

Allergenic pollens and pollinosis in Italy: recent advances

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The authors have mapped the occurrence of allergenic pollens throughout Italy and defined their most common clinical symptoms. To obtain an accurate aerobiological and clinical picture of such a geographically complex country as Italy, a detailed investigation was carried out involving 80 data-gathering stations and 40 clinical centers nationwide. Three main pollination periods can be distinguished: winter-pre-spring (January to March) for *Betulaceae*, *Corylaceae*, *Cupressaceae*, *Salicaceae* and *Ulmaceae*; spring-summer (April to June) for *Gramineae*, *Urticaceae*, *Oleaceae*, *Plantago*, *Fagaceae*, *Pinaceae* and *Polygonaceae*, and summer-autumn (August to September) for *Urticaceae*, *Compositae* and *Chenopodiaceae*. Examination of 49660 patients affected by pollinosis (conjunctivitis, rhinitis, asthma, with positive skin tests or IgE-specific serum determination: RAST, ELISA) throughout Italy revealed sensitivity to *Gramineae* in 64.6%, to *Parietaria* in 36.7% to *Olea* in 15.8%, to *Compositae* in 13.2%, to *Betulaceae-Corylaceae* in 7% and to *Fagaceae-Cupressaceae-Plantago* in 4%–10%; marked regional variations were observed. The patients suffered from rhino-conjunctivitis (55.7%), rhino-conjunctivitis plus asthma (31.6%) and asthma (12.7%). In monosensitized individuals, *Parietaria* was seen to be the main cause of the asthmatic syndrome (though our preliminary data also implicate *Olea*) followed by *Gramineae*.

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In theory any plant can cause an allergic reaction. In practice, however, only about 30 major botanical families worldwide are recognised as causing clinical symptoms (pollinosis) in the majority of patients.

Leaving aside the question of possible cross-reactivity between different plants, it should be remembered that in some cases the individual allergenic species has been identified (e.g. *Plantago lanceolata*), in others the genus (e.g. *Parietaria*, *Ambrosia*) and in others again, the family (*Gramineae*).

The main allergenic agents which cause pollinosis vary from continent to continent and from region to region according to the vegetation of the area. In the United States, the principal allergen is *Ambrosia*, while in the rest of the world pollinosis is caused predominantly by *Gramineae* (23, 24). A prevalence of other agents may be noted locally, such as that of *Betulaceae* in north-eastern Europe and *Parietaria* and *Olea* in the Mediterranean area (6, 10).

The aims of the present survey were to identify the most common allergenic pollen species in Italy and to draw up a clinical picture based on a particularly broad and homogeneous sample of atopic subjects (20).

In this paper we report the results of a 5-year

aerobiological study (1984–1988) of the principal allergenic pollens in Italy and of a clinical survey of the symptoms of pollinosis and the frequency of skin test positivity among the patients examined.

Material and methods

Sampling centers in Italy

Italy's network of aerobiological monitoring has grown rapidly in recent years. The number and distribution of sampling centers compare favourably with other EEC countries. Most of these centers are situated in densely populated urban areas (76%) while only 24% are located in sparsely populated areas. There is, nevertheless, a lack of sampling stations at high altitude (over 1000 m) and in open country. However, since the data can be used for both diagnostic and therapeutic purposes, they become more meaningful when gathered in the patient's own area.

Aerobiological sampling

Pollen samples were taken at 80 centers (Fig. 1) using Hirst volumetric weekly samplers (Burkard or similar Italian model Lanzoni VPSS 2000) placed about



Fig. 1. Monitoring network in Italy in 1988 (provided by the Italian Association of Aerobiology).

20 m from the ground. Daily values were expressed as pollens/m³ of air. For details concerning sampling techniques, slide preparation, identification and counting of pollen under the microscope, see publications on this subject (11, 13, 14, 17).

Clinical findings

Forty clinical centers throughout the country took part in the study by filling in questionnaires retrospectively (Fig. 2). A large majority of the centers also provided aerobiological data.

Clinical findings refer to the period 1984–1988 and were obtained from studies of 112 500 patients, both male and female, aged 4 to 60 years, selected on the basis of their history of seasonal or chronic rhinitis and/or asthma.

Patient evaluation was based on: anamnesis, clinical examination, skin tests and, whenever necessary, serum determination of specific IgE by means of the RIA (RAST) or immunoenzymatic (ELISA) method.

From the above pool, we selected a group of 49 660 patients with a typical history of seasonal respiratory symptoms and positive skin test (and/or serological test) responses to one or more pollens.

Skin test

Prick tests were carried out using glycerinated allergenic extracts (provided mainly by Bayropharm-



Fig. 2. Centers which provided clinical data.

Hollister-Stier Laboratories, Milan, Italy: 400 AUR/ml (25) and Lofarma Allergeni, Milan, Italy: 1/50 w/v).

In addition to the common inhalant allergens (house-dust mites, cat and dog dander, molds, etc.), these extracts also contained the following pollens: *Parietaria judaica* and *Parietaria officinalis*, Gramineae (*Dactylis glomerata*, *Phleum pratense*, *Holcus lanatus*, *Poa annua*, *Cynodon dactylon*, etc.), *Olea europaea*, Compositae (*Artemisia absinthium*, *Artemisia vulgaris*, *Ambrosia*, etc.), Betulaceae-Corylaceae (*Alnus*, *Betula*, *Corylus*, etc.), Fagaceae (*Fagus* and *Quercus*), Cupressaceae (*Cupressus*, *Thuja*, etc.), Plantago, *Plantanus* and Salicaceae (*Populus* and *Salix*).

