



Airborne pollen calendar of Bartın, Turkey

Zafer Kaya¹ & Aliye Aras²

¹Zonguldak Karaelmas University, Faculty of Forestry, 74100-Bartın, Turkey (e-mail: zkaya23@hotmail.com; fax: 90 378 227 74 21); ²Istanbul University, Faculty of Science, Botany Department 34460-Süleymaniye-Istanbul, Turkey (e-mail: Dr_alieyearas@hotmail.com; fax: 90 212 522 65 62)

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Abstract

Our study comprises airborne pollen analysis of the years 1995–1997 of Bartın (40°38' N–32°21' E). The aims of the study were: to determine the pollen types present in the atmosphere, to calculate their actual concentrations, and to establish the pollen calendar for Bartın. For this purpose, pollen slides of Durham apparatus, which was located in four different locations in Bartın, were examined on a weekly basis. In this study, 19062 pollen grains were counted and 18484 of those were determined on the slides in the air of Bartın during three years of period. Results show that 13758 of 18484 pollen grains belong to arboreal, 4726 belong to non-arboreal taxa. 3698 of determined non-arboreal taxa belong to *Gramineae*.

1. Introduction

It is a well known that some plant taxa have allergic effects on humans. One of the causes of the problems of the inhaling system like allergy and allergic asthma is pollen. Pollen grains are disseminated into the air during flowering periods. Of these pollen grains, the allergenic ones cause “Hay Fever” and allergic asthma in people sensitive to them. It is therefore, of utmost importance in health sciences to know the beginning, the peak, and end of pollen dispersion. Several investigations on the subject have been carried out in various countries (Anderson, 1982; Bousquet et al., 1984; Nilsson et al., 1982; D'amato et al., 1990).

The aim of the paper is to provide pollen calendar for Bartın based on three years of sampling, to determine the pollen types present in the atmosphere, to calculate their actual concentrations, to document trends and fluctuations in annual pollen counts and to list the starting and end dates for the key airborne pollen in the Bartın.

Airborne pollen studies were initiated by Aytuğ et al. (1974) in Turkey and a pollen calendar for 1966–1968 was prepared. The study gave rise to

the preparation of an allergenic pollen calendar too, Aytuğ (1973). Özkaragöz ve Karamanoğlu in Ankara (1967, 1968), Yurdukoru in Samsun (1979), Kaya in Nişantaşı district of Istanbul (1990), İnceoğlu et al. in Ankara (1994), İnce in Kırıkkale (1994), Bıçakçı et al. in Bursa (1996) and Bıçakçı in Kütahya (1999), Güvensen and Öztürk in Buca-Izmir (2002) prepared pollen calendars.

2. Material and method

The studies were undertaken from 1995 to 1997 in Bartın city. Durham apparatus was used during gravimetric studies on the atmospheric pollen trapping. The apparatus was located in northern, western, eastern and southern parts of Bartın city and located at 1.75 m height above ground level. The slides with safranin stained glycerine gel were examined on a weekly basis for three years (Charpin et al., 1974). Most pollen grains were determined at family generic and some at specific level under the microscope. Slides were covered by two cover slips of 32 × 24 mm size and hence pollen grains were determined on a 1536 mm square area.

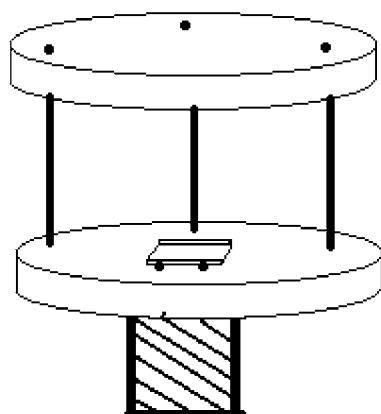


Figure 1. Durham apparatus.

The identification of pollen taxa was done with the help of reference slides which were prepared from the plants of Bartın at different periods of the year, prepared according to the Wodehouse method (1965). The Reference slides were deposited at the Botany department of Karaelmas University. Identification was also followed using the books on palynology (Erdtman, 1966, 1969; Louveaux, 1970; Nilsson et al., 1977; Moore et al., 1991). Meteorological data was obtained from the National Meteorological Directorate-Ankara.

