Effect of seed burying on seedling emergence of Ambrosia artemisiifolia L.

Jean-Philippe Guillemin, Carole Reibel, Bruno B. Chauvel

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FIRST INTERNATIONAL RAGWEED CONFERENCE

10-13 September 2008
Budapest, Hungary

Organizers:

Plant Protection Institute of the Hungarian Academy of Sciences

Hungarian Academy of Sciences

Ministry of Agriculture and Rural Development

Földművelésügyi és Vidékfejlesztési Minisztérium

ORGANIZING COMMITTEE:

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Gellért Gólya, ***Ministry of Agriculture and Rural Development, Budapest, Hungary***

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Jacqui Shykoff, ***Université Paris-Sud/CNRS, Orsay, France***

Edita Štefanić, ***J. J. Strossmayer University, Faculty of Agriculture, Osijek, Croatia***

Photographs by Zsuzsa Basky and Levente Kiss
Technical assistance: Tünde Jankovics, Boróka Kiss and Krisztina Szakolczai

PROGRAM

<u>Wednesday, 10 September 2008</u>

17:00 – 19:00
Registration

19:00 – 21:00
Welcome reception

<u>Thursday, 11 September 2008</u>

9:00 – 9:10
Opening remarks

9:10 – 9:20
Welcome address

Session 1
Introduction to the ragweed problem

Chairs: Zsuzsa Basky & Bruno Chauvel

9:20 – 9:40
THE *AMBROSIA ARTEMISIIFOLIA* INVASION IN EUROPE: GENETIC PATTERNS OF COLONISATION AND ECOLOGICAL FACTORS PROMOTING INVASION SUCCESS

Jacqui A. Shykoff[1], Benjamin J. Genton[1], Tatiana Giraud[1] and Levente Kiss[2]
[1]*Université de Paris-Sud/CNRS, Orsay, France*
[2]*Plant Protection Institute of the Hungarian Academy of Sciences, Budapest, Hungary*

9:40 – 10:00
AN OVERVIEW OF RISING CARBON DIOXIDE, CLIMATIC CHANGE AND RAGWEED BIOLOGY

Lewis H. Ziska
USDA-ARS, Crop Systems and Global Change Laboratory, Beltsville, MD, USA

10:00 – 10:20
RAGWEED (*AMBROSIA* SPP.) ERADICATION AND THE FRAIBERG'S JUDGEMENT OF 2007

Paul Comtois
Département de Géographie, Université de Montréal, Montréal, Canada

10:20 – 10:40
Coffee break

Session 1
Introduction to the ragweed problem (cont.)

Chairs: Lewis H. Ziska & Levente Kiss

10:40 – 11:00
EFFECT OF NATIVE APHID SPECIES ON THE DEVELOPMENT OF INVASIVE RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) IN HUNGARY
Zsuzsa Basky
Plant Protection Institute of the Hungarian Academy of Sciences, Budapest, Hungary

11:00 – 11:20
EFFECT OF SEED BURYING ON SEEDLING EMERGENCE OF *AMBROSIA ARTEMISIIFOLIA* L.
Jean-Philippe Guillemin[1], C. Reibel[1] & Bruno Chauvel[2]
[1]*ENESAD – UMR Biologie et Gestion des Adventices, Dijon, France*
[2]*INRA - UMR Biologie et Gestion des Adventices, Dijon, France*

11:20 – 11:40
***AMBROSIA ARTEMISIIFOLIA* IS JOINT HOST OF TOMATO SPOTTED WILT TOSPOVIRUS (TSWV) AND OF ITS TRANSMITTERS, *THRIPS TABACI* AND *FRANKLINIELLA OCCIDENTALIS* IN HUNGARY**
Gábor Jenser[1], Balázs Kiss[1] & András Takács[2]
[1]*Plant Protection Institute Hungarian Academy of Sciences, Budapest, Hungary*
[2]*Pannon University, Georgikon Faculty of Agricultural Sciences, Keszthely, Hungary*

11:40 – 12:00
WHAT ARE THE KEYS OF THE SUCCESS OF *AMBROSIA ARTEMISIIFOLIA* IN FRANCE?
Bruno Chauvel
INRA - UMR Biologie et Gestion des Adventices, Dijon, France

12:00 – 12:20
THE EFFECT OF EMERGENCE TIME ON THE PHENOPHASES, POLLEN AND SEED PRODUCTION OF COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA*)
Gabriella Kazinczi & Imre Béres
University of Pannonia, Georgikon Faculty, Keszthely, Hungary

12:20 – 13:40
Lunch

Session 2
The ragweed pollen: factors influencing its production and spreading

Chairs: Anna Páldy & Michel Thibaudon

13:40 – 14:00
FRANCE–RAGWEED: A LONG TIME FIGHT
Michel Thibaudon & Gilles Oliver
Réseau National de Surveillance Allergique, St Genis l’Argentière, France

14:00 – 14:20
WIND DISPERSAL AND CLUMPING OF RAGWEED POLLEN
Michael D. Martin[1], Marcelo Chamecki[1], Grace S. Brush[1], Charles Meneveau[1] & Marc. B. Parlange[2]
[1]*Johns Hopkins University, Baltimore, MD, USA*
[2]*Ecole Polytechnique Fédérale de Lausanne, Switzerland*

14:20 – 14:40
AEROBIOLOGICAL MARKERS OF RAGWEED INVASION IN SWITZERLAND
Bernard Clot[1] & Barbara Pietragalla[2]
[1]*MeteoSwiss, Payerne, Switzerland*
[2]*MeteoSwiss, Zürich, Switzerland*

14:40 – 15:00
RAGWEED POLLUTION IN HUNGARY, 1992-2007
Anna Páldy & Dóra Apatini
National Institute of Environmental Health, Budapest, Hungary

15:00 – 15:20
INTERNATIONAL COLLABORATION PROJECT FOR FORECASTING *AMBROSIA* POLLEN
Regula Gehrig[1], Annalisa Ariatti[2], Joe Russo[3] & Bernard Clot[4]
[1]*MeteoSwiss, Zürich, Switzerland*
[2]*Pennsylvania State University, USA*
[3]*ZedX, Payerne, USA*
[4]*MeteoSwiss, Payerne, Switzerland*

15:20 – 15:40
Coffee break

Session 3
The ragweed pollen allergy: immunological and public health issues

Chairs: Anna Erdei & Lorenzo Cecchi

15:40 – 16:00
THE IMMUNOLOGY OF ALLERGIC REACTIONS AND POSSIBILITIES FOR INTERVENTION
Anna Erdei
[1]*Eötvös Loránd University, Budapest, Hungary and Immunology Research Group of the Hungarian Academy of Sciences at Eötvös Loránd University*

16:00 – 16:20
BURDEN OF RAGWEED ALLERGY IN HUNGARY
Kristóf Nékám[1] & Anna Páldy[2]
[1]*Hospital of the Hospitaller Brothers in Buda, Budapest, Hungary*
[2]*National Institute of Environmental Health, Budapest, Hungary*

16:20 – 16:40
RAGWEED POLLEN ALLERGENS FOR DIAGNOSIS AND THERAPY
Gabriele Gadermaier, Fatima Ferreira & Nicole Wopfner
Christian Doppler Laboratory for Allergy Diagnosis and Therapy, University of Salzburg, Salzburg, Austria

16:40 – 17:00
HOW DO METEOROLOGICAL PARAMETERS AND BIOLOGICAL AND CHEMICAL AIR POLLUTANTS INFLUENCE THE INCIDENCE OF ASTHMA AND RHINITIS?
L. Makra[1], Sz. Tombácz[1], B. Bálint[2], Z. Sümeghy[1], T. Sánta[1]
[1]*Dept. Climatology and Landscape Ecology, University of Szeged, Hungary*
[2]*Thorax Surgery Hospital, Deszk, Hungary*

17:00 – 17:20
OPEN QUESTIONS IN RAGWEED ALLERGY
Lorenzo Cecchi[1,2], Tommaso Torrigiani Malaspina[1] & Simone Orlandini[1]
[1]*Interdepartmental Centre of Bioclimatology, University of Florence, Italy*
[2]*Allergy Clinic, Azienda Sanitaria Firenze, Florence, Italy*

19:30 – 22:00
Conference dinner

Friday, 12 September 2008

Session 4
Ragweed problems and regulatory measures in different parts of the world: country reports

Chairs: Edita Stefanic & Gellért Gólya

9:00 – 9:20
SPREAD OF, AND CONTROL MEASURES AGAINST, COMMON RAGWEED IN HUNGARY
Gellért Gólya[1], István Dancza[2] & Paula Lászlóné Pécsi[2]
[1]*Ministry of Agriculture and Rural Development, Budapest, Hungary*
[2]*Central Agricultural Office, Directorate of Plant Protection, Soil Conservation and Agri-environment, Budapest, Hungary*

9:20 – 9:40
***AMBROSIA* SPECIES IN AUSTRALIA AND THEIR CONTROL**
Rachel McFadyen
CRC for Australian Weed Management, Brisbane, Australia

9:40 – 10:00
RAGWEED IN CROATIA – AGRICULTURAL AND PUBLIC HEALTH PROBLEM
Edita Stefanic, Sanda Rasic & Ivan Stefanic
J.J. Strossmayer University , Faculty of Agriculture, Osijek, Croatia

10:00 – 10:20
COMMON RAGWEED IN CANADA
Alan K. Watson
Department of Plant Science, McGill University, Ste-Anne-de-Bellevue, QC, Canada

10:20 – 10:40
Coffee break

Session 4
Ragweed problems and regulatory measures in different parts of the world: country reports (cont.)

Chairs: Gabriella Kazinczi & Christian Bohren

10:40 – 11:00
***AMBROSIA* CONTROL AND LEGAL REGULATION IN SWITZERLAND**
Christian Bohren, N. Delabays & G. Mermillod
Research Station Agroscope Changins-Wädenswil ACW, Nyon Switzerland

11:00 – 11:20
COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) IN RUSSIA: SPREAD, DISTRIBUTION, ABUNDANCE, AND CONTROL MEASURES
Sergey Ya. Reznik
Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia

11:20 – 11:40
THE ACTION PROGRAMME *AMBROSIA* IN GERMANY
Uwe Starfinger
Julius Kuehn Institute, Braunschweig, Germany

11:40 – 12:00
HERBICIDE RESISTANCE IN RAGWEED (*AMBROSIA* SPP.) – A REVIEW
Baruch Rubin
RH Smith Institute of Plant Science and Genetics in Agriculture, Fac. Agric., Food & Environm. Sci., Hebrew University of Jerusalem, Rehovot, Israel

12:00 – 13:40
Lunch

Session 4
Ragweed problems and regulatory measures in different parts of the world: country reports (cont.)

