SEASONAL RESPIRATORY ALLERGY AND THE ASSOCIATED POLLENS IN SOUTH AFRICA

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Some 15 years ago[1] details were given of the plants associated with seasonal respiratory allergy (hay fever, asthma) in South Africa. It was shown that pollinosis in South Africa is almost entirely a summer condition caused by the inhalation of the pollen of the grasses which flower during this period. Tree pollinosis occasionally occurs, mainly from the pollens of the plane (*Platanus* spp.), poplar (*Populus* spp.) and oak (*Quercus* spp.) in the spring, and the cypress (*Cupressus* spp.) in the winter-spring period. Pollinosis from weeds is hardly ever met with in South Africa, in striking contrast to the USA, where ragweed (*Arbrosieae*) pollen heads the list of aetiological agents of seasonal (autumn) hay fever. The ragweed does not occur in South Africa, although other weeds such as goose-foot (*Chenopodiaceae*) and pigweed (*Amaranthaceae*) are sometimes found in old or cultivated lands or waste places, usually in sparsely populated regions.

In this paper, as a result of considerable field and clinical experience obtained over the years, knowledge of the atmospheric pollens has been brought up to date and detailed charts of the pollination times of the more significant plants are provided to facilitate the correlation of seasonal respiratory allergy with the associated pollens in the atmosphere at the time.

For many years now atmospheric pollen surveys have been systematically carried out by the regular exposure to the atmosphere of specially prepared slides. These exposures have been made on top of a high building in Johannesburg. The findings reported, however, can be taken to represent the Highveld as a whole. Similar slide exposures have been made elsewhere in the country and the results will be reported in due course.

The seasons in South Africa are broadly: *Winter* — June - August; *spring* — September - November; *summer* — December - February; *autumn* — March - May.

The greater portion of South Africa has an elevation of more than 3,000 feet above sea level, while the area below 1,500 feet consists of a narrow fringe around the coast. The land surface rises in four plateaux, of which the coast plateau rises to about 500 feet and the inner-

most plateau — the Highveld — to about 4,000 - 6,000 feet. The Highveld, in which Johannesburg lies, occupies the inland plateau in the southern Transvaal, Orange Free State and parts of Natal and Basutoland. These are the regions of spring and summer rainfall, and cold, dry winters. The average temperatures for mid-winter and summer in Johannesburg, for example, are respectively 38 - 61°F. and 56 - 79°F., and the corresponding rainfall is 0·18 and 5·37 inches. The Bushveld occupies the northern Transvaal and portions of the eastern Transvaal, Swaziland and northern Natal. The Lowveld represents the low country in the extreme eastern and northern Transvaal. Mixed savannah country, consisting of open bush with an undergrowth of grass or low shrubs, covers the greater part of the coastal belt and the foot hills in the south-eastern parts of the country. Bush savannah country includes the region of the northern part of the Cape Province lying west of the Transvaal and the Orange Free State. Much of the territory on the west of South Africa consists of semi-desert vegetation where there is hardly any grass. In the south-west Cape, in which Cape Town is the principal coastal city and which has a winter rainfall, the vegetation is of the sclerophyll type with relatively little grass.

GRASS POLLEN

The natural grasslands of the country (Fig. 1) correspond almost entirely to the inland Highveld plateau in the

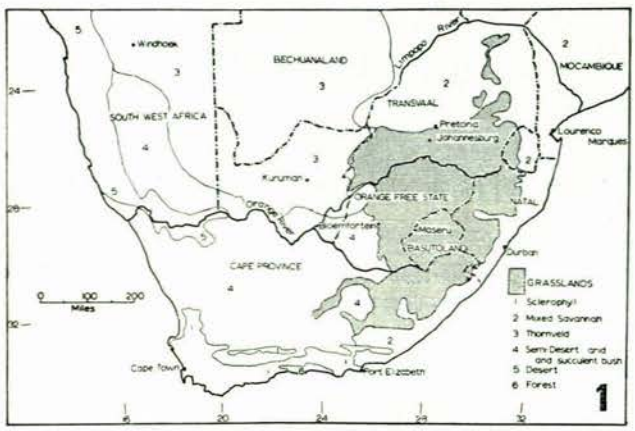

Fig. 1. Map of the Republic of South Africa showing the approximate distribution of the principal vegetation types. The grasslands are shown as stippled areas.

southern Transvaal, the Orange Free State and parts of Natal and Basutoland. Apart from these natural grasslands grass is present, but to a considerably lesser extent, elsewhere and cases of summer grass pollinosis thus come to notice in other parts of the country. Strictly summer hay fever, where the condition is confined to the months of December, January and February, is uncommon — 'summer' hay fever generally occurs from late spring to early autumn.