3. Results and discussion

All data of the three year period are shown in Figure 2 and in Tables 1, 2, 3, 4 and 5. 19062 pollen were counted on the slides in the air of Bartın during the three year period. 18484 of those were determined, 578 were undetermined (Table 1). 13758 of 18484 pollen grains belong to arboreal, 4726 belong to non-arboreal taxa. In percentage form, 72.18% is arboreal and 24.79% is non-arboreal (Table 2). 3698 of determined non-arboreal taxa belong to *Gramineae* family (19.40%), the remaining 1028 belong to the other non-arboreal taxa is percentage form 78.25% in *Gramineae* 21.75% is the rest of the non-arboreal taxa (Table 3). 578 (3.03%) pollen were undetermined. The high number of arboreal pollen resulted from the fact that trees produce more pollen than non-arboreal plants and the presence of diverse trees in the area. The most dominating arboreal taxa were: *Populus*, *Pinaceae*, *Platanus*, *Corylus*, *Salix*, *Quercus*, *Castanea*, *Fagus* and *Robinia*. They make up 64.48% of the total pollen (Table 4). *Gramineae*, *Compositae*,

Table 1. Pollen number and percentage in Bartın air.

ARBOREAL PLANTS	1995		1996		1997	
		%		%		%
<i>Alnus</i>	36	0.53	32	0.53	44	0.70
<i>Cistaceae</i>	8	0.12	2	0.03	6	0.09
<i>Corylus</i>	286	4.23	242	4.02	314	4.99
<i>Castanea sativa</i>	152	4.25	116	1.92	174	2.77
<i>Cupressaceae</i>	58	0.86	52	0.86	68	1.08
<i>Ericaceae</i>	60	0.89	78	1.29	62	0.99
<i>Fagus orientalis</i>	122	1.80	116	1.92	108	1.72
<i>Fraxinus</i>	98	1.45	110	1.83	122	1.94
<i>Pinaceae</i>	1176	17.42	960	15.93	1014	16.14
<i>Platanus</i>	746	11.05	782	12.99	678	10.79
<i>Populus</i>	1440	21.33	1212	20.11	1248	19.86
<i>Quercus</i>	178	2.64	114	1.89	212	3.37
<i>Robinia</i>	108	1.60	122	2.02	114	1.81
<i>Rosaceae</i>	56	0.83	80	1.33	76	1.21
<i>Salix</i>	194	2.87	188	3.12	176	2.80
<i>Sambucus</i>	16	0.24	14	0.23	22	0.35
<i>Tilia</i>	58	0.86	60	1.00	64	1.02
<i>Ulmus</i>	48	0.71	62	1.03	74	1.18
TOTAL	4840	71.68	4342	72.05	4576	72.81

NON-ARBOREAL PLANTS	1995		1996		1997	
		%		%		%
<i>Boraginaceae</i>	2	0.03	6	0.10	4	0.06
<i>Campanulaceae</i>	4	0.06	10	0.17	8	0.13
<i>Caryophyllaceae</i>	16	0.24	12	0.20	10	0.16
<i>Compositae</i>	58	0.86	66	1.10	70	1.11
<i>Cruciferae</i>	8	0.12	10	0.16	12	0.19
<i>Geraniaceae</i>	22	0.32	40	0.66	36	0.57
<i>Gramineae</i>	1410	20.88	1076	17.86	1212	19.29
<i>Labiatae</i>	20	0.30	26	0.43	18	0.29
<i>Leguminosae</i>	10	0.15	14	0.23	12	0.19
<i>Plantago</i>	52	0.77	66	1.10	40	0.64
<i>Ranunculaceae</i>	46	0.68	32	0.53	26	0.41
<i>Umbelliferae</i>	28	0.41	38	0.63	40	0.64
<i>Urticaceae</i>	58	0.86	68	1.13	40	0.64
TOTAL	1734	25.68	1464	24.30	1528	24.32
Undetermined	178	2.64	220	3.65	180	2.87
OVERALL TOTAL	6752	100.00	6026	100.00	6284	100.00

Table 2. Pollen number and percentage in Bartın air.

TAXON	Number	1995	1996	1997	Total	%
Arboreal plants	18	4840	4342	4576	13758	72.18
Non-arboreal plants	13	1734	1464	1528	4726	24.79
Undetermined	–	178	220	180	578	3.03
TOTAL	31	6752	6026	6284	19062	100.00

Table 3. Non-arboreal plants pollen numbers and percentage in Bartın air.

TAXON	Number	1995	1996	1997	Total	%
Gramineae	–	1410	1076	1212	3698	78.25
Other Non-arboreal	13	324	388	316	1028	21.75
TOTAL	–	1734	1464	1528	4726	100.00

Table 4. The most dominant arboreal pollen number and percentage in Bartın air.

TAXON	1995	1996	1997	Total	%
<i>Populus</i>	1440	1212	1248	3900	31.73
<i>Pinaceae</i>	1176	960	1014	3150	25.63
<i>Platanus</i>	746	782	678	2206	17.95
<i>Corylus</i>	286	242	314	842	6.85
<i>Salix</i>	194	188	176	558	4.54
<i>Quercus</i>	178	114	212	504	4.10
<i>Castanea</i>	152	116	174	442	3.59
<i>Fagus</i>	122	116	108	346	2.81
<i>Robinia</i>	108	122	114	344	2.80
TOTAL	4402	3852	4038	12292	100.00

Table 5. The most dominant non-arboreal pollen number and percentage in Bartın air.

