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FINAL PROGRAM AND BOOK OF ABSTRACTS OF THE WORLD CONFERENCE OF THE INTERNATIONAL RAGWEED SOCIETY 8-9 SEPTEMBER, 2022, BUDAPEST, HUNGARY

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IRS 2022
INTERNATIONAL RAGWEED SOCIETY CONFERENCE
BUDAPEST, HUNGARY

RAGWEED: A SUCCESSFUL STORY

Tackling Ragweed: a multidisciplinary and international approach

Conference of the International Ragweed Society,

8th-9thSeptember, 2022 | National Public Health Center | Budapest | Hungary

Editors: Michel Thibaudon – Donát Magyar – Tamás Szigeti – Gabriella Kazinczi – Tamas Komives – Zoltán Botta-Dukát – László Orlóci – László Makra

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Ragweed – 2022

Tackling ragweed

Ragweed is native to the southern desert areas of North America and moved from Arizona (USA) to Europe, where its most important areas of occurrence are Lombardy (Italy, the Rhône Valley (France), and the Pannonian Basin (especially Hungary, Serbia, Croatia, and Slovakia).

Ragweed and its pollen cause severe damage to the national economy in many areas of everyday life. Outpatient and hospital treatment costs for patients with allergic respiratory diseases caused by ragweed pollen (rhinitis, bronchitis, asthma), increasing crop losses due to the spread of ragweed habitats, tourist and nature conservation damages, seeds contaminated with ragweed seeds, etc. cause enormous economic damages. This loss in Hungary exceeds 0.6% of the annual GDP. Based on all this, ragweed and its pollen are a fundamental natural, economic, human, and environmental health problem in highly exposed countries.

As a result of ongoing global climate change, pollen concentrations are increasing, the pollen season is prolonging, the habitats of allergenic taxa as well as those of ragweed are expanding northward, more and more people are affected by ragweed and its pollen, the number of allergic diseases is increasing globally, and the global public health risk is increasing. The conference aims to raise attention to the growing importance of the topic, as well as to provide insight and solutions to the environmental and social challenges posed by ragweed and its pollen.

PROGRAM

Oral communications will take place in Fodor Auditorium
Poster communications will take place in the aula of Fodor Auditorium

Thursday, 8th September, 2022

08:00 – 12:00	**Registration** National Public Health Center, 1097 Budapest, Albert Flórián út 2-6.	
12:00 – 14:00	**Lunch at the Conference venue**	
14:00 – 14:30	**Welcome address**	
14:30 – 15:00	**Keynote 1** **Michel THIBAUDON (France):** Ragweed pollen, the story of a pollutant	
15:00 – 16:45	**Scientific Session 1**	
	Distribution of ragweed species	
	Monty, A., Delforge, A. (Belgium): Managing the northern progression of common ragweed using citizen science: the case of the Walloon region (Belgium)	S1-O1
	Grewling, Ł., Szymańska, A., Kostecki, Ł. et al. (Poland): What's new about ragweed in Poznań, Poland?	S1-O2

	Montagnani, Ch., Gentili, R., Karrer, G. et al. (Italy): *Ambrosia psilostachya* DC. (Asteraceae): the almost unknown ragweed gaining ground	S1-O3
	Sozinova, O. (Latvia): Ragweed plant and pollen in Latvia	S1-O4
	Magyar, D., Novák, R., Páldy, A. et al. (Hungary): Ragweed pollen forecast in the Pannonian Biogeographical Region: lessons learned	S1-O5
	Agricultural impacts; Economic costs	
	Savić, A., Oveisi, M., Müller Schärer, H. et al. (Serbia): The influence of the competitive hierarchy of two ragweed species on other weeds in the plant community	S1-O6
16:45-17:15	**Coffee break**	
17:15 – 17:45	**Scientific Session 2**	
	Authorities and institutions : local, regional, national, European, international	
	Albertini, R., Veronesi, L., Colucci, M.E. et al. (Italy): Ragweed studies in the scientific community	S2-O1
	Mottet, M. (France): How to stop the spread of *Ambrosia* seeds in sowing material throughout Europe?	S2-O2
17:45-18:45	**Poster Session with drinks**	
18:45-19:15	IRS Committe meeting	
	Evening: Conference dinner	

Friday, 9th September, 2022

08:30 – 09:00	**Keynote 2** **Müller-Schärer, H., Sun, Y., Schaffner, U. (Switzerland):** When a plant meets its old enemy abroad: new insights for developing sustainable biological control	
09:00 – 10:15	**Scientific Session 3**	
	Aerobiology: expansion, pollen spread, pollen transport, monitoring (classical and real time), forecasting	
	Karrer, G., Hall, R., Le Corre, V. et al. (Austria): Population genetics of the invasive *Ambrosia psilostachya* DC. in Europe	S3-O1
	Déchamp, Ch., Belmonte, J. (France): Lyon (France), 40 years of *Ambrosia* pollen counts	S3-O2
	Reupke-Hager, D., Salinski, H., Hildebrand, L. et. al. (Germany): Automated Evaluation of *Ambrosia* Pollen Release in Northwest Germany	S3-O3
	Thibaudon, M., Bastl, M., Dirr, L. et al. (France): Do photoperiod parameters limit the northward expansion of ragweed?	S3-O4
10:15 – 10:45	**Coffee break and poster**	
10:45 – 12:45	**Scientific Session 4**	
	Management and control methods (chemical, physical, biological, cultural, integrated, etc.)	

	Nikolić, N., Šoštarčić, V., Šćepanović, M. et al. (Italy): Estimation of germination parameters of four European ecotypes of *Ambrosia artemisiifolia*: contribution to the predictive emergence model	S4-O1
	Osman, M., Szalai, M., Zalai, M. et al. (Hungary): *Ambrosia artemisiifolia* seed predation levels in arable fields and adjacent semi-natural habitats in Hungary: a key ecosystem service for weed management	S4-O2
	Konstantinović, B., Popov, M., Samardžić, N. et al. (Serbia): Influence of the peppermint and thyme hydrolates on the common ragweed	S4-O3
	Toepfer, S., Dorner, Z., Zalai, M. et al. (Hungary): Improving our understanding of nature-based management against *Ambrosia artemisiifolia*: testing projections of the impact of *Ophraella communa* across Central and Southeastern Europe	S4-O4
	Vuillemin, F., Duroueix, F. (France): How to manage common ragweed in crop rotations with sunflower or soybean?	S4-O5
	Salas, M., Lukács, D., Lucas, F. (Spain): ViballaTM - an Indispensible Tool for ragweed *(Ambrosia artemisiifolia)* control in Europe	S4-O6
	Novák, R., Magyar, M., Simon, G. et al. (Hungary): The change in the situation of common ragweed in Hungary in the light of the national arable weed surveys (1947-2018)	S4-O7
	Tóth, P., Tóthová, M., Krchňavá, V., Máčajová P. (Slovakia): Sterile common ragweed without pollen	S4-O8
	Ragweed and climate change	
	Rodinkova, V.V., Palamarchuk, O.O., Yemets, T.I. et al. (Ukraine): Assessment of ragweed season changes in Ukraine	S4-O9
	Deák, J.Á., Makra, L. (Hungary): Risk potential and expansion potential due to climate change for the most common allergenic taxa on the example of Szeged, Hungary	S4-O10

12:45 – 14:00	**Lunch at the Conference venue**	
13:30 – 14:00	**IRS General Assembly**	
14:00 – 14:30	**Keynote 3** **Ziska, H.L. (USA):** Carbon dioxide, climate change and human health: through a botanical lens	
14:30 – 16:00	**Scientific Session 5**	
	Health aspects (allergens, impact, diagnosis, therapy, etc.)	
	Bonini, M., Ceriotti, V., Carcano, D. et al. (Italy): Monitoring ragweed pollen levels and ragweed allergy after the spreading of *Ophraella communa* in northern Italy	S5-O2
	Bonini, M., Ceriotti, V., Monti, G.S. et al. (Italy): Defining the health thresholds for airborne ragweed pollen	S5-O3
	Zemmer, F., Dahl, Å., Galán, C. et al. (Spain): Threshold levels of airborne ragweed pollen concentrations and the relative risk for hay fever based on crowd sourced data in two regions of southeast Europe	S5-O4
	Leru, P.M. (Romania): Ragweed spread and health impact in Bucharest area – research activities and implementation of national legislation	S5-O5
	Páldy A., Magyar D., Udvardy, O. et al. (Hungary): The Hungarian aerobiological network – 30 years of achievements	S5-06
16:00 – 16:30	**Coffee break and poster**	
16:30 – 17:30	**Stakeholder Meeting** (in Hungarian) The *Ambrosia* situation in Hungary today and in the future	
17:30	**Farewell with drinks**	

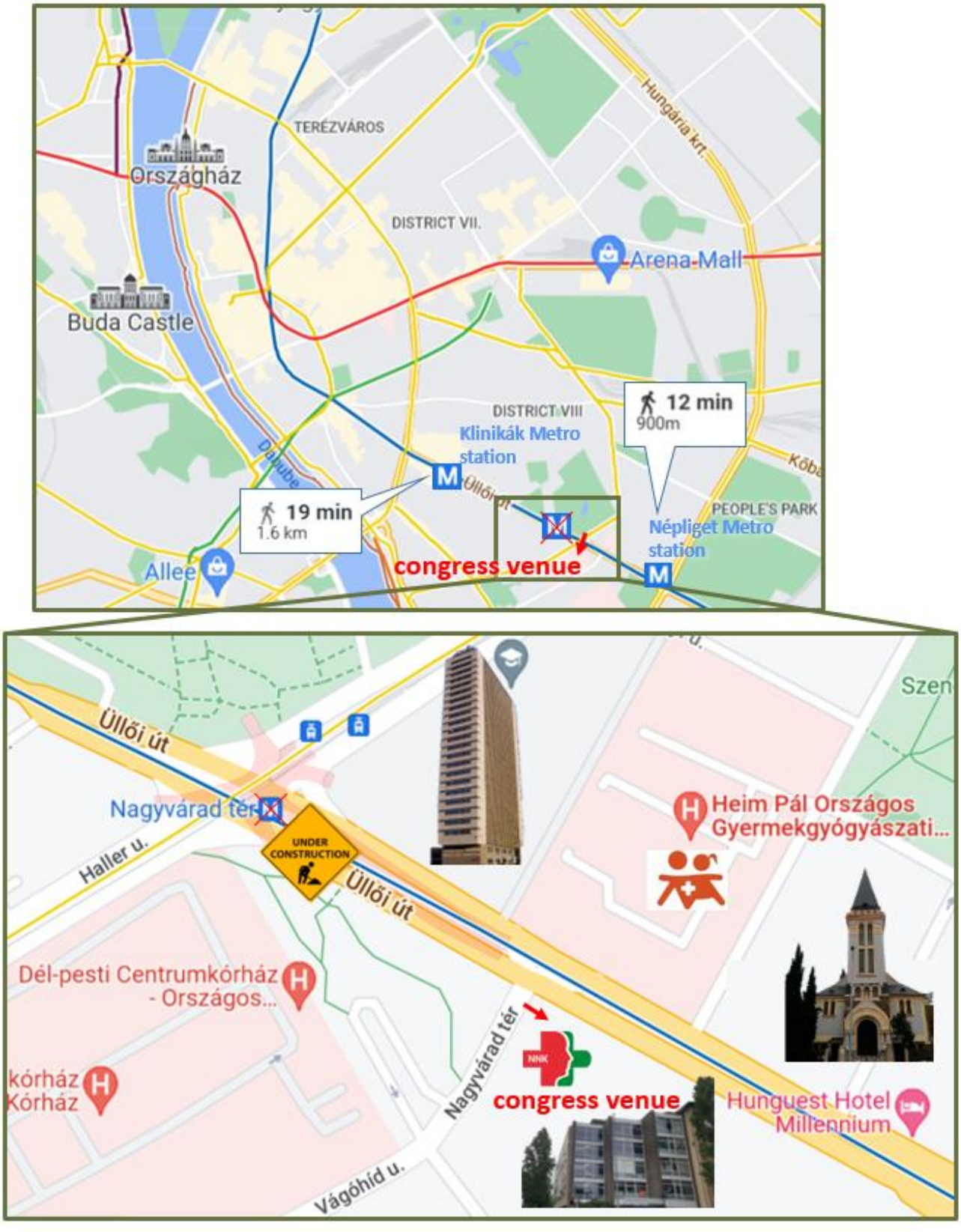
POSTERS EXHIBITION:

	Belmonte, J. Bonini, M., Damialis, A. et al. (International): The European aerobiology society in pursuit of multidisciplinary and novel research: a new era in aerobiology	P1
	Oliver, G., Monnier, S. (France): The interactive platform "signalement-ambroisie": a tool to fight against ragweed	P2
	Večenaj, A., Hrga, I., Stjepanović, B. (Croatia): Croatian pollen forecast mobile application	P3
	Grewling, Ł., Matavulj, P., Mimić, G. et al. (Poland): New insights into *Ambrosia* pollen in ambient air from high temporal resolution monitoring	P4
	Mátyás, K.K., Hegedűs, G., Taller, J. et al. (Hungary): Floral genes and the genetic regulation of flowering in the common ragweed (*Ambrosia artemisiifolia* L.)	P5
	Nagy, E., Hegedűs, G., Virág, E. et al. (Hungary): The chloroplast genome of the common ragweed *(Ambrosia artemisiifolia* L.*)*	P6
	Pölös, E., Pető, J., Hüvely, A. et al. (Hungary): The role of the authorities in the weed control of common ragweed in Hungary	P7
	Thibaudon, M., Roberto, A., Bonini, M. et al. (International): IRS (International Ragweed Society), an international tool to help *Ambrosia* management	P8
	Kaminska, O., Yasniuk, M., Rodinkova, V. (Ukraine): Population' sensitivity to *Ambrosia* pollen in different regions of Ukraine	P9

Saturday, 10th September, 2022

9:00-11:00	**Excursion: Botanical Garden of the Eötvös Loránd University, Budapest - guided tour**

MAPS : Location of the conference



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RAGWEED POLLEN, THE STORY OF A POLLUTANT

M. Thibaudon (France):

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Abstract

The definition of pollutant most often used is a biological, physical, or chemical component, which beyond a certain threshold, and sometimes under certain conditions, develops negative impacts on all or part of an ecosystem or environment in general. Within the framework of the European Commission, a substance is considered a pollutant if it is of anthropogenic origin, if it has a health impact, and if only man can help with its elimination. The question is, whether ragweed pollen can be considered a pollutant. A lot of work, articles, research projects, etc. are published about ragweed and ragweed pollen. For more than 50 years, ragweed became more and more important. The creation of the International Ragweed Society by our colleague Professor Tamás KŐMÍVES in Budapest 14 years ago, is an example of the necessity and the wish of several research teams to work on this topic. The creation of the International Ragweed Day (IRD) at the beginning of the summer each year is an important event to sensitize the population, the territorial authorities, the health authorities, and the medical profession on the importance of recognizing the plant and knowing the means of eviction. But still, a lot of work remains to be done!

WHEN A PLANT MEETS ITS OLD ENEMY ABROAD: NEW INSIGHTS FOR DEVELOPING SUSTAINABLE BIOLOGICAL CONTROL

H. Müller-Schärer[1], Y. Sun[2], U. Schaffner[3]

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Abstract
In 2013, Europe was confronted with the accidental introduction of the North American native ragweed leaf beetle *Ophraella communa*. This entailed the need for an urgent decision on how to respond to this unforeseen arrival of an oligophagous insect and potential biocontrol agent against common ragweed *Ambrosia artemisiifolia*, one of the most prominent plant invaders in Europe and elsewhere. An international research programme, together with the use of *Ophraella* as a most successful biological control agent of Ambrosia in Asia, and the rapid spread in Europe greatly boosted studies on the *Ophraella-Ambrosia* interaction. By this, it has become a research model for exploring aspects of both basic ecology and evolution, but also for its application in the importation of biological weed control (IBWC).
Firstly, I will briefly summarize our recent findings from a multitude of ecological and modelling studies on the beetle's present and future distribution, its potential benefits, and its potential risks for non-target plants in Europe.
Secondly, I will report results from a novel experimental evolutionary approach to assess the beetle's potential to select for resistant/tolerant ragweed populations, as well as the beetle's potential for evolutionary adaptation to novel biotic (sunflower) and abiotic (climate change) conditions, using next generation sequencing, metabolomic analyses, modelling, bioassays and environment-phenotype correlations. We found increased biomass of offspring ragweed in response to climate warming and showed that this arose through changes in the genetic composition of populations. In contrast, the observed increased resistance to herbivory arose through a shift in plant metabolomic profiles without genetic changes, most likely by transgenerational induction of defences. Importantly, while increased resistance was costly at ambient temperatures, warming alleviated this constraint and favoured both vigorous and better-defended plants under biocontrol. Climate warming may thus decrease biocontrol efficiency and promote *Ambrosia* invasion. Furthermore, genomic scans and behavioural studies of *Ophraella* from replicated field cages with either ragweed or sunflower indicate no genetic adaptation to sunflower and no shift in host choice over 10 beetle generations.
This is the first attempt to rigorously and simultaneously assess the evolvability of a target weed and its biological control agent when they interact. These findings now need to be combined with further demographic studies of ragweed and *Ophraella* across their suitable

areas in Europe to identify those regions where the IBWC approach is likely to reduce the impacts of common ragweed. Augmentative biological control by mass rearing and targeted releases of *Ophraella*, together with the importation of other agents might then be needed to cover cooler regions with expected lower numbers of *Ophraella* generations and thus reduce the impact of IBWC.

CARBON DIOXIDE, CLIMATE CHANGE AND HUMAN HEALTH: THROUGH A BOTANICAL LENS

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Abstract

Much of the relationship between rising levels of carbon dioxide, climate change and public health is still to be determined. However, at present, there is growing evidence that rising CO_2 and warmer temperatures can have a substantial influence on plant biological phenology and shifts in plant chemistry. One process that has a tremendous influence on human health is allergenicity. In this presentation I will review what is known, from contact dermatitis in poison ivy, to air-borne pollinosis, to food allergies in peanuts. It is hoped that these data, while incomplete, will serve as a starting point for ongoing research that will help determine future allergenic impacts.

S1.O1 - MANAGING THE NORTHERN PROGRESSION OF COMMON RAGWEED USING CITIZEN SCIENCE: THE CASE OF THE WALLOON REGION (BELGIUM)

A. Monty[1], *A. Delforge*[1]

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Abstract

For three growing seasons, common ragweed populations have been monitored and managed in the Walloon region (Southern Belgium) by the Walloon Ragweed Observatory. Although the plant has been present for several decades, it does not yet seem to have reached its exponential phase of colonization.

To estimate the extent of the invasion and its spatial distribution in the Walloon Region, citizen encoding platforms (iNaturalist; Observations.be; Atlas of the flora from Wallonia) are used. In a way to obtain a census as exhaustive as possible, priority has been placed on communication around the species (little known) and the training of stakeholders.

The majority of the populations observed are less than 25 individuals and are near bird-feeding sites, demonstrating that the likely introduction pathway is the contamination of birdseed lots. Although these populations are limited, the number of observed populations is increasing, and some populations already contain several hundred plants, thus risking becoming significant spread centres.

Faced with climate change and the multiple factors favouring the extent of the plant in our region (hen houses and sunflower crops increasing, etc.), the main goal is to be able to detect and coordinate the management of each new population identified.

S1.O2 - WHAT'S NEW ABOUT RAGWEED IN POZNAŃ, POLAND?

Ł. Grewling[1,2], A. Szymańska[1], Ł. Kostecki[1], M. Nowak[1], J. Gwiazdowska[1], E. Morawiec-Kowalska[3], M. Nowak[2,4], B. Jackowiak[2,5]

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5 Biodiversity Digitization Laboratory, Faculty of Biology, Adam Mickiewicz University, Poznan, Poland
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Abstract
Each season, since 1996, ragweed (*Ambrosia* sp.) pollen grains have been observed in the air of Poznań (Western Poland). Most of this pollen was not local but originated from distant sources e.g. Pannonian Plain. Recently, considerable populations of *A. artemisiifolia* have been found in the city. This finding creates new challenges and gives new opportunities in studying *Ambrosia* at the border of its range.
Airborne ragweed pollen data was collected by two Hirst-type volumetric pollen traps: one located in Poznań city centre (between 1996-2021) and the second in the outskirts (2005-2021). The inventory of ragweed populations was carried out in 2021 within the citizen science project "Non-divine *Ambrosia*" and using the AMUNATCOLL mobile application as a part of the AMUNATCOLL IT system developed within the project of the digitization of Adam Mickiewicz University Natural Collections. The birds feed sold in pet shops in Poznań was examined for possible ragweed seeds contamination.
The mean annual ragweed pollen integral (API) was 113 and 98 pollen*day/m^3 (for the city centre and the outskirts, respectively). There is a slight nonsignificant tendency for API decrease (around 2.0 pollen*day/m^3 per year). The API in the centre and outskirts of Poznań are highly correlated ($r=0.907$, $p<0.001$). The inventory of ragweed populations in Poznań revealed the presence of several new populations of *A. artemisiifolia* with the largest exceeding 1000 m^2. In the vicinity of this population, the mean daily pollen concentration reached 350 pollen/m^3. Other smaller populations have been found, e.g. in the zoo and near bird feeders. An analysis of the bird feed packaging showed that ~25% of them had ragweed seeds.
The highest level of contamination reached almost 700 ragweed seeds per 1kg of bird feed. Ragweed is slowly spreading in Poznań. Presumably, feeding the animals can be a significant factor in the infestation of ragweed in the city. Currently, we do not observe an increase in pollen levels in the air. However, in the vicinity of the largest populations found, the concentration of ragweed pollen grains was much higher than the thresholds doses for eliciting allergic reactions.
Keywords: pollen, seeds, long-range transport, birdfeed, zoo, citizen science, AMUNATCOLL

S1.O3 - *AMBROSIA PSILOSTACHYA* DC. (ASTERACEAE): THE ALMOST UNKNOWN RAGWEED GAINING GROUND

Ch. Montagnani[1], R. Gentili[1], G. Karrer[2], R. Hall[2], M. Kropf[2], V. Le Corre[3], S. Citterio[1]

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Abstract
Rapid research on Google Scholar reveals that *Ambrosia psilostachya* DC. (Asteraceae) is the less studied ragweed among those that massively spread outside their natural American range. While for *A. artemisiifolia* L. and *A. trifida* L. several thousands of studies have been published since 2010 (14700 and 4710 scientific papers and grey literature, respectively), clearly less than 2000 studies (1630) covered *A. psilostachya*. Native to Western North America, *A. psilostachya* is perennial ragweed occurring in all continents (except Antarctica) listed as exotic species in almost 40 countries in the world. It is a quite successful plant invader, widely naturalized; its success is essentially based on its resistant belowground rhizome, which ensures a very good resprouting capacity in case of damage. Vegetative propagation is key to the success and spread of *A. psilostachya*, while seed production seems to be secondary, at least in comparison to *A. artemisiifolia* and *A. trifida*. Concerning its aforementioned congeners, *A. psilostachya* has a major ability to colonize natural and semi-natural habitats, competing with resident species also in phytocoenoses of conservation concern as those of coastal sand dune systems. Despite being a threatening alien plant to native plant communities, its biology and ecology as well as its pathways of introduction and spread, and potential impacts are not well understood. Moreover, also its allergenic impact is not deeply studied, even if it can be relevant due to the wide distribution that *A. psilostachya* can reach in optimal conditions. Probably, one of the main reasons why *A. psilostachya* has been overlooked is related to issues in correctly identifying it: confusion can be made between *A. psilostachya* and *A. artemisiifolia*, also due to hybrids documented between these two species at least from the native range; especially in the past decades, also because of lack of reliable identification keys, *A. psilostachya* has been confused with *A. maritima* L., the only species of the genus likely to be native of the Mediterranean Basin, which went extinct in several zones along the Mediterranean coasts with the increase of anthropogenic transformation.
In the present work, we take the stock of the knowledge about *A. psilostachya* adding new data from our research in progress about the distribution of this alien species in Europe, population genetics and unresolved knowledge gaps. This contribution aims at communicating the most updated information about *A. psilostachya* as a threatening, but neglected species.

