 2-1.5 (± 1.55) 0-4 and 2-1.38 (± 0.96)-0-2 before and during activity, respectively. Regarding IMA values the results were: 1) at 24°C 1.5-1.81 (± 1.47)-0-5 and 1-1.31 (± 1.25)-0-4 before and during activity, respectively; 2) at 37°C 0-0.31(± 0.70)-0-2, before activity; during activity not fungy were found. The first floor was the most contaminated: before activity at 24°C average: 26 CFU/m^3 and 3 IMA; during activity at 24°C: 14 CFU/m^3 and 1 IMA; before and during activity at 37°C: 2 CFU/m^3; 0 IMA. The highest value was found at the first floor laboratory, during activity by active method at 24°C (36 UFC/m^3). Among identified fungal colonies, *Penicillium* spp. was the most frequently isolated microorganism (52.25%), also on each floor. The other fungi isolated were *Cladosporium* spp., *Mucorales* spp., *Aspergillus* spp. and *Absidia* spp.

CONCLUSIONS

Unexpectedly the highest values were recorded before the activity both on the total and for each floor. This results is interesting to analyze in depth during following steps of the study. The obtained data will represent a contribution for a better understanding of the aerobiological pattern of indoor fungi aimed to identifying acceptable levels for fungal contamination in work indoor environments.

ID: 167
Session: INDOOR AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

O.039 | Monitoring of pollen-related allergenic potential present in an indoor environment

Helena Ribeiro[1], Catarina Pereira[2], Bruno Silva[3], Maria Fernández-González[4], Sónia G. Pereira[3], Ilda Abreu[5]

1 Earth Sciences Institute (ICT). Department of Geosciences, Environment and Spatial Plannings of the Faculty of Sciences University of Porto, Portugal
2 Department of Biology of the Faculty of Sciences University of Porto, Porto, Portugal
3 Department of Geosciences, Environment and Spatial Plannings of the Faculty of Sciences University of Porto, Porto, Portugal
4 Earth Sciences Institute (ICT). CITACA. Department of Plant Biology and Soil Sciences University of Vigo, Ourense, Spain
5 Earth Sciences Institute (ICT). Department of Biology of the Faculty of Sciences University of Porto, Porto, Portugal

Keywords: IAQ, pollen qualification, protein quantification, outdoor pollen

BACKGROUND AND OBJECTIVES
People can spend up to 90% of their time in indoor environments, being exposed to several bioaerosols namely pollen that inhaled can induce allergies. The main source of indoor pollen is outdoor air and everyday activities can change indoor concentrations. We study the pollen allergic potential inside an university facility where students can spend up to 12 hours and different occupation regimes occur during the course of a pollen season.

MATERIAL AND METHODS
The study was carried out at the lobby of the Faculty of Sciences-University of Porto for 2 years. Daily airborne samples were collected directly into a 1.5 mL Eppendorf vials using a Burkard Cyclone sampler. Afterward, the total soluble protein amount was determined by the Bradford method and the residual pollen pellet was diluted to a constant concentration, mounted on glass slides, qualified and quantified using an optical microscope at ×400. Outdoor pollen sampling was conducted using a Hirst volumetric sampler and the standard method was applied for pollen analysis and quantification. Correlation with the meteorological parameters was performed.

RESULTS
Twenty-one pollen types were identified indoor. The most common were Acer, Betula, Cupressaceae, Olea, Pinus, Platanus, Poaceae, Quercus and Urticaceae. These were also the most representative in the outdoor air. The distribution of indoor airborne pollen concentration presented several peaks related to the outdoors diversity of taxa with different flowering seasons. Daily total indoor pollen levels were significantly correlated with daily total soluble protein amount, outdoor pollen concentrations, air temperature, relative humidity and rain. Nonetheless, it was observed a tendency to a time-delay of one to two days between each pollen species indoor-outdoor peak concentrations. Low indoor pollen concentrations, as well as soluble protein amount, were observed during the holidays and examination periods.

CONCLUSIONS
Indoor pollen concentrations were significantly influenced by outdoor airborne pollen. Also, some of the most representative pollen types found indoor are considered potentially allergenic and can persist inside for longer periods than outside, extending the exposure period.

ID: 106
Topic: INDOOR AEROBIOLOGY
Session: INDOOR AEROBIOLOGY

O.040 | Quantification of indoor pollen concentrations of mountain cedar (Juniperus ashei) during rainy episodes in Austin, Texas

Susanne Jochner-Oette[1], Johanna Jetschni[1], Darren Cattle[2], Petra Liedl[2], Annette Menzel[3,4]
1 Physical Geography / Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, 85072 Eichstätt, Germany
2 School of Architecture, The University of Texas at Austin, Austin, TX 78712, USA
3 Department of Ecology and Ecosystem Management, Ecoclimatology, Technical University of Munich, 85354 Freising, Germany
4 Institute for Advanced Study, Technical University of Munich, 85748 Garching, Germany

Keywords: indoor pollen concentration, personal volumetric air samplers, Thermal Labs

BACKGROUND AND OBJECTIVES
Standard pollen monitoring programs evaluate outdoor pollen concentrations, however, information on indoor pollen is crucial for human wellbeing as people stay inside buildings most of the day. In this study, we analysed the differences of indoor mountain cedar pollen concentrations between rooms with different use and ventilation at The University of Texas at Austin and focused on the effect of rainy episodes.

MATERIAL AND METHODS
Juniperus pollen were sampled using Personal Volumetric Air Samplers (Burkard Manufacturing Co Ltd) every second hour between 8 am and 6 pm on a total of 6 days in the beginning of 2015. These samplers were installed in seven rooms and two outdoor research facilities, the Thermal Labs that were controlled for ventilation. In addition, one sampler was located outside to obtain background pollen concentrations. We calculated the daily pollen integral (DPI, sum of hourly pollen concentrations), the campaign pollen integral (CPI, sum of all daily pollen integrals) and the ratio between indoor and outdoor concentrations (I/O ratio).

RESULTS
The highest CPI (906) was recorded in a room where the window and door were almost exceptionally opened, the lowest CPI (75) in a storeroom with no window and no forced ventilation. Rainy episodes were linked to a higher I/O ratio (0.98) compared to non-rainy episodes (0.05). This suggests that pollen was accumulated during time reaching even higher levels than outdoors. Low ratios during the non-rainy episode seem to signal a low risk for allergy sufferers when staying inside. However, the highest mean daily pollen concentration of the investigated flowering season even exceeded 5,000 pollen grains/m^3. Thus, small ratios can still be associated with high indoor pollen concentrations.

CONCLUSIONS
In addition to background pollen concentrations, further studies and monitoring programs should consider indoor environments and actual health effects while taking weather conditions into account.

ID: 018
Session: INDOOR AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

O.041 | Humans' invisible companions in their residences

Ioanna Pyrri[1], Asimina Stamatelopoulou[2], Dimitra Pardali[3], Thomas Maggos[2]
1 National and Kapodistrian University of Athens, Department of Biology, Section of Ecology and Systematics, Panepistimioupoli 15784 Athens, Greece
2 Institute of Nuclear & Radiological Sciences and Technology, Energy & Safety, Environmental Research Laboratory, NCSR Demokritos, Athens, Greece
3 National and Kapodistrian University of Athens, Department of Physics, Section of Applied Physics, Panepistimioupoli 15784 Athens, Greece

BACKGROUND AND OBJECTIVES
Humans spend a substantial fraction of their time within their home. The advancement in technology and life style changes have resulted in a shift from naturally ventilated to air tight and energy efficient buildings. Indoor air quality is a key element for human well-being and health. Fungi constitute a significant part of airborne particulate matter of biological origin and may have adverse health effects to humans, especially in enclosed environments.

MATERIAL AND METHODS
The diversity and concentration of airborne fungi were investigated daily inside 6 residences in the Athens metropolitan area for two time periods, February-March and May-June 2019. Samplings were performed with a Burkard portable volumetric sampler for agar plates with PDA as a nutrient medium. Fungal aerosol was evaluated in relation to environmental factors (T, RH, TVOC, PM2.5, CO2, NO2, O3) recorded concurrently.

RESULTS
Airborne fungal community was classified into 24 genera and 4 groups, yeasts, Basidiomycota, Sphaeropsidales and NSF (Non Sporulating Fungi). The genera *Penicillium*, *Cladosporium*, *Aspergillus* and *Alternaria* and the yeasts constituted the dominant components. The mean daily total fungi concentration was 739 CFU/m3 in winter and 931 CFU/m3 in summer although several times unusually high values were registered. Several environmental parameters were statistically significantly related to the indoor mycobiome.

CONCLUSIONS
Aerobiological surveys coupled with environmental parameters monitoring enable the identification of the conditions of potential biological risk.

ID: 108
Session: INDOOR AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

O.042 | House Dust Mites are an external source of pro-inflammatory HODEs that contribute to HDM allergenicity

Nestor González Roldán[1], Petra Behrens[1], Sylvia Düpow[1], Regina Engel[1], Katharina Jakob[1], Uta Jappe[2], Katarzyna Anna Duda[1]

1 Research Center Borstel, Leibniz Lung Center, Airway Research Center North (ARCN), German Center for Lung Research (DZL), D-23845 Borstel, Germany.

2 Interdisciplinary Allergy Outpatient Clinic, MK III, University of Lübeck, D-23538 Lübeck, Germany

Keywords: House Dust Mite, HODEs, allergic inflammation, mast cells

BACKGROUND AND OBJECTIVES

House Dust Mite (HDM) is the major indoor-airborne allergen source inducing allergic asthma. Chemically, aside from proteins, HDM consist of a large variety of lipids. Lipids can initiate and modulate allergic reactions alone or as adjuvants for single allergens. In addition, several HDM allergens bear hydrophobic domains, allowing them to interact with lipids.

9- and 13-**H**ydroxy-**O**ctadeca**D**i**E**noic acid (9-HODE and 13-HODE) are enzymatic metabolites of linoleic acid (LA, 18:2n-6). In humans, HODEs are endogenous lipid mediators released by several lung cell types. Atopic asthmatics have increased serum levels of 13-HODE. In experimental models, 13-S-HODE induced pulmonary hyperresponsiveness resembling severe asthma. In this study, we aimed to isolate bioactive lipids from HDM and to determine their role in the development of allergic responses towards House Dust Mite.

MATERIAL AND METHODS

To examine the role of HDM-derived lipids in allergic inflammation, we performed a chloroform/methanol/water extraction from *Dermatophagoides pteronyssinus* bodies, the organic phase was fractionated on silica gel and HPLC, and chemically characterized by gas chromatography, mass spectrometry, and nuclear magnetic resonance. The biological activity of the lipids was studied using *in vitro* screening systems based on murine bone marrow-derived mast (MCs) and dendritic cells (DCs), and analyzed by flow cytometry

RESULTS

We confirmed the presence of 9- and 13-HODEs in HDM. Chemically, HDM-HODEs consist of a 1:1 mixture of *R* and *S*, and of *cis* and *trans* isomers, and are identical to the known endogenous pro-inflammatory HODEs. Functionally, they strongly enhance IgE-mediated degranulation of mast cells. In dendritic cells, HDM-HODEs induce the upregulation of molecules involved in glycolipid uptake (CD36) and presentation (CD1d), and the Th2-polarizing molecule ICOS-ligand.

CONCLUSIONS

Altogether, our study is the first to show that HDM is an exogenous source of bioactive HODEs. Moreover, we reveal their role in the acute allergic effector phase and their potential contribution to the development of an allergic response towards HDM.

ID: 134
Session: INDOOR AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

O.043 | Pollen production of genetically identical birch trees in a seed plantation

Surendra Ranpal[1], Miriam Sieverts[1], Verena Wörl[1], Johanna Jetschni[1], Stefani Gilles[2], Kira Köpke[3], Maria Landgraf[3], Franziska Kolek[2], Daria Luschkova[2], Claudia Traidl-Hoffmann[2], Carmen Büttner[3], Athanasios Damialis[2], Susanne Jochner-Oette[1]

1 Physical Geography / Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, 85072 Eichstätt, Germany

2 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Augsburg, Germany

3 Department of Phytomedicine, Humboldt University, Berlin, Germany

Keywords: pollen production, cloned birch, seed plantation

BACKGROUND AND OBJECTIVES

Airborne pollen concentrations have been increasing worldwide over the last decades and this has been partly attributed to increases in pollen production observed under a warming climate. To date, still little is known about the associated relationships, particularly the interaction between genetics and (a-)biotic parameters that alter pollen production. In this study, we investigated if pollen production differs among cloned birch trees and focussed both on the effects of environmental factors and genetic predisposition.

MATERIAL AND METHODS

Cloned *Betula pendula* ROTH trees of the same age were studied in a seed plantation characterized by similar microclimatic conditions in Baden-Württemberg, Germany. Catkins were sampled prior to anthesis from 28 trees of 11 clones in 2019 and pollen production was assessed for one selected catkin of each cardinal direction. We measured morphometric traits including catkin numbers per crown surface and biotic and abiotic parameters such as air temperature, relative humidity, neighbourhood effects, leaf area index, and virus infection (using PCR and HTS).

RESULTS

Pollen production at catkin level was highest in the south-facing branches, which also received relatively more sunshine. Each clone demonstrated a diverse pollen production at tree level widely ranging between 4.4×10^8 to 2.4×10^10. The average pollen production per tree is estimated at 7.2×10^9 grains. No relationship was found between catkin number and tree dimensions. In addition, no clear picture on the spread of viruses was revealed. The influence of shading and wounding might have contributed to large differences within single clones.

CONCLUSIONS

There is a huge variation in pollen production among the same aged cloned trees. To elucidate the underlying mechanisms, the whole complex system of plant-environment has to be thoroughly investigated, and also at larger spatial scales with distinctive differences in climates, as well as in, as in alpine regimes exhibiting large environmental gradients.

ID: 039
Session: BIOAEROSOLS AND MOLECULAR
Topic: BASIC AEROBIOLOGY

O.044 | Is there a relationship between the meteorological conditions, bioaerosol dispersion and the largest Legionnaires' disesase outbreak ever occured in Italy?

Maira Bonini[1], Marino Faccini[1], Antonio Giampiero Russo[1], Serafina Cammarata[1], Eros Santo Barrese[1], Valentina Ceriotti[1], Sabrina Senatore[1], Anna Lamberti[1], Giorgio Ciconali[1], Sara Tunesi[1], Rossella Murtas[1], Monica Sandrini[1], Sonia Vitaliti[1], Marina Foti[1], Gabriella Gentili[1], Elisabetta Graziano[1], Maria Gramegna[2], Danilo Cereda[2], Gianuario Aulicino[3], Silvana Castaldi[3,4], Antonietta Girolamo[5], Maria Grazia Caporali[5], Maria Scaturro[5], Maria Cristina Rota[5], Maria Luisa Ricci[5]

1 Agency for Health Protection of Metropolitan Area of Milan (ATS), Milan, Italy
2 Prevention Unit, General Directorate for Welfare, Lombardy Region, Italy
3 Department of Biomedical Sciences for Health, Post Graduate School in Public Health, University of Milan, Milan, Italy
4 Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy
5 Department of Infectious Diseases, Istituto Superiore di Sanità, Rome, Italy

Keywords: Bioaerosol, Legionella, Outbreak

BACKGROUND AND OBJECTIVES
During the summer 2018, the largest community-acquired Legionnaires' disease (LD) outbreak caused by Legionella pneumophila serogroup 1 (Lp1) in Italy occured in Lombardy. Fifty-two cases were diagnosed among the inhabitants of Bresso, a small town north to Milan, and 5 of them died. To identify the source, microbiological, epidemiological and environmental investigations were conducted. In particular, since some meteorological conditions can help the dispersion of the infected bioaerosol, the possible relationship between the outbreak and the weather conditions was investigated.

MATERIAL AND METHODS
Association between heavy rainfall and LD cases was evaluated by a case–crossover study. A case-control study and an aerosol-dispersion investigation model were also performed. Comparisons with the microbiological and environmental investigations (598 samples collected and analyzed) were also conducted. All statistical analyses were performed using SAS version 9.4.

RESULTS
The case-crossover study showed that extreme rainfall, which occurred 5-6 days before the onset of symptoms, was associated with increased LD risk. The aerosol-dispersion model showed that a potential source, a decorative fountain located in a public garden of the town, fit best with the cases distribution. The case-control study demonstrated a significant 8-fold increase in risk for cases living near the same public fountain. Of the overall 598 environmental samples collected and analyzed, only a match between the four human strains available (ST23, two Philadelphia and two France-Allentown subgroup) and the Lp1 ST23 France-Allentown, isolated only from the above mentioned public fountain, was found.

CONCLUSIONS
In conclusion, weather conditions played a role in the infected bioaerosol dispersion. The three studies and the matching of clinical and fountain Lp1 strains, identified the fountain as the most likely source of the outbreak.

ID: 026
Session: BIOAEROSOLS AND MOLECULAR
Topic: BIOAEROSOLS AND MOLECULAR

O.045 | Species-specific traits affecting the local exposure to Artemisia allergens

Łukasz Grewling[1], Paweł Bogawski[2], Łukasz Kostecki[1], Agata Szymańska[1], Małgorzata Nowak[1], Agata Frątczak[3]

1 Laboratory of Aerobiology, Faculty of Biology, Adam Mickiewicz University, Uniwersytetu Poznańskiego 6, 61-614 Poznań, Poland
2 Laboratory of Biological Spatial Information, Faculty of Biology, Adam Mickiewicz University, Uniwersytetu Poznańskiego 6, 61-614 Poznań, Poland
3 Department of Systematic and Environmental Botany, Faculty of Biology, Adam Mickiewicz University, Uniwersytetu Poznańskiego 6, 61-614 Poznań, Poland

Keywords: Artemisia, allergens, exposure

BACKGROUND AND OBJECTIVES

The genus *Artemisia* comprises dozens of species that are considered important sources of allergenic pollen. This study aims to determine the species-specific traits that are responsible for the local differences in the exposure to *Artemisia* allergens.

MATERIAL AND METHODS

Artemisia pollen grains were collected by two Hirst-type volumetric traps located in Poznań (Poland), both city center and outskirt. Phenological observations of three *Artemisia* species, i.e. *A. vulgaris, A. campestris* and *A. absinthium*, were conducted around pollen monitoring sites. The level of the major allergen of *A. vulgaris* pollen (Art v 1) as well as the level of gene expression of allergenic proteins were determined in pollen collected from all three species. Temporal atmospheric variation in *Artemisia* pollen allergenicity (Art v 1/pollen) was estimated using ChemVol cascade impactor and immunoenzymatic analysis.

RESULTS

Our analysis showed that three common species of *Artemisia* differ in phenology, habitat preferences, pollen production and pollen allergenicity. Although *A. vulgaris* is the most common species and should be considered the main pollen contributor, *A. campestris* pollen shows ~60% higher allergenic potential (based on Art v 1 and gene expression levels). Pollen grains of *A. campestris* may pose a high allergenic risk in the second part of the season, especially in suburban area. In contrast, *A. absinthium* is the rarest species in Poznań but with relatively high pollen production per plant. In rural areas, e.g. in villages, farmland, this species may locally become important cause of allergy reactions.

CONCLUSIONS

Observed differences in *Artemisia* distribution, phenology, pollen production and allergenicity have high impact on local allergen exposure. For better pollen allergy prevention strategies, such species-specific traits should be determined in every allergenic taxon that comprises high number of species, e.g. grasses and oaks.

This study was supported by National Science Centre Grant No. 2011/03/D/NZ7/06224 and relates to COST Action CA18226 (ADOPT).

ID: 075
Session: BIOAEROSOLS AND MOLECULAR
Topic: MOLECULAR AEROBIOLOGY

O.046 | Airborne microarthropods in Catalonia (NE Spain)

Víctor Sarto i Monteys[1], Concepción De Linares[1,2], Jordina Belmonte[1,2]
1 Institut de Ciència i Tecnologia Ambientals (ICTA-UAB). Universitat Autònoma de Barcelona, Bellaterra. Spain.
2 Unitat de Botànica Universitat Autònoma de Barcelona, Bellaterra. Spain.

Keywords: airborne microarthropods, aerobiota, Hirst trap

BACKGROUND AND OBJECTIVES
Despite most Aerobiology researches generally look at airborne pollen and spores, other airborne organisms use this environment for transport. Microarthropods, such as insects, spiders and mites smaller than 3 mm, constitute an important part of this aerobiota. Their study is important because some of them can act as vectors of plant and animal/human diseases as well as inflict damage by themselves. The aim of this communication is presenting the first results of the study of airborne microarthropods found in standard aerobiological samples collected in Catalonia.

MATERIAL AND METHODS
The Hirst daily aerobiological samples collected from January 2018 to July 2019 in nine monitoring stations of the Catalan Aerobiological Network (Barcelona, Bellaterra, Girona, Lleida, Manresa, Planes de Son, Roquetes-Tortosa, Tarragona and Vielha) have been analyzed looking for the presence of microarthropods. The specimens detected were photographed and provisionally identified to the main taxonomical groups.

RESULTS
The analysis of the airborne samples within the period mentioned above rendered 76 insects and 1 spider. The insects found, in order of abundance, were as follows: Diptera (63%; suborders Culicomorpha (41%), Bibionomorpha (13%), Psycodomorpha (8%), Brachycera (1%)), followed by Hemiptera (25%; superfamilies Aphidoidea (17%), Membracoidea (8%)), Psocoptera (11%; suborder Psocomorpha) and Lepidoptera (1%; suborder Glossata). The aerobiological station with more airborne microarthropods detected was Lleida (21% of the total), followed by Girona (17%); and the least were Vielha and Planes de Son (4% each) and Barcelona (3%). The spider (Order Araneae, suborder Araneomorphae) was detected in Vielha. Mites, belonging to the orders Sarcoptiformes and Trombidiformes, were also present though have not yet been identified.

CONCLUSIONS
The standardized Hirst type method used for sampling pollen and spores is also suitable for sampling outdoor airborne microarthropods.

Financial support CTM2017-89565-C2-1-P.

ID: 127
Session: BIOAEROSOLS AND MOLECULAR
Topic: AIRBORNE MICROORGANISMS

O.047 | Not only pollen: fine particulate emissions from early flowering trees

Julia Burkart, Jürgen Gratzl
University of Vienna

Keywords: bioaerosols, pollen, subpollen particles

BACKGROUND AND OBJECTIVES

Wind pollinated plants are known to shed large quantities of pollen to the environment. For health reasons pollen grains are monitored in many station throughout the world. Much less is known about blooming trees as sources of particles smaller than 10 µm in diameter. At the same time there is increasing evidence that such particles, e.g. subpollen particles, could be important for health and climate.

MATERIAL AND METHODS

In this study we investigate blooming catkins of early flowering trees (hazel, alder, birch) as sources of particles smaller than 10µm. We bring blooming catkins into a small aerosol chamber and agitate the catkins continuously by gentle air currents. The chamber is sealed and has inlets for clean air including a set-up to control relative humidity (RH), as well as outlets where instruments can be connected. We use an aerodynamic particle sizer (TSI APS 3321) to monitor the size distribution of particles between 0.5 – 20 µm and a 4-stage cascade impactor to collect particles in different size ranges. RH within the chamber is varied from 30 % to 100 % and emissions are observed over the course of several hours. Light and electron microscopy is used to examine the nature of the particles.

RESULTS

Our results show that hazel and birch release numerous fine particles along with pollen, whereas alder sheds mainly pollen. The particle number concentrations are a function of RH with a tendency to higher concentrations at higher RH. We also find that the aerodynamic diameter of pollen grains is significantly smaller (up to 40%) than their physical diameter.

CONCLUSIONS

We show that wind pollinated trees do not only shed pollen grains but also particles much smaller in size. Due to their small size they exhibit longer residence times in the atmosphere and are likely to distribute farther distances than the larger pollen grains.

ID: 199
Session: BIOAEROSOLS AND MOLECULAR
Topic: BIOAEROSOLS

O.048 | Molecular detection of airborne fungi

C. Pogner[1], V. Unterwurzacher[1], J. Strauss[2] and M. Gorfer[1]
1 Center for Health & Bioresources, AIT Austrian Institute of Technology GmbH, 3430 Tulln, Austria
2 Department for Genetic and Cell Biology, University for Life Sciences Vienna, 3430 Tulln, Austria
Email: clara.pogner@ait.ac.at

BACKGROUND AND OBJECTIVES

High concentrations of airborne fungi increase the risk to develop adverse health effects like respiratory symptoms, infections, skin symptoms, asthma or allergies. Such impairment to health can be caused by viable as well as non-viable fungal spores and mycelia fragments. Various sampling and detection systems are available to analyse the diversity in air, but still the majority of commonly available detection systems is based on cultivation and focuses on the detection of Ascomycota.

MATERIAL AND METHODS

At the AIT molecular methods for the study and detection of fungi, in the environment, in plant, soil and air samples are evaluated, developed and used for research and analysis. In the last decade many assays for PCR and qPCR have been developed and published, targeting higher phylogenetic levels such as orders or genera, to cover a wide spectrum of airborne fungi. Sequencing of microbiological samples has become cheaper and is meanwhile done on routine bases.

RESULTS

Molecular studies of airborne microbial communities, need highly efficient sampling techniques that are compatible with DNA isolation. We compared filtration system to a wet wall cyclone under controlled conditions in a bioaerosol chamber. We found, that the extraction of the spores from the filter was insufficient and the cyclone is influenced by differing setting, sampling time and used buffer. For sample preparation, we compared different methods and found huge differences between different DNA isolation kits, resulting in up to four times higher efficiency of the best method compared to the least effective. Different matrixes for cell disruption and doubling may result in an eight times higher DNA yield.

To compare sampling based on cultivation with molecular techniques, we established a qPCR system, covering the most frequent Ascomycota genus as well as Basidiomycota. Additionally we sequenced the samples via next generation sequencing. For Ascomycota a good agreement between molecular and cultivation data was found, but Basidiomycota were almost only detected by molecular methods. In the outdoor as well as the indoor samples, up to 40% of the detected genome equivalents belonged to this group.

For molecular investigation with next generation sequencing, the selection of primers and the investigated genome area is affecting the results. A comparison of two primer sets on the ITS region, combined with different preamplification methods, showed considerable differences in the ratio of detected Ascomycota and Basidiomycota, recognized diversity in the samples (Simpsons index) as well as differences in the recognition of specific genus, like Alternaria.

CONCLUSIONS

In Conclusion, results from investigating the fungal community in air depend highly on the chosen method for preparation, processing and detection or sequencing. The use of molecular based methods enables to investigate the huge portion of airborne fungal particles, that are not cultivatable or not recorded with the standard cultivation method and media. But also molecular based methods can't present the whole picture. Influences of sample preparation, selected barcoding area and depth of analysis influence the results and have to be considered.

ID: 081
Session: BIOAEROSOLS AND MOLECULAR
Topic: MOLECULAR AEROBIOLOGY

O.049 | How to increase the sensitivity of a biosensor based on a nanowire field-effect transistor to virus bioaerosol samples

Aleksandr Safatov[1], Vladimir Generalov[1], Konstantin Generalov[1], Galina Buryak[1], Anastasia Cheremiskina[1], Olga Naumova[2], Elza Zaitseva[2], Alexander Aseev[2]

1 FBRI State research Center of Virology and Biotechnology 'Vector' of Rospotrebnadzor

2 A.V. Rzhanov Institute of Semiconductor Physics, Siberian Branch of Russian Academy of Sciences

Keywords: nanowire FET, bioaerosol, virus detection

BACKGROUND AND OBJECTIVES

Real-time indication of viruses in samples of atmospheric bioaerosols can be carried out using biosensors based on field nanowire transistors (FET). In some cases, the concentration of viruses in the aerosol is small and sensitivity of the sensor is unsufficient. Viruses in the sample are relatively uniformely distributed over the measuring cell volume in which the space with the nanowire occupies only a small fraction of it. Viruses easily reach the surface of the nanowire from this small volume only, the rest of them remain out of its "field of view'. The aim of this work is to consider and implement some ways to increase the sensitivity of such biosensors.

MATERIAL AND METHODS

The first possibility is the modification of the surface of the transistor's nanowire for sewing antibodies to the desired virus and the modification of the rest of the cell surface, where the antibodies should not be sewn.
The second possibility is the use of dielectrophoretic forces to concentrate the desired antigen in the vicinity of the nanowire.

RESULTS

A new biochip design with additional electrodes for dielectrophoresis (DEF) has been developed. Studies were conducted in model systems to select the conditions under which the use of DEF is manifested in the concentration of the desired antigens in the region of the nanowire. It has been demonstrated that when using DEF, both cells and viruses may be concentrated in the region of the nanowire.

CONCLUSIONS

Thus, the possibility of increasing the sensitivity of a biosensor based on a nanowire FETs by concentrating viruses in bioaerosol samples on a biosensor's sensitive element has been demonstrated. It is estimated that this concentration will increase the sensitivity of the biosensor by several times.

Acknowledgement. This work is supported by the Russian Science Foundation for Basic Research project # 18-29-02091 and by State assignment of Rospotrebnadzor.

ID: 008
Session: BIOAEROSOLS AND MOLECULAR
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.050 | High-Throughput DNA Sequencing Defines Spatiotemporal Shifts In Airborne Grass Pollen Communities At Species Level

Gareth Wyn Griffith[1], Caitlin Potter[1], Georgina L. Brennan[2], Carsten A. Skjøth[3], Matthew Hegary[1], Nicholas J. Osborne[4], Ben W. Wheeler[5], Francis M. Rowney[5], Adam Barber[6], Helen M. Hanlon[6], Yolanda Clelow[6], Rachel N. McInnes[6], Charlotte Armitage[7], Alexander Kurganskiy[3], Geoff M. Petch[3], Beverley Adams-Groom[3], Simon Creer[2]

1 Institute of Biological, Environmental and Rural Sciences, Aberystwyth University, UK.
2 School of Natural Sciences, Bangor University, Bangor, UK.
3 School of Science and the Environment, University of Worcester, Worcester, UK.
4 School of Public Health, Faculty of Medicine, The University of Queensland, Herston, Brisbane, Australia.
5 University of Exeter, Exeter, UK.
6 Met Office Hadley Centre, Exeter, UK.
7 The Woodland Trust, Kempton Way, Grantham, Lincolnshire, UK.

Keywords: DNA metabarcoding, eDNA

BACKGROUND AND OBJECTIVES

Grass pollen is a potent outdoor aeroallergen, responsible for allergic rhinitis and asthma exacerbation. Whilst there are known variations in sensitivity to pollen from different grass species, these species cannot be distinguished by established methods for monitoring of airborne pollen concentrations. As such, the modelling of changes in aerial-dispersion of pollen from individual grass species is currently not possible and it is not known whether temporal turnover in species composition of airborne pollen matches terrestrial flowering patterns. The aim of this study was to use DNA metabarcoding of trapped pollen grains to obtain species level discrimination of grass pollen across a network of UK sampling sites.

MATERIAL AND METHODS

[i]We used two complementary DNA barcode marker genes (rbcL and ITS2) to identify how the taxonomic composition of grass pollen exposure changes across the summers of 2016/17. This involved establishment of a UK-wide network of Burkard Multivial Cyclone Samplers for daily sampling and development of DNA metabarcoding methods to identify the trapped pollen grains.

RESULTS

We found that UK grass species display discrete, temporally restricted peaks of pollen incidence which vary with latitude and longitude across the UK. Grass pollen comprised the majority (ca. 60%) of airborne pollen during the summer months, dominated by *Lolium* and Holcus spp. Significant amounts of *Agrostis capillaris*, *Poa trivialis*, *Dactylis glomerata* and *Arrhenatherum elatius* (ca. 5% of all grass pollen each) were also detected. Thus the taxonomic composition of airborne grass pollen changes substantially across the grass allergy season and changes in total grass pollen concentration. We also demonstrate that flowering and anthesis (pollen release) events may be useful for predicting the incidence of particular species of grass pollen in the air.

CONCLUSIONS

Our results demonstrate how targeted, high-throughput sequencing of eDNA can be used to understand the biodiversity of airborne pollen communities and fill a substantial knowledge gap that has persisted over the past 50 years of aerobiology research.

We also acknowledge the help of Natasha de Vere, Laura Jones and Colin Ford (National Botanic Garden of Wales) in this work

ID: 032
Session: BIOAEROSOLS AND MOLECULAR
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.051 | Different approaches for interpolating missing pollen data in aerobiology

Antonio Picornell[1], Jesús Rojo[2], Jose Oteros[3], María del Mar Trigo[1], Rocío Ruiz-Mata[1], Baltasar Cabezudo[1], Marta Recio[1]

1 Department of Botany and Plant Physiology, University of Malaga. Spain. Campus de Teatinos s/n 29071.

2 Center of Allergy & Environment (ZAUM), Technical University Munich, Germany & University of Castilla-La Mancha, Spain.

3 Department of Botany, Ecology and Plant Physiology. University of Córdoba. Campus de Rabanales 14014, Córdoba, Spain.

Keywords: interpolation, missing data, pollen databases, time-series, modeling

BACKGROUND AND OBJECTIVES

Pollen traps frequently are installed in not easily accessible places and, being the mechanism only tested once a week. Consequently, failures in the traps are not detected immediately and days with missing data are usually found in databases. Sometimes the lost data are not relevant for the research, but other times, these gaps may compromise results. The aim of this study is to test the effectiveness of different methods for interpolating missing data, searching for the most accurate strategy depending on the circumstances and pollen type.

MATERIAL AND METHODS

Interpolation was performed by using different strategies implemented in the "AeRobiology R package": mathematical approaches, time series analysis and data from nearby stations. Each method was applied to 11 different pollen types searching for differences in the accuracy of the methods of interpolation, considering the abundance and the time period of the seasonal curve in which the data were lost. Aerobiological data from Ronda station (southern Spain) during 2017-2019 were used to test the accuracy of the different interpolation methods. For each pollen type, the natural year was split into five periods: pre-season, pre-peak, peak, post-peak and post-season, the main pollen season. Gaps of 3, 5, 7 and 10 days were considered. Errors were expressed as Mean Absolute Error (MAE).

RESULTS

For all the methods, the highest MAEs were obtained when the gaps affected the peak period. Regarding the pollen types, the highest MAEs were detected for the most abundant pollen types. These errors were also higher when 3-days gaps were used, and the lowest for 7-days gaps. Mathematical approaches obtained the lowest MAEs while the highest were obtained by using the data coming from nearby stations.

CONCLUSIONS

According to our results, mathematical approaches resulted to be the most accurate methods to interpolate missing data. Small gaps have a bigger influence of daily oscillations in pollen concentrations, being more difficult to predict than larger gaps, in which the general trend of the pollen concentrations could be observed, and daily fluctuations are smoothed. Abundant pollen types generally have bigger daily oscillations, obtaining a bigger MAE.

ID: 042
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.052 | Main factors affecting pollen abundance within cities in the Iberian Mediterranean region

Jesús Rojo[1], Stella Moreno-Grau[2], Beatriz Lara[1], José María Moreno-Grau[2], Jorge Romero-Morte[1], Belén Elvira-Rendueles[2], Rosa Pérez-Badia[1]

1 University of Castilla-La Mancha, Institute of Environmental Sciences (Botany), 45071, Toledo, Spain
2 Department of Chemical and Environmental Engineering. Technical University of Cartagena, 30202, Cartagena, Spain

Keywords: aerobiology, relative abundance, pollen sources, pollen production

BACKGROUND AND OBJECTIVES

Some factors influence the abundance of the airborne pollen types such as the distribution of the sources, the production rates of the wind-pollinated plants and the dispersal capability of their pollen (Thommen's postulates regarding the plants with allergenic risk). In this work these factors were analyzed in the Iberian Mediterranean region.

MATERIAL AND METHODS

Airborne pollen abundance was compared in central and Southeastern areas of the Iberian Peninsula. For this purpose, the pollen spectrum of several cities was studied. Morphological traits of plants such as life form, type of inflorescence and pollen size were analyzed. The land cover mapping was used to estimate the distribution of the land-uses and vegetation.

RESULTS

The most important factor affecting pollen abundance was the distribution of surrounding sources. Also, the most abundant pollen types came from wind-pollinated plants with high-productive inflorescences such as catkins, cones or panicles (e.g. holm oak, pine tree, olive tree). In central Spain, arboreal pollen coming from autochthonous species of the genera *Quercus*, *Populus* and *Pinus* and cultivated species such as *Olea europaea* L. represents 70-80% of the total pollen, while 50-60% of pollen in Southeastern areas. Pollen coming from Amaranthaceae species was a shrub/herbaceous indicator to quantify differences among bioclimatological areas following an aridity gradient. Some exclusive species such as *Zygophyllum fabago* L. was found in Southeastern semi-arid areas. The effects of urban green areas were very intense in all studied areas being Cupressaceae or *Platanus* the most abundant pollen coming from ornamental species, besides the *Casuarina* and Palmae in the southeast.

CONCLUSIONS

The study of the factors involved on the pollen abundance is very relevant since the pollen exposure is a determinant cause for the sensitization of the allergic population. Grasses are the main cause of pollinosis, while Amaranthaceae pollen increase their relevance in Southeastern Spain. Also, arboreal pollen types related to the anthropogenic activity such as *Olea*, Cupressaceae or *Platanus* are found among the most important triggers.

ID: 198
Session: FORECASTING AND MODELING
Topic: BASIC AEROBIOLOGY

O.053 | Tracking birch and grass pollen levels in Belgium

Willem W. Verstraeten[1], Nicolas Bruffaerts[2], Rostislav Kouznetsov4[3], Marijke Hendrickx[2], Mikhail Sofiev[3], Andy W. Delcloo[1]
1 Royal Meteorological Institute of Belgium (KMI), Ukkel, Belgium
2 Belgian Institute of Public Health (Sciensano), Elsene, Belgium
3 Finnish Meteorological Institute (FMI), Finland
4 Obukhov Institute for Atmospheric Physics, Moscow, Russia

Keywords: SILAM, birch, grass pollen

BACKGROUND AND OBJECTIVES
Biogenic aerosols such as airborne allergenic pollen affect the public health badly and create additional distress on people already suffering from cardiovascular and respiratory diseases in presence of anthropogenic induced air pollution. In Belgium, ~10% of the people is estimated to suffer from allergies due to birch pollen and ~15% due to grass pollen. In some European countries the prevalence is up to 40%.
In Belgium, five aerobiological stations, operated by Sciensano, monitor off-line daily concentrations of airborne pollen from grasses and birches among other species. Therefore, patients suffering from rhinitis have no timely access to detailed real-time spatial information and warnings on forthcoming exposures.

MATERIAL AND METHODS
Chemistry Transport Models (CTM) can both quantify as well as forecast the spatial and temporal distribution of airborne birch and grass pollen concentrations if accurate and updated maps of birch and grass pollen emission sources are available, and if the large inter-seasonal variability in emissions can be considered.
Here we show the results of the modelled spatio-temporal distributions of grass and birch pollen over Belgium using the CTM SILAM (http://silam.fmi.fi). This CTM is driven with the ERA5 meteorological reanalysis from ECMWF, a recent updated birch tree fraction map based on local information, and by a map showing the spatial distribution of the potential grass pollen sources.

RESULTS
We present the 2008-2019 times series of modelled grass pollen by SILAM compared to daily observations from the aerobiological surveillance network in Belgium. We will also show the extended time series of modelled birch pollen levels by running SILAM for the birch pollen seasons of 2019 and 2020. Inter-seasonal variability in birch pollen release is considered by using spaceborne MODIS vegetation activity. For grass pollen this approach is not suitable, therefore we will use as a first approach the average temperature and precipitation of the previous seasons.

CONCLUSIONS
SILAM is able to simulate airborne birch pollen over levels well if the inter-seasonal variation is introduced. Grass pollen can also be modelled.