After 15 min, the reaction was read and evaluated according to the Standardization Committee of the Northern Scandinavian Society of Allergy (1).

Results

The data provided by the aerobiological monitoring stations enabled us to draw up a generic pollen calendar (Fig. 3) showing the 15 most important pollens from an aerobiological and allergological point of view. The findings are subdivided by region into north and south.

In addition, aerobiological calendars for a few taxa of greater clinical relevance (Gramineae, Urticaceae, Compositae and Oleaceae) are reported. These were drawn from 12 centers representing all parts of the country and refer to 1988 (Figs. 4 and 5).

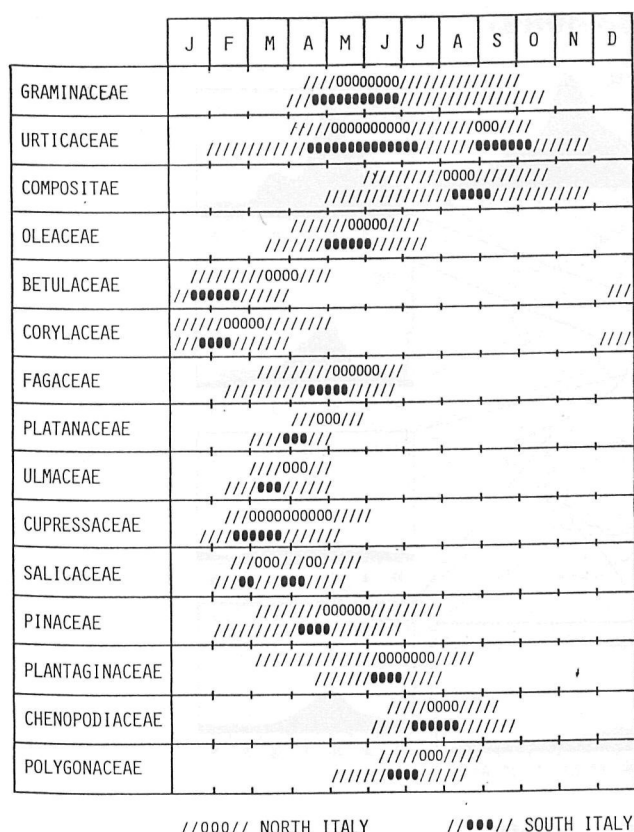


Fig. 3. Pollination periods of some allergenic plants. Comparison between the north and south of Italy.

Table 1 shows the percentages of positive skin tests for the main allergenic pollens (*Gramineae*, *Parietaria*, *Olea*, *Compositae* and *Betulaceae-Corylaceae*) among 49 660 pollinosis patients of both sexes tested by the 40 clinical centers. The national averages are given in the first column, while the other 3 columns show the ranges most frequently found in the north, center and south. The last column shows the maximum prevalence rates recorded in 6 cities.

Analysis of the clinical cases revealed a slight prevalence of males over females (55% vs. 45%). Pollinosis most frequently affects patients from the second through the fourth decade of life and declines progressively in the elderly. The clinical symptoms encountered in this survey were conjunctivitis and/

or rhinitis (55.7%) and broncho-asthmatic syndrome (44.3%).

The following observations were made regarding the plant family of greatest clinical relevance:

Gramineae. This family includes numerous genera, both wild and cultivated, which are found all over Italy, including urban areas. The pollination period runs from April to June, though in southern regions it may extend to August or even September. The highest pollen concentration is found in the Padana Plain, where 70% to 85% of pollinosis sufferers are sensitised. *Gramineae* also abound in some localities on the slopes of the Central Appenines, in Campania and Sardinia; in the south of Italy sensitivity reaches 30%–50%. This family is, therefore, of primary importance throughout Italy, with 64.6% of patients sensitised nationwide.

Urticaceae. The most notable genus of this family is *Parietaria*. This typical representative of Italian flora grows wild and abundantly on walls, ruins, roadsides and ditches all over Italy below 1000 meters. Concentrations of airborne pollen are particularly high in southern areas (including the islands), along the Ligurian coast and in some eastern areas of the Padana Plain. In these parts of the country, airborne pollen is present in varying quantities practically all year round. Pollination has 2 peaks: the first from April to June, and the second from August to September with a drop in between in areas where the summers are very dry. In the northern regions pollination begins later (May) and continues uniformly until September. Sensitivity to *Parietaria* can be detected in 36.7% of pollinosis sufferers nationwide. In the north figures range from 10% to 40% with a high of 71% along the Ligurian coast. Values of around 52% are found in central-southern regions with peaks up to 80% along the coasts of Sicily and Campania.

