June 2016 Issue No 80 ISBN 0357 451 https://sites.google.com/site/aerobiologyinternational/

International Aerobiology Newsletter

Newsletter of the International Association for Aerobiology

Bernard Clot IAA President



Dear colleagues and friends,

At least in this part of the world (Central-Western Europe), the summer has finally started after some wet spring months. However, this weather did not prevent pollen allergy, as the season was considered severe by many allergy sufferers. Neither did it stop the aerobiological activities in research and operational tasks.

Very soon, many of us will have the great pleasure to meet in Lyon at the European Symposium on Aerobiology and to exchange the latest news and results. The organisers are very proud to welcome participants from over 30 countries! Several important meetings for the aerobiology community will also take place during this Symposium such as the IAA Council meeting and the EAS General Assembly. You will read more about those in the next issue of this Newsletter.

I would like to encourage all of you to communicate your activities by sending contributions to the IAA Newsletter. This is the place to share experiences, exchange information and advertise topics of interest for aerobiologists. On a different level, it is also my pleasure to invite you to submit your research and review papers to Aerobiologia, the official Journal of our Society.

I wish all of you success and happiness, in your work and your private life, and happy holidays for those who will take some!

Message from the editor...

Welcome to the 80th issue of the International Aerobiology Newsletter. In this issue, we present contributions from around the world. We have news from Austria, France, Germany and Switzerland and, outside of Europe, we also have updates from India and the United Kingdom.

Importantly for IAA members, we have a call from Bernard Clot for the the next Advanced Aerobiology Course. Teaching is central to the values of the IAA, and carrying on the theme of education we have a report from Dr. Rangaswamy of a 1-day workshop on "Air sampling Principles and Methodologies" held at the Bapuji Institute of Engineering & Technology, Karnataka, India. Dr. Rangaswamy benefitted from attending the 10th European Course on Basic Aerobiology that was held in Holbæk, Denmark, in 2011. It is good to see the skills learnt during this course being passed on.

We have reports of, quite literally, high level aerobiological research, which is being carried out in the Alps in Austria and Germany. From Austria we hear from the globe trotting Virginia Tech Prof. David Schmale and his colleagues who are prospecting for ice nucleators in the mountains. You can follow David's exploits on Twitter (@SchmaleLab). From Germany, Prof. Annette Menzel and her team describe the work going on at the highest pollen trap in Germany. We also have research news from the University of Worcester in the UK where Carsten Skjoth et al. are using aerobiology to combat Ash Dieback.

Many of us are looking forward to participating in the 6th European Symposium on Aerobiology that will soon be held in Lyon (18-22 July, 2016). In this issue we hear about the Symposium programme, and grants for young researchers awarded by the International Ragweed Society. Still on the subject of meetings, Jose Oteros and Jeroen Buters report on the recent ePIN workshop held in Munich.

The European Aerobiology Society bring us important news about a new law on Public Health passed by the French Parliament that is the first step towards the mandatory monitoring of aeroallergens. Plus an announcement of the new EAS website!

Finally, I must thank all contributors for their excellent work, and I reiterate Bernard's call for material for the next issue of our Newsletter.

Matt Smith, IAA Newsletter editor

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Call for the next IAA Advanced Aerobiology Course

Bernard Clot, IAA President

The series of Advanced Aerobiology courses has been created for those who already have a technical knowledge of aerobiology, i.e. of sampling and identification of airborne biological particles. This series of courses is aimed at understanding the scientific principles behind aerobiological sampling and analyses, and at providing a solid background for the interpretation of aerobiological results. The courses deal with fundamental topics such as the principles of atmospheric transport, the principles of deposition and sampling, the methods of analysis, data presentation and interpretation and are in most cases focused on one topic. This series of courses is held in different bio-geographical zones, and for this reason they include classes and practical activities strictly linked to the chosen site. The Advanced Aerobiology courses are organized jointly by an international team of experts, under the umbrella of the IAA.

