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Aerobiological survey in L'Aquila (Italy) throughout 1988 to 1990

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SUMMARY. Airborne pollens were sampled in L'Aquila (Italy) throughout 1988 to 1990. Our data indicate that the flowering seasons of pollens mostly accounting for airborne concentrations are somewhat unique as compared to other Mediterranean areas. The prolonged season of Cupressaceae as well as the two different flowering seasons of Oleaceae, namely of Fraxinus, Ligustrum and Olea europaea, respectively, were the most relevant findings of our study. Furthermore, it is also worth to note that Parietaria judaica could be detected during the study period throughout March to June, but not in late summer and early autumn, as expected.

Moreover, we evaluated the frequency of different pollen sensitizations in 2813 patients requiring medical care during the study period because of allergic diseases, such as conjunctivitis, oculorhinitis, and bronchial asthma. Our data demonstrate that both Compositae and Urticaceae proved to be the most allergenic pollens despite the low airborne concentrations detected. Finally, a relevant finding was the high Olea sensitization among patients with bronchial asthma.

Key words: aerobiology, pollen, survey.

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INTRODUCTION

Pollinosis occurs in atopic subjects following the exposure to pollens exhibiting allergenic properties. Furthermore, symptom severity depends on the the exposure frequency as well as on pollen concentrations in the atmosphere

throughout the exposure period. Therefore, wind-pollinating plants, which strictly depend on the wind for cross-fertilization, release pollens mostly accounting for high airborne concentrations. Thus, sporadically occurring pollens contribute little or nothing to the causation of pollinosis.

Occurrence of pollens is monitored almost throughout Europe. However, since until 1988 there was no information available from L'Aquila (Italy), we report here the results of the monitoring of airborne pollen concentrations throughout 1988 to 1990. Our study clearly demonstrated that the seasons of pollens mostly accounting for airborne concentrations are somewhat unique as compared to other Mediterranean areas. The sustained season of Cupressaceae as well as the two different flowering seasons of Oleaceae, by *Ligustrum* and *Fraxinus* and by *Olea europaea*, respectively, were the most relevant findings of our study. Furthermore, it is also worth to note that *Parietaria judaica* could be detected throughout March to June, but not in late summer and early autumn, as expected.

MATERIALS AND METHODS

L'Aquila (770 m. above sea level) is located approximately 120 km west of the Adriatic Sea, nearby the Gran Sasso mountain. The sampling sites were located at the Department of Internal Medicine (L'Aquila University) in the city area (AQ1) and at the Department of Allergic Diseases (USL 06, L'Aquila) in the suburban area of Coppito (AQ2).

The airborne pollen monitoring was performed using Lanzoni VPPS 2000 samplers (Lanzoni, Bologna, Italy). Both samplers were located on the roof, 10-15 m above ground level, to rule out the direct influence of surrounding vegetation. During the study period, AQ1 was continuously sampling, whereas AQ2 was activated only in 1989. Both samplers were operating at the same flow rate (10 liters/min). Slides were mounted and pollen grains identified as described by Famularo *et al.* (1988). The data are reported as daily means of pollen grains per cubic meter of air (p/m^3). The length of pollen seasons was defined by excluding

those aggregates (single days or several days) contributing less than 10% of the total. The total pollen count is the sum of the daily averages for the season as a whole. The main pollen season was stated starting when airborne pollen concentrations exceeded $30 \text{ p}/\text{m}^3$ and continuing until concentrations no longer exceeded this level.

The frequency of airborne pollen sensitizations was evaluated in 2813 patients who required medical care throughout the study period because of allergic diseases (conjunctivitis, oculorhinitis, and bronchial asthma). Skin prick tests (SPT) were performed as described by Tursi *et al.* (1987).

RESULTS AND DISCUSSION

Thirty-two different airborne pollens were identified throughout the study period. However, only few exceeded the concentration of $30 \text{ p}/\text{m}^3$ which proved to be the minimum able to induce symptom onset in allergic patients. The pollen taxa identified in L'Aquila during monitoring throughout 1988-90 are shown in Tab. I.

Table I. Pollen taxa identified in L'Aquila during monitoring throughout 1988-90.

Betulaceae	Geraniaceae
Compositae	Juglandaceae
Corylaceae	Liliaceae
Fagaceae	Dianthaceae
Graminaceae	Leguminosae
Oleaceae	Umbrelliferae
Plantaginaceae	Euphorbiaceae
Urticaceae	Caprifoliaceae
Cupressaceae	Bignoniaceae
Cheno-Amaranthaceae	Simarubaceae
Ulmaceae	Rosaceae
Platanaceae	Lauraceae
Pinaceae	Tiliaceae
Salicaceae	Myrtaceae
Ericaceae	Moraceae
Cannabaceae	Aceraceae

Corylaceae, Betulaceae, and Cupressaceae mostly accounted for total pollen counts during winters.