Compositae. The pollination period runs from spring to summer. For *Artemisia*, however, which is the most common source of airborne pollen, it extends to the autumn. Sensitivity is 13.2% nationwide: from

Table 1. Prevalence of principal skin positivities in 49,660 pollinosis patients, subdivided by region, (most frequent average values, and maximum values recorded in 6 Italian cities)

Pollen	% Italian average	% Positive skin test			
		North Italy	Middle Italy	South Italy	Max. value
<i>Gramineae</i>	64.6	70–85	65–75	30–50	83 Milano, 88 Bologna
<i>Urticaceae (Parietaria)</i>	36.7	10–40	30–60	30–60	71 Genova, 80 Napoli
<i>Compositae</i>	13.2	15–16	10–11	12–14	20 Milano, 31 Trento
<i>Oleaceae (Olea)</i>	15.8	6–8	14–16	21–23	15 Genova, 30 Bari
<i>Betulaceae-Corylaceae</i>	7.0	12–14	5–6	1–2	24 Trento, 27 Milano

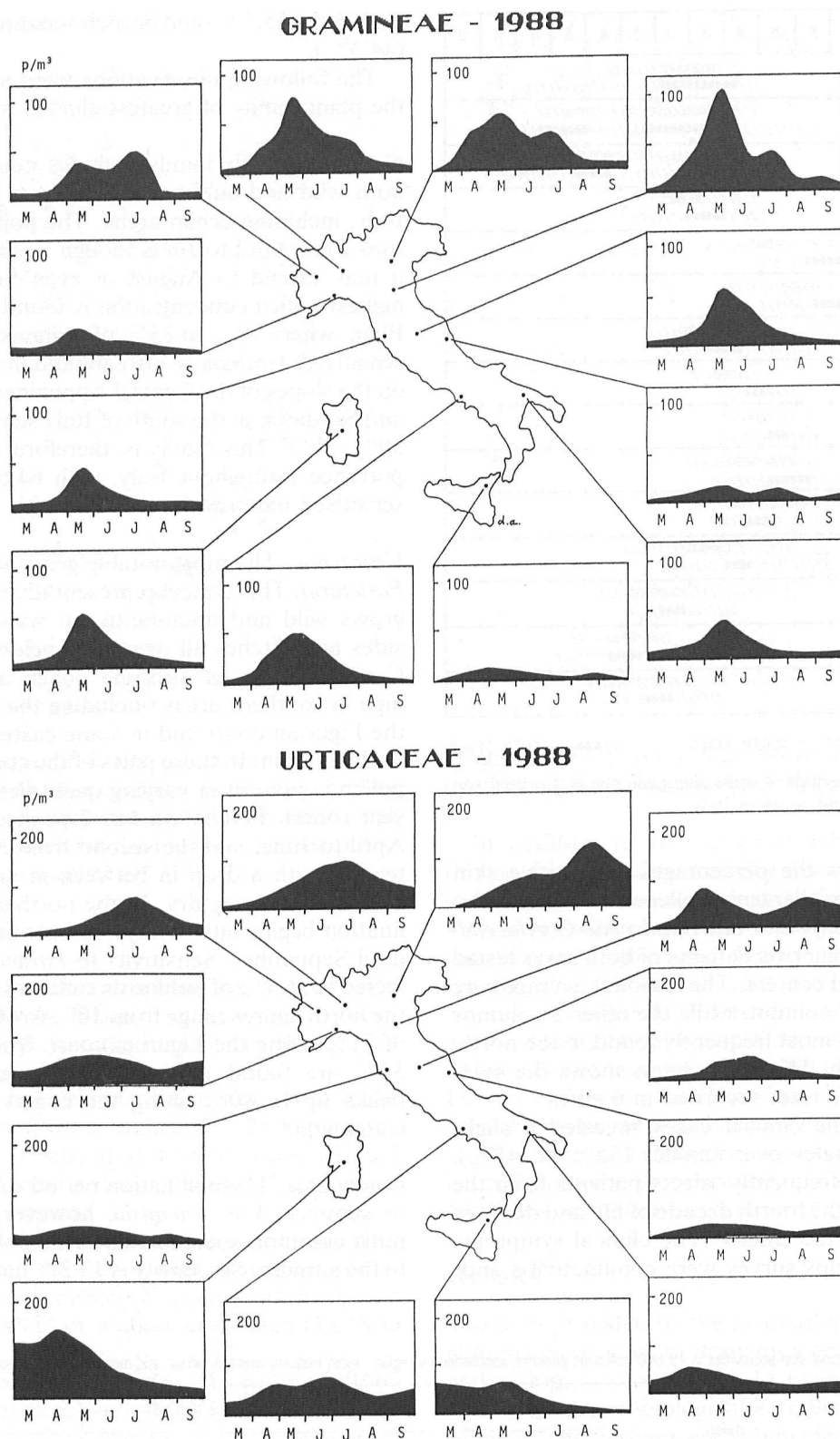


Fig. 4. Aerobiological calendars for *Gramineae* and *Urticaceae* (*Parietaria*) at 12 sampling centers for the year 1988.

15% to 16% in the north, with peaks up to 31% in the north-east, and 13% in the south.