The IAA invites proposals from members to organize the next course in 2017 or 2018. Proposals (max. 4 pages) should be submitted by email to the President before the end of November 2016 and include the following: Primary contact/host; Course theme; Proposed location and dates; A short paragraph that briefly summarizes the overall course plan; Members and structure of the organizing committee; Teachers/lecturers (name, affiliation); Course venue, including rationale, advantages and estimated costs; Organizational, logistical, and funding support available; Lodging facilities and estimated costs; Transportation arrangements and estimated costs; Price of the course (for the participants); Other considerations

Please, note that the finances of the course are under the responsibility of the course organisers. IAA may support the organization by offering grants for young aerobiologists. The teachers/lecturers are not paid (volunteers), but their expenses are usually covered by the course organisation.

Ragweed article makes Springer list of Must-Read Articles From 2015

Earth and Environmental Sciences

Springer invited its editorial boards to pick one article from their journal published in 2015 that addresses the world's most pressing challenges. Ground-breaking articles with the potential to "Change the World" are presented from more than 100 journals:

https://www.springer.com/gp/marketing/change-the-world

The following article by Maira Bonini et al. was selected from Aerobiologia, the official journal of the IAA.

Citation: Bonini, M., Šikoparija, B., Prentović, M., Cislaghi, G., Colombo, P., Testoni, C., Grewling, L., Lommen, S. T. E., Müller-Schärer, H. and Smith, M. (2015). Is the recent decrease in airborne *Ambrosia* pollen in the Milan area due to the accidental introduction of the ragweed leaf beetle *Ophraella communa*? Aerobiologia 31(4), 499-513.



Springer credit: © BRAD / Fotolia

11th ICA Sept 2018 - Parma - Italy



ICA2018
INTERNATIONAL CONGRESS ON AEROBIOLOGY
3–7 September 2018
Parma - Italy

Aerobiology to fight Ash Dieback in Europe

Carsten Ambelas Skjoth, Thor-Bjørn Ottosen, Mary Lewis and Geoffrey Petch

University of Worcester, Institute of Science and the Environment, WR2 6AJ Worcester, UK

Ash Dieback is a tree pathogen caused by a fungus called *Hymenoscyphus fraxineus* (previous termed *Chalara fraxinea*), which is an Ascomycete fungus. The disease has spread into many areas in Europe. In countries like Denmark or Poland, most trees are already dead, infected or expected to die in a few years. In 2012, it was observed for the first time in Eastern parts of the UK, and it is now spreading throughout the country (Fig 1a). Optical detection of the spores from this species is very challenging as it is nearly impossible to separate this spore from other spores related to Ascomycete fungus, and management of the disease is limited.

It is expected that new detection methods and new modelling approaches can assist in the management of *Hymenoscyphus fraxineus* as well as other airborne pathogens that threaten European trees. Due to this, the UK research council has funded the project "New approaches for the early detection of tree health pests and pathogens" within the Tree health and Plant Biosecurity Initiative. The project, with a total value of £1.9 million, has a number of partners including University of Worcester. At Worcester this project is now entering its second phase. This focuses on field detection, genomic detection and combining modelling approaches from ecology, geography and atmospheric sciences.

It has already been shown that it is possible to use genomic approaches to detect *Hymenoscyphus fraxineus* in both small and large quantities with high accuracy. It is based on real-time PCR (Fig 1b). The method is based on known samples and will be tested on airborne samples from 2016 and 2017. The detection in the field uses both the proven Seven-day recording volumetric spore trap from Burkard – the type of trap that forms the backbone of the European monitoring network - and a new generation of multi-vial cyclone samplers – also for seven day use. This sampler is optimised for genomic studies, for use in the field, and includes a new easy programmable unit for sampling into multiple Eppendorf tubes (Fig 1c).

