



Short communication

Incidence of allergenic pollen of *Acer* spp., *Fraxinus* spp. and *Platanus* spp. in the city of La Plata, Argentina: preliminary results

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Abstract

This work studies the airborne pollen concentrations of *Acer* spp., *Fraxinus* spp. and *Platanus* spp. since the pollen of these three taxa has been characterized as etiological agents of pollinosis. These tree species are present in large amounts in the streets of La Plata city. The aeropalinological monitoring was performed with a Hirst-type spore trap (Lanzoni VPPS, 2000). The emission period of the three taxa extends from approximately late August to October. The maximum cumulative total of arboreal pollen was found to be 30824.7 from September 12 to 18. This period coincides with the peak of total pollen concentration. Pollen grains trapped were analysed and expressed as daily averages of 5-hour bands per day during the whole year. Maximum pollen concentration was registered between 10 a.m. and 2 p.m. During the studied period, 67 patients examined at the Allergy Service of “Hospital Interzonal de Agudos R. Rossi” (La Plata) showed allergic disease. These allergenic episodes may be produced by the large amount of pollen trees in the city area.

1. Introduction

These are the preliminary results of the first aeropalinological record of the city of La Plata, performed during July 1998–June 1999. The airborne pollen behavior of *Acer* spp., *Fraxinus* spp. and *Platanus* spp. was analysed throughout this period. Due to its high incidence, the pollen of these species constitutes a main component of the serum used in skin tests of patients affected by respiratory allergies (asthma, rhinitis, rhinoconjunctivitis, etc.). The interest arising from the study of these three genera is based on their known allergic potential (Dominguez Vilches et al., 1984; Nilsson, 1990; Rybnicek et al., 1990; Galán et al., 1991; Varela et al., 1997).

The aim of this project was to provide data about the reproductive biology of these allergenic

taxa through pollen calendars as well as providing information for allergologists for the diagnosis and the treatment of pollinosis. The analysis of this subject will be completed in future research with the study of the herbaceous component of the airborne pollen spectrum (NAP), which is a very important aspect to be considered in allergic diseases.

1.1. Geographical location of the area under study

The city of La Plata (35°S, 58°W), is located on the Río de la Plata coast and covers 16 km², including 20 squares and 6 parks in the city area. The population is 643,000 inhabitants.

The climate is temperate-humid with seasonality and rains all year round with dominant winds from NE and SW.

It is situated within the Provincia fitogeográfica Pampeana Distrito Este (Cabrera, 1976).

The city vegetation comprises cultured trees (*Platanus*, *Acer*, *Quercus*, *Salix*, *Pinus*) and bushes that grow in parks, squares, gardens and streets, as well as in domestic areas. The native flora is restricted to the NE and E of the city and to the coastal border which is represented by the Subclimatic Marginal Forest and the “talar” (Cabrera, 1976).

2. Materials and methods

2.1. Sampling method, and pollen count

Urban trees were counted during the last two censuses (1982, 1995) undertaken by the Municipalidad de La Plata (Candau, 1982, 1995).

The aeropalynological monitoring was carried out with a Hirst-type spore trap (Lanzoni VPPS, 2000) (Hirst, 1952) placed near the geographical centre of the city, at 15 metres height. Pollen grains trapped were examined with an optical microscope under a magnification of 200X along 5 hour bands (2:00, 8:00, 10:00, 14:00, 20:00) per day throughout the year. Data were expressed as number of pollen grains/m³ of air per hour.

The identification of pollen types was made according to pollen Atlases (Heusser, 1971; Markgrak and D'Antoni, 1978; Moore and Webb, 1991) and the palynological collections of the Cátedra de Palinología (Universidad Nacional de La Plata) and Laboratorio de Palinología y Paleobotánica (Universidad de Buenos Aires).

