

Short communication

Airborne pollen calendar of the central region of Bursa (Turkey)

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Abstract

This report describes qualitatively and quantitatively the level of pollen in the atmosphere in the central region of Bursa, Turkey. In 1991, the season of maximum pollen concentration was from April to June, with a prevalence of arboreal pollen during the initial months, and of pollen from herbaceous plants in the latter months. During the year of research, 24 taxa of arboreal and 12 taxa of herbaceous pollen grains were collected and identified. In the region investigated *Pinus*, Cupressaceae/Taxaceae, *Abies nordmanniana*, *Platanus orientalis*, *Olea europaea*, Gramineae, Urticaceae, Chenopodiaceae/Amaranthaceae, *Artemisia* and Compositae were responsible for the greatest amounts of pollen. Some important allergenic pollens such as *Olea europaea*, Gramineae and Urticaceae were also found in high concentration. In this study, a pollen calendar for the region is presented.

Keywords: Aerobiology; Pollen; Pollen calendar; Pollen allergy

1. Introduction

Pollen grains of various families are known to cause allergic ailments in human beings. Determination of kinds and concentrations of atmospheric pollen grains will be beneficial for patients suffering from allergic diseases. For this reason, annual pollen calendars had been prepared in many countries (Aytuğ, 1973; Mandrioli et al., 1982; Bousquet et al., 1984; Nardi et al., 1986; Spijsma et al., 1989). This study was also carried out in order to determine the annual dispersal of pollen grains in the atmosphere of Bursa.

tural land: vineyards, plum, quince, peach, olive groves and land suitable for the growing of sunflower, tobacco, etc.

Analysis on the flora of Mount Uludağ shows that Euro-Siberian elements (63%) are dominant while 31% Mediterranean and 6% Iran-Turan elements can be observed. In the vegetation zones the following species are found: Lauretum (*Laurus nobilis*, *Pinus brutia*, *Olea europaea*, *Juniperus oxycedrus*, *Cercis siliquastrum*, *Erica arborea*, *Platanus orientalis*), Castanetum (*Castanea*

2. Materials and methods

Bursa, situated at 41°11' N, 29°04' E in north-west Anatolia (Fig. 1) at an altitude 100 m above sea level, is located in a plain flanked by Mount Uludağ to the south and the Samanlı Range to the north. Bursa has a Mediterranean vegetation and climate in general. The plain near the metropolitan district comprises agricul-

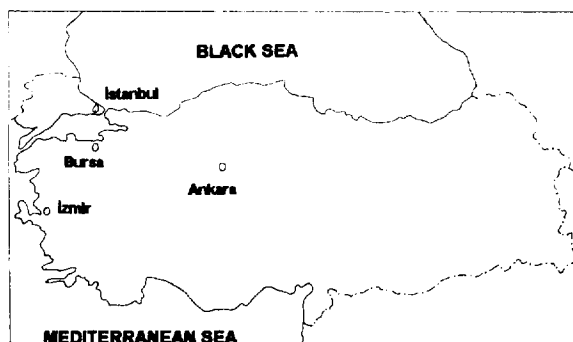


Fig. 1. Map of Turkey showing the location of Bursa.

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Table 1
Pollen taxa found in the atmosphere of Bursa over the study period

Taxa	Total pollen grains	
	Pollen grains/cm ²	%
Arboreal pollen		
<i>Pinus</i>	749	12.0
Cupressaceae/Taxaceae	561	9.0
<i>Abies nordmanniana</i>	512	8.2
<i>Platanus orientalis</i>	489	7.8
<i>Olea europaea</i>	486	7.8
<i>Quercus</i>	373	5.9
Oleaceae	255	4.1
<i>Fagus orientalis</i>	182	2.9
<i>Fraxinus excelsior</i>	109	1.7
Moraceae	106	1.7
<i>Corylus avellana</i>	90	1.4
<i>Salix</i>	65	1.0
<i>Populus</i>	65	1.0
<i>Castanea sativa</i>	51	0.8
Rosaceae	48	0.7
<i>Betula verrucosa</i>	47	0.7
<i>Juglans regia</i>	47	0.7
Ericaceae	43	0.6
<i>Acer</i>	42	0.6
<i>Carpinus betulus</i>	27	0.4
<i>Ostrya carpinifolia</i>	7	0.1
<i>Ulmus</i>	7	0.1
<i>Aesculus hippocastanum</i>	5	0.1
<i>Tilia</i>	5	0.1
TOTAL (arboreal pollen)	4373	70.1
Non-arboreal pollen		
Gramineae	916	14.7
Urticaceae	182	3.7
Chenopodiaceae/Amaranthaceae	154	2.9
<i>Artemisia</i>	130	2.1
Compositae	101	1.6
<i>Plantago</i>	87	1.3
<i>Rumex</i>	80	1.2
<i>Carex</i>	19	0.2
Umbelliferae	12	0.2
Rubiaceae	5	0.1
Juncaceae	1	0.1
Campanulaceae	1	0.1
Total (non-arboreal pollen)	1686	27.0
TOTAL (arboreal and non-arboreal pollen)	6059	97.1
Unidentified	180	2.9
Total	6239	100