Oleaceae. The pollination period is rather early, beginning around April and continuing until July. *Olea europaea* is widely cultivated in coastal areas of the

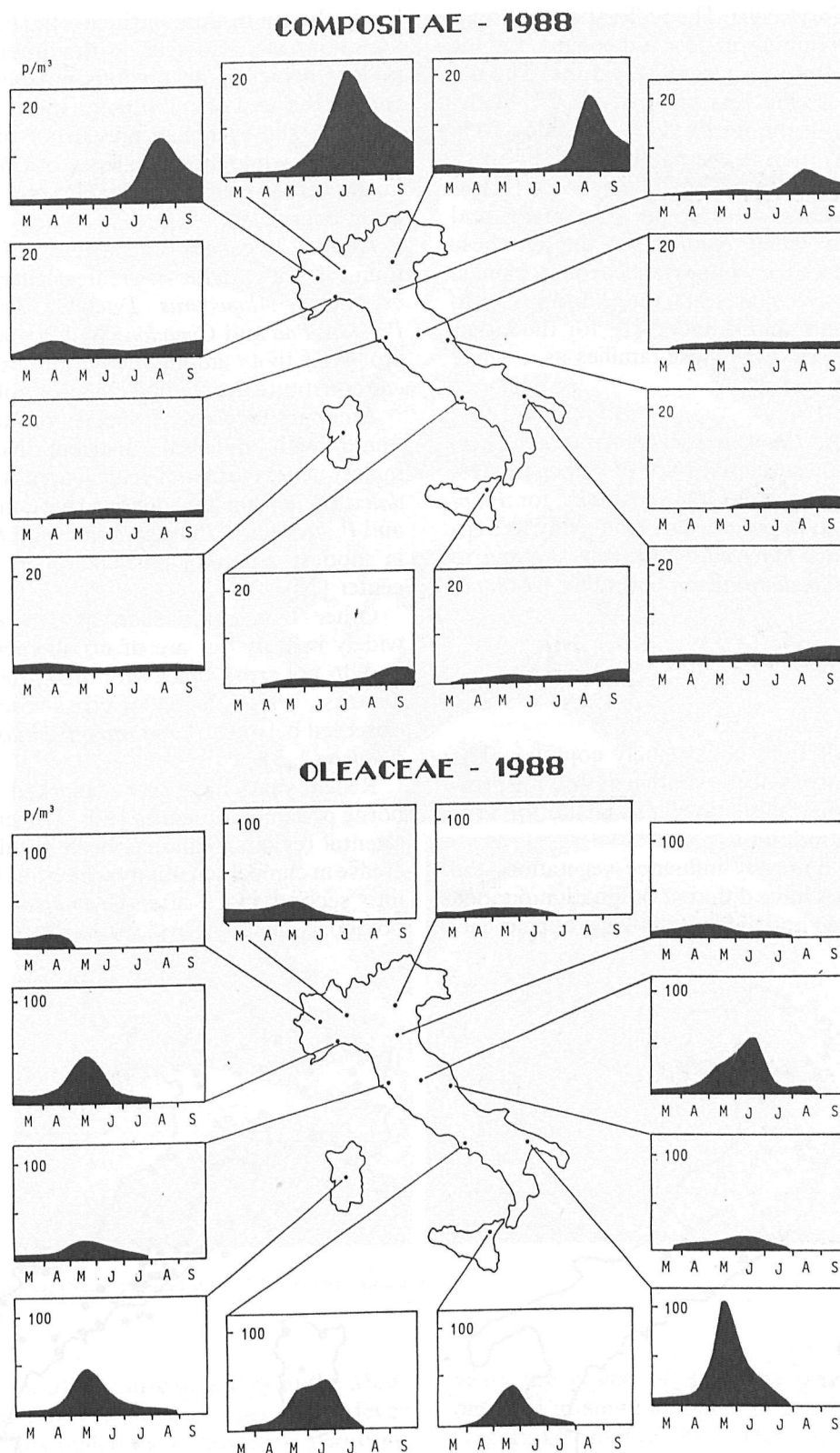


Fig. 5. Aerobiological calendars for *Compositae* and *Oleaceae* at 12 sampling centers for the year 1988.

Italian peninsula and the islands and its presence correlates directly with the high frequency of sensitivity (15%–25%) recorded in these same areas. In

the north and in continental regions, sensitivity rarely exceeds 5%, a far lower value than the national average of 15.8%.

Betulaceae and *Corylaceae*. The pollination season is early in Italy, beginning in December and, for the various genera, continuing until May-June. The national average for skin test positivity is 7% with a higher frequency in the north (13%, reaching 24% in the north-east) than in the south (1%).

Other trees. Although pollens of *Fagaceae* (*Fagus* and *Quercus*) and *Cupressaceae* (*Cupressus* and *Thuja*) have been widely recorded in the air, these families are of secondary importance from a clinical standpoint: positive skin tests range from 7% to 15% for the former and number 4% for the latter. The pollination period for these families as a whole is from February to July.

Plantaginaceae and *Chenopodiaceae*. Among the herbaceous plants, these families are of rather modest allergological importance (4% sensitivity for *Plantago*). The pollination period runs from May to September for *Plantago lanceolata* and from summer to autumn for *Chenopodium album* and other *Chenopodiaceae*.

Discussion

The geography of Italy is extremely complex. The length of the country's north-south axis and the presence of mountains, hills and plains make for very varied climatic conditions.