2.2. Clinical control

From 67 clinical records of patients at the Allergy Service of the “Hospital Interzonal General de Agudos (HIGA) R. Rossi” of La Plata from 1 August 1998 to 30 October 1998, a database was designed to provide information about the frequency of examination, clinical tests, and personal data.

Patients were tested with serums of both herbaceous and arboreal species. In this work we analysed the relation between the airborne pollen concentration of *Fraxinus* spp., *Acer* spp. and *Platanus* spp. during their pollen season in relation to allergic episodes registered in the population under study.

3. Results

Maximum pollen concentrations in the atmosphere of La Plata during 1998–1999 were recorded from the end of winter (August–September) to the end of spring (November–December). The maximum concentration of pollen of anemophilus species of *Fraxinus* spp., *Platanus* spp. and *Acer* spp. occurred between 22 August and 23 October.

3.1. Contribution of AP to the total pollen

Pollen analysis shows that the relation AP/TP is higher than 95% in the three months studied, and both curves coincide during this period of time (Figure 1). This result agrees with studies undertaken in Buenos Aires (Noetinger and Romero, 1997) and Mar del Plata (Latorre and Perez, 1997) for the same period in previous years, where a pollen season occurs with a predominance of arboreal species.

The AP contribution in August is lower than 8% because the anthesis starts at the end of the month, being highly significant in September with 90% and in October with 80%.

It is important to remark upon the contribution of these genera to the total arboreal pollen spectrum during a short period (20 days). The pollen concentrations of these taxa were very low during the week that started on 22 August. The maximum pollen concentration was recorded between 12 and 18 September, with a maximum cumulative total of arboreal pollen of 30824.7. Figure 2 shows the pollen concentrations of AP together with the contribution of *Acer* spp., *Fraxinus* spp. and *Platanus* spp. species.

3.2. Pollen calendar

3.2.1. *Acer* spp.

The most abundant tree species of the city are *A. negundo*, *A. pseudoplatanus* and *A. campestre*. The number of specimens of *A. negundo* present in squares, boulevards and urban trees is 3202, according to the census of 1995. There is no information available on the other two species.

The *Acer* spp. pollen season recorded started on 11 September with 7.4 grains/m³. The maximum was on 17 September with 573.5 grains/m³. Another peak was observed on 22 September with 462.5 grains/m³, recordings ended 20 November with 3.7 grains/m³, when the emission cycle recorded was completed (Figure 3).

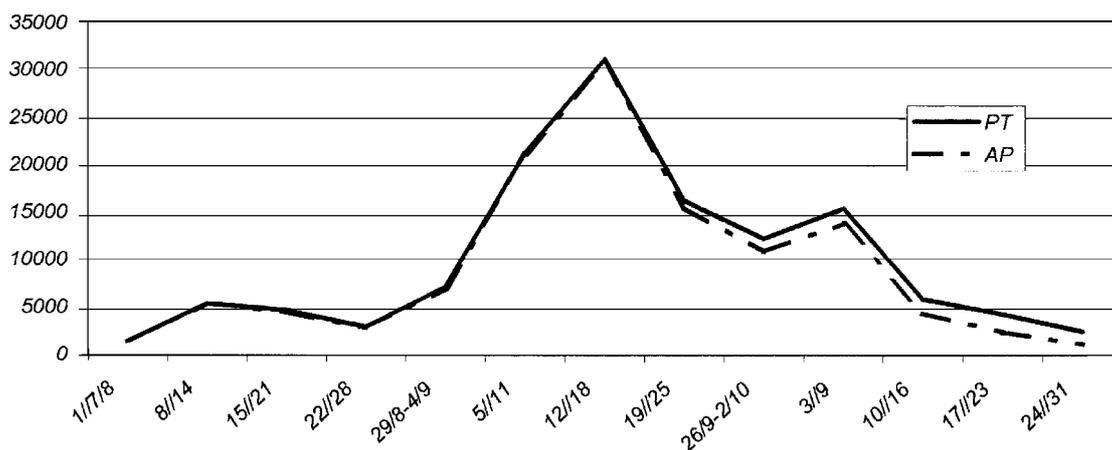


Figure 1. Arboreal pollen (AP)/Total pollen (TP) relation expressed as sums of weekly concentrations.

