

Short communication

Aeropalynological monitoring in Bishkek, Kyrgyzstan

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Abstract

The pollen spectrum of Bishkek was investigated by a gravity method, during March–October in 1984, 1988 and 1992. The recovered pollen types belong to 20 families and 26 taxa. Only 4 types reach significant levels of deposition of over 10% as annual average. These include: *Artemisia*, Chenopodiaceae/Amaranthaceae, *Quercus* and Poaceae. Pollinosis in Bishkek is mainly induced by *Artemisia* and Poaceae pollen. Hay fever patients showed polyvalent allergy to *Artemisia* and Poaceae pollen (32 to 51%), *Artemisia* and *Atriplex* pollen (34.5%).

1. Introduction

The knowledge of the atmospheric pollen presence found in different regions is of great interest for clinicians and allergic patients. In fact, the seasons of different pollen types vary from country to country depending on the climate and vegetation (d'Amato, Lobefalo, 1989).

Our investigations include a systematic aeropalynological study in the city of Bishkek with the purpose of establishing the taxonomic spectrum and the quantitative fluctuations in deposition of airborne pollen.

2. Materials and methods

2.1 Geographical location

Kyrgyzstan lies in the North-east of Central Asia. The city of Bishkek, capital of Kyrgyzstan, is situated in a valley which is about 700–900 m above sea level. Bishkek is an industrial city with a population of 600 000 inhabitants (Figure 1).

2.2 Pollen count

Pollen grains were collected by Durham gravity-slide samplers located on the roofs at 5 sites in Bishkek. These locations were approximately 10 and 25 m above the ground. In each of the 3 years, the sampling started before the pollination season, based on observations of botanical activity and the weather, starting from March. The sampling was continued up to October well beyond the main pollen season. The beginning, duration and end of pollen count were determined.

The exposed slides were prepared with glycerine jelly containing a basic fuchsine stain. These were exposed with an interval of 24 hours. The area under the cover glass was 4.84 cm².

3. Results

Plant taxa represented in the pollen spectrum in Bishkek are listed in Table 1 in decreasing abundance. Most pollen types cannot be identified to the species level with the light microscope, but only to genus or higher taxa. The pollen types belong to 20 families and 26 taxa.

Table 1. Pollen deposition and abundance percentage for each taxa in Bishkek (per cm²)
Sampling period March–October.

Pollen types	n	%	n	%	n	%
	1984		1988		1992	
Artemisia spp.	788	24.6	780	19.2	1026	20.4
Chenopodiaceae gen. spp.	655	20.4	700	17.2	895	17.8
Quercus robur L.	563	17.6	804	20.0	657	13.1
Poaceae gen. spp.	326	10.2	380	9.4	368	7.3
Ulmus spp.	223	7.0	216	5.3	230	4.6
Betula spp.	193	6.0	207	5.1	252	5.0
Gleditsia triacanthos L.	102	3.2	90	2.2	99	2.0
Populus spp.	80	2.5	195	4.7	189	3.8
Cannabaceae gen. spp.	75	2.3	180	4.5	271	5.4
Acer spp.	61	2.0	75	1.9	68	1.3
Cupressaceae gen. spp.	48	1.5	80	2.0	216	4.3
Fraxinus spp.	43	1.3	–	–	95	1.9
Morus spp.	33	1.0	154	3.8	80	1.5
Juglans regia L.	30	0.9	60	1.5	58	1.1
Salix spp.	16	0.5	104	2.6	146	2.9
Cyperaceae spp.	–	–	–	–	361	5.2
Plantago spp.	–	–	34	0.8	120	2.4
Total:	3270	100	4059	100	5031	100