These factors naturally influence vegetation; the same plant species have different pollination periods in different regions and airborne pollens appear ear-

lier in the south than in the north (Fig. 3). Regional variations are also seen in the amount of airborne pollens, which is an obvious indicator of the presence in the area of a particular species (5). Fig. 5, for example, shows a clear prevalence of *Compositae* in the north, while the prevalence of *Oleaceae* is found in the center-south, the islands and along the Ligurian coast (19).

About 120 genera (442 species) of *Gramineae* are found in Italy, those of greatest allergological interest being *Alopecurus*, *Dactylis*, *Festuca*, *Lolium*, *Phleum*, *Poa* and *Cynodon*. With a marked allergenic cross-reactivity among the various species, *Gramineae* constitute the leading cause of pollinosis in Italy.

Among *Urticaceae*, 5 species of *Parietaria* can be found with different distributions: *P. officinalis*, mainly in northern and central areas (Fig. 6A); *P. judaica* or *diffusa*, throughout the country (Fig. 6B); and *P. lusitanica*, *P. mauritanica* and *P. cretica* found in modest amounts particularly in the south and center (22).

Other *Urticaceae*, such as *Urtica dioica*, grow widely in Italy but are of no allergenic importance and do not cross-react with the *Parietaria* genus. By contrast, a high degree of cross-reactivity has been observed between *Parietaria officinalis* and *Parietaria judaica* (4, 8).

Recent years have seen a marked increase in airborne pollen of *Parietaria* (Fig. 7) even in Italy's continental regions. This has been paralleled by an increase in clinical sensitivity which has lifted *Parietaria* into second place after *Gramineae* as a cause of pollinosis in Italy.

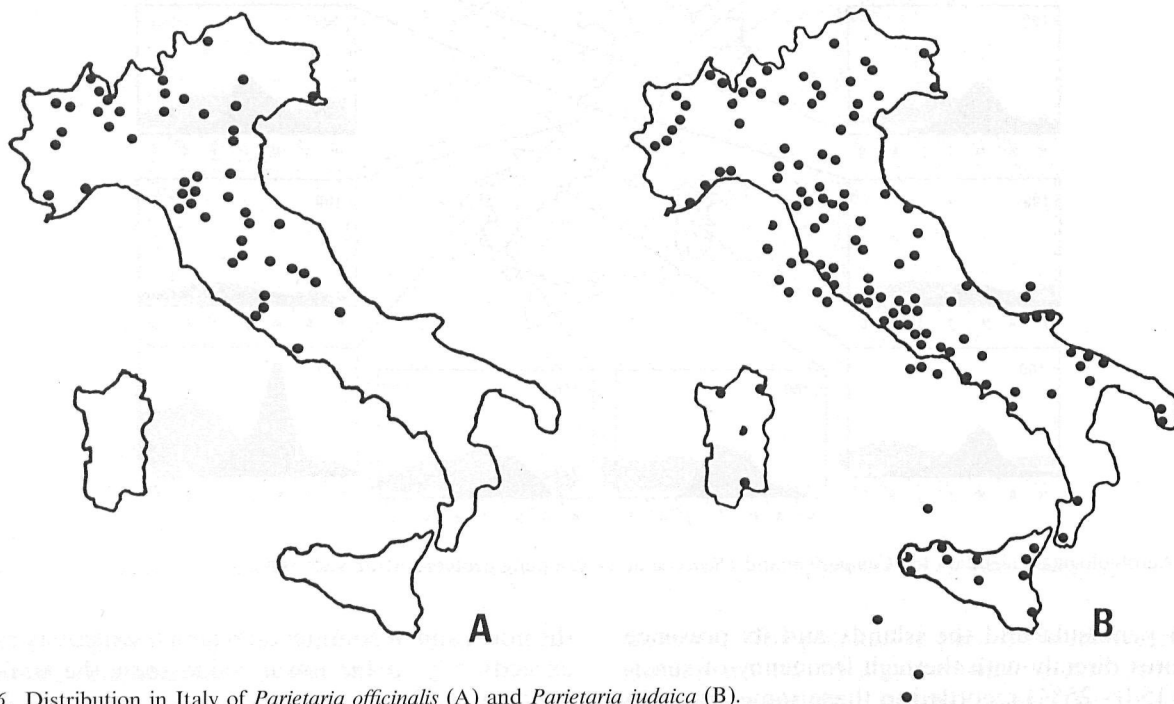


Fig. 6. Distribution in Italy of *Parietaria officinalis* (A) and *Parietaria judaica* (B).