ID: 017
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.054 | Predicting the severity of the upcoming grass pollen season and the effect of climate change in Northwest Europe

Alexander Kurganskiy[1,12], Simon Creer[2], Gareth W. Griffith[3], Nicholas J. Osborne[4], Benedict W. Wheeler[5], Rachel N. McInnes[6], Yolanda Clewlow[6], Adam Barber[6], Georgina L. Brennan[2], Helen M. Hanlon[6], Matthew Hegarty[3], Caitlin Potter[3], Francis Rowney[5], Beverley Adams-Groom[1], Geoff M. Petch[1], Catherine H. Pashley[7], Jack Satchwell[7], Letty de Weger[8], Karen Rasmussen[9], Gilles Oliver[10], Charlotte Sindt[10], Nicolas Bruffaerts[11], Carsten A. Skjøth[1]

1 School of Science and the Environment, University of Worcester, Worcester, UK
2 School of Natural Sciences, Bangor University, Bangor, UK
3 Institute of Biological, Environmental and Rural Sciences, Aberystwyth University, UK
4 School of Public Health, Faculty of Medicine, The University of Queensland, Herston, Brisbane, Australia
5 University of Exeter, Truro, UK
6 Met Office Hadley Centre, Exeter, UK
7 Aerobiology and Clinical Mycology, Dept. of Respiratory Sciences, Institute for Lung Health, University of Leicester, Leicester, UK
8 Department of Pulmonology, Leiden University Medical Center, Leiden, The Netherlands
9 Astma-Allergi Danmark, Roskilde, Denmark
10 Réseau National de Surveillance Aérobiologique (R.N.S.A.), Brussieu, France.
11 Mycology & Aerobiology service, Sciensano, Brussels, Belgium
12 Now at: University of Exeter, Penryn Campus, Penryn, Cornwall, UK.

Keywords: grass pollen, modelling, statistical and mechanistic approaches

BACKGROUND AND OBJECTIVES

Managing hay fever symptoms is challenging. The major questions often posed by hay fever sufferers are: How bad is this year's grass pollen season going to be? How will the season severity develop over the years? How should I manage my symptoms? No country provides a solution to address these questions. This study aimed to provide novel methods for predicting the severity of the grass pollen season.

MATERIAL AND METHODS

Thirty-four pollen observation stations located in Northwest Europe were selected for the study. The Seasonal Pollen Integral (SPIn) was extracted to quantify the severity of the grass pollen season based on the years 1996-2018. Two novel approaches were proposed: statistical and mechanistic models.
The statistical approach aimed to build four regression models based on the SPIn, pre-seasonal precipitation and air temperature data. The mechanistic approach aimed to describe interannual variation of SPIn through variation in grass growth via Net Primary Production (NPP) simulated by the JULES model.

RESULTS

The regression models had a coefficient of determination varying from 0.64 to 0.73. The number of statistically significant stations increased when including both pre-seasonal meteorological conditions and the measured SPIn. Comparison of NPP and SPIn interannual variations demonstrated positive and significant associations between both parameters according to the mechanistic model simulations. Doubling the initial value of CO2 atmospheric concentrations in the JULES parameters led to increasing the NPP values up to 50-80%

CONCLUSIONS

The study sheds new light on the current feasibility and limitations of predicting grass SPIn, hence grass pollen exposure. The results suggested that annual severity was largely governed by pre-seasonal meteorological conditions. The mechanistic model also suggested that climate change would increase the severity with up to 50-80%, in line with verifying chamber studies. Both models could be applied as forecasting tools for advising hay fever patients and healthcare professionals.

ID: 117
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.055 | Clustering hourly patterns of Olea pollen concentrations along the pollen season

Santiago Fernández-Rodríguez[1], Rafael Tormo-Molina[1], José María Maya-Manzano[2], Inmaculada Silva-Palacios[1], Alejandro Monroy-Colín[1], Raúl Pecero-Casimiro[1], Jeroen Buters[2], Jose Oteros[2]
1 University of Extremadura
2 Technical University and Helmholtz Center Munich

Keywords: Olea pollen, hourly data, "AeRobiology" package, clustering

BACKGROUND AND OBJECTIVES
Bioinformatics applications are becoming more relevant in the mining of aerobiological data. Clustering methods are applied to group a large data set. This study aims to describe and to model the daily distribution of Olea pollen concentration.

MATERIAL AND METHODS
The study was performed with hourly pollen concentrations measured during 8 consecutive years (2011-2018) in Extremadura (Spain). First we divided temporally the Olea pollen season by quartiles of the pollen integral in preseason (Q1: 0%-25%), season (Q2 and Q3: 25%-75%) and postseason (Q4: 75%-100%). Days with pollen concentrations above 100 grains/m3 were clustered attending to the daily distribution of the concentrations. The factors affecting the prevalence of the different clusters were analyzed: distance to olive crops, the moment during the pollen season and the meteorology.

RESULTS
During the season, the highest hourly concentrations during the day where between 12:00 and 14:00, while during the preseason the highest hourly concentrations were detected in the afternoon and evening hours. In the postseason the pollen concentrations were more homogeneously distributed during the central hours of the day. The representation shows a well defined hourly pattern during the season, but more heterogeneous distribution during the preseason and postseason. The cluster dendrogram shows that all the days could be clustered in 6 groups: Most of the clusters shows the daily peaks between 11:00 and 15:00 with a smooth curve (Cluster 1 and 3) or with a strong peak (cluster 2 and 5). Days included in cluster 9 shows an earlier peak in the morning (before 9:00). On the other hand, cluster 6 shows a peak in the afternoon, after 15:00.

CONCLUSIONS
We observed that the hourly concentrations show a sharper pattern during the season, with the peak during the hours close to the emission. Out of the season, when pollen is expected to come from farther distances, the hourly peak is located farther from the emission time of the tree. Significant factors for predicting the hourly pattern were the winds and the distance to the olive groves.

ID: 118
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.056 | Application of the pollen-SILAM CTM for aphid migration forecasts

Pilvi Siljamo[1], Matti Leskinen[2], Erja Huusela-Veistola[3], Seppo Neuvonen[4]
1 Finnish Meteorological Institute
2 University of Helsinki
3 Natural Resources Institute Finland
4 University of Turku

Keywords: atmospheric dispersion, pest insect migration, bird cherry-oat aphid

BACKGROUND AND OBJECTIVES
Pest insect migrations are difficult to predict, but they can cause significant damage to the crops. The risk of the pest insects has traditionally been forecasted by winter egg counts and temperature sum calculations. Suction trap records support the predictions. However, these methods cannot forecast pest insects that have traveled far away. Here we have used the SILAM chemical transport model (CTM) to simulate migrations of the bird cherry-oat aphids.

MATERIAL AND METHODS
The SILAM CTM has been used for numerical pollen forecasts for about 15 years. Here we have used the same method to forecast bird cherry-oat aphid migrations. Small insects - like aphids - behave in many ways like pollen grains: they mainly follow air flows, temperature sum is a good predictor for the uplift and they favour nice weather. The simulations include source areas, temperature sum calculations, weather-related uplift and atmospheric dispersion with removal processes.

We selected years 2002, 2010 and 2016 for a closer look. We compared the SILAM results to the first suction trap records at Jokioinen, insect echoes in the weather radar data, and farmers' and experts' observations from fields.

The firsts bird cherry-oat aphids were recorded in early summer in 2002 and 2010 when the temperature sum was well below the uplift threshold of the temperature sum and the only explanation for these records was migration. In 2016 the first bird cherry-oat aphid record was later, but the insect migration was verified by weather radar.

RESULTS
SILAM CTM adapted to the bird cherry-oat aphids predicted well pest insect migrations in 2010 and 2016. 2002 was more challenging – mainly because the flow field was more complicated and sensitive to small shifts.

CONCLUSIONS
Many processes are simplified or left untreated in the model. These are e.g., landing and aphids own need to adapt their flying height. Despite these, SILAM seems to catch the right idea of the aphid migrations.

ID: 067
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.057 | Quantifying the uncertainty of the numerical pollen dispersion model COSMO-ART: first experiences using ensemble simulations

Andreas Pauling, Daniel Leuenberger
MeteoSwiss, Operation Center 1, Zurich-Airport, Swizterland

Keywords: COSMO-ART, ensemble modeling, uncertainty

BACKGROUND AND OBJECTIVES

Numerical pollen dispersion models can provide pollen forecasts at high spatial and temporal resolution. They represent valuable information to a wide range of users including allergy sufferers, allergologists and authorities. However, these forecasts are associated with largely unknown uncertainties. The sources of these uncertainties include meteorology and sub-grid scale processes as well as the emission parameterization and the used source map. Our aim is to make first steps to quantify the uncertainties related to meteorology.

MATERIAL AND METHODS

We use the numerical pollen forecast model COSMO-ART run on a 1.1 km grid using 80 vertical levels and time steps of 10 sec. The domain covers the greater Alpine area. We performed ensemble simulations using the KENDA (Kilometer-scale ENsemble Data Assimilation) system with hourly cycles and 40 members. Every hour, short forecasts and meteorological observations are combined by an LETKF (Local Ensemble Transform Kalman Filter) to form an analysis ensemble. Pollen species include alder, birch and grasses.

RESULTS

The spread of the ensemble members indicates the uncertainty related to meteorology. Results show that this uncertainty alone can be very large and varies across time periods and pollen species. In addition, we compare the ensemble with the control (undisturbed) simulation and observations. We make suggestions how this new information can add value for the end-user of pollen forecast information.

CONCLUSIONS

Quantifying the uncertainty of numerical pollen forecasts is a new and very complex topic. However, it has a great potential to add value to pollen forecasts. Pollen ensembles will allow probabilistic forecasts very similar to state-of-the-art weather forecasts. Still, there are various issues to be solved before operational probabilistic pollen forecasts are ready for the end-user.

ID: 109
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.058 | Air mass trajectories and land cover map reveal cereal crops as major local sources of Alternaria spores in Worcester and Leicester, UK

Godfrey. P Apangu[1], Carsten. A Skjoth[1], Beverley Adams-Groom[1], Carl. A Frisk[1], Catherine. H Pashley[2], Jack Satchwell[2]

1 National Pollen and Aerobiology Research Unit, School of Science and the Environment, University of Worcester, Hendrick Grove, WR2 6AJ, Worcester, UK

2 Department of Respiratory Sciences, Institute for Lung Health, University of Leicester, LE1 9HN, Leicester, UK

Keywords: harvesting, pathogen, allergen

BACKGROUND AND OBJECTIVES

Alternaria is a plant pathogen and human allergen. Agricultural areas are known sources of Alternaria spores. Transport of Alternaria spores may occur between such geographical regions. This study examined Alternaria spore abundance and potential pathways for atmospheric transport of the spores between the cities of Worcester and Leicester in the UK, both surrounded by agricultural land.

MATERIAL AND METHODS

Alternaria spores were sampled using Burkard volumetric samplers for the period 2016-2018 at Worcester and Leicester, located ~90 km apart. The Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model and UK's land cover map for crops were used to examine the relationship between air mass trajectories and potential source areas of Alternaria spores at the two locations during an episode (27 Jul-07 Aug 2017) of high spore concentrations.

RESULTS

During the 3 years of observation, 61 and 151 days of clinical relevance were recorded at Worcester and Leicester, respectively. Spore concentrations at Leicester were considerably higher than in Worcester. Analysis of the crop map showed higher amounts of winter barley and oilseed rape near to Leicester than Worcester. HYSPLIT calculations showed that during the episode, the air masses arrived at both stations from Ireland and the Atlantic Ocean. Long distance transport probably had a small and equal contribution to the observations at both sites. The hypothesis is therefore that the substantially higher concentrations of Alternaria spores at Leicester are caused by specific local sources with high emission potential: potentially winter barley and oilseed rape.

CONCLUSIONS

Local sources of winter barley and oilseed rape likely contributed to Alternaria spore concentrations of clinical significance in the urban areas of Leicester and Worcester. The strength of the local sources likely resulted in higher emissions of spores at Leicester than at Worcester. Long distance transport probably had a small but equal contribution to the total spore load at the two stations.

ID: 070
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.059 | Incorporation of pollen data in source maps is vital for pollen dispersion models

Alexander Kurganskiy[1,2,3,8], Carsten Ambelas Skjøth[3], Alexander Baklanov[4], Mikhail Sofiev[5], Annika Saarto[6], Elena Severova[7], Sergei Smyshlyaev[2], Eigil Kaas[1]

1 Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark
2 Russian State Hydrometeorological University, St. Petersburg, Russia
3 School of Science and the Environment, University of Worcester, Worcester, United Kingdom
4 World Meteorological Organization, Science and Innovation Department, Geneva, Switzerland
5 Finnish Meteorological Institute, Atmospheric Composition Research, Helsinki, Finland
6 Biodiversity Unit, University of Turku, Turku, Finland
7 Biological Faculty, Department of Higher Plants, Lomonosov Moscow State University, Moscow, Russia
8 Now at: University of Exeter, Penryn Campus, Penryn, Cornwall, United Kingdom

Keywords: birch pollen, source maps, dispersion models

BACKGROUND AND OBJECTIVES
Information about distribution of pollen sources, i.e. their presence and abundance in a specific region, is important especially when atmospheric transport models are applied to forecast pollen concentrations. The goal of this study is to evaluate three pollen source maps using an atmospheric transport model and study the effect on the model results by combining these source maps with pollen data.

MATERIAL AND METHODS
Here we evaluate three maps for the birch taxon: (1) a map derived by combining land cover data and forest inventory; (2) a map obtained from land cover data and calibrated using model simulations and pollen observations; (3) a statistical map resulting from analysis of forest inventory and forest plot data. The maps were introduced to the Enviro-HIRLAM (Environment – High Resolution Limited Area Model) as input data to simulate birch pollen concentrations over Europe for the birch pollen season 2006. 18 model runs were performed using each of the selected maps in turn with and without calibration with observed pollen data from 2006.

RESULTS
The model results were compared with the pollen observation data at 12 measurement sites located in Finland, Denmark and Russia. We show that calibration of the maps using pollen observations significantly improved the model performance for all three maps.

CONCLUSIONS
The findings also indicate the large sensitivity of the model results to the source maps and agree well with other studies on birch showing that pollen or hybrid-based source maps provide the best model performance. This study highlights the importance of including pollen data in the production of source maps for pollen dispersion modelling and for exposure studies.

ACKNOWLEDGMENTS
The authors are thankful to Andrea-Pil Holm for extracting and providing the grass SPIn data for two Danish sites (Copenhagen and Viborg) involved in the study.

ID: 112
Session: FORECASTING AND MODELING
Topic: FORECASTING AND MODELING

O.060 | Long-term Trends in the Tulsa Air Spora

Estelle Levetin, Josh McLoud
University of Tulsa, 800 S. Tucker Dr. Tulsa, OK 74014

Keywords: *Cladosporium*, basidiospores, ascospores

BACKGROUND AND OBJECTIVES

Fungal spores are ubiquitous constituents of the atmosphere. Although aerobiology research has provided much information about pollen levels, less is known about airborne spores, especially in North America. This study analyzed airborne spore levels in Tulsa, Oklahoma from 2001 to 2016 to determine concentrations and changes over time.

MATERIAL AND METHODS

The Tulsa atmosphere has been monitored with a Hirst-type spore trap on the roof of a building at the University of Tulsa. Standard methods were used for sample collection and analysis. Up to 26 spore types were identified; however, the current study focused on total spores and the 3 most abundant spore types. *Cladosporium* conidia represent the dry air spora, while ascospores and basidiospores represent the moist air spora. Data were log transformed prior to statistical analyses. Meteorological data were obtained from the National Weather Service in Tulsa and soil moisture from the Oklahoma Mesonet.

RESULTS

Spore concentrations were highly variable each year, and over the 16-year period the 3 spore types represented 79% to 90% of total spores. Average daily concentration of all spores showed significant positive correlations with all temperature measures, relative humidity, and soil moisture. Ascospores and basidiospores showed positive correlations with daily rainfall. Total fungal spores were most abundant during 2008 with annual spore integral (ASPIn) over 3.03 million and lowest in 2011 with ASPIn of 1.65 million. *Cladosporium* conidia were similar with highest ASPIn in 2008 and the lowest in 2011. Ascospores also had their highest ASPIn in 2008, but the lowest was in 2002. Basidiospores showed the highest ASPIn in 2015 and the lowest in 2011. The ASPIn for total spores and ascospores showed no significant change over time. However, basidiospores showed significant increase over time ($r = 0.62$, $p < 0.05$), while *Cladosporium* showed significant decrease over time ($r = -0.58$, $p < 0.05$).

CONCLUSIONS

Long term sampling has shown that airborne spore concentrations in Tulsa are highly variable year to year; however, total spore levels have shown no significant change over time.

ID: 040
Session: FUNGAL SPORES
Topic: AIRBORNE MICROORGANISMS

O.061 | A walk in the park: Exposure to fungal spores changes the nasal mycobiome and increases nasal inflammatory responses to grass pollen

Denise Rauer[1], Selina Herrmann[1], Franziska Kolek[1], Vera Schwierzeck[2], Fiona Skottke[1], Vivien Leier-Wirtz[1], María Pilar Plaza[1], Claudia Traidl-Hoffmann[3], Athanasios Damialis[1], Stefanie Gilles[1]

1 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Augsburg, Germany

2 Institute of Hygiene, Universitätsklinikum Münster, Münster, Germany

3 Christine-Kühne Center for Allergy Research and Education (CK-CARE), Davos, Switzerland

Keywords: pollen, fungal spores, allergy

BACKGROUND AND OBJECTIVES

Sensitization to pollen allergens depends on innate immune stimulation by pollen-derived compounds and could be facilitated by microbial molecules. Seasonal diversity and abundance of airborne fungal spores coincides with the pollen season of allergenic grasses and weeds. We investigated the co-exposure effect of pollen and fungal spores on the immune response of human nasal epithelial cells (HNECs).

MATERIAL AND METHODS

In the main grass (Poaceae) pollen and fungal spore season in June and July 2018, study participants sat in a flowering meadow five times for one hour to be naturally exposed to airborne grass pollen and fungal spores. They wore nasal filters to quantify ambient Phl p 5 content or received nasal swabs directly before and after the exposure for mycobiome analysis (ITS sequencing). Simultaneously, we monitored indoor and outdoor airborne pollen and fungal spores by portable Hirst-type volumetric traps. Similar traps using PDA agar plates were set up to culture airborne fungi. We stimulated HNECs from non-allergic donors with timothy grass pollen allergens (Phl p 1, Phl p 5) alone or in combination with spores of fungal isolates. Immunological and barrier functions were assessed by ELISA and electrical resistance measurements.

RESULTS

We found the amount of Phl p 5 in nasal filters paralleled the concentration of grass pollen in the air. During outdoor exposure, *Cladosporium* spores were most abundant in the air. The nasal mycobiome of the subjects differed significantly pre- and post-exposure. Spores of *Cladosporium*, *Fusarium* and *Penicillium* induced expression of IL-8 and IL-1ß in HNECs alone or in combination with grass pollen allergens. The physical barrier function of HNECs was reduced upon fungal spore stimulation and co-stimulation with Phl p 1.

CONCLUSIONS

Our results show that fungal spore exposure changes the nasal mycobiome and induces nasal inflammatory responses. This indicates that fungal spores facilitate sensitization to grass pollen allergens, or exacerbate allergic inflammation. We provide first insights into host-microbe interactions under natural exposure with complex mixed bioaerosols.

ID: 179
Session: FUNGAL SPORES
Topic: AIRBORNE MICROORGANISMS

O.062 | Alternaria spores behaviour in the atmosphere of Salamanca (MW Spain)

Sánchez Reyes E.[1,6], Rodríguez de la Cruz D.[1,2], García Sánchez A.[3], Dávila I.[3,4,5], Sánchez Sánchez J.[1,2]
1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain.
2 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Mendez Nieto s/n, 37007, Salamanca, Spain.
3 Department of Biomedical and Diagnostic Sciences, Faculty of Medicine, University of Salamanca, Alfonso X, El Sabio s/n, 37007, Salamanca, Spain
4 Inmunoalergy Service, University Hospital of Salamanca, Spain.
5 Institute for Biomedical Research of Salamanca
6 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain.
Email address: fani_sanchez@usal.es

Keywords: *Alternaria*, Spain, Meteorological parameters

BACKGROUND AND OBJECTIVES

The results shown in this work correspond to those obtained in the project entitled *Determination of the clinical and epidemiological profile of sensitization in patients allergic to Alternaria. Study of the Alternaria spore count in the city of Salamanca and its correlation with atmospheric conditions*, funded by the Regional Health Authority, Junta of Castile and León. *Alternaria* was selected due to its importance as an aeroallergen and the paucity of studies about it in the city of Salamanca.

MATERIAL AND METHODS

The aeropalynological monitoring was carried out from January 1st, 2014 to December 31st, 2018, in Salamanca (MW Spain), using a Hirst-type trap, Burkard model, placed on the roof of a centrally located municipal building, 20 m above ground level. The methodology used was the suggested by the Spanish Aerobiology Network in regard to spore count and sample processing.
The seasonal behaviour of atmospheric spore concentrations was evaluated (being the main spore season defined by the method that calculates the start of this period as the date by which 5% of the total year spore record was registered, and the end by the 95% captured), as well as intra-daily variations. Correlations with the main meteorological parameters were evaluated using the SPSS software (v.25) and applying the Spearman non-parametric correlation test.

RESULTS

The annual spore integral (ASIn) varied between 2471 spores/m^3 registered in 2016 to 6423 spores/m^3 in 2017, with a main spore season from mid-spring (May 6th, 2015) to mid-autumn (November 9th, 2015). Daily peaks were mainly detected in July being the maximum on July 15th, 2017 (622 spores/m^3). The daily pattern was uniform without finding a predominant hourly distribution. Significant positive correlation coefficients were obtained with temperature, total sunshine hours and winds blowing from the first quadrant, but negative with rainfalls, relative humidity and winds blowing from the third quadrant.

CONCLUSIONS

Alternaria maintained a distribution pattern positively related to the increases of temperatures and the absence of precipitations, with maxima during summer months.

ID: 078
Session: FUNGAL SPORES
Topic: BASIC AEROBIOLOGY

O.063 | Seasonal behaviour of Alternaria airborne spores in Santiago de Chile, Chile (2005-2015 period)

Estefanía Sánchez Reyes[1,2,5], Alicia Córdova Jara[2,3], José Sánchez Sánchez[1,4], Pedro Mardones Precht[2,3]
1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain.
2 Fundación de Aerobiología Medio Ambiente y Salud, Pérez Valenzuela 1572, Of 404, Santiago, Chile.
3 Centro del Alérgico, Av. Las Condes 6815, Las Condes, Región Metropolitana, Santiago, Chile.
4 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Méndez Nieto s/n, 37007, Salamanca, Spain.
5 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain.

Keywords: *Alternaria*, spores, Chile

BACKGROUND AND OBJECTIVES

Since *Alternaria* is an important aeroallergen in temperate areas of the world, this study was undertaken in order to provide the first results obtained about the seasonal behaviour of *Alternaria* airborne spores in the atmosphere of Santiago de Chile (Chile), for a period of 10 years.

MATERIAL AND METHODS

The aeropalynological monitoring was carried out from June 27th, 2005 to April 26th, 2015, in Santiago de Chile (Chile), using a Hirst-type trap, Burkard model, placed on the roof of the Clínica Miguel Servet building (33°25'38'S, 70°37'13'W, 600 m.a.s.l.). The methodology used was the suggested by the guidelines established by the World Allergy Organization. The seasonal behaviour of atmospheric spore concentrations was evaluated (being the main spore season defined by the method that calculates the start of this period as the date by which 5% of the total year spore record was registered, and the end by the 95% captured), considering the location of the city in the Southern hemisphere.

RESULTS

The annual spore integral (ASIn) varied between 4,491 spores/m3 registered in 2014 to 6,906 spores/m3 in 2008, with a main spore season from mid-winter (mid-July/mid-August) to the end of the autumn (June). Daily peaks were mainly detected in autumn season (March 29th 2015; April 4th 2007, 6th 2015, 17th /18th 2011 and May 3rd 2008) and spring time (October 13th 2012, 22nd 2006; November 17th 2010, 18th 2012, 23rd 2005, 28th 2005 and December 3rd 2014, 7th 2005), or even in winter (August 28th 2009; September 9th 2013), although without surpassing 65 spores/m3 in any case.

CONCLUSIONS

Alternaria maintained an irregular distribution pattern during the year, being more abundant in the summer and autumn seasons. However, it did not reach high daily concentrations.

ID: 151
Session: FUNGAL SPORES
Topic: BASIC AEROBIOLOGY

O.064 | Comparison of Alternaria spore concentrations between two zones within the same city in Salamanca (Middle West of Spain)

Fuentes Antón, S.[1,2], Rodríguez de la Cruz D.[1,2], Sánchez Sánchez, J.[1,2], García Sánchez A.[3,4], Dávila I.[3,4,5], Sánchez Reyes E.[1,6]

1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain.
2 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Méndez Nieto s/n, 37007, Salamanca, Spain.
3 Department of Biomedical and Diagnostic Sciences, Faculty of Medicine, University of Salamanca, Alfonso X, El Sabio s/n, 37007, Salamanca, Spain
4 Institute for Biomedical Research of Salamanca
5 Immunoallergy Service, University Hospital of Salamanca, Spain.
6 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain.
Email address: u87950@usal.es

Keywords: *Alternaria*, spore count, trap comparison

BACKGROUND AND OBJECTIVES

In the past years, was made a survey about the spores present in the atmosphere of Salamanca, resulting in the publication of the first spore calendar for the city in 2019. The aim of this work was to contribute to the knowledge about *Alternaria* concentration in Salamanca (MW Spain), comparing its airborne behaviour between two different monitoring locations within the same city.

MATERIAL AND METHODS

The aerobiological sampling was carried out using two Hirst volumetric traps for two consecutive years (2014-2016): One sampler was located in the city centre and the second trap in a seminatural environment. The datum analysis of spore concentrations was done considering the main spore season (MSS), including the number of days in which the threshold levels for allergic people were surpassed. The threshold level used was 100 spores/m^3. We have also analysed possible statistical correlations between the daily spore concentrations at both samplers as well as the influence of the meteorological parameters on *Alternaria* spore concentrations between the two zones.

RESULTS

During 2014 the number of days exceeding the threshold levels were the same in both samplers. Nevertheless, during 2015 the rural sampler duplicated the days with moderate/high levels respect to city centre, focused in the same week (16-20 June).
There was a positive correlation of the airborne spore concentrations between the two traps (during 2014, 2015 and both years together). Also there was statistically significant positive correlation between the atmospheric spore concentrations and temperature and sunshine. On the contrary, there was statistical significant negative correlation between the spore concentrations and relative humidity and rainfall.

CONCLUSIONS

The correlations between the two sampling zones showed a highly positive correlation and the days of threshold levels surpassed were very similar in the two locations, focused in similar dates, what suggests that the differences between both zones were minimal.

ID: 146
Session: FUNGAL SPORES
Topic: BASIC AEROBIOLOGY

O.065 | The relationship between Platanus sp. pollen and the pollen allergen Pla a1 in the atmosphere of Northwest Turkey

Sevcan Çelenk[1], Matt Smith[2], Hulusi Malyer[1], NIhat Sapan[3]

1 Science Faculty, Biology Department, Aerobiology Laboratory, Bursa Uludag University, Bursa, Turkey
2 University of Worcester, School of Science and the Environment, Worcester, UK
3 Faculty of Medicine, Division of Pediatric Allergy, Bursa Uludag University, Bursa, Turkey

Keywords:

BACKGROUND AND OBJECTIVES

This study examines airborne pollen and pollen allergens of plane trees (genus *Platanus*, family Platanaceae) *Platanus orientalis* is the native and most abundant species in Turkey. Other ornamental species include *P. occidentalis* and *P. x acerifolia*. The city of Bursa records some of the highest concentrations of airborne plane tree pollen in Turkey and the incidence of pollen allergy to *Platanus* sp. pollen is increasing. The aim of this study is to examine correlations between airborne concentrations of *Platanus* pollen and the allergen Pla a 1 in Bursa in order to determine whether airborne pollen can explain the prevalence of allergy symptoms.

MATERIAL AND METHODS

Airborne pollen were collected by Hirst type 7-day recording volumetric trap (2008 - 2019) located 12 m above ground level. Airborne pollen grains were sucked in at 10 l/min and impacted onto an adhesive covered tape. Samples were examined by light microscopy and expressed as Pollen grains-1 daily average. Allergens of *Platanus* sp. (Pla a 1) were concomitantly collected by ChemVol sampler for allergen detection (2018 - 2019). The Chemvol collects particles at 800 l/min and contains 2 impaction stages PM>10 micron and 10 > PM>2.5 micron. Analysis of Pla a 1 in air samples was performed by antibody-based two-site immune enzymatic assay (ELISA).

RESULTS

Both the daily and seasonal incidence of plane tree pollen in the atmosphere of Bursa have been established using data from 12 pollen seasons from 2008 to 2019. The main pollen season of *Platanus* sp. was observed between April and May. There are variations in seasonal and daily concentrations of airborne *Platanus* pollen. Airborne pollen and allergens follow similar trends and both pollen and Pla a 1 are significantly correlated.

CONCLUSIONS

The amount of plane tree pollen in the atmosphere of Bursa varies temporally and is significantly related to atmospheric concentrations of Pla a 1. Research in this field is essential for a better understanding of the relationship between of aeroallergens and pollinosis

This study was supported by TUBITAK project no 109S032 and 117Y171.

ID: 202
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.066 | Personal pollen monitoring and symptom scores by grass pollen allergic patients

Letty A de Weger[1], Peter Th. W van Hal (4)[1], Bernadette Bos[1], Frank Molster[2], Raheel Gill[1], Marijke Mostert[3], Pieter S Hiemstra[1]

1 Department of Pulmonology, Leiden University Medical Center, Albinusdreef 2, 2333ZA, Leiden, The Netherlands

2 Leidse Instrumentmakers School, Einsteinweg 61, 2333 CC Leiden

3 University of Applied Sciences, Zernikedreef 11, 2333 CK Leiden

4 current address: Department of Respiratory Medicine, Het Van Weel-Bethesda Hospital, Stationsweg 22, 3247 BW Dirksland

Keywords: personal pollen monitoring, symptoms, handheld sampler, grass pollen

BACKGROUND AND OBJECTIVES

Pollen is a major trigger for allergic symptoms in sensitized individuals. The presence of pollen in the air is monitored by Hirst type pollen samplers at roof top level, providing a general overview of what kind of pollen one can be exposed to. Since sensitised individuals mostly are exposed at street level, it is better to relate symptoms not only to pollen counts at rooftop level, but to those at street levels too. Therefore, in this study grass pollen allergic patients were asked to collect grass pollen in their direct environment and score their symptoms, in order to study the relation between personal grass pollen exposure and symptom severity.

MATERIAL AND METHODS

Nine grass pollen sensitized individuals were enrolled in this study in May, 2017 and asked to monitor personal pollen exposure using a newly developed handhold pollen sampler (Pollensniffer) on their way to school, work or other destination, and to score their symptoms via a mobile app on a scale from 0 to 10. The grass pollen were collected on a cellulose strip covered with Vaseline, and analysed with a microscope. Results were analysed using the software package STATA 14.0 (StataCorp, TX).

RESULTS

The grass pollen counts collected by the individuals with the Pollensniffer were normally distributed after log transformation. The correlation coefficient (CC) between the log transformed grass pollen counts and the eye, nose and lung symptoms of the participants showed a moderate but significant correlation (CC>0.55) for 3 individuals, whereas in the other 6 individuals a low or no correlation (CC< 0.3) was observed. The first group was characterized by high grass pollen specific IgE levels (IgE>30kU/l), no sensitisation to house dust mite (HDM) and high symptoms scores (>4).The other group showed low grass pollen IgE levels (<4).

CONCLUSIONS

Our results show that significant correlations between grass collected by the Pollensniffer and the severity of clinical symptoms of grass pollen allergic patients are restricted to a subgroup of patients characterized by high levels of grass pollen specific IgE, no detectable sensitisation to HDM and high symptom score.

ID: 023
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.067 | Inhalant Allergen Sensitization and Symptoms in Istanbul

Franziska Zemmer[1], Cenk Evren[2], Åslög Dahl Dahl[3], Carmen Galán[1], Fatih Özkaragöz[4]
1 University of Córdoba, Spain
2 Medilife Hastanesi Istanbul, Turkey
3 University of Gothenburg, Sweden
4 Memorial Hermann Houston, USA

Keywords: pollen allergy, symptoms, Istanbul

BACKGROUND AND OBJECTIVES
The aim of the this study was to investigate comprehensively the relationship between airborne pollen concentrations, main allergen sensitization and allergy symptom development in a sample population of Istanbul.

MATERIAL AND METHODS
After approval by an ethic commission, informed consent, and the compilation of a questionnaire on symptoms, 66 participants were skin prick tested (SPT) using 36 inhalant allergens. By means of the European Aeroallergen Network (EAN; www.ean-net.org), weekly pollen information was transferred to the participants through the webtool pollendiary.com. Subscribers obtained pollen information timed with symptom data entry. Symptoms and pollen data were statistically analysed.

RESULTS
The top ten sensitizers were: *Phleum pratense* (25,8%); *Sorghum halepense* (22,6%), *Anthoxanthum odoratum* (21%), *Cynodon dactylon* (19,4%), *Dermatophagoides farinae* (16,1%), *Poa pratensis* (14,5%); *Dermatophagoides pteronyssinus* and *Rumex crispus* (12,8%); *Fraxinus excelsior* (8,1%), *Corylus avellana*, *Olea europaea* and *Morus alba* (each 6,5%); *Artemisia vulgaris*, *Ambrosia artemisiifolia* and *Juniperus arizonica* (each 4,8%). In 2015, the maximal pollen concentration of grasses was 66 pollen/m-3day, of *Rumex* and *Fraxinus* 7, of *Corylus*, *Olea*, *Morus*, *Artemisia*, *Ambrosia* and *Cupressaceae* 33, 67, 17, 7, 138 and 422 pollen/m-3day, respectively. The nose (63,7%) was the most affected organ followed by the eyes (50%) and the lungs (34,8%). The main symptoms were sneezing (62,1%), itchy eyes (43,9%), and cough (28,8 %), respectively.

CONCLUSIONS
In our SPT panel, *Phleum pratense* (Pooideae), *Sorghum halepense* (Panicoideae) and *Cynodon dactylon* (Chloroideae) best represent wild grass allergens. Sensitization to *Ambrosia* in Istanbul was proved for the first time. Overall, pollen concentrations were low and sensitization patterns reflect urban - Mediterranean flora.

ID: 092
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.068 | Delivery of the allergy-related information to a target audience: Ukrainian case

Victoria Rodinkova[1], Danylo Tovstyk[1], Serhii Yuriev[2]
1 National Pirogov Memorial Medical University, Vinnytsya, Ukraine, Pirogov Street, 56, Vinnytsia, Ukraine, 21018
2 O.O. Bohomolets National Medical University, Kyiv, Ukraine, Taras Shevchenko Boulevard, Kyiv, Ukraine, 01601

Keywords: allergy-related information, pollen forecast, patients' education, health impact

BACKGROUND AND OBJECTIVES

It is undoubtful that the top aim of any scientific investigation is to be of service to the society. To be useful, interesting and understandable to users – this is the real and best goal of every science-based service including that, which provides wide range of information related to the pollen count and allergy in whole.

MATERIAL AND METHODS

To achieve this goal we established allergy.org.ua — 'All About Allergy' Project, which is allergy-related web-portal in Ukraine. Significant part of the main page occupies pollen forecast heading, which leads to the forecast page. This, in turn, connects detailed prognosis of allergenic risks with illustrated description of plants under the "Plants-allergens" heading.
ollen forecast is also connected with SILAM-based real-time maps, which let users estimate the pollen risk day and certain time of it.
Other headings of web-portal devote to allergy triggers, to control of asthma, food allergy, drug allergy. Users can find here advice, debunking of allergy myths, videos with doctors opinion on allergy-related topics. Up to 70 % of articles are written using the results of the most recent scientific papers on allergy. Medical doctors check the content of all such articles before they appear online.

RESULTS

We gained more than 155 000 customers during the 2019, which was the first year of the portal work. However number of visitors significantly increased and now we can get up to 54 000 of customers during the month, which led to 76 674 of new users just during 1,5 month of 2020, which is almost a half of customers we attracted during 2019.
Many of doctors agree that portal should perform the educational function to both doctors and patients. Thus, we provide the opportunity to deliver information to users for allergy opinion leaders of Ukraine.

CONCLUSIONS

To be efficient for users it is important to deliver the information in simple way and be concentrated on the needs of target audience. Further work on seeking for needs and interests of audience is essential to improve the content of portal.

ID: 171
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.069 | An overview of airborne pollen distribution and allergenicity in the Philippines

Maureen Sabit
University of Santo Tomas, Manila, Philippines, 1015

Keywords: aerobiology, sensitization, pollen

BACKGROUND AND OBJECTIVES
Allergic diseases such as allergic rhinitis, asthma, and urticaria caused by pollinosis are a growing health problem especially in urban cities and developing countries. There is limited knowledge on the prevalence and abundance of clinically important atmospheric pollen as well as on the sensitization profile of Filipinos against a panel of pollen allergens. This paper presents the aerobiological researches conducted in different parts of the Philippines and its implication as an inhalant allergy.

MATERIAL AND METHODS
Research papers published in related journals in the Philippines were the main sources of information. Studies on atmospheric pollen in Manila and its surrounding areas were done by the pioneering efforts of the Allergy Unit, Medical Research Center of the National Institute of Science and Technology (NIST) laboratory. Other similar researches developed after this project.

RESULTS
Based on aeropalynological studies of the Manila and Makati area, it was found that the abundant pollen allergens were from species belonging to Fabaceae, Moraceae, Amaranthaceae, and Asteraceae. In another aerobiological study in different capital cities of the Philippines, such as Manila, Davao, Cagayan, and Baguio City yielded similar results. After 30 years, the change in local vegetation in Manila was evident as the three most predominant pollen types were Urticaceae, Cannabaceae and Poaceae. Previous studies also presented results of patients showing allergic reactions to the pollen of grasses and other herbaceous weeds. Recent studies presented results on tree pollen sensitization.

CONCLUSIONS
Previous studies concluded that the months of November, December and January generated the greatest number of pollen in the atmosphere. Currently, pollen peaks occur from February to April. The landscape and vegetation have changed over the years signifying a change in local airborne pollen.

ID: 193
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.070 | Health impacts of long-distance transport of aeroallergens? A new perspective based on a real-life human cohort on the alps

Maria P. Plaza[1,a], Daniela Bayr[1], Franziska Kolek[1], Vivien Leier-Wirtz[1], Stefanie Gilles[1], Claudia Traidl-Hoffmann[1,2], Athanasios Damialis[1]

1 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Germany - German Research Center for Environmental Health, Augsburg, Germany
2 Christine Kühne Center for Allergy Research and Education (CK-CARE), Davos, Switzerland
[a] corresponding author: maria.plaza@tum.de

Keywords: aeroallergens, long-distance transport, high altitude

BACKGROUND AND OBJECTIVES

Pollen and fungal spores are main causes of respiratory allergies worldwide. Aeroallergen exposure becomes significantly shorter and lower in higher locations due to complex environmental parameters, like prevailing winds and micrometeorology, local vegetation and topography. However, it is not thoroughly investigated as to what extent higher elevation indeed equals to lower aeroallergen concentrations and, consequently, reduced allergic symptoms. We investigated the spatiotemporal patterns of airborne pollen and fungal spores on a high-altitude location aiming to predict higher risk aeroallergen exposure and, moreover, to integrate these patterns with real-life symptoms in an allergic human cohort.

MATERIAL AND METHODS

The research was carried out in 2016 in the alpine research station UFS, located at 2,650 m. a.s.l., on the Zugspitze Mountain in Bavaria, Germany. Airborne pollen and fungal spores were monitored by use of portable Hirst-type volumetric traps, both indoors and outdoors. As a case study, grass pollen-allergic (and control non-allergic) human volunteers were registering their symptoms daily during the peak of the grass pollen season in 2016, during a 2-week stay on Zugspitze, 13-24 June. The possible origin of some pollen types not present in the area, was identified using back trajectory model HYSPLIT for the 20 air mass backward trajectories up to 24 hours.

RESULTS

Exposure on the Alps was significantly lower compared to that at lower altitudes, as expected. However, under appropriate environmental conditions, mainly atmospheric pressure and precipitation, systematic episodes of high aeroallergen concentrations may also occur at this high-altitude location. The spatiotemporal patterns of airborne pollen and fungal spores showed more than 1,000 pollen grains and fungal spores per cubic meter of air measured on the UFS within only 4 days. Among them, also pollen to which human cohort were sensitized in, and, hence, patients immediately exhibited allergic symptoms. The allergy percentage in grass allergic patients increased an average of 20% on days with the highest pollen concentration (>60%). The allergy rate was significantly higher these days compared to days with low pollen grains (<7%) detected (x^2 = 10.46, df = 2, p<0.05).