Chairs: Rachel McFadyen & Gábor Csornai

13:40 – 14:00
RAGWEED MONITORING BY REMOTE SENSING IN HUNGARY
Gábor Csornai, Gábor Mikus, Gizella Nádor, Irén Hubik & István László
Institute of Geodesy, Cartography and Remote Sensing (FÖMI), Budapest, Hungary

14:00 – 14:20

MONITORING RAGWEED AT A LOCAL SCALE: LESSONS FROM A PROGRAM CARRIED OUT IN THE RHONE ALPES REGION (FRANCE)

C. Sausse[1], D. Chollet[2], P. Delval[3], Y. Drieu[4], P. Jupont[5], L. Masson[6], B. Real[7], R. Reau[8] & N. Schmitt[1]

[1]*Centre Technique Interprofessionnel des Oléagineux Métropolitains (CETIOM), Thiverval Grignon, France*

[2]*CETIOM, Lyon, France*

[3]*Association de Coordination Technique Agricole (ACTA), Marcy l'Etoile, France*

[4]*Arvalis Institut du Végétal, Lyon, France*

[5]*CETIOM, Dijon, France*

[6]*Chambre d'Agriculture de l'Isère, Antenne de Vienne, France*

[7]*Arvalis Institut du Végétal, Estrées Mons, France*

[8]*Unité Mixte de Recherche Agronomie INRA / AgroParisTech, Thiverval Grignon, France*

14:20 – 14:40

FRENCH ASSOCIATION FOR RAGWEED STUDY: THE FIRST IN FRANCE TO HAVE STUDY SHORT RAGWEED AND ALERT INSTITUTIONS SINCE 1982

C. Déchamp[1] & H. Méon[1,2]

[1]*Association Française d'Etude des Ambroisies (AFEDA), Saint-Priest, France*

[1,2]*Université Lyon, UMR CNRS PEPS 5125, Villeurbanne Cx France*

14:40 – 15:00

STUDIES ON SPREAD, POPULATION BIOLOGY AND MANAGEMENT OF *AMBROSIA ARTEMISIIFOLIA* L. IN AUSTRIA

Melinda Vitalos & Gerhard Karrer

University of Natural Resources and Applied Life Sciences, Vienna, Austria

15:00 – 15:20

PRESENT SITUATION OF RAGWEED PROBLEMS AND POTENTIAL BIOLOGICAL CONTROL IN KOREA

Hyeon-Dong Shin

Division of Environmental Sciences and Ecological Engineering, Korea University, Seoul, Korea

15:20 – 15:40

***AMBROSIA* SPECIES, A NEW HEALTH AND ENVIRONMENTAL THREAT IN ISRAEL**

Toby Yaacoby

Plant Protection and Inspection Services (PPIS), Bet Dagan, Israel

15:40 – 16:00

Coffee break

16:00 – 17:00

POSTER SESSION

Moderator: TBA

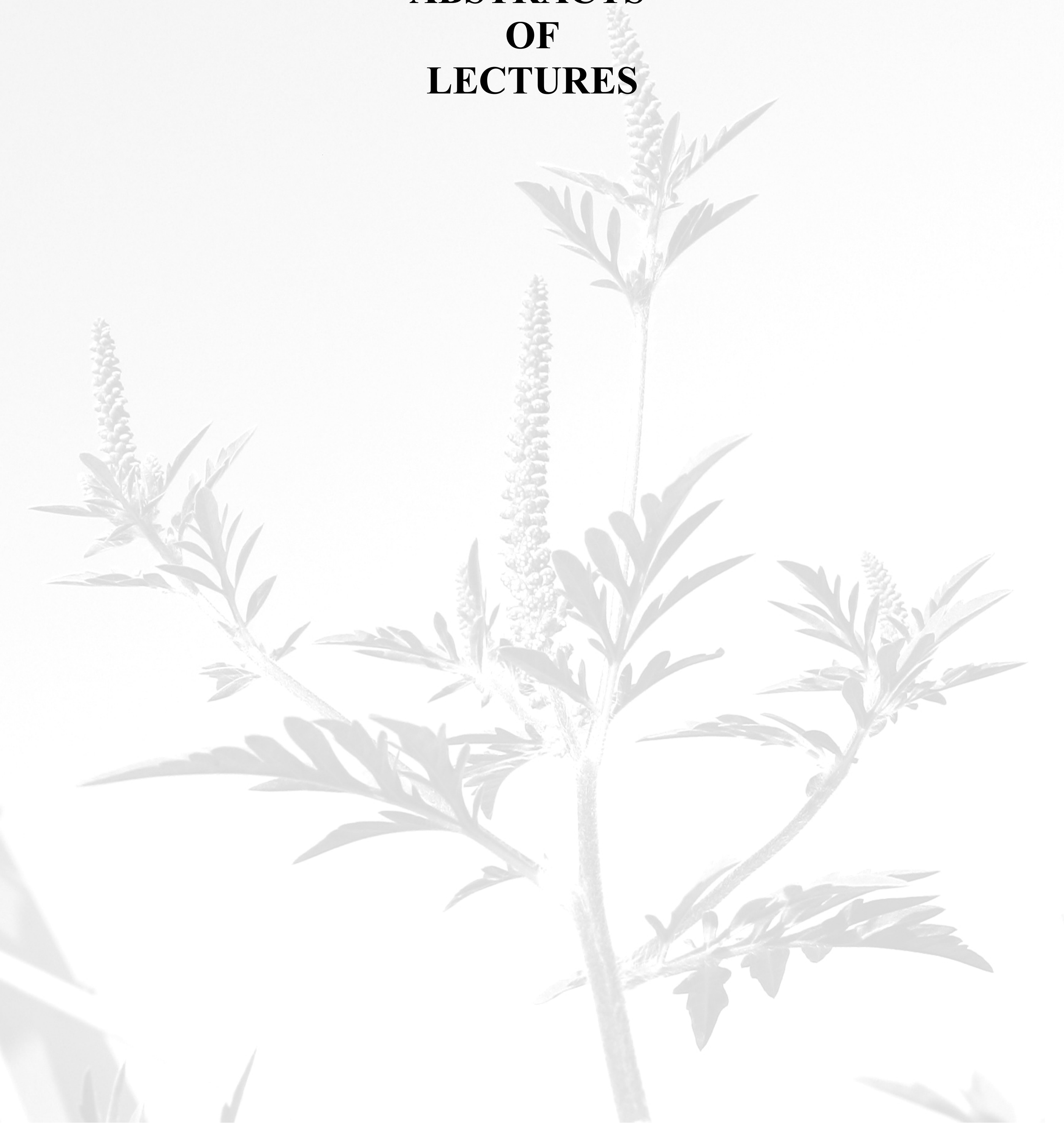
17:00 – 19:00

ROUND-TABLE DISCUSSION ON THE RAGWEED PROBLEM
Moderator: Jacqui A. Shykoff

Saturday, 13 September 2008

9:00 – 18:00 (approximately)
Scientific excursion, including lunch, and transfer to Osijek, Croatia

ABSTRACTS OF LECTURES



THE *AMBROSIA ARTEMISIIFOLIA* INVASION IN EUROPE: GENETIC PATTERNS OF COLONISATION AND ECOLOGICAL FACTORS PROMOTING INVASION SUCCESS

Jacqui A. Shykoff[1], *Benjamin J. Genton*[1], *Tatiana Giraud*[1] *and Levente Kiss*[2]
[1]Université de Paris-Sud/CNRS, Orsay, France
[2]Plant Protection Institute of the Hungarian Academy of Sciences, Budapest, Hungary
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Ambrosia artemisiifolia is a very successful invader of Eurasia. Here we examine genetic and ecological aspects of the biology of this invasive species. We compare invasive populations in Eastern and Western Europe with native populations throughout the native range in Eastern and Central North America using neutral genetic microsatellite markers. Patterns of genetic diversity reveal that the European populations contain as much genetic variation as do the native populations, suggesting the absence of a bottleneck during the invasion process. European populations contain alleles from a broad range of native, North American populations, suggestion multiple introductions or introductions from a mixture of sources. In addition we found large differences in the genetic composition of Eastern and Western European populations, a result that points to the existence of different invasion foci, one centred in Lyon, France and one on the Black Sea, from different parts of the native range. One explanation for the success of invasive species in habitats to which they have not adapted is that they escape from top-down control by natural enemies such as pathogens and herbivores or predators. Further, there may be an evolutionary response by which invasive populations lose defensive traits and thereby have additional energy to allocate to growth and reproduction. Comparing natural attack rates in the invaded and native range and using a reciprocal transplant experiment of plants from Western Europe and North America we tested whether either of these explanations can explain ragweed success and spread. Herbivory levels were much lower in the introduced than the native range, suggesting that invasive populations have indeed escaped from damaging biotic interactions. On the other hand we found no evidence that defensive traits have been lost in the invasive population or that there has been a shift in life history traits towards higher reproduction at the cost of defense. European ragweed populations are extremely healthy and produce high numbers of seeds because of better habitat conditions, including the absence of natural enemies, but not because they have a newly evolved, poorly defended, invasive phenotype.

AN OVERVIEW OF RISING CARBON DIOXIDE, CLIMATIC CHANGE AND RAGWEED BIOLOGY

Lewis H. Ziska
USDA-ARS, Crop Systems and Global Change Laboratory, Beltsville, MD, USA
E-mail: *Lewis.Ziska@ars.usda.gov*

In addition to being a constraint on agronomic crops, weeds such as common ragweed (*Ambrosia artemisiifolia*) can have significant impacts on public health. Among plant based allergies, ragweed species are the predominant source of pollen and allergic rhinitis during the fall in North America. Beginning in 1999, we have been studying those climatic factors which could alter ragweed growth and pollen production. Initial growth chamber data indicated a high sensitivity to rising carbon dioxide levels since the beginning of the industrial revolution. Later studies, using an in-situ gradient of carbon dioxide and temperature along a rural-urban transect, confirmed these initial laboratory findings and indicated a potential link between human-induced climatic forcing and increased pollen load. Longer-term studies examining the persistence of ragweed in the plant community have indicated that soil disturbance is also a key factor. An overview of USDA-ARS studies in this context, as well as potential changes in weed management will be presented.

RAGWEED (*AMBROSIA* SPP.) ERADICATION AND THE FRAIBERG'S JUDGEMENT OF 2007

P. Comtois
Département de Géographie, Université de Montréal, Montréal, Canada
E-mail: *paul.comtois@umontreal.ca*

Montréal Island has a long history of ragweed populations' management. Since 1945, large scale eradication campaigns were undertaken under the leadership of Léopold Cabana[1], emulating similar campaigns by Elzéar Campagna in the Gaspé Peninsula since 1938[2]. In 1978, the by-law no. 44, article 7.03, which banned the presence of flowering Ragweed individuals after August 1st anywhere on its territory[1], was adopted by the Montreal Urban Community. Even so, municipal authorities were reluctant to apply the same zealous behaviour they have embraced in regards to private owners towards the portion of their territory occupied by public utilities, even if they represent 41% of the total Montreal island area and are the privileged habitat for 54% of the ragweed populations in the Montreal Metropolitan Area. This is why, in 1992, a citizen undertook a class action against the Municipality (Nadon vs. Montreal) alleging that they failed to comply to their own by-law, and requesting that they eradicate ragweed on public lands, and pay $2000 per allergic person living on its territory per year since 1991 (a total of 1,8 billion of dollars). The case was pleaded in the presence of Hon. William Fraiberg J.S.C., who, after 84 days of hearing in 2005 & 2006, ruled in favour of the defendants on January 24th 2007. This 105 pages decision is a major drawback not only for hay fever sufferers (ragweed being responsible for between 50 to 70% of symptoms[3], but as well for those trying to advocate environmental responsibilities under the "polluter pays" principle. This judgment is also an instructive example of the differences between a scientific significant result (such as under the 95% confidence level) and a legal argument. Moreover, it constitutes likewise an expression of the special place that aerobiology occupies in Science[4]: its dependent condition downstream of such chaotic elements as weather; and its independent position upstream towards qualitative measurements such as health. A detailed analysis of the judgement will be presented, with special attention to exposure pathways for ragweed: are symptoms caused by a regional pollen cloud or by close contacts with local sources?

