

Ragweed – An allergy risk in Sweden?

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Abstract

Ragweed pollen, which is a major cause of allergic rhinitis in North America and during the last decades, also in parts of the European continent, has not been regarded as a risk in Sweden, since occurrences of *Ambrosia* have been rare and with two exceptions, ephemeral. During the last four years, however, long-distance transported pollen has been registered in South Sweden. Moreover, seeds are dispersed by man with birdseed and reports on ragweed plants growing at birdtables are becoming more and more common. In warm years, the fruits of these plants mature and are germinative. We argue that there is a risk that ragweed pollen may be a problem in the future in Sweden. Long-distance transport from the continent is likely to be increasingly more common, and in larger amounts, as ragweed is rapidly spreading in Europe. Among the plants now appearing within Sweden, selection is likely to favour phenotypes which are able to fulfil their life-cycle during the indigenous vegetation period, especially in a scenario of global warming.

Introduction

Members of the genus *Ambrosia* ("ragweeds") are the major cause of allergic rhinitis in North America (Buck and Levetin, 1983). In parts of South, Central and Eastern Europe, ragweed pollen is increasingly important from an allergological point of view (d'Amato and Spieksma, 1993; Járαι-Komlódi and Juhasz, 1993).

During the last few years, flowering *Ambrosia* plants have become common in Sweden. Pollen of *Ambrosia* has been registered in South Sweden during the last four years (1995–1998), and the last two years, in amounts considered to be able to cause allergic symptoms of at least moderate severity in sensitised patients. Thus, it is motivated to discuss the possibility that ragweed could be a new cause of pollen allergy also in Sweden.

The genus *Ambrosia* belongs to the Asteraceae (Compositae) family and comprises ca 35–40 species. In effect, only two species are important causes of pollen allergy, viz. *Ambrosia artemisiifolia* (Common

or Short Ragweed) and *A. trifida* (Giant Ragweed). In Europe, only *A. artemisiifolia* is of significance to allergy, since *A. trifida* is rare (Leuschner, 1990).

Ambrosia artemisiifolia is an annual plant, and rapidly colonises cultivated fields, wasteland and disturbed soil, mainly due to the large seed production. The seeds are very small, and are impossible to remove from contaminated crop seed. Furthermore, they may remain dormant for decades (Comtois, 1998). The plant thrives in relatively dry environments, i.e. also in the soil of ordinary arable fields and gardens. The height is 1–1.5 m. Also pollen is produced in enormous amounts, and one plant alone may produce millions of pollen grains. Since the pollen grains are small (18–22 μ), they are often involved in episodes of long-distance transport (Mandrioli et al., 1998). Flowering is initiated in the end of July, when days become increasingly shorter. Pollen emission culminates in early September, and is favoured by dry and sunny weather and nocturnal temperatures above +10 °C. In the southern parts of the distribution area, not only initiation but also the length of flowering is governed

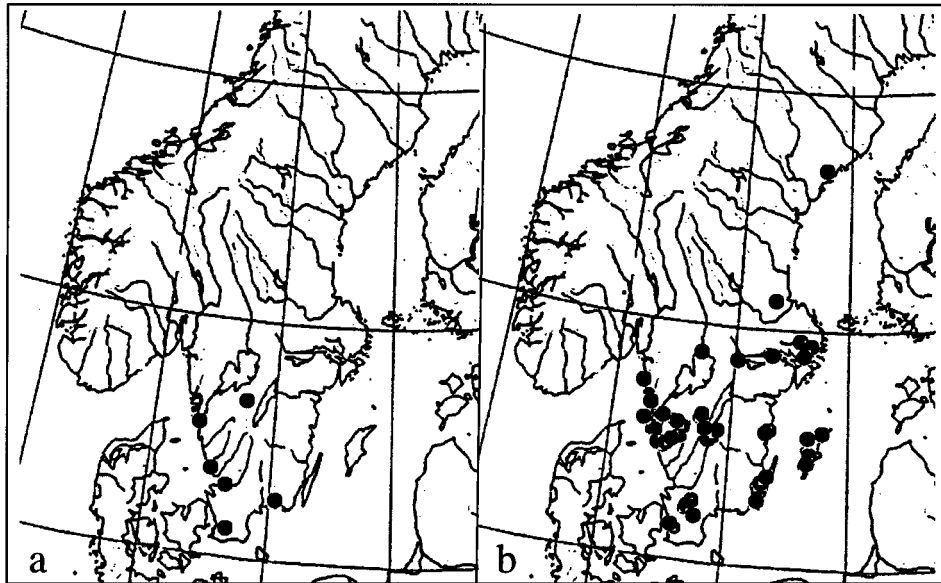


Figure 1. (a) Locations of Burkard 7-day volumetric spore traps in South Sweden where *Ambrosia* pollen has been registered during 1995–1998. (b) *Ambrosia artemisiifolia* – occurrences in Sweden during 1992–1998, as reported to the authors. One dot may represent a number of observations.

by the photoperiod (Lewis et al., 1991). In the northern parts, however, anthesis is usually terminated by the occurrence of frost. The plants die in temperatures below -5°C .