CONCLUSIONS

Here we confirm for the first time that long-distance transport of aeroallergens can indeed cause allergic symptoms to sensitized individuals. This may occur even low-exposure, 'low-risk' environments, like the Alpine ones.

ID: 102
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.071 | Comparative study of airborne concentrations of Ole e 1 and pollen from the Oleaceae family in Barcelona (Catalonia, NE Spain)

Jordina Belmonte, Concepción De Linares
Unitat de Botànica and Institut de Ciència i Tecnologia Ambientals (ICTA-UAB). Universitat Autònoma de Barcelona, Bellaterra. Spain.

Keywords: Ole e 1, Oleaceae pollen, allergy risk

BACKGROUND AND OBJECTIVES

Olive pollen (*Olea europaea*) is the major cause of allergy in the Mediterranean area. Ole e 1 is one of the major allergens and represents 20% of the total protein of this pollen. The observation, in recent years, that some people suffer from allergies to olive pollen in absence of this pollen in the air has suggested studying the simultaneity of the allergenic activity and the airborne pollen.
In this work, we present a comparative study of the concentrations of the Ole e 1 allergen and the pollen from the Oleaceae family (*Olea*, *Fraxinus*, *Phillyrea*, *Ligustrum*) in the atmosphere of Bellaterra (Barcelona), with the aim to help to better evaluate the temporality and the potential risk of this allergy in the area.

MATERIAL AND METHODS

Samples were collected daily using a Cyclone Burkard (allergen) and a Hirst trap (pollen) on the roof of the C Building at UAB, during the years 2016 and 2018. The allergen analysis was performed using the ELISA technique and the pollen analysis according to the methodology of the Spanish Aerobiology Network (REA). Spearman was applied to calculate the correlations.

RESULTS

Oleaceae pollen type and Ole e 1 were present in the atmosphere from January to August in both years, especially during the spring. The highest concentrations of both variables coincided with *Olea* pollen, although in earlier periods Ole e 1 was already present in the air coinciding with the pollinations of *Fraxinus* and *Phillyrea*. Spearman test showed positive and significant correlation between Ole e 1 and Olea pollen (2016: 0.328, $p < 0.01$; 2018: 0.164, $p< 0.01$) and, even higher, with Oleaceae pollen type (2016: 0.514, $p < 0.01$; 2018: 0.225, $p< 0.01$).

CONCLUSIONS

The period with risk of allergy to Ole e 1 is longer than *Olea* pollination. The cross-reaction between this allergen and several species of the Oleaceae family provoke that the sensibilized patients can suffer symptoms since January to August.

Study funded by Laboratorios LETI and the "Respiratory Allergy Committee" (CAR) of the Societat Catalana d'Al·lèrgia i Immunologia Clínica (SCAIC) and CTM2017-89565-C2-1-P.

ID: 135
Session: HEALTH IMPACT
Topic: INDOOR AEROBIOLOGY

O.072 | Thunderstorm-related respiratory symptoms in pollen allergics: a personalised biomonitoring approach

Stefanie Gilles[1], Franziska Kolek[1], Daniela Bayr[1], Maria Pilar Plaza[1], Vivien Leier-Wirtz[1], Annette Straub[2], Stefanie Seubert[2], Michael Gerstlauer[3], Christoph Beck[2], Andreas Philipp[2], Claudia Traidl-Hoffmann[1], Athanasios Damialis[1]

1 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Augsburg, Germany

2 Institute for Geography, Physical Geography and Climate Science, University of Augsburg, Augsburg, Germany

3 Department of Pediatric Pneumology and Allergology, Children's University Hospital Augsburg, Augsburg, Germany

4 Christine Kühne - Center for Allergy Research and Education (CK-CARE), Davos, Switzerland

Keywords: allergy, allergic rhinitis, asthma, panel study, Poaceae pollen

BACKGROUND AND OBJECTIVES

Epidemiological studies have implicated airborne pollen as possibly being correlated to high occurrence of asthma cases during thunderstorm events. Despite the high clinical relevance of the phenomenon of thunderstorm asthma, no determinative relationship among involved co-factors has been revealed to date.

MATERIAL AND METHODS

As part of the joint project Climate Change and Health (Bavarian State Ministries of the Environment and Consumer Protection and of Health and Care), we performed a retrospective analysis to test for relationships between airborne pollen occurrence, lightnings, other climatic factors and respiratory symptoms in a dedicated panel study on clinically characterised pollen-allergic subjects in Bavaria, Germany. Daily symptom data (nasal, pulmonary and total) were retrieved by means of a smartphone-based allergy diary during two full seasons, 2015-2016. Local lightning data were obtained from Siemens. Concentrations of airborne pollen were obtained with a Hirst-type volumetric device. In a case-control design, we tested whether allergic symptoms in subjects sensitised to pollen change during the co-occurrence of thunderstorms and airborne pollen.

RESULTS

Eleven out of 16 subjects showed allergic sensitisation to Betulaceae and Corylaceae (hazel, alder, birch), 2 of 16 to Oleaceae (ash, olive) and 14 of 16 to Poaceae (grass) pollen. Most of the lightning cases were highly seasonal with their peak during summer, thus, coinciding mainly with the Poaceae family pollen from end-May to mid-July. A positive correlation between nasal symptoms, grass pollen and lightnings ($r=0.53$; $p< 0.001$) was identified.

CONCLUSIONS

Our retrospective analysis on a well-characterised seasonal allergic rhinitis human cohort showed that dedicated panel studies can be a valuable biomonitoring tool to detect the interaction effects of complex environmental systems that could provoke thunderstorm asthma. Integrating environmental, biological and human health data can comprise the basis for real-time warning systems so as to avoid fatalities.

ID: 096
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

O.073 | New methodology for the measurement of airborne allergens

Concepción De Linares[1], Jordina Belmonte[1], Rosario Delgado[2]
1 Ins. Ciència i Tecnologia Ambientals (ICTA) i Dept. Biologia Animal, Vegetal i Ecologia. Universitat Autònoma de Barcelona (UAB). 08193 Bellaterra
2 Dept. de Matemàtiques, Universitat Autònoma de Barcelona, Edifici C, 08193 Bellaterra, Spain.

Keywords: airborne allergens, High-Volume sampler, detection, Ole e 1

BACKGROUND AND OBJECTIVES
The significant increase of allergy sufferers makes necessary the control of the quality of the air. It has been demonstrated that the air contains, in addition to pollen grains, allergenic particles of smaller size (allergens). There are several traps to collect airborne allergens, but usually the number of allergens that can be analyzed in a sample is limited. The aim of this study is to present a methodology for the detection and quantification of several airborne allergens in a daily sample.

MATERIAL AND METHODS
The collector used for sampling is a High-Volume TSP Sampler (CAV-A / mb, MCV S.A.) that aspires 400 L / min., placed in the roof of the C building at the Universitat Autònoma de Barcelona (Bellaterra, Spain) at 23 m.s.a.l. The sampling surface is a glass fiber filter of 15 cm in diameter (12 cm in diameter of impacted surface). Samples correspond to 1 day (from 0 to 24 hours) and they are taken alternating days. The filters are analyzed with ELISA technique using Ole e 1 as allergen.
With the aim to stablish the efficiency and viability of this new methodology and to validate the obtained results, we have conducted a statistical study. To do so, we have considered the half of the filter divided into 24 zones (in 6 sectors of 30º each, and inside each sector, in concentric annulus). In a first phase, we have studied the distribution of the allergens in the 24 zones of the half filter. Then, we have determined how many subsamples (circles of 0.5 cm in diameter) must be taken in these zones to be reasonably sure that we detect and quantify adequately the allergens.

RESULTS
The more representative zones to take subsamples are the sectors closest to the center. With a 95% of confidence, seven subsamples are enough to detect the presence of allergens in a disc, if any, with a probability of 95%.

CONCLUSIONS
High Volume TSP Sampler and ELISA technique showed to be a good method to measure between six to eight allergens per sample.

Financial support CTM2017-89565-C2-1-P and PGC2018-097848-B-I0.

ID: 115
Session: HEALTH IMPACT
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.074 | Traffic related pollution in urban environments enhanced Platanus hybrida pollen allergenicity

Celia M. Antunes[1], Marta Otílio[1], Ana Galveias[1], Beatriz Lara[2], Mª João Costa[3], Jesus Rojo[2], Ana R. Costa[1], Rosa Perez-Badia[2]

1 Institute of Earth Sciences - ICT & Department of Chemistry, School of Sciences and Technology, University of Évora, Évora, Portugal

2 Institute of Environmental Sciences (Botany), University of Castilla-La Mancha, Toledo, Spain

3 Institute of Earth Sciences - ICT & Department of Physics, School of Sciences and Technology, University of Évora, Évora, Portugal

Keywords: airborne allergens, air pollution environmental allergies

BACKGROUND AND OBJECTIVES

Air pollution aggravates asthma and respiratory allergies evoking higher incidence and/or symptoms worsening in heavily polluted areas. The effect of traffic pollution on pollen allergenic potential is still unclear. The objective of this work was to evaluate the effect of atmospheric pollution in the P. hybrida pollen allergenicity.

MATERIAL AND METHODS

Pollen was harvested (in 2018 and 2019) from trees growing in the Évora urban area (38.575099, -7.905096) and at the Herdade da Mitra — Mitra - (38.531037, -8.014918), a rural area 12 km outside the city. NO2 was monitored by the ESA Sentinel-5P satellite using the TROPOMI instrument. Pollen production was evaluated by collecting inflorescences in phase II (5/tree) from 5 trees in each site; 3 anthers per inflorescence were homogenized in 70% ethanol; Microscopy slides with the suspensions were prepared and pollen was counted following the standard methodology.

Micro BCA Protein Assay Kit was used to determine the protein in pollen extracts. Pla a1 content was determined by a specific ELISA. IgE-reactive bands were identified by western blot, using sera from sensitized indivials.

RESULTS

Troposferic NO2 reached 2.40x10-05 mol.m-2 in Évora city and 2.35x10-5 mol.m-2 in Mitra. The average pollen production was similar in both sites, but the dispersion of the values was higher in Évora (Évora: 10,977-39,273 pollen/anther; Mitra: 21,023-25,290 pollen/anther). Pollen from Évora showed 2- to 4-fold lower protein content but a ~20% higher Pla a1 content. Six IgE-reactive proteins have shown higher intensity in pollen harvested in Évora (MW 73.7±4.6; 47.8±1.5; 29.8±1.1; 26.7±0.4; 24.4±0.9; 17.4±0.6 kDa), three of those corresponding to known allergens Pla a1 (~48kDa confirmed by Western blotting), Pla TLP (~24kDa) and PLa a8 (~17kDa).

CONCLUSIONS

Despite the geographical proximity, a higher concentration of air pollutants is found in urban environments. This is severely changing the biochemistry of pollen, shifting towards augmented expression of several allergens. Taken together, these results suggest that traffic related pollution in urban environments is one cause for highest prevalence and/or aggravation of respiratory allergic diseases.

ID: 145
Session: ENVIRONMENTAL POLLUTION
Topic: HEALTH IMPACT

O.075 | Possible relationship between the physiological conditions of Betula pendula and physico-chemical properties of its pollen at selected sites in Lesser Poland

Monika Ziemianin[1], Andrzej Skoczowski[2], Jakub Oliwa[3], Diana Saja[4], Magdalena Ryś[4], Iwona Stawoska[2], Dorota Myszkowska[1]

1 Jagiellonian University Medical College, Department of Clinical and Environmental Allergology, Śniadeckich 10, 31-531 Kraków, Kraków, Poland
2 Institute of Biology, Pedagogical University of Krakow, Podchorążych 2, 30-084, Krakow, Poland,
3 University of Physical Education in Krakow, 31-571 Kraków Al. Jana Pawła II 78, Poland
4 The Franciszek Górski Institute of Plant Physiology, Polish Academy of Sciences, Niezapominajek 21, 30-239, Krakow, Poland

Keywords: birch pollen, allergens, physiology, calorimetry

BACKGROUND AND OBJECTIVES
It is supposed that the physiological conditions of trees, modified by abiotic pollution, may affect the metabolic activity, chemical composition and the proteins profile of pollen. The aim of the study was to find the relationship between the selected physiological parameters and the features of pollen originating from B. pendula Roth specimens growing at the selected sites in Lesser Poland.

MATERIAL AND METHODS
Leaves and catkins of B. pendula were collected at the selected sites of the different pollution level, in Lesser Poland in 2017-2019. Among physiological measurements, the PSII photochemical efficiency (by fluorometry) and leaf reflectance (by spectrometry) were performed. 13C discrimination was investigated by Thermo Flash EA 1112HT analyzer coupled to a mass spectrometer. Birch pollen was analyzed for metabolic activity (by isothermal calorimetry) and the main allergen concentration (ELISA).

RESULTS
The values of physiological parameters indicate that trees growing outside the urban area were relatively the most exposed to environmental stress. The highest discrimination coefficient values δ13C were found for specimen in a forest complex. Similarly, the metabolic activity of pollen, produced by trees existing in the forests was more than twice as high compared to the urban environment. On the other hand, the concentration of the main birch pollen allergen (Bet v1, PR-protein) was significantly lower in pollen collected from outside of Kraków ($\alpha < 0.05$), but this relation depends on the study year.

CONCLUSIONS
Trees in a large urban agglomeration do not show a significant stress response expressed through the physiological indices, but the higher stress proteins occurrence in pollen can testify to the growth and development in the non-favorable conditions. Then it cannot be ruled out that trees growing in an environment exposed to pollution have adapted to difficult environmental conditions, while in forest conditions 'multi stress' affects plant metabolism to much greater extent than air pollution in the cities.

The study was supported by Polish National Science Centre grant no. 2016/21/N/NZ8/0136.

ID: 176
Session: ENVIRONMENTAL POLLUTION
Topic: ENVIRONMENTAL POLLUTION

O.076 | Bioaerosol monitoring in the study of the impact of air pollution on building stones in the Pò Valley urban site (Italy)

Paola De Nuntiis[1], Alessandro Sardella[1], Giorgia Vidorni[1,2], Adelaide Dinoi[3], Daniele Contini[3], Carmela Vaccaro[1,2], Delia Fernandez Gonzalez[1,4], Alessandra Bonazza[1]

1 Institute of Atmospheric Sciences and Climate, CNR-ISAC, Via Gobetti 101, 40129, Bologna Italy
2 Department of Physics and Earth Sciences, University of Ferrara, Via Saragat 1, 44122, Ferrara
3 Institute of Atmospheric Sciences and Climate CNR-ISAC, Str. Prv. Lecce-Monteroni km 1.2, 73100, Lecce Italy
4 Department Biodiversity and Environmental Management, University of León, Campus de Vegazana s/n, 24071, Leon Spain

Keywords: biodeteriogens, architectural surfaces, Bologna

BACKGROUND AND OBJECTIVES

The impact of air pollution on stones buildings located in urban areas is widely demonstrated, but gaps remain in the measurement of deposition flows on architectural surfaces. Moreover, thanks to the mitigation policies and use of low-sulphur fuels (Bonazza, 2017), possible effects on built heritage of the current urban atmosphere, richer than in the past of NOx and organic compounds (emitted from vehicular traffic), should be considered. The study was conducted in Bologna, an urban city located in the Pò Valley, the most polluted area in Europe with serious consequences not only for human health.

MATERIAL AND METHODS

Field exposure tests were performed for 2 years in Bologna, with sample models of Marble (Carrara Marble) and limestone (Red Verona Marble), largely used in historic Italian architecture. Monitoring campaigns of particulate matter and bioaerosol have been realized in order to quantify the organic and elemental carbon and microbial load (fungi and bacteria). Surface Air System (SAS) with contact plates containing culture mediums for bacteria and fungi were utilized to determine the atmospheric concentration of the potentially biodeteriogenic. The colorimetric analysis was realized to evaluate the aesthetical changes due to the deposit.

RESULTS

Aerosol monitoring campaigns confirmed the leading role of traffic in pollution. During the winter the atmospheric stagnation and heating systems favored the major accumulation of aerosol. Instead bioaerosol monitoring shows an increase of total microbial load during summer (fungi). The accumulation of deposited matter influenced the aesthetic appearance of exposed stone samples, mainly of those horizontally and obliquely placed.

CONCLUSIONS

A non invasive methodological approach for studying the impact of urban pollution on stones was performed. The final aims of this study is to provide specific tools for cultural heritage management in polluted areas in a changing environment.

ID: 195
Session: ENVIRONMENTAL POLLUTION
Topic: CULTURAL HERITAGE

O.077 | Modification of lipids of allergenic pollen grains by ozone

Nicolas Visez[1], Jinane Farah[1], Sylvie Gosselin[1], Marie Choël[2]
1 Univ. Lille, CNRS, UMR 8522 - PC2A - Physicochimie des Processus de Combustion et de l'Atmosphère, F-59000 Lille, France
2 Univ. Lille, CNRS, UMR 8516 - LASIRE - Laboratoire de Spectroscopie pour les Interactions, la Réactivité et l'Environnement, F-59000 Lille, France

Keywords: air pollution, lipidomics, pollen analysis

BACKGROUND AND OBJECTIVES
Pollen lipids are involved in the germination processes of pollen grains (PGs). Lipids can also have inflammatory effects when PGs come into contact with epithelial cells and they can also play an adjuvant effect during protein-induced allergic reaction. PGs germination is impaired by air pollution and the polluted PGs are known to have stronger allergenic properties. However, the specific molecular mechanisms at work between pollutants and constituents of PGs are rarely described in the scientific literature.

MATERIAL AND METHODS
PGs were either directly collected on trees (*Pinus halepensis*, *Betula pendula*) or purchased from pollen providers (*Phleum pratense*, *Ambrosia eliator*). PGs were exposed in the laboratory to ozone at concentrations of 100 ppb for 16 hours under dry conditions. Lipids were extracted with organic solvent (methylene chloride) and extracts were concentrated, silylated and analysed by gas-chromatography coupled to mass spectrometry. PGs were mechanically crushed prior to extraction in order to release internal lipids.

RESULTS
Comparison of the modification of pollen lipids of those species allowed to distinguish several major trends depending on the plant species considered. Pollen lipids of *Ambrosia eliator* were very abundant (120 mg lipids per gram of pollen) but did not react under our experimental conditions with ozone. Birch and timothy grass pollens had a similar lipid mass (around 20 mg of lipids per gram of pollen) and a similar lipidic composition. Reactivity of both species was dominated by alkene ozonolysis. PGs of Pinus halepensis showed a double reactivity to ozone characterized by the ozonolysis of linear unsaturated fatty acids and the reactivity of monomers parts of sporopollenin structure.

Internal pollen lipids were also analysed for timothy grass and birch pollen. The unsaturated fatty acids constituting these internal lipids were never degraded by ozone, even when PGs were fractured before exposure to ozone.

CONCLUSIONS
Pollen lipids could act as antioxidants either by forming a thick physical barrier preventing the diffusion of ozone inside the pollen grain or by possessing double bonds easily chemically attacked by ozone.

ID: 137
Session: ENVIRONMENTAL POLLUTION
Topic: ENVIRONMENTAL POLLUTION

O.078 | Pollution of Birch Catkins and Pollen Grains by Atmospheric Particulate Matter

Marie Choël[1], Karine Deboudt[2], Xavier Secordel[2], Nicolas Visez[3]
1 Univ. Lille, CNRS, UMR 8516 — LASIRE — Laboratoire de Spectroscopie pour les Interactions, la Réactivité et l'Environnement, F-59000 Lille, France
2 Univ. Littoral Côte d'Opale— LPCA — Laboratoire de Physico-Chimie de l'Atmosphère, F-59140 Dunkerque, France
3 Univ. Lille, CNRS, UMR 8522 — PC2A — Physicochimie des Processus de Combustion et de l'Atmosphère, F-59000 Lille, France

Keywords: birch, catkins, pollen grain, atmospheric particulate matter, air pollution

BACKGROUND AND OBJECTIVES
Anemophilous pollen grains (PGs) could be contaminated by air pollutants directly on plant before dehiscence and during atmospheric transport by wind. Observations of atmospheric particulate matter (APM) on the surface of PGs are indeed regularly reported in literature as a qualitative evidence of the deterioration of the integrity of pollen due to urban air pollution. However, quantitative assessments are rare, making it difficult to estimate the effects of particulate contamination of pollen on both allergic reactions and reproductive capacities. In this work, we quantitatively compare the extent of APM adhesion on birch catkins, on PGs directly released from the anthers, and on PGs sampled during airborne dispersal.

Catkins were harvested in low and high polluted zones in Dunkerque (Hauts-de-France). Mature catkins were shaken onto adhesive tape to collect PGs. Both catkins and PGs surfaces were observed by scanning electron microscopy coupled to energy-dispersive X-ray spectrometry (SEM/EDX). For comparison, airborne PGs were sampled during birch pollination in Lille (Hauts-de-France) on a day with a mean PM10 mass concentration of 30 µg/m3 lower than the EU daily limit value. Hundreds of PGs were individually observed by SEM/EDX. Particles adhered on PGs and catkins were sorted according to their elemental composition.

RESULTS
Birch catkins harvested in the vicinity of a large steelworks were covered in APM. Catkins surfaces were notably contaminated by metal-rich particles. In contrast, PGs released from mature catkins were found much less polluted with

CONCLUSIONS
In conclusion, low contamination of PGs released from mature catkins was found despite high particulate contamination catkin surface. The scales of catkins and pollen sacks have a protective effect against pollution, by shielding PGs from APM deposition until anther dehiscence. The degree of pollution of airborne PGs by APM is still poorly understood despite potential health risks due to the marked presence of harmful particles on PGs.

ID: 055
Session: ENVIRONMENTAL POLLUTION
Topic: ENVIRONMENTAL POLLUTION

O.079 | Artificial Intelligence - enabled system for automatic detection of airborne pollen

Danijela Tešendić[1], Danijela Boberić Krstićev[1], Predrag Matavulj[2], Branko Sikoparija[2]
1 Department for mathematics and informatics, University of Novi Sad Faculty of Sciences, Trg Dositeja Obradovica 4, Novi Sad, Serbia
2 BioSense Institute - Research Institute for Information Technologies in Biosystems, University of Novi Sad, Dr Zorana Đinđića 1, Novi Sad, Serbia

Keywords: automatic pollen identification, integrated information system, neural networks

BACKGROUND AND OBJECTIVES
The aim of this presentation is to describe a solution suitable for the automation of standard pollen information service (CEN/TS 16868:2017). We are describing the RealForAll integrated information system developed for automatic airborne pollen detection and real-time data delivery to end-users.

MATERIAL AND METHODS
RealForAll system for Automatic Detection of Airborne Pollen combines automatic real-time measurements using Rapid-E device, Artificial Intelligence based classification of bioaerosols of interest, RealForAllHub implemented using Java EE technologies designed to store and maintain classified data and end-user applications (i.e. web application, Android and iOS mobile applications) for delivering the data.

RESULTS
Convolutional Neural Network model trained to classify 26 classes on cross-validation yields an accuracy of 65.3%. Test of performance during operational work in 2019 when compared to side-by-side standard monitoring of airborne pollen (CEN/TS 16868:2017) proved good performance (Pearson correlation coefficient during pollen season > 0.7) for 11 pollen types i.e. Taxaceae/Cupressaceae, *Alnus*, *Ulmus*, *Fraxinus*, *Acer*, *Salix*, *Jugans*, *Platanus*, *Morus*, *Broussonetia*, Ambrosia.

CONCLUSIONS
The system provides hourly measurements with a latency of 15 minutes for delivery of hourly pollen concentrations, which is a significant improvement in comparison with the standard method. Also, the system provides easy integration of new devices as well as pollen measurements from other systems. Further work should be focused on the improvement of the classification model to limit false positive detections.

ID: 006
Session: ENVIRONMENTAL POLLUTION
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.080 | Approaches to utilization of the real-time pollen observations in pollen dispersion modelling

Mikhail Sofiev[1], **Andreas Uppstu**
Finnish Meteorological Institute

Keywords: pollen dispersion modelling, pollen realtime monitoring, data assimilation

BACKGROUND AND OBJECTIVES

The emerging real-time pollen monitoring technologies open the principal possibility for sharp improvement of the pollen forecasts by means of data assimilation. However, at present, there is no technology suitable for this task. The classical model state assimilation, i.e. correction of the concentrations towards the observed levels, has been shown to fail even the mildest quality requirements. In the latest works of our team, we showed that alternative approaches can potentially lead to working assimilation protocols but there is a long way to go.

MATERIAL AND METHODS

With the current work, we continue exploring the extended data assimilation of the emission model parameters rather than concentrations in the air. Four-dimensional variational- and ensemble Kalman filter- based technologies are among the most-promising ones (denoted as 4D-Var and EnKF, respectively). The efficiency of both approaches has been demonstrated in retrospective analysis for pollen season strength (4D-Var) and anthropogenic emission and air quality in Asia (EnKF).

RESULTS

We shall present the latest results of the 4D-Var and EnKF applications in pollen and AQ reanalysis and forecasting problems and highlight the pros and contras of each approach. In particular, retrospective analysis of the season severity can be obtained via 4D-Var. Applications of EnKF have been mostly concentrated on air quality problems, where the cheaper 4D-Var method is difficult to use due to non-linearities in chemical transformations. We shall show the unique multi-species multi-input EnKF assimilation, which has been applied to the cases with limited observational data and showed robust performance.

CONCLUSIONS

Usage of real-time observational information is one of the complicated areas in the air quality forecasting. Success in development of this technology would give a strong push to procurement of real-time pollen monitors.

ID: 201
Session: ENVIRONMENTAL POLLUTION
Topic: FORECASTING AND MODELING

O.081 | Swiss automatic pollen network: deployment of first devices and rethinking pollen at MeteoSwiss

Crouzy Benoît, Clot Bernard, Tummon Fiona, Lieberherr Gian, Pauling Andreas, Gehrig Regula, Graber Marie-José, Sallin Christine, Konzelmann Thomas, Calpini Bertrand
MeteoSwiss

Keywords: automatic pollen monitoring, national pollen monitoring network

BACKGROUND AND OBJECTIVES
MeteoSwiss has been testing various automatic systems since 2010 in order to evaluate the feasibility of automating pollen measurements. After this testing phase MeteoSwiss published in 2019 an open tender to select the instrument provider for the Swiss automatic pollen network. Prior to the deployment of the full network (up to 25 measuring sites), a pre-operational phase with a limited number of devices has been planned (February to June 2020).

MATERIAL AND METHODS
Three Swisens Poleno devices were installed in Payerne in order to evaluate device performance and reproducibility of measurements. Devices were additionally validated using an aerosol chamber at the Swiss institute for Metrology METAS. Validation was not limited to the measuring devices as the data handling chain was also evaluated in this initial phase.

RESULTS
We present the specifications used for the MeteoSwiss instrument tender in 2019. We show that aspects related to a smooth device operation shall be considered in addition to the capabilities in pollen identification and counting. Systematic device calibration was performed and machine learning algorithms were improved in order to optimise capabilities. We evaluate the performance of the Swisens Poleno in spring 2020 regarding the minimal requirements (technical specifications) and performance criteria defined in the tender. We finally give an outlook on the future operational Swiss automatic pollen monitoring network and on the next phases of its deployment.

CONCLUSIONS
Automation of measurements shall provide real-time data availability and a seamless process going from measurements to forecasts and products. Manpower currently needed for manual counts can in turn be affected to other research and operational tasks. Network automation provides momentum and ressources for implementing changes, like an optimisation of site locations or a reworking of pollen products and forecasts.
Human input will certainly still be needed for some reference stations, quality control and new developments. However, the logistic issues related to the Hirst device workflow might be solved by using an automatic system to collect images of pollen grains (e.g. BAA500), even for reference stations.

ID: 187
Session: ENVIRONMENTAL POLLUTION
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.082 | Real-time Automatic Pollen Recognition: Know-How in Lithuania

Ingrida Šaulienė, Laura Šukiene, Gintautas Daunys, Gediminas Valiulis, Lukas Vaitkevicius, Mikhail Sofiev
P. Visinskio street 38, 76352 Siauliai, Lithuania

Keywords: allergenic pollen identification, artificial neural network, quality tests

BACKGROUND AND OBJECTIVES

Currently, real-time identification of airborne allergenic pollen is among the major issues in aerobiology. Along with the development of sufficient technological potential to analyse bioaerosol in real-time, there emerged a need for essentially new knowledge that would help to reliably measure pollen load and properly evaluate the results obtained. The challenges encountered encompass various aspects ranging from experiments intended for the creation of the recognition algorithm to the impact of environmental conditions on the stability of results. We will share experiences of implementing real-time pollen monitoring in Lithuania.

MATERIAL AND METHODS

In 2018-2019 we used Rapid-E device operating based on laser-induced fluorescence. Experiments were conducted in the laboratory, testing the device with 20 pollen morphotypes collected in the nature. The basis of the recognition algorithm was neural networks. To monitor pollen dispersion outside, during the vegetation period of 2019, the device operated on the roof of the building. Next to it, pollen was recorded using the Hirst-type trap. Pollen concentration was converted to pollen grains/m3.

RESULTS

The algorithm developed based on the results of tested morphotypes can identify pollen recorded by the Rapid-E device to the genus level, but recognition to the species level is insufficient. Assigning pollen to one of the morphotypes, the algorithm analysing the data registered by the device more often mixes it in the same plant family than among individual plant families. The comparison of Betulaceae pollen concentrations captured by Rapid-E with the Hirst data showed that concentrations partially do not coincide, but the dynamics of pollen concentration curves are similar.

CONCLUSIONS

The algorithm for pollen recognition, created by analysing at least 10,000 cases of one pollen morphotype, generates an ability to recognize airborne pollen. Continuity of research is necessary, seeking to use the results obtained for such purposes as raising public awareness of allergenic pollen levels in the air.

This research funded from the European Social Fund (No 09.3.3-LMT-K-712-01-0066) under the grant agreement with the Research Council of Lithuania (LMTLT).

ID: 045
Session: ENVIRONMENTAL POLLUTION
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.083 | Assessing automatic pollen monitoring systems using controlled chamber measurements

Benoît Crouzy[1], Bernard Clot[1], Fiona Tummon[1], Gian Lieberherr, Konstantina Vasilatou[2], Eric Sauvageat[3], Thomas Konzelmann[1], Bertrand Calpini[1]

1 MeteoSwiss
2 Federal Institute for Metrology METAS
3 University of Bern

Keywords: validation, automatic monitoring, quality control

BACKGROUND AND OBJECTIVES

The move from manual pollen measurements to automatic systems results in a method convergence with existing automatic aerosol monitoring networks. In this direction, standard calibration methods are needed for the operation of automatic pollen networks. Providing reference measurements is however difficult due to the specificity of pollen: low airborne concentration, biological variability, storage issues,... We start addressing this need by performing a validation of existing bioaerosol monitoring systems.

MATERIAL AND METHODS

Three different types of bioaerosols monitoring systems (Plair Rapid-E, Swisens Poleno and DMT Wibs Neo) were tested at the Swiss Institute for Metrology METAS in two different campaigns (spring 2019 and 2020). PSL particles with known characteristics were inserted in a chamber routinely used for the validation of particle counters.

RESULTS

We present the sampling efficiency of the three systems in dependence of particle size by comparing online counts with the reference certified optical particle counter. Good correspondence was obtained for the three devices as far as the counting of large aerosols is concerned, however, sampling efficiency dramatically drops for small aerosols (0.5 to 5 micrometers). As the three devices that were evaluated rely on induced fluorescence to identify particles, we compared off-line fluorescence measurements on PSL particles with online device output and obtained good correspondence with reference spectra for the three devices.

CONCLUSIONS

The results of the two measurement campaigns show the feasibility of using controlled chamber calibration to assess pollen measuring systems. While those measurements provide a validation of raw outputs, it is planned in a follow-up campaign to include bioaerosols in addition to PSL in the chamber validation in order to provide a solid quality insurance for the Swiss automatic pollen network. Chamber experiments provide a controlled environment but frequent evaluation of devices in chambers is difficult from a logistical perspective. It is planned to develop a concept of moving standards used in first line to detect device malfunction or drift.

ID: 189
Session: ENVIRONMENTAL POLLUTION
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.084 | Validation of an operational automatic pollen monitoring network based on image recognition

Jeroen Buters[1], Jose Oteros[1], Alisa Weber[2], Susanna Kutzora[2], Jesus Rojo[1], Stefanie Heinze[2], Caroline Herr[2], Robert Gebauer[5], Carsten Schmidt-Weber[1]

1 Center of Allergy & Environment, Technical University Munich
2 2. Bavarian Health and Food Safety Authority (LGL), Munich, Germany
3 Insitute and Outpatient Clinic for Occupational, Social and Environmental Medicine, Hospital of the University of Munich, Germany
4 1. Department of Environmental Sciences, University of Castilla La-Mancha, Toledo, Spain.
5 IT Consulting Robert Gebauer

Keywords: pollen, aerobiology, BAA500, monitoring network, ePIN, Quality Control

BACKGROUND AND OBJECTIVES

We evaluated the performance of a network of 8 automatic pollen BAA500 monitors.

MATERIAL AND METHODS

Two simultaneous operating networks of either robotic BAA500´s or manual Hirst-type pollen traps, both at the same location, were run for one pollen season. Classifications by BAA500 were checked by human pollen experts. We assumed that the identification by pollen experts is the "gold standard", i.e. 100% correct.

RESULTS

BAA500 had a multiclass accuracy of over 90%. Correct identification of any individual pollen species was always >85%, except for Populus (73%) and Alnus (64%). BAA500 was more precise than the manual method with less discrepancies between robots than between humans. The time online of BAA500 was 97%. There was a significant correlation of 0.84 ($p < 0.01$) between the pollen counts from Hirst-type pollen traps and BAA500. The absolute numbers given by BAA500 versus Hirst-type pollen traps varied per pollen species, mostly ranging from 0.5 (double concentration in Hirst-type pollen traps versus BAA500) to 2 (double concentration in BAA500 versus Hirst-type pollen traps). Due to the lack of calibration samples it is unknown which instrument gives the right concentration. BAA500 recognizes pollen reliable but currently classifies some pollen as "unknown" which humans can classify.

CONCLUSIONS

The robotic network delivered pollen data rapidly, reliable and online. We consider the ability to afterwards check the correctness of the reported classification essential for any robotic system.

ID: 050
Session: ENVIRONMENTAL POLLUTION
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.085 | Data prefiltering in calibrations of Swisens Poleno air-flow cytometer

Evgeny Kadantsev[1], Yanick Zeder[2], Reto Abt[2], Yuliia Palamarchuk[1], Olga Sozinova[3], Laura Šukiene[4], Sanna Pätsi[5], Maria Louna-Korteniemi[5], Lukas Vaitkevičius[4], Gintautas Daunys[4], Lucie Fortova[6], Benoît Crouzy[6], Branko Sikoparija[7], IngridaŠaulienė[4], Mikhail Sofiev[1]

1 Finnish Meteorological Institute, 00560 Helsinki, Finland
2 Swisens AG, CH-6048 Horw, Switzerland
3 University of Latvia, Riga, Latvia
4 Šiauliai University, 76352 Šiauliai, Lithuania
5 University of Turku, Finland
6 MeteoSwiss, Payerne, Switzerland
7 BioSense Institute, Novi Sad, Serbia

Keywords: calibration, cytometer, pollen recognition, neuronal network

BACKGROUND AND OBJECTIVES

Recently introduced real-time air-flow cytometer Poleno (Swisens AG, Horw, Switzerland, https://swisens.ch/products/poleno/) offers operational automatic pollen recognition based on digital holography and UV-induced fluorescence. Since the recognition procedure is based on supervised machine learning algorithms and is very sensitive to the training data set, the area-specific calibration data is required. The extensive calibration campaign organized and hosted by Finnish Meteorological Institute (FMI, 11-15 Nov 2019, Helsinki, Finland) provided such data and opened the way to study the sensitivity and efficiency of the recognition by Swisens Poleno device.

MATERIAL AND METHODS

To train the artificial neuronal network we used the calibration data set consisted of 50 pollen and spores samples from Finland, Latvia, Lithuania, Switzerland, Serbia and Ukraine as well as differently sized (from 1 to 8 um) oil droplets. The stable pollen flow was generated by Swisens Atomizer (https://swisens.ch/products/atomizer/) and measured by Swisens Poleno.

RESULTS

The prefiltering criteria are based on reconstructed holographic images filtering out particles of inappropriate sizes and shapes specified to each pollen sample. The obtained rich calibration data (over 10000 measured particles per sample, 50 samples including uniform oil droplets of known sizes and properties) allowed us to show that the overall recognition skills greatly depend on prefiltering. Thus the sufficient balance between precision and recall is to be found: the clearer the data the higher the score but at the same time the more data is filtered out and neglected.

CONCLUSIONS

The ability of the Poleno device to recognize pollen particles exceedingly depends on training data sets. The recent calibration campaign by FMI and proper measurement prefiltering allowed generating such sets for 50 pollen and spores samples.

ID: 192
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.086 | What's really in the air? A season of pollen counts from automatic instruments

Fiona Tummon[1], Bernard Clot[1], Benoît Crouzy[1], Gian Lieberherr[1], Shigeto Kawashima[2], José Manzano[3], David O'Connor[3]
1 MeteoSwiss
2 Kyoto University
3 Technical University Dublin

Keywords: automatic detection, pollen, monitoring, machine learning

BACKGROUND AND OBJECTIVES

New technologies developed over the past few years now mean that automatic pollen monitoring is a reality. Several different instruments based on different techniques exist but, given their novelty, little is known about how each instrument performs in situ over an entire pollen season.

MATERIAL AND METHODS

Parallel measurements were carried out on the roof of the MeteoSwiss building in Payerne, Switzerland, for the duration of the 2019 pollen season. Seven different automatic pollen monitors were used from five different manufacturers: a DMT WIBS-4, a Helmut Hund BAA500, a Plair Rapid-E, two Swisens Polenos and two Yamatronics KH3000s. Where applicable, machine learning algorithms were applied to the raw data to determine pollen concentrations. In addition, data from two manual Hirst-type monitors were also analysed. Time series and statistics were compared for various parameters including total particle count, total pollen counts, and for various taxa of interest.

RESULTS

The analyses carried out provided an overview of the current capacities of each of the pollen monitors. These vary considerably in terms of the information provided, particularly the number of pollen taxa identified. Overall, results are encouraging and indicate that, depending on the end-users' needs, the various monitors may be suitable for different purposes.

CONCLUSIONS

This study provides a first analysis of several automatic pollen monitors run in parallel over an entire pollen season. Results are encouraging although there is certainly considerable room for improvement, particularly in terms of the identification algorithms which could be extended to include additional pollen taxa.

ID: 093
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.087 | Digitization of Samples and Automated Evaluation of Its Microscopic Particles

Lars Hildebrand[1], Juliana Kaup[2], Georg Meinardus-Hager[2]
1 eXScience GmbH, Bochum, Germany
2 aeromedi GmbH, Sassenberg, Germany

Keywords: sample digitization, microscope, image analysis

BACKGROUND AND OBJECTIVES

The current standard in aerobiology is to sample particles and make a slide for Light Microscopic inspection by eye.
Objective of our Microscope Image Analysis System (MIAS) is to digitize samples as a series of high quality images.
These images are designed for documentation, computer aided evaluation and automatic image analysis of pollen and spores from molds.

MATERIAL AND METHODS

The MIAS relies on Standard methods for the sampling and staining of samples. Operating our automatic light microscope aeroIScope® simulates the routine particle counting: It produces a series of adjacent images and the details of the particles are documented by images from adjoining focus levels.
Eye inspection of these images is simplified by a Marker included in our MIAS. This tool enables recognition, labeling and image-related listing of structures like pollen and/or spores on a screen anywhere.
The image analysis program of MIAS allows the automated image analysis. Looking for decent pollen, it takes five minutes to select as much as 18000 pollen of one kind from 300 images

RESULTS

The MIAS was validated for two aspects:
- Comparing the number of pollen depicted by the images made by the aeroIScope to the eye count at the microscope revealed that counting scattered pollen is no problem, but at high pollen density eye inspection overestimates the number by up to 50%.
- Comparing evaluation of pictures using the Marker to results of our Image Analysis demonstrates that the latter are sensible to quality of sample and kind of grains.

