Grana

ISSN: 0017-3134 (Print) 1651-2049 (Online) Journal homepage: https://www.tandfonline.com/loi/sgra20

Airborne pollen concentration in Ankara, Turkey 1990–1993

Ö. İnceoğlu , N. M. Pinar , N. Şakiyan & K. Sorkun

To cite this article: Ö. İnceoğlu , N. M. Pinar , N. Şakiyan & K. Sorkun (1994) Airborne pollen concentration in Ankara, Turkey 1990–1993, Grana, 33:3, 158-161, DOI: 10.1080/00173139409428993

To link to this article: https://doi.org/10.1080/00173139409428993

Grana 33: 158–161, 1994

Airborne pollen concentration in Ankara, Turkey 1990–1993

Ö. İNCEOĞLU, N.M. PINAR, N. ŞAKIYAN and K. SORKUN

İnceoğlu, Ö., Pınar, N.M., Şakıyan, N. and Sorkun, K. 1994. Airborne pollen concentration in Ankara, Turkey 1990–1993. – Grana 33: 158–161. ISSN 0017-3134.

Atmospheric pollen was collected with a Burkard spore trap in Ankara, Turkey, from January 1990 to January 1993. A total of 135.787 grains/m³ belonging to 47 taxa were observed. The local pollen season started in February in 1990 and 1991 and in March in 1992. Relatively low pollen concentrations were recorded in 1990 and 1992, probably because of precipitation and low wind speed in the spring. A relatively high pollen concentration was recorded in 1991 which could be caused by higher wind speed in the spring and more precipitation during the winter. Cupressaceae/Taxaceae, Pinaceae, Gramineae, *Betula*, Moraceae, *Platanus*, *Populus*, *Acer*, *Quercus*, Chenopodiaceae/Amaranthaceae, *Plantago*, *Rumex* are found to be the dominant pollen types in the atmosphere in Ankara. The pollen composition generally reflects the vegetation of gardens, parks and roadsides, while the natural steppe vegetation of the area around Ankara is not properly represented.

Ö. İnceoğlu, N.M. Pınar and N. Şakıyan, Department of Biology, Faculty of Science, University of Ankara, 06100, Tandoğan, Ankara; K. Sorkun, Department of Biology, Faculty of Science, University of Hacettepe, Ankara, Turkey.

(Manuscript accepted 26 October 1993)

Studies on the presence of pollen and spores in the atmosphere of Turkey were started by Özkaragöz and Karamanoğlu in 1967, in the Ankara area, using Durham samplers. The results of three years (1963–66) were presented in their first paper. Since 1967 no pollen and spore counts of the Ankara atmosphere have been made. Aytuğ (1973) carried out an aeropalynological study in the forest of Belgrade, in the Istanbul area, using the Hirst-Burkard trap, for a period of two years from 1966 to 1968. In this study the effect of meteorological factors on pollen concentration was investigated and a pollen calender was presented. Other aeropalynological studies have been carried out by Yurdukoru (1979), in the Samsun area in the North of Turkey, and by Ince (1988) in the Serik area in the South of Turkey, both using Durham samplers. The aim of this paper is to present the results of three years (1990–1993) of continuous volumetric sampling of airborne pollen in the Ankara atmosphere, their percentage values, pollen season periods and pollen concentrations in relation to some climatic factors.

MATERIAL AND METHODS

Ankara is situated at 39.55 N, 32.5 E in North-east central Anatolia (Fig. 1) at an altitude of 820 m above sea level.

Ankara is built in a region where steppe vegetation is dominant, and 70 km from natural *Pinus* forest. The major physionomy of the landscape in the province is formed by steppe vegetation, which is influenced by arid and semiarid aspects of the Mediterranean climate. Particularly in the vicinities of Ankara province, *Thymus leucostomus, Artemisia santonicum* and some spiny *Astragalus* species form the dominant aspect of the steppe. On marly-soils the floristic community is composed of species such as *Salvia tchihatcheffii, Hedysarum varium, Glycyrrhiza glabra, Genista sessilifolia, on the gyps soil Gypsophyla eriocalyx, Centaurea patula, Astragalus karamasicus* and on silicious soils *Hypericum heterophyllum, Minuartia circassica, Inula montbretiana.* The lowland steppe of Central Anatolia usually contains species such as *Euphorbia macroclada, Linum hirsutum, Phlomis armeniaca, Noaea mucronata, Globularia trichosantha, Onobrychis armena, Helianthemum nummularium, Centaurea triumfettii, Acantholimon* spp., *Bromus tomentellus, Koeleria cristata, Stipa* spp. and *Festuca* spp.