Fig. 2 shows the monthly incidence of grass pollen in the atmosphere of Johannesburg in the 10-year period 1953 - 1962. In Fig. 3 the monthly data of incidence for each year have been superimposed and the average monthly incidence over the period (1949 - 1959) indicated

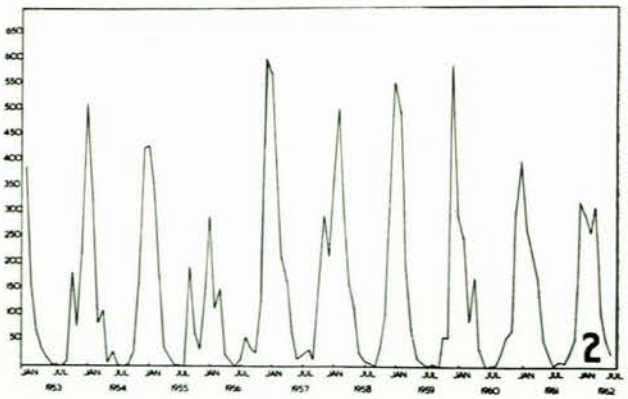

Fig. 2. Atmospheric pollen survey in Johannesburg. Chart shows the number of grains of grass pollen per sq. cm. in each month of the year in the period 1953 - 1962.

by a heavy black line. It will be observed that grass pollen begins to appear in the air in September - October, is at its maximum in December - February, and gradually lessens to disappear in March - April.

From evidence already available in our investigations of pollens in other parts of South Africa it has become evident that the flowering period of many species of grasses extends to June, i.e. early winter. In such regions — mainly in the Lowveld where temperature and humidity

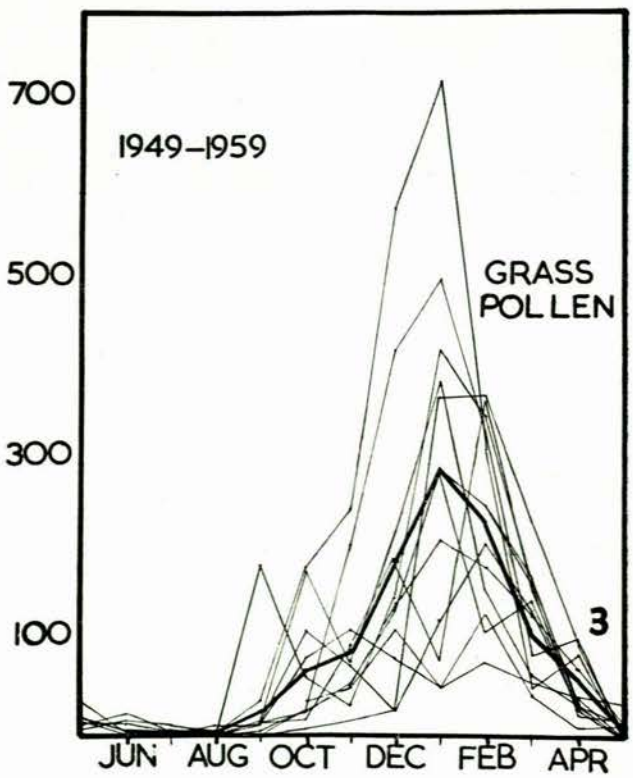

Fig. 3. Atmospheric pollen survey in Johannesburg. Chart shows the number of grains of grass pollen per sq. cm. for each month of the year in the period 1949 - 1959. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

are higher than in the Highveld — the possibility of grass-pollen hay fever should be borne in mind even though symptoms continue to occur when summer is over.