New approaches in ecological studies aimed at assessing the phenological behaviour of the fungus (Fig 1d) will be used in combination with very high resolution remote sensing. This will, in 2016/17, address the spatial and temporal behaviour of the fungus and how this is related to environmental variables. These experiments are very challenging as the fungus is an invasive species that requires quarantine. All experiments therefore follow strict security protocols to mitigate accidental spreading of the fungus from infected areas to healthy areas.

Finally, the key findings will be implemented in a so-called next generation atmospheric model that is developed at the University of Worcester. This model is globally applicable and fully integrates chemistry, biology and meteorology for use in both research and forecasting. If successful, aerobiology will have contributed substantially towards sustainable management of the forest in UK and the mitigation of airborne pathogens.



Fig 1. (a). An ash tree in Herefordshire, England with visible signs of ash-dieback

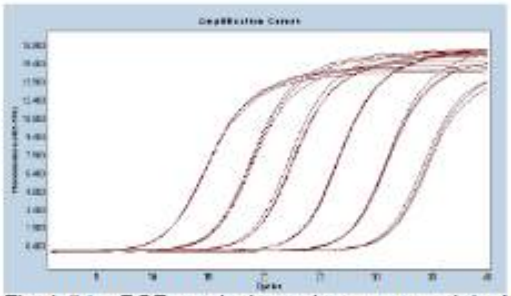

Fig 1.(b) qPCR analysis on known material of *Hymenoscyphus fraxineus*.



Fig 1. (c) Interior of the Burkard multi-vial cyclone.



Fig 1. (d) Example of the fungus growing on the rachises from ash trees.

BasePollen-LAU: a new photo database of pollens coupled to a multi-criteria determination key

Anne-Marie Rachoud-Schneider and Philippe Sauvain



The first aims of our work were the conservation of about 8,100 photos of pollen stored at the Musée et Jardin botanique cantonaux (Lausanne, Switzerland) and the development of their corresponding digitized records in order to efficiently incorporate them into our current palynological studies.

We began by scanning the 1,400 argentic photos made by Margita Villaret-von Rochow and Pierre Villaret because the original films were not conserved. In a second step, part of the collection of the Institute of Plant Sciences (Bern, Switzerland) was also scanned. We rapidly realized that it was a unique opportunity to add a multi-criteria pollen determination key for two main reasons :

- It is the only way to sort out all the photos, in order to efficiently compare them in a simple click

- It is a handy way to construct a multi-criteria determination key (i.e. to avoid the dichotomous keys) that can be used by all the researchers and also by the public

At that time, 1,228 botanical taxa (e.g. *Plantago lagopus*) were classified into 525 pollen types (e.g. *Plantago lanceolata* type). These are recorded in the BasePollenLAU and the pollen key itself is made up from about 175 independent criteria (e.g. number of pores). The following traditional determination criteria were used: Faegri, Punt, Webb, Beug, etc.

Finally we received a series of SEM photographies of Swiss species collected by Mr. J.-E. Germond and made by Mrs. J. Fakan that we could easily add to the database.

BasePollen-LAU has been developed on a Filemakerpro platform and will be open-accessed on the internet for researchers, students or a broader audience, with no need to locally install a software.

We hope to receive contributions from other scientists such as photos or schemes in order to improve and to develop the database. The link to the new version of Basepollen-LAU is the following:

http://prdfmp2.unil.ch/fmi/iwp/res/iwp_home.html

Click on "BASE_POLLENS"; User = Pollens; no password required

Book - Boreal and Temperate Trees in a Changing Climate: Modelling the Ecophysiology of Seasonality

Heikki Hänninen, Professor terrestrial plant ecology, University of Helsinki

This book published by Springer summarizes Prof. Hänninen's work carried out over 30 years in Finland. Prof. Hänninen's main research interest is the seasonality and climatic adaptation of northern plants, with the assessment of the effects of projected climatic change as the principal domain of application in his research work.

Blurb from the website

This book provides an overview of how boreal and temperate tree species have adapted their annual development cycle to the seasonally varying climatic conditions. Therefore, the frost hardy dormant phase, and the susceptible growth phase, are synchronized with the seasonality of the climate.