Many of the steppe species are seen in the abandoned areas, parks, gardens, and roadsides in the town. In these areas, many cosmopolitian weeds have a wide distribution i.e., *Chenopodium, Atriplex, Rumex, Amaranthus, Sisymbrium, Erysimum, Alyssum, Raphanus, Trifolium, Urtica, Parietaria* and *Plantago*. In some wet habitats around the town, members of the Cyperaceae and Juncaceae can also be observed. In addition to the natural vegetation around Ankara, the following species are frequently seen in the parks, gardens and streets of the town: *Aesculus hippocastanum, Platanus orientalis, Ailanthus glandulosa, Fraxinus excelsior, Populus alba, Robinia pseudoacacia, Acer platanoides, Salix babylonica, Sophora japonica, Morus alba, Juglans regia, Pinus nigra, Ligustrum vulgare, Picea pungens, Forsythia intermedia, Quercus pedunculata, Tilia* spp., *Thuja orientalis, Rhus* spp.

Pollen was collected by means of a Burkard seven-day recording volumetric trap. The trap was placed 15 m above the ground on the

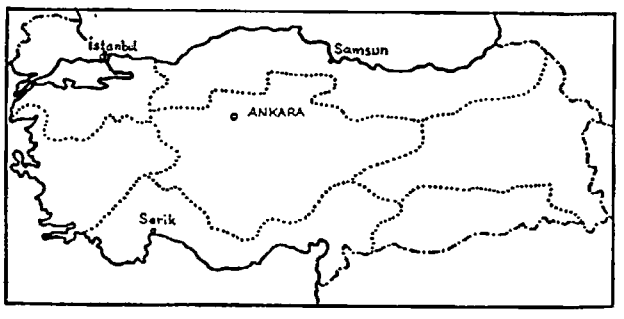

Fig. 1. Map of Turkey showing the location of Ankara.

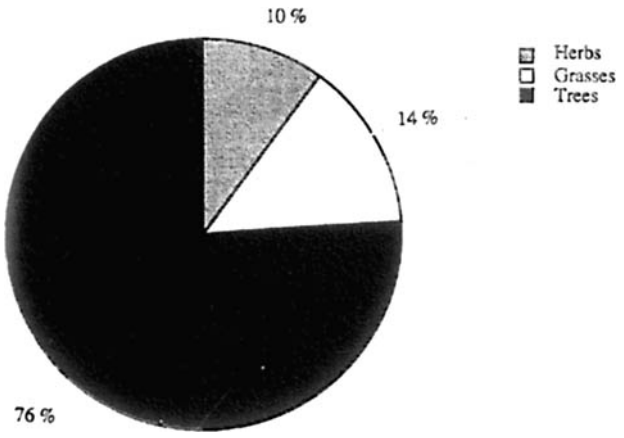

Fig. 2. Percentages of airborne tree, herb and grass pollen the city of in Ankara for the period 1990–1993.

roof of the Department of Geology, University of Ankara. The pollen was sucked at an air flow rate of 10 litres per minute onto tapes which were coated with a thin film of vaseline-paraffin wax in toluen. The tape was then mounted in glycerin jelly (Hirst 1953). The pollen was counted at a magnification of X400, in twelve transverse bands. Counts were made at two hour intervals, and total daily counts were converted to numbers per cubic meter of air (Ogden et al. 1974). The meteorological data were derived from the records of the Meteorological Station in Ankara.

RESULT AND DISCUSSION

During the three years of observation, 47 taxa were determined in the Ankara atmosphere (Table 1). Many pollen types in Ankara do not reflect the typical steppe vegetation. The vegetation in the city is typically urban because of the introduction of ornamental plants and park trees. Tree pollen was dominant in the Ankara atmosphere forming 76%, of the total amount of pollen collected over the period 1990–93 with grasses 14%, and herbs 10% (Fig. 2).