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EFFECT OF NATIVE APHID SPECIES ON THE DEVELOPMENT OF INVASIVE RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) IN HUNGARY

Z. Basky
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The common ragweed, A*mbrosia artemisiifolia* L. was first detected in Hungary in the early 1920-s[1,2]. Under favourable climatic and environmental conditions it became the most frequent weed species, present on 5 million ha of the 6.5 million ha arable crop area of Hungary[3]. Surveys were conducted for indigenous insects associated with the invasive common ragweed in Hungary. Among mostly polyphagous and univoltine insects, three aphid species were found feeding on common ragweed. Among these, *Brachycaudus helichrysi* (Kaltenbach) caused chlorotic spots and leaf distortion on infested plants. On rare occasions, *Aphis fabae* (Scopoli) formed dense colonies on the stems and *Myzus persicae* (Schulzer) was found on the lower side of the fully developed leaves without causing any visible symptom. Common ragweed plants were grown in a greenhouse and artificially infested with 5 apterous individuals of *Aphis fabae, Brachycaudus helichrysi* and *Myzus persicae* at the 4-leaf stage. Feeding by all three aphid species over a 5 week period significantly reduced plant height, length of flower spikes, plant dry mass, the number of male inflorescences and pollen emission. Colony growth rate of *B. helichrysi* was the highest, followed by *M. persicae* and *A. fabae*. In a host plant choice test, *B. helichrysi* showed significant preference for ragweed over sunflower, whereas *A. fabae* preferred sunflower. *M. persicae* did not show any preference. In a field experiment, the growth rate of *A. fabae* on caged ragweed plants was similar to that in the greenhouse, but final numbers of the other two species, *B. helichrysi* and *M. persicae* were much lower (after 30 d 10 and 7 times lower than in greenhouse, respectively). Under field conditions the development of ragweed was more dynamic therefore no aphid species affected significantly the height, or dry weight of either caged or exposed plants during a 30 d period. On exposed field plants, *B. helichrysi* was significantly more abundant compared to the other two species. However, the exposed plants during longer exposure (83, 112 d) suffered more from aphid feeding and it resulted in significant plant height and dry mass decrease regardless of the aphid species. But, statistical significance is not necessarily equivalent to biological significance. However, naturally occurring aphids can enhance the ability of native vegetation to counter the weed but their effect is not strong enough to drive down the number of this invasive species.

Acknowledgement: I wish to thank Dr. Balázs Kiss for collecting *A. fabae* and Dr. Donát Magyar for the pollen emission studies. The project was supported by GVOP-3.1.1-2004-05-0111/3.0.

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EFFECT OF SEED BURYING ON SEEDLING EMERGENCE OF *AMBROSIA ARTEMISIIFOLIA* L.

J.P. Guillemin[1], *C. Reibel*[1] *and B. Chauvel*[2]
[1] ENESAD – UMR Biologie et Gestion des Adventices, Dijon, France
[2] INRA – UMR Biologie et Gestion des Adventices, Dijon, France
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Common ragweed (*Ambrosia artemisiifolia* L.) is now described as an invasive weed in France. The space this species occupies has become larger and larger since it was first introduced to the Rhône Valley about hundred years ago. In France[1], it has widely spread in arable fields, especially in sunflower fields. The development of strict control strategies is needed to stop that spread. The aim of our work was to test the effect of burying by soil tillage on common ragweed seeds. An experiment was carried out to determine the effect of burying on seedling emergence according with the seed weight. These data of seed emergence could help to control its spread after soil tillage.

The population of *A. artemisiifolia* was collected in Pluvet (Côte d'Or, department of Eastern France) in 2005. Before the seeds were used in experiments, they were stored in moist chilling (4°C) conditions to remove the primary dormancy. Seeds were then divided up into three weight classes (S<0.0031 g, 0.0031<M<0.005g and 0.005g>B)[2]. The seeds were placed on the surface of the soil or buried 2 and 10 cm below the surface. Each seed was put in a pot containing 1L of clay soil/sand mix (1:1;v:v). Pots were initially watered to field capacity and then watered during experiment to maintain field capacity. Plants were placed in a greenhouse at fluctuating day/night temperatures of 25/17°C. The number of emerging seed was daily recorded during 25 days. Seedlings were considered emerged when the cotydelons were visible. The percentage of emergence was calculated using only viable seeds (empty seeds were eliminated before experiment).

No seed emerged from 10 cm depth. Whatever the seeds, the emergence percentages for those placed on the surface and those buried at a depth of 2 cm were virtually identical to each other with 94.4% and 93.1% respectively. In the case of the seeds placed on the surface, the size had statistically no effect on emergence (S = 98.8%, M = 90.6% and B = 100%). In contrast, the small seed emergence (Class S) was reduced when seeds were buried at 2 cm (S = 86%, M = 93.7% and B = 98.7%). The results obtained at a depth of 10-cm deep confirm those of the litterature[3, 4] and show that deep ploughing could be an option to control the spread of *A. artemisiifolia*. Burying the seed at a depth 2 cm is not enough to control the emergence of common ragweed. However, it opens up prospect of managing of *A. artemisiifolia* based on their seed size. Apparently, small seeds are more susceptible to burying. It will be necessary to confirm these results by testing other burying depths between 2 and 10 cm.

References

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AMBROSIA ARTEMISIIFOLIA IS A JOINT HOST OF TOMATO SPOTTED WILT TOSPOVIRUS (TSWV) AND OF ITS TRANSMITTERS, THRIPS TABACI AND FRANKLINIELLA OCCIDENTALIS IN HUNGARY

G. Jenser[1]*, B. Kiss*[2] *and A. Takács*[3]
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Since *Ambrosia artemisiifolia* Linnaeus became known as a host plant of tomato spotted wilt virus (TSWV), it was important to investigate the occurrence of Thysanoptera species living on it, under Hungarian conditions. Samples were taken in different biotopes: in gardens, in fields and on ruderal vegetations. In the more than 50 samples the dominant Thysanoptera specimens proved to be *Thrips tabaci* Lindeman, which is an effective vector species of TSWV under European conditions. In a few cases the specimens of *Frankliniella occidentalis* (Pergande) were also found. In our experiments the TSWV was transmitted by the adults and the larvae of *T. tabaci* from *Nicotiana tabacum* Linnaeus to *A. artemisiifolia*, under laboratory conditions. The transmission of the TSWV was checked by DAS-ELISA test. According to these data *Ambrosia artemisiifolia* is a dangerous reservoir host of the TSWV under Middle European climatic conditions.

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WHAT ARE THE KEYS OF THE SUCCESS OF *AMBROSIA ARTEMISIIFOLIA* IN FRANCE?

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Ambrosia artemisiifolia L. (common ragweed) is an annual monoecious weed (*Asteraceae*) which was certainly introduced into France in the nineteenth century, with seeds of cultivated forage species. The study of specimen labels found in herbarium collections indicates that this species has been introduced at various independent geographical points and at various times[1]. Commercial trade and American troops have contributed to its spread during the twentieth century. Its recent spread in different new areas is explained by the co-occurrence of different factors, such as the modifications of cropping systems (increase of sunflower crops, decrease of herbicide use) or the increasing urbanization around cities. Furthermore, the invasion of southern France could be partially explained by water dispersal of achenes through rivers.
The capacity of *A. artemisiifolia* to be invasive appears to be high, possibly due to its huge plasticity in seed mass which may help it to cope with a wide range of conditions and to establish in disturbed habitats. But, if *A. artemisiifolia* appears to be a successful pioneer in early successional habitats with a high degree of disturbance (erosion area, burning places)[3], the species does not seem to be able in France to compete in habitats where the competition is higher (hedge, grassland, forest).
Two types of seeds, differing in their floating ability, were observed in ragweeed[2]. However, no particular achene morphology was associated with floating ability. Hydrochory could play a major role in long distance dispersal of seeds and could also explain local spread along roadsides owing to water run-off. This dispersal mechanism should be taken into account to prevent its spread in new areas. Another survey[4] carried out in France showed that the majority of *A. artemisiifolia* populations were mycorrhizal. Individual plant root colonization was higher in wasteland and riverbank habitats than in cultivated lands and populations developing along roadsides represented the most highly mycorrhizal populations. The spread of ragweed could be facilitated by arbuscular mycorrhizal fungi, underlining the need to integrate symbiotic interactions in future work on invasive plant processes.
These different results highlight the potential of *A. artemisiifolia* for invasion in spring crops and all semi-natural or disturbed open areas. The success of its ongoing invasion can be explained by both its generalist character and the existence of vacant ecological niches, which are poorly occupied by the plants of the French native flora.

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THE EFFECT OF EMERGENCE TIME ON THE PHENOPHASES, POLLEN AND SEED PRODUCTION OF COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.)

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Common ragweed (*Ambrosia artemisiifolia* L.) is the most important species of the genus *Ambrosia*. Hungary is considered as an *Ambrosia* centre in the Carpathian Basin. In spite of enormous efforts, its importance has not yet decreased[1,2]. We have studied the relationship between emergence time and productivity of *A. artemisiifolia* under field conditions. On the basis of more than 30 years observations we can conclude that *A. artemisiifolia* can germinate continuously which makes its control more difficult. The first seedling can be appear at the end of March, with a germination peak in April and May. After May, germination rate increases again but never reaches the April maximum. From August germination decreases strongly again, but it can occur continuously until the first frosts. Plants germinated in August and later failed to ripen. When seeds germinated on the 7 April, 183 days needed for the whole development. When *Ambrosia* seeds germinated on the 23 July, it took only 115 days. When the seeds germinated later, the time between germination and flowering was considerably reduced. On the contrary, the time between flowering and seed ripening relatively remained constant (58-71days). This proves high adaptability of *A. artemisiifolia* plants, which allows them to move their distribution area towards north. The germination time determines the vegetative development and seed production. The height of *A. artemisiifolia* is 170-180 cm, when seeds germinate in April and 3000-4000 achenes are established on one plant. When *Ambrosia* seeds germinate in August, the plant height is only 8-12 cm and only a few (3-4) unripened achenes can be established[3,4,5]. Late emergence also considerably reduced the number of male flowers on a plant.

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FRANCE - RAGWEED : A LONG TIME FIGHT !

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The RNSA is the French structure in charge of the monitoring of the pollen contents of the air and of its effects on health. To realize it, the RNSA has 70 Hirst type traps in basic positions in the principal towns of France. Among supervised pollens, ragweed pollens are paid special attention.

Thanks to the follow-up of the nychthemeral rate of pollination within the areas bordering the zones infected by the plant, the RNSA can indicate if the pollen on the trap has a local or a long distance origin.

Moreover, the implementation of a network of phenological observations makes it possible to regularly follow the period of pollen production by the plants.

In addition, the RNSA's network of clinicians makes it possible to follow the clinical impact of the exposure to pollens of ragweed plants.

Thus, the RNSA can establish estimated reports on the allergic risk and establish correlations between the phenological data of exposure and the clinical index of the medical impact.

WIND DISPERSAL AND CLUMPING OF RAGWEED POLLEN

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Ragweed (genus *Ambrosia*) is an aggressively invasive species whose pollen is the main aggravator of seasonal allergic rhinitis for more than 30 million people in the U.S. alone[1, 2]. However, the mechanisms of pollen release from the ragweed flower, its atmospheric entrainment, and wind dispersion are not well understood. We report results of a field study designed to investigate the role of meteorological conditions and floral morphology on these mechanisms. Measurements of 3-D wind velocity, atmospheric turbulence, solar radiation, humidity, temperature, and atmospheric pollen concentration were recorded above a 6.0 hectare field dominated by *A. artemisiifolia* (common ragweed). The dynamics of ragweed pollen release were captured simultaneously and in real-time with over 70 hours of close-up videography. From the videos of pollen release, we estimated the number of grains in clumps shed from ragweed flowers. We also analyzed pollen distribution on Rotorod samples collected above the ragweed canopy in order to characterize the size of pollen clumps advecting in the atmosphere. We used a simple, 2-D mathematical model to examine the effect of clump size on wind dispersal. Our results show that although ragweed pollen is released in large clumps consisting of hundreds of grains, the clumps are quickly broken down by atmospheric turbulence into much smaller clumps and solitary grains. We also used the model to show that the variety of clump sizes produced by atmospheric turbulence may provide a more efficient means of wind-pollination for dense populations of ragweed. Disaggregation of the large clumps into smaller clumps and individual pollen grains is advantageous for ragweed, considering that wind dispersal distance is inversely related to particle size, and may explain in part the success of ragweed in invading much of the world over a short period of time.

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AEROBIOLOGICAL MARKERS OF RAGWEED INVASION IN SWITZERLAND

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Background

Ragweed (Ambrosia artemisiifolia) pollen is very allergenic. The rapid spread of this invasive plant in Europe exposes large human populations to a new aeroallergen. Even in areas where the plant is not present or not frequent, airborne pollen transport can be responsible for sensitization and/or allergy.

