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Ambrosia artemisiifolia L. – in Switzerland: concerted action to prevent further spreading

***Ambrosia artemisiifolia* L. – in der Schweiz: Maßnahmen zur Kontrolle der weiteren Ausbreitung**

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Abstract

Common ragweed (*Ambrosia artemisiifolia* L.) was described in Switzerland already in the end of the 19th century. Ragweed remained hidden until changing conditions triggered its spread. The invasion of this neophyte in Switzerland is still in a stage, where an effective low cost control should be feasible. A survey of the Swiss Research station Agroscope Changins-Wädenswil ACW, formerly RAC Changins, showed a clear trend for 2005: Beside a few known foci in arable fields, ragweed grows mainly in private garden sites all over the country. Ragweed follows human activities, and it was observed that its seeds are found in bird grain mixtures. Seeds also enter the regions along the French and Italian borders by agricultural machines and excavated material from building sites.

The fact that ragweed endangers public health was one reason to follow more carefully its beginning invasion. The spread of ragweed from private house gardens via compost or via professional gardening as pathways to the fields seems to be very easy. Therefore it was necessary to act rapidly to start an effective campaign in 2005. The information on how to eradicate ragweed went to all municipalities in Switzerland and met increasing interest. This year, the aim was to eradicate ragweed in house gardens, to reduce seed production and to make ragweed known to the population. The campaign will be continued in 2006.

Key words: invasive plants, common ragweed, *Ambrosia artemisiifolia*, neophytes, public health

Zusammenfassung

Ambrosia (*Ambrosia artemisiifolia* L.) wurde bereits Ende des 19. Jahrhunderts in der Schweiz beschrieben. Die Pflanze blieb unbeachtet, bis veränderte Bedingungen eine schnelle Ausbreitung von *Ambrosia* hervorriefen. Die Invasion dieses Neophyten in der Schweiz ist heute immer noch in einem Stadium, wo eine wirksame Bekämpfung mit niedrigen Kosten möglich sein sollte. Eine Umfrage der Eidgenössischen Forschungsanstalt für Pflanzenbau, damals RAC Changins, heute Agroscope Changins-Wädenswil ACW, zeigte für das Jahr 2005 einen klaren Trend: Neben den bisher bekannten Standorten wächst *Ambrosia* im ganzen Land hauptsächlich in Einzelbeständen in privaten Hausgärten. *Ambrosia* folgt den menschlichen Aktivitäten. Mit Vogelfutter gelangt sie in die Familiengärten. In grenznahen Regionen gelangt Ambrosiasamen mit ausländischen Landmaschinen und mit Aushubmaterial von Baustellen in die Schweiz.

Die Tatsache, dass *Ambrosia* die Volksgesundheit gefährden kann, verlangte ein rasches Handeln in 2005. Der Weg vom Hausgarten via Kompost und Gärtnereien auf die Felder scheint für *Ambrosia* nicht sehr weit zu sein. Deshalb war es nötig, rasch und wirkungsvoll eine Kampagne zur Information der breiten Bevölkerung zu starten. Alle Gemeinden in der Schweiz wurden informiert, wie mit *Ambrosia* im privaten Hausgarten umzugehen sei. Ziel war es, die Samenproduktion in diesem Jahr wirkungsvoll zu reduzieren und die *Ambrosia* der Bevölkerung bekannt zu machen. Die Kampagne wird nächstes Jahr fortgesetzt.

Stichwörter: Invasive Pflanzen, aufrechtes Traubenkraut, *Ambrosia artemisiifolia*, Neophyten, Volksgesundheit

Introduction

Common ragweed (*Ambrosia artemisiifolia* L.) presently causes growing concerns in Switzerland. Firstly described in the 1880s and present sporadically in the country as a neophyte, ragweed begun spreading intensively during the last decade. Besides being a weed in arable fields, the plant produces pollen with a high allergenic potential that could induce severe health problems in the population. This situation requires a strong control strategy involving not only farmers but also staff in charge of managing natural areas, road sides, building- and gravel industries.