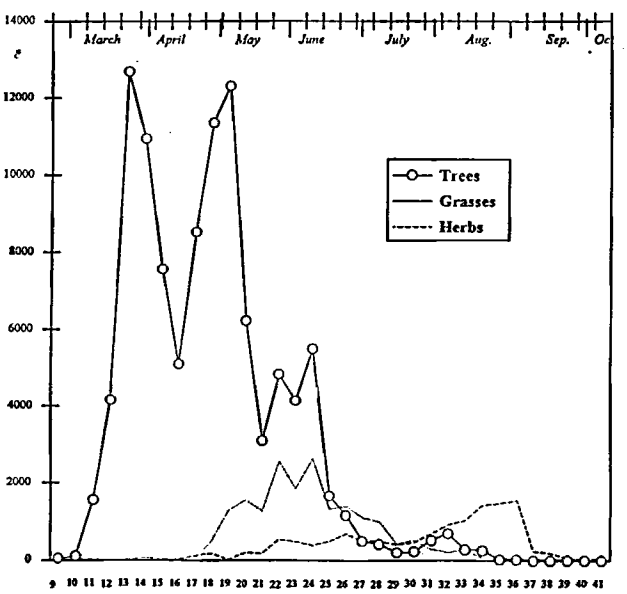

Fig. 3. Total weekly variation in atmospheric pollen from 1990 to 1993.

The seasonal variation in tree, herb and grass pollen for these three years is shown in Fig. 3. Tree pollen concentrations were higher than those of herbs and grasses. Five peaks in concentration were recognised. The first and highest occurred in weeks 9–15 (March–April) and is caused by *Acer, Betula*, Cupressaceae/Taxaceae, *Populus, Fraxinus*, Oleaceae, *Platanus* and *Ulmus* pollen. While the pollination of these plants was decreasing they were joined by *Pinus*, Moraceae, *Quercus* and Rosaceae. So the second peak occurred in weeks 16–20 (April–May). At the same time that pollination of Moraceae and *Quercus* began to decrease that of *Pinus* increased, so that the third peak occurred in the 22nd week. The addition of pollen of *Ailanthus* to these caused the fourth peak in the 24th week. The fifth peak occurred in the 32nd week with a maximum value in the pollen of *Robinia*.

Grass pollen appeared throughout the year with a maximum flowering period from the end of March to the end of September and an overall maximum value at the begining of June.

The herb pollen season was recorded from the first week of April until the end of September. The highest herb pollen peak was recorded in the begining of September when *Artemisia* and Chenopodiaceae/Amaranthaceae pollen were very abundant in the atmosphere. At this period grass pollen values were very low (Fig. 3).

The types of pollen present in the Ankara atmosphere are shown in the form of pollen calender based on the counts for 1990–93 in Fig. 4. The results of qualitative and quantative analyse of the Ankara atmospheric pollen show a correlation with some meteorological parameters, such as temperature, wind speed and rainfall.

In 1990–91 the pollen season began in February, while in 1992 it began in March and continued until October. Only a few pollen types continued to remain in the air after the flowering season was over. Pinaceae, Gramineae, Chenopodiaceae/Amaranthaceae and *Artemisia* pollen were observed in November, December and January in very small amounts (Fig. 4). Janzon (1981) found 24 taxa in the atmosphere of Stockholm during the winter of which the taxa *Pinus* and Gramineae were the most abundant.

The lower pollen concentration in 1990 can be attributed to high rainfall (110 mm in April) in the spring (Fig. 5). Mc Donalds (1980) showed that high and continuous rainfall depressed pollen dispersal. In addition, the lower wind speed (2.1 m/sec) slowed down pollen dispersal in the atmosphere.

The most striking feature of the results is the much higher count in 1991 than in 1990 and 1992 (Table 1). The higher numbers of pollen in the air samples collected in 1991 is attributed to greater wind speed in the spring. The mean wind speed in the spring of 1991 was 4.8 m/sec while it was 2 m/sec in the spring of 1990 (Fig. 5). This clearly shows that the pollen concentration in 1991 was effected by the wind speed. Kapyla (1984) showed the same tendancy in the