Methods

Long term aerobiological measurements in Switzerland were initiated by the Swiss Society for Aerobiology and are since 1993 performed by the National Pollen Monitoring Network, part of MeteoSwiss. Additional pollen traps were set up around Geneva (4 traps) and South of the Alps in Tessin (2 traps). Both areas are exposed to long distance pollen transport respectively from France and from Italy and to pollen from local sources. Aerobiological measurements and pollen analysis are performed according to international standards; Hirst-type pollen traps are used.

Results

Ragweed is spreading in Europe from 3 main infested areas: Hungary, Northern Italy and South-Eastern France. Long-distance transport of its pollen has been reported in different regions (e.g. Sweden, Poland, Central Italy) including Switzerland, where long-distance transport of ragweed pollen is responsible for a large part of the pollen counts. In contrast, pollen locally produced by small fields infested with few hundreds ragweed plants is source of a higher exposure frequency and severity in a radius of few kilometres, leading to increased sensitization and allergy rates in that area. Locally produced pollen is registered in the morning, shortly after being released from the plant, and pollen from remote sources is measured by favourable weather conditions in the afternoon or the evening, after few hours airborne transport.

Conclusions

Sensitization can also occur when people are exposed to low pollen levels in the air. Ragweed produces very large amounts of pollen and even small populations can be responsible for an increased pollen exposure. Ragweed should then be considered very early in the invasion process. Airborne pollen and scattered ragweed plants are the first signs of ragweed invasion. Survey and early eradication actions are necessary in order to stop the spread of this allergenic weed and the consequences of its presence for health.

RAGWEED POLLUTION IN HUNGARY, 1992-2007

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Pollen grains of ragweed (*Ambrosia artemisiifolia*) are the most important ambient biological air pollutants in Hungary since the majority of patients with inhalative allergic diseases are sensitized to ragweed (35-60%).
The aim of this study was to investigate the changes in major parameters of ragweed pollen seasons based on data monitored by the Aerobiological Network (AN) of the National Public Health Service. AN was founded in 1992 with 3 monitoring stations and it has 19 traps throughout in Hungary by 2007.
Each station uses Hirst volumetric sampler.
The major parameters to describe ragweed pollen season were yearly total pollen count, the highest daily maximum concentration and number of days with high and very high pollen load during the year.
The highest yearly total pollen counts are related only to 3 stations: Kecskemét (in the middle of Lowland; 1996-99, 2001, 2004, 2005), Pécs (in Southern Transdanubium; 1992-'95, 2006) and Nyíregyháza (in North-East of Hungary; 2000, 2002, 2003, 2007). The highest total pollen count was registered in 1999 in Kecskemét (21769 pollengrains/m^3) during the 15 years period. The highest pollen load was registered in 1999 with 80639 pollengrains/m^3 total amount of ragweed pollen counts for the whole country. Salgótarján (the Northest sampling site) has the lowest ragweed pollen load with 1174 pollengrains/m^3 maximum total pollen count from 1992 to 2007.
The highest daily maximum concentration varied between 6 towns, although it was registered in a three years period in Pécs (1994-1996) and in Debrecen (in the North Lowland Region; 2001-2002). The highest daily ragweed pollen concentration monitored from 1992 to 2007 was 1419 pollengrains/m^3 (Debrecen, 2002). This parameter was the lowest also in Salgótarján, where the maximum daily concentration was 96 pollengrains/m^3 in the 15 years period.
Number of the days with pollen concentration higher than 30 pollengrains/m^3 (high loaded days) was the highest in Kecskemét in most of the years (from 1996 to 2003 and in 2005) and in Pécs (from 1992 to 1995 and in 2007). In the year of 2000 the number of days with pollen load >30 pollengrains/m^3 was the highest (397 days).
Very high loaded days with more than 100 pollengrains/m^3 were the most also in Kecskemét and in Pécs, but the number of these days was the highest in 2006 (235 days). Salgótarján is the only site where daily ragweed pollen concentration has never reached 100 pollengrains/m^3 during the 15 years.
Concerning the trend ragweed pollen load is decreasing in the whole country due to the effective ragweed control and the variation of the weather.

INTERNATIONAL COLLABORATION PROJECT FOR FORECASTING AMBROSIA POLLEN

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Ambrosia pollen is very allergenic and easily transported by the wind. Therefore this pollen is regularly measured in considerable amount in the aerobiological networks of countries where Ambrosia is only sparsely distributed or even absent. The effect of this transported pollen on allergic people as well as the general interest of forecasting airborne pollen concentrations makes Ambrosia an interesting species for developing a pollen forecast model.

An international collaboration for forecasting ragweed pollen was launched through a discussion group, which met in June 2007 during the Pan-American Aerobiology Association Symposium. Our goal is to forge an international collaboration among scientists to build and operate an Internet-based platform to forecast aerial concentrations of ragweed pollen in Europe and North America (http://www.ceal.psu.edu/ragweed.ht). Output from the final model will be available for all participants to use. ZedX Inc., an Information Technology company, based in Pennsylvania and specialized in weather driven models for agriculture applications, provides operational support for the development of a restricted access pilot website through which ragweed phenological data for North America and Europe are collected.

Phenological observations are one of the essential parts of this model processing. The more participants, the better the calibration of the forecast model will be.

Phenological observations were made in different countries of Europe and in the USA in 2007. First emergence was observed in Serbia on March 25 and in the rest of Europe and US mainly from April 13 to 25. First flowers releasing pollen were observed during the first weeks of July in Europe. In Hungary and Switzerland the main flowering period started around mid July and lasted until September 9 to 26. The collection of ragweed phenological data will continue this year through the restricted access website (http://ragweed.zedxinc.com/index.html), with the aim of refining the ragweed phenology model, helping the calibration of the ragweed pollen forecast model, and possibly enable the creation of European and North American ragweed phenology maps.

The multilayered architecture of the system, encompassing public, private, and research components will ensure sustainability and will provide tangible benefits both to the allergy sufferers and to the scientific community.

THE IMMUNOLOGY OF ALLERGIC REACTIONS AND POSSIBILITIES FOR INTERVENTION

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Allergy or immediate type hypersensitivity reactions are caused by allergens, which are usually harmless, non-invasive substances. The source of the allergenic proteins is wide – they may derive from environmental substances including pollens, animal hair, insects, food etc. The pathophysiology of allergic responses can be divided into two phases. During the acute response mast cells and basophil granulocytes play a central role, which had become previously sensitized with allergen-sepcific immunglobulin E. Binding of the allergen crosslinks of $Fc\varepsilon$ receptors on the cell membrane, leading to the activation of these effector cells. Upon degranulation they release mediators of allergy such as histamine, various enzymes and inflammatory mediators which cause vasodilation, mucous secretion, nerve stimulation and smooth muscle contraction. This secretory response results in the appearance of the allergic symptoms including rhinorrhea, itchiness, dyspnea, and anaphylaxis. Depending on the mode of introduction and the given allergen the symptoms can be localized to the respiratory system (asthma) or to the dermis (eczema). Up to 24 hours after allergen-exposure the late-phase response may take place, due to neutrophils and eosinophils migrating to the site of the initial reaction.

Inhibition of allergic reactions is a major goal in clinical medicine. There are several target-points of the allergic reaction where the process can be influenced/inhibited by various drugs – e.g. the interaction of IgE with the high affinity $Fc\varepsilon RI$, production of IgE, activation of mast cells, release of mediators, the effect of histamine and inflammatory substances. Attempts to intervene in this process will be discussed.

BURDEN OF RAGWEED ALLERGY IN HUNGARY

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Ambrosia artemisiifolia, identified on close to 7% of the territory of Hungary, has grown to the major pollinosis inducing factor in the last decade. Its allergenicity is amplified by environmental pollution (mainly PM 10, SO_2, NO_X , O_3), the concentration itself by global warming and an increase in CO_2.

In some parts of South-East Hungary, sensitization has grown to more than 80% in the allergic population, while 40-60 % has been observed in the total population (followed by Parietaria and/or grass pollen, and house dust mite proteins).

More than ten years ago comparative figures in South-West Hungary have been: ragweed skin prick test positivity: 12,6% in allergic patients, 2.8 % in healthy people. Ragweed-specific IgE was identified in 12.1 % of the sera of patients vs. 6.3 % in healthy residents. Experts believe that ragweed is involved in at least 50% of pollinosis cases as causative factor today, including allergic rhinoconjunctivitis, asthma, and pollinosis-related food allergy. Although no exact data exist on some components of direct costs of ragweed allergies (in vivo and in vitro diagnosis is usually performed on a panel of allergens, costs of medical care are irrealistic, etc.), it is feasible that about 1/3 of the total costs of pharmacotherapies and half of that of immunotherapies go for the treatment of ragweed allergies. Total costs of antiallergenic medication were 8.3 billion HUF in 2002. In 2005, however, medication for respiratory allergies alone has grown to 17 billion HUF (including antihistamines, 5 billion HUF). Assets to eradication and communication of prevention make up a small portion of the annual pharmacotherapy budget.

In a survey about parents' concerns about their children, the child's disease was on the top of the list (85% of all answers) and 60% have mentioned ambrosia also, a much higher incidence than of fear from a traffic accident involving a child.

RAGWEED POLLEN ALLERGENS FOR DIAGNOSIS AND THERAPY

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Background: Pollen of ragweed is an important source of allergens causing atopic reactions in late summer and autumn[1,2]. In recent years pollen of ragweed became a severe health problem in parts of Central Europe, since pollen distribution and sensitization rates increased tremendously.
Methods and Results: Amb a 1 is the most important *Ambrosia artemisiifolia* allergen since 95% of ragweed-sensitized individuals react with the major allergen. The protein is highly abundant in aqueous extracts and undergoes proteolytic cleavage during purification. Besides the major allergen, several new pan-allergens were identified from *Ambrosia artemisiifolia*, e. g. Amb a 6 (nonspecific lipid transfer protein), Amb a 8 (profilin), and Amb a 9/10 (calcium-binding proteins)[2]. We purified the allergenic molecules from pollen source or as recombinant proteins in *Escherichia coli*. Proteins were physico-chemically and immunologically characterized in detail. An allergen microarray using ragweed and mugwort pollen allergens demonstrated the IgE-reactivity and cross-reactivity pattern of weed sensitized patients.
Conclusions: A detailed knowledge of the allergenic molecules of *Ambrosia artemisiifolia* provides important information for ragweed allergy diagnosis and therapy.

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OPEN QUESTIONS IN RAGWEED ALLERGY

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The genus Ambrosia (A.), which includes both *A. artemisiifolia* (short or common ragweed) and *A. trifida* (giant ragweed) has long been recognized as a significant cause of allergic rhinitis. The pollen of *A.artemisifolia* is produced in enormous amounts and one single plant alone may produce millions of pollen grains. Since the pollen grains are small (18-22 μm) they are often involved in episodes of long distance transport. The most representative species, *A. artemisifolia*, was first reported in Europe in 1860 and ragweed pollen is increasingly important from an allergological point of view in parts of Central and Eastern Europe (1). Despite the huge number of studies published in the last decades, several aspects of ragweed allergy have to be completely understood.

Ragweed and mugworth have nearly identical flowering seasonal periods and high degree of cross reactivity. In a recent study was shown that patients with both ragweed and mugworth IgE reactivity on RAST and/or skin prick tests are actually co-sensitized. This observation is of clinical relevance especially in patients for whom specific immunotherapy is indicated (2). A large cross reactivity between short and giant ragweed is also well known. However, recent data suggest the two plants are not allergenically equivalent. Due to this, in subjects sensitized to ragweed, diagnosis and eventually immunotherapy should be performed according to type of pollen species present in that specific area (3). Emerging evidences showed that long distance transport might represent a cause of sensitization and of symptoms among allergic population, in areas far from the source of pollen. Ragweed seems to be frequently involved in transboundary transport in Europe. In central Italy several episodes of detection of ragweed pollen appeared to be linked to air mass coming from Balkans (possibly Hungary) and pollen count often reached the clinical threshold suggesting a possible increase in sensitization rate and clinical impact on allergic population (4,5). This hypothesis was supported by a preliminary observation of increasing trend of ragweed allergy in a neighboring region where plants are not present, as well (6). Finally, the possible effects of climate change on ragweed allergy are still unpredictable, although current data suggest a negative impact on allergic people. In fact, current studies show that increasing CO_2 and temperature seem to induce substantial increase in pollen production and increased Amb 1 concentration in pollen from ragweed in experimental conditions. Moreover, the observed long-term changes in the large-scale atmospheric circulation might contribute to increase the occurrence of episodes of long distance transport of ragweed pollen (7). In conclusion, since the last decades of the 19th century, ragweed has been increasingly important from an allergological point of view, covering large areas of Central and Eastern Europe. Despite this, several clinical and epidemiological aspects of ragweed allergy has still to be clarified.

