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A Comparison of the Hyde and Durham Air-borne Pollen Collecting Shelters

INTRODUCTION

The first attempts to make quantitative and qualitative analyses of the pollen content of the atmosphere were made in England about 85 years ago (Blackley 1873, Airy 1874). The chief purpose of these early studies was the acquisition of data which could have a bearing on the then poorly understood problem of pollen allergy and asthma. Similar routine analyses of air-borne pollen have been conducted with increased frequency in this country since 1917 (Scheppergrell).

Over the years a number of methods of atmospheric analysis including those involving rather complicated air-suction, air-filter devices have been employed. Data acquired during the last quarter century indicate that the relatively simple "gravity method" offers a feasible, dependable way of obtaining daily records of air-borne pollen (Hyde 1956, 1957). Briefly, the method consists of exposing to the atmosphere, each 24 hours, an aseptically clean microscope slide coated with a sticky paraffin oil mixture which will catch and retain pollen grains carried in the air. After the 24 hour exposure, the slide is taken into the laboratory and analyzed microscopically for pollen both qualitatively and quantitatively. Various devices have been designed to permit passage of air over the slide while still offering some protection from rain. Overprotection of the slide during exposure could introduce experimental error. A satisfactory pollen slide shelter should not introduce undue qualitative error nor reduce the quantitative efficiency of an unprotected sampling slide. Reasonable control of these experimental errors will permit successful application of pollen statistics in allergology or for fundamental studies involving, for example, the

¹We are indebted to the Graduate School, University of Minnesota, for funds in partial support of this research.

relationship of pollen precipitation and the pollen occurring in recent and ancient sediments of lakes. Faegri and Iversen (1950) have effectively called attention to the difficulties experienced in gaining accurate records which would approach closely the natural pollen precipitation on unprotected surfaces.

Since 1946 most of the routine reports on air-borne pollen in North America have been based on slides exposed in a shelter designed by Mr. O. C. Durham of Abbott Laboratories, Chicago, and designated the "Standard" device by the American Academy of Allergy (Durham et al 1946). In Great Britain a different shelter has been used extensively since 1942. This device was designed by Mr. H. A. Hyde, Keeper of Botany, National Museum, Cardiff, Wales, who is the leading investigator of atmospheric pollen in the British Isles.

The continuing need for simple and yet dependable methods for obtaining long-term data on air-borne pollen makes it desirable that comparative analyses should be made of slides exposed simultaneously in the two shelters. The present report represents an introduction to such a comparative study. In consequence, our discussion at this time does not relate the characteristics of these two devices over the long period desirable before final conclusions may be reached.

METHODS

Slides were exposed by us over the period July - October, 1955; April - June, 1956. The Hyde and Durham shelters were installed approximately seventy feet above the ground on the west parapet on the botany building roof at a distance of 2 meters on either side of a Durham shelter which has been in constant use in this location since 1944. The additional new Durham shelter was used as a control for a slightly modified slide holder employed on our Hyde device. The modification allowed the slide to be anchored to the holder, via the cohesion of grease between the smooth surfaces of the slide and slide holder, without any projecting flange on the holder. Thus, the only obstruction to the free passage of air over the slide was the edge of the slide itself.

The data summarized are restricted to the month of August, which provides for comparative analysis of periods of low and high pollen dispersal together with varied weather conditions. We are much indebted to Miss Agnes Hansen for her data covering the same

time period which provide an invaluable independent check for our analyses.

Both the Hyde and Durham pollen-slide shelters consist of two disks oriented horizontally and held parallel by vertical struts. The platform for holding a microscope slide is located in each case between these disks. The differences between the two shelters are primarily matters of size. The Durham device has disks nine inches in diameter separated by 3 inches with the slide platform arranged 1 inch above the lower disk. The disks making up the Hyde shelter are 36 inches in diameter and are separated by 11 inches, and the slide is exposed 4 inches above the lower disk. For further details concerning dimensions and construction of the devices see Durham (1946) and Hyde (1950).

OBSERVATIONS

During the period sampled pollen grains of twelve taxonomic entities were recorded. The groups represented were: Ambrosia, Chenopodiales, Gramineae, Urtica, Cannabis, Artemisia, Rumex, Cyperaceae, Helianthus, Pinus, Abies, and Quercus. There were no significant qualitative differences evident in the three series of slides. With the Hyde shelter eleven types were represented while ten and eight types were recorded respectively with our own, and Miss Hansen's, Durham shelters. Helianthus was the only pollen type not observed on slides exposed in the Hyde device.

