

Short communication

Pollen grains of *Ambrosia* in the air of Sofia, Bulgaria

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Abstract

Up to now, *Ambrosia* pollen has not been considered a cause of allergy symptoms in Bulgaria. However, the results of pollen monitoring suggest that such allergies will become inevitable in the near future. This conclusion is supported by allergometric data on 120 patients. Copyright © 1996 Elsevier Science Ireland Ltd.

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1. Introduction

Pollen grains from species belonging to the Poaceae family are the most frequent cause of pollinosis in Bulgaria (Yankova, 1978, 1980a; Petrunov and Yankova, 1991), followed by pollen grains of weed and ruderal species (*Artemisia* sp., *Plantago* sp., *Chenopodium* sp., *Amarantus* sp., Urticaceae) (Yankova, 1980b). A substantial role in this second group is played by *Ambrosia* species, most of which were brought to Europe from America in various ways. These extremely aggressive species with significant pollen production are progressively colonizing larger areas in European countries, and as a result, the number of patients becoming sensitized to *Ambrosia* pollen is growing (Vasic, 1988; Jäger, 1991; Sauli et al., 1992; Komlodi and Juhasz, 1993). Many investigations have been carried out to characterize this sensitization and its related clinical problems (Jäger, 1991; Pozzi et al., 1992; Piazza et al., 1992; Albasser, 1992; Prandini et al., 1992).

Up to now, no data are available on the distribution of *Ambrosia* species in Bulgaria. These species are not

characteristic of the Bulgarian flora, and the Sofia University Herbarium at the Department of Botany contains only sporadic records of *Ambrosia artemisiifolia* in the town of Mizia of the Belogradchic region (north-west Bulgaria).

The purpose of the present paper is to summarize the results of aeropalynological investigations in Bulgaria that demonstrate a definite increasing trend of *Ambrosia* pollen concentrations in Sofia. It is also of great interest to determine the relationship between the amount of *Ambrosia* pollen in the air and the rate of sensitization to it in our population.

2. Materials and methods

Aeropalynological investigations in Bulgaria started in 1967, and have continued up to the present. The first region in which these observations took place was Sofia. Sofia is situated 550 m above sea level, at the foot of the Vitosha and Ljulin Mountains. Up to 1991, the sedimentation method alone was employed for collecting airborne pollen, using a Durham apparatus modified to be much more effective for catching pollen

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Table 1
Pollen grains in Sofia (sedimentation method)

Year	Total pollen grains	<i>Ambrosia</i> pollen
1981	6789	2
1982	5889	1
1983	3468	4
1984	10 032	1
1985	14 299	0
1986	7224	15
1987	4944	26
1988	12 989	47
1989	2896	62
1990	15 259	2
1991	10 038	11
1992	11 527	42
1993	14 002	12

from the air (Yankova, 1980b). Pollen grains adhering to an area of 2 cm² on the slide were identified and counted each day. From 1991 onwards we have also used a Lanzoni apparatus which draws 10 l/min of air, so results can be expressed as pollen per m³ of air. Both devices are located 15 m above the ground, on the NCIPD terrace. Data obtained by both methods are presented here. The flowering period and the time of maximum concentration of *Ambrosia* pollen grains in the air have been defined, and the ratios of *Ambrosia* to total pollen and to the total for herb species in each pollen season have also been determined.

The aerobiological data were then compared with skin reactivities in allergic subjects in order to establish the rate of sensitization in the population. We studied the sensitization to ragweed pollen in 120 patients with seasonal allergy and positive skin reactions to pollen allergens. Patients were tested by a skin prick test (SPT) with common inhalant allergen (Hollister Stier Labs): *Dermatophagoides pteronyssinus*, *Dermatophagoides farine*, *Alternaria tenuis*, *Cladosporium herbarum*, *Aspergillus fumigatus*, *Betula pendula*, *Artemisia vulgaris*, *Lolium perenne*, *Cynodon dactylon*, *Ambrosia artemisiifolia*, *A. trifida*, *Olea europea* and *Parietaria judaica*, cat and dog dander. The reactions were read 20 min afterwards and the wheal size was compared with positive histamine controls according to the Standardization Committee of the Northern Society of Allergy.

3. Results

Ambrosia pollen was first noticed in September 1981, and an increase in its concentration in the air has been observed since 1986 (Table 1). One of the possible explanations for this could be the increased seed and animal food imports into the country in the same period.