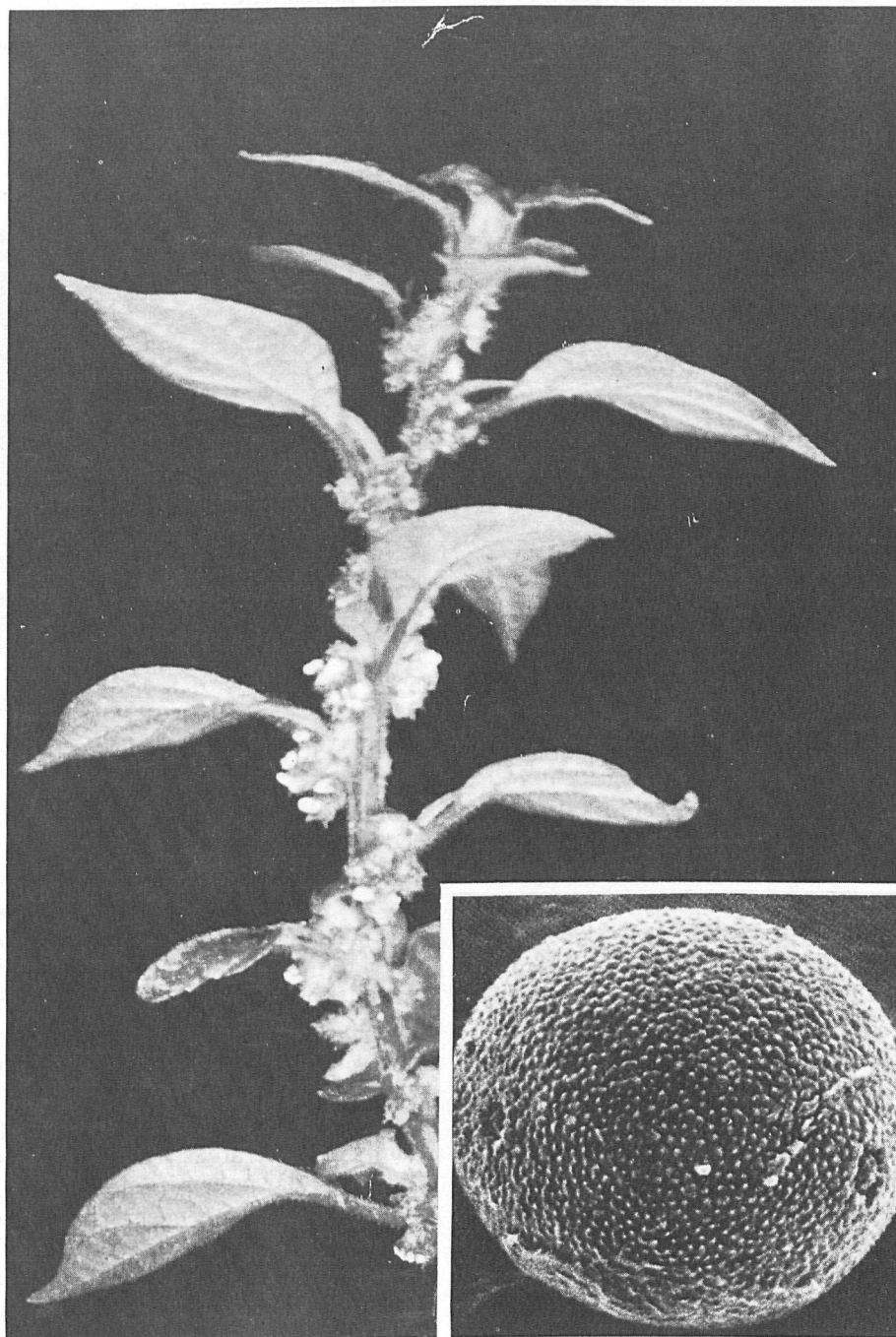


Fig. 7. Plant and pollen (SEM photograph) of *Parietaria judaica*.

Parietaria is a leading cause of allergy in the Mediterranean area (10, 19). A few cases of hayfever brought on by this pollen have, however, also been reported in other parts of Europe, as recently happened in Southampton in the UK (12).

The number of genera of the *Compositae* family in Italy is high (approx. 120 comprising 690 species). Pollination is mainly entomophilous, with *Artemisia* showing the greatest aerial presence. In the last few

years the pollen of *Ambrosia* (ragweed) has been detected in small amounts in a few regions of Italy (Liguria, Piemonte, etc.). This can be linked to the spread of a few species of American origin (*A. artemisiifolia*, *A. trifida*, *A. coronopifolia*, etc.). Rare cases (2%) of sensitivity have also been reported (16).

Sensitivity to *Compositae* is uncommon in Italy, unlike in the USA, where it is the leading cause of