The volume discusses the annual cycle, including various attributes such as timing of bud burst and other phenological events, seasonality of photosynthetic capacity or frost hardiness of the trees.

During the last few decades dynamic ecophysiological models have been used increasingly in studies of the annual cycle, particularly when projecting the ecological effects of climate change. The main emphasis of this volume is on combining modelling with experimental studies, and on the importance of the biological realism of the models.

http://www.springer.com/gp/book/9789401775472#aboutBook

One day Hands on Training on Air Sampling Principles and Methodologies

Dr. B. E. Rangaswamy



Dr. Rangaswamy demonstrating pollen identification, processing and slide preparation

The Department of Biotechnology at the Bapuji Institute of Engineering & Technology, Karnataka, India organized a 1- day workshop on "*Air sampling Principles and Methodologies*" during a weeklong training programme, 18-24 January 2016.

Fifty-four Students from different parts of the Karnataka state participated in the workshop. The course included aerobiological techniques and principles, a demonstration of samplers, as well as hands on training with technical sessions about allergy, asthma and respiratory infections.

Dr. B. E. Rangaswamy, Dean, Research & development demonstrated the principles, procedures and methodologies of the six stage Anderson viable particle sampler, A Merck MAS-100 NT sampler, the Burkard personal volumetric air sampler, Coriolis® *µ*Bio liquid air sample, plus sample preparation procedures, e.g. pollen reference slides, mounting, etc.

Dr. V L Jayasimha Professor of Microbiology S. S. Institute of Medical Sciences & Research Centre, Davangere in his technical sessions presented evolving trends in clinical microbiology and demonstrated ELISA and Serology techniques.

Mr. Prakash, Mr. Vinay Kumar, Mrs Vanitha, Mrs. Yogitha Seema and Ms. Pavithra Research scholars in the department demonstrated hands on air sampling techniques and procedures.



Dr. Rangaswamy presenting different air sampling principles



Dr. V. L Jayasimha during technical sessions

Making Snow in Austria: Prospecting for Ice Nucleators in the Mountains of Tirol

Philipp Baloh[1], Hinrich Grothe[1], and David G. Schmale III[2]

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If you collect samples of rain, snow, hail or clouds and culture them in the laboratory, you are likely to find many different species of bacteria and fungi. Some of these microbes produce ice-nucleating proteins that help facilitate heterogeneous ice nucleation—the process by which particles can nucleate ice between 0 and -35°C. If you go to a ski resort and you find snow during an unusually warm winter, chances are that snow was made with the help of sophisticated snow production machines (e.g., snow cannons or cloud chambers) that mix the right amount of pressurized air and water. Such snow-making technology could be improved with the use of natural ice nucleators mixed into the water.

With support from the FFG in Austria (https://www.ffg.at/), Liftgesellschaft Obergurgl, Technik Wille, Neuschnee GmbH and in cooperation with the University of Innsbruck, we are prospecting for ice nucleators in the mountains of Tirol, Austria. Our first coordinated sampling campaign was during the first week of June, 2016 in Obergurgl; a unique natural laboratory that has a long history of Alpine research. We climbed mountains, hiked along valleys, crossed patches of snow and ice, and collected samples from rivers of snowmelt (Figure 1) and reservoirs of glacier water (Figure 2). A portion of each of the samples was filtered, and cultured on different types of media (Figure 3). Resulting microbes are being screened for ice nucleation activity and identified to the level of species. Other portions of the samples are being analyzed for their abiotic constituents using vibrational spectroscopy and ice nucleation assays. Resulting abiotic and/or biotic materials from these studies could be used as important tools for creating snow for the commercial ski industry in and around Obergurgl.



Fig. 1. Vienna University of Technology Graduate student Philipp Baloh collecting a water sample from fresh snow melt near Obergurgl, Austria.