COMPOSITAE POLLEN

The compositae group of plants includes garden flowers (daisies, dahlias, asters, marguerites, chrysanthemums, zinnias, sunflowers, etc.) as well as the veld weed composites of the Highveld, principally cosmos *(Cosmos bipinnata)* and khakiweed *(Tagetes minuta)*. The latter two flower in the late summer in the Transvaal and are found in moderate quantity in some parts of the country; they are probably responsible for occasional cases of hay fever on the Highveld. In addition, especially in the Karroo and in the western part of the Cape Province, compositae flowers (arctotis, gazania, ursinia, Namaqua and other daisies, etc.) cover the veld in great profusion in the spring. These wild flowers generally occur, however, in regions rather sparsely populated, and consequently compositae pollinosis is seldom of significance.

Fig. 4 shows that over an 11-year period the compositae pollen incidence in the atmosphere was relatively low and

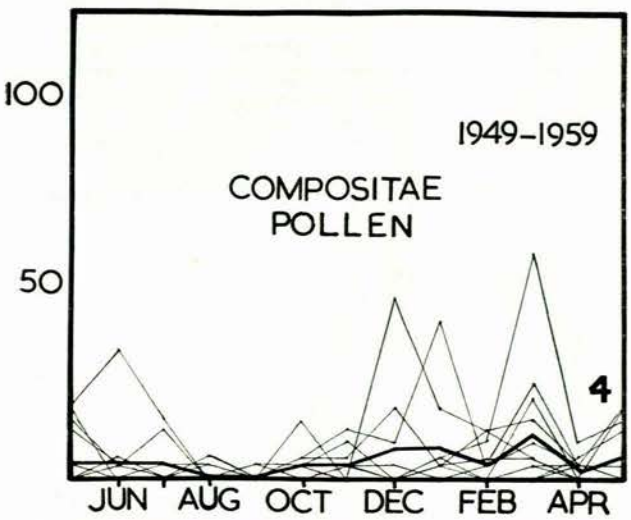

Fig. 4. Atmospheric pollen survey in Johannesburg. Chart shows the number of compositae pollen grains per sq. cm. for each month of the year in the period 1949 - 1959. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

without seasonal exacerbation. Small increases do occur from time to time, but without any significant regularity. In general, however, the compositae, whether cultivated or wild, are not allergenically significant except to the occasionally specifically sensitive person who is periodically in intimate contact with the plants and thus inhales the essentially insect-borne pollen of these plants, e.g. horticulturists, florists, or gardeners.

In a rather high proportion of instances in our experience grass-pollen skin-sensitive persons give positive skin reactions to compositae pollen also. The question of a common antigen in these two pollens is under investigation. In a relatively few instances, however, patients may show a positive skin reaction to compositae pollen alone.

TREE POLLINOSIS

1. *Spring-flowering Trees*

The important trees pollinating in the spring — August and September — are plane (*Platanus* spp.), poplar (*Populus* spp.) and oak (*Quercus* spp.). Cases of pollinosis from these sources occasionally come to notice and patients with a respiratory allergy confined to or aggravated during this period should be submitted to confirmatory skin tests with the pollens of these trees. Sometimes positive skin reactions are obtained in these persons to more than one of these tree pollens. Investigations are in progress to