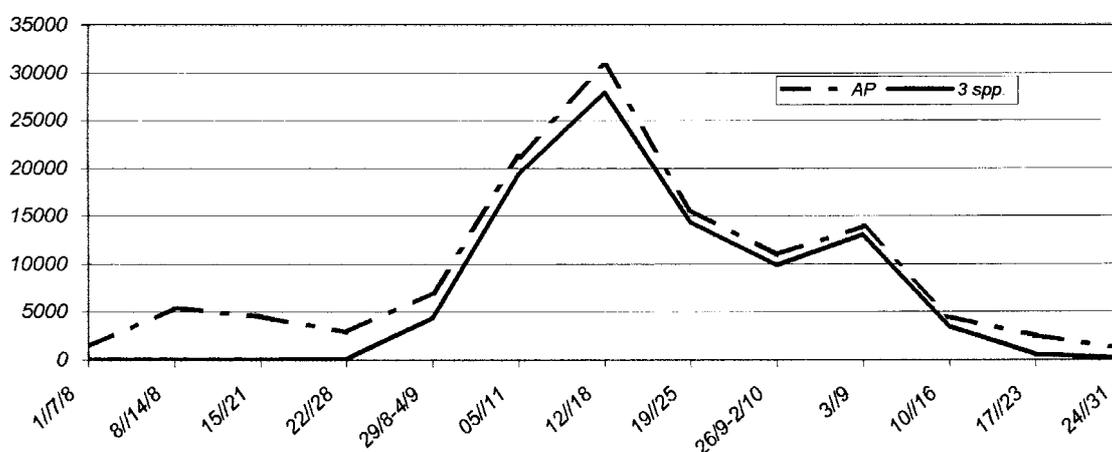


Figure 2. Arboreal Pollen (AP)/sum of the pollen of the three taxa expressed as sums of weekly concentrations.

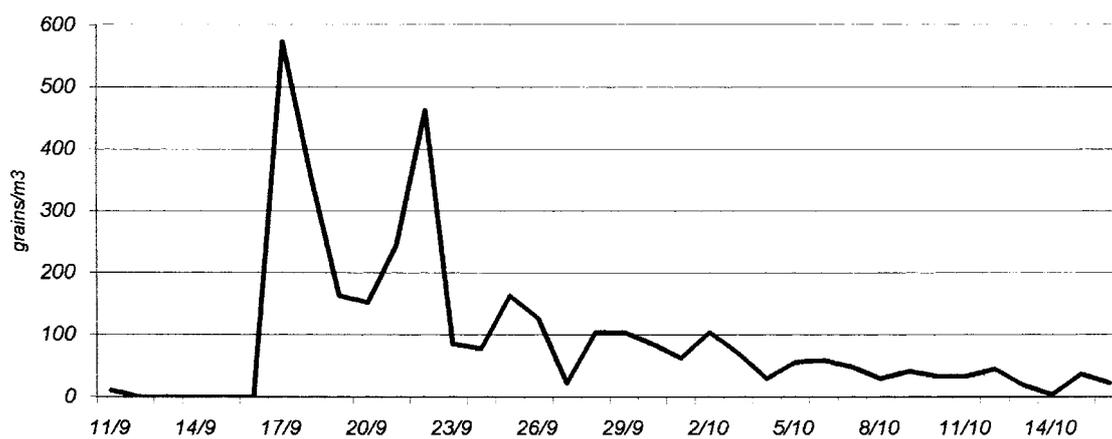


Figure 3. Pollen calendar of *Acer* spp. expressed as sums of daily concentrations.

