

Aerobiological studies based in Galway. A comparison of pollen and spore counts over two seasons of widely differing weather conditions

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(Received 11 December 1978; revised 16 February 1979; accepted for publication 20 February 1979)

Summary

A comparison was made of the pollen and spore counts at Galway in relation to the varying weather conditions of the summers of 1977 and 1978 in an attempt to explain the low incidence of allergies in that area during the summer of 1978. The phenomenon was attributed to the change in the dominant wind direction, which, from May to September 1978 was mainly over sea. Correlations were made between changes in pollen and spore catches and variations in particular meteorological factors for both seasons investigated.

Introduction

Since 1973 pollen and spore counts for the Galway area have been carried out in the Department of Botany, University College, Galway in collaboration with the Department of Therapeutics, Regional Hospital, Galway. The incidence of allergies resulting from air-borne pollen grains and fungal spores in the Galway area during the summer of 1978 was found to be significantly lower than in the corresponding period of recent previous years (B. J. O'Driscoll, personal communication). The widely differing weather conditions of the summers of 1977 and 1978 prompted an investigation of the possible effects of changing meteorological factors on the pollen and spore concentrations in the atmosphere over the area. A comparison was made of the pollen and spore counts in relation to the weather conditions of the summers (May–September) of 1977 and 1978 in an attempt to explain the low incidence of allergies in the area in the summer of 1978.

Materials and methods

The area investigated lies in the immediate vicinity of Galway City (Fig. 1). It is bounded on the north by lakeland and low-lying grassland and on the south by Galway Bay; the west is mainly heath and blanket bog and the eastern part is mainly grassland. Apart from built-up regions the area is devoted mainly to grassland with little tillage and mixed farming.

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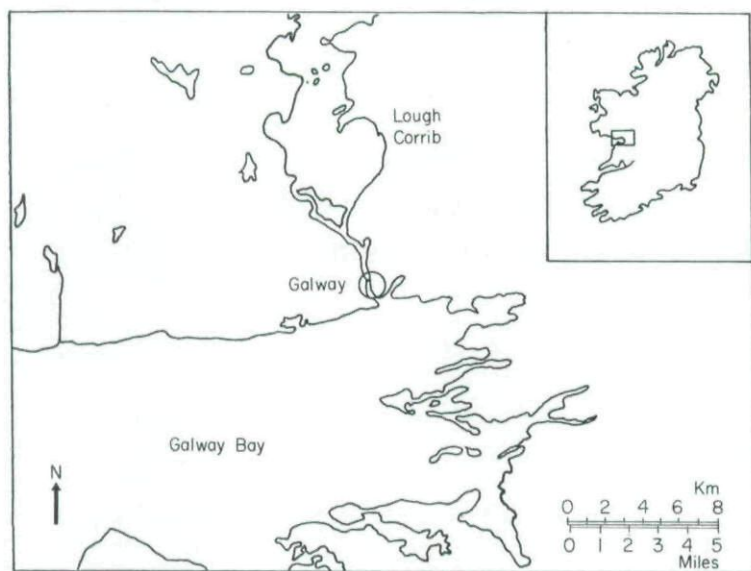


Fig. 1. Survey area.

A Hirst automatic spore-trap was operated continuously about 20 m above ground, on the roof of the Botany Department, University College, Galway. The techniques used for trapping and identification of pollen grains and fungal spores were similar to those described by Hirst (1953). Pollen grains were related to standard taxonomic classes for the purpose of classification; fungal spores were separated into categories which were not homogenous but were varyingly related to standard taxonomic classes and were in general 'form groups'.

Categories: Cladosporium.

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| Basidiospores | — | hyaline plus brown and yellow coloured spores. |
| 'others' | — | filiform and fusiform septate and aseptate spores plus hyaline forms mainly <i>Penicillium</i> , <i>Aspergillus</i> and <i>Botrytis</i> . |

Counts were made at 2-hour intervals and total daily counts were converted to a computed number per cubic metre of air. Counts were not corrected for variations in the efficiency of the trapping. Pollen and spores deposited in clumps were counted as separate individuals.

The meteorological data was supplied by the Department of Experimental Physics, University College, Galway.

Results

Wind direction varied greatly between the two seasons investigated. From May to September 1977 low percentages occurred from the south-west and south-east with a fairly even distribution from all other points (Fig. 2). During the corresponding period of 1978 low percentages occurred from the south-east and east; most of the wind was westerly, southerly and northerly and north-easterly (Fig. 2). The concentration