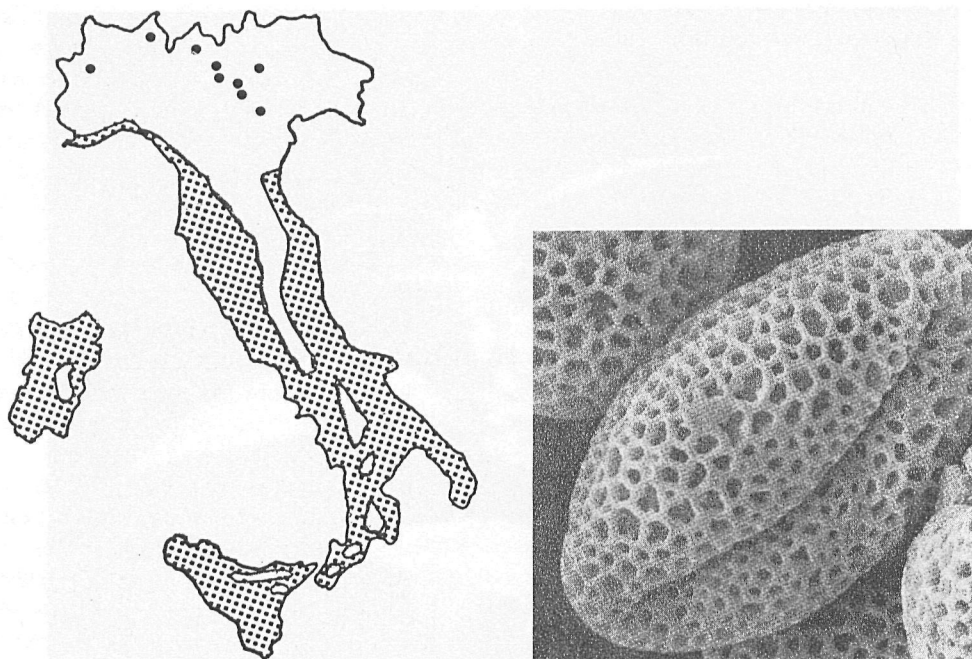


Fig. 8. Distribution in Italy of *Olea europaea* and pollen (SEM photograph).

pollinosis (15). It should be remembered, however, that incidental sensitisation may occur occupationally or even via ingestion in the case of mainly entomophilous pollen (7). In pollinosis caused by *Compositae* a simultaneous hypersensitivity to celery may also occur, while pollinosis caused by *Ambrosia* is often associated with a hypersensitivity to melons and bananas (2, 27).

The family of *Oleaceae* is extremely widespread in the whole Mediterranean basin, where the genus *Olea* is cultivated as a foodstuff. Since our first reports of sensitivity to *Olea* (Fig. 8) in Liguria, allergologists in Italy have taken an increasing interest in this genus, rather than in the other genera of the family (*Fraxinus*, *Phillyrea* and *Ligustrum*); *Olea* is the third most frequent cause of pollinosis (3, 9).

The *Betulaceae* and *Corylaceae* families, which include the genera *Betula*, *Alnus*, *Carpinus*, *Ostrya* and *Corylus*, show a close systematic affinity. A typical allergenic cross-reactivity between the two families has repeatedly been observed (18, 26). Moreover, in subjects allergic to these families, an allergic oral syndrome (AOS) may occur with regard to certain vegetable foodstuffs, in particular: pears, apples, nuts, carrots, fennel, etc. (21).

Regarding symptomatology, the analysis of the study population revealed conjunctivitis and/or rhinitis in 55.7% of cases. Bronchial asthma appeared in 44.3%, frequently as a morbid development of oculo-rhinitis (31.6%); in 12.7% of patients, however, it was the only symptom present.

Bronchial asthma affected 52% of patients allergic only to *Parietaria*; in the south and center of the country this value reached 60%. The figure among subjects monosensitised to *Gramineae* was 40%. Another interesting finding to emerge from this survey was the high incidence (around 60%) of asthmatic symptoms in patients monosensitised to *Olea*. This finding, however, requires further investigation in view of the rarity of cases of monosensitisation to this pollen.

Monosensitisation to a given pollen appears mainly in those areas where a high concentration of that particular pollen is found. Thus, in the north of Italy, where *Gramineae* abound, monosensitisation is mainly due to the pollen of that family (67.8%). Similarly, *Parietaria* is responsible for 55.6% of the cases of monosensitisation in the south but for only 23.2% in the north. The figures for *Olea* are 10.6% in the south and center and 1.7% in the north. Cases of pollinosis due only to *Compositae* or to *Betulaceae-Corylaceae* are rare: 7.0% and 6.3% respectively in the north. The most frequent associations observed among the various pollen families are: *Gramineae* with *Parietaria*, *Gramineae* with *Compositae*, *Gramineae* and/or *Parietaria* with *Olea*, and *Gramineae* and/or *Parietaria* with *Betulaceae-Corylaceae*. Certain conclusions can be drawn from an analysis of the botanical-aerobiological and clinical-diagnostic data obtained from the various Italian centers. Italy's particular geographic and climatic conditions facilitate the growth of a few typical plant species which pro-

duce allergenic pollens. We can distinguish three main pollen seasons correlated with clinical symptoms:

- **winter-pre-spring:** from December to March, for trees (*Betulaceae*, *Corylaceae*, *Cupressaceae* and others);
- **spring-summer:** from April to June, the most important season, with pollens of trees and herbaceous plants (*Fagaceae*, *Oleaceae*, *Gramineae*, *Urticaceae*, *Plantago*);
- **summer-autumn:** from August to September (*Compositae*, cf. *Artemisia*, *Chenopodiaceae*, plus *Urticaceae* and others).

Sensitisation to *Parietaria* and *Olea* constitutes the most typical feature of pollinosis in Italy on account of the tendency of these pollens to cause broncho-asthmatic syndrome and because of the duration of the symptoms, which, in the case of *Parietaria*, may last for several months of the year. In this respect, pollinosis in Italy differs from pollinosis in other parts of Europe.