"Snow is a vital component of our winter resort activities in Obergurgl. We need new tools to make better snow, so we can invent new types of slopes and present different wintersport experiences for our guests," said Werner Hanselitsch of the Ski Resort who is funding part of the project.



Fig. 2. Virginia Tech Professor David Schmale collecting a water sample from a reservoir near Oberburgl, Austria using a La Motte

About 70 percent of the Earth's surface is covered with water—a huge reservoir for ice nucleating particles. Though terrestrial environments are often considered a major contributor to atmospheric aerosols, little is known about aquatic sources of ice nucleating particles. Droplets containing ice nucleating particles can aerosolize from the water surface, liberating them into the atmosphere where they affect cloud formation as cloud condensation nuclei, and influence the earth's radiation budget. Aerosolization may occur in natural aquatic environments by crashing waves, splashing, bursting bubbles, and wind sweeping across water surfaces. Our studies in the mountains of Tirol are an important step toward understanding the aeroecology of ice nucleating particles that are tightly linked to natural precipitation events and man-made snow. When are you hitting the slopes next?

Fig. 3. Samples from Tirol, Austria were filtered and plated of different types of media in the Schmale Lab at Virginia Tech. Cultured microbes are being screened for ice nucleation activity and being identified to the level of species.



The Highest Pollen Trap in Germany

Annette Menzel, Stephan Jung, Susanne Jochner, Ecoclimatology, TUM School of Life Sciences Weihenstephan, Technische Universität München, Freising, Germany (S. Jochner now at Physical Geography/Landscape Ecology and Sustainable Ecosystem Development, Catholic University of Eichstätt-Ingolstadt, Eichstätt, Germany)

The highest pollen trap in Germany is situated at the Environmental Research Station Schneefernerhaus in 2660 m a.s.l. (47.42°N, 10.98°E), 300 m below the summit of the Zugspitze. Since the end of March 2014, it has been operated by the TUM (Technische Universität München, Professorship of Ecoclimatology) and the UFS GmbH (Umwelt-Forschungsstation Schneefernerhaus), funded by the Bavarian State Ministry of Environment and Consumer Protection.

The Burkard 7 Day Recording Volumetric Hirst Spore Sampler is mounted on an open measurement terrace of the building which is surrounded by sparse subnival / periglacial vegetation only. The mean annual temperature of ~ -0.6°C at UFS (2014/15) supports the fact that local pollen season is extremely short and thus pollen concentrations are reduced at this characteristic high Alpine site. Consequently, the observed pollen composition of this trap reflects pollen transport over various distances in an exceptional manner. Transport phenomena may range from short-range transport from the surrounding alpine meadows, mixed forests in the montane zone as well as grassland in the valleys to long-range transport from Mediterranean to Scandinavian locations. Thus, (micro-) climatic conditions, land cover and topography, vertical mountain-valley wind systems as well as synoptic-scale atmospheric conditions trigger the various transports. A second pollen trap situated in the proximity of UFS in the mountain valley at Garmisch-Partenkirchen (47.48°N, 11.06°E, 740 m a.s.l., straight-line distance between the two pollen traps ~ 9 km) enables us to discriminate the contribution of valley breezes. At the UFS, only ~ 10-20% of the pollen concentrations compared to the valley are captured, with large contributions of Poaceaea, *Betula*, and Pinaceae at both sites. Data from the pollen stations as well as ample meteorological and atmospheric data provided by partners of the Virtual Alpine Observatory Schneefernerhaus is being used to detect the influence of climate on short-, mid- and long-term transport of pollen.