There is an evident difference in the quantity of pollen observed on the three series of slides. In terms of the total pollen count, the amount of pollen recorded with the Hyde device was some 26% greater than was the case with our Durham shelter. Ambrosia and Chenopodiales pollen was predominant quantitatively. Slides exposed in the Hyde shelter yielded 33% more pollen of the Chenopodiales and 25% more Ambrosia pollen than was the case with our slides from the Durham shelter. There were occasional individual daily differences between the two Durham shelters which are attributable to technique (time of initiation of exposure of slide, area of slide analyzed, etc.). In Figures 1, 2, and 3 it will be evident that there is obvious similarity in the trends of quantitative variation recorded in the various graphs. The Hyde shelter appears to provide greater efficiency than the Durham device in frequently giving a higher daily yield of pollen. However it seems appropriate, in view of the limitations of our

observations, to reiterate that both devices give similar information concerning trends of variation of air-borne pollen. In his extensive studies, Hyde (1957) has referred quite aptly to the fact that conclusions drawn from observations made by now classical gravity methods are still valid.

SUMMARY

In spite of recent advances in instrumentation for sampling air-borne pollen, there is still demand for a simple and reproducible method for sampling the pollen in the atmosphere. This study compares two of the most widely used gravity method slide shelters: the Durham shelter, which is designated the "Standard" device by the American Academy of Allergy and the shelter designed by Mr. H. A. Hyde, the leading exponent of atmospheric pollen studies in the British Isles. These shelters are described.

During the sampled period pollen grains of twelve taxonomic entities were recorded on slides exposed in a Hyde shelter and two Durham shelters. There were no significant qualitative differences evident in the three series of slides. Quantitatively 26 per cent more total pollen was recorded on slides exposed in the Hyde instrument. The most predominant pollen types, Ambrosia and Chenopodiales pollen, were observed in concentrations which were 33 and 25 per cent greater respectively on slides exposed in the Hyde shelter.

On the basis of the period sampled, the Hyde shelter was found to be more efficient quantitatively while both devices gave nearly equivalent results qualitatively.

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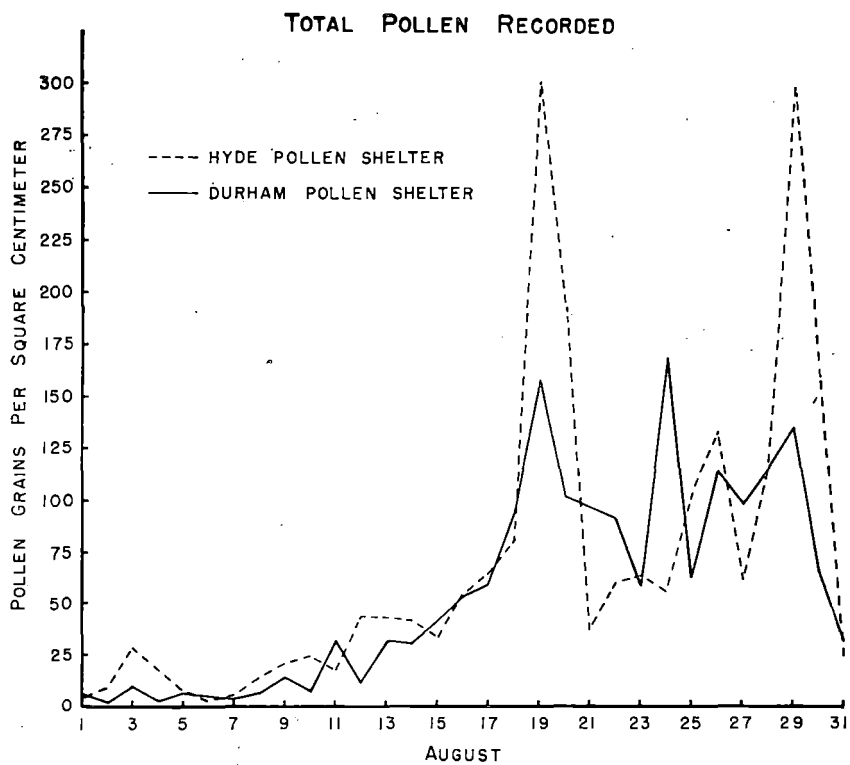


Fig. 1. Daily total pollen concentration recorded with the two types of shelters, August 1955.

