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HETEROMORPHIC POLLEN GRAINS IN POLYMNIA[1]

T. RICHARD FISHER AND JAMES R. WELLS

During the course of a biosystematic study of the genus *Polymnia*, it was discovered that one population (Wells 254) of *P. laevigata* Beadle contained an extremely high percentage of different pollen shapes and sizes. This collection was taken from a population 5 miles southeast of Monteagle, Tennessee on U. S. Route 41. The plant was transplanted to the greenhouse and all pollen samples were taken from the living plant. This station was made known from previous collections of Ford and Russell for the University of Tennessee in 1946. Flowering heads were preserved in 3 parts 95% ethyl alcohol and 1 part acetic acid. The immature pollen was stained with aceto-carmine and studied for overall shape and number of nuclei. Aniline blue in lactophenol was used to study stainability of the mature pollen grains. Voucher slides are on deposit at The Ohio State University.

RESULTS

From observation of several hundred pollen grains, five morphological types were easily discerned as follows:

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1. uninucleate and spherical (fig. 2, 3, 5)
2. binucleate and elliptical (fig. 4)
3. trinucleate and kidney bean-shaped (fig. 3)
4. trinucleate and ovoid (fig. 4)
5. quadrinucleate and spherical (fig. 2, 5)

The above morphological forms were placed in four groups based on the number of nuclei in each pollen grain (table 1). In a sample of 500 randomly selected pollen grains, the uninucleate condition had a frequency of 68%

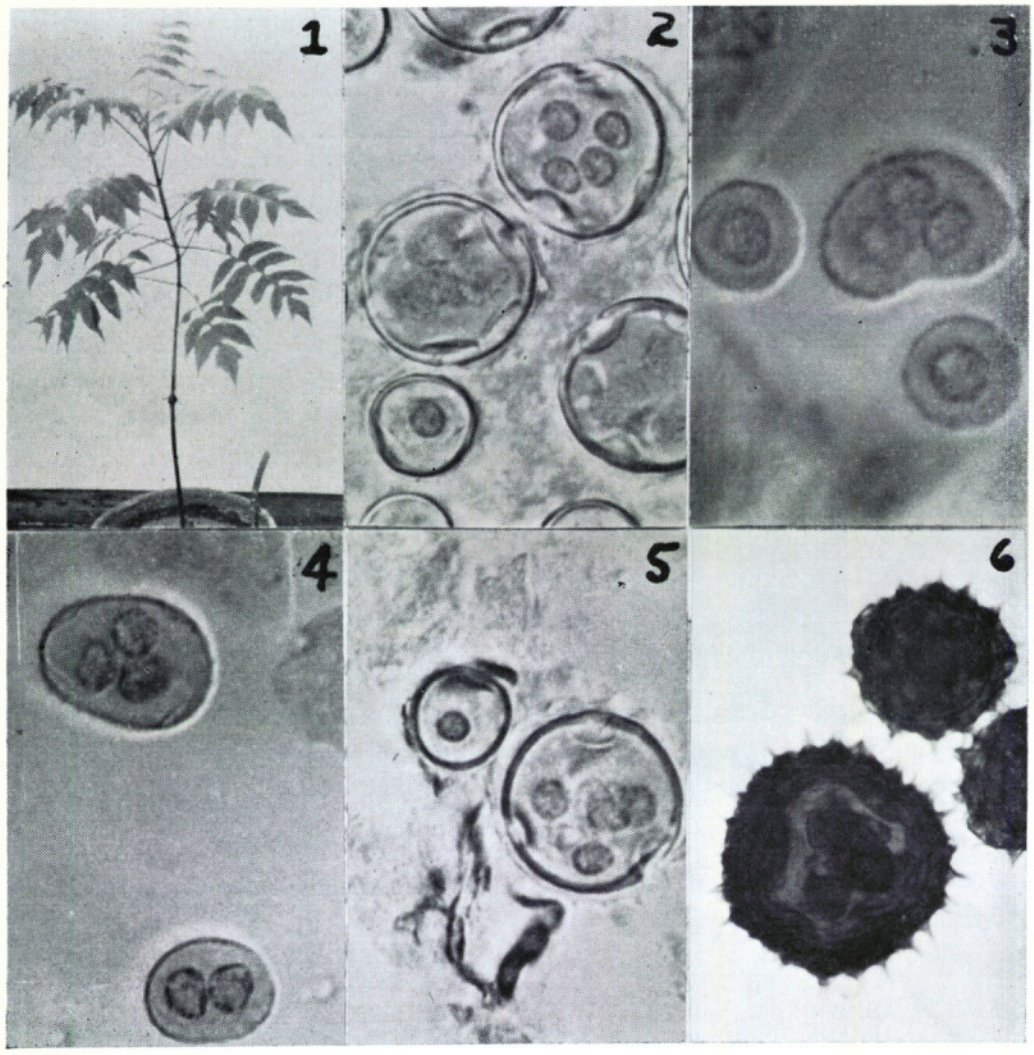

Plate 1273

Figures 1-6. Photographs of *Polymnia laevigata* showing plant and various pollen forms. Fig. 1. Immature plant. Figs. 2-5. Variable nuclear condition and morphologic forms of pollen. Fig. 6. Mature pollen, large and small spheres. Large spherical pollen grains in figures 2, 5, and 6 are 25μ in diameter; small uninucleate spherical forms are 15μ in diameter.