Among Corylaceae, *Corylus avellana*, despite the low concentrations, was usually detected throughout January to June during the study period. Furthermore, high concentrations due to the main flowering seasons of *Carpinus betulus* and *Ostrya carpinifolia* were detected throughout April to May both in 1988 and 1989. The flowering peaks were on May 8th (440 p/m³) and on April 24th (70 p/m³) in 1988 and 1989, respectively. On the other hand, during the 1990 spring we were not able to detect any increase in the airborne concentrations of Corylaceae, as demonstrated by concentrations constantly below 30 p/m³. Finally, low concentrations of these pollen grains were seldom identified from June to December throughout all the sampling period.

Betulaceae were recorded in 1988 and 1989 throughout January to June, although in low concentrations. However, in 1990 the flowering season was more abundant and the concentration peak was recorded on April 27th (534 p/m³). It is worth to note that this pollen is not usually found in neighbouring areas (D'Amato *et al.*, 1989a; D'Amato *et al.*, 1989b; D'Amato *et al.*, 1983; D'Amato *et al.*, 1988b). Thus, our finding clearly indicates that the vegetation surrounding the sampling site plays a major role in accounting for variations in pollen concentrations. In fact, we found a colony of *Betula pendula* Roth at Cagnano Amiterno, approximately seven miles South of L'Aquila.

Medium-high concentrations of Cupressaceae were recorded in 1988 and 1989 from January to May (Fig. 1) as well as low concentrations from May to September. Three different flowering peaks were observed in February (847 p/m³ on the 19th and 624 p/m³ on the 24th, in 1988 and 1989, respectively), in March (192 p/m³ on the 19th and 331 p/m³ on the 31st,

in 1988 and 1989, respectively), and in April-May (821 p/m³ on May 2nd and 215 p/m³ on April 25th, in 1988 and 1989, respectively). However, in 1990 we were not able to record such a sustained high season of this pollen (Fig. 1), since airborne concentrations never exceeded the upper limit of 50 p/m³. As far as the striking reduction of Cupressaceae pollen concentrations in the atmosphere observed throughout 1990 is concerned, the phenomenon proved to be dependent on an epidemics of *Coryneum cardinale* infection.

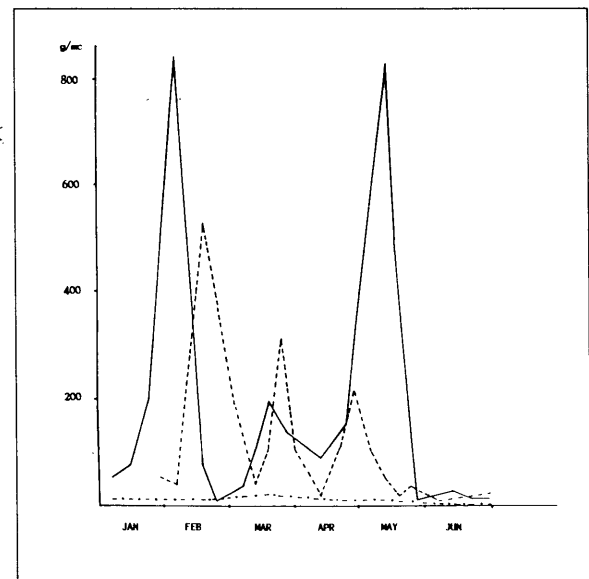


Figure 1. Airborne Cupressaceae monitored in L'Aquila during the study period.

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Among Urticaceae, *Parietaria Judaica* mostly accounts for airborne pollens although low concentrations were usually recorded. Flowering peaks were recorded on March 8th (194 p/m³ by AQ1), on May 7th (98 p/m³ by AQ2), and on May 20th (120 p/m³ by AQ2) in 1988, 1989, and 1990, respectively. In the Mediterranean area Urticaceae usually exhibit two very long flowering cycles and pollen is firstly

detected during the initial warm period in late winter (Arobba *et al.*, 1986; Bousquet *et al.*, 1984; D'Amato *et al.*, 1989a; D'Amato *et al.*, 1989b; D'Amato *et al.*, 1983; D'Amato *et al.*, 1988a). Then, airborne pollen is commonly detected throughout spring and summer and a second peak can be recorded at the beginning of autumn. However, in L'Aquila we could not detect such a second concentration peak in autumn. Thus, the Urticaceae flowering season recorded in L'Aquila seems to exhibit somewhat unique features as compared to the Mediterranean area.

The flowering season of Graminaceae was as similar as that previously reported in the Mediterranean area. In fact, the pollination period usually starts at the end of March, is continuing until the end of June, and eventually decreases in July (D'Amato *et al.*, 1989a; D'Amato *et al.*, 1989b). Thus, significant airborne pollen concentrations were recorded only throughout May to July. The flowering peaks were on May 2nd (270 p/m³ by AQ1), on June 15th (200 p/m³ by AQ2), and on May 16th (107 by AQ2) in 1988, 1989, and 1990, respectively. As expected, throughout August to October very low pollen concentrations were found during the study period.