CONCLUSIONS

MIAS® makes the analysis of pollen objective and effective: The design of the aeroIScope® provides a series of adjacent images which
- provide photographic documentation including clear relation to position on the slide
- enables comfortable evaluation anywhere
- has a quality suitable for digital analysis to detect and classify distinct pollen.

The digitization of aerobiological samples makes it possible to share, conserve and compare these samples via our cloud at WorldWidePollen.com.

ID: 139
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.088 | Sensitivity and efficiency of Rapid-E calibrations

Julia Palamarchuk[1], Olga Sozinova[2], Laura Šukiene[3], Sanna Pätsi[4], Maria Louna-Korteniemi[4], Lukas Vaitkevičius[3], Gintautas Daunys[3], Evgeny Kadantsev[1], Reto Abt[5], Yanick Zeder[5], Lucie Fortova[6], Benoît Crouzy[6], Branko Sikoparija[7], Ingrida Šaulienė[3], Mikhail Sofiev[1]

1 Finnish Meteorological Institute, 00560 Helsinki, Finland
2 University of Latvia, Riga, Latvia
3 Šiauliai University, 76352 Šiauliai, Lithuania
4 University of Turku, Finland
5 Swisens AG, CH-6048 Horw, Switzerland
6 MeteoSwiss, Payerne, Switzerland
7 BioSense Institute, Novi Sad, Serbia

Keywords: Rapid-E, calibration, recognition

BACKGROUND AND OBJECTIVES

The number of active users of automatic pollen counters Rapid-E (http://www.plair.ch) had increased in Europe during last years. The exploitation of the pollen counters in different geographical regions brought up the problem of comparability of the results obtained with different devices and under different environmental conditions. To better understand the device uncertainties, an extensive calibration campaign was hosted by Finnish Meteorological Institute during 11-15 Nov 2019 in Helsinki, Finland.

MATERIAL AND METHODS

The calibration procedure was performed with the Rapid-E counter in the laboratory conditions. Over 50 pollen and spore samples were collected from Finland, Latvia, Lithuania, Serbia, Switzerland and Ukraine. Learning from difficulties experienced during previous calibration campaigns, the current exercise used new technology for the pollen aerosolising: Swisens Atomizer (https://swisens.ch). Unlike previous home-made approaches, the atomizer can generate stable pollen flow over long time using very limited amount of pollen grains. This feature allowed for sharp increase of the pollen records in each sample. It was also possible to quickly switch to the next pollen sample with minor intermediate cleaning effort.

RESULTS

The outcome of the calibration campaign is the rich data collection of pollen and spores with more than 10000 particles recorded for majority of the samples. This dataset was subsequently used to train the artificial neural network, which was previously constructed for the Rapid-E device by Šaulienė et al (AMT, 2019). Already the first iteration of the ANN training showed that the recognition skills have substantially improved: the model accuracy had increased by about 10% in comparison with our previous results.

CONCLUSIONS

The features of calibration technology have significant impact on the quality of derived datasets and the capabilities of the pollen recognition algorithms. The accuracy of automatic pollen identification with the Rapid-E device is becoming comparable with the quality of the traditional manual pollen counting.

ACKNOWLEDGMENT

Collection, calibration and analysis of pollen samples from Latvia were performed by Olga Sozinova within the scope of PostDoc Latvia No 1.1.1.2/VIAA/2/18/283.

ID: 181
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.089 | An automatic sensor for cypress pollen identification: Preliminary results from PS2

Sevcan Çelenk[1,2]

1 Science Faculty, Biology Department, Aerobiology Laboratory, Bursa Uludag University, Bursa, Turkey
2 ULUTEK, Bursa Uludağ University, Technology Development Zone, Görükle 1. Street, Bursa-Turkey

BACKGROUND AND OBJECTIVES

The explosion of the prevalence of pollinosis over the last decades, which has reached 20% in many developed countries, has led to an intensive research activity and has contributed to the affirmation of aerobiology as an independent discipline. Most scientists use conventional type volumetric pollen traps where airborne particles (> 5 µm) are collected on a rotating drum covered by a tape and samples are identified by a microscopic analysis. This method is labor-intensive and incorporates significant uncertainties. Besides, due to manual treatment of collected samples and weekly cycle of the trap, the data are always delayed from a few days up to a few weeks. Emerging new approaches to automatic pollen monitoring can allow for real-time availability of the data with computer-based technology. There are a few different types automatic pollen sensor and one of them using in Japan for pollen grains of Japanese cedar called Pollen sensor (PS2). In current knowledge, PS2 did not tested any Mediterranean country for any pollen types. This study aimed to test PS2 for Mediterranean region and compare data from automatic pollen sensor and volumetric trap for Cupressaceae pollen.

MATERIAL AND METHODS

Pollen sensor and seven day recording volumetric trap were used in this study. Both devices located as closest to each other. The trap was placed at 40°22'33" N, 28°86'42"E and located about 12 m above ground level and 106 m above sea level. Airborne pollen grains were trapped on an adhesive tape by the intake of air at a flow of 10 l/min by Hirst trap and 0.7 l/min for pollen sensor during 129 days from 18th of January to 30th of June 2020. The time resolution is for PS2 is 20 second and with two different level as over 70 % and 90 % probabilities. The amount of cypress pollen was expressed as the number of pollen grains m^{-3} of air. The PS2 detects the particle with light scattering method, using one light emitter and two light receptors, and discriminates pollen from other particles with two factors "scattered light intensity" and "degree of polarization".

RESULTS

The specificity of traditional pollen traps may have limited the expansion of networks and the resources allocated to them. The potential using of the PS2 for operational use in cypress pollen monitoring network for the Mediterranean region is investigated in this study by comparing the data from volumetric trap. A statistically significant difference was found between the data for 70% probability and Hirst trap data according to the t-test (t: 4.457; p: 0.00). However, when the data for 90% probability was compared with the Hirst trap data, no significant difference was found (t: 1.843; p: = 0.066). PS2 has an advantage with small size and low price. According to the first results, PS2 has a potential for identification of real time exposure levels of cypress pollen from the atmosphere.

ID: 203
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

O.090 | Automatic bioaerosol identification with Swisens Poleno System and system reliability

Reto Abt[1,2], Philipp Burch[2], Elias Graf[1], Erny Niederberger[1,2], Yanick Zeder[2]
1 Lucerne University of Applied Sciences and Arts, Technikumstrasse 21, 6048, Horw, Switzerlan
2 Swisens AG, Technikumstrasse 21, 6048, Horw, Switzerland

Keywords: bioaerosol, real-time measurement, holography, fluorescence lifetime, single aerosol particle measurement, automatic bioaerosol identification, reliability, long term stability, field operation

BACKGROUND AND OBJECTIVES

The very high sensitivity of the Swisens Poleno System enables the measurement of aerosol particles in the size-range from 1µm to 200µm. For several months monitoring in the field a high reliability is required.

MATERIAL AND METHODS

To validate the sensitivity and quality of the detector for triggering the different measurement methods and also the fluorescence measurement, polystyrene latex beads with defined size and fluorescence emission are measured.
To verify the accuracy of the concentration measurement, a defined particle concentration is generated and measured. For comparison, this is measured in parallel with a reference instrument and the Swisens Poleno.
To evaluate the sensitivity and dynamic range of the measurement system for spores and pollen, various pollen and spores were atomized with the Swisens Atomizer and then measured with the Swisens Poleno system. The excitation light was changed sequentially (365nm, 280nm,405nm). The spectral fluorescence intensity of the individual particles are recorded with five detectors which have five different spectral windows in the range from 220nm to 700nm.The stability of the operating point of the Swisens Poleno System is checked by measuring the particle velocity and the instrument temperature. Contamination resistance is tested by taking periodic background images of the measuring chamber and by examining for deposits in the instrument after several months of continuous operation.
To investigate the comparability of the measured particle concentration of different systems, two systems were operated at the same location for 70 days.

RESULTS

Results of the Swisens Poleno performance tests
Particles 1µm and larger are reliable detected by the trigger. The measured particle concentration for 5µm particles is within the uncertainty of the reference and can be measured accurate. The concentrator efficiency for 5µm particles of the integrated aerosol concentrator is 1.6%. The measured fluorescence intensity matches the expected values from literature for different excitation sources. Fluorescence intensity of pollen and spores can be measured.
The results for sensitivity and concentration measurement will be shown. Further different results for important fungal spore types will be presented.

Results of the Swisens Poleno reliability tests
The particle velocity within the measurement chamber was kept constant at 0.5 ±0.01 m/s over a period of 70 days with a variation of the outside temperature from 8°C to 36°C. The variation of the mainboard temperature during the examined period of 70 days was kept constant in the range of 22°C to 38°C with a variation of the outside temperature from 8°C to 36°C.
The regularly recorded background images of the holography measurement show that no further deposits occur in the measuring channel over an operating period of 70 days. Two Swisens Poleno systems running in parallel operation at the same location provide a Pearson correlation up to 0.94 for the number of measured particles.

CONCLUSIONS

The Swisens Poleno system is sensitive for monitoring bioaerosols. The integrated aerosol concentrator works as intended.

The Swisens Poleno system particle velocity and the electronics temperature is kept stable. It is very resistant to contamination and shows a very good availability. The devices deliver comparable results for the aerosol particle concentration.

The Swisens Poleno system is ready and mature for long-term and real-time monitoring in the field.

COMMENTS

This presentation is in relation to the COST Action ADOPT, CA18226 - New approaches in detection of pathogens and aeroallergens

ID: 143 and 143
Session: NEW METHODS FOR DETECTION AND ANALYSIS
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

POSTER ABSTRACTS

Bioaeroso

Environm

Im

P.001 | The European Aerobiology Society: an association in action for multidisciplinary research on aerobiology

Ingrida Šaulienė[1], Jordina Belmonte[2], Letty de Weger[3], Regula Gehrig[4], Gilles Oliver[5], Michel Thibaudon[5]

1 Siauliai University, P. Visinskio street 38, 76352 Siauliai, Lithuania
2 Universitat Autònoma de Barcelona, E- 08193 Bellaterra (Cerdanyola del Vallès - Barcelona), Spain
3 Leiden University, Medical Center, Albinusdreef 2, Leiden, Netherlands
4 MeteoSwiss, PO Box 257, 8058 Zurich Airport, Switzerland
5 RNSA, 11, Chemin de la Creuzille, 69690 Brussieu, France

Keywords: airborne pollen, spores, collaboration, research

The European Aerobiology Society (EAS) has been established in 2008 with the purpose to facilitate collaboration, research, education, information, technical development and practical application in the field of aerobiology and to encourage collaboration with other areas of science. In 2017-2018 73 individuals and 6 associations were members of the EAS.
Members of EAS are active in 4 working groups. The working group "Quality control" has organised an exercise in a digital quality control system, "European legislation" has established the European standard EN16868, "Education" has been involved in the organisation of the Basic course on Aerobiology 2019 in Lyon and in the awarding of grants for young researchers and "European Symposium" supported the organisation of the European Symposium of Aerobiology (ESA2020) in Cordoba.
In 2019-2020 the EAS encourages young researchers to become active members of our society and granted them to take part in the Basic Course of Aerobiology (2 grants), the Advanced Course (1 grant) and the ESA2020 (8 grants).
Being involved in the AutoPollen program from the beginning enables EAS members not only to get information timely but also provides possibilities for the sharing of expertise and creates collaboration opportunities.
The EAS is an active family of researchers reaching out to several other disciplines and ready for the future. The latest information on advances in aerobiology is available at EAS website: http://www.eas-aerobiology.eu/

ID: 034
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.002 | Analysis of distance range characteristics of Castanea pollen

Herminia Garcia-Mozo[1], Rocio Lopez-Orozco[1], Miguel Angel Hernandez-Ceballos[2], Carmen Galan[1]
1 Department of Botany, Ecology and Plant Physiology. University of Córdoba
2 European Commission, Joint Research Centre (JCR), Ispra, Italy

Keywords: Castanea, pollen, long distance transport

BACKGROUND AND OBJECTIVES

Long-range transport potental of Castanea pollen has been pointed out by different authors in North Europe. Despite the presence of chestnut is scarce in South Spain, the isolated Castanea populations, surrounded by the Quercus Mediterranean forest, offer us the opportunity of study transport ranges of Castanea pollen. The present work is an integrated analysis of the more recent tools on aerobiology to evaluate Castanea pollen pathways and distance ranges.

MATERIAL AND METHODS

The study was performed at the province of Córdoba, analysing data from 2015 up to nowadays. A joint study including pollen data from Hirst traps, placed at different locations of the province, and from a Kelly trap at the main chestnut crop field of the province. Also field phenological data from cultivated and wild chestnut populations of the province andland cover information were analysed together with meteorological data and air mass backward trajectories.

RESULTS

Airborne Castanea pollen levels recorded at the crop field located only at 25 km far from Córdoba city reached high concentrations, whereas at the city trap, were so low and similar to concentrations detected at southern sites of the provinces located hundreds of kilometres far from the main chestnut area. Moreover, field phenological observations on wild and cultivated populations, located around the city, suggested a percentage of pollen recorded at Cordoba city would be coming from more southern distant areas to the south. In addition, combined analysis of back-trajectories, airborne pollen and floral phenology revealed potential long distance transport events recorded at Cordoba city.

CONCLUSIONS

In usual atmospheric conditions, chestnut pollen flows mostly remain at a local level. The phenological observations from potential pollen sources, and the aerobiological monitoring confirmed pollen transport pathways. Nevertheless, long range transport events are relatively frequent under special atmospheric conditions. In the case of Córdoba city,results indicated that chestnut populations, located at higher mountains of southwester in the province, could be the main responsible source.

Acknowledgments to CLIMAQUER project, REF. 1260464, supported by FEDER funds

ID: 186
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: PLANT PHENOLOGY

P.003 | First phenological and aerobiologial assessment of olive orchards at the Northern limit of the Mediterranean bioclimatic area

Garrido A.[1], Álvarez-López S.[1], Piña-Rey A.[1], González-Fernández E.[1], Fernández-González M.[1,2], Aira M.J.[2], Rodríguez-Rajo F.J.[1]

1 CITACA. University of Vigo. "As Lagoas". 32004 Ourense. Spain.
2 Earth Sciences Institute (ICT), Faculty of Sciences, University of Porto, Porto, Portugal.
3 University of Santiago of Compostela. Santiago of Compostela. 14970.
Email address: javirajo@uvigo.es

Keywords: Olive, Aerobiology, Phenology

BACKGROUND

Olive-producing ecosystems are a major economic resource in the Mediterranean region. In recent years, an increase in the cultivation of olive trees has been observed in areas of north-western Spain that are favoured by the agricultural policies of the region. The aim of this study was to investigate the phenological and aerobiological behaviour of the olive trees in the area to determine their thermal requirements and develop predictive agrophenological models.

METHODS

The study was conducted in an olive grove located in Verín (NW Spain) in 2016 and 2017. The phenological survey was conducted on 20 selected trees of the Arbequina and Frantoio varieties using the BBCH scale. To estimate their chilling hours, the models proposed by Aron (1983) and Jato et al. (2002) were used. Heat requirements were calculated using the Ring et al. (1983) method. To complete the predictive phenological models, Mitscherlich's monomolecular equation was used. A Hirst sampler was used to assess the *Olea* pollen concentration in the atmosphere of the olive grove. The HYSPLIT model was used to evaluate the origin of air masses during the main episodes of pollen concentrations in the atmosphere of the plot.

RESULTS

The olive-growing cycle's duration decreased from 191 days in 2016 to 146 days in 2017. An average of 654 C.H. (Th 7.5°C) was required to overcome dormancy. A total of around 2000-1700 °GDD (Th 10°C) were necessary to reach the end of stage 7. Mitscherlich's monomolecular equation indicated that the proposed models have a prediction variability of around 1-3 phenological scales. Several pollen peaks were detected in the atmosphere during the days prior to flowering of Arbequina and Frantoio. A back trajectory analysis showed that the previous pollen peaks coincided with southern air masses passing through potential source areas in the important olive groves located in north-eastern Portugal.

CONCLUSIONS

The model that was developed can become a useful tool for the prediction of successive ecological events affecting olive production in this area.

ID: 085
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: PLANT PHENOLOGY

P.004 | Floral phenology trends in a Mediterranean Natural Park during the last two decades

Herminia Garcia-Mozo, Rocio Lopez-Orozco, Alejandro Morales, Jose Oteros, Galan Carmen
Department of Botany, Ecology and Plant Physiology. University of Córdoba, Spain

Keywords: pollen, trends, Mediterranean forest, oak

BACKGROUND AND OBJECTIVES

Long term observations of airborne pollen offer the possibility for studying patterns on floral phenology fluctuations and to determine potential effects of climate change. In this study, pollen measured in a Mediterranean Natural Park during the last 20 years has been analysed considering on some aspects: flowering trends and fluctuations considering the pollen season timing and intensity.

MATERIAL AND METHODS

A Hirst trap located at the Hornachuelos Natural Park (South-West Spain) was used to monitor the atmosphere during the last 20 years (1998-2019). The vegetation in the park is a typical Mediterranean forest where holm oak dominates. The herbaceous layer comprises grasses, rockroses and aromatic plants. A meteorological station located just beside the trap recorded main meteorological parameters. The statistical study analyses include trends' analyses based on linear regressions and Mann-Kendall tests of aerobiological and meteorological data.

RESULTS

Results indicate rising trends on annual airborne pollen concentrations in most of pollen types, especially in the case of Quercus, Olea, Pinus and Poaceae. A delay on pollen season start has been observed in most pollen types, except for Artemisia, Ericaceae, Plantago, Rumex and Asteraceae. Regarding peak dates, Poaceae and Artemisia suffer the highest advance whereas the main pollen types, i.e. Quercus and Olea, recorded delayed dates. In the case of pollen season end, early spring pollen types presented a significant advance whereas those flowering in late season showed a general delay of the end dates.

CONCLUSIONS

The results obtained here indicate increasing variations in annual airborne pollen concentrations for many woody and herbaceous plants in this natural area of the South-West of the Mediterranean area. The results also showed a shift in pollen season timing. Pollen season start is delaying except for the less water-dependent species. A similar delayed trend has been observed on the peak dates, but it is mostly in advance for late spring species. In general, the observed trends would contrast in many cases with the findings described by other authors in urban aerobiological studies.

AUTHORS WISH TO THANK FOR THEIR SUPPORT TO THE PROJECT CLIMAQUER, REF. 1260464, FUNDED BY THE ANDALUSIA REGIONAL GOVERNMENT & UCO UNIVERSITY THROUGH EUROPEAN REGIONAL DEVELOPMENT FUNDS (FEDER-ERDF)

ID: 077
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: CLIMATE CHANGE

P.005 | Phenological and aerobiological grapevine trends in the Ribeiro D.O. area

Alba Piña-Rey[1], Maria Fernández-González[2], Sabela Álvarez-López[1], Alejandro Garrido[1], Estefania González-Fernández[1], M. Jesús Aira[3], F. Javier Rodríguez-Rajo [1]

1 CITACA. University of Vigo. "As Lagoas". 32004 Ourense. Spain.

2 Earth Sciences Institute (ICT), Faculty of Sciences, University of Porto, Porto, Portugal.

3 University of Santiago of Compostela. Santiago of Compostela. 14970.

Keywords: phenology, climate change, Vitis

BACKGROUND AND OBJECTIVES

In agronomical, economic and cultural terms, grapevine is one of the most important crops in NW Spain. The goal of this study was to know the vitis phenological and aerobiological behaviour in the Ribeiro D.O. in order to determine the thermal requirements and to ascertain their variations during the last 15 years.

MATERIAL AND METHODS

The study was conducted in a vineyard located in in the Ribeiro D.O. (NW Spain) from 2005 to 2019. The phenological survey was conducted on 20 selected vines of the Treixadura variety following the BBCH scale. In order to determine the Chill requirements to overcome the dormancy period the methods of Aron (1983) and Vegetation Activity (Jato et al., 2002) were used. For determining the heat requirements needed for the start of the different phenological stages the following methods were applied: Zalom et al. (1983), Rickman et al. (1983), Chuine et al., (1999), Galán et al. (2001) and Cessaraccio et al. (2004). Finally, Vitis pollen grains in the atmosphere were determined using a Lanzoni VPPS-2000 volumetric trap.

RESULTS

The phenological BBCH stage with the maximum length was the stage 7 (development of fruits) with an average duration of 48 days, whereas the stage with the short duration was flowering (stage 6) with 13 days. A trend to a longer growing season was detected. An average amount of 613 Chill units were required for the beginning of the stage 0 (bud development) with the V.A. method an a base of temperature of 8,5ºC. A trend to a lower cold period was detected. The heat requirements were calculated following five different methods, been the most accurate the proposed by Rickman et al. (1983). The start of flowering takes place when 503 GDD were registered and the optimal harvest data when 2095 GDD were reached, with a trend to an early maturation during recent years.

CONCLUSIONS

The knowledge about the timing of the aerobiological and phenological processes results of great agronomical importance for the optimization of cultural practices and the establishment of the adaptive capacity of varieties to different environmental conditions.

ID: 086
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: CLIMATE CHANGE

P.006 | Extreme precipitation and climate change in the Iberian Peninsula: possible aerobiological consequences

M. Carmen Casas-Castillo[1], Raúl Rodríguez-Solà[2], Amanda García-Marín[3], Xavier Navarro[4], Cristina Periago[5], Marta Alarcón[5]

1 Department of Physics, ESEIAAT, Universitat Politècnica de Catalunya · BarcelonaTech, Colom 1, 08222 Terrassa, Spain. m.carmen.casas@upc.edu

2 Department of Physics, ETSEIB, Universitat Politècnica de Catalunya · BarcelonaTech, Diagonal 647, 08028 Barcelona, Spain. raul.rodriguez@upc.edu

3 Department of Rural Engineering, ETSIAM, Universidad de Córdoba, Campus Rabanales, Nacional IV km 396, 14071 Córdoba, Spain. amanda.garcia@uco.es

4 Department of Physics, EPSEVG, Universitat Politècnica de Catalunya · BarcelonaTech, Víctor Balaguer s/n, 08800 Vilanova i la Geltrú, Barcelona, Spain

5 Department of Physics, EEBE, Universitat Politècnica de Catalunya · BarcelonaTech, Eduard Maristany 16, 08019 Barcelona, Spain

Keywords: climate change, extreme rainfall, airborne pollen concentration

BACKGROUND AND OBJECTIVES

The relationship between airborne biological particles and meteorology is a matter of great interest, especially in the context of climate change and its possible impact on human health. In particular, there is a twofold impact of precipitation on airborne pollen concentration: while rainfall and the subsequent pollen production are generally correlated positively, rain itself can remove pollen from the air due to a wash-out effect.

In general, rainfall regimes are expected to change in the Mediterranean area due to global warming, with a substantial reduction of light or moderate rainfall causing a decrease in total precipitation, while the occurrence of short and intense rainfall episodes increases. However, the possible effect of this pattern change in the pollen production and removal is still unknown. As a first step in the attempt to explore this, the expected temporal evolution of the annual precipitation and the rainfall patterns of Barcelona and Madrid during the 21st century are presented.

MATERIAL AND METHODS

Future daily rainfall was estimated using a statistical spatial downscaling technique. A temporal downscaling method based on the fractal property of rainfall scaling invariance was used to estimate future sub-daily rainfall. Several general circulation models and different climate change scenarios were considered.

RESULTS

Both rainfall regimes for Barcelona and Madrid are expected to evolve to a more irregular and arid type by the end of the century, with an increase in rainfall intensity for short durations. A decrease of at least 5% was found for the annual precipitation in Barcelona, while for Madrid a not significant slight increase was observed. In Barcelona, extreme winter rainfall was found to increase.

CONCLUSIONS

Rainfall simulations agree with the forecasts of a future increase in heavy or even torrential rainfall in the Mediterranean area. The effects on ambient air of this change towards aridity and irregularity, with more isolated rainfall intensity peaks, are the next step to address. An increase of rainfall preceding pollination, together with a decrease of annual rainfall linked to the wash-out effect, could mean a future increase in airborne pollen concentration.

ID: 122
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: CLIMATE CHANGE

P.007 | Analysis of changes in the start of the Betula pollen season in Lublin (Poland) in 2001-2019

Agnieszka Kubik-Komar[1], Krystyna Piotrowska-Weryszko[2], Izabela Kuna-Broniowska[1], Elżbieta Weryszko-Chmielewska[2], Bogusław Michał Kaszewski[3]

1 Department of Applied Mathematics and Computer Science, University of Life Sciences in Lublin, Głęboka 28, 20-950 Lublin, Poland

2 Department of Botany and Plant Physiology, University of Life Sciences in Lublin, Akademicka 15, 20-950 Lublin, Poland

3 Department of Meteorology and Climatology, Maria Skłodowska-Curie University, Al. Kraśnicka 2cd, 20-718 Lublin, Poland

Keywords: birch pollen start, ANOVA, meteorological factors

BACKGROUND AND OBJECTIVES

Birch is a common tree in the northern range and in central Europe. In Poland, it belongs to the most sensitizing plants. The beginning of the pollen season differs significantly between years, mainly due to changing weather conditions, which makes its estimation very difficult. Therefore, research enriching information about this parameter seems extremely important. The study examined changes in the start of the birch pollen season as well as determined the trend of these changes. Additionally, the model describing the relationship between season start and weather factors was proposed.

MATERIAL AND METHODS

Pollen monitoring was performed in Lublin in the period 2001–2019 using the volumetric method. In order to study the changes in the start parameter over this period of time, pollen seasons were divided into three groups (A: 2001-2006, B: 2007-2013, C: 2014-2019), among which statistically significant differences of start means were checked. Besides, a linear trend was adjusted for the sets of high (H) and low (L) abundance seasons. The relationship between the beginning of the pollen season and the weather factors was checked using polynomial regression.

RESULTS

The beginning of the birch pollen season was recorded between 29.03 and 22.04 during 19 years of research. A statistically significant difference in pollen start means was found between the studied groups, but only between groups A and C. Significant changes in *Betula* pollen season start were also determined for high abundance seasons on the basis of a linear trend, while the results for seasons with a low concentration of pollen varied, depending on whether 2013 was included in the data set or treated as outliner. Moreover, a polynomial relationship was found between the beginning of a pollen season and the average values of monthly temperatures in the period preceding the season.

CONCLUSIONS

These analyses show that the start of the *Betula* pollen season is getting significantly earlier. Dynamics of changes differ between seasons with high and low concentrations of pollen.

ID: 210
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: CLIMATE CHANGE

P.008 | Long-term airborne pollen monitoring in southern Bavaria: time series analysis with implications for land use and climate

Stephan Jung[1], Ye Yuan[1], Annette Menzel[1,2]

1 Department of Ecology and Ecosystem Management, Technical University of Munich, 85354, Freising, Germany

2 Institute of Advanced Study, Technical University of Munich, 85748, Garching, Germany

Keywords: pollen concentration, climatology, time series

BACKGROUND AND OBJECTIVES

Pollen emission and distribution is influenced by climatic factors such as temperature, wind speed, wind direction and humidity/precipitation and beyond that by land use/land use change. The impact of those changes on the pollen concentration is differently distributed in regions and in addition dependent on the respective pollen emitting plant species. The objective of this study is to identify climatic and land use related impacts on pollen emission and distribution.

MATERIAL AND METHODS

In this study, daily records from Hirst-type pollen traps installed at 480 m a.s.l. (FS Freising), 740 m a.s.l. (GA Garmisch-Partenkirchen), and 2650 m a.s.l. (UFS Schneefernerhaus near Zugspitze) were used. For investigations of pollen species, Poaceae, Betula and Pinus series were chosen due to their abundant quantities observed at all three sites. Trend analyses were performed on these pollen time series by applying the Seasonal-Trend decomposition technique based on Loess (STL) in order to detect seasonal and inter-annual patterns in consecutive years. Potential pollen sources were studied and identified combining pollen data with wind and land use data.

RESULTS

Clear source distribution patterns were observed, e.g. for Freising potential pollen sources derived from wind profile could be traced back in the northwest for Betula and Pinus, and in the west for Poaceae. Moreover, trend analyses revealed similar trends for Pinus and Poaceae, while an opposite behavior for Betula.

CONCLUSIONS

Combined pollen observations and climatic measurements proved to be efficient for identifying the potential pollen sources, which can be cross-validated by the respective land use types in the relevant areas. Long-term trend analysis is able to distinguish species-related patterns, as well as to provide insights for data quality check.

ID: 123
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.009 | Aerobiology of olive pollen (Olea europaea L.) in the atmosphere of Portugal

C. Penedos[1], E. Caeiro[1,2], B. Tavares[1,3], J. Fonseca[1,4,5,6], P. Carreiro-Martins[1,7,8], R. Rodrigues-Alves[1,9], M. Branco Ferreira[1,10,11]

1 Sociedade Portuguesa de Alergologia e Imunologia Clínica, Lisboa, PORTUGAL,
2 Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento MED, IIF, Universidade de Évora, Évora, PORTUGAL
3 Serviço de Imunoalergologia, Hospitais da Universidade de Coimbra, Centro Hospitalar e Universitário de Coimbra, Coimbra, PORTUGAL
4 Departamento Medicina da Comunidade, Informação e Decisão em Saúde - MEDCIDS, Faculdade de Medicina, Universidade Porto, Porto, PORTUGAL
5 Centro de Investigação em Tecnologias e Serviços de Saúde - CINTESIS, Porto, PORTUGAL
6 Unidade de Alergia, Instituto & Hospital CUF Porto, Porto, PORTUGAL
7 Centro Hospitalar Universitário de Lisboa Central, Lisboa, PORTUGAL
8 NOVA Medical School/Comprehensive Health Research Center, Lisboa, PORTUGAL
9 Hospital do Divino Espírito Santo, Ponta Delgada, Açores, PORTUGAL
10 Clínica Universitária de Imunoalergolgia, Faculdade de Medicina, Universidade de Lisboa, Lisboa, PORTUGAL
11 Serviço de Imunoalergologia, Centro Hospitalar e Universitário Lisboa Norte, Lisboa, PORTUGAL

Keywords: respiratory allergy, pollen, Portugal

BACKGROUND AND OBJECTIVES

The genus Olea is widely represented in the Mediterranean region by the species *Olea europaea* L., which has two varieties, var. sylvestris (wild olive) which is part of the natural vegetation and the var. europaea, cultivated olive tree primarily for olive oil production. In Portugal, olive growing is an activity of significative importance, occupying about 32% of the entire agricultural area in the country.
The pollen type Olea is one of the most represented in the atmosphere of the Mediterranean region and one of the principal causes of respiratory allergy in this area.
The aim of this study is to analyze the prevalence and behavior of Olea pollen in the atmosphere of Portugal, by determining the pollen season and updating the pollen calendar for this taxon

MATERIAL AND METHODS

In this study we used the Olea pollen monitoring data from the Portuguese Aerobiology Network (RPA-SPAIC) from 2002 to 2019, in seven monitoring stations in Portugal, located in Vila Real, Porto, Coimbra, Castelo Branco, Lisboa, Évora and Portimão.
The monitoring of the atmospheric pollen was performed with a Burkard Seven Day Volumetric Spore-trap® and used the methodology suggested by the European Aerobiology Society.
The influence of meteorological factors on atmospheric levels of olive pollen were analyzed using Spearman's correlation. The pollen calendar was prepared using the statistical software R.

RESULTS AND CONCLUSIONS

Olea pollen is one of the most abundant pollen types in some regions of Portugal, with a representation in the pollen spectrum that ranged between 4% in Porto and 36% in Portimão. The pollination season of this taxon, on average, started in April / May and ended in June, with pollen peaks being recorded in April, in Vila Real and Lisboa, and May, for the remaining regions under study. The highest pollen levels were recorded in Portimão (13679 grains of pollen/m^3/air) and the lowest levels in the region of Porto (549 grains of pollen/m^3/air).
The olive pollen counts presented a significant positive correlation with temperature, total global radiation and sunshine, whereas with relative humidity and total rainfall significant negative correlations were observed.

The Olea pollen type exhibited a short and very intense pollination period, as well as a biannual flowering rhythm, characterized by alternating years of high and low pollen production. This study provides valuable information to health professionals, helpful for the treatment and prevention of allergic respiratory diseases. The obtained results allow for a more comprehensive relation with possible sensitization and pollinosis symptomatology.

ID: 211
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.010 | Pollen production and androsterility in olive cultivars

María de las Mercedes Rojas-Gómez[1], Rocío López-Orozco[1], Diego J. Cabello Pozo[2], Concepción Muñoz Díez[2], Diego Barranco Navero[2], Carmen Galán Soldevilla[1]

1 Botany, Ecology and Plant Physiology Department, University of Cordoba. 14071 Cordoba (Spain)
2 Agronomy Department, University of Cordoba. 14071 Cordoba (Spain)

Keywords: olive pollen grain, olive tree, androsterility, male sterility

BACKGROUND AND OBJECTIVES

Olea europaea ssp. *europaea* var. *sativa* is a crop of great importance that covers a large part of the agricultural lands of the Mediterranean Basin. The pollen production *per* anther is a cultivar characteristic that has been scarcely studied, despite its crucial effect in the productive capacity of the crop and its allergenic potencial. Therefore, the main objective of this first study was to analyze the pollen production of a large set of olive cultivars that represents the genetic variability of the olive crop in the Mediterranean Basin.

MATERIAL AND METHODS

The present study has been carried out in the World Olive Germplasm Bank – University of Cordoba (UCO) collection. We selected 49 olive cultivars representing the three different cultivated genetic pools present in the Mediterranean Basin. To analyze the presence-absence of pollen in the selected cultivars, the Cruden protocol was followed, taking 9 anthers *per* tree and two trees *per* cultivar. After the pollen count under the microscope, the data were analyzed using descriptive statistics and represented using the R package.

RESULTS

The results obtained showed significant variability in the production of pollen in the different olive cultivars. We found cultivars able to produce considerable amounts of pollen, such as 'Mawi' and other not producing pollen at all such as 'Farga'. Remarkably, all the cultivars that did not produce pollen belonged to the same genetic group (Q2). Furthermore, other cultivars, previously described as androsterile, were able to produce pollen in our local conditions. It is important to emphasise that this is a preliminary study and it is necessary to replicate our evaluations during additional years in order to contrast our results and to find robust hypothesis to our observations.

CONCLUSIONS

The knowledge of the variability in pollen production in the different olive cultivars is crucial to determine their productive and allergenic potential. Our preliminary study showed a wide range of pollen production amoung olive cultivars. Future research perspectives will offer the possibility to determine the factors causing androsterility in olive cultivars described in this study.

ID: 125
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: AGRONOMY AND FORESTRY APPLICATION

P.011 | Spatial flowering patterns in Dactylis glomerata populations

Carl A Frisk, Beverley Adams-Groom, Carsten A Skjøth
School of Science and the Environment, University of Worcester, Worcester, United Kingdom

Keywords: *Dactylis glomerata*, phenology, spatial dynamics

BACKGROUND AND OBJECTIVES

Dactylis glomerata is thought to be one of the major contributors to the annual grass pollen load in temperate regions due to wide distribution, high abundance and high pollen production. Detailed information about its flowering dynamics may therefore help in assessing the severity of the grass pollen season. Grass flora estimates of the flowering period are not enough to determine when the species is capable or most likely to release pollen. Observing multiple grass populations over time would enhance the detail and understanding of the flowering dynamics and reveal the variation in flowering events within a region.

MATERIAL AND METHODS

Eight populations were chosen in Worcestershire, UK in 2018, with minimum 150 individual tillers each to secure full variation within each population. Flowering progression was determined from the BBCH scale adapted from cereal monitoring. The phenology was focused on the percentage of extruded anthers, with equal intervals of 25, 50, 75 and 100%. Senescence was considered reached with the detachment of the last anther to avoid ambiguity in terms of pollen emission. The two main populations were observed every second day while the six secondary populations were observed ten times during the season.

RESULTS

A total of 2672 tillers were observed. The spatial investigation highlighted the uniformity of flowering progression between both main and secondary populations, with a mean seasonal difference of less than 1/10th of a phase. Both main populations started to flower on May 29th. The main populations reached peak flowering on June 14th while the average population reached full flowering on June 20th. Peak flowering is reached earlier than average full flowering in all populations due to the divergent growth progression of individual *Dactylis* tillers. The flowering ended on Aug 9th, 73 days later.

CONCLUSIONS

This study highlights that *Dactylis glomerata* flowering is uniform over an entire region. There is little to no difference between populations in the timing of crucial flowering events such as start, peak and full flowering. It also notes the difference between peak and full flowering, which will be of importance in the aspect of pollen release.

ID: 099
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: PLANT PHENOLOGY

P.012 | Comprehensive study of the phylogenetic and environmental characteristics involved in the flowering timing of grass species

Jorge Romero-Morte[1], Jesús Rojo[1], Ana Costa[2], Beatriz Lara[1], Ana Galveias[2], Alicia Serrano[1], Celia Antunes[2], Rosa Pérez-Badia[1]

1 University of Castilla-La Mancha. Institute of Environmental Sciences (Botany). Avda Carlos III s/n. 45071 Toledo, Spain

2 University of Évora. Institute of Earth Sciences - ICT & Department of Chemistry, School of Sciences and Technology. Évora, Portugal

Keywords: grass pollen, floral phenology, Iberian Peninsula

BACKGROUND AND OBJECTIVES

Grass pollen is the main cause of pollinosis worldwide. Grass pollen season is spatially dependent of the environmental conditions and altitude has a relevant influence on flowering. Besides, internal physiological and morphological characteristics of plants such as lifeform, photosynthetic pathway and pollination strategy affect phenological patterns. In this study we analyzed the influence of these factors on the flowering of grasses and their effects on pollen dynamics.

MATERIAL AND METHODS

Phenological field observations were carried out in 96 species of grasses over the period 2013-2019 in 4 areas of the Iberian Peninsula (Évora, Toledo, Sisante and Cuenca) following an altitudinal gradient that ranged from 200 to 1450 m a.s.l. Pollen was daily monitored using a Hirst-type volumetric spore trap. The environmental conditions of the studied areas and the physiological and morphological traits of the grass species with respect to their evolutionary history were related to aerobiological and phenological data.

RESULTS

The start of flowering and the pollen peak day of grasses started earlier in lower altitudes. Grass pollen season suffered a delay as the altitude increased since the spring temperature was higher at lower altitudes. At lower altitudes the length of flowering increased, showing a negative relationship between the start date and the length of the flowering. From a phylogenetic point of view, closely related grass species sharing lifeform, the same photosynthetic pathway and similar pollination strategies exhibited floral phenological synchronization. Allogamous and perennial grass species showed the latest flowering period and they contributed with the largest airborne pollen amounts.

CONCLUSIONS

The physiological and morphological characteristics of grasses have a notable influence on the phenology of flowering. Also, the altitude strongly influenced floral phenology because of the gradient of temperature associated to the altitudinal range. Consequently, the periods of allergenic risk of grass pollen will vary in different geographical areas depending on the environmental conditions and the characteristics affecting the emission and dynamics of the pollen from the most abundant species.

ID: 165
Session: PHENOLOGY, CLIMATE CHANGE AND BASIC AEROBIOLOGY
Topic: PLANT PHENOLOGY

P.013 | Study of the correlation between the precipitation ETCCDI and airborne pollen in the NE of the Iberian Peninsula

Raúl Rodríguez-Solà[1], M. Carmen Casas-Castillo[2], Jiang Ji Ho Zhang[3], Ricard Kirchner[1], Marta Alarcón[3], Cristina Periago[3], Concepción De Linares[4], Jordina Belmonte[4]

1 Department of Physics, ETSEIB, Universitat Politècnica de Catalunya · BarcelonaTech, Diagonal 647, 08028 Barcelona, Spain. raul.rodriguez@upc.edu

2 Department of Physics, ESEIAAT, Universitat Politècnica de Catalunya · BarcelonaTech, Colom 1, 08222 Terrassa, Spain. m.carmen.casas@upc.edu

3 Department of Physics, EEBE, Universitat Politècnica de Catalunya · BarcelonaTech, Eduard Maristany 16, 08019 Barcelona, Spain

4 Institute of Environmental Sciences and Technologies - Dept. de Biologia Animal, Vegetal i Ecologia. Universitat Autònoma Barcelona, 08193 Bellaterra

Keywords: precipitation ETCCDI, airborne pollen parameters, wash-out effect

BACKGROUND AND OBJECTIVES

Among the meteorological variables, precipitation has a not very clear relationship with airborne pollen concentration due to its twofold impact: the positive influence in pollen production when rainfall occurs previous to pollination; and the pollen removal from the air by a wash-out effect when it occurs during pollination. To better explore this impact, the correlations between airborne pollen parameters and the precipitation indices proposed by the Expert Team on Climate Change Detection and Indices (ETCCDI) to characterize climate extremes, have been calculated.