S1.O4 – RAGWEED PLANT AND POLLEN IN LATVIA

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Abstract
The total area of Latvia is 64,559 km^2 and it has the fourth-highest forest cover among EU countries. About 54% of the area is covered by boreal and mixed forests as well as a smaller part by deciduous forests – mostly in the southern part of the country. The noticeable area is covered by mires, the rest is used as agricultural lands, roads, water bodies and urban areas. Although ragweed species require higher temperatures to grow in the area, three ragweed species have been observed regularly since the 1970s. The first ragweed in the area was addressed in 1884 when *A. artemisiifolia* was found in Lithuania. Ragweed the first time was mentioned in Latvia in 1900 (A. trifida), and in 1936 (*A. artemisiifolia*).
Complex analysis of *Ambrosia* distribution was performed by: (i) analysis of the national herbarium of the University of Latvia; (ii) long-year aerobiological monitoring; (iii) field-trip for territory observation and evaluation of possible growing places; (iv) population survey using social platforms.
According to herbarium data from the Institute of Biology of the University of Latvia, samples of *A. artemiisifolia*, *A. trifida* and *A. psilostachya* were picked up near railways and roads during the 40 years (1970-2007), mostly following the rail trade ways. Aerobiological monitoring was started in 2003. First *Ambrosia* grains were collected in 2008 and since that time the concentration of ragweed has been slowly increasing. The concentration doesn't exceed moderate or high concentration levels, keeping daily ragweed concentration below 20 grains/m^3. Population survey has given worrying information about ragweed seeds' occurrence in the bird's food - particularly in seed-fat balls used to feed birds in winter periods.

Acknowledgements
This study is supported by postdoc project Nr.1.1.1.2/VIAA/2/18/283 Development of Pollen data fusion and assimilation: Real-time MonItoring and Modelling for public health.

S1.O5 – RAGWEED POLLEN FORECAST IN THE PANNONIAN BIOGEOGRAPHICAL REGION: LESSONS LEARNED

D. Magyar[1], R. Novák[2], A. Páldy[1], O. Udvardy[1], D. Kajtor-Apatini[1], E. Környei-Bócsi[1], V. Pál[1], T. Szigeti[1], B. Stjepanović[3], I. Hrga[3], A. Večenaj[3], A. Vucić[4], D. Peroš Pucar[4], B. Šikoparija[5], P. Radišić[5], T. Škorić[6], J. Ščevková[7], E. Simon-Csete [8], M. Nagy[9], Z. Topa[10], A. Kofol-Seliger[11], P.M. Leru[12], A-M. Eftimie[12], M. Bastl[13], U. Berger[13], Á. Leelőssy[1,14]

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Abstract

Common ragweed (*Ambrosia artemisiifolia* L.) is a major concern of public health and agriculture in the Pannonian Biogeographical Region (PBR). Pollen monitoring started more than 30 years ago in Hungary. Since then, the Seasonal Pollen Index of this plant shows an increasing tendency. Ragweed pollen affects approximately 15-20% of the population; 93% of them regularly use pollen information services. Allergic patients and doctors need information about the onset of the season to start the intake of preventive medication two weeks ahead of the appearance of symptoms (10 pollen/m^3/day).

During the main season, the short-term (i.e. 3 days) ragweed pollen forecast is crucial –this information can be achieved by different methods. Season start: in the early period of the season, a calendar method is useful (it is a conservative, bell-shaped curve of the 7-day moving average of 10 years' data). The positioning of the ragweed season to the start date is important for the calculation of a reliable forecast for the first weeks. Therefore, several attempts were made to forecast the start of the season, including already existing and new

methods. It was concluded that phenological observations provide the most appropriate input to forecast the start of the ragweed pollen season. Concerning the PRB, the season started 9 times out of the last 10 years in Hungary, most frequently (4 times) in Debrecen. Thus, phenological data were collected from this region weekly to enable a precise prediction of pollen seasons' start in the last 3 years. In most of the years, the onset of pollen season fell within the same five-day period of 27-31 July, however, anomalies were also detected. Extremely early peaks of pollen concentrations were observed at several monitoring stations in Hungary in June 2017 and 2018, one month before the usual onset (2). During the nationwide, biweekly field surveys, early blooming *A. artemisiifolia* plants were found, mostly in North-East Hungary. These field observations matched the source areas identified by trajectory analyses. Main season: For the prediction of the short-term changes in the pollen concentration in the main season the Ragweed Pollen Alarm System (R-PAS) was elaborated with the international collaboration of 28 monitoring stations in 2017 to generate a forecast in the PBR. The most critical point in the routine operation of such a large pollen alarm system is the coordination of data updates. We experienced that appropriate forecast models can handle some delay in data transmission, i.e., 3-day lagged pollen data provide acceptable forecast results in R-PAS (1). On the other hand, 1- or 2-day lagged pollen data would require unnecessarily high operational costs vs. the added value. As a first version a neural network model was used, nowadays a source-based dispersal model is applied to provide hourly forecasts too. Season end: Further research is needed to forecast the end of the ragweed season, using a different approach due to the re-aerosolization of pollen grains.

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S1 – O6 COMPETITIVE HIERARCHY OF TWO RAGWEED SPECIES AND ITS EFFECT ON OTHER WEEDS IN THE PLANT COMMUNITY

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Abstract

Ambrosia artemisiifolia (AMBEL) and *Ambrosia trifida* (AMBTR) are recognized as troublesome invasive plant species in several regions of the world, including Europe. Under their impact, crop production is reduced in the invaded areas, and a large amount of pollen produced is harmful to human health. The height and density of these species can produce strong shading effects and inhibit the growth of other species, which is a precondition significantly changing the biodiversity and structure of the invaded ecosystems. Unlike AMBEL, which is widespread in many parts of Serbia, AMBTR is currently naturalized only in the area of central Bačka. Their harmful impact has also been noted in this area. Given all the above, the aim of this research was focused on examining the interaction of two ragweed species and their impact on other species in the plant community. During 2016 and 2017, field experiments were carried out at a farm near Dobrić, Republic of Serbia (44°41'N, 19°34'E). Unlike AMBEL, which forms dense populations in this area and greatly impacts crop production, AMBTR has not yet been recorded in this part of Serbia. Seeds of AMBTR were collected in autumn 2015 from infested crop fields in Central Bačka (45°30'N, 19°31'E). The experiment was set up as a replacement series design (four replicates) in different AMBEL/AMBTR ratios per m^2: 10/0; 8/2; 6/4; 4/6; 2/8; 0/10. In addition to maintaining the total number of ragweed/m^2, other weed species were not removed. They were more or less homogeneously distributed, with the most abundant species being *Setaria viridis, Echinochloa crus-galli, Sorghum halepense, Polygonum aviculare, Cirsium arvense, Chenopodium album, Plantago major,* and *Erigeron annuus*. The dry mass of plants was measured to assess interactions, and data analysis was performed in R-studio. During both seasons, ANOVA showed the same trend. With the increase in the number of AMBTR/m^2 and the decrease in the number of AMBEL/m^2, the dry mass of AMBTR decreased. Opposite, with the increase in the number of AMBEL and the decrease in AMBTR, the dry mass of AMBEL was increasing. According to the results, it can be concluded that interspecific competition is larger for AMBEL, in contrast, intraspecific is greater for AMBTR. During both seasons, in the treatments with the increase in the number of AMBTR and the decrease in the number of AMBEL/m^2, the dry mass of other weeds decreased. Additionally, we conclude that AMBTR had a greater impact on other weeds in the plant community.

Acknowledgements

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S2 – O1 RAGWEED STUDIES IN THE SCIENTIFIC COMMUNITY

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Abstract

Airborne ragweed pollen is one of the triggering agents of respiratory allergy in our changing environment. For several years ragweed plants and pollen spread has been considered an emerging problem determining the increase of related allergies and sanitary and not sanitary costs for people and institutions. This can be due to both anthropogenic causes and climate change. Moreover, ragweed plants grow better in soil abandoned and disturbed by human activities and deforestation. In addition, it is impossible to avoid pollen exposition, because pollen can travel many kilometres in the wind. Hence, the monitoring of pollen is essential to the management of pollen allergy and the improvement of its forecasting methods. The chemical and biological fight against ragweed is also important.

In some cases, attention paid to the different issues seems related to the success of published papers and not to any real interest among researchers.

The focus of this study is on understanding the changing over time of appeal of this topic and its facets among the scientific community. We would like to understand what remains to be addressed and in which direction scientific research could turn.

We searched PubMed and Scopus for articles published until 23 March 2022 reporting the words ragweed or *Ambrosia* cross-checked with other related words (i.e. pollen spread, pollen monitoring, seed, crop, public health). Only studies in English were considered. We deepened many issues related to these topics not only on allergy and public health but also on other issues involving ragweed.

As expected, Scopus is the database with the highest number of published papers (7601 starting from the year 1892). Instead, in PubMed ragweed appeared from 1935 with a total of 3529 papers. In Scopus the subject areas most addressed are Medicine, (3369) Agricultural and Biological Sciences (2636), Immunology (1720), and Genetics (950). The papers using the word “allergy” are 2096 in PubMed (59.4%), the first in 1978, while in Scopus they are 2036 (26.8%), the first in 1928. The word “*Ophraella*” appeared first time in 1991 in Scopus with a total of 93 (1.2%) papers related to ragweed, and instead in PubMed, this word appeared in 1993 for a total of 25 papers (0.71%). Many other issues have been addressed.

This study aims to provide a picture of the evolution of the studies about ragweed-related topics over time. The analysis of the results will provide a useful contribution to the scientists identifying the more recent interest in ragweed-related research towards future goals in a global approach.

S2 – O2 HOW TO STOP THE SPREAD OF *AMBROSIA* SEEDS IN SOWING MATERIAL THROUGHOUT EUROPE?

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Abstract

According to the European and Mediterranean Plant Protection Organization (OEPP), *Ambrosia artemisiifolia* L. is more or less widespread in many European countries: Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Georgia, Germany, Hungary, Italy, Lithuania, Luxembourg, Moldova, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and United Kingdom.

Different pathways allow the plant to disseminate and seeds of *A. artemisiifolia* are dispersed mostly through human activities: fieldwork like harvesting, transports of soil while doing construction work, bird seeds, etc. One of these pathways is the exchange of contaminated seed lots (sowing material contaminated with the seed of *Ambrosia*) within or between countries. *Ambrosia* seeds in the sowing material could germinate in the fields where this material has been sown and hence cause heavy infestations. It seems necessary to control commercial trade to avoid the spread of this species throughout Europe.

The European regulation, which is currently being reviewed, could be upgraded with new rules that prohibit the presence of *Ambrosia* seeds in sowing material with the help of our scientific community.

