



Short communication

Airborne grass pollen in Granada (Spain)

Consuelo Díaz de la Guardia*, Roberto Alonso, Francisca Alba, Francisco Valle

Departamento de Biología Vegetal, Facultad de Ciencias, Universidad de Granada, E-18071-Granada, Spain

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Abstract

We have carried out a study on the annual and daily pollen concentrations from Gramineae over four consecutive years in the atmosphere of Granada (Spain). Samples of pollen grains were collected by the volumetric method with the aid of a Burkard spore-trap. Gramineae, according both to their high sensitizing capacity and to data from allergologists, are responsible for many pollinoses diagnosed in this area. In this work, daily pollen levels from April to July are monitored and the variations identified are interpreted in relation to meteorological conditions. Results indicated that the highest airborne concentrations of Gramineae pollen were found in May and June, although the beginning and intensity of pollination have been variable during these 4 years.

Keywords: Airborne pollen; Allergy; Gramineae; Granada; Spain

1. Introduction

The allergenic capacity of pollen from Gramineae has been reported by several authors from different parts of Europe (Subiza Martin, 1980; Belmonte-Soler and Roure-Nolla, 1985; Spieksma et al., 1985, 1989; Goldberg et al., 1988; Galán et al., 1989; D'Amato and Spieksma, 1990; Norris-Hill and Emberlin, 1991; Zambito et al., 1992). It is considered to be one of the most important causes of spring pollinoses within the Mediterranean area. This is due, on the one hand, to the allergenic character of many species that share common antigens and provoke serious allergic symptoms in patients (Larese et al., 1992; Negrini et al., 1992). On the other hand, these plants are able to colonize different ecosystems and occupy large extents of ground, thanks to their great capacity for reproduction. In the province of Granada, important cereal crops (oat, wheat, barley, etc.) are grown together on large areas of fertile ground (high nitrogen content, the so-called Vega) which favour the development of many species of Poaceae. In these areas, Gramineae pollen is frequent and, because of its tendency to air dispersal, causes allergic symptoms in

sensitized individuals. Díaz de la Guardia et al. (1991) have shown its particular significance since it represents one of the most important causes of pollinosis in this city along with the pollen from olive, a situation similar to that occurring in other areas of southern Spain (Galán et al., 1989).

Although this pollen is detected in the city of Granada virtually throughout the year (Fernández et al., 1990), we have limited our study to those months in which higher levels are reached. We have carried out a seasonal and daily variation study for different years, in order to detect the patterns that govern the variation of its concentration in the atmosphere.

2. Material and methods

The city of Granada is situated in the south/south-eastern area of the Iberian Peninsula, 37°11' latitude North and 3°35' longitude West at 685 m above sea level; it belongs to the Mediterranean region, Betica chorological province. Granada's basin is a deep graben with postorogenic deposits surrounded by a mountain range. Granada lies within the mesomediterranean bioclimatic belt and it features a dry ombroclimate. Pollen monitoring was performed from April to July over

* Corresponding author.

4 years, from 1989 to 1992, using a Burkard 7-day recording volumetric spore-trap sampler, located on the roof of the Department of Medicine, about 18 m above ground level. The adhesive tape was changed every week, divided into seven segments, each corresponding to 1 day of sampling, covered with fuchsin-stained glycerol jelly and mounted on slides. The pollen concentration was expressed as the daily number of pollen grains found per cubic metre of air. The meteorological parameters (average temperature and rainfall) used in this study were supplied by Granada Airport's Climatology Service.

3. Results and discussion

Gramineae pollen concentrations in the atmosphere of Granada are particularly interesting in April–July. During this period, this taxon showed remarkable fluctuations in the quantities of the pollen detected. As Bricchi et al. (1992) have shown, the morphologic homogeneity of Poaceae pollen makes it very difficult to determine the pollination period for each species. However, due to the fact that each might have a different habitat, the timing of their blooming and pollen dispersal is also different, thus resulting in a very wide pollinic spectrum. Since Granada is a city surrounded by mountain ranges (Sierra Nevada, Sierra de Huétor, Sierra de Almijara, etc.), its topography delays the blooming period of mountain species until June or July, months in which very high pollen levels are detected on certain days. In the area of Granada, the blooming of species of the taxa *Avena*, *Poa*, *Hordeum*, *Arrhenatherum* and *Bromus* was observed from April; while, in May and June, most of the species of the taxa *Alopecurus*, *Phleum*, *Brachypodium*, *Festuca*, *Agropyron*, *Dactylis*, *Lolium*, *Cynodon*, etc. are blooming. In these months, the air-