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References

1. AAS K, BELIN L. Standardization of diagnostic work in allergy. *Acta Allergol* 1972; 27: 439–68.
2. ANDERSON LB, DREYFUSS EM, LOGAN J. Melon and banana sensitivity coincident with ragweed pollinosis. *J Allergy* 1970; 45: 310–4.
3. AROBBA D, NEGRINI AC. Etude aérobiologique des Oleacées à Gênes (Italie) de 1981 a 1983. *Grana* 1985; 25: 205–13.
4. BOUSQUET J, HEWITT B, GUÉRIN B, DHIVERT H, MICHEL FB. Allergy in the Mediterranean area. II. Cross-allergenicity among *Urticaceae* pollen (*Parietaria* and *Urtica*). *Clin Allergy* 1986; 16: 57–64.
5. CARAMIELLO R, SINISCALCO C. Presenza di specie di interesse allergologico nei vari settori floristici italiani. *Proc. 3rd Congr Naz Associaz Ital Aerobiol*, Pavia 1988; 21–22 Sept: 93–103.
6. CHARPIN J, SURINYACH R. Atlas of European allergenic pollens. Sandoz Ed., Paris, 1974.
7. COHEN SH, YUNGINGER JW, ROSENBERG N, FINK JM. Acute allergic reaction after Composite pollen ingestion. *J Allergy Clin Immunol* 1979; 64: 270–4.
8. CORBI AL, PELAEZ A, ERRIGO E, CARREIRA J. Cross-reactivity between *Parietaria judaica* and *Parietaria officinalis*. *Ann Allergy* 1985; 54: 142–7.
9. D'AMATO G, MULLINS J, NOLARD N, SPIEKSMAS FTM, WACHTER R. City spore concentrations in the European Economic Community (EEC). VII. *Oleaceae* (*Fraxinus*, *Ligustrum*, *Olea*). *Clin Allergy* 1988; 18: 541–7.
10. D'AMATO G, LOBEFALO G. Allergenic pollens in the southern Mediterranean Area. *J Allergy Clin Immunol* 1989; 83: 116–22.
11. HIRST JM. An automatic volumetric spore trap. *Ann Appl Biol* 1952; 39: 257–65.
12. HOLGATE ST, JACKSON L, WATSON HK, GANDERTON MA. Sensitivity to *Parietaria* pollen in the Southampton area as determined by skin-prick and RAST tests. *Clin Allergy* 1988; 18: 549–56.
13. JELKS ML, SOLOMON WR. Airborne allergens. In: KAPLAN AP, ed. *Allergy*. New York: Churchill Livingstone, 1985: 255–320.
14. KUMER E. Monitoraggio delle particelle aerodisperse. *Boll Acc Gioenia Sci Nat* 19, 1986: 328: 251–71.
15. LEWIS WH, VINAY P, ZENGER VE. Airborne and allergenic pollen of North America. Baltimore, MD: Johns Hopkins University Press, 1983.
16. LOMAGNO R, MONTACCHINI F, POLINI V, GALLESIO MT, FURNO F. Diffusione del genere *Ambrosia* in Piemonte e nota preliminare sulla sua rilevanza allergologica nella nostra casistica. *Folia Allergol Immunol Clin* 1984; 31: 151–8.
17. MANDRIOLI P, LOBIETTI A. La rete italiana ed europea per il controllo dei pollini allergenici aerodiffusi. *Proc 3rd Congr Naz Associaz Ital Aerobiol*, Pavia 1988; 21–22 Sept: 249–51.
18. NEGRINI AC, DELBONO G, EBBLI A, TROISE C, VOLTOLINI S, AROBBA D. La sensibilizzazione al polline delle piante arboree. II. Valutazione aeropollinica e clinica. *Folia Allergol Immunol Clin* 1987; 34: 291–8.
19. NEGRINI AC, AROBBA D, EBBLI A, TROISE C, VOLTOLINI S. Le calendrier pollinique de Gênes. Considerations aéro-palynologiques, météorologiques et cliniques. *Rev Fr Allergol* 1987; 27: 65–70.
20. NEGRINI AC. Pollinosis in Italy. In: *Pollinosis in the Mediterranean area*. Proceedings, Naples, 16–18 March, 39–42, R. Curto, Naples, 1989.
21. ORTOLANI C, ISPARNO M, PASTORELLO E, BIGI A, ANSALONI R. The oral allergy syndrome. *Ann Allergy* 1988; 61 (II part): 47–52.
22. RAFFAELLI M. Note corologiche sulle specie italiane del genere *Parietaria* L. *Webbia* 1977; 31: 49–68.
23. SOLOMON WR, MATHEWS KP. Aerobiology and inhalant allergens. In: MIDDLETON E Jr, REED CE, ELLIS EF, ADKINSON NF Jr, YUNGINGER JW, eds. *Allergy: principles and practice*. 3rd ed. St. Louis: C.V. Mosby, 1988: 312–72.
24. SPIEKSMAS TM. Allergenic plants in different countries. III. Grasses and grass-like plants. In: FALAGIANI P, ed. *Pollinosis*. Boca Raton, FL: CRC Press, 1990: 24–7.
25. WATSON HK, ROOKE MB. A proposed unitage system for allergen extract. *Allergy* 1982; 37 (Suppl 1): 24–5.
26. WEBER RW. Cross-reactivity among pollens. *Ann Allergy* 1981; 46: 208–12.
27. WÜTHRICH B, HOFER T. Food allergy: the celery-mugwort-spice syndrome. *Dtsch Med Wochenschr* 1984; 109: 981–5.

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