TAXON	1995	1996	1997	Total	%
Gramineae	1410	1076	1212	3698	80.60
Compositae	58	66	70	194	4.23
Urticaceae	58	68	40	166	3.62
Plantago	52	66	40	158	3.44
Umbelliferae	28	38	40	106	2.31
Ranunculaceae	46	32	26	104	2.27
Geraniaceae	22	40	36	98	2.14
Labiatae	20	26	18	64	1.39
TOTAL	1694	1412	1482	4588	100.00

and asthma are indicated by the symbol x in Figure 2. We hope the pollen calendar prepared as a result of data gathered will be of use to those interested in the subject.

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References

- Anderson J.H.: 1982, A survey of allergenic airborne pollen and spores in the Fairbanks area, Alaska. *Annals of Allergy* **52**, 26–31.
- Aytuğ B.: 1973, İstanbul Yöresinin Polinizasyon Takvimi. *İ.Ü.Or.Fak.Derg.* **23**(1), 1–33.
- Aytuğ B., Aykut S., Merev N. and Edis G.: 1974, Belgrad Ormanının ve İstanbul Çevresi Bitkilerinin Polinizasyon Olayının Tesbiti ve Değerlendirilmesi. T.B.T.A.K. Proje No. 11, Yay. No. 221, 710 say.
- Bıçakçı A., İncoğlu Ö., Sapan N. and Malyer H.: 1996, Airborne pollen calendar of the central region of Bursa (Turkey). *Aerobiologia* **12**, 43–46.
- Bıçakçı A.: 1999, Airborne pollen concentration in Kütahya. *Turkish Journal of Botany* **23**, 75–81.
- Bousquet J., Cour P., Guerin B. and Michel F.B.: 1984, Allergy in the Mediterranean area 1. Counts and pollinosis of Montpellier. *Clinical Allergy* **14**, 249–258.
- Charpin J. and Surinych R.: 1974, *Atlas of European Allergenic Pollen*. Sandoz Editions, Paris.
- Davis P.H.: 1985, *Flora of Turkey and the East Aegean Islands*. Vol. I–IX, Edinburgh (1965–1985).
- D'amato G. and Spieksma F.Th.M.: 1990, Allergenic pollen in Europe. *Grana* **30**, 67–70.
- İnce A.: 1994, Kırıkkale Atmosferindeki Alerjik Polenlerin İncelenmesi. *Türk. Journal of Botany* **18**, 43–56.
- Erdtman G.: 1966, *Pollen Morphology and Plant Taxonomy Angiosperms*. Hafner Publishing Company, New York and London.
- Erdtman G.: 1969, *Hand Book of Palynology*. Hafner Publishing Company, New York.
- Güvensen A. and Öztürk M.: 2002, Airborne pollen calendar of Buca-İzmir, Turkey. *Aerobiologia* **18**, 229–237.
- İnceoğlu Ö., Pınar N.M., Şakıyan N. and Sorkun K.: 1994, Airborne pollen concentration in Ankara, Turkey, 1990–1993. *Grana* **33**, 158–161.
- Kaya Z.: 1990, İst. Nişantaşı Bölgesinin Havasında Tesbit Edilen Allerjen Graminae Polenleri ve Polen Morfolojileri. M. Ü. Eczacılık Fak. Derg. Cilt: 6 Sayı: 1, 1–15.
- Louveau J.: 1970, *Atlas Photographique D'Analyse Pollinique des Miels*. Paris-France.
- Moore P.D., Webb J.A. and Collinson M.E.: 1991, *Pollen Analysis*. Blackwell Scientific Publications, London.
- Nilsson S., Pragłowski J. and Nilsson L.: 1977, *Atlas of Airborne Pollen Grains and Spores in Northern Europe*. Stockholm-Sweden.

Nilsson S. and Palmberg-Gothard J.: 1982, Pollen calendar for Huddinge (Sweden), 1973–1980. *Grana* **21**, 183–185.

Özkaragöz K. and Karamanoğlu K.: 1967, Allergenic pollen and mold spore survey in the Ankara area. *Acta Allergol.* **22**, 399–407.

Özkaragöz K. and Karamanoğlu K.: 1968, A Preliminary study on allergenic pollen producing plants of the Ankara area and their pollination calendar. *Rev. Paleobotany Palynol* **7**, 61–67.

Yurdukoru S.: 1979, Samsun ili havzasındaki Allerjenik Polenler. *Ank. Tıp Bülteni* **1**, 37–44.

Wodehouse R.P.: 1965, *Pollen Grain*. Hamer Press, New York.