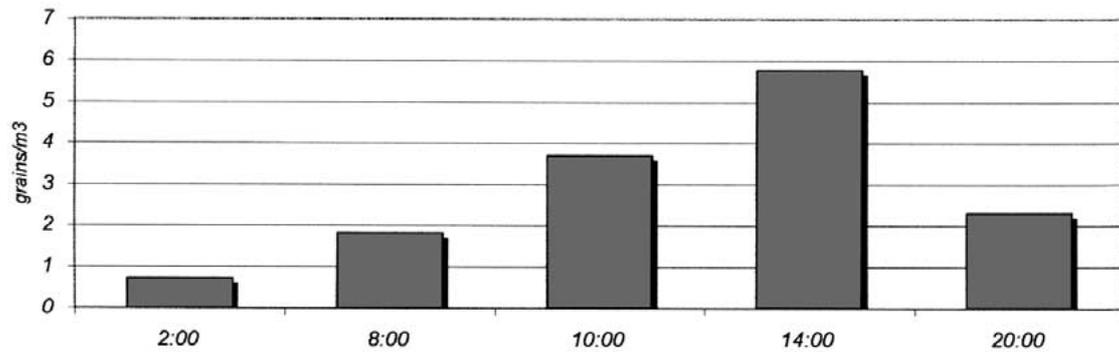


Figure 4. Hourly average of *Acer* spp.

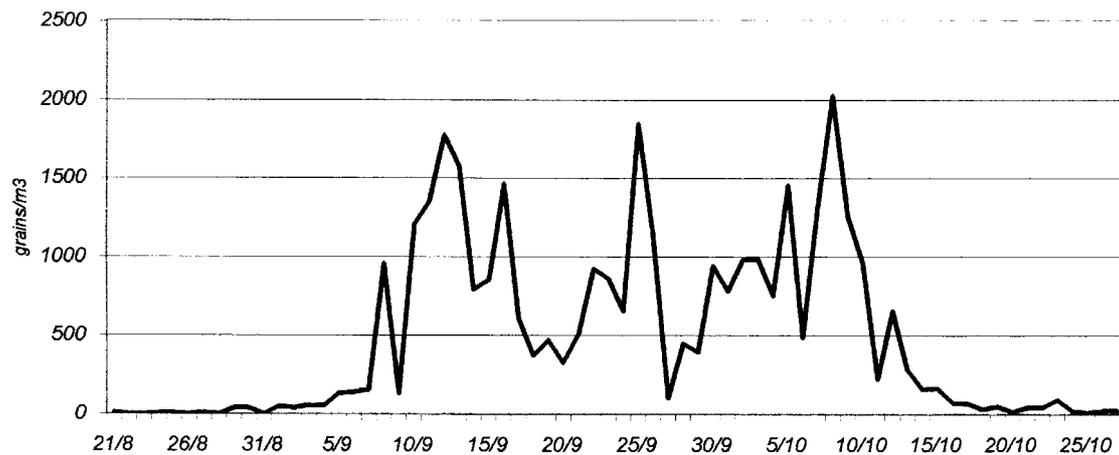


Figure 5. Pollen calendar of *Fraxinus* spp. expressed as sums of daily concentrations.

Averages of pollen concentration were calculated for 5-hourly bands during the time in which the species were present (Figure 4). The maximum average concentration was recorded at 2 p.m.

3.2.2. *Fraxinus* spp.

Two species *F. americana* (the more abundant one) and *F. excelsior* var. *aurea* represent the genus, with 20.900 specimens according to the census of 1995.

The pollen season of these species began on 21 August with 11.1 grains/m³ and ended on 16 December with 3.7 grains/m³. The maximum concentration was recorded on 8 October (2027.6 grains/m³). The total pollen recorded for this taxon was 33470.2 grains/m³ of air (Figure 5).

The maximum hourly pollen average was at 10 a.m. although at 2 p.m. the decrease was not significant, and consequently it may be stated that the period of maximum concentration was between 10 a.m. and 2 p.m. (Figure 6).

