

GEOGRAPHY OF POLLEN AND CHROMOSOMAL HETEROMORPHISM IN *LEUCOCRINUM MONTANUM* (LILIACEAE)

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Sand-lily, *Leucocrinum montanum* Nutt., is a showy perennial that occurs widely in the arid regions of the western United States. Recently, the second author reported chromosome counts of $n = 11$, 13, and 14 for this species (Cave, 1970). Plants from the Rocky Mountain region have $n = 14$ (see also Löve et al., 1971), those from several localities in California, western Nevada, and Oregon have $n = 13$, and one population from Nevada has $n = 11$ (fig. 1). In addition, Cave noted that in some populations pollen is shed in tetrads and in others it is shed singly. In this paper we further discuss the variation in chromosome number and in the condition of pollen at the time of shedding.

In order to determine the condition of pollen at the time of shedding, all herbarium material of *Leucocrinum montanum* at the following institutions was examined: CAS, DS, JEPS, OSC, RENO, UC, and UO. Pollen was removed from the flowers, mounted in lactophenol, and subsequently examined microscopically. Pollen was also removed from the voucher specimens for the chromosome counts reported by Cave. Tetrad pollen for SEM investigation was obtained from flowers preserved in FAA. Monad pollen from herbarium material was rehydrated in water for 5 days, dehydrated in glacial acetic acid, acetolyzed for 3 minutes, and washed three times in water. Both types of pollen were placed in Swinny filter holders between two gold-coated Nucleopore filters, run through graded series to absolute ethanol, then to Freon TC, and critical-point dried. Tetrads were coated with chromium and monads with gold-palladium. Observations were made using a Coates and Welter model 50 SEM.

Pollen of *Leucocrinum montanum* is shed either in tetragonal tetrads or in monads (fig. 2). Although there are some morphological differences in wall sculpturing between the two populations we examined, we do not know if these differences are consistent throughout the species. With one exception, plants producing pollen in monads and those producing tetrads occupy allopatric ranges (fig. 1). Populations from the Rocky Mountain region, Utah, and central and eastern Nevada produce monads, the exception being a single collection from Lincoln County, Nevada, that produces tetrads (*Lehenbauer s.n.*, Joseco, RENO). However, another collection from the same area (*Wm. Mathews s.n.*, RENO) produces monads. Populations from extreme western Nevada and from California and Oregon all produce tetrads.

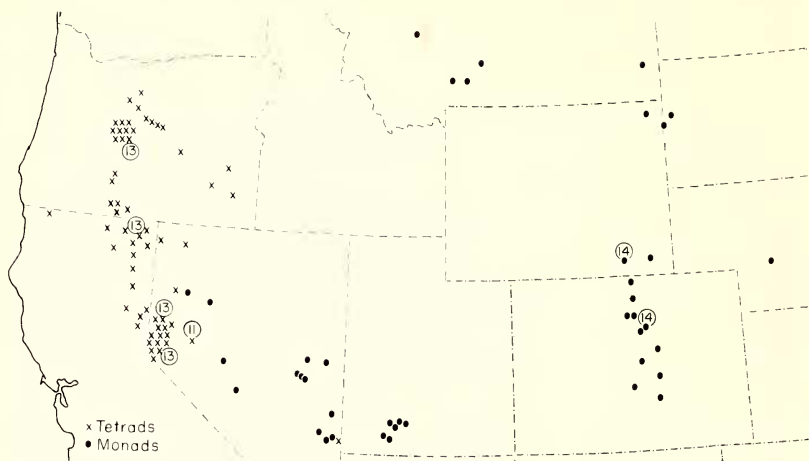


FIG. 1. Distribution of different pollen types in *Leucocrinum montanum* in the western United States. Numbers in circles indicate the chromosome number reported for populations in that locality.

The geographical variation in the nature of the pollen seems to be correlated with differences in chromosome number. Plants with $n = 14$ produce monads; those with $n = 11$ or $n = 13$ produce tetrads. There is one record of $n = 14$ for material from central Oregon (Assavesna, 1956) but preparations are not available for confirmation and this count must be accepted as provisional. In addition, Chambers (pers. comm.) reports that plants from Modoc County, California, have $2n = \text{ca } 50$, with meiosis disturbed as a result of multivalent formation. It is likely that this population contains autotetraploid plants with $2n = 4x = 52$. Clearly the chromosome cytology of *Leucocrinum montanum* merits further study.

The occurrence of pollen tetrads is known in at least 50 angiosperm families (see Walker, 1971, pp. 10–11). Although we are not aware of the presence of pollen tetrads elsewhere in the Liliaceae (Nair and Sharma, 1965), tetrads are known in other monocot families such as the Amaryllidaceae and Velloziaceae. Monads and tetrads may be produced by different species in various genera, but the occurrence of intraspecific dimorphism in these traits is exceptionally rare. The only other example of which we are aware was reported by Walker (pers. comm.), who has discovered one specimen of *Eucommia ulmoides* Oliv. (Eucommiaceae) at the Arnold Arboretum that produces pollen in tetrads, while another specimen of the same species there produces monads. Whether this dimorphism occurs in the natural range of this Asian species is unknown.

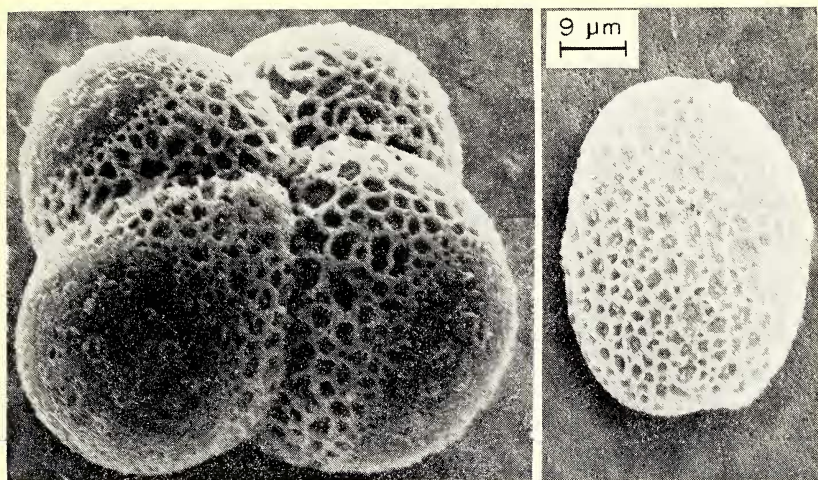


FIG. 2. Scanning electron micrographs of pollen of *Leucocrinum montanum*. Left: *M. Williams s.n.*, near Reno, Nevada, 1974 (UC). Right: *E. N. Brandegee s.n.*, Helena, Montana, 1898 (UC).

Although we have not made a detailed study of other morphological features of *Leucocrinum*, there are no evident consistent character differences associated with the pollen and chromosome variation noted above, and we believe that it is premature to suggest a taxonomic separation of these races. At present, we are also unable to explain the adaptive significance, if any, of the chromosomal and pollen heteromorphisms that are characteristic of this species.

We are indebted to Margaret Williams, Wayne Roderick, and C. L. Porter for providing us with living specimens of *Leucocrinum*, to J. W. Walker for information on *Eucommia*, to F. H. Smith and K. L. Chambers for assisting in other ways, and to Patricia Watters for technical assistance. Preparation of the pollen for the SEM work was supported by a grant from the National Science Foundation.

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