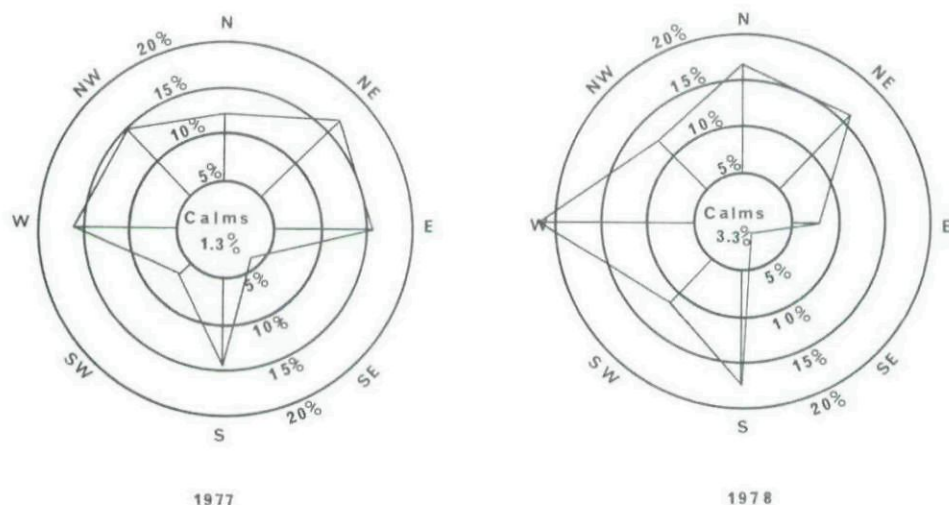


Fig. 2. Relative frequencies of wind direction over Galway from May to September 1977 and 1978 expressed as percentages of the total wind for each season.

changes of pollen, *Cladosporium*, Basidiospores and 'others' are given in Fig. 3 for 1977 and in Fig. 4. for 1978.

Grass pollen dominated the pollen catch both in the 1977 and 1978 seasons; other main components of the catch included *Chenopodium*, *Rumex*, *Urtica*, *Compositae* and tree pollen. The upper parts of Figs 3 and 4 show sunshine (hr), rainfall (mm), mean temperature ($^{\circ}\text{C}$), relative humidity (%), and wind speed (m/sec) which are plotted as five day means; changes in pollen and spore concentrations are plotted as 5-day running means, in the lower parts.

Discussion

The much higher counts for fungal spores throughout the whole season of 1977 compared with the corresponding period in 1978 (Figs 3 and 4) could only be explained by the large difference in the dominant wind direction for the two seasons. During the 1977 season wind direction varied from west through north to east (Fig. 2), which was mainly overland; during the 1978 season the dominant wind direction was westerly, south-westerly and southerly which was mainly over sea. There appears to be a correlation between high temperature and high relative humidity and spore concentration; peak catches were obtained in June, July and August of 1977 (Fig. 3) and in May, June, July and August of 1978 (Fig. 4). Such meteorological factors favour spore production.

In 1977, *Cladosporium* dominated the spore catch with peak values for Basidiospores and 'others' occurring only in July; in 1978 Basidiospores and 'others' accounted for the bulk of the season's catch. This contrast between the two seasons may have resulted from the higher relative humidity and lower sunshine in 1978. Rainfall was less continuous during the 1977 season than in the corresponding period of 1978 yet the higher rainfall levels recorded at various times in 1977 added to the higher peaks of splash-dispersed *Cladosporium* spores in that season.

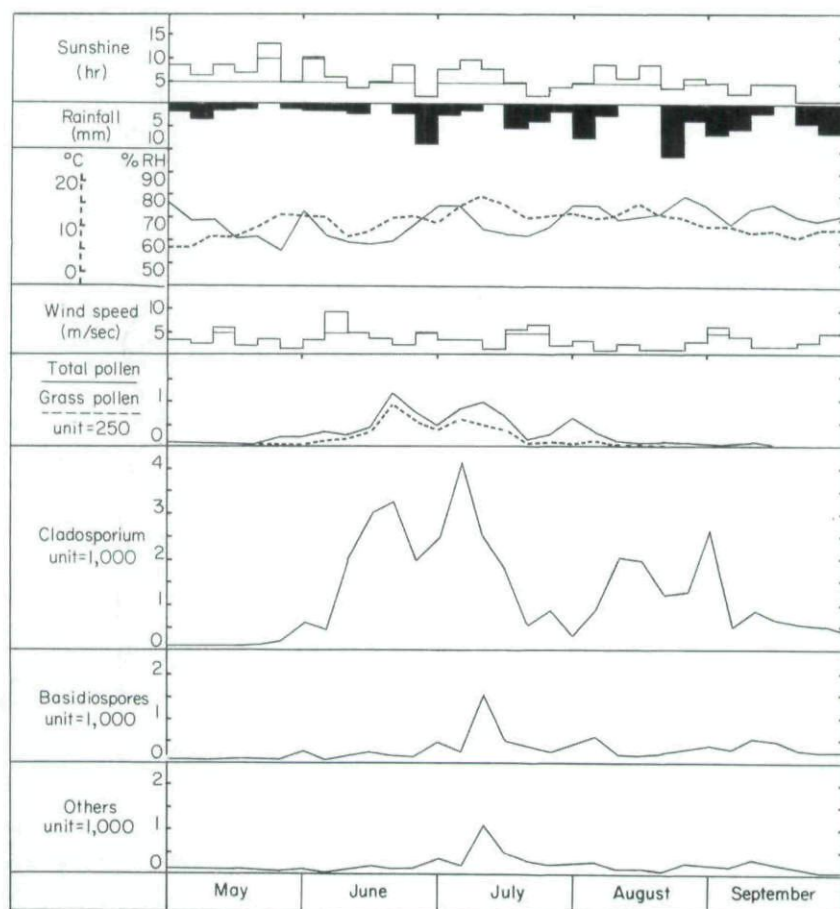


Fig. 3. Concentration changes of air-borne pollen and fungal spores with meteorological factors, May to September 1977.