Ragweed has entered Europe accidentally. It was first introduced as a ballast weed, and occurrences were for a long time limited to ocean ports. However, since World War II, *A. artemisiifolia* has become established and more and more abundant at several locations in Central and South Europe. The main reason is probably increased intercontinental transports of cereals, changed agricultural methods and the prevailing policy to turn vast agricultural areas into fallow fields, or to abandon them entirely, creating ideal conditions for ragweed colonisation. Ragweed is now dispersed from two main nuclear areas, a small one in the Rhone valley near Lyon and a larger one in Hungary. From there, it rapidly spreads in France, north Italy, the former Yugoslavia, Romania, Greece, Czechia, Slovakia, Slovenia, Bulgaria, and adjoining parts of Ukraine and Russia. The speed is dramatic. Long-distance transported *Ambrosia* pollen occurs on a regular basis in Austria, Poland, and Switzerland, where the species is as yet not established. The registered pollen amounts increase from one year to another, sometimes twofold during the course of two years.

The pollen allergens of ragweed are aggressive. In North America (USA and Canada), more than 15 million people suffer from ragweed pollen allergy. The rhinoconjunctivitis symptoms are unusually severe. According to clinical experience, *Ambrosia* pollen appears to induce asthma about twice as often than what is usual in other pollen allergies, i.e., in 40–50% of ragweed pollinosis patients (Dechamp and Cohen, 1982; Dechamp et al., 1993; Lu et al., 1994). The number of sensitised patients grows in all areas where ragweed is established. In the nuclear areas of ragweed occurrence in Europe, Hungary and France, ragweed is already the most common cause of allergy symptoms during late summer. But also in areas where most of the registered ragweed pollen is allochthonous, the prevalence of ragweed allergy increases. In Vienna, e.g., it is the fourth most important from an allergological point of view (Jäger, 1990; Rybníček, 1995). In Poland, 50% of atopics show sensitisation towards ragweed (Obtulowicz et al., 1995).

In North Europe, allergy towards mugwort (*Artemisia vulgaris*) pollen is the third most important pollen allergy after Fagales (mainly birch) and grass pollen. The cross-reactivity of ragweed and mugwort allergens is estimated to 50% (Horak and Jäger, 1991). Cross-reactions are also common when ragweed allergy patients eat, e.g., melons and bananas.

Ragweed may also induce contact dermatitis, due to the presence of sesquiterpene lactones drained to the plant surface in resin canals. People handling the weed, e.g. farmers in connection with the harvest, sometimes develop eczematous eruptions involving the face, neck, and arms (Cohen, 1959; Stoner and Rasmussen, 1983; Menz and Winkelman, 1987).

Methods

Pollen monitoring has been practised in Göteborg and Malmö since 1975, in Blekinge since 1992, up to present. In Halmstad and Ängelholm monitoring was undertaken during 1995 and 1996, and in Skara during 1996. In all sites (Figure 1a) Burkard Seven Day Recording Volumetric Spore Traps have been used, and the analyses made at the Botanical Institute, Göteborg University (from 1998 by Pollengruppen i Göteborg, a company within the University). The traps were situated 10–30 meter above ground level. As long as *Ambrosia* pollen occurred occasionally, as singular grains, they were recorded under the name “Misc. Asteraceae”. In 1998, there recordings were reanalysed and identified as to genus.

During 1998, a Burkard trap was placed in a private villa garden at ground level in Kåhög, a village ca 7 km E of Göteborg, where *Ambrosia artemisiifolia* has become increasingly common.

In 1998, the authors inquired for information about recent occurrences of *Ambrosia artemisiifolia* within a couple of active botanical societies in West Sweden, organising as well professional botanists as competent amateurs.

Results and discussion

As the range of *Ambrosia artemisiifolia* increases north- and eastward in the European continent, the risk of long-distance transport of *Ambrosia* pollen grains into Scandinavia increases. We have re-investigated pollen tapes from 1993 and onwards, and found that during this period, such episodes have occurred since 1995 (Table 1). In August 1995, only two *Ambrosia* pollen grains were recorded at two different occasions. In 1996, *Ambrosia* pollen were registered at stations in South Sweden during the periods 13–16 August, 20–24 August and 29 August, still is low amounts only. In the end of August 1997, an warm air stream containing *Artemisia* as well as *Ambrosia* pollen swept over

Table 1. Yearly sums of *Ambrosia* pollen at six locations in South Sweden.

Location	1995	1996	1997	1998
Bräkne Hoby	0	6	78	0
Göteborg	0	3	23	0
Halmstad	1	4	—	—
Malmö	1	3	55	27
Skara	—	6	—	—
Ängelholm	—	9	—	—

South and Middle Sweden, and pollen were recorded in concentrations up to 40 pollen/cubic metre air and 24 hours. In the beginning of September 1998, when all traps in South Sweden except for the one in Malmö were shut down for the year, 26 pollen pollen/cubic metre air and 24 hours were recorded in Malmö. Two weeks later moderate amounts of *Ambrosia* pollen was recorded from Stockholm. All these events could be related to the influx of easterly air streams. However, the risk of exposure to indigenous *Ambrosia* pollen in Sweden is also rising.