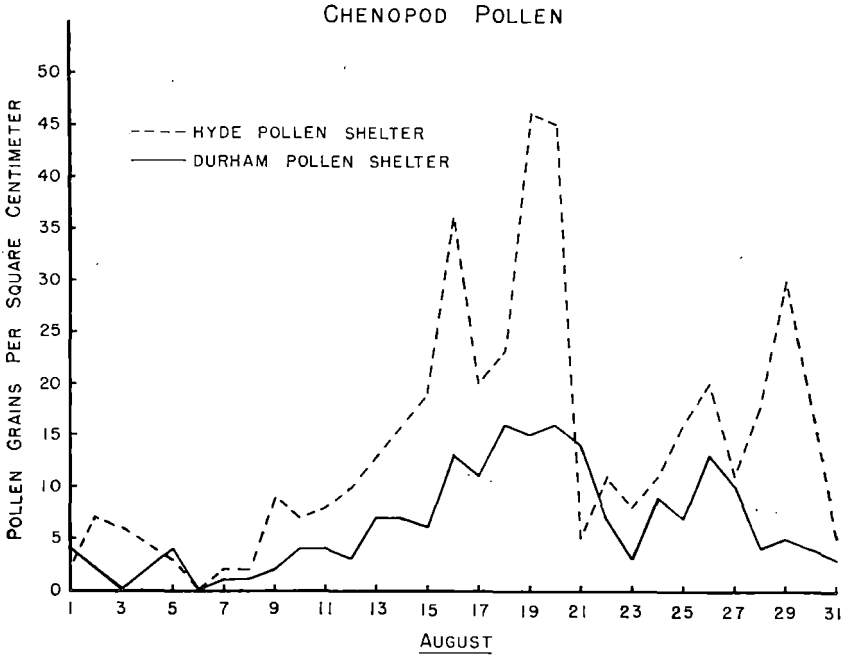


Fig. 2. Daily incidence of pollen of the Chenopodiales as recorded with the two types of shelters, August 1955.

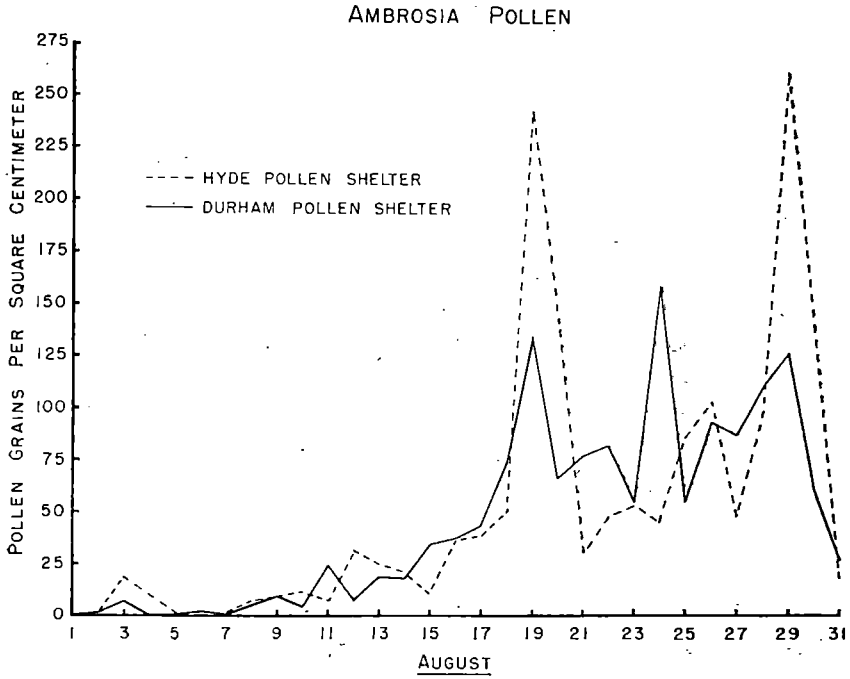


Fig. 3. Daily concentrations of Ambrosia pollen as recorded on slides exposed in the two types of shelters, August 1955.