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ePIN Workshop "Pollen monitoring Current Development"

5th April 2016, Bavarian Health and Food Safety Authority

Jose Oteros & Jeroen Buters

ZAUM – Center of Allergy & Environment, TUM/Helmholtzzentrum München, Germany



The ePIN (electronic Pollen Information Network) project aims to build a fully automatic pollen monitoring network in Bavaria, Germany. The project has tested a fully automatic pollen monitoring system (Oteros et al., 2015) and selected the optimal pollen monitoring locations for Bavaria, taking into account both environmental and health criteria. During 2015/2016, a dense pollen monitoring network of 27 Hirst type traps was built and evaluated over the whole region. The selection of the definitive locations was made by a combined analysis between the Centre of Allergy and Environment (ZAUM) and the Finish Meteorological Institute (FMI). The natural next step will be the installation of automatic pollen monitors in parallel with manual traps at the selected locations.

The workshop, entitled "Pollen monitoring Current Development", was held on 5 April 2016 in Munich. The workshop was supported by "Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit" and was organized by Dr. Stefanie Kolb, Dr. Alisa Weber, Prof. Caroline Herr (Bavarian Health and Food Safety Authority), and Prof. Jeroen Buters (ZAUM). The event gathered together the collaborators involved in the project, scientific experts, institutional representatives and public authorities in one place.

The main aim of the workshop was to show current developments relating to ePIN. About a third of the Bavarian population has pollinosis. The current situation of pollen monitoring in Bavaria is that there have only been two official Hirst pollen traps since 2010. Also, there is a demand that the pollen count should be provided to the public in real time, which is hardly satisfied by the Hirst method. The overall goal is to establish a long-term fully automatic measurement network in Bavaria.

The topics during the day focused on automatic pollen monitoring, quality control in Aerobiology, the state of pollen monitoring, pollen modelling, climate impacts on pollen and allergy. There were 9 presentations in the workshop. Prof. Herr gave the welcome. The first talk was from Herr Martin Hicke (Bavarian Ministry of Health and Care) who introduced the state of pollen monitoring in Bavaria. Prof. Jeroen Buters (ZAUM, TUM) talked about the necessity of having reliable pollen monitoring and introduced the problem. Prof. Karl-Christian Bergmann (German Pollen Information Service Foundation) gave an introduction about pollen monitoring in Germany and the PID network. Mr. Kachelmann (Kachelmann GmbH/Meteologix AG) gave an overview about utilising pollen monitoring for users. Dr. Jose Oteros (ZAUM, TUM) described the design of the ePIN project. Dr. Smith (Aerobiologist, EAS, IAA, UK) showed the results of Quality Control tests performed during the project. Prof. Mikhail Sofiev (FMI) showed the use of computer modelling for understanding pollen records. Dr. Bernard Clot (MeteoSwiss) talked about automatic pollen monitoring. Finally, Prof. Jeroen Buters closed the session by showing the state of the project and future plans. The following discussion included technical questions about the project. Scientific experts, such as as Prof. Annette Menzel (TUM), Prof. Claudia Traidl-Hoffmann (Institut für Umweltmedizin, Technische Universität München) and Dr. Reinhard Wachter expressed their opinions. Representatives from Deutscher Wetterdienst (DWD), Bayerische Landesamt für Umwelt (LfU), TUM, private companies (Hund) and political authorities (Bavarian Ministry of Health and Care, Bavarian State Ministry of the Environment and Consumer Protection) also took part in the discussion.

In conclusion, a consensus on technical aspects of pollen monitoring was achieved and statements were agreed upon, such as the necessity for faster pollen monitoring. However, some questions were also left unanswered, e.g.: Should the on-line pollen data be free for everybody, and could this lead to irresponsible automedication?

The European Aerobiology Society

Excellent news for aerobiology!

In January the French Parliament voted for a new law modernising Public Health, which opens the door for the mandatory monitoring of aeroallergens.



The extensive "Code de l'Environnement" includes a paragraph that clearly states the obligation to survey biological particles (pollen and moulds).

It is a first step, important for France, but also for Europe and further abroad. For Europe, we need one or two other countries with such a new regulation to try to convince the European parliament and commission to add pollen and mould in the air survey network. We need the help of each of you! If you have some useful information on this topic, please send them to us (michel.thibaudon@wanadoo.fr).