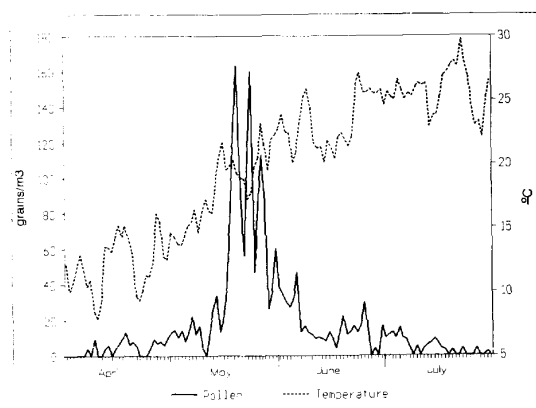


Fig. 2. Daily airborne grass pollen concentration during the main pollination period in 1990 with respect to average temperature level.

borne pollen content increases and the incidence of sensitizations is so high that allergic symptoms are more severe. Its allergenic power is quite strong in the city of Granada and its province, where it is considered to be the second most important cause of pollinosis.

The results show that throughout this 4-year study (Figs. 1–4), the highest levels of pollen concentration were found in May and June. In 1989 (Fig. 1) from 10 April and despite important irregularities, there was a clear increase reaching 98 grains/m³. This pollinic type was recorded almost every day in May, usually showing concentrations of over 30 grains/m³. Airborne pollen occurrence was registered throughout June, yet had lower levels, except for the case of the first days of the month. The highest concentration of this pollen was reached in 1990 (Fig. 2); maximum peaks were featured from the second fortnight of May when levels of over 50

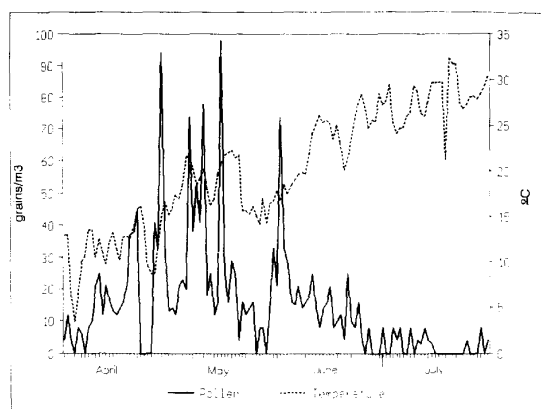


Fig. 1. Daily airborne grass pollen concentration during the main pollination period in 1989 with respect to average temperature level.

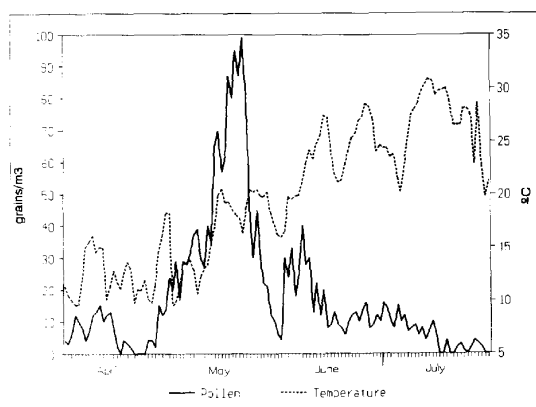


Fig. 3. Daily airborne grass pollen concentration during the main pollination period in 1991 with respect to average temperature level.

