

#### 7. Factors controlling pollen grain size in maize.

In palynological studies various morphological characters such as pollen grain size (largest outer diameter), number of furrows and pores and their size, exine patterning and other features are often used to identify pollen grains. However, pollen size is sometimes the most useful character for separating the species of a genus. And it is generally considered that all these various characters are genetically controlled. Almost no importance has been given to variations in pollen grain size, often caused by environmental factors during their ontogeny. However, Jones and Newell (1948) have demonstrated a positive correlation of environment and pollen grain size in many grasses, including maize. In contrast, Blanco (1950) has shown a negative correlation and emphasized that no significant influence of environment was found on pollen grain size in maize. Among earlier reports on various climatic effects are those documented by Piech (1922) in Linaria, Kawecka (1926) in Oenothera, and Stow (1930) with Hyacinthus. These investigators demonstrated the effect of high temperature which favors the formation of large pollen grains. In a recent report, Kurtz and Liverman (1958) found that variation in pollen diameter is due to temperature in tomato and cocklebur. Further, they reported that pollen grain size increased with decreased day temperature, while pollen size decreased at high and low night temperatures and at high day temperatures. Michaelis (1928) found that occasional cooling of flower buds induces formation of abnormal pollen with a variable number of germ pores in Epilobium and Oenothera. Moreover, the work of Andreev (1934), of Schoch-Bodmer (1940) in Lythrum, of Mehlquist (1942) in Primula, and our work with maize indicate that the position of the flower on the plant (on the tassel in maize), the size of the anthers, and the time of anthesis and anther dehiscence all influence pollen grain size. Again Schoch-Bodmer with Lythrum and our work with maize suggest that even water deprivation causes variability in pollen grain size. Mikkelsen (1949) emphasized that nutrition has a marked influence on pollen grain size. Bell (1959) reported that pollen grain size variation in tomato, petunia and portulaca is due to mineral nutrition. In our recent report (Banerjee and Barghoorn, 1970), we found that wheat pollen grain size is greatly influenced by several environmental

factors; in addition, genetic make-up and different chromosome numbers (at different ploidy levels) directly influence the pollen grain size and density of ektexine spinules per unit area.

In our study of maize pollen, we found the various factors which influence the pollen grain size are directly or indirectly connected with the physiology of the plant. We will categorize these factors as (a) external and (b) internal. However, factors such as seed size are also important. The influence of this factor was tested using a popcorn type (chapelote). A number of the largest and smallest kernels were selected from a single cob; all kernels were considered genetically similar. After germination all seedlings were exposed to similar environmental conditions such as temperature, light, water and soil. At maturity the seedlings from the large kernels consistently produced large plants with large pollen grain size, while the seedlings from smaller kernels produced smaller plants and smaller pollen grains. It is also interesting to note that plants grown from smaller kernels flower a few days earlier than the plants grown from large kernels.

U. C. Banerjee  
E. S. Barghoorn

8. Request to the readers of maize genetics cooperation News Letter.

Professor E. S. Barghoorn and U. C. Banerjee, of the Department of Biology, Harvard University, Cambridge, Mass., would like to request the readers of this News Letter to send dry mature pollen grains (at shedding stage) of pure inbred lines of sweet corn (with no gene for starchy character) and flour corn (with no gene for sugary character). They are also interested in receiving documented pollen grain samples of any primitive popcorn, pod-corn, teosinte or any other maize relatives.

They also request chlamydo-spores of smut from any maize relatives except corn-smut from maize.

E. S. Barghoorn  
U. C. Banerjee