S3 – O1 POPULATION GENETICS OF THE INVASIVE *AMBROSIA PSILOSTACHYA* DC. IN EUROPE

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Abstract

Western Ragweed (*Ambrosia psilostachya* DC.) is native to North America and naturalized in Europe. Its pollen can cause also allergic reactions in human beings like that of *A. artemisiifolia*. This perennial species is reproducing highly clonal by root sprouts which enables the invasion into a wide range of climatic regions in Europe – from southern Italy to Scandinavia and Scotland, and from Southwestern Spain to Southern Russia (1). However, the process and patterns of spreading, the mutual relationship of the various populations as well as the genetic and demographic structure of the invasive populations are unexplored.

Therefore, we sampled 60 populations throughout Europe and analyzed genetic diversity and population genetic structure based on 15 microsatellite loci that were previously developed for *A. artemisiifolia* (Meyer et al. 2017), but transferable to our species of interest.

Our results indicate meaningful genetic differentiation among populations of *A. psilostachya*. Allelic richness (Na) within populations varied between 1.5 and 4.7 (mean: 2.56). The average gene diversity (He) across all populations was 0.43 ± 0.13 with the lowest diversity of 0.19 observed in the Swedish population. The mean Fis calculated over all individuals was -0.20 ± 0.31 indicating heterozygote excess in 39 out of 60 populations. All populations showed significant deviations from Hardy-Weinberg equilibrium, 33 populations had at least one monomorphic locus. Significant clonal structures were detected from genetic data in 55.7 % of all populations studied ANOVA showed clearly that 10.4 % of genetic variation occurred among regions, about 40 % of the genetic variation was found among populations, and ca. 50 % was observed among individuals. Spatial differentiation of genetic variation was indicated by the results of Bayesian clustering analysis that identified six groups as the best solution.

In general, populations originating from the same region showed reduced genetic distance compared to populations from remote regions. In 8 populations we found at least one clone which also occurred in one other population, indicating an exchange of clones between these populations. Two of those populations that exchanged clones were rather nearby (0.3 and 7 km, resp.; connected by continuous anthropogenic disturbance and a river bed, resp.). The others were far from each other (162 km and 106 km, resp.; disconnected across the Adriatic Sea and along the southern Adriatic coastline, resp.).

When the first case can be interpreted as post-introductory expansion by obvious vectors, the second case can be explained either by very rare far-distance shoot fragment dispersal or by a concerted introduction from identical sources.

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S3 – O1 POPULATION GENETICS OF THE INVAS

S3 – O2 LYON (FRANCE), 40 YEARS OF *AMBROSIA* POLLEN COUNTS

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Abstract
We present these data because they seem to be the longest series in the world for *Ambrosia* pollen counts: 1982-2021.
The East area of Lyon is the cradle of the *Ambrosia* spread in France. It is the place where Dr. Dechamp's patients were diagnosed (1; 2). In 1982 a Cour sampler was put near this place by AFEDA foundation at the meteorological station of LYON-Bron (alt. 200 m, 45.72°N, 4.94°E). At this period *Ambrosia* allergy was not well known and was sometimes mistaken for Artemisia by allergists. Lyon-Bron is a semi-urbanized area, a representative for the Rhône department. The trap was running yearly, during the weeks 31 to 39 (August-September), i.e., during the pollination period of *Ambrosia*.
The parameters under study are:
-Mean weekly pollen concentration (P/m3), weeks 31 to 39, each year under study,
-Pollination Period Integral (PPI), defined as the sum of the mean weekly *Ambrosia* pollen concentrations of the weeks 31 to 39,
-Number of weeks with Allergy Risk (NwAR, defined as weeks with *Ambrosia* pollen concentration higher than 5 P/m^3),
-Number of weeks with Debilitating Allergy Risk (NwDAR, defined as weeks with *Ambrosia* pollen concentrations higher than 100 P/m^3).
We present the trend shown by the parameters considered during the 40 years under study and the corresponding correlation coefficients. The parameters PPI (R^2=0.255), peak concentration (R^2=0.166), NwAR (R^2=0.03), NwDAR (0.193) decrease significantly.
Many publications show that the upward trend in the average temperatures produces an increase in *Ambrosi*a pollen production (3). The Lyon-Bron Meteo-France internet site indicates that global warming increased since 1980 by 0.3°C every 10 years and that precipitations are about settled. It is meaningful to think that the good evolution of the studied parameters is the result of the *Ambrosia* fight policies.

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S3 – O3 AUTOMATED EVALUATION OF *AMBROSIA* POLLEN RELEASE IN NORTHWEST GERMANY

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Abstract

Ambrosia artemisiifolia has been seen as an aggressive invasive species in Germany over the last decade. For an ongoing survey, monitoring of the pollen emission rate was started by the DWD (German weather service) in Braunschweig. The current standard in aerobiology is to sample particles and make a slide for Light Microscopic inspection by eye. The 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.

The MIAS relies on Standard methods for the sampling and staining of samples. Operating our automatic light microscope aeroIScope® simulates 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, labelling and image-related listing of structures on a screen anywhere. The image analysis program of MIAS allows automated image analysis. An AI-Network was trained to recognize pollen from a daily slide in a few minutes and discriminate *Ambrosia* against pollen from relevant species at an accuracy of over 80%.

The MIAS was validated for two aspects: (i) 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%. (ii) comparing the evaluation of pictures using the Marker to the results of our Image Analysis demonstrates that the latter are sensitive to the quality of the sample and kind of grains.

MIAS® analyzes 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 (i) enables comfortable evaluation anywhere, and (ii) has a quality suitable for digital analysis to detect and classify distinct pollen. The digitalization of aerobiological samples makes it possible to share, conserve and compare these samples via our cloud WWP.

S3 – O4 DO PHOTOPERIOD PARAMETERS LIMIT THE NORTHWARD EXPANSION OF RAGWEED?

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Abstract
Ambrosia artemisiifolia belongs to the Asteraceae family. It is an annual plant, whose maintenance in each environment is related to its reproductive success. It is an invasive exotic species native to North America capable of growing in our latitudes (45°N) and able to produce a large quantity of pollen and mature seeds.
The World Health Organization (WHO) classifies allergic diseases as the fourth largest health problem in the world and considers them to be "a major public health problem in terms of quality of life, loss of working and teaching days, drug costs and even mortality". In France, especially in the Rhône-Alpes region, 13 to 21% of the exposed population is allergic to ragweed (Rhône-Alpes ORS study).
Photoperiod is defined as day length or "the period of daily illumination received by an organism" and remains constant between years at a given geographic location. As such, latitude is the only parameter of the photoperiod. The photoperiod has an important role in agriculture as it determines fundamental physiological developments in some plants. This is crucial as plants can program themselves to develop in line with the right season.
A lot of studies such as the Bullock report (1), Scalone (2) and Deen (3; 4; 5) try to show a possible expansion of ragweed into Northern countries. These studies summarise that temperature may increase the vegetative parameter of plant production and therefore also a possibility of a Northern distribution of ragweed. However, the photoperiod cannot increase or decrease vegetative production but is an essential parameter for reproduction. Hence, if the plant can grow at northern latitudes due to global warming, the photoperiod of the northern latitude doesn't automatically permit the production of pollen grains or fertile seeds.
After a preliminary study in France, this work is performed by using 4 years of ragweed pollen data (SPI, date of start, peak and end) from different European pollen monitoring stations

ranging from the North to the south of Europe. The data included in this study were extracted from the European Aeroallergen Network (EAN, https://ean.polleninfo.eu/Ean/) from the following pollen monitoring stations: Barcelona, Belgrade, Berlin, Budapest, Lyon, Poznan, Strasbourg, and Vienna.

In conclusion, photoperiodic responses are the most important factors limiting the European distribution of invasive plants such as *Ambrosia artemisiifolia*. Attempts to predict the northward range shift of ragweed have led to the conclusion that the extension of the range limit is to a large extent dependent on the photoperiodic requirements for the induction of flowering as well as seed production. At the northern latitudes, the amount of pollen in the air is low and seed production is limited due to the photoperiodic parameters. Hence, *Ambrosia* does not develop well at higher latitudes and will not experience extensive dissemination.

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S4 – O1 ESTIMATION OF GERMINATION PARAMETERS OF FOUR EUROPEAN ECOTYPES OF *AMBROSIA ARTEMISIIFOLIA*: CONTRIBUTION TO THE PREDICTIVE EMERGENCE MODEL

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Abstract

Ambrosia artemisiifolia L. is one of the most invasive weed species in Europe. Thanks to its adaptability, it has easily spread throughout most of Europe. In this work, four replicas of 50 seeds each for germination tests and 100 seeds for characteristics measurements, from four different ecotypes of *A. artemisiifolia* were used: Italy (I), France (F), Croatia (HR) and Serbia (SRB) and tested for germination parameters (base temperature (Tb) and base water potential (Ψb)) and seed characteristics (seed size, weight). For base temperature estimation, germination tests were performed in climatic chambers at 11 constant temperatures (1 to 30°C) and with a photoperiod of 12:12h (day: night). For base water potential estimation seeds were exposed to 9 different water potentials (0-(control) to -2 MPa) at 24°C, using PEG 6000 solutions to simulate water availability. Both germination parameters (Tb and Ψb) were determined using drc and drcSeedGerm packages in R, while seed size was measured under a microscope using a graduated scale. The results indicate that Tb differed between ecotypes and ranged from 0.58°C (I) to 2.74°C (F), with the I ecotype statistically different from the other ectoypes, Ψb ranges from -0.74 (HR) to -1.35 MPa (SRB) with the I and HR ecotypes statistically different from the SRB and F ecotypes. For both seed size parameters (length and width) and seed weight the I ecotype showed the lower values, ranging from Length (mm) 2.98 to 3.39; Width (mm) 1.76 to 2.27; Weight (g) 0.34 to 0.45. These differences in the morphological and phenological traits of the different ecotypes are important to understand the invasive potential of the species, moreover, they can serve as a basis for predictive models, where using Tb and Ψb it will be possible to better predict the emergence of these ecotypes, resulting in more effective control.

S4 – O2 *AMBROSIA ARTEMISIIFOLIA* SEED PREDATION LEVELS IN HUNGARIAN ARABLE FIELDS AND ADJACENT SEMI-NATURAL HABITATS: A KEY ECOSYSTEM SERVICE FOR WEED MANAGEMENT

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Abstract
In Europe, the common ragweed *Ambrosia artemisiifolia* has become a noxious species in agricultural areas and landscapes. Long-term management solutions are still required to limit the abundance of this weed. Weed seed predation by naturally existing seed predators is a key ecosystem service in agricultural fields. It contributes to long-term weed management due to seed consumption and changing weed composition. Invertebrate seed predators are thought to be the primary drivers of weed seed consumption. They ingest weed seeds before distributing them or when shed on the soil surface, thus limiting weed seed emergence next season. We measured the seed predation levels of *A. artemisiifolia* inside wheat fields in summer (June 2019, 2021), and maize fields in autumn (November 2019 and October 2020), as well as in neighbouring semi-natural habitats, before crop harvest. Using a total of 160 seed cards, four sampling rounds of weed seeds exposure to invertebrate seed predators were performed at the Hungarian University of Agriculture and Life Science research farm (Száritópuszta). Per round, 40 seed cards were placed on the soil surface with 20 cards inside the crop field and 20 in semi-natural habitat (SNH), 10 m from the field border. Twenty seeds of A. artemisiifolia were attached with repositionable adhesive to sandpaper (25x10 cm, P=60, kL361 J-Flex Klingspor). Metal wire meshes were used as a vertebrate exclusion strategy. Seed removal was assessed every 24 hours of exposure for 5 days in June 2019 and October 2020, 6 days in June 2021, and 7 days in November 2019. The proportion of seed predation was quantified using the number of removed seeds from the seed cards. Results revealed high consumption rates of *Ambrosia* seeds in all sampling rounds. Seed predation was observed on all seed cards with an overall average of 95.2 ± 8.5% (mean ± sd).
The consumption rates were higher inside field crops in summer e.g., in 2019: 99 ± 2%, than in autumn 2019: 81.7±16%, with a slight difference between SNHs (99.5±1.8%) and inside fields (93.9 ±7.8%). These findings show the possibility of seed predation to contribute to integrated weed management of *A. artemisiifolia* in agricultural fields.