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SPREAD OF, AND CONTROL MEASURES AGAINST, COMMON RAGWEED IN HUNGARY

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Ambrosia artemisiifolia is an invasive plant species, which causes significant damages of human health and agriculture in Hungary. It has been known in Hungary from 1920's. In the beginning of the 1990's, after the change of political system the land owners have changed, too. This time many fields were abandoned because of the improper soil cultivation. So ragweed became the most frequent weed species in Hungary. In 1988 it was found in the weed survey, including to twelve weed species and all fields of Hungarian agricultural units, that ragweed become the predominant weed species. The results of the last survey on this species in 2005 showed some regions of Northeast Hungary (Borsod-Abaúj-Zemplén and Heves counties) with restricted spread of ragweed, but the South part of these counties were heavily infested. Nowadays the agricultural areas are greatly infested in Hungary. Therefore besides the prevention, control of this weed is essential after its establishment.

Official control is organized at government level in Hungary and is obligatory for each landowner before the flowering period. In Hungary the obligatory control of *Ambrosia* is regulated by Act 2000/35 on plant protection and the following rules:

– Decree 5/2001 (16 January) of Ministry of Agriculture and Rural Development (MARD) on plant protection activity;
– Government Decree 160/2005 (16 August) on detailed rules on determination of fees of control of public interests;
– Government Decree 335/2006 (23 December) on administrative organization of plant protection;
– Act 140/2004 Act on general rules of the official administration procedure and service;
– Government Decree 187/2006 (5 September) amended by 214/2007 (7 July) on detailed plant protection fine;

30 June is the deadline of the obligatory control of ragweed, as specified in the legislation. This is an average period of the appearance of ragweed buds. After this deadline the authorities order control of public interest. The local checks are carried out by employees of the Land Offices.

Control of public interests is ordered by notary inside the settlements, and by county agricultural offices, plant protection and soil conservation directorates outside the settlements

The Land Offices submit their data on *Ambrosia* infestation by server, which is operated by the Institute of Geodesy, Cartography and Remote Sensing to the authorities. This server contains also data (documents etc.) of plant protection authority.

In the case of default of obligatory control, fine is ordered. The fines are between 20.000 to 5 million Forints, depend from the size of are, the level of infection, departure of settlements.

The national control of *Ambrosia* is organised by "Interministerial Commission For The Ragweedfree Hungary "of six Hungarian ministries (MARD, Ministry for Human Health, Ministry for Local Government and Regional Development, Ministry for Economy and Transport, Financial Ministry, Ministry of Environment and Water, Ministry of Education and Culture) with the participation of non-governmental organizations.

AMBROSIA SPECIES IN AUSTRALIA AND THEIR CONTROL

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Australia is a large continent extending from 10 to 43ºS with climatic zones from alpine and cool temperate through Mediterranean to tropical summer rainfall. There are no native *Ambrosia* species in Australia but four species occur as introduced invasives: *A. artemisiifolia* L., *A. confertiflora* DC., *A. psilostachya* DC.and *A. tenuifolia* Sprengel, of which *A. artemisiifolia* is the only common or widespread species[1]. *A. artemisiifolia* was first recorded in 1908 in northern New South Wales (NSW) (28.5 ºS, 152.5 ºE) but the source of the population is unknown. The plant spread slowly until the 1940s and then more rapidly, until in 1974 a major flood event spread the weed throughout the river systems of SE Queensland and northern NSW[2]. At present annual ragweed is widespread along the east coast of Australia from 27 º to 31ºS and for about 100 km inland, with isolated populations in a high-altitude area in north Queensland and in the far south west of Western Australia.

Allergic rhinitis due to ragweed pollen was first recorded in northern NSW in the 1980s[3] and continues but as a minor problem[4]. Annual ragweed is a Declared weed in the affected regions, ie landholders are supposed to control the plant. Control is by chemical herbicides or plants are slashed prior to flowering to prevent seed set. However enforcement is variable, and infestations on waste land or roadsides are rarely controlled. A biocontrol program started in 1984 and two insects, the moth *Epiblema strenuana* (Walker) and the beetle *Zygogramma biocolorata* Pallister, were established. Both are now widespread and damaging throughout the ragweed areas[5]. Ragweed no longer forms dense tall stands and is not now regarded as a major weed. However in the last decade summer rainfall has been low until last summer, when with above-average summer rainfall there was a ragweed resurgence. The biocontrol agents are expected to re-establish control in the next season.

A range of insects were investigated during the biocontrol program, several of which could be trialled for use in Europe. These include gall midges from North America[6] and a galling weevil *Conotrachelus albocinereus* Fiedler from NW Argentina[7] as well as strains of the rust disease *Puccinia melampodii.*

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RAGWEED IN CROATIA – AGRICULTURAL AND PUBLIC HEALTH PROBLEM

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Short ragweed (*Ambrosia artemisiifolia* L.) is an invasive plant species that spreads extremely aggressively in the Republic of Croatia and in more and more countries. Pollen of short ragweed is the most important risk factor for allergic disease and the most prevalent pollen in continental part of the Republic of Croatia[4], as well as in many other European countries[1,2]. However, in the Republic of Croatia short ragweed is recognized as both a principle source of pollen for autumn allergies and a noxious agricultural weed causing enormous economic problems to farmers[5]. It is most often found in grain fields (particularly sunflower) and wheat stubble fields causing dramatic yield loss in crop production, but it also dominates along the roadsides, railways lines and ruderal areas.

The concentration of ragweed pollen in the air was evaluated for each sampling year over a four year period (2004-2007) for continental and Mediterranean region of the Republic of Croatia respectively. Ragweed blooms for a long time (in some cases for 3 months) and produces a high quantity of pollen which, when breathed-in, causes characteristic symptoms of pollinosis. The ragweed pollen is present in the atmosphere of the investigated areas from the beginning of August to the end of September. The maximum pollination is detected from mid-August to mid-September with the peak at the beginning of September in 2004 and 2006 and the end of August in 2005 and 2007. The results show that the contribution of ragweed pollen was quite distinct and changed from year to year. Moreover, the duration, average daily count and total count have shown considerable fluctuations, having a similar pattern to previous observations in the Republic of Croatia[4] as well as in observations in Southern Hungary[3].

Currently, common ragweed is a management challenge due its extended emergence patterns, rapid growth rate and possible herbicide-resistant evolution. The extent of its infestation is also being monitored in the Republic of Croatia in order to measure the direction and rate of change in the size of the colony. There are several methods available for ragweed control. However, the most effective method should combine sequential management approaches.

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COMMON RAGWEED IN CANADA

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Common ragweed (*Ambrosia artemisiifolia* L.; Asteraceae) is a native annual weed species which occurs throughout North America but is most abundant in southern Ontario and Québec and in the northeast and north central states[1]. Common ragweed is a pioneer species that flourishes in disturbed habitats such as along rights-of-way, in vacant lots, and in cultivated fields. Various herbicides and herbicide mixtures provide control in most crops, but populations of common ragweed have developed resistance to triazine, ALS inhibitor, urea, and glyine herbicides, thus restricting control options. After the province of Quebec banned the use of herbicides in urban settings, common ragweed increased dramatically, exacerbating medical problems for individuals with allergies. Foliar application of sodium chloride solutions is a new treatment option being used in cities and municipalities of Quebec. Research has demonstrated the capability of *Ophraella communa* (Coleoptera: Chrysomelidae) to control ragweed[2]; a biocontrol agent candidate for introduction into Europe.

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AMBROSIA CONTROL AND LEGAL REGULATION IN SWITZERLAND

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Common ragweed (*A. artemisiifolia*) was described in Switzerland already in the second half of the 19th century. Ragweed remained hidden until changing conditions triggered its spread. The invasion of this neophyte is still in a stage, where an effective low cost control is feasible. We count in Switzerland north of the Alps an estimated 100 foci of small and big populations. Additionally we observed thousands of single plant stands in the urban areas. The endangering of human health by ragweed pollen requires a concerted action of several disciplines: “Ambrosia groups” do exist in several cantons. Members are mostly agriculturalists, botanists, environmentalists, medical, meteorological and road services. In 2006 the Federal Department for Economic Affairs (ministry) adapted the ordinance on plant protection and declared *A. artemisiifolia* subject to official control and obligation to register foci. Cantonal agricultural advisory services are now forced to control and register every focus announced even by private people. A possible yield loss for farmers, because of control measurements dictated by the authorities can be partly reimbursed by the Federal Office of Agriculture.
The research station Agroscope Changins-Wädenswil ACW has carried out several field and glass house trials to develop an adapted control strategy. In areas where invasion is at the beginning, hand pulling of single plant stands seems to be very effective. Herbicide efficacy was tested for the treatment of larger foci. Breaking the plants life cycle by preventing the ripening of new viable seeds is recommended in all infested sites. Control measures aiming at reducing quickly the pollen production may lead to a continuing stealthy multiplication of Ambrosia. ACW has organized several information campaigns (Bohren *et al.*, 2006a) in the country, like the national hand pulling day. The control strategy has been described (Bohren *et al.*, 2008) and the information is spread regularly at international conferences (Bohren *et al.*, 2006b, 2007). Most publications are written in French and German for the Swiss professional magazines (ask list from authors).

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COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) IN RUSSIA: SPREAD, DISTRIBUTION, ABUNDANCE, AND CONTROL MEASURES

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Ambrosia artemisiifolia was first recorded in Stavropol' territory of Russia in 1918. At the end of 1940th, numerous infestations were rather widely distributed over the North Caucasus. In 1950th - 1980th, the explosive spread of the weed occurred[1,2], when the heavily infested area has increased from 2,000 to 60,000 km^2. Starting from 1990, the situation was practically stable suggesting that from that time common ragweed has occupied its potential range. At present, almost 80% of the total square infested by common ragweed in Russia is in Krasnodar territory. Stavropol' territory and Rostov province are also heavily infested, while in adjacent regions (Belgorod, Voronezh, Kursk, Saratov, and Volgograd provinces, and certain other parts of South-East European Russia) only small local infestations could be found[2]. Primorsk and Khabarovsk territories (Russian Far East) are another isolated area of ragweed invasion. In European Russia, the northern limits of common ragweed distribution range are determined by average September temperature of 14-15°C, while the total of April – October precipitations less than 250 mm is limiting its spread eastward. Southwards, the area infested by *A. artemisiifolia* extends into Georgia and Azerbaijan, and westwards, into Ukraine and Moldova. In 2005-2007, random sampling was conducted in the southern part of European Russia. Approximate average cover of *A. artemisiifolia* was 2% and 40%, and average plant height was 20 cm and 60 cm, in crop rotations (agricultural fields, n=69, a total of 11.8 km^2) and in relatively stable habitats (field margins, roadsides, etc., n=181, a total of 0.2 km^2), respectively.