As with the fungal spores the only explanation that could account for the extremely low pollen count over the whole season of 1978, compared with the corresponding period of 1977, was the change in the dominant wind direction. The lower sunshine and continuous rainfall during the 1978 season may also have depressed both pollen production and dispersal. The sharp drop in the pollen counts for late June, mid-July and August of 1977 (Fig. 3) and from July onwards of 1978 (Fig. 4) may be attributed to the coincident high levels of rainfall which would be expected to depress pollen dispersal. There also appears to be a correlation between wind velocity and the concentration of air-borne pollen: the highest counts recorded in late May and in June and July, with a smaller peak in August of 1977 (Fig. 3) followed closely after the higher wind speeds recorded for that season. Such correlations were to be expected and agree with the findings generally reported by other investigators.

The results of the present investigation are of value since no previously published record of this data for Ireland exists. The findings are useful in a general way in that they provide a true representation of the changes in pollen and spore counts with varying weather conditions for the area studied since particles were collected by a

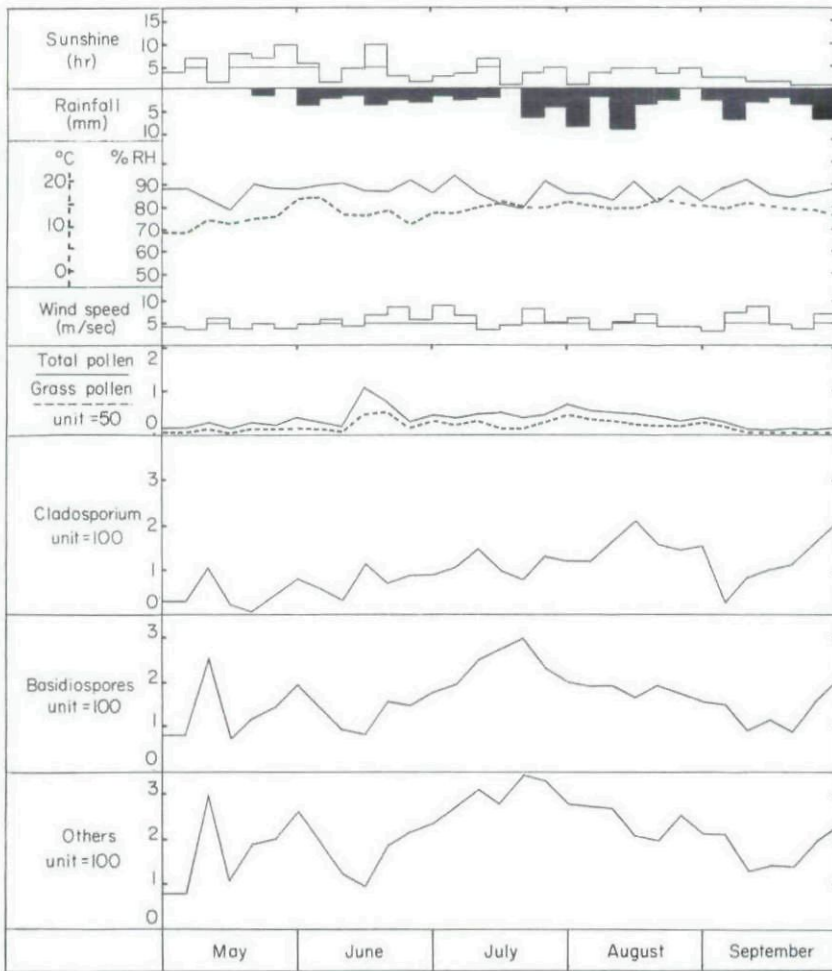


Fig. 4. Concentration changes of air-borne pollen and fungal spores with meteorological factors, May to September 1978.

continuous method with little or no partiality to size or shape. However, since the method used is unable to distinguish viable from non-viable pollen and spores further work is necessary in order to provide more meaningful information for allergy studies. In this connection setting up traps at a second or third site in the survey area would greatly add to the aerobiological studies in Galway.

Acknowledgments

The authors wish to express their gratitude to the Department of Experimental Physics, University College, Galway, who provided the meteorological data and to the Western Health Board, Ireland, for their financial support for the project.

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