3.2.3. *Platanus* spp.

According to the census of 1995, *P. acerifolia* is the only species of this genus represented in the urban trees, with 2980 specimens.

The pollen season started on 12 August with 3.7 grains/m³ and ended 16 December with 7.4 grains/m³. The maximum was produced on 12 September with 7840.3 grains/m³ (Figure 7).

The analysis of hourly data showed that the maximum pollen concentration was recorded at 2 p.m. (Figure 8).

3.3. Epidemiological study

Clinical records of patients who were treated in the Allergy Service of "HIGA" "R. Rossi" in La Plata were analysed between 1 August 1998 and 30 October 1998. These patients were previously tested with commercial aqueous extracts for intradermal reaction. All of them evidenced skin sensitivity to pollen

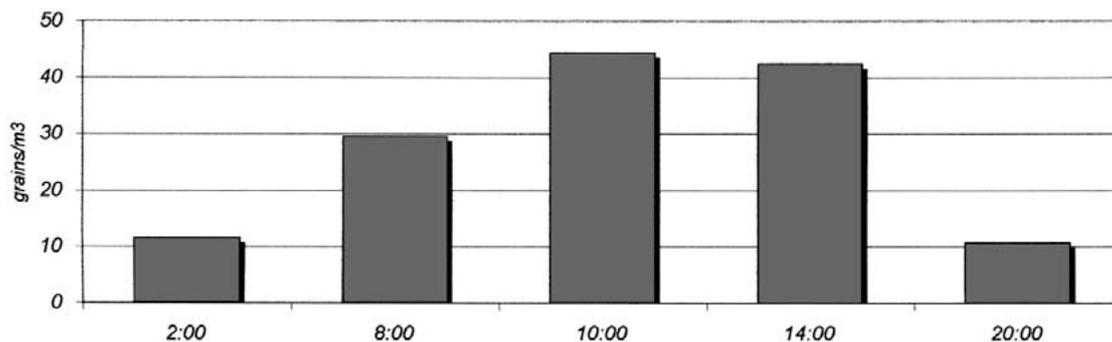


Figure 6. Hourly average of *Fraxinus* spp.

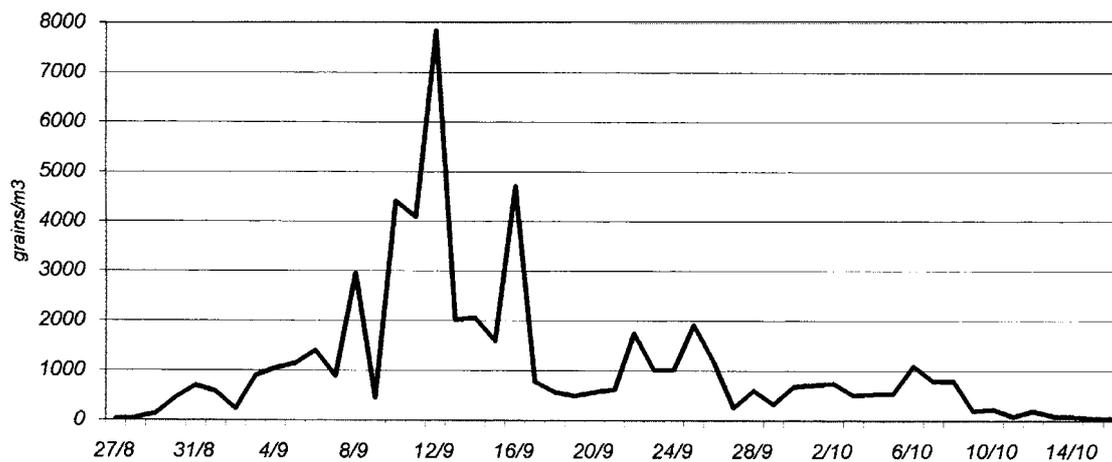


Figure 7. Pollen calendar of *Platanus* spp. expressed as sums of daily concentrations.