MATERIAL AND METHODS

Spearman correlations between the pollen parameters of 27 pollen taxa from six aerobiological stations located in the littoral (Barcelona and Tarragona), pre-littoral (Bellaterra and Girona) and central (Lleida and Manresa) areas of Catalonia and the annual and winter precipitation ETCCDI (RX1day, RX5day, SDII, R10, R20, R50, CDD, CWD, R95p, R99p, PRCPTOT) have been calculated. The pollen parameters were the Annual Pollen Integral (APIn), the maximum daily concentration and its date, and start and end dates of the pollen season (temporal interval between 2.5% and 97.5% of the APIn) and its length.

RESULTS

For 10 of the 27 pollen taxa, significant correlations were found in all stations, suggesting a strong dependence of their pollination on precipitation. For indices calculated using annual precipitation, some correlations resulted negative as a consequence of the wash-out effect: if annual precipitation indices increase, APIn and the number of days with pollen decrease, and the peak day occurs later. However, an increase in winter precipitation indices favors the subsequent pollen production: the start of the pollen season is advanced, the end delayed and its length extended.

CONCLUSIONS

In order to elude the wash-out effect of precipitation on pollination, it has been useful to address the correlation study using the ECCDT indices calculated from winter precipitation. As expected, a positive influence of this variable in the resulting subsequent pollen production has been found.

ID: 140
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: ENVIRONMENTAL POLLUTION

P.014 | Potential contribution of distant sources to the airborne Betula pollen transport over NE Iberian Peninsula

Marta Alarcón[1], Cristina Periago[1], Jiang Ji Ho[1], Concepción De Linares[2], Jordina Belmonte[2]

1 Departament de Física. Universitat Politècnica de Catalunya (UPC). Avda. Eduard Maristany 16, 08019 Barcelona

2 Ins. Ciència i Tecnologia Ambientals (ICTA) i Dept. Biologia Animal, Vegetal i Ecologia. Universitat Autònoma de Barcelona (UAB). 08193 Bellaterra

Keywords: *Betula*, distant transport; source-regions, back-trajectories

BACKGROUND AND OBJECTIVES

Birch trees (*Betula* sp.) are abundant in North, Central and Eastern Europe, while scarce in the Mediterranean region, especially in Spain, where they only grow in mountains in the northern regions and are sometimes used as ornamental. The airborne daily birch pollen patterns in Catalonia, NE Iberian Peninsula, show abrupt high concentrations in areas with low local influence that previous studies attributed to distant transport from four main sources. The present work evaluates the differentiated potential contribution of these sources over Catalonia.

MATERIAL AND METHODS

The pollen record consisted in daily *Betula* pollen concentrations in years 2005-2014 at six stations (Barcelona, Bellaterra, Girona, Lleida, Manresa and Tarragona) of the Xarxa Aerobiològica de Catalunya. The simultaneous pollen peaks (concentration>95th of the annual series, computed for each station) at the six stations were selected. The associated air-masses were determined by using HySplit back-trajectories, considering as possible source-regions: North Iberian Peninsula (NIP), Pyrenees (PYR), French Central Massif (FCM) and Central Europe (CEU). The residence time of the back-trajectories in each region was computed by dividing the number of one-hour time-steps between the number of back-trajectories in the region. Based on the amounts collected and the residence time, the potential contribution of each source region was estimated.

RESULTS

A total of 28 simultaneous peaks were identified, with concentrations presenting high variability between stations, the highest ones in Girona and the lowest in Lleida (nearly 10 times lower). For the 10-year period and the six stations, the total *Betula* pollen amount collected in the 28 episodes (sum of the peak day and the previous and after days) was 5420 p/m3, accounting 58% of the total collected in the entire period.

CONCLUSIONS

Distant transport is the main source of *Betula* pollen in Catalonia. The estimated potential contribution of the main distant sources is 31% NIP, 31% FCM, 26% PYR and 12% CEU. Girona is exposed to the highest CEU and NIP transport, while Manresa is the most influenced by PYR; FCM is the highest in Lleida and the lowest in Girona.

ID: 110
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: ENVIRONMENTAL POLLUTION

P.015 | Proposal of LIDAR applied in ISTRAM BIM for Environmental Impact Assessments based on urban green infrastructure and aerobiological air quality

Santiago Fernández-Rodríguez[1], Juan Francisco Coloma-Miró[1], Marta García-García[1], Eva Quevedo-Martínez[1], Marta Fernández-Ramos[1], Raúl Pecero-Casimiro[1], Roberto Cintas-Leal[1], Juan Jesús Hidalgo-Barquero[1], José María Maya-Manzano[2]

1 University of Extremadura

2 Technical University and Helmholtz Center Munich

Keywords: vegetation sources, LIDAR, ISTRAM-BIM

The Environmental Impact Assessment is based among other parameters by the allergenicity index. For this purpose is suitable to use new technology as LIDAR (Laser Imaging Detection and Ranging), whose definition and precision in the data collection of a cartography is an essential part of environmental studies of Civil Engineering.

A 3-dimensional cartographic realization can be obtained with high precision and reduced costs. On the other hand, the emergence of the BIM (Building Information Modeling) methodology has made the computer-aided design programs of linear works adapt to this new way of working and generate 3D digital models that control the projected elements throughout their life cycle (planning, project, construction and exploitation). This is the case of ISTRAM BIM software that is capable of modeling any infrastructure in 3D by providing each of its own identification elements and being able to export it to the most common BIM exchange files such as IFC or LandXML. At the urban level, in the design of parks, the type of tree that must be planted is taken into account depending on the type of shade that is to be given or the type of leaf most suitable for reducing urban pollution. However, there is also the allergic factor that is rarely taken into account and each time it has more influence on the health of human beings suffering from this seasonal disease. To help affected people there are sensors that receive information on the amount of pollen in the air and allow users to be notified of the type and concentration of pollen that is available at all times. However, this type of information is not always known by the user and causes many people to suffer the effects of allergy (conjunctivitis, rhinitis, asthma, etc.). This research intends based on LiDAR cartography, woodland modeling and pedestrian infrastructures in BIM and knowledge of pollen structures data, establishing criteria for the design of pedestrian routes that minimize human exposure in the areas of greatest Pollen concentration and thus make the journey to allergic people healthier. To this end, 3 areas with different arrangements and types of trees have been modeled in Extremadura

ID: 074
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: GREEN URBAN SPACES

P.016 | Light Detection and Ranging on Building Modelling Information as tool for urban planning by green infrastructure of Cupressaceae spp

Eva Quevedo-Martínez[1], Santiago Fernández-Rodríguez[1], Juan Pedro Cortés-Pérez[1], José María Maya-Manzano[2], Marta García-García[1], Juan Francisco Colomá-Miró[1], Raúl Pecero-Casimiro[1]
1 University of Extremadura
2 Technical University and Helmholtz Center Munich

Keywords: LIDAR, BIM, 3D Botany, urban planning

BACKGROUND AND OBJECTIVES
In green urban areas, the allergenic factor has high importance when trees are selected, to improve the quality of life of those affected. Thus, the main goal of this study is to use Bulding Information Modelling (BIM) to model environments from Light Detection and Ranging (LiDAR) point clouds for assessment of synchronous interactive devices for project coordination as tool for urban planning by green infrastructure of Cupressaceae spp, obtaining the accurate information in aerobiological indices, as Urban Green Zone Allergenicity Index (IUGZA).

MATERIAL AND METHODS
BIM is a methodology that includes the generation and management of built environments based on their physical and functional data. Together with LiDAR point clouds of the Engineering Agricultural School (Badajoz, Spain), using Mobile Mapping System Topcon IPS-3 and BIM work-flow using Autodesk Software, it is possible to get IUGZA more precise.

RESULTS
The inventory of green infrastructure based on the geolocation and measure the biometric parameters (height and width) of cypress species (191 individuals) was done, estimating the Urban Green Zone Allergenicity Index (0.04254) and proposing new construction green infrastructure models BIM at different detail level (100, 200 and 300) and new dimension urban environment (6D). The main novelty is to model with point clouds by laser scanner of LiDAR an actual urban environment based on aerobiological urban planning information using BIM, which reflects the information to understand the potential allergenic factor risk and its impact on the urban population. The measures of urban green infrastructure as cypresses trees allow calculating the biophysical parameters and distance in order to apply it in several aerobiological index as IUGZA.

CONCLUSIONS
This innovation is very important as a tool for urban planning in the construction, for describing actual 3D environmental or for designing new scenarios to work in 6D as a tool to prevent future troubles in urban areas in construction projects.

ID: 073
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: GREEN URBAN SPACES

P.017 | Airborne pollen flora of Manila, Philippines

Maureen Sabit
University of Santo Tomas, Manila, Philippines, 1015

Keywords: pollen morphology, anemophilous

BACKGROUND AND OBJECTIVES

Pollen is a haploid, immature endosporic male gametophyte that attains its maturity once it gets in contact with the sticky stigma of the flower. Pollen-related studies are numerous and more progressive in temperate regions while understudied in tropical regions. This study assessed the morphological characteristics of airborne pollen to aid in its identification in conducting aerobiological studies.

MATERIAL AND METHODS

Possible plant sources of airborne pollen were identified by conducting monthly vegetation surveys and field collections. Both entomophilous and anemophilous plants were recorded and observed for their flowering phases. Anthers from collected flowers of each plant were immersed in alcohol and crushed to release the pollen. Pollen was stained with fuchsin-glycerine and observed under light microscopy with a 400x magnification. Morphological characteristics of the pollen such as the size, shape, aperture, and ornamentation were noted using accepted terminologies.

RESULTS

Principal trees and shrubs around the city belong to 73 plant families. Of the 300 plants surveyed, 69% were entomophilous, 15% anemophilous, 5% both entomophilous and anemophilous (ambophily), and 10% ferns and gymnosperms. Thirty-five percent (35%) of the anemophilous plants were trees, 61% herbs, 4% shrubs while 64% of ambophilous plants were trees and 36% Herbs. The airborne pollen in this study ranged from 10 to 80 µm in size. Based on their computed P/E (polar/equatorial), 63% of the pollen were oblate-spheroidal, 33% suboblate and 2% for both oblate and spherical. Apertures, which serve as exit for pollen tubes were varied and classified in to nine types: 1) monoporate (23%), 2) di/triporate (28%), 3) tricolporate (23%), 4) pantoporate (7%), 5) calymmate (5%), 6) monosulcate (7%), 7) tricolpate (2%), 8) pantocolpate (2%) and 9) inaperturate (2%). As to ornamentation, 51% were psilate, 30% reticulate and 9% echinate.

CONCLUSIONS

For further studies, a rich collection of pollen from different plants and their description should be undertaken to produce a monograph with photomicrographs (400x magnification) and taxonomic keys as a guide to the airborne pollen of the Philippines.

ID: 196
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.018 | Effect of meteorological parameters on Cupressaceae pollen prevalence in southwestern Iberia

Ana Galveias[1], Maria João Costa[2], Juan Luís Guerrero-Rascado[3], Paloma Cariñanos[4], Ana Rodrigues Costa[1] & Célia M. Antunes[1]

1 Institute of Earth Sciences - ICT & Department of Chemistry, School of Sciences and Technology, University of Évora, Évora, Portugal
2 Institute of Earth Sciences - ICT & Department of Physics, School of Sciences and Technology, University of Évora, Évora, Portugal
3 Applied Physics Department Sciences Faculty, University of Granada, Granada, Spain
4 Andalusian Institute for Earth System Research (IISTA-CEAMA) and Department of Botany, University of Granada, Granada, Spain

Keywords: pollen, *Cupressaceae*, meteorological parameters, aeroallergen, bioaerosol

BACKGROUND AND OBJECTIVES

The *Cupressaceae* is considered a significant source of airborne allergens and allergy to its pollen is reported worldwide. The period pollination for this species is the end of winter and beginning of spring, depending meteorological factors. The objective of this study was to compare the aerobiology of *Cupressaceae* pollen and to analyse the influence of meteorological factors in the *Cupressaceae* pollination in two different sites: Évora and Granada.

MATERIAL AND METHODS

Data were collected in two cities of southwestern Europe (Évora: 38.568542°N; -7.910526°W and Granada: 37.1041°N 3.3555°W). The *Cupressaceae* pollen was monitored using standard Hirst-type traps (2017-2019) and identified by optical microscopy, according to the standard methodology. The meteorological parameters were obtained from ICT/CGE platform and Agencia Estatal de Meteorología (AEMET).

RESULTS

According to the Köppen climate classification Evora and Granada are Csa, characterized by a temperate climate with warm and dry summer. The annual mean air temperature is 15.8 °C and 15.7 °C, respectively. The rainfall period, occurring mostly between autumn and spring, presents an average annual precipitation of 608.5 and 352 mm, respectively. Large concentrations of pollen were detected in both cities, 5-6-fold higher in Granada (Annual Pollen Integral, API, ranging from 2642-7568 pollen/m3 in Évora and 15868-56593 pollen/m3 in Granada). The peak date occurred between 25th February and 14th March in both cities and the pollen season duration was similar, ranging from 60-84 days. Granada presented twice the days >100 pollen/m3. During the season, temperature and solar radiation positively correlated with API while precipitation and relative humidity were negatively correlated. Accumulated precipitation from September-November and accumulated temperature from December-January correlated with higher seasonal API.

CONCLUSIONS

These results have shown higher prevalence of Cupressaceae pollen in Granada, probably due to the surrounding forests. Meteorological factors, particularly, the autumn rain and the temperature during winter months are relevant for Cupressaceae API and might constitute indicators for the prediction of pollen seasonal intensity.

This work is co-funded by the European Union through the European Regional Development Fund, included in the COMPETE 2020 (Operational Program Competitiveness and Internationalization) through the ICT project (UID/GEO/04683/2013) with the reference POCI-01-0145- FEDER-007690 and also through ALOP (ALT20-03-0145-FEDER- 000004) project.

ID: 177
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.019 | Airborne fungal spore monitoring: between analyst proficiency testing

Carmen Galan[1], Matt Smith[2], Anasthasios Damialis[3], Giuseppe Frenguelli[4], Regula Gehrig[5], Agnieszka Grinn-Gofroń[6], Ingrida Kasprzyk[7], Donat Magyar[8], Jose Oteros[1], Ingrida Šaulienė[9], Branko Sikoparija[10], Michel Thibaudon[11]

1 University of Cordoba, Spain
2 University of Worcester, UK
3 Technical University of Munich, Germany
4 University of Perugia, Italy
5 MeteoSwiss, Zürich, Switzerland
6 University of Szczecin, Poland
7 University of Rzeszow, Poland
8 National Public Health Center, Hungary
9 University of Cordoba, Spain
10 University of Lithuania, Lithuania
11 BioSense Institute, Serbia
12 RNSA, France

Keywords: aerobiology, quality assurance, Quality Control, questionnaire, fungal spores

BACKGROUND AND OBJECTIVES

This study presents the results of a Europe-wide training and Quality Control (QC) exercise carried out within the framework of the European Aerobiology Society's QC Working Group. The main aim of this exercise was to examine the feasibility of carrying out a QC exercise for fungal spore monitoring in Europe, using a similar methodology to the one previously used for pollen.

MATERIAL AND METHODS

The QC survey was conducted in two parts: (1) Coordinators of national and regional aerobiological networks in Europe involved in the monitoring of atmospheric fungal spores were invited to complete a questionnaire survey related to their network and asked whether they were interested in taking part in an external inter-laboratory QC exercise; (2) Participating networks performed an inter-laboratory ring test with the same sample slide in order to determine the reproducibility of identifying and counting two fungal spore taxa (Alternaria and *Epicoccum*) in air samples collected by a Hirst-type volumetric spore trap. Participants were instructed to read five separate longitudinal transects in the "effective collecting area" of the slide. Reproducibility of analysis was determined following the method previously used in European Aerobiology Society's QC exercises for pollen.

RESULTS

Thirty-two counters from 16 national or regional networks in Europe participated in the QC exercise. Coefficients of Variation (CV%) ranged from 23.0 and 22.5 when reading 1 transect to 14.0 and 16.0 when reading 5 transects for *Alternaria* and *Epicoccum*, respectively. Considering a CV% of 30 as the limit for fungal spores, no significant differences were observed between the absolute errors from 2, 3, 4 and 5 transects. The only significant difference was between 1 and 5 transects

CONCLUSIONS

We recommend that fungal spore analysis should be carried out with 2 transects, which equates to about 5% of the slide, because results are not significantly different to 5 transects

ID: 182
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.020 | Preliminary Findings of the Irish Pollen Monitoring Network

Emma Markey[1], Jerry Hourihane Clancy[1], Jose María Maya-Manzano[2], Eoin McGillicuddy[1], Paul Dowding[3], David O'Connor[1]

1 School of Chemical and Pharmaceutical Sciences, Technological University Dublin, Ireland.
2 Centre of Allergy and Environment, Technische Universität München, Germany.
3 Department of Botany, Trinity College Dublin, Ireland.

Keywords: Pollen Monitoring, Airborne Pollen, Ireland

BACKGROUND AND OBJECTIVES

Until recently, pollen monitoring in Ireland has largely remained underdeveloped with little known about the primary pollen types present in the ambient environment. In the last few years monitoring efforts have commenced in several locations towards developing the first Irish pollen network. The primary aim of this poster is to present findings of the 2017-2019 monitoring campaign by identifying the prevalent pollen types/season and determining the correlation between pollen concentration and meteorological factors.

MATERIAL AND METHODS

Pollen monitoring was carried out in two sampling locations, one urban (Dublin City) and one rural (Carlow) from 2017-2019. Pollen data was collected using Hirst-Lanzoni and Hirst-Burkard 7-day volumetric pollen samplers in Dublin and Carlow, respectively and counted using light microscopy at 400x magnification.
Meteorological data was obtained via the Met Éireann (National Meteorological Service) website from weather stations located at Dublin Airport and in Oak Park.
The Main Pollen Season (MPS) was calculated using the 90% method and correlation between weather and pollen concentration was determined by calculating Spearman's rank correlation.

RESULTS

The correlation between pollen concentrations and meteorological parameters varied depending on the location and year owing to changes in weather between 2018-2019.

CONCLUSIONS

The prevalent pollen types/season varied slightly by location and year but generally began with arboreal pollen in January and ended with grass/herb pollen in October.
The correlations between pollen concentration and meteorological parameters highlighted the complex relationship between the impacts of weather on pollen concentration and release

ID: 164
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.021 | Urban real allergenic load on the atmosphere of Ourense NW Spain

Sabela Álvarez-López[1], Alejandro Garrido[1], Alba Piña-Rey[1], Estefania González-Fernández[1], Maria Fernández-González[2], M. Jesús Aira[3], F. Javier Rodríguez-Rajo [1]

1 CITACA. University of Vigo. "As Lagoas". 32004 Ourense. Spain.

2 University of VigoEarth Sciences Institute (ICT), Faculty of Sciences, University of Porto, Porto, Portugal.

3 University of VigoUniversity of Santiago of Compostela. Santiago of Compostela. 14970.

Keywords: aerobiology, allergens, pollen

BACKGROUND AND OBJECTIVES

The World Health Organization (WHO) reported that 30-40 % of the global population shows allergic sensitization (Pawankar et al., 2011). The aim of our study was to combine the traditional pollen information data with the aeroallergen content in the atmosphere of Ourense in order to ascertain the real allergenic load and the amount of days with potential allergy risk episodes.

MATERIAL AND METHODS

The aerobiological study was carried out during 2018 by means a Hirst volumetric sampler for the pollen (*Alnus*, *Betula*, *Fraxinus*, *Olea*, *Parietaria*, *Platanus* and Poaceae) and a Burkard Cyclone sampler for the aeroallergens (Bet v1, Ole e1, Par j1-2, Pla a1 and Lol p1). A correlation analysis between pollen, allergens and the main weather variables was conducted. A regression analysis between pollen and allergens was conducted for the identification of the days in which the allergen threshold of pollinosis symptoms was reached.

RESULTS

The pollen type with the longer main pollen season was *Parietaria* (251 days) and the lower for *Betula* (28 days). The taxa with the higher seasonal pollen integral was *Betula* with 8397 pollen and a pollen peak of 1283 pollen/m3. Regarding the atmospheric allergen concentrations, the taxa with the higher total seasonal allergen integral was Poaceae with 11.28 ng and an allergen peak of 0.478 ng/m3. The pollen of *Parietaria* registered the higher number of days with concentrations over the allergenic threshold. If we considering the aeroallergen data, the Lol p1 threshold of high allergenic symptoms risk was overcome during 23 days. Moreover, the days of aeroallergen allergenic risk do not coincide with the observed risk days considering the airborne pollen thresholds. Cross reactions were detected between the Betulaceae (as the allergen Bet v1 detect the Alnus allergens) and Oleaceae (as the allergen Ole e1 detected the *Fraxinus* and *Ligustrum* allergens) families.

CONCLUSIONS

Our results reinforce the importance to combine pollen and aeroallergen quantification to know the real allergenic load in the atmosphere in order to improve the allergenic risk alert models for the sensitized people.

ID: 083
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.022 | Effect of temperatures on different adhesive sampling efficiency of Hirst-type traps

Sabine Fürst[1], Joana Cadeias[2], José Oteros[2], Susanne Jochner-Oette[1], Jeroen Buters[2]
1 Physical Geography / Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany
2 Center of Allergy & Environment (ZAUM), Member of the German Center for Lung Research (DZL), Technical University/Helmholtz Center Munich, 80802 Munich, Germany

Keywords: adhesive, sampling efficiency, pollen traps

BACKGROUND AND OBJECTIVES
In Germany, temperatures can drop below zero, even in spring, but might also exceed 30 °C in summer. However, there is a tendency towards lower temperatures, compared to for instance Mediterranean locations. Vaseline as a Hirst-trap adhesive is generally used in Germany. Differences in pollen sampling efficiency might arise due to varying temperatures. The aim of this study was to compare the sampling efficiency of different adhesives (Vaseline [V], Silicone [S], Bayer [B] and Pollen SenseTM [PS]) tested under various temperature conditions.

MATERIAL AND METHODS
Volumetric pollen sampling was carried out between 5th July and 2nd August 2019. Three Hirst-type pollen traps were positioned within 5 m of each other in a garden-like setting in Munich (Germany). Before sampling, the Melinex tape was split into two strips and coated with different adhesive combinations. Pollen concentrations were calculated for Poaceae, Plantago, Tilia and Urticae. Additionally, Betula and Poaceae pollen were sampled under controlled laboratory conditions. Microscope slides were placed vertically in a pollen exposure chamber and pollen injection was repeated three times per temperature condition (4°C, 25°C and 37°C).

RESULTS
The highest pollen counts were obtained with Pollen Sense adhesive tape ($p < 0.001$). Mann-Whitney-U-test revealed that there were no significant differences in mean values for the investigated species. Supplemented weather data showed that heteroskedasticity as partly observed under higher maximum temperatures. For most adhesive combinations, no significant difference was observed within the brief sampling period. In addition, experimental pollen impaction revealed higher pollen counts at lower temperatures when using Vaseline, but not Silicone.

CONCLUSIONS
This study revealed that sampling efficiency under real conditions depends on the adhesive, but also on the temperature. Unfortunately, the effect of temperature on adhesive efficiency is largely neglected but was substantial between 4 and 37°C using Vaseline.

ID: 209
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.023 | Urban atmospheric levels of allergenic pollen: comparison of two samplers located in Salamanca (Middle West Spain)

Sergio Fuentes Antón[1,2], Estefania Sánchez Reyes[1,6], David Rodríguez de la Cruz[1,2], Asunción García Sánchez[3,4], Ignacio Dávila[3,4,5], José Sánchez Sánchez[1,2]

1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain.
2 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Méndez Nieto s/n, 37007, Salamanca, Spain.
3 Department of Biomedical and Diagnostic Sciences, Faculty of Medicine, University of Salamanca, Alfonso X, El Sabio s/n, 37007, Salamanca, Spain.
4 Institute for Biomedical Research of Salamanca.
5 Immunoallergy Service, University Hospital of Salamanca, Spain.
6 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain.

Keywords: pollen count, trap comparison

BACKGROUND AND OBJECTIVES

This study was aimed to quantify and compare the atmospheric pollen content of Salamanca (MW Spain) using two samplers at different locations.

MATERIAL AND METHODS

Aerobiological sampling was carried out using two Hirst volumetric traps from February 2014 to February 2016, one placed in the city centre and the other in a semi-natural environment. Only pollen types known to be allergenic were considered for further analysis. The statistical comparison of the daily pollen levels between both traps was performed using the Spearman's non-parametric correlation test (SPSS software v.23). The effect of the main meteorological factors on pollen levels was also evaluated.

RESULTS

The main pollen types identified in both samplers were Cupressaceae, *Fraxinus*, *Olea*, *Platanus*, and Poaceae, with *Betula* showing the lowest levels of pollen, during both years. Correlations between samplers showed positive significant values and also meteorological parameters and pollen levels showed significant positive coefficients for temperature and hours of sunshine, except *Betula*, Cupressaceae, *Fraxinus*, *Platanus* and *Rumex*, which had negative significant or not significant coefficients. Rain and relative humidity were negatively correlated with all pollen types, except *Fraxinus*. Winds from the Southwest and the Northwest showed significant positive correlations with *Olea* and winds from the Northwest and the Southeast with *Platanus*.

CONCLUSIONS

We found positive significant correlations between both samplers, although slight differences were detected between them. The city centre could lead to higher concentrations of *Olea* and *Platanus*, while on the outskirts of the city, Amaranthaceae, Poaceae and Urticaceae were more abundant.

ID: 152
Session: GREEN URBAN SPACES, POLLUTION AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.024 | The Investigation of Particulate Matter and Microfungi in Public Indoor Environments

Ilona Keriene, Audrius Dagelis
Šiauliai University, P.Višinskio g. 38, Šiauliai, Lithuania
ilona.keriene@su.lt, audriusdagelis@gmail.com

Keywords: Particulate matter, microfungi, indoor air quality

BACKGROUND AND OBJECTIVE

The World Health Organization (WHO) states that people spend 85-90% of their total time indoors. The air quality of premises is influenced by particles of aerosol and bio-aerosol origin. The aim of this study was to identify contamination of public indoor environments with particulate matter and microfungi and to evaluate indoor air quality.

MATERIAL AND METHODS

The amount of PM 2.5-10 (size 0.3-10 μm), microfungi in air and dust in the indoor public environments of the town of Lithuania with the population of 8500 were analysed. The analysis encompassed the total of 90 samples taken from 15 rooms in the nursery, school, library, shopping centre, bookstore, cultural centre, and offices from March to May, 2019. The PM concentration (μg/m3) was measured with a FLUKE 983 dust gauge. Microfungi in the indoor air were collected by a cyclonic air trap and grown on the potato dextrose agar medium. The microfungi species were identified by a light microscope, the final results are given in colony forming units of 1 m3 of air (CFU/m3).

RESULTS

Studies have shown that the WHO's recommended limit values of PM 2.5 (25 μg/m3) and PM 10 (40 μg/m3) were exceeded in 6 out of 15 indoor environments. In all investigated premises of nurseries, concentration of PM (2.5-10 μm) was distributed in the interval from 25 μg/m3 (PM 2.5) to 196±52 μg/m3 (PM 10). The concentration of more than 45-50 μg/m3 (PM 10) was found in the library premises. Dust analysis showed that openings of ventilation systems in the nursery were contaminated with microfungi of *Penicillium* spp., *Aspergillus* spp., *Cladosporium* spp., producing allergic reactions and toxic mycotoxins. The air quality in the salesroom of the supermarket of building materials posed a threat to public health: the amount of 1649 cfu/m3 exceeded the norm recommended by the WHO (500 CFU/m3) three times. Of these, 93% were *Penicillium* spp.

CONCLUSIONS

In conclusion, 43% of all analysed indoor environments had air quality problems. The managers of premises should pay attention to improving the air circulation in indoor environments. Most PMs and microfungi were found in the premises with dismantled, sealed or uncleaned air ventilation systems.

ID: 031
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

P.025 | ALIX as a possible marker for pollen-released nanovesicles

Chiara Suanno[1], Elisa Tonoli[2], Enzo Fornari[3], Maria Pia Savoca[2], Iris Aloisi[1], Luigi Parrotta[1], Elisabetta Verderio Edwards[2], Stefano Del Duca[1]

1 Università degli Studi di Bologna, Via Irnerio 42 40126 Bologna (BO)
2 Nottingham Trent University, Clifton Campus NG11 8NS
3 Nottingham Trent I-SMART group, Clifton Campus NG11 8NS

Keywords: pollen, ALIX, nanovesicles, allergens, hazel, kiwi, marker, exosomes

BACKGROUND AND OBJECTIVES

Pollensome is a new unexplored topic of aerobiology and allergology. It includes the nanovesicles of respirable size that are released by pollen into the atmosphere. Some of these vesicles have been proven to carry pollen allergens, hence they could vehicle them to the low respiratory tract, aggravating respiratory symptoms of pollen allergy. Since plant exososomes existence was proven in 2010, different membrane trafficking proteins have been used as their molecular markers, but never consistently. ALIX, a surface protein of exososomes commonly used as nanovesicles marker in mammals, is well conserved in eukaryotic cells. We decided to investigate whether plant homologs of ALIX, that are involved in vesicular trafficking, are good nanovesicle marker candidates for plants as well.

MATERIAL AND METHODS

Nanovesicles with diameter smaller than 200 nm were isolated from kiwi and hazel pollen grains previously hydrated or germinated. Nanovesicles isolation was performed through subsequent filtrations and differential centrifugation. Nanoparticles isolated were analysed with ZetaView to measure their diameter and concentration, and micrographed with AFM. Proteins from pollen-derived nanoparticles were tested for the presence of ALIX homologs by SDS-PAGE and Western blot analysis.

RESULTS

In both species, nanoparticles form germinated pollen were more concentrated than those from hydrated pollen. Their average peak diameter was between 160 and 140 nm for germinated samples, and between 140 and 130 for hydrated ones. Western blot analysis revealed a higher concentration of ALIX homologs in the putative nanovesicles than in the total cell lysate for germinated pollen of both species, whilst we were not able to detect these proteins in nanoparticles from hydrated pollen.

CONCLUSIONS

ZetaView and AFM analysis suggests that the isolated nanoparticles are compatible with nanovesicles for size and shape. The high concentration of ALIX plant homologs shown by nanoparticles from germinated pollen samples is consistent with this idea, and confirms ALIX homologs potential as pollen nanovesicles markers.

ID: 157
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

P.026 | Evolution of Cladosporium sp. and Aspergillus/Penicillium type spores in Jaén cathedral (Spain)

Ruiz-Valenzuela L.[1], Aguilera-Padilla, F.[2], Montejo-Palacios, E.[3]
1 Department of Animal Biology, Plant Biology and Ecology (University of Jaen).
2 Department of Didactic of Sciences (University of Jaen).
3 Department of History of Art (University of Granada).

Keywords: Jaén cathedral, fungal spores, indoors

It is normal for numerous species of fungi to be constantly indoors present. The ability of these organisms to colonize materials of diverse organic nature and then propagate is, often favoured by optimal humidity and environmental temperature. Under these conditions the intensity of certain fungal species is especially high. The effects of these fungi are serious as they are very responsible for the alteration and deterioration of artefacts, often of great intrinsic value, buildings. Additionally, fungi can cause health-related problems people who, permanently or occasionally, frequent these spaces and who are directly exposed to the inhalation of the particles that are emitted when fungi produce spores.
In this work, we studied the spore intensity of *Cladosporium* sp. and *Aspergillus/ Penicillium* in the central choir, museum and diocesan historical archive of Jaén cathedral to determine how concentrations vary according to space and seasons of the year. Average temperatures, increased constantly with the season; however, the relative humidity varied throughout seasons but was generally low in all the monitored spaces. This pattern may be responsible for the low spore content of the air, although both, of these spores type were relatively frequent corresponding approximately 49% for *Cladosporium* sp. and 17% *Aspergillus/Penicillium* respectively, of all fungal propagules detected; these were by far the highest intensity indices for any of the identified types. The presence of these taxa was greatest in the central choir in all analyzed seasons; air concentrations were linked to the moments of most human activity occurring between 11:00 and 20:00.
Cladosporium sp. and *Aspergillus/Pencillium* spores were the most abundant fungi in the air of Jaén cathedral, possibly because they originate from visible colonies on some of the cathedral´s work of art and furniture located in the study areas. The cultivation of these sources would confirm their presence.

ID: 128
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: CULTURAL HERITAGE

P.027 | Diversity and seasonality of fungal propagules in the museum of the Cathedral of Jaén (Spain)

Fátima Aguilera Padilla[1], Luis Ruiz Valenzuela[2], Elena Montejo Palacios[3]
1 Department of Didactic of Sciences (University of Jaen)
2 Department of Animal Biology, Plant Biology and Ecology (University of Jaen)
3 Department of History of Art (University of Granada)

Keywords: Cathedral of Jaén, Fungal spores, indoors, biodeterioration

BACKGROUND AND OBJECTIVES

The air of indoor and outdoor environments contains biological particles in suspension that come from various sources. Most of them are pollen grains and fungal spores, bioparticulates widely recognized for their ability to cause respiratory diseases and other pathologies that justifies the large number of studies focused on their analysis in relation to allergies in different environments. However, few works on aeromycological airborne content inside museums, churches and cathedrals are addressed. Heterotrophic organisms such as fungi can promote biodeterioration of an extensive range of materials and have a negative effect on the preservation of artistic-historical heritage. In this sense, aerobiological investigations allow us to define the original sources or means of access of the biological particles and determine the levels and the main accumulation areas of airborne biodeteriogen organisms.

MATERIAL AND METHODS

The aim of this study was to identify and quantify the fungal propagules content in the museum of the Cathedral of Jaen (Spain), which is considered one of the best preserved and representative examples of Spanish Renaissance style. The museum holds seminal pieces created in a large range of materials which are dated between the 16th and 18th centuries. Airborne fungal propagules, mainly fungal spores, were recorded from February to July 2019 by using a volumetric sampler.

RESULTS

During the study period, a total of 24 taxa were identified. Cladosporium and Aspergillus/Penicillium were the most frequently taxa present in the air. In general, the spore concentration is low. Nevertheless, of the airborne fungal spores recorded in the museum, around 80% belong to biodeteriogen fungi that, under suitable conditions for their germination, could have a negative effect on the preservation of artistic-historical heritage.

CONCLUSIONS

Biodeterioration has been observed in different pieces housed in the museum, so prevention measures must be taken into consideration.

ID: 130
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: CULTURAL HERITAGE

P.028 | Does the pollen of Ailanthus altissima (Tree-of-heaven) need more attention in Central Europe?

Matthias Werchan[1], Barbora Werchan[2], Karl-Christian Bergmann[1]
1 Charité – Universitätsmedizin Berlin, Department of Dermatology, Venerology and Allergology, Charitéplatz 1, 10117 Berlin, Germany
2 German Pollen Information Service Foundation, Charitéplatz 1, 10117 Berlin, Germany

Keyword: Ailanthus altissima, invasive species, pollen flight

BACKGROUND AND OBJECTIVES
Tree-of-Heaven (*Ailanthus altissima* [Mill.] Swingle), originally native to China, has proven to be a problematic invasive plant species in Germany as well as in many other regions of the world. In Germany, the focus of colonization has so far been on urban centers, from where *Ailanthus* continues to spread along transport corridors to the outskirts of cities and into the surrounding countryside. The main flowering season of *Ailanthus* in Germany is June when approx. 24-29 µm large pollen grains can be monitored in the air. In China approx. 30% of the patients visiting the Department of Allergy in Peking Union Medical College Hospital are sensitized to *Ailanthus* pollen. Thus, *Ailanthus* may be regarded as a potentially allergologically relevant airborne allergen also in Germany. As climate change favors the spread of this thermophilic plant species, increase in both airborne pollen concentration and the number of sensitizations against *Ailanthus* pollen is expected in Germany in the future. The study aimed to gain insight into the spatial distribution of airborne *Ailanthus* pollen within the city of Berlin.

MATERIAL AND METHODS
Pollen data from four pollen monitoring stations (Hirst-type trap) in the city of Berlin (3 traps) and the adjacent city of Potsdam (1 trap) together with information about the occurrence of male *Ailanthus* trees around the traps were used to study pollen flight intensity and dispersal capacity of *Ailanthus* pollen.

RESULTS
Ailanthus pollen was detected at all four stations during all analyzed years. The pollen concentrations differed strongly between the sites. The highest concentrations were measured in all years at the trap in the center of Berlin, where also the largest number of *Ailanthus* trees in the vicinity of the trap was found, whereas the lowest pollen concentrations and the lowest number of flowering Ailanthus trees in the surrounding area were found at the monitoring station in Potsdam, followed by a station in a suburb of Berlin, which altogether indicates a limited dispersal capacity of the *Ailanthus* pollen.

CONCLUSIONS
The occurrence and expansion of Ailanthus within urban agglomerations lead to increased exposure of the population to *Ailanthus* pollen. Therefore, it is recommended to carry out researches on sensitization to *Ailanthus* pollen, wherever *Ailanthus* is designated as "naturalized", focusing in particular on urban dwellers.

ID: 170
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.029 | Influence of meteorological parameters and air quality on Alternaria spore concentration

Alberto Rodríguez-Fernández[1], Sheila Díez-Casado[1], Ana María Vega-Maray[1], Tibor Molnár[2], Rosa María Valencia-Barrera[1], Delia Fernández-González[1]

1 Department of Biodiversity and Environmental Management, University of León, León, Spain.
2 Institute of Agricultural Sciences and Rural Development. Szent Istvan University, Szarvas, Hungary

Keywords: *Alternaria*, meteorological data, pollutants

BACKGROUND AND OBJECTIVES

Alternaria fungal spores are a common component of atmospheric bioaerosol and their presence is strongly correlated to climatic conditions. Since these spores have a high allergenic capacity and affect a high percentage of the population, more information on their atmospheric concentration is required throughout the year and paying particular attention to the season in which the levels are highest.

MATERIAL AND METHODS

The sampling campaign was carried out in León, north western Spain, from January 2016 to December 2019 using a volumetric Hirst type spore-traps Lanzoni VPPS 2000. The samples were prepared and analyzed by the method proposed by CEN Ref. No. FprEN 16868:2018 E. The meteorological data were provided by the National Meteorological Agency (AEMET) and the pollutants and coarse and fine particles data were supplied by the Network of Atmospheric Quality Control (COAT ⊠ Castilla y León Region).

RESULTS

During the sampling period, an increase in the concentration of *Alternaria* was observed in recent years, with the highest value for Annual Spore Integral (ASIn) being recorded in 2018 (5095 spores*day/m3). The highest concentrations in the air is found from the beginning of June to the end of October and the lowest from December to April. As for the correlation analysis, it was observed that the presence of this spore in the atmosphere is highly influenced by temperatures, both maximum (0,785 $p \leq 0.01$) and minimum (0,747 $p \leq 0.01$), with high positive correlations. In contrast, the correlations are negative with relative humidity (-0,592 $p \leq 0.01$). No significant values were obtained for the wind (speed and direction), pollutants and coarse and fine particles.

CONCLUSIONS

The spore of *Alternaria* presented a seasonal behavior. The concentration is strongly influenced by meteorological parameters, especially temperature and relative humidity. However, the ASIn is different in every year studied. Thus, more years of study are needed for a better understanding of the dynamics of this spore.