Keywords: weed seed predation, common ragweed, ecosystem service, integrated weed management

S4 – O3 EFFECTS OF PEPPERMINT AND THYME HYDROLATES ON COMMON RAGWEED GERMINATION AND EARLY GROWTH

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Abstract
Common ragweed is one of the most problematic weeds in Serbia, especially in ruderal habitats where only mechanical control is possible. Since herbicide treatments are forbidden in these habitats, research to find ecologically acceptable replacements is becoming more common. This study aimed to discover the effect of the different peppermint (*Mentha piperita* L.) and thyme (*Thymus vulgaris* L.) hydrolates concentrations on the germination and initial growth of ragweed. It was determined that the highest applied concentrations of both studied hydrolates (50 and 100%) completely inhibited ragweed germination. The lower concentrations of the peppermint hydrolate (10 and 20%) reduced germination by 70 and 72,5%, while in the case of the thyme the reduction was 93%. By comparing the mean lengths of the hypocotyl and epicotyl, statistically significant differences were found between the control and the tested concentrations, except for the 20% peppermint hydrolate, which did not exhibit statistical significance. Results indicate the potential of peppermint and thyme hydrolates for ragweed control. The further research goal includes testing the other medicinal plants and lower hydrolates concentrations.

S4 – O4 IMPROVING OUR UNDERSTANDING OF NATURE-BASED MANAGEMENT AGAINST *AMBROSIA ARTEMISIIFOLIA*: TESTING PROJECTIONS OF THE IMPACT OF OPHRAELLA COMMUNA ACROSS CENTRAL AND SOUTHEASTERN EUROPE

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Abstract
The American native plant *Ambrosia artemisiifolia* (Asteraceae) is a serious invasive weed in Europe, Eastern Asia and Australia. Current distribution and habitat suitability models suggest that the central region of Central Europe is particularly suitable for the build-up of high weed densities with serious consequences for agriculture and human health. Cultural and mechanical management of *A. artemisiifolia* is challenging, as it is a fast-propagating weed, can quickly re-grow after cutting, and occurs in many different habitats, including crop fields, road margins and natural riparian ecosystems. The leaf beetle *Ophraella communa* (Coleoptera: Chrysomelidae), also of North American origin, is successfully used in China as a biocontrol agent against ragweed. In 2013, *O. communa* was also detected in northern Italy and southern Switzerland. Since then, airborne pollen concentrations in the Milano region, where the beetle builds outbreak populations, have dropped by 80%. More recently, the beetle has spread eastwards and has now been reported from Hungary, Slovenia, Croatia, Serbia and Romania. Integration of distribution models with climate-dependent vital rates of the beetle suggests that some areas in Central and Southeastern Europe are highly suitable for *O. communa*, while in other parts the beetle may not be able to build up high densities by itself. Here we present a new project that will test the projections made by laboratory and field studies in northern Italy on the case of Central Europe. We may also extend presently available host-range testing studies for a European-wide risk assessment of this accidentally introduced biological control candidate. In case the non-target risks of this beetle will appear small for Central and south-eastern Europe, one may consider combining natural control by *O. communa* (the 'Classical Biological Control' approach) with mass releases of the beetle early in the season ('Inundative Biological Control'), particularly in areas with less suitable climatic conditions.
We hope that this project will help reduce airborne pollen concentrations in Central Europe to a similar extent as currently observed in northern Italy. We are open to collaboration with institutions and experts in the region.

Acknowledgements
We acknowledge the financial support by the Hungarian state scholarship for the plant science PhD school of MATE as well as by ADOPT-IPM: EU-China joint action to increase the development and adoption of IPM tools (HORIZON-CL6-2021-FARM2FORK-01-19 – EU-China international cooperation on integrated pest management in agriculture).

S4 – O5 HOW TO MANAGE COMMON RAGWEED IN CROP ROTATIONS WITH SUNFLOWER OR SOYBEAN?

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Abstract
Common ragweed is very competitive for spring crops, causing yield losses (less than 3 q/ha each step of 10 ragweeds / m²). To control ragweed, only a combination of several techniques can be successful. This includes introducing winter crops into crop rotations (to create a gap between the ragweed emergence period and the crop emergence, and to benefit from a wider range of herbicides), using long intercropping, mixing mechanical hoeing with herbicides in spring crops and cleaning combine harvesters.
About long intercropping (between winter cereal and soybean for example), it is recommended to take advantage of bare soil during summer (after cereal harvest) and practice tillage to stimulate ragweed emergence to reduce the seed bank (obviously, destroying ragweed before its flowering). During this long intercropping, in spring before the next soybean or the next sunflower, some results from Terres Inovia showed that delaying the sowing date of the spring crop, to have enough time to practice stubble cultivation and destroy the ragweed seedlings more easily, is interesting to manage common ragweed. Indeed, a trial on soybean showed a reduction of 64% of ragweed seedlings afterwards in the soybean (between classical and delayed sowing dates). A trial on sunflowers showed 72% fewer ragweeds on mechanical destruction before the delayed sowing date and 88% fewer ragweeds with destruction by glyphosate (compared to the witness sowed at a classic date and without stubble cultivation).
Moreover, other trials from Terres Inovia on sunflower testing several herbicides showed the efficiency of the combination of pre-emergence herbicides like metobromuron or flurochloridone with post-emergence herbicides like imazamox or tribenuron-methyle (both need to be applied on tolerant variety). Agronomy and the implementation of herbicide programs also contribute to the fight against resistance. Later, programs will be changed to halauxifen-methyl, a new molecule not yet registered in France, which is usable on classical sunflower varieties.
In addition, combining mechanical hoeing with herbicides programs respecting spraying stages and recommended doses can contribute to reducing ragweed density in spring crops. A trial on soybean showed that hoeing permitted a reduction of 74% of ragweed emergencies. Finally, cleaning the combine harvester to avoid seed dissemination of ragweed when harvesting the most infested fields is strongly recommended.

S4 – O6 VIBALLA™ - AN INDISPENSIBLE TOOL FOR RAGWEED *(AMBROSIA ARTEMISIIFOLIA)* CONTROL IN EUROPE

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Abstract

Ambrosia artemisiifolia (ragweed) is an invasive weed native to North America and introduced in Europe during the 20th century, especially during World War I, and is currently found in many countries in Europe such as France, Italy, Germany, Austria, Hungary, Czech Republic, Romania, Bulgaria, Ukraine, Russia, and the Balkans.

This invasive weed is on the EPPO list of invasive alien plants as it has a high potential for the spread which poses a huge public health risk due to its allergenic pollen that could cause serious pollen allergies as well as food allergies in humans. The EPPO strongly recommends countries where ragweed has been reported to take measures to prevent further spread or to manage established weed populations.

Ambrosia artemisiifolia also causes major agricultural concerns mainly in spring crops (sunflower, soybean, corn) and is widely regarded as a persistent and difficult weed to control. The cost associated with ragweed control has been estimated to be hundreds of millions of euros.

Viballa™ selective post-emergence herbicide for use on all conventional and herbicide-tolerant varieties of sunflower offers a new, versatile tool for ragweed control in sunflower crops. Viballa™ contain Arylex™ active that belongs to a new class of chemistry, the Arylpicolinates, within HRACs Group 4 (Synthetic Auxins), and very active controlling key broadleaf weeds, like *Ambrosia artemisiifolia*, Chenopodium album, *Xanthium spinosum* and *Abutilon theophrasti* currently not fully controlled by existing herbicide solutions. In particular, it provides unprecedented control of *Ambrosia artemisiifolia* even on biotypes resistant to other modes of action, such as ALS inhibitors, and even at developed stages of the plant. By significantly reducing the number of plant survivors, it reduces the production of allergenic pollen. Viballa™ can be safely used on conventional and herbicide-tolerant sunflower varieties in a wide application window of the crop.

S4 – O7 CHANGE IN THE SPREAD OF COMMON RAGWEED IN HUNGARY IN THE LIGHT OF THE NATIONAL ARABLE WEED SURVEYS (1947-2019)

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Abstract

Periodical collection of data series on the national distribution of weeds in Hungary happens periodically for about seventy years. This kind of data collection is unique both domestically and internationally. Based on this database, we have the opportunity to monitor the spread of common ragweed *(Ambrosia artemisiifolia)* in space and time. The applied uniform methodology and processing system allows for the incorporation of data from subsequent surveys and the comparable processing of weed survey results.

The first national arable weed survey was named after Prof. Miklós Ujvárosi. After the first national arable weed survey (1947-1953), four other surveys have been taken (1969-1971, 1987-1988, 1996-1997, 2007-2008).

Ten years after the fifth national weed survey (2007-2008), Hungarian weed flora changed significantly due to the changes in agriculture. These changes necessitated doing a new field weed survey in 2018-2019 years. The main changes that justified the new one were the following: 1. improved financial opportunities and stricter requirements for area-based payments in the EU, 2. stronger official action to control the obligation to remove ragweed, 3. the changes in the weed management technologies (the proportion of post-emergent treatments increased), 4. narrowing herbicide selection due to strict EU regulations.

The sixth national weed survey (2018-2019) was carried out after the work of Prof. Miklós Ujvárosi on winter wheat and maize crops. Winter wheat and maize fields were surveyed at the end of spring and early summer. Maize and winter wheat stubbles were surveyed at the end of summer. Surveys were carried out on non-controlled fields, so we did not get data on the size of the areas infested with each weed, but on how infested our areas would be in the absence of weed control. The total weed cover in winter wheat, its stubble and maize fields considerably decreased as compared to that of the results of the fourth and fifth surveys. *Ambrosia artemisiifolia*, *Echinochloa crus-galli* and *Chenopodium album* are believed still to be the most important weeds of maize fields in Hungary. Based on the results of the late summer surveys, the cover percentage of *A. artemisiifolia* decreased, although it retained its first place in the rankings.

On winter wheat fields, *A. artemisiifolia* belongs to the dominant weeds in the rank of order, although it can only significantly damage incomplete or underdeveloped wheat. *A. artemisiifolia* is still the number one species on wheat stubbles in the rankings.
Since the date of the fourth national weed survey (1996-1997), *A. artemisiifolia* is considered the most important weed species in Hungary. Although its cover considerably decreased on winter wheat, stubbles and maize crops; however, based on the late summer results of winter wheat and maize, it retained its first place on our arable fields.

S4 – O8 STERILE COMMON RAGWEED WITHOUT POLLEN

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Abstract
Common ragweed (*Ambrosia artemisiifolia,* Asteraceae) is the most outstanding invader in Europe with severe negative impacts on agriculture, biodiversity, and human health. Ragweed is strong and difficult to stop species. Nevertheless, we asked ourselves the question of whether and how can be prevented pollen production in natural conditions. Investigations were realized in 2014-2021, mainly in Slovakia and partly in Hungary. We watched mainly fauna with an emphasis on species with a narrow host range. The huge screening by sweeping and visual observations was realized. The species composition was quite similar in all locations across various habitats (species from *Coleoptera, Heteroptera, Diptera, Auchenorrhyncha, Arachnoidea*). Most species were generalists, sometimes causing heavy damage but plants were still able to produce pollen. Only one group of animals specialized for ragweed: Eriophyoid mites from genera Aceria (Acari: *Eriophyoidea*). Mites occurred rarely, depending on the habitat. Infested plants had very specific crazy symptoms. The phenotype was significantly changed, with young tissues pale green / yellow, proliferation, malformation and virescence of male inflorescence, witches' broom and phyllody. The deformed male inflorescence formed "seeds" instead of pollen and seeds were not viable. Female seeds did not form on symptomatic plants at all. Production of pollen by symptomatic plants was assessed in the field. Looking at symptomatic plants in more detail, after extraction of DNA and subsequent PCR we found the presence of phytoplasma, which live with mites and cicadas likely in symbiosis. We hypothesize that the obligate parasite, phytoplasma, together with mites and cicadas could be responsible for stopping pollen production and overall plant sterility. All these exciting findings are discussed, and ecological implications are highlighted.