The sedimentation method showed the highest concentration of *Ambrosia* pollen in 1989, the highest single count (11 grains in 24 h) being recorded on 25th August of that year. The length of the pollen dispersal period in different years involves no more than 6–7 days in August and 1–2 days in July and September (Table 2).

By the volumetric method, the highest concentrations of *Ambrosia* pollen were recorded in 1993, 41 grains per m³ on September 2nd, 32 on August 15th and 28 on August 20th. Pollen grains of this type were found in the air in August for a period of 14 days in 1991 and 1992 and for 24 days in 1993. In September, they were found for 7 days in 1991, 12 days in 1992 and 11 days in 1993. The lowest pollen concentration during the day occurred from 18:00 to 00:00 h and the highest from 12:00 to 18:00 h (Table 3).

Both sedimentation and volumetric methods have been performed in parallel during 1991–1993 in Sofia, and the results are compared in Table 4 using correlation coefficients and *T*-tests. In 1991 there was no relationship between both data sets. In 1992 and 1993, even if a correlation could be found, over 81% of the variation between samples remains unexplained. However, the mean daily values obtained were of the same magnitude.

The direct relationships between air pollen concentrations and meteorological conditions are being studied continuously by a number of workers (Emberlin and Norris-Hill, 1991; Cadman, 1991). Our investigation confirms the positive influence of temperature and low air humidity on pollen concentrations. The highest quantities of *Ambrosia* pollen were found during periods (25/08–5/09 1992; and 12/08–31/08 1993) when optimal conditions were present for pollen dispersal. Temperature decreases along with relative

Table 2
Sedimentation method

Year	Month					Total <i>Ambrosia</i> pollen grains	Total herb pollen grains	%	Total pollen grains	%
	VI	VII	VIII	IX	X					
1991	—	—	10	1	—	11	323	3.40	10 038	0.10
1992	—	1	25	15	1	42	1546	2.71	11 527	0.36
1993	1	—	7	—	—	12	261	1.39	14 002	0.08

Table 3

[illegible]

Table 4
Comparison of the *Ambrosia* pollen grain quantities determined by sedimentation and volumetric methods

Year	Correlation coefficient*		T-test mean**	
1991	–0.0289	n.s.	0.3157	n.s.
1992	0.4469	sig.	0.2358	n.s.
1993	0.4474	sig.	0.5196	n.s.

*Correlation significant at 5% error level when >0.2521 .

**T-test significant at 5% error level when >1.6711 .

humidity increases are the main causes for an increase in pollen grain quantities during the period 15th–20th August 1991. As there are as yet no data showing the presence of *Ambrosia* species in this region, we assume that the presence of *Ambrosia* pollen grains is due to long-distance transport. The period of *Ambrosia* pollen dispersal lasts from July to September–October, with a peak in August.

Pollen grains of *Ambrosia* recorded in some other Bulgarian cities were linked to long-distance transport from neighbouring countries (Greece, Rumania, Serbia) where *Ambrosia* species are well established. (Apostolou and Yannitsaros, 1977; Vasic, 1988; Yankova and Christova, 1994).

The analysis of the clinical data showed that 26 out of the 120 patients with pollinosis were SPT positive to ragweed pollen extracts. They were highly allergic to other pollen types (mostly from Poaceae and Asteraceae families), and most showed light skin reaction to ragweed. High SPT reaction to ragweed pollen was only recorded in six patients. Table 5 shows the numbers of patients with ragweed sensitization in 1991 and 1993, and the allergy symptomatology found among them.

4. Conclusion

From an analysis of our aeropalynological data obtained from the last 13 years of research work, we could not conclude that *Ambrosia* is gaining in area in Bulgaria. However the incidence of ragweed sensitization in our population as well as the clinical significance of ragweed pollinosis are low but they have increased 2.29 times in only the past 3 years.

Table 5
Allergy manifestation and SPT positivity to ragweed

Year	No.	SPT positive to ragweed n/%	Clinical manifestation in ragweed allergic patients		
			Rhinitis n/%	Asthma n/%	Conjunctivitis n/%
1991	52	4/7.69	2/50.0	2/50.0	0/0
1993	68	12/17.65	2/16.6	8/66.6	2/16.6
Total	120	16/13.30	4/25.0	10/62.5	2/12.5

Taking into account increased international trade and environmental disturbance as well as the high sensitizing power of this pollen taxa, we could expect an increasing health problem with ragweed pollinosis in coming years.

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