In Europe ragweed has been known since the 1860s, in France as well as in Germany. Around 1950 ragweed began to spread in the region of Lyon (France). In the sixties and seventies it became an increasing problem for public health in France and up to nowaround 140,000 people are affected in the region Rhône-Alpes. 12,1 % of the population around Lyon is allergic (ARVALIS, 2005). In Hungary 90 % of the land area is infested, whereas in former Yugoslavia ragweed is widely distributed mostly on fallow land as a consequence of war. The Po Valley in northern Italy is nearly completely colonized (AFEDA, 2005).

This paper briefly presents the historical and current distribution of ragweed in Switzerland, some information on the presence of pollen in the air with related medical aspects and, finally, the latest information on the control campaign in Switzerland.

A neophyte in Switzerland

HEGI (1908) reported sporadic findings of ragweed in Geneva, Basel, Zurich and Berne in the late 19th century on fallow ground, along road banks, and in gravel pits. JAQUET (1925) described it as a sporadic species, growing in the region of Fribourg. But ragweed remained hidden. The map set up by the Centre of the Swiss Floristic Network (CRSF/ZDSF 2004) shows that three foci of ragweed were found before 1994, and about 85 after 1994. Cur-

rently, colonization of Switzerland by ragweed is described as "at the onset of an invasion" (CORDILLOT, 2004) and therefore the costs for controlling it might still be low. However, the canton of Ticino, on the southern side of the Alps, is already severely infested.

In the canton of Geneva and in the neighbouring region of the canton of Vaud, ragweed is present on agricultural fields, along road banks, and in recreational areas. Other cases – small foci with high infestation rate – have been reported for a long time in Basel, Ticino, Geneva and recently in Zurich. Ragweed seeds reached the Geneva region via agricultural machines such as combine harvesters. Machines for soil treatment are also routinely exchanged between the French region of Lyon and the Swiss Bassin Lémanique. Excavated material from building sites has been transported between France and Geneva very often, likewise between Italy and the canton of Tessin.

These examples show how the spreading of ragweed benefits from human activities. Thus, it is not amazing to find ragweed in many private house gardens, or flower pots in urban and recreational areas. It is also present along traffic routes, often growing directly along the asphalt. Heavily infested areas are found in gravel pits where several hectares can be left untouched for several years. Smaller foci are also known to be present on building sites.

A few reasons may account for ragweed spreading nowadays at a much faster rate:

- As a consequence of globalisation, there is more travel, and transportation of goods is more intensive; ragweed seeds directly benefit from these to spread further;
- more environmental-friendly agricultural practises led to less intensive crop management, in particular against weeds;
- global warming may help ragweed to grow and spread at faster rates in the northern hemisphere;
- imported bird seed mixtures that are distributed nationwide.

Pollen counts

Ragweed produces pollen in large quantities from August to September which is often transported over far distances by wind. The pollen of *Ambrosia* has a high potential to provoke hay fever and in some cases asthmatic reactions. Concentrations between 6 and 10 pollen grains per m^3 air represent a moderate load and more than 10 pollens per m^3 a high load. By comparison, more than 49 pollen per m^3 air represent a high load for grass pollen which is the main allergen for hay fever in Switzerland.

The airborne pollen is collected with a volumetric pollen trap and analysed by light microscopy. In 1969 R. M. LEUSCHNER initiated the pollen measurement in Switzerland with the first pollen trap in Basel. Since 1993 MeteoSwiss runs the national pollen monitoring network with 14 measuring stations. The *Ambrosia* pollen counts increased in the region of Geneva in the eighties and nineties. Most of the pollen is transported by wind from neighbouring regions, as shown by the correlated increase of pollen in Lyon (CLOT et al., 2002). The highest levels of *Ambrosia* pollen in Switzerland are detected in Ticino. In 2004 11 days of high load were measured in Lugano and Locarno and in Geneva 9 days, whereas in Zurich no high concentrations of pollen were detected (CLOT et al., 2005).

Medical aspects

If invasion by *Ambrosia* is left uncontrolled, increase of allergies could heavily augment the estimated costs of 260 million Swiss Francs for allergy and asthma (MÜLLER et al., 2000). Experiences from France and North America have shown that around 10 % of the population is sensitive to *Ambrosia* pollen (DRASS, 2000). A quarter of them may develop heavy asthmatic reactions. So far, ragweed allergy with evidence of sensitisation in Geneva remains low with possibly 4 to 5 potential cases in 2004 (TARAMARCAZ et al., 2005). Only 8 of 18 polled medical practitioners have encountered 1 or 2 patients allergic to ragweed during the 2004 ragweed pollinisation period.