Various methods are currently used to control this noxious invasive weed. In agricultural fields, common ragweed is controlled by various herbicides (application methods depend on the crop plant), by cultural control (various grasses, particularly, winter crops could suppress the ragweed growth), and by appropriate agricultural practice (timely cultivation, summer fallow, etc.). In more stable habitats (field borders, roadsides, ruderals, etc.) *A. artemisiifolia* could be suppressed by sowing of cultured or wild perennial grasses[2]. In 1960th - 1970th, several biocontrol agents were introduced[1]. Two of them, the noctuid moth *Tarachidia candefacta* Hubn. and the ragweed leaf beetle *Zygogramma suturalis* F. have successfully established. *T. candefacta* is still a rather rare species, although its abundance has recently increased[3]. As for the ragweed leaf beetle, random sampling conducted in 2005-2007 have showed that *Z. suturalis* has spread over most of the area heavily infested by ragweed in Russia. However, its average population density was very low: ca 0.001 first generation adults/m^2 in agricultural fields and ca 0.1 adults/m^2 in more stable habitats. In only a few of the studied plots *Z. suturalis* population density up to 2–3 adults/m^2 and a detectable level of target plant damage (ca 5% of the leaf surface) were recorded.

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THE ACTION PROGRAMME AMBROSIA IN GERMANY

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Though *Ambrosia artemisiifolia* was first found growing in Germany in 1860, it occurred mostly scattered and as a casual for a long time. Only in recent decades, more and more established stands were recorded – most of them in the warmer parts of the country and in cities. A relation to global warming seems likely, and a further spread may lead to a situation similar to that in warmer European regions, where *A. artemisiifolia* has become abundant and troublesome.

In order to discuss the potential threat of the species, an interdisciplinary working group was founded at the Julius Kuehn Institute comprising experts from the fields of plant health, allergology, meteorology, ecology and botany, etc. With the help of Swiss colleagues, the working group designed in 2007 a national "Action Programme Ambrosia". The programme has three aims:

- to educate the broad public and policy makers about the negative effects the plant has on public health, agriculture and – possibly – biodiversity,
- to monitor existing stands of the plant in order to gain a comprehensive overview of its occurrence in Germany, and
- to trigger measures against further introduction and spread and for the control of individual stands.

In the first season of the programme the plant has received wide attention in the press and other media. Most stands are still small, but some large stands were recorded, e.g. long linear stands along motorways. Many plants have been destroyed, but more efforts are needed to enhance the effectiveness of the control measures. The bird seed industry has been informed about the problem of contamination of sunflower seeds with *Ambrosia* seeds.

HERBICIDE RESISTANCE IN RAGWEED (*AMBROSIA* SPP.) – A REVIEW

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The genus *Ambrosia* spp. (ragweed) with several species - *A. artemisiifolia,* (annual) *A. confertiflora, A. tenuifolia* (perennials) has invaded Europe and several Mediterranean countries from North America during the late 20th century. These invasive species are now abundant in urban and rural habitats. Apart from being nuisance to farmers, *Ambrosia* spp. are also aeroallergen species, causing hay fever and/or asthma during its long pollination period. We assume that ragweed plants were transported from North America as contaminants in bulk grains imported for food or feed. In the USA and Canada, *A. artemisiifolia* and *A. trifida* have evolved resistance to a wide range of herbicides commonly used in commodity grain crops such as corn and soybean. Resistance to triazine and some urea herbicides was detected in Canada as early as 1976 and during the 90's in the US. With the increased use of acetolactate syntase (ALS) inhibiting herbicides in grain crops during the last two decades, the selection pressure applied on the ragweed plants resulted in the evolution of ALS-resistant populations hundreds of sites throughout the Midwestern states. Furthermore, resistance to glyphosate has evolved in *A. artemisiifolia* and *A. trifida* infesting crops such corn, soybean and cotton in seven different states. *A. artemisiifolia* populations were detected in soybean fields in Delaware that confer multiple resistance traits (to ALS-inhibitors and PPO-inhibitors). We postulate that these resistant biotypes may move in shipments of commodity grains to other countries, not only invading new habitats but may also disseminate herbicide-resistant weeds that are no longer controlled by these common herbicides.

RAGWEED MONITORING BY REMOTE SENSING IN HUNGARY

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The ragweed pollen allergy has gradually become an important issue in Hungary. The number of pollen allergic people had been increasing so that there was an imperative need for a National Ragweed Control Program (NRCP) which integrated several governmental authorities. To the efficiency of this priority program, the government amended the plant protection law in 2005.

FÖMI has supported the nationwide NRCP by its own developed remote sensing methodology to monitor the main ragweed infected areas. FÖMI produces countrywide ragweed risk maps focusing to the most heavily infected arable lands. Important case-categories are non-cultivated arable lands, the cereal stubbles and sunflower fields. These ragweed risk maps are derived from time series of medium and high-resolution satellite images. Based on the characteristics of weeds and the high resolution (HR) images, the ragweed delineation focuses to the spots larger than 0.8 hectares where the most significant pollen production comes. Ragweed risk maps are public and also available via FÖMI's website (www.fomi.hu).

FÖMI has developed the Central Ragweed Server and Information System. This ensures the fast data exchange among the authorities and stores information about the infected spots. The central server synchronizes 300 officials in July-Sept during the most critical ragweed-growing period.

In 2005, FÖMI detected 19 249 spots which were 58 682 ha ragweed infected area in the whole Hungarian arable-land territory. In 2006 the detected area was limited and FÖMI focused on especially the highly ragweed infected areas thus 3 500 ragweed infected spots which amount to 18 601 ha were found on arable lands. In 2007, 4 034 spots come to 9 794 ha were registered as ragweed infected areas by FÖMI. The ragweed risk maps based on remote sensing, the Central Ragweed Server and Information System also contribute to the successful ragweed control in Hungary.

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MONITORING RAGWEED AT A LOCAL SCALE: LESSONS FROM A PROGRAM CARRIED OUT IN THE RHONE ALPES REGION (FRANCE)

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In order to support a concerted program against ragweed in eight voluntary communes near Lyon (France), a monitoring methodology has been designed and implemented since 2005. Inspired by the PSR model (Pressure - State - Response) from OECD[1], it follows the principle of the "quality spiral" ensuring a continuous improvement. After setting the general objectives for the program, priority actions were identified to promote ragweed control practices chosen amongst a complete inventory set up by technical institutes. Each action was associated with indicators to check its implementation and to assess how the targeted practices evolved. The impact of these practices was estimated by mapping the presence and the density of ragweed on the territory for both agricultural and non agricultural areas, and by a diagnosis of the risk of water contamination by pesticides used to control that weed.

This numerous and heterogeneous information was gathered and synthesized in a monitoring dashboard for decision makers, allowing them to be informed about the measures implemented, their efficiency, and the associated impacts[2]. This synthesis allowed a reassessment and possibly a modification of the program. The assessments made in 2005 and 2007 usefully highlighted some critical points, such as the management of inter cropping periods on agricultural areas, or the importation of soils contaminated by seeds and the manpower availability to deal effectively with ragweed at the right time on non-agricultural areas.

This monitoring methodology faces some practical problems and still needs to be improved. However, it presents several advantages: the adaptation to local conditions can complement or provide an alternative to approaches based only on regulation. The lessons learned at the local level in the context of this pilot operation can also lead to a global improvement of ragweed control methods.

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FRENCH ASSOCIATION FOR RAGWEED STUDY: THE FIRST IN FRANCE TO HAVE STUDY SHORT RAGWEED AND ALERT INSTITUTIONS SINCE 1982

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In 1964, for the first time in Lyon in France, R. Touraine recognized this pollinosis but he did not informed authorities. The first author, an allergist, outlines the conditions in which she was interested in short ragweed since 1978. Every year she treated about six hundred ambrosia (A)-sufferers when she practised her activity. She treated some patients who have seen the weed growing in their fields during the 1930 years. They knew (without genetic research), where they have bought seeds or plants that have introduced A.
From 1978 to 1994, the authors, then the French Association For Ragweed Study informed the decision-makers of this plague but they were not interested! So in 1983, the non governmental organism was founded to gather specialists, to study this question in different aspects and try to be listen by authorities. They were alone during 15 years. Aims of this organism are to make bibliography about a question, to establish new programs of research, to find a budget and to prepare the research-program with the specialized research group that it finances (it is often a governmental institution). The work is then published. AFEDA has published about 100 studies, a yearly pollen calendar, two books (in French) which are the only ones in the world. Moreover AFEDA organizes a yearly congress and print in French and English a scientific journal "Ambroisie" that is able to print your works.
A summary of these publications is presented.
- Pollen counts (pc), *1982-2008*: 9 pollen traps are in action. *1996-2007*: a predictive model of A pollination and a medical advise are broadcasted on AFEDA internet site to help sufferers to adapt their treatment to pollen amounts. *1982-1999*: pc show the impact of Commune Agricultural Policy on A spreading. *1982-2007*: pc show climate changes, so in spite of inter-annual variability, a very slight precocity is registered at the beginning and the middle of flowering. Moreover pc show sites where fight takes place against A and where it does not.
- Clinical, epidemiological studies, *1982-1984*: frequency of asthma/cough is greater -50%- than for other pollinosis; from one to three symptoms (rarely more) are observed -rhinitis: 90%, conjunctivitis: 75%. *1989, 91, 94, 97*: pollinosis affects 6-20% population in some parts of the Rhône-Alpes Region. *1997*: like Cupressaceae, A is a biological pollutant (allergenic and pollutant) as some clinical characteristics are different from classical pollinosis that are only allergenic. - Fossil A research: has shown that Ambrosiacae were present in SE France 8M years ago, whithout knowing what genus it is. - Regulatory measures, *1997*: municipal orders, *2000:* prefectoral ones were established, with the AFEDA participation.- Ecology, *1982-2008*: sites where A is growing, factors influencing or limiting its spreading were studied. - Costs for farmers, governmental organisms, French National Health Fund were evaluated. - Veterinary aspects, *2000* :a high percentage of dogs with atopic dermatitis was observed. - Remote sensing, *2001-2008:* AFEDA realized studies for the first time in the world. The performance of this technology to give a cartography of short ragweed culture-infestation is good if several images with the same sight direction and good acquisition dates are acquired. In conclusion, in France, the Lyon region is the "cradle" of ragweed. The question is now well known, decision-makers have to act in our country and in Europe. We are waiting since 30 years.

STUDIES ON SPREAD, POPULATION BIOLOGY AND MANAGEMENT OF *AMBROSIA ARTEMISIIFOLIA* L. IN AUSTRIA

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Ambrosia artemisiifolia (common ragweed) is an annual invasive neophyte causing serious health and agricultural problems.

Currently, the University of Natural Resources and Applied Life Sciences Vienna is performing studies to obtain sufficient data for developing management strategies against the further spread of *A. artemisiifolia* in Austria. First we focus on the population biology of Austrian ragweed populations – we study the seed bank (age, structure, dynamics), the biometrical characteristics (hight, width, internode lengths, inflorescences, seeds) and the population genetics using microsatellites for DNA-fingerprinting (Genton et al. 2005). The second major scientific goal is to define the dimension of the actual spread, to analyze its history and causes. In this module of our study we analyze the contribution of bird seed (Vitalos and Karrer 2008), agricultural seeds, harvesters and reapers as well as vehicles on highways to the spread of ragweed.

Studies on population biology as well as on dispersal will allow the development of applicable treatments for a successful control of ragweed in Central Europe, based on a well-founded knowledge of the biology of this species.

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PRESENT SITUATION OF RAGWEED PROBLEMS AND POTENTIAL BIOLOGICAL CONTROL IN KOREA

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Two species of *Ambrosia* have been found in Korea. Common ragweed (*Ambrosia artemisiifolia*) was introduced into Korea in 1960s and now distributed throughout South Korea. Giant ragweed (*Ambrosia trifida*) was introduced into Korea around 1970 and distributed mainly in the northern part of South Korea where US Forces are located. A recent data on ITS sequence analysis showed 18 different ITS types from 156 individuals of common ragweed and four types from 46 individuals of giant ragweed in Korea. This suggests that introduction of ragweed into Korea was occurred several times from different sources.