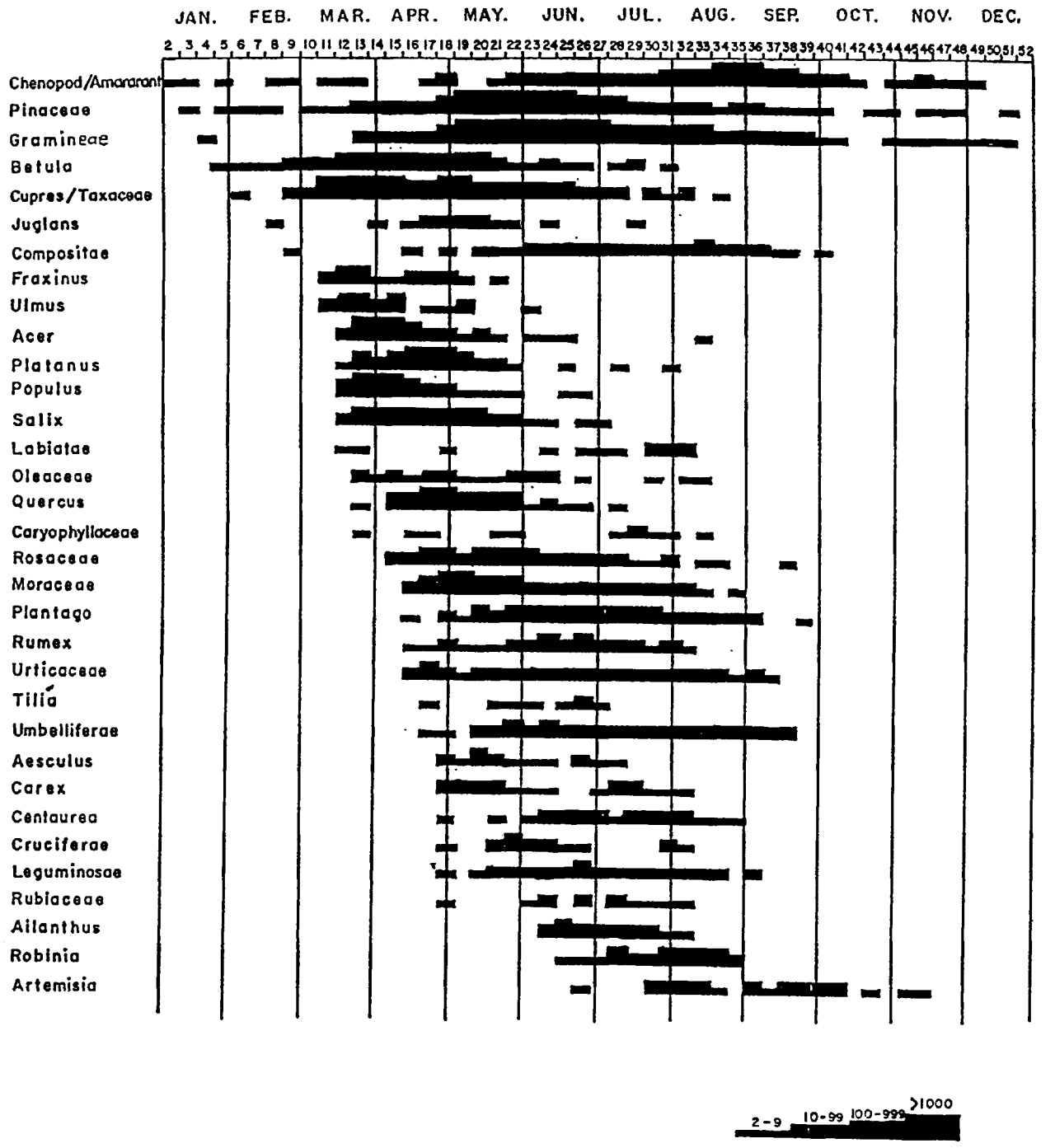

Fig. 4. Pollen calender for Ankara from 1 January 1990 to 1 January 1993.

diurnal variation of *Pinus* and *Picea* pollen, which seem to have a thresold wind speed of about 4 m/sec above which concentrations became higher. An other reason for the greater amount of pollen in 1991 is higher precipitation during December 1990 (44.2 mm) and January 1991 (25.3 mm) than in the other years (Fig. 5). Storage of water in the soil during the winter, caused plant growth and increased flowering intensity in the spring.

In 1992 the pollen season began a month later than in the other years. The low February temperature (−3.8°C) caused a month's delay compared to the other years (Fig. 5). The earliest pollen grains appeared in the first week of March and reached a maximum value in April. Lower pollen concentration in this year is attributed to low temperature, low precipitation and low wind speed in the spring.