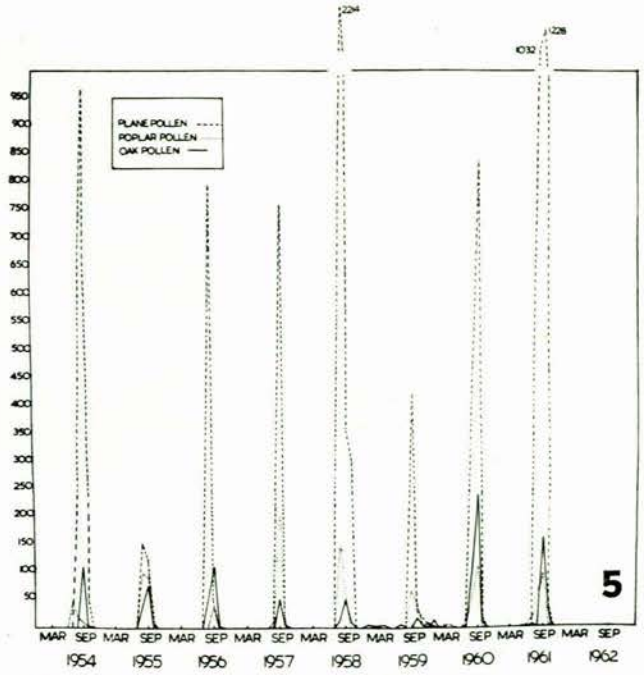

Fig. 5. Atmospheric pollen survey in Johannesburg. Chart shows the number of pollen grains per sq. cm. of the spring-flowering trees — plane, oak and poplar — in each month of the year in the period 1954 - 1962.

determine whether such multiple skin sensitivities do in fact reflect corresponding multiple clinical sensitivities. In the meantime, in such cases preseasonal desensitization is advised with the extracts of the pollens to which the patient has given a positive skin reaction, commencing a few months before the beginning of spring, i.e. in April or May.

The spring incidence of these pollens in the period 1954 - 1962 is shown in Fig. 5. It will be seen that the flowering time of these trees is almost entirely confined to August and September.

2. *Winter - spring Flowering Trees*

The cypress (*Cupressus* spp.) flowers from about May to October,[2] with a maximum incidence of atmospheric pollen in July, and the possible cypress pollen factor in respiratory allergy occurring in this winter - spring period should be borne in mind and confirmed by skin testing. Fig. 6 shows the seasonal occurrence of cypress pollen in the atmosphere in Johannesburg.

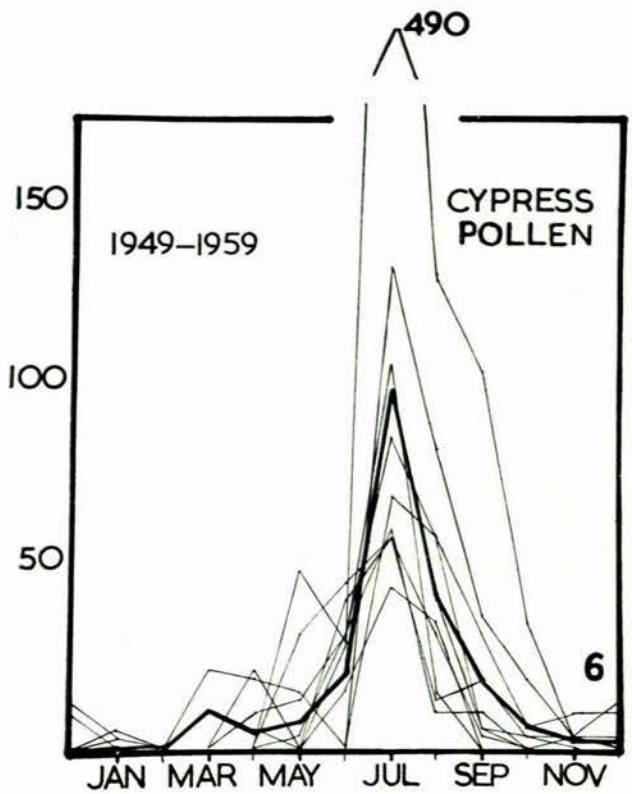

Fig. 6. Atmospheric pollen survey in Johannesburg. Chart shows the number of cypress pollen grains per sq. cm. for each month of the year in the period 1949 - 1959. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

The cypress tree is fairly common in the Transvaal, the Orange Free State and the eastern part of the Cape Province, where it is grown largely for hedges or as a garden tree.

3. *Summer-flowering Trees*

The pepper tree (*Schinus molle*) and privet (*Ligustrum* spp.) flower largely during the summer. The importance of knowing this is to avoid overlooking the possibility of their pollens being the aetiological agent of summer respiratory allergy where the expected skin reactions to grass pollen are not obtained. A more remote possibility is that these pollens may be sensitizing agents additional to grass pollen sensitivity in the summer.