ID: 154
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.030 | Removal of House Dust Mite allergens from homes using air purifiers

Maya-Manzano, J.M[1,2], Pusch, G[1,2], Ebner Von Eschenbach, C[1,2], Karg, E[2], Scheja, M.M[3], Schmidt-Weber, C[1,2], Buters J.[1,2]

1 Center for Allergy and Environment (ZAUM), Technical University Munich (Biedersteiner straße, 29 80802 Munich. Bayern. Germany).
2 Helmholtz Center Munich German Research Center for Environmental Health.
3 Philips Research China, Shanghai, People's Republic of China.

Keywords: House dust mites, Der p 1, Der f 1, allergens, air purifiers, HEPA, particle matter, indoor environments, biological exposome

BACKGROUND AND OBJECTIVES
Faecal material of house dust mites (HDM) are the main source of indoor allergens, becoming airborne after disturbance. This work aims to remove HDM´s allergens and particulate matter (PM) fractions from ambient air in households by using air purifiers.

MATERIAL AND METHODS
After dust disturbance events, indoor air was sampled in Munich, Germany using a cascade impactor. The allergens Der p 1 and Der f 1 were analysed by ELISA. Different size fractions of PM and Ultra Fine Particles were recorded using different samplers. A questionary was filled in to link the allergen concentrations to the characteristics of the homes.

RESULTS
The reduction of PM using an air purifier was effective for all PM-size fractions, being significant after already 10-13 min. Der f 1 was the dominant allergen in Munich, Germany, and was mostly detected in fractions $PM_{>10}$ and PM_{10}. Der p 1 was abundant only in some homes. The air purifier reduced Der f 1 by 56% and Der p 1 by 77%.

CONCLUSIONS
The air purifier showed effectiveness and speed to remove airborne particles in all size fractions, and consequently removed particulate HDM allergens efficiently. Air purification offers an adequate and fast solution to allergy patients to actively mitigate the effects caused by the exposome to HDM´s allergens.

ID: 213
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

P.031 | Airborne Pollen Composition and Pollen Load during the Vegetation Season in Lithuania

Laura Šukiene, Ingrida Šaulienė
Siauliai University, P. Visinskis str. 25-115, Siauliai, Lithuania

Keywords: long-term pollen data, Hirst, pollen seasons

BACKGROUND AND OBJECTIVES

The concentration of allergenic pollen in the air is undoubtedly determined by the geographical characteristics of the area and the specificity of the local vegetation. In order to provide timely information to persons sensitive to pollen allergens, it is purposive to evaluate multi-annual data and to identify the main peculiarities of the pollen load in a particular territory. The study analyses the peculiarities of the load of the most important allergenic pollen types in Lithuania, evaluating the monitoring data of the last 15 years.

MATERIAL AND METHODS

Pollen data recorded in Lithuania in 2005-2019 were analysed. Samples were collected with Hirst-type traps at Klaipeda, Siauliai, Vilnius. They were identified under the microscope using conventional aerobiological methods. Pollen seasons are distinguished using the 1% principle. The main characteristics of pollen dispersion were identified and a pollen calendar was developed.

RESULTS

Considering the diversity of airborne pollen found in Lithuania by abundance, the pollen dispersed by *Betulaceae*, *Pinaceae*, *Poaceae* family plants and *Artemisia*, *Urtica* genera plants distinguish themselves. The maximum daily pollen concentration > 11000 pollen/m3 was identified in 2012 in the birch case, and the mean multi-annual peak value is ~ 2500 pollen/m3 (SD=2859). The highest SPI of > 48000 pollen/m3 was established for these plants too. During flowering of *Poaceae*, the peak reaches the average of ~ 123 pollen/ m3 (SD=73). The longest season of *Poaceae* was in 2008 and lasted 115 days (average was 82 days, SD=19). In the second half of the summer, the main source of allergens in Lithuania is the mugwort, whose pollen concentration can reach up to ~145 pollen/m3 (SD=91). The highest concentration of the mugwort (460 pollen/m3) was recorded in 2005.

CONCLUSIONS

Having evaluated the overall dynamics of the pollen load, it was identified that the total amount of pollen year after year was similar. It has been found that the duration of the pollen season changes little and has a non-significant tendency to shorten.

The study was funded from the Research Council of Lithuania (LMTLT), agreement No S-MIP-19-53.

ID: 035
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.032 | Late exposure to grass pollen in September: The case of Phragmites in Burgenland

Maximilian Bastl[1], Katharina Bastl[1], Lukas Dirr[1], Thomas Zechmeister[2], Uwe Berger[1]
1 Research Group Aerobiology and Pollen Information, ORL-Department, Medical University of Vienna, Waehringer Guertel 18-20, 1090 Vienna, Austria
2 Biological Station Lake Neusiedl, Seevorgelaende 1 7142 Illmitz, Austria

Keywords: phenology, common reed, Lake Neusiedl

BACKGROUND AND OBJECTIVES

The grass pollen season in Austria takes place between May and the end of July (based on historic data). The importance of late flowering grass species might be underestimated in diagnosis, therapy and forecasting routines. Moreover, late flowering grass species such as common reed can lead to a prolonged grass pollen period and unseasonable local allergenic burden. The reed bed area of Lake Neusiedl is one of the biggest uninterrupted in Europe and therefore the ideal site for this study.

MATERIAL AND METHODS

Daily mean pollen concentrations were collected by a Hirst-type pollen trap at the roof of the Biological Station Lake Neusiedl, Illmitz, Burgenland from 2017 to 2019. Sample preparation and analysis were performed according to European standards. To calculate the grass pollen season, the standard EAN season definition was applied (1% to 95% of the APIn).

RESULTS

During the three years of data collection, the calculated grass pollen season was characterized by multiple peaks in May, June, July and September. The grass pollen concentrations decrease after the peaks in June or July, before a very late peak in September is recorded. This unique characteristic is specific for this pollen monitoring station.

The measured concentration of grass pollen in September exceeded 20 pollen per cubic meter air on multiple days, each year. This resembles a moderate to high burden for pollen allergy sufferers. Phenology reveals *Phragmites australis* (Cav.) Trin. ex Steud. (Poaceae) as dominant grass species flowering in the reed belt of Lake Neusiedl at this time.

CONCLUSIONS

No other station in Austria records comparable grass pollen concentrations at this time of the year. Pollen of *Phragmites* is not triggering an intense immune response such as *Poa pratensis* or *Dactylis glomerata*. However, 90% of the grass pollen allergy sufferers are sensitized to *Phragmites* as well. Therefore, local grass pollen allergy sufferers could be affected. This study reveals the importance of frequent monitoring of the local flora to improve forecast quality and therefore enhance the quality of life for pollen allergy sufferers.

ID: 037
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.033 | Application of quantitative TaqMan PCR to monitor airborne fungal spores with impact on crop performance and human health

M.D. Campos[1], E. Caeiro[1,2], M.R. Felix[1,3], B. Tomero[4], A. Peixe[3], C. Nunes[1,5], E. Pedro[1,6], M.B. Ferreira[1,7,8], H. Cardoso[1]

1 MED – Mediterranean Institute for Agriculture, Environment and Development, Instituto de Formação e Investigação Avançada, Universidade de Évora. Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.
2 SPAIC — Sociedade Portuguesa de Alergologia e Imunologia Clínica, Lisboa, Portugal.
3 MED – Mediterranean Institute for Agriculture, Environment and Development & Departamento de Fitotecnia, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal.
4 Departamento de Química, Escola de Ciências e Tecnologia, Universidade de Évora, Évora, Portugal
5 Centro de Imunoalergologia do Algarve, Portimão, Portugal
6 Centro Hospitalar Universitário Lisboa Norte- CHLN, Lisboa, Lisboa, Portugal
7 Clinica Universitária de Imunoalergologia - Faculdade de Medicina, Universidade de Lisboa, Lisboa. Portugal
8 Serviço de Imunoalergologia, Centro Hospitalar e Universitário Lisboa Norte, Lisboa, Portugal
E-mails of authors: mdcc@uevora.pt, mrff@uevora.pt, egcaeiro@uevora.pt, peixe@uevora.pt, hcardoso@uevora.pt

Keywords: Airborne spores monitoring, *Alternaria* airborne spores, *Fusarium* airborne spores pathogenic fungi control, Real-time PCR, Molecular aerobiology

BACKGROUND AND OBJECTIVES

Aerobiological studies provide important information about the biological particles present in the air. The fungal spores often constitute the major component bioaerosols in outdoor environments, and several fungal species are pathogenic with a high impact on agriculture, with negative effect on crop performance, and on human health due to the inflammatory process and respiratory allergy disease associated. The fungi *Alternaria* spp. and *Fusarium* spp. are among these important fungal with high impact on crop performance and on human health. The establishment of an efficient approach that would enable farmers and/or clinicians and patients to early react will for sure lead to a better control of the diseases associated to these fungi.

MATERIAL AND METHODS

Biological particles from the atmosphere were collected with a Burkard 7-Day Volumetric Spore Trap. As proof-of-concept, the analysis was focused on samples weekly collect from 1st October - 31st December 2018 (for 14 weeks) at the Évora station of Portuguese Aerobiology Network (RPA — SPAIC) (38°34'N; 7°54'W). Genomic DNA (gDNA) was extracted from collected biological particles, adhered to the Melinex tape containing a silicon solution. Two TaqMan probe—based assays were applied to detect and quantify the levels of airborne biological spores of *Fusarium* spp. and *Alternaria* spp. It was determined from the quantification cycle (Cq), the limit of detection of each fungus by measuring the sensitivity and quantitative range of each qPCR assay.

RESULTS AND CONCLUSIONS

The quantitative Taqman PCR methodology was successfully established for *Alternaria* spp. and *Fusarium* spp. Amplification plots reveled amplification of the samples throughout the 14 weeks of the period of study, with all Cq values in the range detectable by the method. Quantitative data revealed differences on quantitative distribution of both fungi, which was associated with climatic conditions during the period of study and life cycle specificity of each fungus.
The approach allowed an accurate detection and quantification of the levels of *Alternaria* spp. and *Fusarium* spp. spores in the outdoor environment. Currently, to monitor fungi airborne spores the Hirst-type methodology is followed, that is based on spore's identification and quantification by optical microscope, a hard and time consuming process. In this context, the use of Real-time PCR system combined with TaqMan chemistry could be as an alternative methodology that enable to get accurate and reliable results in a faster way. Monitoring the

presence of airborne fungal spores will help farmers and clinicians to prevent the onset of fungal diseases that may affect both quantity and quality of crops and humans.

ACKNOWLEDGMENTS
This work is funded by National Funds through FCT - Foundation for Science and Technology under the Project UIDB/05183/2020.

ID: 047
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: MOLECULAR AEROBIOLOGY

P.034 | Air fungal contamination in hospital operating theatres and cleanrooms

Roberto Albertini[1], Simonetta Turchi[2], Pietro Vitali[2]
1 Department of Medicine and Surgery, University of Parma
2 Hygiene Unit, University Hospital of Parma

Keywords: indoor air quality, biological monitoring, cleanrooms

BACKGROUND AND OBJECTIVES

Operating theatres (OTs) and cleanrooms (CRs) are risk environments for patients, staff and products. Air can be a contamination vehicle and guidelines recommend use of Heating, Ventilation and Air Conditioning (HVAC) systems to ensure safety standards and reduction risk of infection or contamination. Indicators have been identified with maximum permissible particle and microbial contamination referring to international or national guidelines. Assessment of airborne fungal spores can be a useful tool to verify HVAC effectiveness and management nevertheless guidelines do not indicate thresholds values and unambiguously how to perform monitoring. This study was carried out to assess airborne fungi in OTs-CRs at the University Hospital of Parma (IT).

MATERIAL AND METHODS

During 2019 air quality monitoring *at rest* involved 38 turbulent and 5 mixed flow OTs, 14 turbulent flow outpatient surgeries (OSs), 33 CRs, 12 bone marrow transplantation unit (BMTU), and 58 "clean" operational corridors, where fungal air contamination was assessed. Active air sampling was carried out according to UNI EN ISO 14698-1:2004 and EU-GMP Annex 1:2008. Plates coated with Sabouraud Dextrose Agar, incubated at 25 ±1°C for 120 hrs were used. Colonies were stained with lactophenol blue for microscopical recognition.

RESULTS

Fungal spores were found in 13.6% CRs-OTs and in 47.3% of corridors: (as % of recognized) *Cladosporium* 39.1, *Penicillium* 34.7, *Aspergillus* 12.6, *Alternaria* 6.6, *Mucorales* 3.8, *Absidia* 2.2, *Ulocladium* and *Trichothecium* 0.5. The min-max-median-average of colony-forming units per cubic meter were respectively: 0-6-0-0.8 in ISO 8 OSs, 0-34-0-1 in ISO 7 OTs, 0-9-0-1.4 in Grade B and C CRs, 0-71-0-4.1 in corridors. No fungi were isolated in Grade A CRs, ISO 5 OTs and BMTU.

CONCLUSIONS

The data shows that only ISO 5 class or Grade A OTs-CRs avoided presence of airborne fungal spores *at rest*. In OTs-CRs with fungal spores, plants effectiveness and sanitization procedures were checked until negative outcome before their reuse. The results shown that only a set of parameters, supporting particle monitoring, allows a thorough assessment of airborne risk of infection or contamination, improving the environmental hygiene management.

ID: 094
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: INDOOR AEROBIOLOGY

P.035 |Alternaria spores behaviour in the atmosphere of Salamanca (MW Spain) and Tulsa (Middle South USA) during 2014-2016 period

Estefanía Sánchez Reyes[1,2], Asunción García Sánchez[3], Ignacio Dávila[3,4,5], José Sánchez Sánchez[1,6], Josh McLoud[7], Estelle Levetin[7]

1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain.
2 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain.
3 Department of Biomedical and Diagnostic Sciences, Faculty of Medicine, University of Salamanca, Alfonso X, El Sabio s/n, 37007, Salamanca, Spain.
4 Immunoallergy Service, University Hospital of Salamanca, Spain.
5 Institute for Biomedical Research of Salamanca.
6 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Méndez Nieto s/n, 37007, Salamanca, Spain.
7 Department of Biological Science, Faculty of Biological Science, Oliphant Hall, University of Tulsa, 74104, Tulsa, Oklahoma, United States of America.

Keywords: *Alternaria*, Spain, USA

BACKGROUND AND OBJECTIVES

Alternaria is an important aeroallergen in temperate areas of the world. This study was undertaken to compare airborne *Alternaria* spores in Salamanca (MW Spain) and Tulsa (Middle South USA), during the 2014-2016 period.

MATERIAL AND METHODS

The aerobiological monitoring was carried out from January 1st, 2014 to December 31st, 2016, using in both cases a Hirst-type trap, Burkard model. One was placed on the roof of a centrally located municipal building, 20 m above ground level in Salamanca (MW Spain); and the other, on the roof of Oliphant Hall, 12 m above ground, at the University of Tulsa (Oklahoma, USA). The methodology used was suggested by the Spanish Aerobiology Network in regard to spore count and sample processing for Salamanca samples and by a single longitudinal traverse, using an oil immersion lens (1000x) at Tulsa as recomendad by the Pan-American Aerobiology Association.

The seasonal behaviour of atmospheric spore concentrations was evaluated (being the main spore season defined by the 90% method). Correlations with the main meteorological parameters were evaluated using the SPSS software (v.25) and applying the Spearman non-parametric correlation test.

RESULTS

The annual spore integral (ASIn) was considerably higher in Tulsa (varied between 47,390 spores/m3 registered in 2016 to 60,515 spores/m3 in 2014) than in Salamanca (from 2,471 spores/m3 in 2016 to 6,117 spores/m3 in 2014). The main spore season registered a longer duration in Tulsa due to an earlier start in early-spring (March-April) compared to Salamanca (May-June), with a similar end in both localities (October-November). Daily peaks were detected on July 9th, 2014 at Salamanca (263 spores/m3) and on August 12th, 2014 at Tulsa (1,337 spores/m3). Significant positive correlation coefficients were obtained with temperature, but negative with rainfall, relative humidity and wind velocity.

CONCLUSIONS

Alternaria maintained a distribution pattern positively related to the increases of temperature and the absence of precipitation, with maxima during summer months.

ID: 104
Session: INDOOR AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.036 | Evolution of ragweed pollination in France

Samuel Monnier, Michel Thibaudon, Gilles Oliver, Charlotte Sindt
RNSA, 11 chemin de la Creuzille, 69690 Brussieu, FRANCE. E-mail: rnsa@rnsa.fr

Keywords: ragweed, pollen, evolution, exposure

BACKGROUND AND OBJECTIVES

Native from North America, Ambrosia artemisiifolia was accidentally introduced in France in 1863 with red clover seeds. Other introductions followed throughout the 20th century in many places, especially during the First World War. Then ragweed has spread to the roadsides and river banks (Rhône, Loire ...). It was from 1970 that its role was highlighted in pollinosis cases in Lyon. Currently, it is estimated that 9 to 21% of French people living in Auvergne-Rhône-Alpes region is allergic to ragweed pollen. Climate change and meteorology play an important role in pollens and allergies. With data covering the last 30 years, RNSA is able to follow the evolution of ragweed pollination: annual pollen index, start and length of the season, new areas with ragweed pollen, etc

MATERIAL AND METHODS

Pollen exposure measurements are based on data from Hirst-type spore traps and correspond to daily pollen concentrations. These data are recorded on a 2-hourly time step which allows to determine the circadian rhythm of the plant and to evaluate if the pollens are from local origin or transported over longer distance by the wind.

RESULTS

The interest of this ragweed pollen data records is to follow the evolution of pollination during each day of each season and to compare seasons and years for each station in different areas. The health impact of ragweed pollen depends mainly on population exposure and the local origin of seedlings.
In Lyon, one of the hot spots for the ragweed, the start date was more or less stable between 1992 and 2015 but the trend has shown later dates since 2015. The annual pollen index is stable in most of the French stations in areas infested by ragweed but, in the regions recently infested, the annual pollen index has increased since several years.

CONCLUSIONS

30 years of pollen data offer an interesting overview of the evolution of ragweed pollination in France. The amounts of pollen are increasing in most of the stations and it seems that more and more areas are infested and, consequently, more and more people become sensitive and present allergic symptoms.
Ragweed pollen is a real public health problem increasing every year and invading more and more geographical areas.

ID: 012
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: RAGWEED

P.037 | Ragweed Finder App – A useful citizen science approach to contain the spreading of ragweed in Austria

Katharina Bastl, Johannes M. Bouchal, Maximilian Bastl, Lukas Dirr, Uwe E. Berger
Research group Aerobiology and pollen information, Department of Oto-Rhino-Laryngology, Medical University Vienna

Keywords: ragweed, citizen science, mobile app

BACKGROUND AND OBJECTIVES
In the 1970ies ragweed became an invasive neophyte in eastern and south-eastern Austria. Since this time, it has spread especially along the rail- and motorways westward into the Austrian lowlands. Eleven per cent of the Austrian pollen allergy sufferers (ca 115.000 people) experience symptoms caused by ragweed pollen. In Austria, untreated ragweed allergy sufferers cost the health care system approximately 275 Mio €. Hence, it is recognised by several federal governments as a considerable health risk. To improve distribution data of ragweed a citizen science project using mobile app technology was introduced.

MATERIAL AND METHODS
The mobile Ragweed Finder App comprises five major features: (a) Specimen report, (b) a public ragweed distribution map, (c) information, (d) a manual for ragweed identification and (e) a questionnaire to report experienced symptoms. The user is guided through a three-step reporting system to identify a possible ragweed location and report symptoms. The reported specimens are verified by an expert. If reviewed positively, the specimen location is included on the distribution map and the collected data is reported weekly to the responsible federal agencies.

RESULTS
The Ragweed Finder platform was introduced in 2017. In this year 410 reports were received, 324 (79%) were verified. In 2018, 635 reports were filed, 579 (91%) were verified. With the introduction of the mobile Ragweed Finder App in 2019, the number of sightings increased to 1643 with 1468 (89%) confirmed specimens. The ragweed hotspots remain in the eastern regions of Austria, especially Burgenland, Carinthia, Lower Austria, Styria and Vienna.

CONCLUSIONS
This near real-time information helps to contain or slow down the further spread of this weed by documenting hot spots and providing the basis for taking targeted measures. The data serves as a baseline for federal agencies to prioritize certain regions, where the highest symptoms and/or the most specimens are reported. The Ragweed Finder system can be easily adapted for other countries and languages and thus be introduced on a European level or even globally to reduce the burden from ragweed pollen on persons concerned.

ID: 068
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: RAGWEED

P.038 | IRS (International Ragweed Society), an international tool to help Ambrosia management

Michel Thibaudon[1], Roberto Albertini[2], Maira Bonini[3], Sevcan Celenk[4], Sandra Citterio[5], Laszlo Makra[6], Gilles Oliver[7], Olivier Pechamat[8], Uwe Starfinger[9]

1 International Ragweed Society, Brussieu, France
2 Department of Medicine and Surgery, University of Parma, Italy
3 Department of Hygiene and Health Prevention, Agenzia di Tutela della Salute della Città Metropolitana di Milano
4 Uludag University, Department of Biology, Aerobiology Laboratory, Bursa, Turkey
5 University of Milan – Bicocca, Department of Earth and Environmental Sciences, Milan, Italy
6 Institute of Economics and Rural Development, University of Szeged, Hódmezővásárhely, Hungary
7 RNSA, Brussieu, France
8 FREDON France, Paris, France
9 Julius Kuehn Institute, Braunschweig, Germany

Keywords: ragweed, IRS, organisation

One of the main causes of pollen allergy and pollen-induced asthma during the late summer in North America and Central Europe is ragweed (Ambrosia L.), a widespread monoecious genus in the Asteraceae family. In Europe the non native short or common ragweed (A. artemisiifolia L.) is the prevalent species of this genus. Ragweed pollen can be transported by wind over long distances (several hundreds or thousands of kilometers) and may cause allergy symptoms also in areas where the plant is not widespread. Ragweed has an enormous invasive potential through the production of large quantities of seeds with very high germination capacity. The weed damage in agriculture and potential effects on biodiversity add up to a huge negative impact. Actually, ragweed has a higher spread potential than most indigenous annual dicotyledonous and grass species in Central Europe. This situation requires a tight monitoring of the plant and the implementation of an accurate control strategy involving not only farmers but also the staff managing natural areas, roadsides, building, municipalities and health authorities. Unfortunately, in many countries, the legal situation is far from sufficient to monitor and manage the spread of ragweed. It is therefore important that a wide public is aware of the plant and the problems caused by it.

The main topic of the IRS is to gather work from all over the world about phenology, pollen monitoring and management of Ambrosia in different areas. IRS organizes periodical dedicated international congresses in Europe where the researchers can present the state of the art on Ambrosia related knowledge to propose targeted preventive measures.

References:

Karrer G., Starfinger U., Kazinczi G., Kudsk P., Simoncic A., Milakovic I., Sölter U., Verschwele A., Mathiassen S., Basky Z, Kömives T. & R. Leskovsek (2014): Recommendations to fight ragweed derived from the EU-project HALT AMBROSIA In: Fried, G. et al. (eds.), 4th International Symposium on Environmental Weeds and Invasive Plants in Montpellier. Abstracts, p. 167. Starfinger U.; 2009. Can the general public help fight the invasion of an undesired plant invader? The case of Ambrosia artemisiifolia. In: Pyšek, P. & Pergl, J. (Eds) (2009): Biological Invasions: Towards a Synthesis. Neobiota 8: 217—225 Sölter, U., Starfinger, U., Verschwele, A. (Eds.) (2016): HALT Ambrosia — final report and general publication of project findings. Julius-Kühn-Archiv 455, 232 pp. DOI:10.5073/jka.2016.455.00

ID: 011
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: RAGWEED

P.039 | Monitoring of Ambrosia pollen in Southern and Central Russia

Elena Severova[1], Dmitry Britsky[2], Ella Churyukina[3], Elena Goloshubova[3], Vera Karaseva[4], Nadezhda Milchenko[5], Anatoly Moroz[5], Ivan Pavlyuchenko[5], Yulia Selezneva[4], Olga Ukhanova[6], Irina Zheltova[6]

1 Moscow State University, Leninskie Gory 1-12, Moscow 119234 Russia
2 Botanical Institute RAS, prof. Popova str. 2, St-Petersburg 197376, Russia
3 Rostov State Medical University, Nakhichevansky str. 29, Rostov-on-Don 344022, Russia
4 Ryazan' State University, Svobody str. 46, Ryazan' 390000, Russia
5 Kuban' State Medical University, Mitrofana Sedina str. 4, Krasnodar 350063, Russia
6 Stavropol' State Medical University, Mira str. 310, Stavropol' 355017, Russia

Keywords: ragweed, Russia

BACKGROUND AND OBJECTIVES

Pollen of ragweed is one of the most serious causes of allergy-associated respiratory diseases. In Europe sensitization to ragweed pollen ranges from 2.5% to 60%. Southern part of Russia is considered to be one of the most important sources of ragweed pollen in Europe. Despite this, continuous pollen monitoring has never been conducted in this region.

MATERIAL AND METHODS

The year 2019 was the first one when 6 monitoring stations were working in the European part of Russia: three stations in the south (Krasnodar, Stavropol' and Rostov-on-Don) and three - in central and northern parts of the country (Ryazan', Moscow and St-Petersburg).In all stations monitoring was carried out with Hirst-type volumetric traps according to standard method.

RESULTS

The year 2019 was the first one when 6 monitoring stations were working in the European part of Russia: three stations in the south (Krasnodar, Stavropol' and Rostov-on-Don) and three - in central and northern parts of the country (Ryazan', Moscow and St-Petersburg).In all stations monitoring was carried out with Hirst-type volumetric traps according to standard method. The start of ragweed season in the southern stations was registered at the end of July (Stavropol') – beginning of August (Krasnodar and Rostov). The most intensive pollen season was observed in Krasnodar (SPIn 8836 pg/m3, peak concentration 727 pg/m3, 28 days concentration was exceeded 100 pg/m3). The longest pollen season was in Rostov, it length was 60 days. The peak values were observed at all southern stations simultaneously on 22-25th August. Fluctuations of ragweed pollen concentration in Moscow and Ryazan' occurred synchronously. SPIn was 4 times higher in Ryazan' (404 pg/m3) comparing to Moscow (108 pg/m3), peak values were detected on 15th August at both locations. In St-Petersburg ragweed pollen was detected for the first time – single pollen grains were observed on 11-13th September.

CONCLUSIONS

Monitoring in the south of Russia is necessary to continue for evaluation of ragweed pollination intensity and its influence on neighboring territories.

This work was supported by MSU Grant for Leading Scientific Schools 'Depository of the Living Systems'.

ID: 142
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: RAGWEED

P.040 | Exposure to ragweed pollen in Slovenia

Anja Simčič, Andreja Kofol Seliger, Tom Koritnik
National Laboratory of Health, Environment and Food

Keywords: allergenic pollen, ragweed, exposure, Slovenia

BACKGROUND AND OBJECTIVES

In the lowlands of Slovenia ragweed has become common and exposure to it's pollen represents a serious health risk. In this analysis of the period from 2012 to 2019 on 4 sampling stations and an additional station from 2017 to 2019, we wish to present the current state of exposure in Slovenia among the native population as well as visitors and tourists.

MATERIAL AND METHODS

Measurements of pollen concentration in the air are done in the basins of the prealpine phytogeographical region; on the coast of the north Adriatic Sea in the submediterranean region; and in the subpannonian region. Hirst type samplers were used for sampling and the results are given as number of pollen grains per cubic meter of air (pg/m3). Aerobiological samplings and analyses were carried out by the recommended methodology, described by the Spanish Aerobiology Network (REA). Our analyses were focused on pollen exposure of the population and the Main pollen season (MPS) was calculated according to The European Academy of Allergy and Clinical Immunology (EAACI) definition.

RESULTS

According to the annual pollen integral (APIn) and the length of the pollen season (MPS) we can distribute the measuring stations into two groups: Group 1–APIn doesn't exceed 1500 pg/m3, MPS lasts 39 days with the start on 11th August and end on 18th September; Group 2–APIn exceeds 1500 pg/m3, MPS lasts 61 days with the start on 30th July and end on 28th September. However, measurements on the edge of the Pannonian plain in the subpannonian region during the 2017-2019 period show a possible third group of pollen loads. The APIn there averages more than 10000 pg/m3 and MPS lasts for 93 days.

CONCLUSIONS

Measurements have shown that according to the APIn and MPS values of ragweed pollen grains, inhabitants of the subpannonian phytogeographical region in Slovenia experience the highest exposure.

ID: 156
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: RAGWEED

P.041 | Extreme Pollen Episodes: criteria for typifying and effect of atmospheric conditions

Paloma Cariñanos[1], Juan Luis Guerrero-Rascado[3], Rubén de la Torre[3], Juan Manuel Leyva[3], Inmaculada Foyo-Moreno[3], Inmaculada Alados[4], Lucas Alados[3], Consuelo Díaz de la Guardia[1]
1 Department of Botany. University of Granada
2 Andalusian Institute for Earth System Research IISTA-CEAMA. University of Granada
3 Department of Applied Physics. University of Granada
4 Department of Applied Physics II. University of Malaga

Keywords: Extreme Pollen Episodes (EPE); High Pollen Load; Bioaerosols; Climate Change

BACKGROUND AND OBJECTIVES

The presence of high concentrations of pollen in the atmosphere is related to the development of symptoms in people affected by respiratory diseases. Under certain phenological, meteorological and environmental conditions, atmospheric pollen levels can be extremely high and cause an exceptional impact on the health of the population and the environment. Such kind of events, known as extreme pollen episodes (EPE), are occurring more and more frequently in recent years due to the ~~the~~ effects of changing climatic conditions on vegetation. This work aims to establish a criterion to typify pollen concentrations in the atmosphere as an extreme pollen event and determine the meteorological variables that can affect the presence and permanence of high concentrations over a period of time.

MATERIAL AND METHODS

For the establishment of EPEs, the 1992-2018 aerobiological data-series of the city of Granada (southeast of the Iberian Peninsula) was used. The eight pollen types with the highest contribution to the pollen spectrum were selected. Once the Average Seasonal Pollen Index (AvSPIn) of each of them was established, all the pollen values accumulated during 24 hours that were higher than the 95, 97,5 or 99th percentile were established as EPE. The effect of the meteorological variables on the values corresponding to each percentile has also been analyzed, both on the day the EPE is recorded and on days previous.

RESULTS

The number of EPEs in Granada has increased in recent years for the pollen types of Cupressaceae, *Olea, Pinus* and *Populus*, in some cases with more than 10 days per year in which atmospheric pollen concentrations were higher than the 99th percentile. For most pollen types, the meteorological variables that have had the most effect have been those related to stable atmospheric conditions: high pressures, low relative humidity, low wind speed and no precipitation, usually the day on which the highest pollen concentrations are recorded.

CONCLUSIONS

The characterization of extreme pollen episodes of the main pollen types that contribute to the urban aerobiological spectrum, as well as the atmospheric conditions that favor these episodes, can help identify the maximum risk situations for the affected population of respiratory diseases associated with the presence of pollen atmospheric.

ID: 021
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: CLIMATE CHANGE

P.042 | Are Aerobiology and Anemophily two faces of the same reality?

Tiana Custodio, Paul Comtois
Géographie, Université de Montréal, CP 6128, Montréal, Canada, H3C 3J7

Keywords: scientometrics, aerobiological pathway, pollination, anemophily

BACKGROUND AND OBJECTIVES

Anemophily largely predominates pollination syndromes in gymnosperms, while only 10% of Angiosperms are anemophilous. This mode of pollination appeared at least 65 times independently in Angiosperms, a fact that highlights the ease of transition and questions its evolutionary success. Even taking into account the fact that aerobiology centers its interests on allergenic taxa (vg. Thommen's 1931 postulates), in both the anemophilous and the aerobiological landscapes of temperate regions prevail Betulaceae, Fagaceae, Juglandaceae, Salicaceae and Poaceae, among others. Along with this taxonomical convergence, Aerobiology used to be essentially a quantitative study of anemophily (vg. the anemophilometer used to determine which plants are wind-pollinated). Nowadays, they share little common ground.

MATERIAL AND METHODS

In order to understand how aerobiological tools and/or data have been used in pollination ecology studies, a scientometrics analysis was conducted on papers indexed from 1945 to 2020 at Thomson Reuters database. Each of the 234 search results was screened and 85 papers were selected as relevant.

RESULTS

Thirty-four papers focused on anemophilous species with only 12 using aerobiological tools. Twenty-nine papers indicated ambophilious species (wind and insect pollinated plants) with only 3 papers applying aerobiological techniques. In order to identify pollination mechanisms and/or pollen vectors, the majority of studies combined different approaches, the most common were analyses of floral morphology and bag pollination experiments with 47 and 41 papers, respectively.

CONCLUSIONS

Aerobiology and Anemophilous pollination studies are two different perspectives of the same Aerobiological pathway. Aerobiology focus on the first half of the pathway (source – emission - dispersal, i.e. the ascent phase of airscape) while pollination studies are centered on the second half (dispersal - deposition – impact (fertilization), i.e. the descent phase of airscape). Aerobiological tools and techniques are not only useful in pollination mechanism identification, but it also makes it possible to understand pollen dispersion patterns and the correlation between airborne pollen and environment factors.

ID: 056
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.043 | Intradiurnal dynamics of grass pollen occurrence in Kraków, Poland

Piotrowicz Katarzyna[1], Stępalska Danuta[2], Myszkowska Dorota[3]
1 Institute of Geography and Spatial Management, Jagiellonian University, Kraków, Poland
2 Institute of Botany, Jagiellonian University, Kraków, Poland
3 Department of Clinical and Environmental Allergology, Jagiellonian University Medical College, Kraków, Poland

Keywords: grasses, pollen variation

BACKGROUND AND OBJECTIVES

Grass pollen is the important agent causing pollinosis in Europe, where the pollen season falls between April and July according to the part of Europe. Aerobiological studies on seasonal and intradiurnal dynamics of pollen occurrence are decisive information for people sensitive to grass pollen. The aim of the study was to analyse daily and hourly patterns of pollen occurrence in dry, rainy and heavy rainy days in Kraków, in 2003-2019.

MATERIAL AND METHODS

Hourly pattern (in UTC+1 time) of grass pollen occurrence is presented using three curves for dry, rainy (0.1-5 mm) and heavy rainy (>5 mm) days, considering days with the diurnal pollen concentration higher than threshold values of 25 and 50 Pollen/m^3. Spearman's correlation test was used to establish the trend line, if any, for days with values over threshold. Cluster analysis was applied separately for days with >25 and ☒50 Pollen/m^3, to find pollen grains percentage in individual hours in dry, rainy and heavy rainy days.

RESULTS

The highest pollen grains number in dry days occurs between 10 am and 1 pm UTC+1. In rainy days the maximum number of pollen grains falls between 11 am and 1 pm, while in heavy rain most pollen grains concentrate between 6 am and 7 am. The declining trend line, statistically significant (α=0.05), was marked for days with >25 Pollen/m^3, while the trend line for days with >50 Pollen/m^3 slightly increased, statistically non-significantly. Cluster analysis exposed 3 groups of dry days with:(1) high grains percentage between 10 am and 1 pm, (2) high percentage between 5 am and 7 am, (3) high percentage between 5 pm and 7 pm. In rainy and heavy rainy days high percentage occurred between 6 am and 7 am, and for heavy rain additionally between 2 am and 6 am.

CONCLUSIONS

Cluster analysis revealed a few patterns of intradiurnal periodicity of pollen grains number in different weather conditions. The highest pollen grains number not always occurs around midday but also during the night and in the morning.

ID: 095
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.044 | Relationship between cereal harvest and concentration of grass pollens in Toledo area in the period from 1995 to 2019

Jose Alejandro Lemus Calderón, Raúl Gúzman Rodriguez, Angel Moral de Gregorio, Carlos Jesús Senent Sanchez
Allergy Service, Hospital Virgen del Valle, Toledo, Spain

Keywords: cereal harvest, grass pollens

BACKGROUND AND OBJECTIVES

The grass family is the most important botanical family from an economic point of view, encompassing all cereals and constituting 20% of the plant cover of the planet. In the Toledo area, two groups of cereals differ according to the planting season: winter (barley, oats, rye and triticale) and spring (corn and sorghum). The objective is to demonstrate the correlation that may exist between the levels of grass pollens and cereal production in Toledo.

MATERIAL AND METHODS

The concentration of grass pollens was measured with a Burkard collector installed on the roof of the Virgen del Valle Hospital in Toledo (39º 50´36´´north latitude, 4º 1´18´´ west longitude) at 620 m above sea level and following the criteria for the analysis of samples of the SEAIC Aerobiology Committee. Cereal production data from the Toledo area, were obtained from the website of the Ministry of Agriculture, Fishing and Food (www.mapa.gob.es). The data obtained were analyzed with the statistical program SPSS version 20.

RESULTS

From 1995 to 2019 an average concentration of grass pollens of 5170 grains / m3 and an average of 694.783 tons /year of harvested cereals have been determined, finding a correlation of R = 0.656 (p = 0.68). When separating the cereal groups, a correlation R=0.658 (p = 0.005) was found for winter cereals and grass pollens. In the case of barley the correlation was the highest R = 0.66 (p = 0.007). For the spring cereals and these pollens the correlation was lower R = 0,150 (p = 0.68). A linear regression was performed, obtaining the formula 289.285.96 + (55.24 x grass pollen) to calculate the tons of winter cereals.

CONCLUSIONS

We verify that there is a clear correlation between the concentrations of grass pollens and the harvest of cereals, specifically with those of winter in the Toledo area.
The cereal harvest, specially winter, could be estimated in relation to the amount of grass pollens obtained.

ID: 054
Session: RAGWEED AND BASIC AEROBIOLOGY
Topic: AGRONOMY AND FORESTRY APPLICATION

P.045 | Pla a 1 allergen and Platanus pollen in the atmosphere of Porto

Maria Fernández-González[1], Helena Ribeiro[2], Javier Rodríguez-Rajo[3], Ilda Abreu[4]

1 Earth Sciences Institute (ICT), Pole of the Faculty of Sciences UP. CITACA-Agri-Food Research and Transfer Cluster, Campus Auga, U.Vigo

2 Earth Sciences Institute (ICT). Department of Geosciences, Environment and Spatial Plannings of the Faculty of Sciences University of Porto

3 CITACA-Agri-Food Research and Transfer Cluster, Campus Auga, University of Vigo

4 Earth Sciences Institute (ICT). Department of Biology of the Faculty of Sciences University of Porto

Keywords: Platanus, Pla a1, Porto

BACKGROUND AND OBJECTIVES

Allergic disorders related to pollen are an important public health problem in Europe since 20% of the total people suffer from pollen-induced allergies (World Allergy Organization 2013). Plane trees are usually planted in urban areas as ornamental flora releasing pollen that can produce allergenic symptoms in sensitized people. The objective of the present study was to quantify the airborne Platanus pollen and Pla a1 content in Porto (Portugal) during the 2018 and 2019 years. The weather parameters influence in the pollen and allergen patterns distribution was also assessed.

MATERIAL AND METHODS

Platanus pollen sampling was performed using a Hirst volumetric sampler. Pla a1 aeroallergen was collected using a Burkard multivial Cyclone sampler and quantified by the ELISA method using a Pla a1 monoclonal antibody. A non-parametric Spearman´s correlation test was performed to analyse the relationship between daily pollen and allergen concentrations and the main weather parameters (maximum, minimum, average temperatures, rainfall and relative humidity).

RESULTS

Platanus main pollen season was shorter in 2019 than in 2018. The airborne annual pollen integral was 1.5 times lower in 2018 (735 pollen grains/m3, with a maximum daily pollen content of 73 pollen grains/m3) compared with 2019 (1116 pollen grains/m3, with a maximum daily pollen content of 145 pollen grains/m3). In addition, the Pla a1 content was higher in 2019 than 2018 (3.22 ng/m3 with peak value of 0.58 ng/m3 and 2.76 ng/m3 with a peak value of 0.37 ng/m3 respectively). The presence of airborne pollen and Pla a1 aeroallergen was significantly correlated with temperature, rainfall and relative humidity.