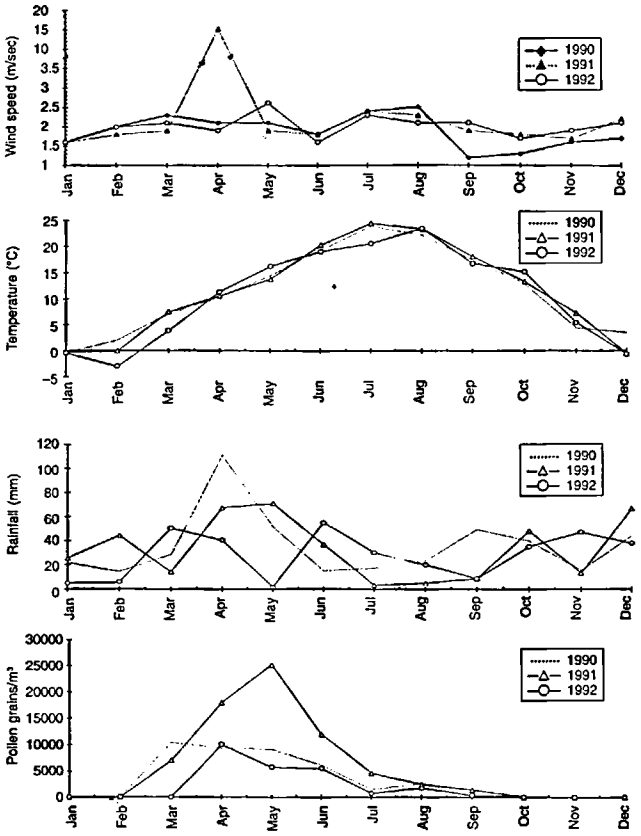

Fig. 5. Monthly variations in atmospheric pollen and weather conditions over the period Jan. 1990–Jan. 1993.

Table I. *Annual totals of daily pollen counts, Ankara 1990–93.*

	1990	1991	1992	1990–1992
Acer	2714	2504	324	5542
Aesculus	105	94	64	263
Ailanthus	39	172	194	405
Betula	742	2641	446	3829
Carpinus	7	19	–	26
Corylus	–	11	3	14
Crocus	–	2	–	2
Cupress/Taxaceae	3789	9419	4416	17624
Ericaceae	–	9	4	13
Fagus	3	–	–	3
Fraxinus	128	586	131	845
Juglans	53	128	19	200
Moraceae	1078	6423	1074	8575
Oleaceae	69	51	57	177
Pinaceae	6890	15036	4891	26817
Platanus	4059	3450	2659	10168
Populus	7809	6389	2202	16400
Quercus	1240	3331	1612	6183
Robinia	293	996	525	1814
Rosaceae	208	690	238	1136
Salix	1059	1882	341	3282
Sambucus	–	44	–	44
Tilia	12	18	2	32
Ulmus	175	267	278	720
TOTAL (AP)	30472	54162	19480	104114
Artemisia	48	272	58	378
Boraginaceae	5	2	–	7
Campanula	–	–	5	5
Caryophyllaceae	20	27	4	51
Carex	48	44	38	130
Centaurea	52	108	84	244
Compositae	73	350	243	666
Chenopodiaceae	2832	2309	1274	6415
Cistaceae	8	–	–	8
Cruciferae	155	123	114	392
Geraniaceae	4	–	–	4
Gramineae	5298	11238	2070	18606
Labiatae	20	51	2	73
Leguminosae	137	210	207	554
Liliaceae	–	–	3	3
Papaveraceae	2	–	–	2
Plantago	361	865	408	1634
Ranunculus	2	–	–	2
Rubiaceae	23	39	24	86
Rumex	254	316	154	724
Saxifragaceae	–	20	–	20
Umbelliferae	418	383	163	964
Urtica	153	455	142	750
TOTAL (NAP)	9913	16812	4993	31718
TOTAL (AP+NAP)	40385	70974	24473	135832

ACKNOWLEDGEMENTS

This work was supported financially by the Research Foundation of Ankara University. We express our gratitude to Ankara University for giving us this opportunity and we are indebted to the Meteorological Station of Ankara for the meteorological data.

REFERENCES

Aytug, B. 1973. İstanbul yöresinin polinizasyon takvimi. – Istanbul Univ. Orman Fak. Derg., Seri A, 23 (1): 1–33.

Hirst, J. M. 1953. Changes in atmospheric spore content; Diurnal periodicity and the effects of wheather. – Trans. Br. Mycol. Soc. 36: 375–393.

İnce, A. 1988. Antalya ili Serik ilçesi atmosferik polenlerinin araştırılması. – Ph.D. thesis. Gazi Univ., Ankara.

Janzon, L. A. 1981. Airborne pollen grains under winter conditions. – Grana 20: 183–185.

Käpylä, M. 1984. Diurnal variation of tree pollen in the air in Finland. – Grana 23: 167–176.

Mc Donald, M. S. 1980. Correlation of air borne grass pollen levels with meteorological data. – Grana 19: 53–56.

Ogden, E. C., Raynor, S. G., Hayes, J. V., Lewis, D. M. & Haines, J. H. 1974. Manual for sampling airborne pollen. – Hafner Press, New York.

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

Yurdukoru, S. 1979. Samsun ili havasındaki allerjenik polenler. – Ankara Tıp Bült. 1: 37–44.