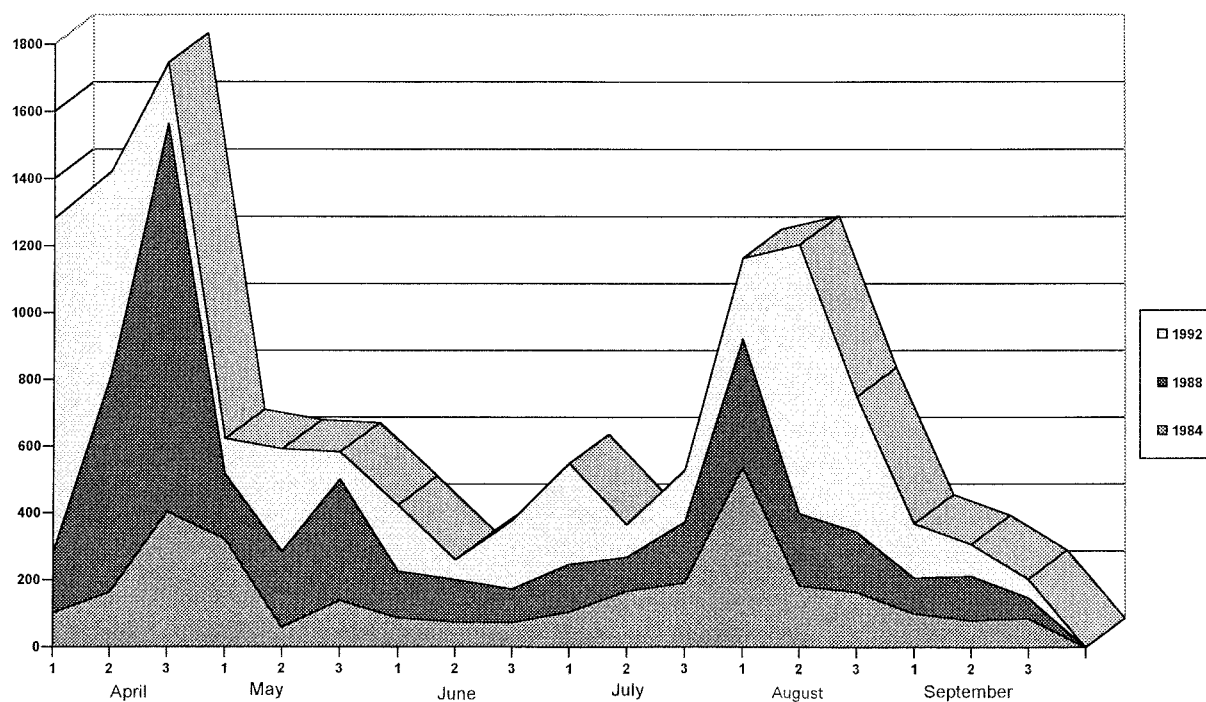


Figure 2. Decadal (10-day) variation of pollen in Bishkek.

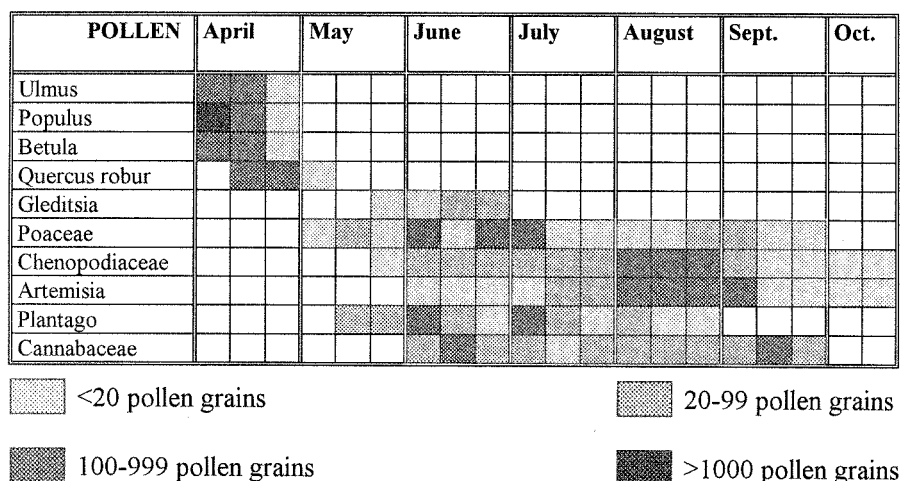


Figure 3. Pollen calendar in Bishkek. Data are related to the average of 1984, 1988, and 1992.