(*a*) *The pepper tree* (*Schinus molle*) flowers in the early summer, mainly from October to December, and has in the past been incriminated as a cause of local seasonal hay fevers. No definite evidence has so far been obtained to support the suggestion that this pollen gives rise to specific sensitization. In all cases investigated there has been an associated sensitivity to grass pollen and desensitization with extracts of the latter alone has invariably been successful. It may be that the suspicion of pepper-tree pollen sensitivity has arisen because of the fact that the anthers with their sticky pollen attached become dry and friable in warm weather, and the resulting dust acts as an irritant to the nasal mucosa in basically allergic persons. Fig. 7 illustrates the incidence of pepper-tree pollen.

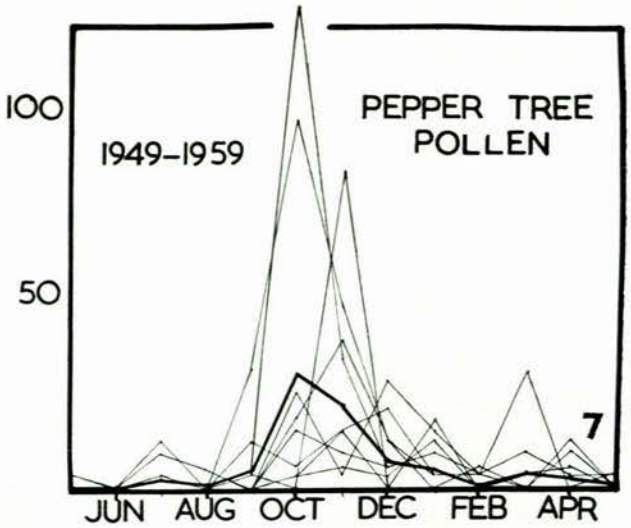

Fig. 7. Atmospheric pollen survey in Johannesburg. Chart shows the number of pepper-tree pollen grains per sq. cm. for each month of the year in the period 1949 - 1959. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

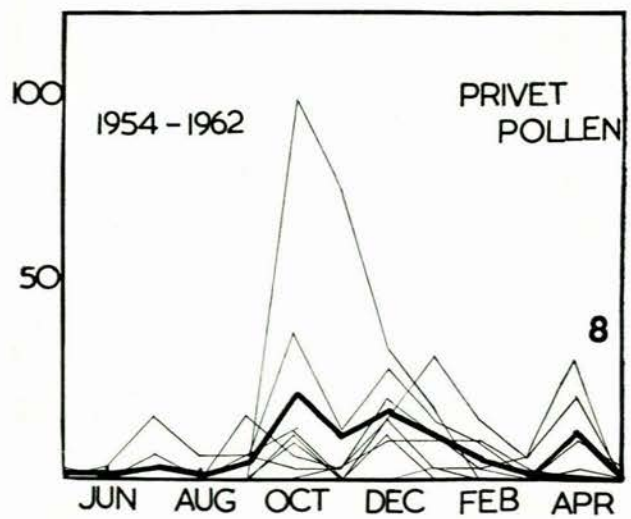

Fig. 8. Atmospheric pollen survey in Johannesburg. Chart shows the number of privet pollen grains per sq. cm. for each month of the year in the period 1954 - 1962. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

(*b*) *Privet* (*Ligustrum* spp.) flowers in the summer and positive skin reactions are not infrequently obtained to this pollen. The pollinating time of privet is shown in Fig. 8 to be from August to April, with a higher incidence from September to January. In view of the fact that the privet flowers approximately at the same time as grasses in the summer, some cases of summer respiratory allergy could possibly be associated with both privet and grass pollens or conceivably with privet alone. An investigation into the significance of privet pollen is in progress.

OTHER TREE POLLENS

Other tree pollens, especially that of acacia, have occasionally been suspected as causative factors in pollen respiratory allergy. Acacia trees (*Acacia* spp.) include the various 'mimosas', the thorn bushes of the Karroo, the Port Jackson willow and the wattle trees in Natal. In Fig. 9 the occurrence of acacia pollen in the atmosphere of Johannesburg from 1949 to 1959 is depicted, indicating a rise in incidence in the April - October period. It is doubtful, however, in spite of general opinion to the contrary, if the pollens of the acacias are of significance in seasonal hay fever. Although reactions are not infrequently obtained to this pollen by skin test, these are almost invariably accompanied by reactions to other inhalant substances much more likely to account for the symptoms.