and the grains were about 15μ in diameter. This is the condition normally observed in other populations of this species. The trinucleate condition was the least observed condition, only 1.4% of the sample.

It is a common practice in taxonomic studies to use pollen stainability using aniline blue and lactophenol, as an index of pollen viability. Since this stain often obscures nuclear detail, rendering an exact count of nuclei uncertain, the pollen was grouped into two categories; namely, "large" and "small." The "large" group included quadrinucleate and trinucleate forms. The "small" group included the uninucleate and binucleate forms. There were a few instances in which the size of the pollen and its orientation made grouping difficult but familiarity with the material was thought to have avoided such miscalculation. The results of this treatment are shown in table 2.

From a random sample of 500 pollen grains, 77.5% fell into the "small" group and proved to be 94% stainable. The large pollen grains represented by 22.5% of the total sample were 88% stainable. In other words, the frequency of stainability among the smaller pollen grains was higher than for the larger. Ordinarily, when such a stainability test is applied to large and small pollen, the smaller pollen usually fails to become stained.

DISCUSSION

Dimorphic pollen has been reported previously. Lee (1961) in *Tripogandra grandiflora* observed two types of pollen from the same flower; namely, hemispherical, fertile grains and elongate, sterile grains. Erdtman (1952) noted two pollen shapes in two different plants of *Primula farinosa*. Punnett (1923) reported round pollen versus long pollen in different plants of *Lathryus odoratus*. Clark (1940) observed variation in the number of nuclei in pollen of *Zea mays*.

In *P. laevigata*, both anomalies are combined within the same plant: that is, variation in the number of nuclei and the shape of pollen grains. Moreover, there are not just 2 shapes of pollen (dimorphism) but 4 distinct shapes.

This assemblage of pollen forms coupled with variation in number of nuclei is termed "heteromorphic pollen." To the authors' knowledge, this term has not been used previously. No meiotic abnormalities were observed using the aceto-carmine squash technique. The gametic chromosome number is n = 15. First generation hybrids have been obtained involving *P. laevigata* and *P. canadensis* but only one hybrid resulted from 38 attempted crosses using this plant (Wells 254) as the pollen parent.

Two reasonable explanations can be proposed to account for this heteromorphic pollen. First, failure of wall formation at the completion of meiosis II would account for a pollen grain with four nuclei. Second, and we believe more plausible, an erratic precocious division of the microspore nucleus. This population of Tennessee plants will be revisited and an attempt made to secure more material for a thorough developmental study.

SUMMARY

One population representative of *P. laevigata* was found to contain 4 kinds of pollen grains in respect to number of nuclei and four kinds in respect to shape. If large and small spheres are considered separately, there are 5 kinds of pollen grains. The smaller sized pollen were uninucleate; the larger quadrinucleate. A term suggested for this type of pollen found on the same plant is "heteromorphic pollen." Although no explanation for this condition is known, two theories are proposed; namely, failure of wall formation at the termination of meiosis II and erratic precocious divisions of the microspore nucleus.

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Table 1. The number and frequency of nuclei per pollen grain from a random sample of 500 grains.

number	frequency
1	340 (68%)
2	58 (11.6%)
3	7 (1.4%)
4	95 (19%)
Total	500 (100%)

Table 2. The stainability and frequency of small and large pollen from a random sample of 500 grains.

stainability	frequency
small pollen	
+ stain	366 (94%)
— stain	23 (6%)
Total	389 (100%)
large pollen	
+ stain	98 (88.3%)
— stain	13 (11.7%)
Total	111 (100%)

CHANGES IN FLORA OF THE MACHIAS SEAL ISLANDS

RADCLIFFE B. PIKE AND ALBION R. HODGDON[1] [2]

Machias Seal Islands, at the entrance to the Bay of Fundy, have occupied a prominent place in ornithological literature ever since 1603 when they were named Les Isles des Perroquets or the Parrot Islands by Champlain. A number of studies were made here by Audubon, and at the present time, a bird sanctuary is maintained by the United States Govern-

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[2]Department of Horticulture and Botany, University of New Hampshire, Durham, N. H.