Among Oleaceae the most allergenic pollen is produced by *Olea europaea*. The latter exhibit in the Mediterranean area a pollination period lasting from May to the end of June (Arobba *et al.*, 1986; Candau *et al.*, 1981; Macchia *et al.*, 1987; D'Amato *et al.*, 1989). Furthermore, severe *Olea*-induced pollinosis has been frequently reported in recent years in the Mediterranean area, probably due to the widespread *Olea* cultivation. On the contrary, in Central and Northern Europe, where there are no olive trees, *Fraxinus* and *Ligustrum* commonly account for Oleaceae airborne pollen (D'Amato *et al.*, 1988b). However, both *Fraxinus* and *Ligustrum* exhibit a low sensitization frequency as

compared to *Olea europaea* (D'Amato *et al.*, 1988b).

In L'Aquila, Oleaceae were mostly recorded throughout April to July. However, two different flowering seasons were observed, due to *Fraxinus* and *Ligustrum* and to *Olea europaea*, respectively (Fig. 2). In fact, *Fraxinus* and *Ligustrum* mostly accounted for airborne pollen found during May. Peaks were on the 11th (122 p/m³ by AQ1), on the 24th (54 p/m³ by AQ2), on the 21st (45 by AQ2) in 1988, 1989, and 1990, respectively. As expected, the main flowering season of *Olea europaea* was a short season observed during June and concentration peaks were found on the 2nd (81 p/m³ by AQ1), on the 27th (84 p/m³ by AQ2), on the 10th (61 by AQ2) in 1988, 1989 and 1990, respectively. It is noteworthy that the recorded airborne Oleaceae pollen concentrations were strikingly lower than the values commonly found in the Mediterranean area (D'Amato *et al.*, 1989). Thus, the above described double flowering season seems to be unique in the Mediterranean area.

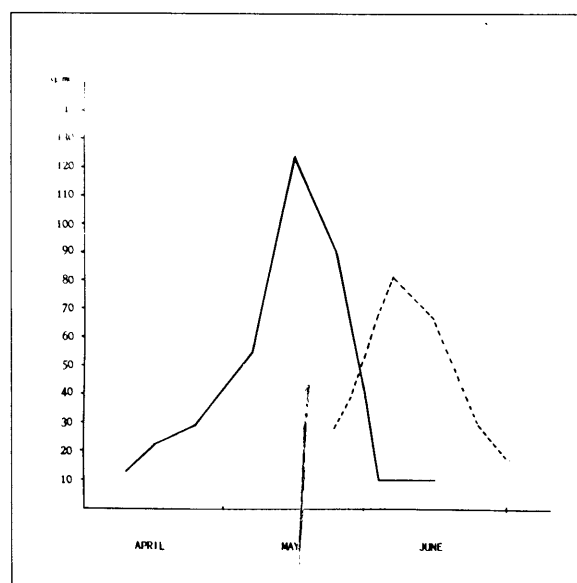


Figure 2. The typical double flowering season of Oleaceae pollen recorded in L'Aquila. The 1988 season is shown.

— *Fraxinus*, *Ligustrum*
 - - - *Olea*

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Compositae were seldom recognized throughout May to October, and mostly from July to September, during the study period. However, the airborne pollen concentrations were usually lower than 30 p/m³.

Finally, we evaluated the frequency of pollen sensitization in 2813 patients requiring medical care during the study period because of allergic conjunctivitis, oculorhinitis, and bronchial asthma. Out of 107 subjects with conjunctivitis, 69% had positive skin prick tests (SPT) to Graminaceae and 10.2% to Compositae. Nine out of 13 patients (69.2%) with SPT positive to several allergens had positivity to both Graminaceae and Compositae. Out of 815 subjects with oculorhinitis, 39.6% had positive SPT to Graminaceae. One hundred eighty-seven out of 325 patients (22.9%) with multiple positivity exhibited positive SPT to both Graminaceae and Compositae. Out of 73 patients with bronchial asthma, 32.5% had positive SPT to Compositae, 22% to Urticaceae, 16% to Oleaceae. Sixteen out of 20 patients (20%) with multiple positivity had positive SPT to both Compositae and Urticaceae. These overall data clearly indicate that both Urticaceae and Compositae proved to be the most allergenic pollens despite the low airborne concentrations recorded throughout the sampling period. Furthermore, the high frequency of positive SPT to Oleaceae among patients with bronchial asthma is noteworthy. Finally, most patients with conjunctivitis and oculorhinitis exhibited positive SPT to both Graminaceae and Compositae, as expected.

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