Several plant pathogens and insect pests were recorded in Korea. *Golovinomyces cichoracearum*, *Passalora ambrosiae*, and *Phyllachora ambrosiae* have been collected on *A. artemisiifolia.* Powdery mildew caused by *G. cichoracearum* is common without serious damage on the ragweed growth. *Passalora* leaf mold is rather rare. However, leaf blight associated with *Phyllachora ambrosiae* usually occurs during wet season, showing as a potential biocontrol agent. Recently more attention has been paid to the biocontrol of *A. trifida* in Korea. *Puccinia xanthii* is the only known plant pathogen on *A. trifida* (unpublished, 2007). Two insect pests are expected to control the giant ragweed. *Ophraella communa*, already known as a biocontrol agent, is most promising. *Epiblema sugii*, a stem-borer, is also under study. No bacteria, no viruses, and no phytopathogenic nematodes have been found as pathogens on *Ambrosia* plants.

AMBROSIA SPECIES, A NEW HEALTH AND ENVIRONMENTAL THREAT IN ISRAEL

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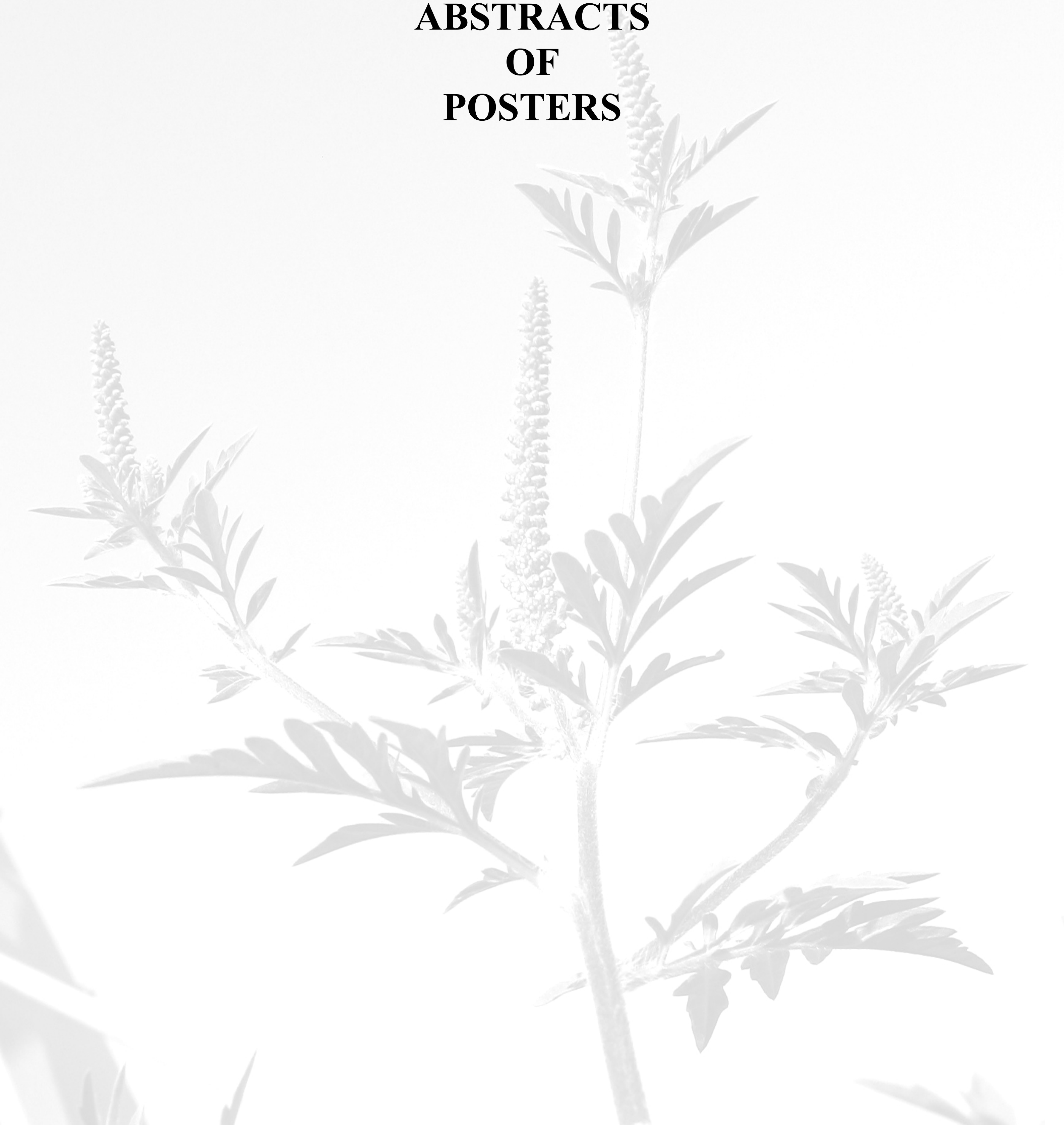
The genus *Ambrosia* contains 24 species, but only few of them are considered as weeds, or cause damage to agriculture and eco-systems. Recently, five *Ambrosia* species were found as invasive weeds in Israel. *Ambrosia maritima* L. is the only species listed in the Israeli flora as a rare plant, grown on the Mediterranean cost sand. The other allergenic species invaded the Northern Galilee habitats are *A. trifida* and *A. artemisiifolia* in a bird feeding site where migrating Cranes are fed with corn grains imported from the USA. After detection, the whole site was treated immediately with 2,4-D herbicide, in order to prevent their further dissemination and to enhance the naturally-grown grasses. Heavy infestation of another allergenic species, *A. confertifolia* was found in the Sharon region along the Alexander River banks, a very popular tourist recreation site. This invasive weed severely infests orchards, field crops and nature reserve hence reducing farmer's income and biodiversity. *A. confertifolia* is a hard to kill perennial weed that was declared by the PPIS as a "quarantine noxious species" requiring intensive containment and control program. An update survey made in summer 2007 indicated that this specie was introduced to Heffer valley from Nablus (The Palestinian Authority) via sewage- and rainfall-water flowing down hills towards Alexander River. Hence, efforts are on the way to establish a bilateral program in order to allocate continuous and efficient efforts to control this weed and prevent its establishment in other areas of Israel and the Palestinian Authority.

ABSTRACTS OF POSTERS



ESTABLISHMENT OF *AMBROSIA ARTEMISIIFOLIA* IN SWEDEN

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Ambrosia artemisiifolia was very rarely recorded in Sweden until the 1990's, when the plant began to appear in many place. We shall report from the trend during the last decade, when new records continuously were reported. *Ambrosia* is apparently mainly dispersed with bird-seed, since most of the records are from places where birds have been fed during the winter. Another source is fodder-pellets made from sunflower bran, which may also be contaminated by *Ambrosia* seeds. Flowering occurs late in the year. The vegetation period in South Sweden is often too short as to favour full seed maturity, but during warm years, ripe and germinative seeds have been produced. During pollen monitoring in regional pollen traps, situated on ±elevated locations, *Ambrosia* pollen is still mainly registered in connection with episodes of long distance transport from the European continent. But there are anecdotal data of people reacting to pollen from plants growing in their own gardens. A continued import of contaminated birdseed will make the establishment of new plants possible. Climate change can create conditions that promote seed ripening, but a selection of early phenotypes is also expected.

AFEDA SEASONAL POLLEN RAGWEED COUNTS IN FRANCE SINCE 1982: VARIABILITY IN TIME AND SPACE (COUR'TRAPS)

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Ragweed (*Ambrosia artemisiifolia* L.) is an invasive plant spreading in Europe. Since 1982, the French-Association-For-Ragweed-Study (AFEDA) has been sampling the atmospheric pollen contents in the Lyon area and in some other French regions. The goal of the study is to present the Seasonal Total Pollen Counts (STPC) in different regions from the beginning of measures.

Cour'traps, always at the same height, 3 m above ground used a volumetric method based on the principle of filtration. Usable surface of a filter, collecting every day a mean of $571m^3$ of air, is 400 cm^2. After exposure, filters are chemically dissolved, acetolysis destroys cytoplasmic components of the pollen grains (pg), increasing the quality of identification. So, Cour'traps easily sample small amounts of pollen (beginning and end of the pollination period).

Lyon region is the "cradle" of ragweed in France.

-"Lyon-Bron" is a semi-urbanized site. Measures, carried out since 1982, reflect an evolution in 3 steps. 1982-1994: STPC increase, they vary from about 300 to1300 pg. 1994-2000: STPC significantly decrease from 1432 to 330 pg. From 2000 to 2007: STPC are stable with 300 pg.

-"Lyon-Saint-Exupéry", a rural site, is situated at 15km as the crow flies at the east of "Lyon-Bron". STPC, begun in 1996, are about more than twice higher than Lyon-Bron. 1996-2006: STPC significantly decrease from 1439 to 846 pg. 2007: they are about 400, one half of 1996-2006 average.

Regions around Lyon: a significant increase of STPC is recorded.

-1997-2007, *in the Rhône Valley,* at the south of Lyon: -30km- Vienne (rural), STPC were in 2002 about 1000 pg, -100km- Valence, they varies from about 1000-2000 pg with a pollen peak (pp) fluctuating from 400-700 pg, -160km - Montélimar, STPC vary from 600-1200 pg, pp is multiplied by 5 in 24 years.

-In the *Ain department*, "Ambérieu-en-Bugey" (rural), 50 km north-east Lyon, STPC also increase, they vary from 380-530 pg with a pp near 180, multiplied by more than 4 in 23 years.

In other regions, ragweed is spreading : *Côte d'Or department,* "Dijon", 200 km north, *Allier department,* "Vichy", 150 km north-west, *Nièvre department*, "Nevers-", 200 km north-west and in *Poitou-Charente* near Atlantic Ocean, "Angoulême". Everywhere, 2007 summer was colder than 2006, so decrease in STPC was, Lyon-Bron: 65 %, Lyon-Saint-Exupéry: 50 %, Dijon: 46%, Angoulême: 36%, Ambérieu: 29%, Vichy: 16%, Nevers: 8%, Valence: 7%, but they increase of 18% in Montélimar.

In direction of the South, for example, in 2002 STPC was only 38 in "Nîmes" and 9 in "Montpellier".

Conclusion: measurements reflect behaviors depending on sites and regions. An example, recordings of 1984 and 2007 in "Nevers", "Montélimar", "Ambérieu-en-Bugey", show an important increase for these 3 sites whereas "Lyon-Bron" recordings where ragweed is fought decrease.

EFFECT OF ENVIRONMENTAL FACTORS ON THE PRODUCTION AND SPREADING OF THE RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) POLLENS

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Ragweed (*Ambrosia artemisiifolia* L.) is a plant common to roadsides and disturbed habitats through out most of the countries. Human allergic responses to the pollen of certain plant species is a serious environmental health issue. Throughout ragweed distribution, ragweed pollen is one of the most abundant aeroallergens.

Timing and manner of pollination depend greatly on meteorological factors; temperature, humidity and light. Increasing temperature and decreasing humidity enhance pollination.

The increase temperature also fostered the start of pollen season around two weeks earlier than before. Light stimulates Ragweed germination; hence, waste lands and mixed soils are very soon infested by ragweed. Climate changes also result in increased periods and amounts of pollen production. The association between warmer weather and increased pollen production has been supported from biological experiments and observational data. Dry and hot weather speeds up maturation and the loosening of pollen grains from anthers, and the concentration of pollen grains is considerably higher than in cold and wet weather. On dry windy days, the pollen will travel many kilometers. Meteorological factors are very important for the occurrence of pollen grains in the air and distribution. Temperature, relative humidity and rainfall play the most significant role for pollen concentration.

Ragweed is a plant of concern in the global warming issue, because tests have shown that higher levels of carbon dioxide will greatly increase pollen production. Experimental study has found, increase in concentration of carbon dioxide (CO_2) can the amount 4 folds increase in amount of A*mbrosia artemisiifolia* (ragweed) pollen. Carbon dioxide is also responsible of increase in the number and size of floral spikes. But overall, floral weight as a percentage of total plant weight decreases. Some reasons may relate for ragweed spreading extensively such as globalization, seed import, global warming and agricultural practices. The aim of study is to give a short survey history on effect of different environmental factors and their impact of on pollen production and the spreading of pollens.