An estimated 100 million CHF is spent in Switzerland to cover overall costs for treatment of allergic rhinitis (MÜLLER et al., 2000). But numerous sensitive persons may not consult a doctor. Two-thirds of the patients in Geneva – a town hosting numerous international organisations – were sensitised outside of Switzerland (HAUSER, 2004). In the St. Gall Rhine valley in eastern Switzerland 10.6 % of 15 year old students showed sensitivity to pollen of ragweed (GASSNER, 2005), amongst other pollen.

Seed spread and distribution

French observations clearly show that bird seed mixtures contaminated with *Ambrosia* seed are an important pathway (CHAUVEL et al., 2004); up to 2500 grains were found in one kg. Another important source for spread is the feed for small animals such as rabbits and hamsters. It might contain fertile *Ambrosia* seeds which could directly reach the field. Seeds are also found in imported sunflower and sorghum. In most cases it is technically impossible to separate ragweed grains because weight and size could be similar to other seeds like e.g. sorghum. Grain importers and feed producers should bear the responsibility and sterilise the grains used for feed.

Seeds of *Ambrosia* are not airborne, normally they fall on the ground. Spread of ragweed is greatly favoured by human activities. Ragweed has a higher spread potential than most indigenous annual dicotyledonous weed species and most indigenous grass weeds in Central Europe. Among neophytes, only South African ragwort (*Senecio inaequidens* DC.), Canadian horseweed (*Conyza canadensis* L.) and Japanese knotweed (*Reynoutria japonica* HOUTT.) show higher spread potentials (WEBER et al., 2005).

Ragweed is easily mistaken with mugwort species *Artemisia vulgaris* L. and *Artemisia verlotiorum* LAMOTTE.

Distribution of *Ambrosia* registered in different periods

The first Swiss distribution map set up by the Swiss Web Flora (Fig. 1) shows some foci of *Ambrosia* registered in the region of

Figure 1. Distribution of *Ambrosia artemisiifolia* L. before 1982 in Switzerland.

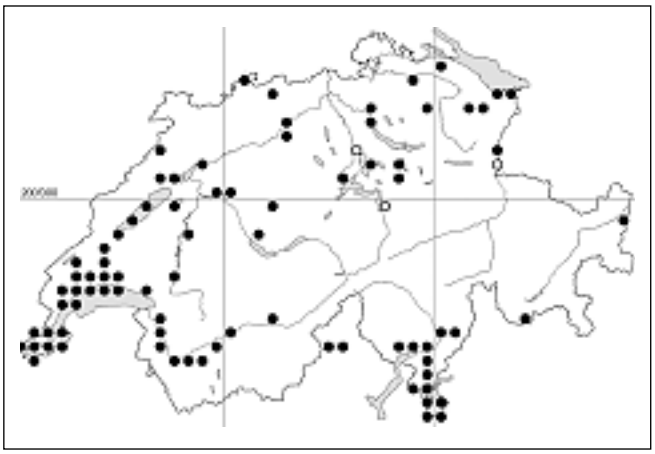

Figure 2. Distribution of *Ambrosia artemisiifolia* L. in 2002 in Switzerland. ○ = observations before 1994, ● = observations after 1994.

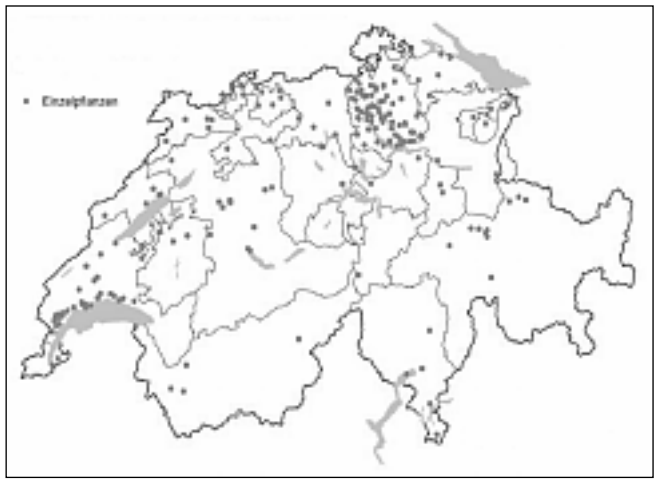

Figure 3. Distribution of *Ambrosia artemisiifolia* L. registered in 2005 by the Swiss Research station Agroscope Changins-Wädenswil ACW. Einzelpflanzen = single plants.