Key words: allergenic pollen, invasive plants, Eriophyoid mites, cicadas, *Ambrosia artemisiifolia*, phytoplasma, sterile plants.

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S4 – O9 ASSESMENT OF RAGWEED SEASON CHANGES IN UKRAINE

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Abstract
It is important to compare possible trends of ragweed season changes in different regions of the country. Data were obtained from two pollen monitoring sites located in different climatic areas of Ukraine: Zaporizhzhia is located in the steppe zone in the Southeast of Ukraine and Vinnytsia is located in the Forest-Steppe zone in the Centre of Ukraine. Pollen data were collected from 2009 to 2021 using Burkard traps of a Hirst type, located on the roofs of buildings of Zaporizhzhia State Medical University and National Pirogov Memorial Medical University, Vinnytsya.
Pollen count was performed using 12 vertical transects. Daily concentrations of *Ambrosia* pollen were taken into analysis. Annual trends of changes of peak and total annual pollen load values, shifts of days of start, end and peak of the season; season duration changes and changes in several days with a clinically significant threshold in 10 pollen grains / m3 were analyzed. Calculations were performed using tools of the European Aeroallergen Network and Excel 2013 Program.
Southern and Eastern Ukraine is a territory with the highest level of contamination by *Ambrosia* in the country. The results obtained supported this consideration: the pollen index of Zaporizhizhia was, on average, 8.95 ± 0.36 times higher than the pollen index in Vinnytsia. It also increased in both areas through the years of monitoring and the season was significantly prolonged over the last 13 years in both Vinnytsia and Zaporizhzhia. This trend was more expressed in Zaporizhzhia, where the duration of the season reached 205 days in 2020 starting from 60 days in 2009. In Vinnytsia, the season was 72 days in 2009 and 129 days in 2019. Besides the time shift, we also observed a tendency to start earlier and end later in both regions. During the studied period, the start of the ragweed season registered in Zaporizhzhia shifted on average for 34 days: in 2009 it started on August 8, and in 2021 on July 8, starting consequently earlier year by year. In Vinnytsia, the ragweed season start shifted, on average, from August 9 to July 3. While the season end in Vinnytsia shifted from the end of September to the middle of October. In Zaporizhzhia end of the season shifted from the mid of September to the beginning or mid of October.
The timing of peak day in Vinnytsia remains almost the same, with the peak at the end of August. In Zaporyzhzhia peak day shifted more significantly – from the end of August to the beginning of September. Interestingly, the trend for peak value suggests that it remains almost the same for the years of monitoring and is 3.56 times higher in Zaporizhzhia than in Vinnytsia (809.4±386.2 against 227.3±197.5).
The number of days with clinically significant concentrations of 10 pollen grains / m3 increased in both areas – from 20 to 28 in Vinnytsia and from 40 to 78 in Zaporizhzhia.
General trends of changes in ragweed season in different climatic zones of Ukraine were similar. Ragweed pollen season elongated in both regions starting earlier and ending later with the increase of total pollen index and rise of the number of days with clinically important concentrations of ragweed pollen in the atmosphere.

S4–O10 RISK POTENTIAL AND EXPANSION POTENTIAL DUE TO CLIMATE CHANGE FOR THE MOST COMMON ALLERGENIC TAXA ON THE EXAMPLE OF SZEGED, HUNGARY

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Abstract
The risk potential (RP) and the expansion potential (EP) estimate the possible changes in the population of allergenic taxa due to climate change in a specific area. Their categories are based on the ecological requirements of each taxon due to Borhidi's ecological indicator values (heat supply (TB-value), soil moisture or water table needs (WB-value), degree of continentality (CB-value)] as well as on field experiences. The risk potential due to climate change (RP) forecasts changes in the existing populations in their places, while the expansion potential due to climate change (EP) refers to their possible distribution increase or decrease in the landscape due to climate change. Taxa in RP classification can be non-endangered (the extension of the populations will not change), moderately endangered (some of their populations may regionally decrease) and endangered (a significant decrease will happen in the pollen source populations). Taxa in EP classification can be sorted into 5 categories, namely: 0: unaffected by global warming; 1: for some species, there is an area-increase, while for some others area-decrease is possible; 2: significantly influenced by global warming; for some species, area-increase is expected; -1: for some species regional area-decrease is possible; -2: significantly influenced by global warming; for the majority of species area-decrease is expected. Szeged area, having significant continentality, is surrounded by diverse natural, agricultural and anthropogenic habitats with the following main allergenic taxa: *Ambrosia, Artemisia, Cannabis, Juglans* and *Platanus*. These aren't endangered due to climate change, and their significant area increase is likely in the landscape except for *Cannabis* (as arable-land use and mowing of verges will continue, other competitor weeds can control their spread resulting them no measurable area change). *Ambrosia* can spread in the stubble fields, early regeneration period of fallows, trapped or non-treated urban grasslands, in natural open dry sandy grasslands as well as occasionally in less treated natural or semi-natural dry, closed grasslands. Artemisia is a characteristic taxon of the Eurasian steppes and North American prairies favouring the arid and warm conditions adopting well with a wide species pool to all geological and soil conditions. Though Poaceae are mainly not endangered due to climate change, some grasses in Szeged are endangered or moderately endangered due to their higher available Na-salt and water needs in drying and eluvating conditions, but on average their moderate area increase is likely in the landscape due to climate change. The majority of Chenopodiaceae, *Plantago, Populus, Quercus, Rumex, Tilia, Ulmus* and *Urtica* is also not endangered due to climate change, however, few of their species can be moderately endangered, which means their moderate area increase in the landscape. *Alnus, Betula* and *Taxus* are endangered taxa due to RP and, in this way, they can suffer a major area decrease considering their EP. *Morus* and *Pinus* are moderately endangered due to climate change in Szeged and can have a moderate area decrease in their population on a landscape level.

S5 – O2 MONITORING RAGWEED POLLEN LEVELS AND RAGWEED ALLERGY AFTER THE SPREADING OF OPHRAELLA COMMUNA IN NORTHERN ITALY

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Abstract
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. This study aimed to monitor the ragweed pollen levels in light of the reduction of *O. communa*, previously observed in that area and to assess the possible impact on the health of such variations.
Pollen grains were sampled by three Hirst volumetric traps located in Legnano (L), Magenta (M) and Rho (R). The observation period ranged between 1995 and 2021. The seasonal pollen parameters were assessed. The areas infested by *O. communa* were checked by visual inspection from 2014. Clinical data were collected by three allergy clinics in the surroundings of the pollen monitoring stations, from 2005 to 2020. Pollen and clinical data trends were calculated by nonparametric means.
Seasonal Pollen Integral (SPI) and peak value (C max) down trended significantly in all the stations ($p<0.05$), as did the number of days with ≥ 100 p/m3 and ≥ 50 p/m3 ($p<0.05$). Nevertheless, an increase of SPI was observed in all stations since 2018, more evidently in L and M. An increase of C max was also observed in L and M since 2018 and in R since 2019. Only in L the day of the C max was delayed. A marked drop in the number of areas infested by *O. communa* was detected, varying from 181 in 2014 to 36 in 2021.
A significantly reduced rate of ragweed pollinosis ($p<0.05$) was observed in two allergy clinics. Over the long term, the reduction of ragweed pollen levels in the Milan area seems maintained. A positive impact on health seems detectable only where the infestation was less intense. However, SPI and C max fluctuated since 2018 in coincidence with a decreased presence of *O. communa*. In parallel, two allergy clinics recorded an increase in the ragweed allergic subjects, possibly reflecting the increase of pollen levels associated with the decrease of *O. communa* in this area.

Keywords: ragweed, *Ophraella communa*, pollen exposure

S5 – O3 DEFINING THE HEALTH THRESHOLDS FOR AIRBORNE RAGWEED POLLEN

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Abstract
The North-West Milan area is one of the most infested with ragweed in Europe.
The study aimed to define the airborne ragweed pollen concentration thresholds related to the impact on human health.
Pollen grains were sampled by three Hirst volumetric traps located in the studied area.
Ragweed-allergic patients were enrolled in 5 allergy clinics close to the pollen traps. During the ragweed pollen season in 2014, they compiled a daily diary of the symptoms.
The quantiles of order (0.25, 0.5, 0.75) for the total number of symptoms per person in the period from August 01, 2014, until September 02, 2014, were considered to define the airborne ragweed pollen threshold levels. The quantiles defined classes based on the total number of symptoms: low, medium-low, medium-high and high. The threshold levels corresponding to each class were obtained by computing the averaged ragweed pollen concentrations (pollen grains/m^3) for the corresponding days.
We established three different average ragweed pollen concentration thresholds, each corresponding to a different symptom intensity level.
Specific health thresholds for airborne ragweed pollen were defined and represent an important tool for setting ragweed-allergy preventative measures.
The pollen threshold levels established in our study are probably not generalizable, but, at the moment, remain unique and can be used as an indicative reference for planning various territorial interventions to reduce the ragweed plant's expansion.

Keywords: ragweed allergy, pollen health thresholds, quantiles

S5 – O4 THRESHOLD LEVELS OF AIRBORNE RAGWEED POLLEN CONCENTRATIONS AND THE RELATIVE RISK FOR HAY FEVER BASED ON CROWD SOURCED DATA IN TWO REGIONS OF SOUTHEAST EUROPE

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Abstract
The threshold levels necessary to induce pollen allergy symptoms are not universal. For Southeast Europe pollen thresholds, the risk for allergy symptoms, and the need for medicine use have not been investigated yet. This study aimed to identify ragweed pollen threshold levels and the relative risk for respiratory allergy symptoms and medication use in western Istanbul, Turkey, and Yuvojvod, Serbia.
The effects of airborne pollen sampled according to the current norm (1) on symptom and medicine scores obtained from crowdsourced data (pollendiary.com) between 2014 and 2016 were analyzed with generalized additive models (GAMs). Maximum daily temperature, time and PM10 were used as confounders. Thresholds were visually identified on a dose-response curve. The increase in the relative risk (RR) for hay fever at 10 p/m^3 of ragweed was estimated. In western Istanbul, ragweed pollen had a linear effect on symptoms with a RR of 1.10. In Yuvojvod, the effect of ragweed pollen on hay fever began at 2 p/m^3 and reached saturation at 15-17 p/m^3. The RR for symptoms and medication use was 1.21 and 1.14.
Pollen threshold levels and the RR were assessed for ragweed in two regions in Southeast Europe to support public pollen information, and to aid health practitioners.

Keywords: pollen thresholds; electronic pollen diary; non-linear trends; medication scores, symptom scores; aerobiology

Reference
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S5 – O5 RAGWEED SPREAD AND HEALTH IMPACT IN BUCHAREST AREA – RESEARCH ACTIVITIES AND IMPLEMENTATION OF NATIONAL LEGISLATION

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Abstract

Ambrosia is a rapidly spreading invasive weed in Eastern European countries, representing an important environmental and health hazard. Allergies due to *Ambrosia* pollen are increasing emergence in Romania, as there are many patients reported with moderate to severe seasonal respiratory allergies. Despite increasing public concern regarding air pollution, there is only one active pollen monitoring station in Bucharest since 2014. This presentation aims to report eight years' data of pollen monitoring from Bucharest and to place them in the context of local air pollution, public health regulations and available data on the health impact of ragweed pollen in the urban environment.