sativa, *Ulmus minor*, *Juglans regia*, *Corylus avellana*, *Quercus* sp.), Fagetum (*Fagus orientalis*, *Carpinus betulus*), Pinetum (*Pinus nigra* subsp. *pallasiana*), Abietum (*Abies nordmanniana* subsp. *bornmülleriana*) and Alpinetum (*Juniperus nana*, *Vaccinium myrtillus*, *Thymus* sp., *Daphne oleoides*). On the Samanlı Mountains, the local flora features Mediterranean elements such as *Pinus nigra* subsp. *pallasiana*, *Juniperus oxycedrus*, *Quercus* sp., *Olea europaea*, *Laurus nobilis*.

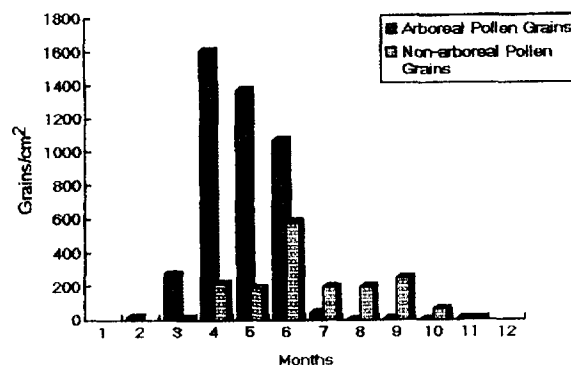


Fig. 2. Total monthly variation in atmospheric pollen in 1991.

In addition to the natural vegetation around Bursa, the following species are frequently seen in the parks, gardens and streets of the town: *Acer campestre*, *A. negundo*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Albizia julibrissin*, *Betula verrucosa*, *Buxus sempervirens*, *Catalpa bignonioides*, *Celtis australis*, *Cedrus libani*, *Cretaeus monogyna*, *Cupressus sempervirens*, *Forsythia intermedia*, *Fraxinus excelsior*, *Ginkgo biloba*, *Ligustrum vulgare*, *Magnolia grandiflora*, *Morus nigra*, *Nerium oleander*, *Ostrya carpinifolia*, *Populus alba*, *P. nigra*, *P. tremula*, *Robinia pseudoacacia*, *Salix babylonica*, *S. alba*, *Syringa vulgaris*, *Taxus baccata*, *Tilia tomentosa*, *Ulmus glabra*.

Field studies lasting 1 year (1991) were carried out in the central region of Bursa. The Durham sampler (based on gravitational sampling) was placed on the roof of Almira Hotel which is located almost at the center of the city, the roof being at a height of 25 m above ground-level. Before exposure, the slides were smeared with glycerine jelly stained with safranin (Charpin and Surinyach, 1974). Slides were changed weekly. The identification and counting of pollen grains was accomplished at least up to family or genus levels and those grains which could not be identified were considered as unidentified types.

3. Results and discussion

During the year of observation, 24 kinds of arboreal and 12 kinds of non-arboreal pollen grains were identified (Table 1). The seasonal variation in arboreal and non-arboreal pollen concentration is shown in Fig. 2.

3.1. Arboreal pollen grains

The occurrence of airborne tree pollen detected was 70.1% (Table 1). The incidence of tree pollen grains was found to be much higher than that of other plants. The trees were mainly *Pinus*, Cupressaceae/Taxaceae, *Abies nordmanniana*, *Platanus orientalis* and *Olea europaea*.