CONCLUSIONS

The Platanus allergenic load in the atmosphere of Porto was higher in 2019. The meteorological variables influence the presence of namely Platanus pollen and the Pla a1 allergen.

ACKNOWLEDGMENTS

Institute of Earth Sciences (ICT) funds, under contract UIDB/04683/2020 with FCT— The Portuguese Science and Technology Foundation and Scholarship (SFRH/ BDP/125686/2016) of M. Fernández-González. CITACA Strategic Partnership ED431E 2018/07 (Xunta de Galicia, Spain).

ID: 163
Session: HEALTH IMPACT
Topic: MOLECULAR AEROBIOLOGY

P.046 | Health Behaviour of Lithuania's Residents during the Airborne Pollen Season

Ingrida Šaulienė, Gintautas Daunys, Laura Šukiene
Siauliai university, P. Visinskio street 25, 76351 Siauliai, Lithuania

Keywords: allergic rhinitis, pollen load

BACKGROUND AND OBJECTIVES

The need for information on pollen load in the air is constantly increasing. Over the last few years, the number of persons diagnosed with pollen-induced allergic rhinitis, especially among children, was increasing in Lithuania. Taking medication is only one of the means for temporary health improvement. Avoidance of pollen allergens is another measure contributing to reducing health problems. The data of the pollen hay fever diary (PHD) enabled to evaluate how pollen load in Lithuania changes health behaviour.

MATERIAL AND METHODS

To conduct the study, the data of airborne pollen recorded in Lithuania between 2009 and 2019 and PHD data of the same period were used. The pollen load was calculated by taking into account the multiannual mean of pollen concentration per day. The analysis of health behaviour is related to pollen periods of *Corylus, Alnus, Betula, Poaceae,* and *Artemisia*. Depersonalized records of PHD users are analysed both with regard to ocular, nasal, pulmonary symptoms and considering the use of medication.

RESULTS

The comparative analysis of data demonstrated that a small share of users started to observe their health condition still before the beginning of the pollen season. Comparing the average pollen load with the number of PHD records, coincidence of records with the average annual pollen load is observed. The number of records has been tendentiously increasing every year. After considering the data about individually reported symptoms, it is observed that PHD users predominantly reported nasal symptoms. However, individuals start taking nose droplets later than medicine tablets. Having assessed PHD users' behaviour, it was identified that the significant increase in the number of records was related to the presence of *Betulaceae* pollen in the air in April. During 2009-2019, the average annual pollen amount reached more than 1500 pollen/m^3, while the number of records was more than 120 per day. During the bloom of the *Poaceae*, PHD users report an average of 60-80 cases related to worsening of health. During *Artemisia* pollen season, activeness of PHD users remains constant, although it is the least, compared to *Betulaceae* (*Corylus, Alnus, Betula*) and *Poaceae* pollen seasons.

CONCLUSIONS

The annual pollen load correlates best with the number records associated with allergy symptoms in 2018 and 2019.

The project has received funding from the Research Council of Lithuania (LMTLT), agreement No S-MIP-19-53.

ID: 036
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.047 | How to do a clinical trial? Recommendation from the aerobiological point of view

Katharina Bastl, Maximilian Bastl, Lukas Dirr, Uwe Berger
Research Group Aerobiology and Pollen Information, ORL-Department, Medical University of Vienna, Waehringer Guertel 18-20, 1090 Vienna, Austria

Keywords: allergy immunotherapy, clinical trial, aerobiological consultancy

BACKGROUND AND OBJECTIVES

The success of clinical trials or the efficacy of allergen immunotherapies (AITs) are strongly depending on aerobiological expertise. Hence this work will support the recommendations of the World Allergy Organization and the EAACI for clinical trials from an aerobiological point of view.

MATERIAL AND METHODS

Eight Hirst-type pollen traps distributed across 7 biogeographic regions of Austria were included in this study to show similarities or dissimilarities in the pollen season. Pollen concentrations of birch, grasses, mugwort and ragweed were evaluated to calculate a Gower's similarity coefficient based on the following criteria: (1) APIn, (2) Peak pollen concentration and (3) the start and end date of the respective pollen season based on the EAN season definition. The analyzed data covered the time from 2013 to 2017.

RESULTS

Pollen data had to be reviewed for each location for the last 5 years in order to guarantee its suitability for a given clinical trial. The trap needs to be located in close vicinity to the study center (up to 90 km, if possible, not more than 30 km), should have a complete data record and most important a significant exposure to the pollen type of interest.
The selection of a season definition (EAACI, EAACI related or EAN) may alter the start and end of the season and therefore has to be stated clearly. Forecasts have to be consulted before and during the trial to be able to react on sudden changes.
To minimize the risk of losing pollen data due to trap malfunctions, the similarity analysis of pollen traps will indicate proper substitutes (with values between 0.7 – 1.0).

CONCLUSIONS

To fulfill the European Medicine Agency (EMA) criteria, trials focusing on pollen allergy need to prove efficacy in the first pollen season. Therefore, the aerobiological expertise during such trials is of major importance. Sufficient exposure to the requested allergen, data quality, adequate season definition, availability of forecasts, a risk management plan and the involvement of mainly ISO-certified institutions will ensure a satisfactory level of aerobiological data in a trial.

ID: 038
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.048 | Chamber study of co-exposure to ozone and allergen

Pia Ørby[1], Jakob Bønløkke[2], Bo Martin Bibby[2], Peter Ravn[2], Ole Hertel[1], Torben Sigsgaard[2], Vivi Schlünssen[2]

1 Department of Environmental Science, Aarhus University, P.O. Box 358, Frederiksborgvej 399, 4000 Roskilde, Denmark

2 Department of Public Health, Aarhus University, Bartholins Allé 2, 8000 Aarhus, Denmark

Keywords: pollen allergen, air pollution, specific inhalation challenges, dose-response profiles, climate chamber

BACKGROUND AND OBJECTIVES

Coinciding exposures of ozone and pollen may aggravate allergic symptoms. However, most studies apply concentrations much higher than naturally occurring, hampering the translation to real-life situations. The majority of studies are performed on patients with allergic asthma, even though allergic rhinitis patients constitute a much larger group. According to the theory on "one airway, one disease" these patients will also have effects of the lower airways, however, this has not been fully studied. We therefore examined the effect of low-level ozone on the bronchial allergic response in rhinitis patients.

Most studies apply PD20 as a measure of responsiveness (dose eliciting 20% drop in 1. sec. forced expiratory volume), estimated by linear interpolation of log-dose-response curves. As the response pattern is rarely linear, we applied a novel non-linear regression model. Furthermore, we assessed the correlation between baseline characteristics and size of PD20.

MATERIAL AND METHODS

In a human exposure chamber, 36 participants with allergic rhinitis and no, or only mild asthmatic symptoms, underwent specific inhalation challenges (SIC) to grass or birch allergen and 120 ppb of ozone in a randomized single blinded cross-over study. 85 SICs were included outside the relevant pollen season. Dose-response profiles and PD20 were modelled by a four-parameter non-linear mixed regression model.

The association between PD20 and baseline characteristics was examined by linear regression.

RESULTS

The model showed a good fit to data. We found no statistical significant effect of co-exposure to ozone on PD20 (birch, p =0.35; grass, p= 0.14), or on the size or shape of the dose-response profiles. At baseline the size of the skin prick test for grass participants was clearly associated to PD20, with a 1 mm larger reaction resulting in a 27% (-40; 12, p= 0.0049) lower PD20.

CONCLUSIONS

A non-linear regression model fits dose-response curves well.

Results does not support that co-exposure to naturally occurring levels of ozone exacerbates the effect of pollen allergen. However, long term effects should be studied in epidemiological studies. This study illustrates a new method to model dose-response-curves.

ID: 064
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.049 | Early warning system application (APK) for patients with severe asthma

Alicia Armentia[1], Sara Fernández Cortés[1], Ángela Moro Simón[1], Sara Martín Armentia[1], Blanca Martín Armentia[1], David Astruga[2], Mariano Garuz[2], Alberto Rodríguez-Fernández[3], Delia Fernández-González[3]

1 University Hospital Rio Hortega, Valladolid, Spain
2 Biodata Devices sl., Valladolid, Spain
3 Department of Biodiversity and Environmental Management, University of León, León, Spain

Keywords: mobile application, pollen, severe asthma

BACKGROUND AND OBJECTIVES

The presence in the atmosphere of bioaerosol of vegetable origin is linked not only to the reproductive periods of plants and mushrooms, but also cutting of meadows, harvesting of cereals, winemaking practices and more. This study presents an APK tele-monitoring application for mobile devices, the aim of which is to provide patients with a personalized alarm to avoid asthma crises caused by environmental agents.

MATERIAL AND METHODS

A mobile application has been developed in an Android system, aimed exclusively at patients diagnosed with severe asthma. To create the application, several parameters were considered: a) Patient severity: from 22,000 clinical diagnoses carried out over 23 years, at the Rio Hortega Hospital, Valladolid (Spain); b) Environmental chemical agents: gas and airborne particles; c) Bioaerosol: pollen and fungal spores; d) Self-care: Peak Flow used in combination with a patient self-assessment questionnaire. These last two parameters offer a level of joint risk, concurrent with the level of external agents. Each of the mentioned parameters, and by means of an algorithm, was assigned a level (null, low, moderate, high) depending on their concentrations and the moment they occurred in relation to the patient's symptoms.

RESULTS

Depending on the concentrations of some air pollutants, risk values were determined for each allergen, in monosensitized patients, with the following levels: Null (0), Low (1), Moderate (4) and High (10). In polysensitized patients, the concurrence of risk levels of different pollen types was established to verify the possible increase in risk in each case. Once the appropriate calculations were made, the risk values were added, obtaining in the end a global value that indicates the level of concurrent risk of the patient, Null (0), Low (1), Moderate (2-9) and High ⩾10. Subsequently, a code was generated that uniquely identifies the patient's clinical picture. After entering its code in the application, the patients receive the recommendations or the relevant treatment.

CONCLUSIONS

The ASMALERT application provides each patient with a personalized alert, one week in advance, about the risk.

ID: 159
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.050 | Is Pla a 1 overexpression a feature of polluted environments?

Ana Rodrigues Costa[1], Beatriz Lara[2], Ana Galveias[1], Marta Otílio[1], Jesus Rojo[2], Célia M Antunes[1], Rosa Pérez-Badía[2]

1 University of Évora. Institute of Earth Sciences - ICT & Department of Chemistry, School of Sciences and Technology. Évora, Portugal

2 University of Castilla-La Mancha. Institute of Environmental Sciences (Botany). Avda Carlos III s/n. 45071 Toledo, Spain

Keyword: *Platanus hybrid,* allergen, ELISA, Wester blot, urban, rural

BACKGROUND AND OBJECTIVES

In polluted areas, the incidence of allergic respiratory disease is augmented, and allergic symptoms are aggravated. The *Platanus hybrida* is a very disseminated tree in man-inhabited spaces, both rural and urban, especially creating shade areas on traffic roads and gardens. The prevalence of allergy to *P. hybrida* pollen is currently considered moderate and probably is underestimated. Pollen from these trees, dispersed in early spring, contacts closely with air gaseous pollutants generated by automobile traffic, such as nitrogen oxides and ozone, whose effects on allergenic properties of the pollen are still unclear.

The aim of this work was to evaluate the effect of urban and rural environment on the major *P. hybrida* allergen the Pla a 1 level.

MATERIAL AND METHODS

Pollen was harvested in 2019, from similar size *P. hybrida* trees in Madrid, Toledo, Argés (rural) (Spain), Lisboa, Évora and Valverde (rural) (Portugal). For each location the pollen from different trees was pooled, in order to create a representative sample.

Pollen protein extracts was prepared: a) in bicarbonate buffered solution, followed by samples lyophilization for ELISA measurements; b) in phosphate buffered solution for western blot. Total protein was quantified by the BCA method. Pla a 1 allergen was quantified by specific ELISA. Western blot was used to evaluate Pla a 1 immuno-reactivity with sera from allergic individuals (pooled) and purified Pla a 1 was used as control.

RESULTS

Pollen Pla a 1 content was equivalent in the four cities (1806±149, 1893±119, 1849±336 and 1525±179 ng Pla a 1/mg protein for Madrid, Toledo, Lisbon and Évora, respectively) and was lower in rural areas (1382±149 and 1121±52 ng Pla a 1/mg protein in Argés and Valverde, respectively). Pla a 1 immunoreactivity to allergic sera, assessed by western blot, was also lowered in pollen extracts originated from rural areas.

CONCLUSIONS

The results suggest that the characteristics of an urban environment, potentially related with road traffic, affects Pla a 1 content and consequently pollen allergenicity. Further studies will be needed to identify the factors that lead to the increased expression of Pla a 1 in urban environments.

ID: 194
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.051 | Allergenic effects of Air-Liquid-Interface exposures to natural whole pollen with or without diesel particles

Joana Candeiras[1], Elias Zimmermann[2], Christoph Bisig[2], Sebastian Öder[2], Ralf Zimmermann[2,3], Carsten Schmidt-Weber[1], Jeroen Buters[1]

1 Zentrum Allergie und Umwelt, Technische Universität and Helmholtz Zentrum München, Germany
2 Comprehensive Molecular Analytics, Helmholtz Zentrum München, Germany
3 Joint Mass Spectrometry Centre, Rostock University (Analyt. Chem.) & Helmholtz Zentrum München (HMGU/CMA), Munich/Rostock, Germany

Keywords: Air-Liquid-Interface, pollen, pollution

BACKGROUND AND OBJECTIVES

Allergies are on the rise since the 1950-ies. Disparities in allergy rates in similar populations living under different environmental conditions raises the importance of more research in this field. Studies performed until now use pollen extracts, which does not mimic real life exposures. Real-life exposure is exposure to dry and whole pollen at the air-nasal epithelium: Air-Liquid-Interface (ALI). Our aim was to develop a pollen exposure chamber that allows exposure of cells, at ALI, to whole pollen and study the adjuvant effect of diesel exhaust particles on the increase of allergic diseases.

MATERIAL AND METHODS

Our Pollen Exposure Chamber was successfully built. We exposed BEAS-2B cells sequentially to whole pollen in our Pollen exposure chamber and then to diesel exhaust particles (DEP) in a VITROCELL® ALI (two different ALI). Total RNA was extracted and Agilent Cy3-Microarrays were performed for transcriptomic analysis.

RESULTS

One day after being exposed to Diesel-CAST, BEAS-2B were exposed to birch pollen and incubated for different times. Viability and cytotoxicity of the cells did not show any effect. A concentration between 150-300µg/m3 of DEP was obtained when using the Diesel-CAST, were about 90%±5 can be considered Black Carbon particles. The upregulation of allergy-relevant pathways was demonstrated for the birch pollen exposure alone. An increase of the gene expression was obtained when Diesel-CAST exhaust was added to the further exposure.

CONCLUSIONS

Our vitro Pollen Exposure Chamber allows real life exposure doses of natural pollen to cells at ALI. Allergy-relevant pathways were higher expressed when epithelial cells were exposed to diesel exhaust prior birch pollen exposure. Our study prove that environmental exposure plays a role in the onset of allergic diseases.

ID: 208
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.052 | Effect of the airborne Betulaceae pollen and Bet v1 content in the symptomatology of sensitized patients

Rodríguez-Rajo F.J.[1], Estévez-Valencia L.[2], Fernández-González M.[1,3], Sánchez-Sánchez N.J.[2], Alves-Pérez M.T.[2], Hernández-Gómez M.A.[2]

1 CITACA. University of Vigo. "As Lagoas". 32004 Ourense. Spain.
2 SERGAS. Centro de Saúde Novoa Santos. 32004 Ourense. Spain.
3 Earth Sciences Institute (ICT), Faculty of Sciences, University of Porto, Porto, Portugal.
Email address: javirajo@uvigo.es

Keywords: *Alnus*, *Betula*, allergens, allergic rhinitis, pollen

BACKGROUND AND OBJECTIVES

Birch pollen is a frequent cause of allergic rhino conjunctivitis within northern America and Europe, with around 100 million people sensitized to the major allergen Bet v 1. The aim of the study is to evaluate the relationship between the symptoms of people affected by birch allergic rhinitis and the atmospheric *Betula* and *Alnus* pollen, and Bet v 1 concentrations.

MATERIAL AND METHODS

The study was conducted in Ourense (NW Spain), during the 2017 *Alnus* an *Betula* pollen seasons. Sampling was conducted with a Lanzoni VPPS-2000 volumetric trap for pollen, and a Multi-Vial Cyclone Sampler for the allergens. Specific 2-site ELISA and Bet v 1 antibodies were used for allergen quantification. One-year prospective observational study for the evaluation of symptoms in patients between 18 and 65 years of age diagnosed with birch seasonal allergic rhinitis was also conducted. The clinical variables were subjective intensity of symptoms (null, mild, moderate and severe), use of antihistamine, history of asthma and treatment with immunotherapy.

RESULTS

The *Alnus* pollen and its allergens were detected from the first ten days of January to the second ten days of February. *Betula* pollen grains and Bet v1 allergen were registered from the second half of March to the end of April. An innovation of our study was the first detection of the Aln g1 allergens in the atmosphere by using Bet v1 antibodies. This fact verified the cross-reactivity between the main allergens of the *Betula* and *Alnus* pollen. From 35 patients diagnosed with pollinosis, 10 of them registered positive skin prick test to birch pollen. The higher symptomatology was detected during the pollen and allergen higher concentrations. Some of the patient also observed symptomatology episodes also during the alder flowering.

CONCLUSIONS

The combination of the pollen concentrations and the allergenic proteins quantification can be used as a tool for predict the allergy risk periods to *Betula* and thus alert to sensitize people.

ID: 087
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.053 | Ole e 1 detection in three varieties of Olea pollen in different regions of Portugal

Fernández-González, M.[1,2], Ribeiro, H.[1,3], Rodríguez-Rajo, F.J.[2], Abreu, I.[1,4]
1 Earth Sciences Institute (ICT), Pole of the Faculty of Sciences University of Porto, Porto, Portugal.
2 CITACA-Agri-Food Research and Transfer Cluster, Campus Auga, University of Vigo, 32004-Ourense, Spain.
3 Department of Geosciences, Environment and Spatial Plannings of the Faculty of Sciences University of Porto, Porto, Portugal.
4 Department of Biology of the Faculty of Sciences University of Porto, Porto, Portugal.

Keywords: *Olea*, Ole e 1, varities

BACKGROUND AND OBJECTIVES

Airborne pollen is considered as the main cause of rhinitis, asthma and related allergic disease with a tendency to their incidence increase. *Olea* trees are usually planted in rural areas as superintensive crops releasing a high amount of pollen. The objective of the present study was to quantify the Ole e1 major allergen content in the pollen of the Arbequina, Picual and Cobrançosa varieties in four years, and to analyse how weather variables can affect the patterns of allergen distribution.

MATERIAL AND METHODS

Olea pollen in the anthesis stage was collect in Trás-os-Montes, Santarém and Elvas (Portugal). The samples were dried at 24ºC and the pollen was released by passing through different grades of sieves in order to obtain pure pollen. Pollen grains (10 mg) were suspended in 1 mL of phosphate-buffered saline (pH 7.4) at 4 ºC. Soluble proteins were extracted by continuous stirring for 3h. The suspension was centrifuged at 13.200 rpm for 30 min at 4 ºC. Ole e1 aeroallergen in the supernatant was quantified by ELISA method using an Ole e1 specific antibody. The one-way ANOVA and the Turkey post hoc test were used to detect interannual differences. A non-parametric Spearman´s correlation test was performed to analyse the relationship between allergen concentrations and the main meteorological parameters.

RESULTS

A higher protein concentration was registered for the Cobrançosa and Arbequina varieties in the Northern Trás-os-Montes region with a maximum peak in 2013 of 221.41 µg/mL and 212.50 µg/mL respectively. The Picual variety was evaluated in two regions, Santarém and Elvas. The higher protein concentration in Santarem was registered in 2012 with 139.72 µg/mL. The year with higher protein concentration in Elvas was 2010 (112.98 µg/mL). The weather variables with better correlations with the allergen content were maximum and minimum temperatures and relative humidity.

CONCLUSIONS

The allergen concentration was different depending on the varieties and the study regions. These results can be related with several factors, such as meteorological variables, plantation structure or soil nutrients, which determinate the diferences in the allergen concentrations.

ACKNOWLEDGEMENTS

National Funds through FCT —The Portuguese Science and Technology Foundation for the project PTDC/ATP-EAM/0817/2014 and Scholarship (SFRH/ BDP/125686/2016) of M. Fernández-González. CITACA Strategic Partnership ED431E 2018/07 (Xunta de Galicia, Spain).

ID: 131
Session: HEALTH IMPACT
Topic: AGRONOMY AND FORESTRY APPLICATION

P.054 | Comparison of Poaceae pollen and Phl p 5 allergen concentrations in the bioaerosol of two monitoring stations in Bratislava (Slovakia)

Jana Ščevková[1], Zuzana Vašková[1], Regina Sep šiová[2], Janka Laffársová[3]

1 Comenius University in Bratislava, Faculty of Natural Sciences, Department of Botany, Bratislava, Slovakia

2 Comenius University in Bratislava, Faculty of Natural Sciences, Department of Genetics, Bratislava, Slovakia

3 Public Health Office, Department of Environmental Biology, Banská Bystrica, Slovakia

Keywords: grass pollen, aeroallergens, ELISA assay

BACKGROUND AND OBJECTIVES

The grass pollen is the main cause of pollinosis in European countries. Several grass allergens have been identified. Phl p 5 is an important allergen recognised by the majority of grass sensitized individuals. The study aims to investigate the relationship between the atmospheric concentrations of Poaceae pollen and Phl p 5 allergen, to determine whether airborne pollen concentrations alone are sufficient to reflect the actual allergenic potential of the air. The influence of major meteorological parameters on airborne pollen and allergen concentrations was also examined.

MATERIAL AND METHODS

The aerobiological data were recorded at two monitoring sites situated in Bratislava city (6 km apart) by using a volumetric Hirst-type pollen trap for grass pollen and a volumetric multi-vial cyclone sampler for Phl p 5 allergen from April to October 2019. Allergenic molecules were measured by ELISA assay.

RESULTS

The higher pollen concentrations were registered in the monitoring station situated in the north-east part of the city, with the Seasonal Pollen Integral by 30.6 % higher than in the station situated in the north-west part. The associations between pollen and allergen concentrations showed that these two variables are significantly and positively correlated. However, during some days of the flowering season, the allergen concentrations did not correspond to the airborne pollen values. Based on the results of Spearman correlation analysis, surface air temperature and rainfall are considered the meteorological factors that the most significantly influenced the airborne grass pollen and Phl p 5 concentrations. The association with air temperature was positive, whereas the association with rainfall was negative.

CONCLUSIONS

The results suggest that both pollen and aeroallergen data may be used in the clinical follow-up of grass pollen sensitive patients.

ID: 168
Session: HEALTH IMPACT
Topic: BASIC AEROBIOLOGY

P.055 | Personal symptom forecasting vs allergy risk: longitudinal and cross-sectional approaches to predicting pollen allergy

Mikhail Sofiev[1], Julia Palamarchuk[1], Olga Sozinova[2], Rostislav Kouznetsov[1], Uwe Berger[3], Jean Bosquet[4]

1 Finnish Meteorological Institute
2 University of Latvia
3 Medical University of Vienna
4 University Hospital Montpellier

Keywords: symptom forecasting, allergy risk, patient hayfever diary, MASK-Air

BACKGROUND AND OBJECTIVES

Principal possibility and the first practical realizations of the personalised allergy symptom forecasting have been recently demonstrated within the Copernicus Use Case PASYFO and EIT Health POLLAR projects, which used the symptom collecting mobile applications Patient Hay Fever Diary and MASK-Air, respectively, to collect the symptom reports voluntarily provided by users of the apps. Combining this information with retrospective and real-time air quality and pollen forecasts of the Copernicus European ensemble and the SILAM model, a Symptom Forecasting Model has been developed by Finnish Meteorological Institute

MATERIAL AND METHODS

The SFM is a collection of statistical instruments for preprocessing the input data (AQ forecasts, pollen concentrations, and symptom reports) and building a multi-regression model capable of short-term prediction of the future allergy symptoms on their basis.

RESULTS

The SFM has been applied to the symptom collections of PHFD and MASK-Air investigating the possibilities and practical applicability of the personalised symptom forecasting in Europe – the longitudinal approach (based on individual time series). It was shown that for a fraction of the regular users of the apps, the SFM was able to generate high-quality forecasts (with temporal correlation coefficient exceeding 0.8). This fraction varied for different types of allergy symptoms, in best cases mounting to a half of the regular-users pool.
A complimentary approach started within POLLAR followed cross-sectional pathway, predicting the "typical" allergy risk by combining the symptom scores and formal model predictions of AQ and pollen. This line, albeit in its infancy, showed high potential for generating representative allergy risk maps, analogously to various AQ indices widely used for regulatory and public information purposes.

CONCLUSIONS

Development and applications of the Symptom Forecasting Model for personalized longitudinal and generalized cross-sectional analysis showed principal possibility of both directions. It was possible to differentiate between risk maps and AQIs for different types of allergy symptoms confirming that the generic AQI does not actually exist and disease-specific AQIs should be used.

ID: 150
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.056 | Personal and regional exposure to birch pollen and the risk of allergic and asthmatic manifestations

Timo T Hugg[1], Qianlai Luo[1], Taina K Lajunen[1], Maritta S Jaakkola[1], Jouni JK Jaakkola[1]

1 Center for Environmental and Respiratory Health Research, P.O.Box 5000, FIN-90014, University of Oulu, Oulu, Finland

2 Medical Research Center Oulu, Oulu University Hospital and University of Oulu, P.O.Box 5000, FIN-90014, University of Oulu, Oulu, Finland

Keywords: allergic manifestation, birch pollen, exposure

BACKGROUND AND OBJECTIVES

Previous studies, mainly based on regional pollen monitoring have provided evidence that pollen grains can cause symptoms among allergic and asthmatic people, but little is known about potential effects of daily personal pollen exposure on daily allergic and asthmatic manifestations. The objective of study was to assess potential relations between short-term (daily) personal and regional exposure to birch pollen and occurrence of manifestations of different allergies and asthma among adults with allergic rhinitis and/or asthma.

MATERIAL AND METHODS

Altogether 19 participants who had allergic rhinitis and/or asthma monitored their daily personal pollen exposure (IOM Personal Sampler) as well as registered their daily symptoms. This study was conducted among the Espoo cohort members between April 18 and May 24, 2014, in the Helsinki Metropolitan Area during the birch pollen season. Information on regional pollen concentrations was also collected.

RESULTS

Exposure to birch pollen was found to vary substantially between the participants. The mean daily personal and regional pollen exposures varied between 20–16773 and 18–27435 pollen grains/m3, respectively. Worsening of both allergies and asthma control followed the peaks of birch pollen. Allergy control followed the trend of pollen exposure more closely. Whereas, the asthma control remained at a reduced level after the major pollen peak. The peak appearance of the symptoms occurred in a following order: nasal, throat / skin, ocular and lower respiratory symptoms. The study subjects reported poorer allergy control on days with abundant and extremely abundant pollen concentrations when compared to days with moderate pollen concentration (for abundant regional p=0.004 and extremely abundant regional exposure p=0.000).

CONCLUSIONS

Despite of substantial variation in pollen exposure there were clear and uniform trends in the responses to regional and personal pollen exposure among subjects with allergic diseases and asthma. Responses to birch pollen exposures differed between allergic and asthmatic people.

ID: 114
Session: HEALTH IMPACT
Topic: HEALTH IMPACT

P.057 | Influence of weather types and meteorological conditions on pollen concentration in NW Spain

F. Oduber[1], C. Blanco-Alegre[1], A.I. Calvo[1], A. Castro[1], D. Fernández-González[2,3], R.M. Valencia-Barrera[2], A.M. Vega-Maray[2], A. Rodríguez-Fernández[2] and R. Fraile[1]

1 Department of Physics (IMARENAB), University of León, León, Spain.
2 Department of Biodiversity and Environmental Management, University of León, León, Spain.
3 Institute of Atmospheric Sciences and Climate, National Research Council, Bologna, Italy.
Presenting author email: delia.fernandez@unileon.es

Keywords: pollen, circulation weather types, meteorology

BACKGROUND AND OBJECTIVES

Meteorological conditions influence the atmospheric processes of dilution, transport and elimination of bioaerosols. The concentration of bioaerosols in the atmosphere is also linked to the occurrence of specific weather characteristics (including wind speed and velocity) induced by mesoscale processes. Thus, the main objective of this study is to analyze the concentration of 20 pollen types under different circulation weather types (CWT) and the relationship with the meteorological conditions.

MATERIALS AND METHODS

The sampling campaign was carried out between 2012 and 2018 in León (Spain). Pollen was collected by a volumetric *Hirst* type spore-trap and quantified by optical microscopy. A CWT classification, based on Lamb (1972), was carried out according to the following notation: C (cyclonic) or A (anticyclonic) followed by the cardinal point. In addition, a weather station recorded meteorological variables.

RESULTS

The cyclonic easterly weather type, CE, has the highest total daily pollen concentration (163 pollen m^{-3}), followed by easterly, E, and cyclonic northwesterly, CNW (95 and 93 pollen m^{-3}, respectively). The occurrence of these CWT is less than 5% of the total sample days, and the frequency is higher during spring. *Platanus, Populus* and *Quercus* showed the highest concentration in these weather types. Days with these CWTs are characterized by low precipitation (mean of 0.1 mm day^{-1} for CE and E, and 5.1 mm day^{-1} for CNW), by mean temperatures of about 12 ºC and relative humidity of 54% (CE, E) and 70% (CNW). The lowest total pollen concentration was recorded in the cyclonic southerly type, CS (4.7 pollen m^{-3}). *Cupressaceae* shows the highest concentration during these days. This CWT is more frequent in autumn (65% of the days) and is characterized by a precipitation of 1.1 mm day^{-1}, a mean temperature of 10.4 ºC and a relative humidity of 78%.

CONCLUSIONS

The knowledge of weather types and meteorological conditions could be a helpful tool for daily pollen forecast and trend analysis.

COMMENTS

This work was partially supported by the Spanish Ministry of Economy and Competitiveness (Grant TEC2014-57821-R), the University of León (Programa Propio 2015/00054/001) and the AERORAIN project (Ministry of Economy and Competitiveness, Grant CGL2014-52556-R, co-financed with FEDER funds). F. Oduber acknowledges the grant BES-2015-074473 from the Spanish Ministry of Economy and Competitiveness. C. del Blanco Alegre acknowledges the grant FPU16/05764 from the Spanish Ministry of Education. The authors are grateful to the Health Department of the Castilla and León Government for funding the RACYL.

ID: 079
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

P.058 | A hazel density distribution over Europe for numerical pollen modelling

Kalcher, M., Scheifinger H.
ZAMG, Hohe Warte 38, 1190 Wien, Austria

Keywords: hazel, plant density, numerical modelling

BACKGROUND AND OBJECTIVES

The distribution and density of the pollen emitting plants are one of the basic parameters to be supplied for the purpose of a numerical simulation and forecast of the emission and dispersion of allergenic pollen in the atmosphere. Although information on the distribution and density of plants does not vary much from season to season, it is not readily available. If a new pollen species is to be added to numerical pollen forecast system, the bits and pieces of information for the best possible estimation of the plant's distribution and density have to be collected from various sources.

MATERIAL AND METHODS

The European pollen season usually starts with hazel, which may release pollen during warm spells already in December. In this work we have compiled the following entities for the estimation of the distribution and density of hazel:

· the Austrian forest inventory on hazel density in forested areas classified in 9 Austrian sub-regions and 5 elevation intervals

· the distribution of hazel over Europe; hazel has a southerly (Mediterranean), northerly (Scandinavia) and elevation limit

· Globe Cover land use inventory; land use classes with vegetation were related with estimated hazel densities

· manual hazel counts for each Globe Cover land use class with vegetation cover

· long term average hazel pollen concentration distribution over Europe to be used for weighting the Globe Cover land use class estimations of hazel density

RESULTS

Finally, combining the above sources of information, a hazel density distribution could be calculated for Europe.

CONCLUSIONS

Although no direct information on hazel density in Europe is readily available, a reasonable first guess can be deduced through forest inventories, distribution maps, land use inventories, manual plant counts and long term hazel pollen distributions for the purpose of numerical pollen modelling.

ID: 178
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

P.059 | Preliminary results from the Irish Fungal Monitoring Network, Fungal mOnitoring NeTwork ANd Algorithm (FONTANA)

Jerry Hourihane Clancy, Emma Markey
School of Chemical and Pharmaceutical Sciences, Technological University Dublin, Kevin Street, Dublin 8, Ireland

Keyword: fungal monitoring, forecasting

BACKGROUND AND OBJECTIVES

After the successful launch of the Irish pollen monitoring network expansion into fungal monitoring via traditional and novel real-time monitors, was undertaken to create of Ireland's first bioaerosol network (namely Project FONTANA).
The goals of this work are to show the analysis of the first data outputs of the FONTANA project (2018-2019), the comparison of this data with an unpublished historical fungal spore dataset from Ireland (1978-1980). Equally real-time devices were compared vs traditional fungal spore counts for 2019.

MATERIAL AND METHODS

· Fungal spore data was collected using Lanzoni/Burkard 7-day volumetric samplers, followed by optical analysis in Dublin for both historical and contemporary data sets.
· 15 fungal spores were analyzed over both time periods. These include *Alternaria*, Ascospores, Basidiospores, *Botrytis*, *Cladosporium*, Downy Mildew, *Epicoccum*, *Erysiphe*, *Ganoderma*, *Polythrincium*, Rusts, *Scopulariopsis*, *Tilletiopsis*, *Venturia*, and Yeasts
· Real-time monitoring of fungal spores utilizing both the WIBS-4 and IBAC2 was undertaken and both devices were co-located with a Lanzoni 7-day volumetric sampler.
· The Main Fungal Fructification Period for the fungal spore dataset was calculated using the 90% methods, wherein the start of the period is when 5% of the cumulative annual fungal spore concentration has been reached, and the end of the period is when 95% of the total is reached.

RESULTS

The historical dataset showed that the breakdown of recorded fungal spores was as follows: Basidiospores 37.3%, *Cladosporium* 30.4%, Ascospores 26.6%, Rusts 2.3%, *Erysiphe* 1%, Others 2.4%
The construction of the historical fungal calendar showed that while fungal spores were sampled year-round, the main periods for the majority of fungal spores occur in the summer months (May-July). *Ganoderma* however was generally seen earlier (end of February), while *Polythrincium's* peak was noted in the middle of August.
Real-time devices showed correlation for fluorescent particle peaks relative to each other (R =0.6, WIBS-NEO vs IBAC2). While also correlating with certain fungal types (eg. ascospores).

CONCLUSIONS

A fungal spore historical dataset showing the main Fungal Fructification Periods was created using previously unpublished fungal spore data. Basidiospores were noted to be the most prevalent fungal spore from the historical data set, which along with *Cladosporium* and Ascospores, accounted for 94.6% of all fungal spores recorded. Real-time instrumentation show promise in the detection of fungal spores, however more analysis is needed. This will be built upon in further studies.

ID: 175
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

P.060 | Below cloud scavenging of pollen during rainfall events (2012-2018) in NW Spain

Carlos Blanco-Alegre[1], Ana Isabel Calvo[1], Fernanda Oduber[1], Amaya Castro[1], Delia Fernández-González[2], Rosa María Valencia-Barrera[2], Ana María Vega-Maray[2], Alberto Rodríguez-Fernández[2], Tibor Molnár[3], Roberto Fraile [1]

1 Department of Physics (IMARENAB), University of León, León, Spain
2 Department of Biodiversity and Environmental Management, University of León, León, Spain
3 Institute of Agricultural Sciences and Rural Development. Szent Istvan University, Szarvas, Hungary

Keywords: air quality, rain, scavenging

BACKGROUND AND OBJECTIVES

Nowadays, air pollution is one of the main concerns of human health. It is caused by several pollutants, such as bioaerosols (like pollen, fungal spore, bacteria), that are related to human diseases such as influenza, lungs diseases and allergies. One of the main sinks of bioaerosols is the scavenging by rain. The main aim of this study is to analyze the evolution of pollen concentration during rain events with different rain intensities.

MATERIAL AND METHODS

Between 2012 and 2018 in the NW Spain (León) a sampling campaign was carried out. The instruments used were: i) a Laser Precipitation Monitor to register rain variables on a 1-minute basis; ii) a volumetric Hirst type spore-trap to estimate the hourly pollen concentration; iii) a Davis weather station to register the meteorological variables. 20 types of pollen were selected, those that cause more respiratory allergies and with the highest concentration in León. Below Cloud Scavenging has been analyzed through the scavenging efficiency (ΔC%) estimated as ΔC% = ((C2-C1)/C1)100 to evaluate the change in pollen concentration (C) between the times t1 and t2. A selection criterion of events has been applied on meteorological and rain variables, to extract the influence of meteorological variables during rain events. Besides, the correction by the daily pattern of each type of pollen has been taken into account to eliminate its influence.

RESULTS

184 rain events met the selection criteria. They presented a mean duration of 119 minutes, a mean rain accumulated of 2.30 mm and a mean rainfall intensity of 0.59 mm h-1. 78 % of the total events presented effective scavenging (mean ΔC% = 46±28 %). Events with intensities between 1-5 mm h 1 caused the highest scavenging (67 %) on pollen concentration. With low intensity (

CONCLUSIONS

Rain characteristics affect the effective scavenging of pollen and this washing effect depends on the type of pollen. Thus, this kind of studies constitutes a valuable tool for the pollen forecast after a rainfall event.

ID: 025
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

P.061 | Variations in Corylus pollen exposure in Lombardy (Northern Italy)

Maira Bonini[1], Valentina Ceriotti[1], Daniela Carcano[1], Giuseppe Cislaghi[1], Paola Colombo[1], Susanna Dellavedova[1], Elena Chiodini[2], Daniele Berra[2], Marco Maggi[2], Anna Molinari[3], Simona Vercelloni[3], Paolo Mascagni[4], Elena Ferraioli[4], Maria Cristina Tacca[4], Antonio Meriggi[5], Ezio Bellinzona[5], Alberto Pini[6], Barbara Paganoni[6], Cristina Somenzi[7], Attilio Bertolotti[7], Nicoletta Cornaggia[8], Agostina Panzeri[8], Maria Gramegna[8]

1 Agency for Health Protection of Metropolitan Area of Milan, Milan, Italy
2 Ospedale di Circolo, ASST Valle Olona, Busto Arsizio, Varese, Italy
3 Prevention Laboratory, ATS Brianza, Oggiono, Lecco, Italy
4 Desio Hospital, ASST Monza, Desio, Italy
5 Allergy and Immunology Unit, ICS Maugeri IRCCS Pavia, Italy
6 Prevention Laboratory, ATS della Montagna, Sondrio, Italy
7 Prevention Laboratory, ATS Val Padana, Mantova, Italy
8 Prevention Unit, General Directorate for Welfare, Lombardy Region, Italy

Keywords: *Corylus*, pollen exposure, impact on health

BACKGROUND AND OBJECTIVES

Corylus is one of the first tree to flower and releases large amounts of pollen in the air mainly from the end of December to the end of March. The aim of this study was to analyze geographic and temporal variations in *Corylus* pollen exposure across Lombardy.

MATERIAL AND METHODS

Pollen data were collected by 8 airborne pollen monitoring stations across Lombardy by using a volumetric Hirst spore traps. Daily average pollen concentrations were expressed as particles per cubic meter of air (p/m3). Observation period ranged between 2008 and 2019. The Annual Pollen Integral (API), the peak value, the peak day and the number of days when daily average concentrations exceeded 1 p/m3 were examined. Trends were calculated using a nonparametric statistical – Cox and Stuart test ($p < 0.05$ significant). Allergy clinics in the surroundings of the pollen monitoring stations provided the clinical data.

RESULTS

Sondrio (S) showed the greater API max (6843) in 2018; the lower API max (145) was found in Mantova (M) in 2017. The highest peak value (718) was observed in 2019 in Legnano (L) and the lowest in 2017 in M (14). The year of peak max and the year of API max coincided in L (2019), S (2018), M (2017) and Pavia (P) (2016). P showed the longer season (148 days when daily average concentrations exceeded 1 p/m3 in 2019). A significant peak value downtrend was observed only in Busto Arsizio (BA) ($p=0.016$). No significant trends were observed regarding other parameters. About the clinical impact, long-term complete data were available only in few cases, showed a fluctuating trend.