Basel before 1982, but in the rest of the country only a few places were infested.

Twenty years later, in 2002, the map established by the Centre of the Swiss Floristic Network shows a wider distribution of *Ambrosia* in Switzerland (Fig. 2). Mainly in the western and southern part of the country large areas are infested with *Ambrosia*, whereas smaller foci are reported from the rest of the country.

The map of 2005 (Fig. 3) is based on the survey of the Swiss Research station Agroscope Changins-Wädenswil ACW. It does not show earlier observations. Single plant foci were found mostly in house gardens following announcement by their owners and verified by official experts. The high number of *Ambrosia* single plant foci in the canton of Zurich reported in 2005 (top centre of the map, north) is the result of a regional publication of the Swiss house owners association (HEV) in July. It was the time when *Ambrosia* had grown high enough to be recognised by the eyes of a layperson.

Control in agriculture

Control of ragweed with herbicides is difficult in some crops like sugar beet and peas, and is nearly impossible in sunflowers as both ragweed and sunflower belong to the same botanical family.

Since 2003 ACW has been performing efficacy trials with many herbicides registered in Switzerland. Table 1 shows the efficacy of the herbicides tested. Knowledge about mechanical control of ragweed could be very important for road services, as the use of herbicides along roads is highly restricted. Since 2004, we have been monitoring mowing trials where we count the seed production of ragweed after a series of various dates of cutting (BOHREN et al., 2005). Our first observations show that a cut in the first half of September can stop the seed production, but cannot prevent the production of pollen. It may be very difficult to inhibit coevally pollen production and seed production.

Ragweed, germinated in cereals, rests in a small stage until the crop is harvested; coming to the light, it starts to reproduce. The flowering time is obviously day length dependent and starts by the end of July. Insufficient mechanical or chemical control allows ragweed to sprout quickly from the base of the stem.

Concerted action

Several factors have to be respected to launch an effective control of ragweed. On one hand it might not be sufficient for public health to apply control strategies in agriculture for ragweed as for any other weed, because we do not know anything about a limit of tolerance which guarantees that the amount of ragweed pollen will not rise above the high load limit of >10 grains per m^3 air. On the other hand it might not be sufficient to apply control strategies along roadsides or in natural reserves to prevent ragweed becoming a weed in agricultural areas.

The endangering of human health by ragweed pollen requires a concerted action of several disciplines:

- In cantons of Ticino, Neuchâtel, and Geneva, "Ambrosia Groups" were created to discuss control strategies. The initiators of such groups often belong to agricultural services, meteorology agencies and medical services. Members of the "Ambrosia Group" in Geneva studied in-depth the dissemination routes of ragweed seeds. Botanists, environmentalists, road services, medical and agricultural services took part. Meanwhile the group in Geneva is officially registered by the cantonal government. Within this group, ACW was appointed to work out control strategies for agriculture (DELABAYS et al., 2005).
- The Swiss Agency for the Environment, Forests and Landscape organised multidisciplinary workshops to learn more about ragweed.
- Cantonal offices also organised workshops to instruct the personnel working with road services and environmental agencies.
- In 2005 the Federal Department for Economic Affairs adapted the ordinance on animal feedstuff with the restriction that all type of feedstuff put into circulation must be free from ragweed seeds. 2006 the Federal Council amended the ordinance on plant protection and declared *A. artemisiifolia* subject to official control (BUND, 2006).
- Agricultural advisory services are now forced to control every focus of contamination in the fields because of the invasive behaviour of ragweed.
- Meteorologists are well equipped to measure pollen in the air, and they edit periodically a pollen report (METEOSWISS) for allergic persons which is also broadcasted by the radio stations.
- Studies by medical services on the allergic symptoms are more intensified in order to treat future patients properly.
- In 2006 road services will support the information campaign financially.