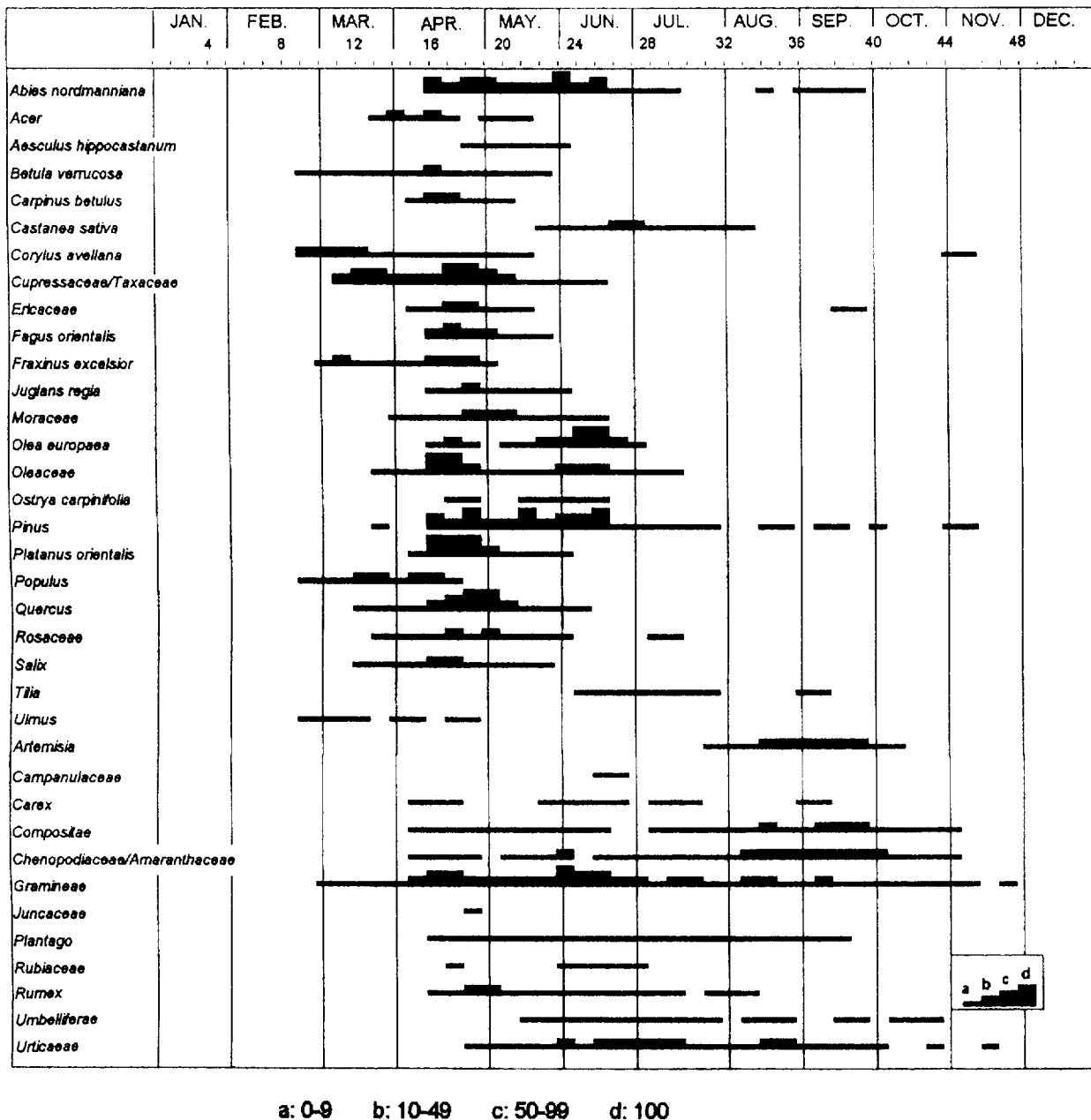


Fig. 3. Annual pollen calendar for central region of Bursa.

3.2. Non-arboreal pollen grains

Grass pollen: The grass pollen grains could not be distinguished morphologically at generic or specific levels. Grass pollen grains appeared throughout the year with a maximum flowering period from April to the end of June. The percentage occurrence of airborne grass pollen was 14.7 (Table 1).

Weed pollen: The main pollen producers were Urticaceae, *Artemisia*, Compositae, Chenopodiaceae/Amaranthaceae and *Plantago*. Like grass pollen grains, a long production period, from spring to winter, was registered.

The percentage of weed pollen was 12.3 (Table 1).

The types of pollen present in the Bursa atmosphere are shown in the form of a pollen calendar in Fig. 3 based on the counts for 1991. The following are the taxa which produced the greatest amount of pollen in the atmosphere of Bursa:

***Pinus*:** The pollen season started in the last week of March and ended in the first week of November. The highest peak was in the last week of April. Its maximum concentration was among the trees.

Cupressaceae/Taxaceae: The pollen season started in the second week of March and lasted until the third week

of June. The highest peaks were recorded in the last week of April.

***Abies nordmanniana*:** Pollen production lasted from the third week of April to the third week of September. The highest counts were recorded in the first week of June.

***Platanus orientalis*:** The pollen season was relatively short. It started in the second week of April and ended in the first week of June. The highest counts were recorded in the last week of April.

***Olea europaea*:** The pollen season started in April and continued to June with maximum counts in the second week of June. This is considered to be an important allergenic pollen in the region.

Gramineae: The pollen season started in the first week of March and ended the third week of November. The highest counts were recorded in the first week of June.

Urticaceae: Pollen production was registered from the first week of May to the second week of November.

Chenopodiaceae/Amaranthaceae: Pollen grains were recorded year-round, from April to November. The highest counts were recorded in the second week of September.

***Artemisia*:** Pollen production lasted from July to October.

Compositae: Pollen grains were recorded almost year-round with maximum values in September.

In this study, a pollen calendar is presented for the Bursa region of Turkey and its aim is to relieve the suffering of pollinotics.

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