Species of the genus *Ambrosia* have occurred in Sweden since centuries, as ballast plants and as weeds, e.g., around cotton- and wool preparation factories. They were also found in the waste heaps of oil mills, and as weeds spread with contaminated clover seed. The early occurrences were usually of an ephemeral nature. *A. psilostachya* is known to be persistent at two localities only in South Sweden, at least since 60–70 years (Georgsson et al., 1997; Weimarck, 1963), without any tendencies of spreading. *A. artemisiifolia* was first recorded in Sweden in 1866, and is said to have been introduced with clover seed (Hylander, 1971). During the last decades, the flora of several provinces in Sweden has been systematically screened, resulting in the publishing of provincial Floras. The first of these “modern” Floras came around 1980 (Genberg, 1979; Malmgren, 1982), and do not even mention the genus *Ambrosia*. In an illustrated Flora, which listed all known Scandinavian plants (Mossberg et al., 1992), *Ambrosia*-species are denoted as rare and ephemeral in ports, railway yards and earth mounds.

Since a number of years, however, seeds of *Ambrosia artemisiifolia* are efficiently dispersed with imported birdseeds, and new occurrences have been recorded as far north as in the province of Ångermanland (Figure 1b). Apart for the reports accounted for in

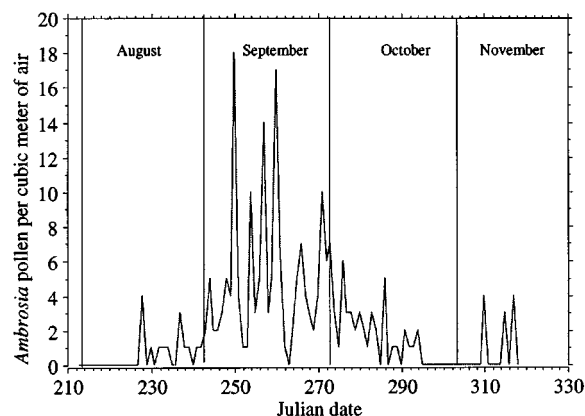


Figure 2. Daily concentrations of *Ambrosia*-pollen registered in Kåhög, 7 km, east of Göteborg, SW Sweden, in the autumn of 1998.

Figure 1, the authors are told that plants of *Ambrosia artemisiifolia* has been observed in another ca 70 sites during the preparation of a new provincial Flora for Skåne (Å. Svensson, pers. comm). Most occurrences reported to the authors have been in connection with bird tables, but imported cattle- and horsefodder also may contain vital weed seed, which may be further dispersed with the manure. Furthermore, the increasing import of plant nursery products has brought about a dispersal of other, more or less exotic weeds, and could also contribute to the introduction of *Ambrosia* seeds. As a consequence, *Ambrosia artemisiifolia* is hardly to be regarded as a rare plant any more, but rather as a regular member of the garden weeds in at least the southern half of Sweden.

Flowering of *Ambrosia* occurs late in the year of Sweden, usually not until the end of August when other allergenic pollen types only occur in low amounts. In the village Kåhög, east of Göteborg in SW Sweden, *Ambrosia*-pollen was recorded until November 1998 (Figure 2).

The vegetation period in South Sweden is often too short as to favour full seed maturity in *Ambrosia artemisiifolia*. Thus, if the species shall remain common in Sweden, seeds must be introduced on a regular basis. However, in favourable habitats, and during warm years, ripe and germinative seeds can be produced, as has been observed in a couple of cases in 1997 and 1998 (R. Daun, C. Sedin, pers. comm.).

Conclusions

A number of conditions must be fulfilled, if a plant species is to become a major problem as a cause of pol-

len allergy. Atopic persons must frequently be exposed to the pollen, which must contain allergen, and the amounts of the inhaled pollen must be large enough. We argue that the following circumstances indicate that *Ambrosia* pollen may induce pollen allergies in Sweden in the future:

1. A continued import of contaminated birdseed with a constant content of ragweed seed will constantly make establishment of new flowering plants possible.
2. As Swedes more and more often travel to areas where ragweed is established, they will more often be exposed to the pollen antigens.
3. Long distance transport of ragweed pollen into the southern parts of Sweden will become more frequent, as *Ambrosia* species are progressively colonising large areas in East and Central Europe. The pollen grains of *Ambrosia* are small (18–22 μ), and they are produced in large amounts. These circumstances increase the possibilities for long distance transport.
4. During the next 50 years, the expected global warming can create conditions that favour seed ripening also in Sweden, and hence create the conditions necessary for the establishment of a persisting and reproducing Swedish population.
5. There is a documented genetic variation with regard to phenology within *Ambrosia artemisiifolia*. Thus, selection may favour varieties with early flowering and rapid seed maturity, as well as frost resistance, which will be genetically adapted to the environment of South Sweden. In annual species, such as this one, selection may be rapid.

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