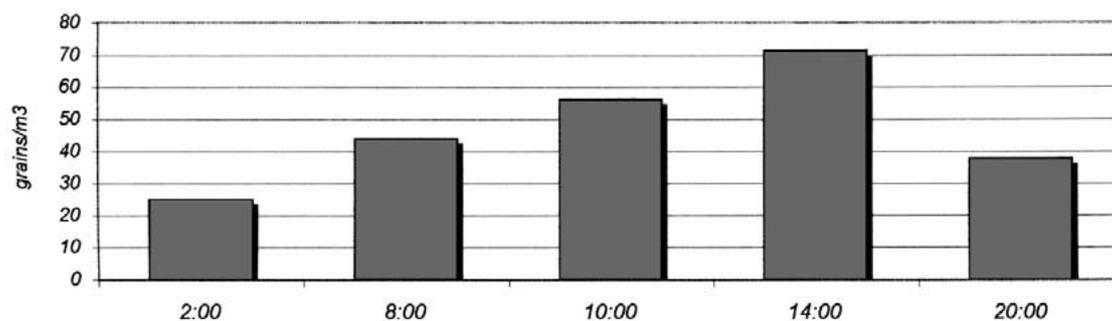


Figure 8. Hourly average of *Platanus* spp.

and presented symptomatology of respiratory allergy, being under treatment with immuno-therapy and pharmacology. The extracts of arboreal species used were *Platanus occidentalis*, *Acer* spp., and *Fraxinus americana*. The evaluated patients were 66% female and 34% male between 16 and 76 years old, inhabitants from La Plata and its surroundings.

The patients were monitored weekly and symptoms of rhinitis, asthma and rhinoconjunctivitis were observed throughout the period; maximum percentages of patients affected were found from the 3rd week of August, to the 3rd week of October with values between 22.2 and 50% (Figure 9).

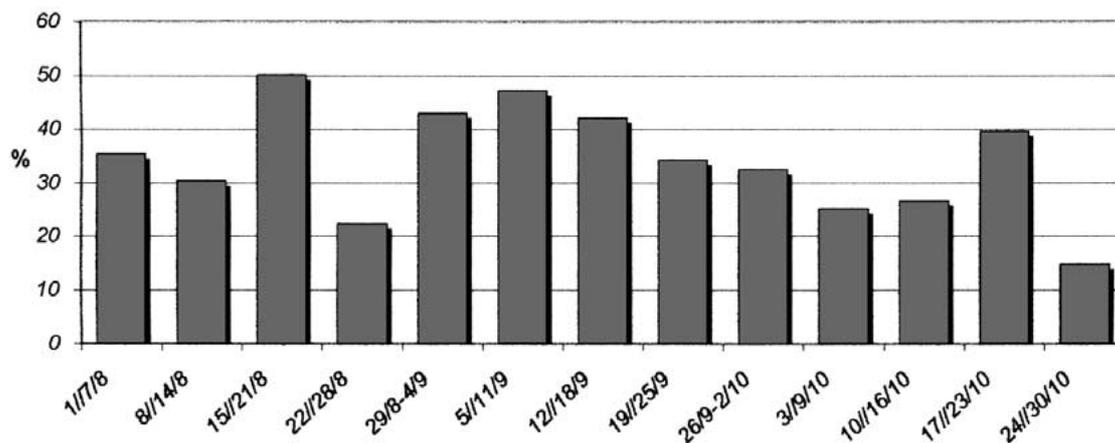


Figure 9. Percentage of patients with allergic symptomatology during August–October 1998.

4. Discussion and conclusion

The atmosphere of La Plata receives a large pollen concentration over two months from different sources, due to the large number of trees planted in the area. For this reason, the synchronous pollen emissions of species with and without allergenic potential could produce cross-reactions in the population (Tommen, 1931).