Pollen monitoring has been initiated and performed in Bucharest since 2014 in the frame of the COST project SMARTER FA-1203, based on collaboration with the Réseau National de Surveillance Aérobiologique (RNSA) from France and the European Aeroallergen Network, coordinated from Vienna. We used a Burkard pollen trap located in Colentina Clinical Hospital with weekly analysis. The results have been sent to www.pollen info.org and were also included in the European project CAMS_23, Copernicus/ECMWF and the regional project Ragweed Pollen Alarm System (R-PAS). Our pollen data were correlated with major air pollutant concentrations and with meteorological factors in a recently published local paper. Clinical data from 760 patients addressed to our Allergy centre for ragweed-induced respiratory symptoms during 33 months were collected and published in 2019. We also evaluated the consequences of Law no. 62/2018 regarding ragweed control after its implementation in 2019.

Our eight-year pollen monitoring data, correlated with reported field data confirm the rapid spread of *Ambrosia* in the Bucharest city area, added to the environmental local problem due to air pollution. The ragweed season in this area lasts between July - October, with many patients asking for allergist consultation in August-September and the air pollen peak concentration recorded during 2-3 weeks in early September. The continuously increasing number of patients with seasonal ragweed-induced respiratory allergies confirms the real alarming health impact of this environmental hazard, besides the increased awareness of the population. The number of patients addressed to our centre almost doubled from one year to year.

Ragweed pollen is an important component of biological pollution in the urban environment, responsible for increasing respiratory allergies and a significant contribution to the health impact of air pollution in the Bucharest area. There is an urgent need to develop a pollen monitoring network and more coherent strategies to control ragweed spread, in terms of the application of existing local and international regulations, air pollution control and evaluation of consequences on human health.

S5 – O6 THE HUNGARIAN AEROBIOLOGICAL NETWORK – 30 YEARS OF ACHIEVEMENTS

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Abstract

The Hungarian Aerobiological Network (HAN) was established 30 years ago by the predecessor institute of the National Public Health Center, which is recently coordinating the network. The HAN has been gradually built up from two stations established in the capital city to a countrywide network including 21 monitoring stations. The stations are operated by the local government offices according to international standards.

Several milestones were reached over the 30 years of continuous operation. The first pollen report was issued in 1994, the attempts to forecast the pollen season onset started in 2010, the Ragweed Pollen Alarm System (R-PAS) was introduced in 2011, and the first short-term ragweed pollen forecast map was published in 2017. Several forecast methods were used to produce the maps such as the calendar method, the neural network and a dispersion model based on the SILAM method. The system was modified several times concerning the spatial and layout, as well as recently both daily and hourly forecast maps are produced during the ragweed pollen season. Since 2017, the R-PAS produces short-term pollen forecast maps for the whole Pannonian Biogeographical Region. Climate-specific pollen indicators were developed in cooperation with the World Health Organization European Centre for Environment and Health. The analysis of the 30 years of data revealed some peculiarities of the ragweed pollen characteristics such as the increasing trend of yearly pollen load in each of the microclimatic regions in Hungary. The potential impact of climate change on ragweed pollen production was studied by using a regional climate model (RegCM) and the A1B emission scenario predicted a considerable further load for society without introducing preventive measures. The yearly mean pollen load will increase by 30% between 2021 and 2050 and almost double by the end of the century. Besides the increase in daily maximum pollen concentration, the increase in the number of days with pollen concentration evoking hay fever symptoms will also notably increase.

Awareness raising and information of the public have been playing an important role in the activity of HAN. Special emphasis is put on the prevention of allergies concerning the healthcare aspects, as well as the development of an allergen-free environment. The further aim is to produce a personalized symptom forecast system for allergy sufferers.

S6 – P1 THE EUROPEAN AEROBIOLOGY SOCIETY IN PURSUIT OF MULTIDISCIPLINARY AND NOVEL RESEARCH: A NEW ERA IN AEROBIOLOGY

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Abstract
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 encouraging cooperation with other areas of science. In 2021-2022 48 individuals and 2 associations were members of the EAS.
Members of the EAS are active in 4 working groups. The working group (WG) “Quality control” has organised so far 3 exercises: on a digital quality control system and on the quality control of measuring airborne pollen and fungal spores. The WG “European legislation” has established the European standard EN16868 and has been continuously promoting the field of Aerobiology across the world and especially in the European scientific community. The WG “Education” has been involved in the organisation of various courses and educational activities, like the Basic courses on Aerobiology (i.e. 2019 in Lyon and 2021 in Brussels), in the awarding of grants for young researchers, and the organisational support of European and International congresses, such as ESA2020 in Cordoba and IRS 2022 in Budapest.
The current Society, in 2021-2022, encourages young researchers to become active members and benefit from various grants, as in the European Symposium on Aerobiology 2020 (6 grants), the Basic Course of Aerobiology 2021 (5 grants), the Advanced Aerobiology Course 2019 (1grant), the IRS2022 (1grant).
Regarding research on Ragweed pollen, the EAS supported the transfer of knowledge to date by sponsoring IRS conferences (Rho 2014, Budapest 2022), organizing joint events (Lyon 2016) and disseminating information about the annual International Ragweed Day.
The EAS is an active family of researchers reaching out to several other disciplines and ready for future challenges. The forthcoming European Symposium on Aerobiology will be held by Vilnius University in Lithuania in 2024 and will – amongst others – be themed "Versatile Research and Novel Technologies for Smart Aerobiology". The organisers of the Symposium will ensure the highest quality of scientific discussions from both top-level scientists and novice researchers. The latest information on advances in aerobiology is available on EAS website: http://www.eas-aerobiology.eu/.
EAS is open to new members who may be from different scientific fields.

Keywords: airborne pollen, bioaerosols, fungal spores, collaboration, research

S6 – P2 THE INTERACTIVE PLATFORM "SIGNALEMENT-AMBROISIE: A TOOL TO FIGHT AGAINST RAGWEED

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Abstract

Ragweed is an annual plant native to North America and has colonized many countries like France and Hungary for instance. An invasive species like *Ambrosia artemisiifolia* is an alien living species that becomes a disturbance agent "harmful" to the indigenous biodiversity of natural or semi-natural ecosystems from which it was established.

Ragweed pollen is highly allergenic and just a few grains are enough to trigger symptoms of allergy for sensitive people. This invasive and dangerous plant for health releases its pollen from August to September: the individual prevalence of ragweed allergy in the Rhône-Alpes region (France) was about 13% in 2014 (compared to 9.2% in 2004) and reached 21% in the highly exposed area (according to a study by Regional Health Agency published in 2014). Furthermore, 67% of Rhône-Alpes people were exposed to ragweed pollen for more than 20 days at a sufficient concentration level to trigger symptoms. The health symptoms experienced by sensitive people are mainly manifested as rhinitis, conjunctivitis, tracheitis, and even asthma. The treatment of these pathologies cost 40,6 million euros (annual public expenses related to ragweed allergy in Rhône-Alpes in 2017), and health costs are increasing.

To fight more efficiently against ragweed and reduce health costs, an interactive platform "Signalement-Ambroisie" has been launched in 2014 to mobilize and involve people in the fight against *Ambrosi*a. “Signalement-Ambroisie” is a simple three-step process that allows everyone to be an actor. The interactive platform allows reporting ragweed using different channels: website, smartphone app, e-mail and phone. With this platform, several thousand reports every year have led to the removal of numerous ragweed plants.

The platform is a dynamic management tool for the presence of ragweed (tracking, monitoring; etc.) and allows everyone to be active in the fight against ragweed and represents positive communication support. Moreover, for the "supervisors" of the fight against ragweed, “Signalement-Ambroisie” allows the collection of large-scale ragweed data to generate the map of the presence of the plant.

S6 – P3 MOBILE APPLICATION FOR CROATIAN POLLEN FORECAST

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Abstract

Pollen allergy reduces the quality of life and is a major public health problem. This problem is also recognized in Croatia and therefore it is of great importance to inform citizens about the daily load of allergens.

Croatia has 20 monitoring stations scattered throughout the country covering both the continental and Mediterranean parts of the country. Since the flora is specific for each part, this information is useful to local citizens as well as tourists. Among these 20 cities, 7 of them have continuous everyday monitoring (using daily sampling head) and presenting this kind of information on daily pollen load is well accepted in public. Therefore, we launched an Android and iPhone application so that our citizens can have accurate and timely information on pollen concentrations even on the move. This application shows information on daily pollen concentrations in the form of colour and number scales. It also shows pollen forecasts for the next two days followed by weather forecast data, a description of each allergenic plant and cross-reaction of pollen and food of plant origin. It is a great tool for providing useful bio-prognostic data that allow allergic persons to plan daily activities and appropriate preventive procedures.

S6 – P4 NEW INSIGHTS INTO *AMBROSIA* POLLEN IN AMBIENT AIR FROM HIGH TEMPORAL RESOLUTION MONITORING

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Abstract
Airborne pollen concentrations of invasive *Ambrosia* species can reach very high levels locally, and the pollen grains have the potential to be transported long distances when conditions are favourable. In this study, we present the first airborne *Ambrosia* pollen measurements recorded by an automatic sampler with 1-hour and sub-hourly resolution (i.e. 1-minute and 1-second data).
The data were collected by traditional Hirst-type methods and new generation Rapid-E real-time bioaerosol detector. Airborne pollen data, for Total Pollen and *Ambrosia*, were collected during the 2019 pollen season in Novi Sad, Serbia. Temporal variations in daily, hourly and sub-hourly *Ambrosia* pollen data were analysed, and the impact of turbulence kinetic energy (TKE) on pollen cloud homogeneity was investigated.
Variations in Seasonal Pollen Integrals produced by Hirst and Rapid-E show that scaling factors are required to make data comparable. Daily average and hourly measurements of atmospheric *Ambrosia* pollen recorded by the Rapid-E and Hirst were highly correlated and so examining Rapid-E measurements with a sub-hourly resolution is assumed meaningful from the perspective of identification accuracy. Sub-hourly data provided an insight into the heterogenous nature of pollen in the air, with short peaks lasting a maximum of 11 minutes, and mostly single pollen grains recorded per second. Short-term variations in 1-minute pollen concentrations could not be wholly explained by TKE.
The new generation of automatic devices has the potential to increase our understanding of the distribution of bioaerosols in the air, provide insights into biological processes such as pollen release and dispersal mechanisms, and allow us to conduct investigations into dose-response relationships and personal exposure to aeroallergens.

Keywords: airborne pollen, *Ambrosia,* high temporal resolution, 1-minute data, 1-second data, laser spectroscopy

S6 – P5 FLORAL GENES AND THE GENETIC REGULATION OF FLOWERING IN COMMON RAGWEED *(AMBROSIA ARTEMISIIFOLIA* L.*)*

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Abstract
Common ragweed (*Ambrosia artemisiifolia* L.) is a monoecious plant with separated male and female inflorescence. However, the genetic regulation of floral morphogenesis of hermaphrodite flowers, like *Arabidopsis* is well understood, fewer studies were done on plants with separated flowers (1). Considering the large amount of highly allergenic pollen produced by ragweed, the purpose of the present research was to investigate the genetic control of sex determination during floral organogenesis. To this end, we performed genome-wide transcriptional profiling of vegetative and generative tissues during plant development. Transcriptome sequencings on NextSeq 500 and HiSeq 2000 platforms (Illumina, USA) with an integrative bioinformatics analysis indicated differences in the expression profile of 80 floral genes. The sex specificity of selected genes was validated by RT-qPCR experiments.
In the transcriptome of the female as well as of the male flowers nine and 14 uniquely expressed floral genes were identified. For the FD, FT, TFL1 and CAL, AP1 ragweed gene homologues increasing expression levels were found in all tissue types both in the male and female floral meristems during organogenesis. Homologue transcripts of LFY and FLC were not found in the investigated generative and vegetative tissues. It is concluded that the morphogenesis of male flowers is regulated through the photoperiodic pathway by the FT / FD complex, while that of female flowers is regulated under the hormonal pathway by the AGL24 / SOC01 complex. The nucleotide sequences of the 13 ABC(E) genes, which are responsible for flower organ development were determined based on known floral gene sequences of various species of the Asteraceae family.
By changing photoperiodic and hormonal in vitro conditions, alterations in male and female floral meristem differentiation were demonstrated.