CONCLUSIONS

This is the first assessment of the exposure to *Corylus* pollen in Lombardy. Any significant trends were observed, except a peak value downtrend in BA. In the North, the population seems to be exposed to a greater concentration of *Corylus* pollen. Indeed the API and the peak value are higher than in the South. While the duration of the *Corylus* pollen season seems longer in the South. An improvement in the recording of clinical data would be required to better assess the impact of the variations in *Corylus* pollen exposure on pollen sensitization.

ID: 027
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.062 | Pollen spread in Mediterranean Basin

M.A. Brighetti[1], A. Travaglini[1], P.M. Matricardi[2], A. Miraglia[1], S. Dramburg[2]
1 Department of Biology, Tor Vergata University, Rome, Italy.
2 Department of Pediatric Pneumology, Immunology and Intensive Care Medicine, Charité Medical University, Berlin, Germany.

Keywords: pollen season, Mediterranean Basin

BACKGROUND AND OBJECTIVES

Pollen is a major cause of respiratory allergies. The diffusion of pollen into the atmosphere depends on the vegetation and the phenology of the plants. The @IT.2020 multicenter study was supported by a grant from Euroimmun (code 118583), and it aims to carry out a quantitative and qualitative analysis of the pollen of the most common pollen taxa in the Mediterranean area, and to verify any differences regarding the descriptors of the pollen season.

MATERIAL AND METHODS

The @IT.2020 multicenter study was carried out in nine European cities, all located in the biogeographical Mediterranean Region: Oporto (Pt), Vila Real (Pt), Valencia (Es), Marseille (Fr), Rome (It), Messina (It), Tirana (Al), Athens (Gr), Istanbul (Tr), Izmir (Tr). The pollen data have been collected in the year 2018, in compliance with current regulations.
They have been considered 6 of the major allergenic *taxa*, characteristic of the Mediterranean region: Amaranthaceae, Cupressaceae, *Olea*, Platanaceae, Poaceae, Urticaceae. For each *taxon* the pollen trends were elaborated, considering phenological indicators and production indicators (Jäger et al., 1996).
The 25.0 IBM-SPSS Statistics Software was used to evaluate the significative correlations between the sampling sites to the same bioclimatic region.

RESULTS

Excluding Cupressaceae, latitude is the parameter that most influences the start of the pollen season and the pollen dispersion in the air.

CONCLUSIONS

The next step will be to evaluate how the climatic characteristics influence flowering inside the Mediterranean basin, through the valutation of additional parameters, such as meteoclimatic variables and geographical descriptors.

ID: 207
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: BIOAEROSOLS

P.063 | Influence of extreme winter temperatures on the airborne pollen parameters in NE Iberian Peninsula

Cristina Periago[1], Marta Alarcón[1], Jiang Ji Ho[1], Concepción De Linares[2], Jordina Belmonte[2]
1 Departament de Física. Universitat Politècnica de Catalunya (UPC). Av Eduard Maristany, 16. 08019 Barcelona.
2 Institut de Ciència i Tecnologia Ambientals (ICTA) i Dept Biologia Animal, Vegetal i Ecologia. Universitat Autònoma Barcelona (UAB). 08193 Bellaterra

Keywords: aerobiology, winter extreme temperatures, NE Spain

BACKGROUND AND OBJECTIVES
Many studies have been conducted to examine the relationship between airborne pollen concentrations and the meteorological variables temperature, precipitation, insolation, etc. It has been demonstrated that temperature is the most important factor affecting the timing of flowering in spring blooming temperate species. In the context of global change, extreme temperatures (Tmax > 90th percentile, Tmin < 10th percentile) are being considered as a relevant factor for plants, since they can develop physiological and phenological strategies to survive. However, the effect of these extreme temperatures has been little studied.

MATERIAL AND METHODS
The present study explores the influence of extreme winter temperatures (from December to March) on the pollen dynamics of seven taxa (*Olea, Pinus, Pistacia, Plantago, Platanus*, Poaceae and, *Quercus* deciduous type) collected at six stations in Catalonia: Barcelona, Bellaterra, Girona, Lleida, Manresa and Tarragona. Correlations between the number of days with extreme temperatures during the previous winter and the main standardized pollen parameters (Annual Pollen Integral, the date and the intensity of the pollen concentration peak, and the start, the end and the length of the pollen season) have been calculated.

RESULTS
The start of the main pollen season is the pollen parameter that is by far the most correlated with extreme winter temperatures. The higher the number of days with extremely high temperatures, the earlier the start of the pollen season (negative correlation in all the stations). In the same way, the higher the number of days with extremely low temperatures, the later the start of the pollen season (positive correlation in all the stations). *Platanus* is the pollen type that shows a higher number of significant correlations, followed by *Pinus* and *Olea*. Bellaterra and Tarragona are the stations giving a higher number of significant correlations.

CONCLUSIONS
Extreme winter temperatures have a great influence on the timing of the pollen season of taxa with a pollination season that lasts from spring until summer or autumn.
Warm winters seem to advance the start of the pollination and extend its length.

ID: 113
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: BIOAEROSOLS

P.064 | Trends of airborne fungal spore concentrations in Belgium: a multi-site analysis on almost four decades

Nicolas Bruffaerts[1], Lucie Hoebeke[1], Caroline Verstraeten[1], Andy Delcloo[2], Marijke Hendrickx[1]
1 Belgian Federal Health Institute (Sciensano), Rue Juliette Wytsmanstraat 14, 1050 Brussels, Belgium
2 Belgian Royal Meteorological Institute (RMI), Avenue Circulaire 3, 1180 Brussels, Belgium

Keywords: fungal spore, trend analysis, aerobiological surveillance

BACKGROUND AND OBJECTIVES
In Belgium, fungal spore concentrations in the air have been continuously monitored by the national aerobiological surveillance network for almost four decades. Data recorded by the Hirst method for up to 25 fungal spore taxa in four Belgian locations have been valorized in this study that aimed to address the long-term evolution of the season timing and intensity, and to give a more comprehensive view of the potential regional impact of climate change.

MATERIAL AND METHODS
Trends of annual data (1982-2019) were calculated by Mann-Kendall test and linear regression. Rates of change in the annual cycle of daily fungal spore concentrations were also analyzed (Sen slope/LOESS) and associated with meteorological parameters. An updated fungal spore calendar representative for the Belgian territory was generated following percentage and categorized occurrence levels.

RESULTS
For the allergenic mold taxa showing the most pronounced seasonality of their spore dispersal, i.e. Cladosporium, Alternaria, Botrytis and Epicoccum, overall trends of decrease in annual/daily airborne spores were revealed in Brussels (38 observation years) and De Haan (36 years) but not in Tournai (7 years) and Genk (6 years). The daily spore concentrations of these taxa were indeed highly correlated. Moreover, the rates of change in annual fungal spore cycles were shown to be associated with temperature change. In term of timing, no seasonal shift was observed except for the basidiospora in Brussels, where a significant trend of increase in concentrations was measured in October and November.

CONCLUSIONS
Due to weaker rates of temporal changes than those for pollen, it is challenging to evaluate the role of factors such as land use, agricultural practices and climate on the changes in airborne fungal spores. These findings highlight the need for continued efforts to monitor airborne fungal spores in the long-term time.

ID: 184
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: BASIC AEROBIOLOGY

P.065 | A methodological approach to estimate the relationship between pollen producing sources and their atmospheric content: The case of the chestnut tree in Castilla y León (Spain)

David Rodríguez de la Cruz[1,2], José Ángel Sánchez Agudo[1,2], Iván Barbero-Bermejo[1], Laura Núñez Crespo[1], Rosa María Valencia-Barrera[3], Ana María Vega-Maray[3], Delia Fernández-González[3]

1 Departament of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca – Salamanca, Spain.

2 Hispano-Luso Agrarian Research Institute (CIALE), University of Salamanca – Villamayor, Salamanca, Spain

3 Department of Biodiversity and Environmental Management, University of Leon, Faculty of Biological and Environmental Sciences — León, Spain

Keywords: *Castanea sativa*, airborne pollen, ecoinformatic tools, MW-NW Iberian Peninsula

BACKGROUND AND OBJECTIVES

It is sometimes complex to determine the sources of pollen production in urban environments, as they may come from those environments or from more or less remote natural or semi-natural vegetation. In this work a new methodological proposal is tested, based on Geographic Information Systems, which could help to determine the origin of emission sources of an aemophilous species and to estimate the levels of atmospheric pollen.

MATERIAL AND METHODS

Based on the official Cartography (Habitats, Natural Areas, National Forest Map), an update and filtering of the chestnut tree forests in Castilla y León was carried out using ArcMap v.11 (ESRI©). From the perimeter of each polygon, a cost/distance layer was obtained, taking into account the Euclidean distance and the roughness of the terrain (orographic diversity), in addition, a buffer of 30 and 100kms was elaborated for each polygon, taking into account the medium and long distance dispersion that is considered for this species in the scientific literature. The layer of buffer rings obtained drags the information on the density of each forest mass of chestnut trees, which once transformed into a raster is processed to obtain a layer in which in each cell the information on the number of overlapping rings with their corresponding densities is collected. Using a raster calculator, each of the layers mentioned is weighted to obtain a final one in which each cell has a value that represents the probability of finding chestnut pollen grains in it. From the collector layer (17 records), an extraction of values in the final layer is carried out, which is compared with the real values counted in the aerobiological samples.

RESULTS

The model obtained fit with the geographical pattern of chestnut trees that basically responds to its natural distribution and pointed out the importance of topographical variables in pollen levels. On the other hand, the presence of pollen in cities far from production sources, with few or no cultivated specimens, could indicate the existence of medium and long distance transport of chestnut pollen.

CONCLUSIONS

There is a direct relationship between chestnut forest formations and airborne levels of chestnut pollen recorded in nearby areas. The methodology tested made it possible to estimate these levels with relative reliability and simplicity at different points in the study area.

COMMENTS

The authors are grateful to the Health Department of the Castilla y León Government for funding the RACYL.

ID: 088
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: FORECASTING AND MODELING

P.066 | Seasonal priming estimated by non-linear regression model

Pia Ørby[1], Jakob Bønløkke[2], Bo Martin Bibby[2], Peter Ravn[2], Ole Hertel[1], Torben Sigsgaard[2], Vivi Schlünssen[2]

1 Department of Environmental Science, Aarhus University, P.O. Box 358, Frederiksborgvej 399, 4000 Roskilde, Denmark

2 Department of Public Health, Aarhus University, Bartholins Allé 2, 8000 Aarhus, Denmark

Keywords: pollen allergen, seasonal priming, specific inhalation challenges, dose-response profiles, climate chamber

BACKGROUND AND OBJECTIVES

Seasonal exposure to pollen may induce priming, where repeated exposures increase the allergic response. This is known for patients with allergic asthma; however, following the theory of "one airway, one disease", bronchial response may also occur in patients with allergic rhinitis, a more frequent condition. We examined the effect of seasonal priming on bronchial responsiveness among patients with allergic rhinitis and no or only mild asthma. Most studies measure responsiveness as PD20 (dose eliciting 20% drop in 1 sec. forced expiratory volume) estimated by linear interpolation of log-dose-response profiles. As the response pattern is rarely linear, we applied a novel non-linear regression model. Furthermore, we assessed the correlation between baseline characteristics and PD20.

MATERIAL AND METHODS

In a cross-over study 36 patients underwent specific inhalation challenges (SIC) to grass or birch allergen in a human exposure chamber. 85 SICs were performed outside and at the end of the season. Differences in bronchial response were assessed by dose-response profiles and PD20 derived by a four-parameter non-linear mixed regression model.

Association between PD20 and baseline characteristics was examined by linear regression.

RESULTS

The model showed a good fit to data. 12 of 19 patients exposed to grass and 9 of 17 exposed to birch, had a lower PD20 at end of season. However, we found no statistically significant effect of seasonal exposure on the modelled dose-response profiles or on PD20 (birch, p= 0.77; grass, p= 0.45). Birch PD20 were 889 (494; 1599) SQ-U outside season and 840 (464; 1519) SQ-U at the end of season. Grass PD20 were 1020 (512; 2031) SQ-U outside season and 792 (400; 1564) SQ-U at the end of season.

Size of skin prick test for grass was significantly associated to PD20 with a 1 mm larger reaction resulting in 26 % (-37;13, p=0,002) lower PD20

CONCLUSIONS

A non-linear regression model fits dose-response curves well.

We found no priming effect of pollen exposure on bronchial hyper-reactivity from natural seasonal exposure in allergic rhinitis patients. Results may reflect individual differences in severity as well as patterns of response, potentially only affecting certain endotypes.

ID: 062
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: HEALTH IMPACT

P.067 | Pollen production of Poaceae species in Central Russia

Elena Severova[1], Yulia Selezneva[2], Vera Karaseva[2]
1 Moscow State University, Leninskie Gory 1-12, Moscow 119234, Russia
2 Ryazan' State University, Svobody str 46, Ryazan' 390000, Russia

Keywords: pollen production, grasses, phenology

BACKGROUND AND OBJECTIVES

Poaceae pollen is among the main causes of pollen allergy in Russia. Classic aerobiological monitoring does not allow to identify species within Poaceae because of the stenopalynous nature of the family. The time of flowering and the allergenicity of different grass species are not the same and allergic patients could be differentially sensitized. One of the approaches to detail the grass pollination curve is based on phenological observations, estimation of pollen production and species abundance. The objective of this study was to define the total pollen production (TPP) per inflorescence of the most common grass species with the purpose of identifying the species with the highest potential pollen emission.

MATERIAL AND METHODS

TPP was determined for 11 species of grasses. Number of pollen grains per anther (mean of 30 inflorescences) was estimated by using the method of Cruden (1977). The numbers of flowers and spikelets were calculated based on 10-30 plants. TPP per inflorescence was calculated by multiplying the number of pollen per flower by the number of flowers per spikelet by the number of spikelets for inflorescence.

RESULTS

TPP varies from 75000 to 5500000 pg per inflorescence. The lowest TPP has Poa annua which is considered as bi-annual species. Among perennial grasses the highest pollen production was reported for Dactylis glomerata, the lowest one – for Elytrigia repens (950000 pg). TPP of the majority of perennial species varies from 1500000 to 2500000 pg per inflorescence. Estimation of species abundance allows to suggest that the main peak of grass pollen concentration is due to the simultaneous pollination of several species. The prevailing grasses are Dactylis glomerata, Arrhenatherum elatius, Festuca pratensis and Bromopsis inermis. Bi-annual species have no effect on the total concentration of pollen.

CONCLUSIONS

The variability in pollen production confirms the idea that only some species produce enough pollen in order to cause allergic symptoms. Pollen production should be taken into account in future aerobiological studies.
The work was financed by grant 19-05-50035 from RFBR.

ID: 141
Session: FORECASTING AND BASIC AEROBIOLOGY
Topic: PLANT PHENOLOGY

P.068 | Fluorescence Peculiarities of Ozone-Exposed Pollen

Laura Šukiene, Ingrida Šaulienė, Gintautas Daunys, Gediminas Valiulis, Alfredas Lankauskas
Siauliai University, P. Visinskio 25-115, Siauliai, Lithuania

Keywords: Airborne pollen, real-time automatic device, *Alnus glutinosa*

BACKGROUND AND OBJECTIVES

The effect of environmental factors on pollen dispersion in the atmosphere has been more widely documented in scientific articles. The emergence of the need for measurement of pollen levels in the air by automatic measurement devices is accompanied by the increased importance of analysing the effect of environmental factors on pollen. Ozone is one of the environmental factors that can affect the peculiarities of pollen fluorescence and this way determine the accuracy of the data obtained by automatic measurement devices based on fluorescence assessment of particles. We conducted investigations in order to identify whether the exceptionally high ozone concentration could significantly alter fluorescence of pollen.

MATERIAL AND METHODS

Investigations were performed with *Alnus glutinosa* pollen collected in situ. The ozone generator used for the experiments. In the field of device operation, ozone-exposed pollen was incubated for 5 days, exposing one group for 3 hr/day; and the other, for 5 hr/day. The cumulative concentration of exposure to ozone reached > 20 ppm. The value of the impact on fluorescence was measured twice: 1 and 5 months after the exposure to ozone. A Rapid-E device was used to measure the change in pollen fluorescence. It recorded at least 10,000 pollen per experimental group. Pollen recognition was performed using an algorithm developed for monitoring purposes.

RESULTS

The obtained results showed that there was no obvious difference between the fluorescence amplitudes, comparing fluorescence spectrum amplitudes of ozone-exposed pollen of *A. glutinosa* with unaffected pollen. Minor differences are seen at less than 500 nm. After considering the results of the principal components analysis (PCA) and the scattering data of 1st PCA and 2nd PCA, it was found that the regression coefficients were insignificant, but the shift between 1st PCA and 2nd PCA exist.

CONCLUSIONS

Fluorescence of *A. glutinosa* pollen exposed to ozone under experimental conditions is ambiguous. This project has received funding from the European Social Fund (project No 09.3.3-LMT-K-712-01-0066) under the grant agreement with the Research Council of Lithuania (LMTLT).

ID: 033
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.069 | Applying LiDAR technology in bioaerosol sensing over Athens, Greece

Stephen Constantine Richardson[1], Michalis Mytilinaios[2], Romanos Foskinis[1], Christina Kyrou[3], Alexandros Papayannis[1], Ioanna Pyrri[4], Eleni Giannoutsou[5], Ioannis Dimosthenis Adamakis[5]

1 Physics Department, School of Applied Mathematics and Physical Sciences, National Technical University of Athens, , 15780 Zografou, Greece

2 Consiglio Nazionale delle Ricerche, Istituto di Metodologie per l'Analisi Ambientale (CNR-IMAA), C.da S. Loja, Tito Scalo, PZ 85050, Italy

3 Department of Physics, National and Kapodistrian University of Athens, Panepistimioupoli, Athens 15784, Greece

4 Section of Ecology and Systematics, Department of Biology, National and Kapodistrian University of Athens, Panepistimioupoli, Athens 15784, Greece

5 Section of Botany, Department of Biology, National and Kapodistrian University of Athens, Panepistimioupoli, Athens 15784, Greece

BACKGROUND AND OBJECTIVES

The atmosphere's microbial inhabitants may affect human health especially in densely populated urban areas. The emerging need to predict high risk exposure to biocontaminants has led to the quest for novel bioaerosol sampling technologies. Automatic monitoring systems have been developed recently for real time information acquisition of the actual exposure levels. The aim of this study was to characterize the major pollen and fungal components in Athens's atmosphere by employing a laser induced fluorescence (LIF) light detection and ranging (LiDAR) technique in parallel with a conventional volumetric sampling method to authenticate LiDAR detection efficiency.

MATERIAL AND METHODS

A pilot study was conducted during spring 2018 in order to detect bioparticles with a LIF LiDAR technique and determine the major components' contribution on the total fluorescence signals. Real-time experiments were carried out in the atmosphere during 17.30-18.30 UTC in order to avoid intense solar radiation. A portable Burkard air sampler was operated concurrently with the LiDAR system to verify the bioaerosol presence and concentration. Additionally, in-situ experiments based on LIF were conducted to retrieve the fluorescence signatures of dominant pollen grains and fungal types suspended in the atmosphere of Athens.

RESULTS

The characterization of the prevalent pollen grains and fungal spores' fluorescence signatures enabled through deconvolution the breaking down of the retrieved LIF LiDAR signals and revealed each bioparticle's contribution. The bioaerosol occurrence and concentration, as determined by the concurrent sampling with a volumetric particle sampler, verified that the detected fluorescence was related to the fungal and pollen aerosol concentration.

CONCLUSIONS

The present study findings were very promising for the implementation of remote sensing technology in routine detection and quantification of airborne bioparticles in real-time, from ground up to ~1km height (with typical spatial resolution of 30 m), which is important for allergy sufferers and physicians. The combination of LiDAR sensing with ground-based bioaerosol monitoring may form the basis of an integrated system for air quality characterization.

ID: 133
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.070 | Biotic and abiotic effects on pollen production and allergenicity of birch and related health impacts: a European study

Susanne Jochner-Oette[1], Surendra Ranpal[1], Maria Landgraf[2], Carmen Büttner[2], Daria Luschkova[3], Franziska Kolek[3], Kira Köpke[2], Miriam Sieverts[1], Verena Wörl[1], Stefanie Gilles[3], Athanasios Damialis[3], Claudia Traidl-Hoffmann[3]

1 Physical Geography / Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany

2 Chair and Division Phytomedicine, Humboldt-Universität zu Berlin, Berlin, Germany

3 Chair and Institute of Environmental Medicine, UNIKA-T, Technical University of Munich and Helmholtz Zentrum München, Augsburg, Germany

Keywords: pollen production/allergenicity, sensitization, Cherry Leaf Roll Virus (CLRV)

BACKGROUND AND OBJECTIVES

Although higher temperatures were mainly found to increase pollen production, for pollen allergenicity there is no conclusive evidence, as there are reports on decreased allergen content under warmer conditions. The interaction effects among biotic (e.g. viruses) and abiotic factors on the pollen amount and allergen content have not been investigated so far. A collaboration between scientists from Landscape Ecology, Phytomedicine and Environmental Medicine aim to disentangle these influential factors within the DFG project pollenPALS (655850).

MATERIAL AND METHODS

We investigate pollen of cloned birch trees free from genetic differences in 40 International Phenological Gardens (IPGs) across Europe. In addition, we focus on 30 cloned birch trees in a seed plantation (Baden-Württemberg) to isolate the effects of genetic diversity or tree age and to minimize climatic variation. To particularly account for a variety of climatic conditions and a great genetic and species diversity, we study 30 birch trees along an altitudinal gradient in southern Bavaria. We gather information on abiotic (e.g. temperature, humidity, air pollutants) and biotic influences such as virus infections (*Cherry Leaf Role Virus*, CLRV) or the pollen-associated microbiome and the *in vivo* relevance of pollen allergenicity using skin prick tests.

RESULTS

In 2019, we received pollen and leaf samples from 37 IPGs. Mean pollen production per catkin ranged between 7×10^3 and 7×10^6 pollen grains. Similarly high variability was also observed in Bet v 1 levels, comprising 20-70% of the total protein, and reflecting in the wheal and flare reaction in the skin. CLRV, which is the only pollen transmissible virus known so far in birch, shows characteristic line pattern and ringspots on leaves. Pollen are recently further tested via molecular tools.

CONCLUSIONS

It is essential to investigate plant-environment interactions comprehensively in order to understand the underlying mechanisms altering pollen production, allergenicity and plant-microbe interactions. Integrating these data with human health/disease enables us to predict and manage allergic diseases in the future, especially under climate change.

ID: 148
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.071 | Comparison between airborne pollen concentrations collected with Hirst type traps using different sampling inlets

Gordan Mimic, Branko Sikoparija
BioSense Institute - Research Institute for Information Technologies in Biosystems, University of Novi Sad, Dr Zorana Đinđića 1, Novi Sad, Serbia

Keywords: sampling inlet, pollen quantity, atmospheric conditions

BACKGROUND AND OBJECTIVES

In this study we have compared time series of pollen concentrations measured by Hirst type volumetric method using regular wind vane inlet and Sigma-2 fixed inlet. The study aims to reveal to what extent sampling inlet introduces discrepancy in quantity when comparing measurements from different methods.

MATERIAL AND METHODS

Airborne pollen samples were collected continuously from February to October 2019, using two "Lanzoni" VPPS samplers at the roof-level, on the top of the building of the Faculty of Sciences located in Novi Sad. Meteorological conditions were recorded simultaneously with the automatic meteorological station measuring solar radiation, air temperature, relative humidity, wind speed and precipitation.

RESULTS

Time series of daily pollen concentrations recorded with different inlets expressed high positive correlations. However, notable differences between signals could be observed on the hourly basis. Absolute difference between hourly values showed very weak correlation with relevant meteorological parameters: temperature, humidity, wind speed and turbulent kinetic energy.

CONCLUSIONS

There is a high correspondence between total pollen concentrations obtained from 10 l/minute sampling regardless the type of inlet. Meteorological conditions did not have notable influence on the sampling performance. It is not expected that type of inlet when other conditions are comparable influence notably the difference between quantity of airborne pollen.

ID: 005
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.072 | Defining pollen and spore counts using metabarcoding

Mary Hanson, Beverley Adams-Groom, Godfrey Apangu, Carl Frisk, Carsten Skjoth
School of Science and the Environment at the University of Worcester, Henwick Grove, Worcester, WR2 6AJ

Keywords: metabarcoding, DNA, pollen, fungi

BACKGROUND AND OBJECTIVES

Pollen and fungal spore counts performed by microscopy are widely used to forecast high allergen days. This is important for sensitized individuals as it enables prophylactic treatments or avoidance strategies to be implemented. As several species are difficult to identify morphologically, there is currently a gap in knowledge regarding lower taxonomical levels, for example, spores of the fungal genus *Alternaria* are generally counted together, despite *A. alternata* being the predominant allergenic species. This creates inaccuracy in studies based on morphological identification alone and metabarcoding offers a complementary approach for defining pollen and spore concentrations.

MATERIAL AND METHODS

We investigated the composition of atmospheric pollen and fungi using a Burkard (Hirst-type) volumetric sampler and a Burkard multi-vial sampler. DNA was extracted from daily samples, pooled weekly and analysed by metabarcoding, with taxonomic assignment against reference databases. The relative abundance of airborne taxa was assessed against microscopy counts from the Hirst-type sampler and the false negative/positive rates were calculated.

RESULTS

Combining microscopy counts with metabarcoding allows taxa to be identified to the genus or species level, for example in the case of *Alternaria*, we find *A. metachromatica* to be the most abundant species, followed by *A. alternata*. The results also show that the reference database used has a large impact on taxonomic assignment. An unexpected presence of some tree species in the atmosphere during autumn was revealed, potentially reflecting seasonal leaf fall.

CONCLUSIONS

Using metabarcoding to define proportions of species within pollen and fungal counts reveals new insights into bioaerosol patterns, including events such as leaf senescence. The choice of reference database for taxonomic assignment is critical for metabarcoding and generalized databases are prone to errors. Despite these limitations the progression of new bioinformatic methods is rapidly transforming the field of aerobiology as they can define important species that are microscopically identical.

ID: 153
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
TOPIC: NEW METHODS FOR DETECTION AND ANALYSIS

P.073 | Pollution of the urban atmosphere by non-native allergenic oak pollen originating from parks and gardens

Maria Grundström[1,2], Beverley Adams-Groom[1], Mary Hanson[1], Geoffrey Petch[1], Carsten Skjoth[1]
1 University of Worcester, School of Science and the Environment, Henwick Grove, WR2 6AJ, Worcester, United Kingdom
2 University of Gothenburg, Department of Biological and Environmental Sciences, Carl Skottsbergs gata 22B, 413 19 Gothenburg, Sweden

Keywords: eDNA, pollen, metabarcoding, oak species

BACKGROUND AND OBJECTIVES
20% of the population in the western world suffer from hay fever and worldwide oak pollen is one of six most allergenic tree pollen. Quantification of airborne pollen, forecasting and avoiding exposure is among the most important measures to limit hay fever symptoms. However, oak pollen is generally neglected compared to grass, birch and ragweed pollen with respect to both diagnosis and treatment. There are few nation-wide forecasting systems and oak pollen are not found in the standard skin-prick testing panels used by doctors in Europe. Efficient forecasting and mitigation can be achieved with detailed knowledge about the source of oak pollen found in the urban atmosphere.

MATERIAL AND METHODS
The oak season progression was tracked in Worcester, UK, in 2017 and 2018. Pollen collected with a 7 day volumetric Burkard trap of the Hirst design were analysed using traditional optical microscopy. Pollen (eDNA) from a multi-vial cyclone were analysed through next generation sequencing (NGS) of targets ITS1 and ITS2. These data were combined with phenological observations of local oak trees.

RESULTS
24 oak species were detected in total from eDNA, a majority of the sequencing reads matched the two native oak species (Q.robur and Q.petraea) and a number of ornamental oaks (Q.falcata, Q.macranthera, Q.hartwissiana, Q.ilex and Q.velutina), of which only Q.ilex is regarded as common. The total oak pollen exposure was caused by a series of flowering tree species, where non-native species both augment and extend the local oak pollen season. This augmentation matched the local flowering phenology of Q.velutina and Q.ilex. During 2018 56% of the oak sequence reads originated from non-native oak trees, generally not found in the English landscape, but frequently in parks and gardens. In 2017, 24% of the oak reads were non-native.

CONCLUSIONS
Increased exposure to aeroallergens in both time and magnitude is linked to planted non-native trees found in the near environment. Reducing exposure can be achieved by managing the urban environment using native trees, ideally with limited allergenic potential. The efficiency of these measures can be verified by applying our methods for pollen detection using molecular genetics.

ID: 185
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: MOLECULAR AEROBIOLOGY

P.074 | Comparison of biological components concentrations in an aerosol sampled over Vasyugan marshes and over the Karakan forest

Aleksandr Safatov[1], Irina Andreeva[1], Galina Buryak[1], Olesya Ohlopkova[1], Sergei Olkin[1], Irina Reznikova[1], Nadezhda Solovyanova[1], Boris Belan[2], Alexander Fofonov[2], Denis Simonenkov[2], Tatyana Alikina[3], Marsel Kabilov[3] and Dmitrii Pysnyi[3]

1 FBRI SRC VB Vector of Rospotrebnadzor, 630559, Koltsovo, Novosibirsk region, Russian Federation;
2 V.E. Zuev Institute of atmospheric Optics SB RAS, 634055, Tomsk, Russian Federation;
3 Institute of Chemical Biology and Fundamental Medicine, SB RAS, 630090, Novosibirsk, Russian Federation
Presenting author: safatov@vector.nsc.ru

Keywords: atmospheric aerosols, bioaerosols, biodiversity

BACKGROUND AND OBJECTIVES

Bioaerosols are omnipresent part of Earth atmosphere. The aim of this work was to compare bioaerosols characteristics over two unique regions (the powerful local sources).

MATERIAL AND METHODS

On September 14, 2018, airborne atmospheric sounding was carried out in the area over Vasyugan marshes (V) and over the Karakan forest (K). Eight samples were taken to determine the concentration of total protein in both regions and 12 (4 V + 8 K) samples to determine the concentrations and biodiversity of microorganisms. The study of bioaerosol samples were conducted using standart methods (Safatov et al., Int. J. Environ. Res. Public Health, 17, 1651, 2020).

RESULTS AND CONCLUSIONS

The analysis of total protein concentrations revealed two trends: at heights of 0.5 - 2 km, the concentrations in both sampling areas are much higher than at heights of 3 - 7 km; concentrations averaged over all heights for K are noticeably higher than those for V.

The average concentrations of culturable at 30 °C microorganisms for V are significantly higher than those for K. These concentrations do not depend on the sampling height in both regions, and for microorganisms cultured at 6 ° C the dependence was found only for K.

The diversity of microorganisms found in samples. Among cultivated at 30 °C microorganisms nonsporeforming bacteria predominate in 7 of 11 samples, cocci are prevail in three samples and in one samples micromycetes prevail. For microorganisms grown at 6° C, non-spore-forming bacteria also prevail in 5 of 9 samples, yeast prevail in three samples and cocci in one sample.

16S metagenomic sequencing was used to analyze taxonomic diversity. Amplicons of the V3-V4 region of the 16S rRNA gene were sequenced on MiSeq (2x300 bp) in Genomics Core Facility (ICBFM SB RAS, Novosibirsk). Bioinformatic analysis of the reads using UPARSE pipeline revealed 161 OTUs, of which 15 OTUs were major and totaled 71.8% to 99.8% of the general diversity. The taxonomic classification using SINTAX allowed to detect 108 bacterial genera, 12 of which were 80-99,9% of the total diversity.

So the differnces in atmospheric bioaerosol in these regions composition were found.

ID: 212
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: BIOAEROSOLS

P.075 | Detecting and measuring Botrytis cinerea spores using recombinant antibody binding fragments (Fabs) in air samples

Roy Kennedy[1], Rachel Osborn[2], Alison Wakeham[3], Andrew Bentham[4], Eithne Brown[5]
1 Warwickshire Colleges, Pershore College, Pershore U. Kingdom WR10 3JP
2 Warwickshire Colleges, Pershore College, Pershore U. Kingdom WR10 3JP
3 Mologic Ltd, Bedford Technology Park, Thurleigh MK44 2YA
4 Mologic Ltd, Bedford Technology Park, Thurleigh MK44 2YA
5 Berry Gardens Ltd Tatlingbury Oast, Five Oak Green Rd, Tonbridge TN12 6RG

Keywords: *Botrytis cinerea*, recombinent antibody fragments

BACKGROUND AND OBJECTIVES
Many fruit crops are affected by *Botrytis cinerea* which results in considerable waste. Immunological detection is a fast and robust approach however conventional methods of raising antibodies are slow and expensive. Raising antibodies to microbial antigens tend to elicit IgM responses due to immunodominant action of the carbohydrate scaffold. Priming the immune response followed by selection of peripheral blood lymphocytes provides opportunity to develop an IgG library and selection of single chain variable antibody fragme

MATERIAL AND METHODS
Peripheral blood lymphocytes (pbls) were collected from New Zealand female White rabbits following an immunization protocol with *Botrytis cinerea*. An IgG *Botrytis* library was developed and *Botrytis* positive selected clones were selected by phage display panning sequenced and FAb expressions made. Reactivity tested Fab clones were selected and mature VH and VL regions were sequenced. Each Fab was conjugated directly to Horse-radish peroxidase. An microtitre immunspore trap, was exposed within a crop of strawberries showing symptoms of *Botrytis* infection. Candidate Fab antibodies were compared to a IgG antibody (BC12) previously reported as specific to *Botrytis* spore germination.100uL the required antibody dilution was added to the microtiter wells containing air samples collected from the crop. 100ul of TMB substrate was added to all wells and incubated on plate shaker for 15mins before stopping.

RESULTS
Variation in ELISA signal was obtained from air samples collected on a weekly basis. Antibody Fab fragment (C5-HRP conjugate) compared favourably with the conventional BC12 antibody for detection in *Botrytis* spores in dilution tests. When used on microtiter wells exposed within strawberry crops increasing levels of *Botrytis* were detected until the end of the growing season. ELISA absorbance was compared to fruit infection during the season.

CONCLUSIONS
This is the first report of a recombinant antibody binding fragment developed to measure *Botrytis cinerea*. This technology could prove useful for other airborne antigens avoiding the invasive procedures used in monoclonal antibody hybridoma production.

ID: 103
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.076 | Preliminary study on immunodetection of Botrytis cinerea germinative material recorded in a vineyard atmosphere

Estefanía González-Fernández[1], Roy Kennedy[2], Rachel Osborn[2], María Fernández-González[3], F. Javier Rodríguez-Rajo[1]

1 CITACA, Agri-Food Research and Transfer Cluster, Campus da Auga, University of Vigo, 32004-Ourense, Spain

2 Warwickshire College Group, Pershore College, Worcestershire WR10 3JP, United Kingdom

3 Earth Sciences Institute (ICT), Pole of the Faculty of Sciences, University of Porto, Porto, Portugal

Keywords: PTA-ELISA, Botrytis cinerea, immunodetection, extraction protocol

BACKGROUND AND OBJECTIVES

Fungal diseases are an important factor affecting crop production on most winemaking areas all over the world. Among them, grey mould caused by Botrytis cinerea is the third most reported disease worldwide. In the present study, we explored detection methods to complement epidemiological models by means of the immunodetection and quantification of this phytopathogen.

MATERIAL AND METHODS

The study was applied during the 2017 and 2018 grapevine flowering in a Ribeiro DO vineyard, located at South Galicia. Phenological observations were made following the BBCH scale. Aerobiological samples were obtained with a Hirst-type volumetric sampler and processed following the Spanish Aerobiological Network method. Protein samples were obtained with a cyclone sampler. A new extraction protocol was developed to adapt the cyclone-samples to a PTA-ELISA processing with the aim of optimize the extracted protein concentration and maximize the absorbance signal. A PCA was applied to determine the influence of meteorological conditions on both fungal propagule measures.

RESULTS

The proposed adaptation for cyclone samples to be processed under PTA-ELISA protocol allowed us to quantify the germinative protein concentrations. Weather conditions were found to be an influential factor on spores' presence and germination process. The 2017 PCA correlated protein concentrations with mean and maximum temperatures. A correlation between spore concentrations and wind speed was also found, showing the dispersion effect of wind on propagules of Botrytis species. The 2018 PCA showed a correlation between spores and protein concentrations but with an inverse influence, what could reflect the self-inhibitory effect of high spore concentrations on conidia germination reported for B. cinerea.

CONCLUSIONS

The combination of immunological techniques and aerobiological monitoring offers a powerful barrier against fungal disease appearance and progress on the crop, what makes possible a more reasoned treatment schedule consistent with real vineyard conditions and needs.

ID: 111
Session: NEW METHODS, BIOAEROSOLS AND MOLECULAR AEROBIOLOGY
Topic: NEW METHODS FOR DETECTION AND ANALYSIS

P.077 | A contribution to the botanical characterization of forest honeys from the Middle-West of the Iberian Peninsula (Salamanca, Spain)

David Rodríguez de la Cruz[1,2], Estefanía Sánchez-Reyes[1,3], Alfredo García-Sánchez[1], Silvia Sánchez Durán[1], Eva Lahuerta-Otero[4], Libia Santos-Requejo[5], José Sánchez-Sánchez[1,2]

1 Spanish-Portuguese Agricultural Research Institute (CIALE), University of Salamanca, Río Duero 12, 37185 Villamayor, Salamanca, Spain

2 Department of Botany and Plant Physiology, Faculty of Pharmacy, University of Salamanca, Licenciado Mendez Nieto s/n, 37007, Salamanca, Spain

3 Catholic University of Ávila, Canteros s/n 05005, Ávila, Spain

4 Departamento de Administración y Economía de la empresa & Instituto Multidisciplinar de Empresa, Universidad de Salamanca, 37007 , Salamanca, Spain

5 Departamento de Administración y Economía de la empresa & Instituto de Estudios de la Ciencia y la Tecnología - ECYT, Universidad de Salamanca, 37007

Keywords: pollen, HHE, forest honey, botanical analysis, MW Spain

BACKGROUND AND OBJECTIVES

Pollen studies in honeys are fundamental tools to determine their botanical and geographical origin. Studies aimed at improving the marketing of honeys produced in a given area should include this type of analysis. The botanical studies of forest honeys produced in the province of Salamanca were framed in this context

MATERIAL AND METHODS

20 samples of honey collected in the province of Salamanca during the year 2018 and catalogued as 'forest' by beekeepers were analysed. For the palynological study, the protocol tested by the honey working group (integrated in APLE, Spanish Society of Palynology) for Spanish honeys was followed. The physical-chemical parameter of electrical conductivity was also determined through the official Spanish methodology, since it specifies threshold values to discriminate forest honeys, honeydew or mixture (⩾0.8 mS/cm)

RESULTS

The average number of pollen types in the samples was 28, being the types *Echium plantagineum*, *Eucalyptus* sp. and *Cytisus scoparius* the ones that presented higher average percentages of representation (48%, 11% and 9%, respectively). Other relevant types were *Castanea sativa*, *Orlaya daucoides* and *Quercus* sp., with average percentages close to 3%. The average number of honeydew elements was 6, highlighting the presence of Ascomycota spores, although never in high numbers. Only 3 of the samples, although showing very close values, did not reach the threshold values of electrical conductivity

CONCLUSIONS

The forest honeys in the MW of the Iberian Peninsula could be characterized by the presence of different types of pollen such as *Cytisus scoparius, [i]Echium plantagineum*, *Eucalyptus* sp., *Lavandula stoechas* and *Quercus* sp. The analyses also showed that the most common elements of honeydew that could discriminate this type of honeys are *Cladosporium*, *Cyberlindnera* (=*Torula*) and *Pleospora* spores

ID: 129
Session: APPLICATIONS
Topic: MELISSOPALYNOLOGY

7th

EUROPEAN

SYMPOSIUM

EUROPEAN AEROBIOLOGY SOCIETY