Of the total pollen grains 95.5%, belonging to 17 taxa, were recorded in 1984, 1988 and 1992. The rest (4.5%) were Rosaceae, *Ambrosia*, Fabaceae, Pinaceae and unknown pollen types.

Only 4 types reach significant levels of deposition amounting to more than 10% as annual average. These include: *Artemisia* (19.2 to 24.6%), Chenopodiaceae/Amaranthaceae (17.2 to 20.4%), *Quercus* (13.1 to 20%) and Poaceae (7.3 to 10%).

Among herbaceous plants, those found to be the main cause of pollinosis in Bishkek are: *Artemisia*, Poaceae and Chenopodiaceae.

The *Artemisia* pollination period lasts from the beginning of July to the end of October (130–150 days). At least 60 species of *Artemisia* are found growing wild in our country. The most common were *A. vulgaris*, *A. absinthium*, *A. annua*, *A. serotina*, *A. dracunculus*. The atmospheric counts of *Artemisia* pollen grains rarely reaches peak levels of 300–400/cm².

The pollination period of Poaceae (101–120 days) is shorter than that of *Artemisia*, starting in the middle of May and lasting till the end of August. The maximum count of pollen grains was 100/cm².

The Chenopodiaceae/Amaranthaceae pollen appears during the middle of May to the end of September (116–129 days). The peak atmospheric count of Chenopodiaceae/Amaranthaceae is rarely greater than 100 grains/cm² recorded from the middle of July to the middle of August, when a simultaneous massive flowering of various species is observed.

The aeropalynological sampling of the pollen deposited in Bishkek, carried out without inter-

ruption from the 1st of March to 30 October in the three years of observation, led us to identify two pollen seasons: Spring–Summer and Summer–Autumn. Aeropalynological studies of pollen count revealed two main pollen peaks. The first one occurs in late April (maximum for 10 days—1000 p.g./cm²) and the second one – in late August (maximum for 10 days – 804 p.g./cm²) (Figure 2). In the Spring–Summer period pollen of arboreal plants and grass pollen prevailed. The most important taxa include: *Ulmus*, *Populus*, Cupressaceae, *Betula*, *Fraxinus*, *Acer*, *Quercus*, *Juglans* and *Morus*. The Summer–Autumn pollen season is of much greater concern to allergologists due to pollination of herbaceous plants: *Artemisia*, *Plantago*, Chenopodiaceae/Amaranthaceae, Cannabaceae.

On average, the maximum pollen deposition was observed in the month of April (29 to 41%) followed by August (24.3 to 29.2%) and July (13.1 to 20%) during the study. The incidence of pollen was low during June (7.9 to 8.1%).

A pollen calendar of Bishkek is presented in Figure 3. *Artemisia* was found to have the widest flowering range among the pollen types. Other long flowering periods were observed in Chenopodiaceae/Amaranthaceae and Poaceae. The shortest flowering period was observed in *Ulmus*, *Populus*, *Betula* and *Quercus*.

Among 633 patients (age range: 1–16 years) undergoing SPT (skin-prick tests) with pollen extracts, 182 (76%) had a positive reaction to important aeroallergen (pollen of *Artemisia* and Poaceae) in Bishkek because of a high hay fever incidence and because of its high seasonal abundances. The second

in significance is Poaceae. We found the frequency of sensitisation to Poaceae pollen was the following: *Dactylis glomerata* (70.5%), *Bromus inermis* (58.9%), *Phleum pratense* (57.8%), *Agropyron* (52%).

Hay fever patients in Bishkek showed polyvalent allergy to *Artemisia* and Poaceae pollen (32 to 51%), *Artemisia* and *Atriplex* pollen (34.5%).

Artemisia pollen numbers among the primary allergy carriers in late summer in Europe (F.Th.M Spieksma et al., 1980; F.Th.M Spieksma, 1986).

The pollen of Poaceae is a well-recognised and important inhalant allergen in Europe (Bagni N. et al., 1976; F.Th.M Spieksma et al., 1986; F.Th.M Spieksma et al., 1989; von Wahl P.G. and Puls K.E., 1989).

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