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Acknowledgements
This research was supported by the Hungarian Government and the European Union, with the co-funding of the European Regional Development Fund in the frame of the Széchenyi 2020 Programme GINOP-2.3.2-15-2016-00054 project.

S6 – P6 THE CHLOROPLAST GENOME OF COMMON RAGWEED *(AMBROSIA ARTEMISIIFOLIA* L.*)*

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Abstract

Common ragweed (*Ambrosia artemisiifolia* L.) is an invasive species present in many countries in the world. Its pollen is highly allergenic and the weed causes significant economic losses in agriculture. Many herbicides are used for ragweed control function in the chloroplast, and others block essential chloroplast genes (1). Hence, understanding the chloroplast genome of ragweed may facilitate further research and development to control this weed. Using a MiSeq (Illumina, USA) platform we determined the chloroplast genome (plastome) of common ragweed. The 152 215 base pair (bp) plastome of common ragweed contains 114 genes, from which 80 are protein-coding genes, 30 are tRNA-s and 4 are rRNA-s. Each of the two inverted repeat regions is 24 929 bp, the large single copy region is 84 399 bp and the small single copy region is 17 958 bp in size. We have analyzed the sequence repeats in the plastome, and created a program, called Clean Repeats (http://cleanrepeats.georgikon.hu/), for the filtering of results obtained with the Reputer repeat detector program. Further, the microsatellites in the common ragweed plastome were also identified. Phylogenetic analyses were performed using the rbcL, ndhF, atpB, genes and the rps16 intron, as well as the sequence between the psbD-trnT-GGU genes. It was concluded that the rps16 intron is not applicable for phylogenetic analyses in the Asterales order.

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S6 – P7 THE ROLE OF THE AUTHORITIES IN THE WEED CONTROL OF COMMON RAGWEED IN HUNGARY

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Abstract

Almost two million people suffer from common ragweed pollen allergy in Hungary. By law, common ragweed must be scrapped. According to the legal regulation of plant protection, common ragweed hasn't always been a significant weed. The importance of common ragweed was emphasized when the weed became not only an agricultural but also a health problem. The control of common ragweed is related to constitutional rights as well. The Hungarian constitution stipulates the right to live in a healthy environment. The legal regulation emphasizes the right to a healthy environment ahead of the property right. It means that the control of common ragweed is legal on residential and commercial properties. According to the law, the authority doesn't have to inform the land users about the inspection in advance. The authority can keep an on-site visit, later a contractor can enter the particular area and mow the ragweed on it.

The following legislation has been introduced to combat the problem, namely Act XLVI of 2008 on the food chain and the official supervision; and Government Decree 221/2008 (VIII.30.) on the rules of the implementation of common ragweed control of general interest, and on the rules of calculating and claiming for expenditures of common ragweed control of general and government interest.

According to Act XLVI of 2008 on the food chain and the official supervision, by 30 June of the particular year, the land user is obliged to prevent the development of buds of common ragweed on his/her property and to constantly maintain this condition until the growing season ends. It means that the land user is obliged to mow common ragweed on his/her property not just once, but also maintain this condition of the area. Control of common ragweed is primarily the task of the land user, although all citizens have a great interest in weed control, after all.

The task of the authorities is that monitoring according to the legislation, giving the order to weed control, and ordering to pay plant protection fines. The defaulting land user bears the cost of control and pays the fine. For this, it is enough to establish the failure of weed control, with no need for harm and health damage. In that case, the administrative procedures will launch after 30 June of the particular year.

County government offices exercise the power and have competence in the control of common ragweed.

S6 – P8 IRS (INTERNATIONAL RAGWEED SOCIETY), AN INTERNATIONAL TOOL TO HELP *AMBROSIA* MANAGEMENT

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Abstract

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 artemisiifolia* L.) a widespread monoecious genus in the Asteraceae. Ragweed pollen can be transported by wind over long distances (several hundred or thousands of kilometres) and may cause allergy symptoms 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 its potential effects on biodiversity add up to a huge negative impact (1; 2; 3).

Ragweed has a higher spread potential than the most indigenous annual dicotyledenous and grass-weeds species in Central Europe. This situation requires high monitoring of the plant and the implementation of an accurate control strategy involving not only farmers but also the staff managing natural areas, roadsides, buildings, 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 a dedicated international congress in Europe every 4 or 5 years, where the researchers can present the state of the art on *Ambrosia*-related knowledge to propose targeted preventive measures.

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S6 – P9 POPULATION' SENSITIVITY TO *AMBROSIA* POLLEN IN DIFFERENT REGIONS OF UKRAINE

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Abstract

Ragweed *(Ambrosia)* covers large areas in Ukraine and poses a significant risk to the healthcare system due to the ability of its pollen to cause allergic reactions. This plant was introduced into the country at the beginning of the 20th century and spreads all over the territory of Ukraine up to now (1). The higher infestation is seen in Southern, Eastern and some Central areas of Ukraine (2). In contrast to areas of the heaviest *Ambrosia* infestation in Ukraine, which are known, sensitization patterns remain unclear. Thus, our study aimed to determine the character of the sensitization to ragweed pollen in different areas of Ukraine.

To achieve the aim we analyzed data of sensitization of 16309 people, who lived in different areas of Ukraine and underwent allergy diagnostics using multiplex molecular component-resolved allergy test Alex2. Tests were performed in 2020-2021 years. Inhabitants of 16 out of 25 territory units of Ukraine were tested. These areas were located in the Forest, Forest Steppe and Steppe zones of Ukraine. Most of the tested patients were from the largest Ukrainian cities, e.g. Kyiv (19.62%, Forest zone), Odessa (14.48%, Steppe zone), Kharkiv (7.7%, Steppe zone) and Dnipro (7.55%, Forest-Steppe zone).

Components taken into consideration for the analyses included *Ambrosia* extract (Amb a) and individual ragweed allergens Amb a 1 (pectate lyase) and Amb a 4 (defensin-like protein).

After the assessment of patients' sensitization levels, it was established that 5225 individuals or 32,04% of all patients had sensitization to either ragweed extract or its allergens or both of them with IgE levels 0.31 kU/L or higher. This threshold indicated a presence of sensitivity to a certain source following the Alex2 test.

The region of their residence has been set for the 3462 patients. Among them, the highest level of ragweed sensitization was observed in the Dnipro region. 57.07% of all patients tested in this Southern-Central region were sensitive to ragweed. The next with 35.10% - 43.72% of sensitive individuals were Southern regions like Odessa, Mykolaiv, and Kherson and Eastern regions like Kharkiv and Poltava. Kyiv region, which is located in the North also had a surprisingly significant level of patients, sensitive to ragweed – 31.30%. Earlier, this region was not considered an area, which is heavily infested by the *Ambrosia* plants.

Regions with a central location like Cherkasy and Vinnytsia had 26.98% and 9.02% of ragweed pollen-sensitive individuals among tested people. The lowest levels of *Ambrosia* sensitization were recorded in Westerly-located Ivano-Frankivsk, Lviv and Khmelnytsky regions. There were 5.83%, 6.87% and 7.14% of ragweed-sensitized patients respectively.

Northern regions had 12.77% (Sumy), 14.29% (Rivne) and 22.22% (Zhytomyr) patients with sensitization to *Ambrosia* pollen respectively. A relatively high level of sensitization to ragweed pollen (15.38%) was noted in the western Ukraine Zakarpattia region. This relatively high sensitization to ragweed pollen in comparison with other western regions can be explained by the infestation of ragweed here from neighbouring Hungary.

Significant levels of sensitization to *Ambrosia* pollen in northern Kyiv and Zhytomyr regions should be taken into account by clinicians. Their phenomenon needs further study by aerobiologists.

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SATURDAY, 10TH OF SEPTEMBER

EXCURSION

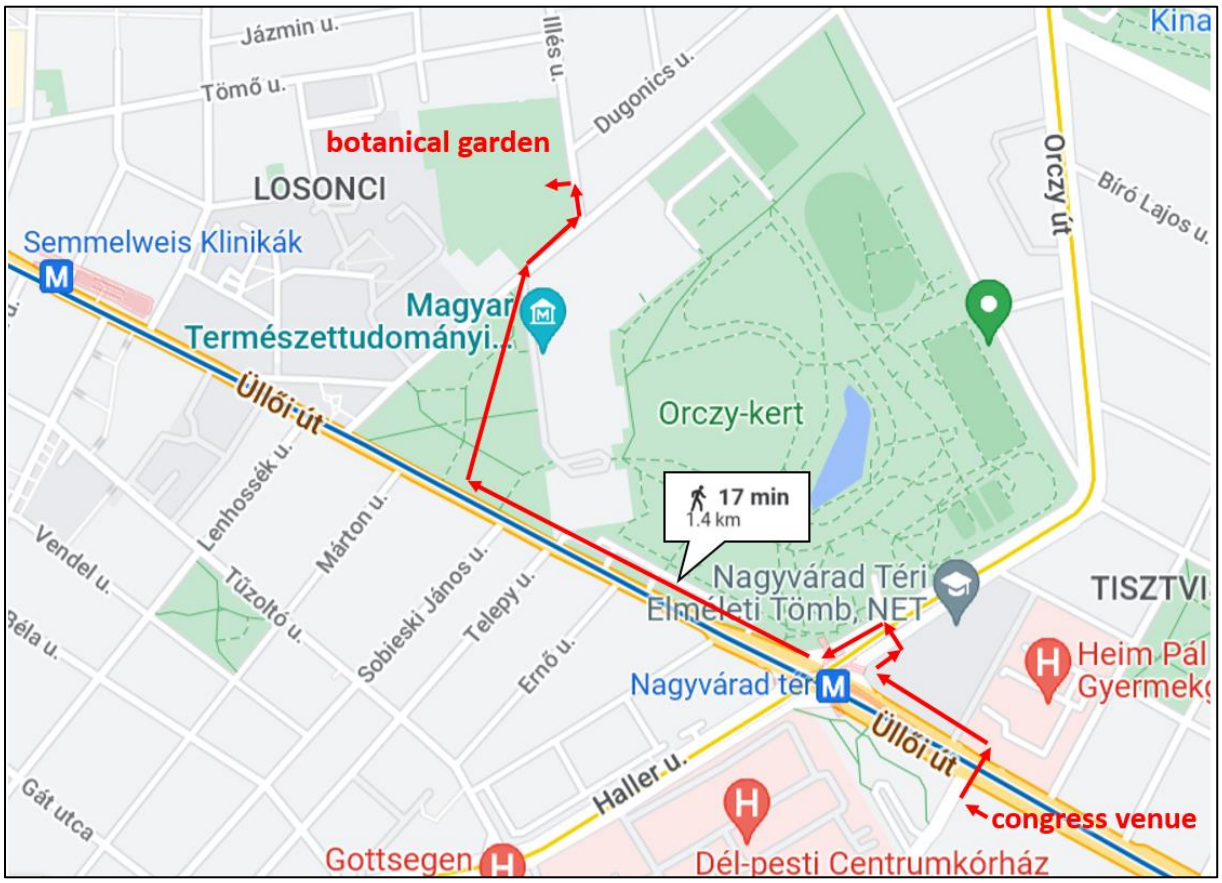
9.00-11.00:

Botanical Garden of the Eötvös Loránd University, Budapest

1083 Budapest, Illés u. 25.

Guided tour

Map : from the congress venue to the botanical garden

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