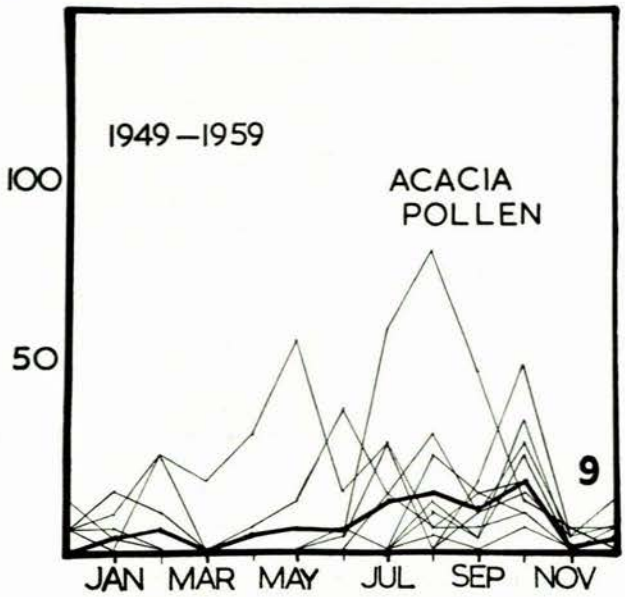

Fig. 9. Atmospheric pollen survey in Johannesburg. Chart shows the number of acacia pollen grains per sq. cm. for each month of the year in the period 1949 - 1959. The figures for each year have been superimposed and the monthly averages are indicated by a heavy black line.

The gymnosperms, of which cypress is a member, include the pine, fir, cedar and juniper trees. These trees flower mainly from September or earlier to December and shed large quantities of pollen, which however is not significantly allergenic.

The prosopis tree[3] (*Prosopis* spp.), found largely in South West Africa, with only occasional instances in South Africa, flowers from August to November. It is not uncommonly responsible for respiratory allergy in districts where it occurs. In South West Africa, however, it should be tested for as a routine in persons with spring respiratory allergy symptoms.

The bluegum (*Eucalyptus* spp.) is often incriminated as a cause of symptoms. This pollen, however, is insect-borne and very little is found in the atmosphere. The same remarks apply to the jacaranda trees which are present in abundance in a number of towns, especially in Pretoria and Johannesburg, and form a striking show of colour in the months of their flowering.

SUMMARY

The findings are given in chart form of a survey over a number of years of the pollens in the atmosphere of Johannesburg, representing the Highveld of South Africa.

The monthly incidence of the pollens is shown to facilitate the correlation of seasonal respiratory allergy (hay fever, asthma, etc.) with the specific pollens involved.

Grass pollen is the principal cause of hay fever in South Africa. The flowering time of the grasses is October - March. This period, however, may be extended to May and June in the Lowveld, where the temperature and humidity are higher than in the Highveld.

During the summer the pepper tree (*Schinus molle*) and privet (*Ligustrum* spp.) are also in flower, but the significance of their pollen as aetiological factors in summer respiratory allergy is doubtful.

Spring pollinosis occurs in September and October and is generally due to the inhalation of the pollens of trees — plane (*Platanus* spp.), poplar (*Populus* spp.) and oak (*Quercus* spp.) — present in the air at that time. The cypress tree flowers in the winter-spring period and seasonal symptoms from about May to October may be due to this pollen. The prosopis tree (*Prosopis* spp.) although uncommon in South Africa, is found in considerable quantity in South West Africa where its pollen is an important cause of respiratory allergy.

The help is acknowledged of the several colleagues who through the years assisted with the regular microscopic examination of the exposed slides and the identification and recording of the pollens found. Thanks are due to Miss D. B. Blecher for help in the preparation of the charts, to Miss E. J. Walker for drawing the map, and to Mr. M. Ulrich of the Photographic Unit of this Institute for the photographs of the charts.

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2. *Idem* (1945): *Ibid.*, **19**, 142.
3. *Idem* (1959): *Ibid* . **33**, 12