When analyzing the pollen behavior of *Acer* spp., *Platanus* spp., *Fraxinus* spp., and comparing the clinical data of treated patients in the hospital, a close relation was observed between the pollination period of the taxa studied and the frequency of appearance of allergic-respiratory symptoms. However, the high concentration pollen emitted together with the allergenicity of tree species constitute the causative agent of pollinosis. For this reason, it is difficult to distinguish crises caused by the species studied and those ones produced by the high concentration of pollen in the atmosphere.

As previously mentioned, comparisons with studies can be made for Buenos Aires and Mar del Plata with respect to a pollen season with a higher AP/NAP ratio. A relevant difference among the above mentioned study sites and the results obtained for La Plata, is the large number of pollen grains recorded in this city. This is most likely produced by a higher airborne pollen concentration in relation to the extent of the forested areas.

An aeropalynological study of one year duration is not sufficient to analyse long trends of daily and seasonal variations of airborne pollen. On the other hand, anthesis is affected by meteorological condi-

tions each year. Consequently, the area is being monitored to obtain more information about the floral phenology of these species, as well as to improve our knowledge of the environmental factors affecting pollen emission.

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References

- Cabrera A.L.: 1976, Enciclopedia Argentina de Agricultura y Jardinería. Tomo II, Fascículo 1: Regiones Fitogeográficas Argentinas. Ed. ACME, Buenos Aires, Argentina.
- Candau A.H. Riqueza forestal. Censo 1982 (Part I) y Censo 1995 (Parte II). Municipalidad de La Plata, Secretaría de Gestión Pública. Subsecretaría de Planeamiento y Desarrollo Urbano. Dirección de Política Ambiental.
- Dominguez Vilches E., Uberta A.J. and Galán C.: 1984, Polen alérgico de Córdoba. Publicación del Monte de Piedad y Caja de Ahorro de Córdoba. Colección Temas Andaluces Caja de Ahorro de Córdoba. Colección Temas Andaluces.
- Galán C., Tormo R., Cuevas J., Infante F. and Dominguez Vilches E.: 1991, Theoretical daily variation patterns of airborne pollen in the South-West of Spain. *Grana* **30**, 201–209.
- Heusser C.J.: 1971, *Pollen and spores of Chile*. Univ. Arizona Press, Tucson.
- Hirst J.M.: 1952, An automatic volumetric spore trap. *Ann Appl Biol* **39**, 257–265.
- Latorre F. and Perez C.: 1997, One year of airborne pollen sampling in Mar del Plata (Arg). *Grana* **36**, 49–53.
- Markgrak V. and D'Antoni H.L.: 1978, *Pollen flora of Argentina. Modern spore and pollen types of Pteridophyta, Gymnospermae and Angiospermae*. The Univ. Arizona Press, Tucson.

- Moore P.D., Webb J.A. and Collinson M.E.: 1991, *Pollen analysis*. 2nd. Ed. Oxford: Blacwell, p. 216.
- Nilsson S.: 1990, Regional and global distribution of aeroallergens. *Review of Paleobotany and Palynology* **64**, 29–34.
- Noetinger M. and Romero E.: 1997, Monitoreo diario y volumétrico del polen atmosférico en la ciudad de Buenos Aires. *Bol Soc Arg Bot* **32**(3–4), 185–194.
- Rybníček O., Rybníček K. and Pocta L.: 1990, Pollen allergies in Czechoslovakia. Pollen incidence and immunotherapy. *Grana* **30**, 150–154.
- Thommen A.A.: 1931, Hayfever. In: A.F. Coca, M. Walzer and Thommen (eds), *Asthma and hay fever*. Thomas, Springfield.
- Varela S., Subiza J., Rodríguez R., García B., Jerez M., Jiménez J. and Panzani R.: 1997, Platanus pollen as an important cause of pollinosis. *Journal Allergy Clin Immunol Part I*. **100**(6), 748–754.