Table 1. Trial site: La Petite Grave, GE Switzerland

application date	active ingredients	g/ha	efficacy in % *	homologated in these crops : beetroot	cereals	faba bean	fallow	maize	pea	potatoe	prairie	soya	sugar beet	vegetables and other cultures
28. 4. 05	Atrazin	1000	100					×						
28. 4. 05	Clopyralid	120	100								×		×	ecological compensation area
9. 5. 05	Dicamba	240	100		×		×	×						
22. 3. 05	Lenacil	2000	99	×									×	planted leek
22. 3. 05	Metribuzin	700	97							×				tomato
14. 3. 05	Orbencarb, Metribuzin	3210 + 268	96			×			×	×		×		carotte/tulip
22. 3. 05	Isoproturon	1500	96		×									
9. 5. 05	Ioxynil	840	95											leek/onion
28. 4. 05	Foramsulfuron	45	94					×						
28. 4. 05	Mesotrion	150	92					×						
22. 3. 05	Orbencarb, Linuron	2860 + 590	88		×	×			×	×				
9. 5. 05	MCPB	1596	85		×				×	×	×			berry
28. 4. 05	Bentazon	1440	81		×			×	×	×	×	×		lin/bean
14. 4. 04	Fluroxypyr	180	80		×									
28. 4. 05	Flufenacet, Metosulam	600 + 25	70					×						
29. 4. 03	Foramsulfuron, Iodosulfuron	45 + 1.5	65					×						
21. 4. 04	Imazamox	40	40						×					
18. 3. 04	Bromoxynil, Diflufenican, Amidosulfuron	375 + 75 + 22	35		×									
29. 4. 03	Ethofumesat, Phenmedipham, Desmedipham	2× 256 + 125 + 31	30	×									×	
29. 4. 03	Thifensulfuron-methyl, Metsulfuron-methyl	61 + 6.1	30		×									
18. 3. 04	Metsulfuron-methyl, Carfentrazon	20 + 5	15		×									
19. 4. 05	Metamitron, Ethofumesate, Phenmedipham	2× 560 +130 + 130	15	×									×	
9. 5. 05	Cinidon-ethyl	50	10		×					×				
28. 4. 05	Triflusulfuron	30	7	×									×	chicorée
29. 4. 03	Rimsulfuron	10	5					×		×				
28. 4. 05	Ethofumesat	1300	5	×									×	
9. 5. 05	Carfentrazon	20	5		×									
18. 3. 04	Tribenuron-methyl	30	0		×									
14. 3. 05	Aclonifen	3000	0			×			×	×				planted onion
14. 3. 05	Prosulfocarb	4000	0		×					×				
14. 3. 05	Pendimethalin	1600	0		×			×	×	×				var. vegetables
14. 3. 05	Trifluralin	1680	0		×									cabbage varieties
	herbicides in autumn		0		×									

* efficacy trials without crop

Information campaign 2005

Experiences from France and elsewhere show that once ragweed is in the fields, it can no longer be fully controlled. Consequently we must control ragweed in this stage of early spread to stop it infesting our fields.

The question in 2005 was, where and how ragweed is located in Switzerland. To answer this question, ACW published an article on ragweed in the house-owners journal (BOHREN, 2005) in spring. The possibility was also offered to send suspect plants for determination to ACW. In 2005 we registered mostly single plant foci in house gardens throughout the country. Nevertheless we also registered the infestation of 6 agricultural plots and 22 public facilities with several hundreds of plants. A massive infestation was discovered in a gravel pit in the region of Basel.

The echo of the campaign 2005 with more than 120 new foci detected, showed, that people are very vigilant. A leaflet – edited in three different languages – with a description of the plant and its dangerous potential was sent to all municipalities. 130,000 copies were distributed. Several institutions continuously edit data sheets and leaflets on ragweed to inform their clientele. Individual measures often do not solve the intrinsic problem.

Private house gardeners are often good observers, and they decide clearly to tolerate or not a certain plant species in their gardens. People sensitive to hay fever and other allergies will even control public areas. Readers of the house-owners journal sending plants to our research stations frequently wrote in their accompanying letter how happy they are to do something good for their health. The elimination of many single plant foci may help to reduce the seed production and may therefore slow down the spreading of ragweed.

The very successful campaign of 2005 will be continued in 2006, aiming in maintaining fields in Switzerland free from ragweed as long as possible. Agricultural institutions must be active with the objective to keep ragweed away from our fields.

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