The European Aerobiology Society has launched a new website

http://www.eas-aerobiology.eu/

Visitors to the homepage can read a brief history of the EAS and the aims of the Society. After that, you can find information about: the different working groups (quality control, European legislation, educational aspects, European symposium); the membership and membership fees; the European Course on Basic Aerobiology; the projects supported by EAS; EAS newsletters; forthcoming events; phenology, etc...

Visitors can also find the statutes of the European Aerobiology Society and all the minutes of general assemblies and committee meetings. If you have any comment or update to suggest, please send them by email to Gilles Oliver (gilles.oliver@rnsa.fr) or Sevcan Celenk (sevcancelenk@hotmail.com).

6th European Symposium on Aerobiology

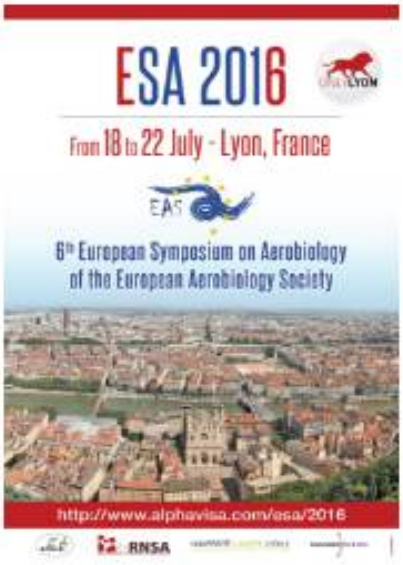
18-22 July, 2016, Lyon, France

Following on from the UEFA European Football Championship 2016, the scenic and historic town of Lyon will host over 160 aerobiologists from more than 30 countries. In the programme, there are over 100 oral presentations and 76 posters that will be presented during the meeting.

This Symposium is being organized by the RNSA and the AFEDA with the support of different associations dedicated to Air quality. The Organizing Committee looks forward to meeting many of you during the Symposium.

RNSA (rnsa@rnsa.fr) is ready to answer your specific questions.

All the information you need can be fond on the following website: http://www.alphavisa.com/esa/2016/index.php



Award of International Ragweed Society (IRS) grants



Conference grants for young researchers to attend the 6th ESA, 18-22 July, 2016, Lyon, France

The International Ragweed Society (IRS) was pleased to offer 3 grants (2 oral presentations and 1 poster) for young ragweed researchers under 35 years of age. Applicants were expected to be researchers studying any aspect of ragweed and had to become members of the IRS if not already (fee 2015-2016: 40 €; http://www.alphavisa.com/esa/fees/membership-irs.php).

Successful candidates received a contribution of 450 € for their participation to the entire European Symposium on Aerobiology (ESA), Lyon 18-22 July 2016.

The applications were considered using the following criteria: the qualifications of the researcher, the importance of the proposed project and its likely contribution to the research on ragweed.

A total of six abstracts were received from five applicants: one oral presentation and five posters. Two applicants, presenting a total of three abstracts deemed "Not acceptable" (wrong or null documentation).

Therefore, the IRS Scientific Committee decided to convert the grant for one oral presentation into a grant for a poster. The Committee selected the two best abstracts submitted for poster and one submitted for oral presentation. Unfortunately, the winner of the grant for the oral presentation was unable to accept the grant, because of changing job.

Finally, the winners are as follows:

- Aydan Acar (Turkey) - Comparative study of *Ambrosia* pollen and Amb a 1 allergen in Turkey. University of Ankara, Faculty of Science

- Olga Ritenberga (Latvia, co-author Laimdota Kalnina) - Temporal changes of ragweed (*A. Artemisiifolia, A. Trifida, A. Psilostachya*) pollen concentration In Latvia . University of Latvia, Faculty of Geography and Earth Sciences

We will award the winners during the final drink of "ESA-Lyon 2016" on Friday at 13:00.

IAA EXECUTIVE COMMITTEE

2014 - 2018

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