THE EFFECT OF TILLAGE TIMING ON EMERGENCE OF VARIOUS WEED SPECIES

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This study was conducted in Karaj, Iran, from 2005 to 2007 to assess the effects of day and night tillage at different dates during the growing season on weed emergence. Experimental design was randomized complete block with four replications. Tillage treatments consisted of day tillage-day disk, day tillage- night disk, night tillage- night disk, and night tillage- day disk. Times of tillage were 6 March, 6 April and 6 May in each year. Four fixed quadrates were established in each plot where weed seedlings were counted 20-days interval after field tillage. In the first year results showed that night tillage-night disk reduced the emergence of all weed species expect foxtail (*Setaria spp)*. The emergence of common lambsquarter (*Chenopodium album*), ragweed *(Ambrosia artemisiifolia),* redroot (*Amaranthus retroflexus*) and turnasole (*Chrozophora tinctoria*) in night tillage- night disk treatment was 54%, 57%, 63%, 50% lower than that of day tillage-day disk, respectively. In the second year the emergence of common lambsquarter, ragweed, redroot and turnasole was 61%, 52%, 70%,40% lower in the night tillage- night disk than day tillage-day disk treatment respectively, but the number of *Kickxia elatina,* heliotrope *(Heliotropium europaeum)* and Purslane *(Portulaca oleracea)* did not reduce in the night tillage- night disk treatment. Tillage treatment on 6 March significantly increased weed emergence compared to the other two dates of tillage in both years.

BIOLOGICAL CONTROL OF WEED SEED IN DIFFERENT ECOSYSTEMS

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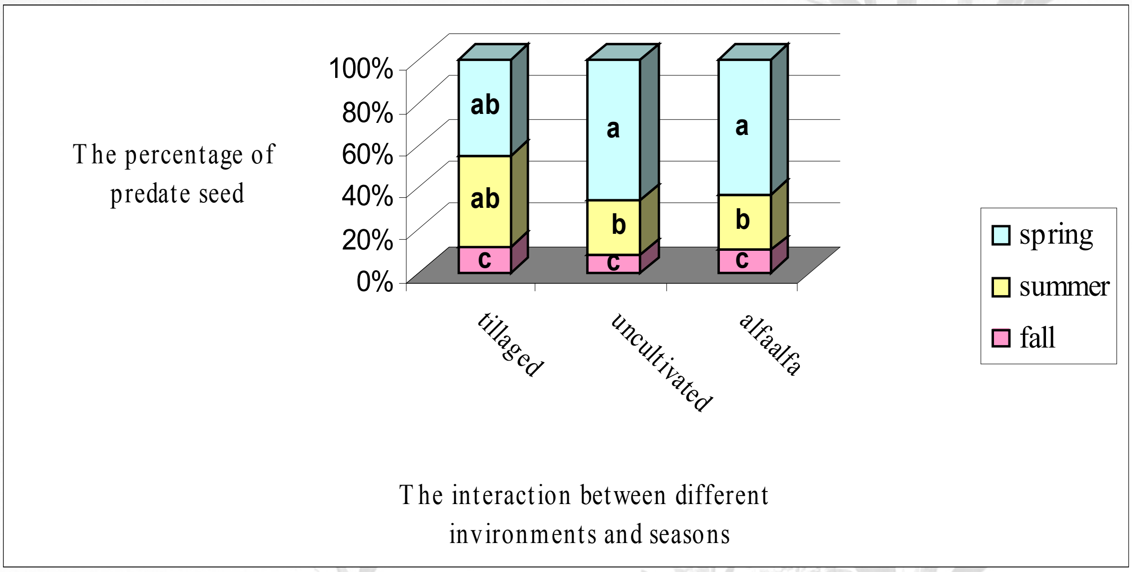
To evaluate the influence of seasons (spring, summer and fall) and ecosystems (uncultivated land, alfalfa field and tillaged field) on the quantity of post dispersal seed predation of jimsonweed *(Datura stramonium),* ragweed *(Ambrosia artemisiifolia),* wild mustard *(Sinapis arvensis)*, hispanica *)Vaccaria pyramidata),* bindweed *(Convolvulus arvensis*, dock *(Rumex crispus*) and maurorum *(Alhagi camelorum)* a field experiment was conducted in Karaj, Iran from 2005 to 2007. The experiment was arranged in a factorial completely randomized design with four replications. To determine the quantity of predation, 50 seeds were placed in Petri dishes and put them in the field, and then they were collected and counted after 14 days. Results indicated that predation was highest in spring in uncultivated ecosystem land (98%) and lowest in fall in all ecosystems (20%). Seeds predation was highest for wild mustard (70%) and lowest for maurorum (2%). Ants were the dominant seed predators and accounted for 80-85% of all seed consumed.



EVALUATION OF THE ACCURACY OF THE METHODOLOGY DEVELOPED FOR IDENTIFYING RAGWEED INFECTED AREAS CONSIDERING PARCEL SIZE IN THE FRAMEWORK OF THE OASIS PROGRAMME

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The objective of our OASIS project was to test SPOT5 satellite data on two selected test areas, in 2007. The main challenge was to demonstrate the accuracy of the newly developed methodology in identifying ragweed-infected parcels focusing on the parcel size.

According to the reference ground survey executed in 2005 and 2006 ragweed infection appears mostly on small parcels. Two pilot sites were selected at the sandy soil Great Hungarian Plain where the typical parcel-size is small. These two areas in the region of Kecskemét and Szeged were among the most ragweed-infected fields in the country. The cereal stubbles were identified by the quantitative evaluation of the SPOT5 (pixel size: 0,01 ha) and Landsat TM (pixel size: 0,1 ha) or IRS-P6 AWiFS (pixel size: 0,5 ha) data time series using the collected ground reference data. To double-check our remote sensing identification results we carried out a ground control survey.

The results of the comparative analysis were as follows:
On large parcels (>5 ha) Weed detection using SPOT5 data was 18,4% more accurate than Landsat TM and 22,9% more accurate than IRS-P6 AWiFS data on large parcels.
On small parcels (<1 ha) Weed detection using SPOT5 data was 39% more accurate than Landsat TM and 48% more accurate than IRS-P6 AWiFS data on small parcels.

As a result of this OASIS project the usefulness of SPOT5 data in ragweed detection was clearly demonstrated. It provides very valuable information for the ground reference data collection about the localization of ragweed spots. SPOT5 data is much more effective in detecting ragweed infection especially on small fields (~ 1 ha) than using Landsat or AWiFS data.

The final conclusion is: combined use of SPOT5 and other high resolution satellite data is the most efficient method for ragweed detection.

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Gizella, Nádor and Diána, Fényes: Weed detection using SPOT5 and other satellite data, SPOT seminar Budapest, June 6. 2007.

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Origin of the SPOT data: SPOT Image distribution/OASIS programme, Copyright CNES

MONITORING OF AIRBORN RAGWEED (*AMBROSIA*) POLLEN IN ROME (ITALY)

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Ragweed (*Ambrosia* sp.) has a very wide expansion and has one of the most allergenic pollen. In the last years, presence of this type of pollen has been observed in Rome, especially in summertime.
The aim of the present contribution was to determine the situation of *Ambrosia* in Rome. In this study we analyzed the atmospheric concentration of *Ambrosia* in three sites in the town: RM5 (Tor Vergata University), RM8 (CRA-CMA), RM6 (San Pietro FBF Hospital); two others stations have been used for a few years: RM7 (S. Eugenio Hospital) and a sampler at ground level in the Roman Foro area.
Pollen monitoring was carried out by means of a Hirst volumetric spore trap. The data were collected weekly and the aerial sampler were prepared and analysed according to the AIA standard method.
The first aim of this investigation was to determine the atmospheric concentration of *Ambrosia* pollen as well as its seasonal fluctuations and the influence of meteorological variables (temperature, rainfall, wind speed and direction) on the presence of airborne pollen. A second one was to value if ragweed in Rome is a case of long distance transport. The highest concentrations were recorded from August to October especially after rainy days.

THE PANNONIAN PLAIN AS A SOURCE OF *AMBROSIA* POLLEN IN THE BALKANS

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Introduction: *Ambrosia* pollen is an important aeroallergen. The aim of this study was to find likely sources of *Ambrosia* spp. pollen recorded at five pollen-monitoring sites in central Europe.

Method: *Ambrosia* flowers in the morning (06:30-08:00) and so *Ambrosia* pollen grains recorded between 06:30 and early afternoon are likely to be from a local source. Conversely, *Ambrosia* pollen grains recorded at night or very early in the morning are liable to have arrived via long-range transport. Daily and diurnal variations in *Ambrosia* pollen recorded by volumetric spore traps at five sites (Novi Sad, Ruma, Negotin and Nis in Serbia and Skopje in Macedonia) during 2007 were analysed in order to find possible sources of the pollen and to identify *Ambrosia* pollen episodes suitable for further investigation using back-trajectory analysis. Two episodes were examined, 1-2/9/07 and 19-20/9/07.

Results: Mean diurnal variations and the magnitude of *Ambrosia* pollen counts during the 2007 *Ambrosia* pollen season showed that Novi Sad and Ruma (Pannonian Plain) and to a lesser degree Negotin (Balkans) were located near to sources of *Ambrosia* pollen. This is because *Ambrosia* pollen counts were notably higher than at the other two sites examined, and concentrations generally peaked during the middle of the day. Back-trajectory analysis showed that during the two episodes air masses brought *Ambrosia* pollen to Nis (Balkans) during the night and early morning after passing near to Novi Sad and Ruma during the previous day. *Ambrosia* pollen counts at Skopje remained low and so it was not possible to determine whether pollen was transported as far south as Macedonia on these occasions.

Conclusion: The results of this study identified the Southern part of the Pannonian Plain around Novi Sad and Ruma as being a potential source region for *Ambrosia* pollen recorded at Nis in the Balkans.

GROWTH OF COMMON RAGWEED (*AMBROSIA ARTEMISIIFOLIA* L.) AS A FUNCTION OF DIFFERENT NITROGEN RATES

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A. artemisiifolia L. has spread in the past decades at a great extent in our country[1]. Results of the 4th National Weed Survey show that it occupies the first place in the order of weed species dominance. Its biological features, adaptability and competitiveness contribute to its spreading on large territories[2,3,4].

In our experiment we investigated the effect of increasing nitrogen doses on the growth dynamics and biomass production of *A. artemisiifolia*. We carried out pot experiments under greenhouse conditions. After germination we measured the fresh and dry weight of shoots and roots, the length of shoots and roots and counted the number of leaves of *A. artemisiifolia* at 5 points of sampling time every 7 day.

Nitrogen was applied in increasing doses, N $mg \cdot kg^{-1}$: control = 0; N_{100} = 100; N_{200} = 200; N_{300} = 300; N_{400} = 400, besides equal quantity phosphorous (100 mg $P_2O_5 \cdot kg^{-1}$) and potassium (100 mg $K_2O \cdot kg^{-1}$) doses. Nutrient applications were carried out in 4 replications.

Our results show that N_{100}, N_{200}, N_{300} applications proved to be favourable for the biomass production of the weeds.

In comparison the biomass production of the control weeds was 75% less on average. N_{400} application had a depressive effect, although the biomass production was 2.5 times higher than in the control application, where the weeds were thin with tiny leaves, but they developed flowers by the 10th week.

In applications with favourable nitrogen supply (N_{200}, N_{100}) the shoot and root weight was 78% higher than the control. In application with high nitrogen doses (N_{300}, N_{400}) the root weight reduced at a higher rate (37-51%) than the shoot weight, which was 11-30%.

A. artemisiifolia is able to grow and form flowers even at lower nutrient supply. The level of nitrogen supply being still favourable for *A. artemisiifolia* biomass production is between large end values ($N_{100-300}$) and the plants are is also able to tolerate extremely high nitrogen supply (N_{400}).

Biomass production is multiple at N-supply levels that produce favourable conditions, but if N supply is low or excessive *A. artemisiifolia* plants are able to grow and form flowers, which ensure their survival by generative reproduction.

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EFFECTIVE CONTROL OF RAGWEED IN DIFFERENT CROPS WITH FLUMIOXAZINE

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