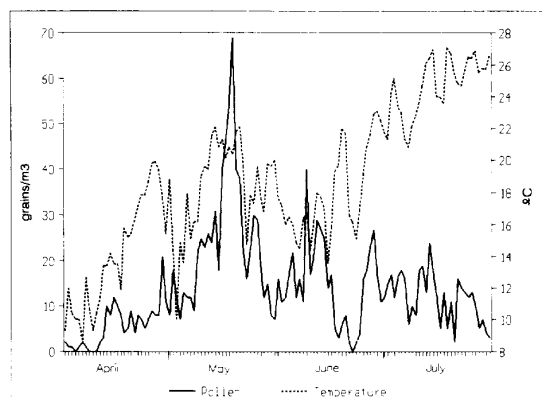


Fig. 4. Daily airborne grass pollen concentration during the main pollination period in 1992 with respect to average temperature level.

grains/m³ were frequent and peaks of 163 grains/m³ were reached. In June, these figures clearly decreased, ranging from 47 to 10 grains/m³. Although airborne occurrence was constant in July, levels showed an important decrease due to high temperatures which shortened the blooming period of many species. In April 1991 (Fig. 3), concentrations started to decrease and become irregular; after some days with a total absence of pollen at the end of the month, there was a slight increase that was more intense in May when peak levels of 98 grains/m³ were recorded. In the first days of June, average and even high levels were again obtained. In 1992 (Fig. 4) the blooming was retarded so that April pollen levels from Gramineae were very low or even non-existent on some days. In May, after registering concentrations from 10 to 30 grains/m³ in the first fortnight, levels increased to peaks of 80–90 grains/m³ just at the

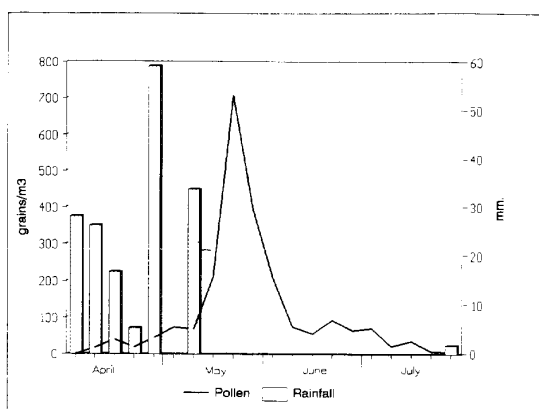


Fig. 5. Average grass pollen concentration per week in 1990 with respect to average rainfall per week.

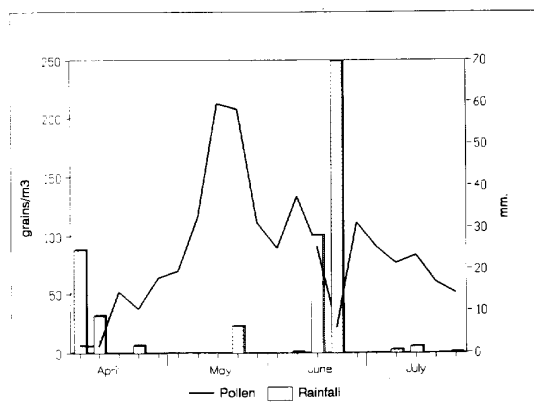


Fig. 6. Average grass pollen concentration per week in 1992 with respect to average rainfall per week.

end of the month. Throughout June and July, concentrations were very irregular, varying between average and low levels.

Though daily temperature averages usually showed a gradual increase from April to July, there were important differences that were very relevant both in determining the beginning of the Gramineae's blooming period and in forecasting the beginning of the pollen season (Frenguelli et al., 1989). For example in April 1989, except the first few days, the average temperature reached 15–20°C, and this caused the earliest flowering season of the studied years and high pollen concentration levels at the end of this month and at the beginning of May. In 1991 and 1992, during the first days of May, the average temperature registered (10°C) caused a decrease in airborne pollen concentration. However, the rapid increase in the average temperature, that even surpassed 20°C by the middle of May, explained a pollen season characterized by a strong beginning, a very marked peak and minor fluctuations during the rest of the month.

The spring of 1990 (Fig. 5) was the most rainy (171.1 mm) with rainfall from April until the middle of May. This delayed the flowering season of many Gramineae taxa and later provoked a short but intense pollen season when airborne pollen reached the highest concentration levels recorded in the 4 years. In 1992 (Fig. 6), abundant rainfall occurred in the middle of June, therefore, airborne pollen concentrations were lower than other years with the same precipitation, though registered at the beginning of the spring. Nevertheless, this fact delayed the blooming of some taxa until July and airborne pollen was detected throughout that month. Different levels of Gramineae pollen concentration can be reached depending on its quantity and period of occurrence.

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