INTERGENERIC HYBRIDS OF MEXICAN CRASSULACEAE.
1. LENOPHYLLUM

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Hybrids between species of the Mexican Crassulaceae are very uncommon in the wild, perhaps because the few species that occur together and flower at the same time are visited by different pollinators. In cultivation most species produce few or no seed when pollinators are excluded, but hybrids between formerly isolated species often appear spontaneously when pollinators can get to the plants.

Several factors contribute to this situation. Most species are protandrous, that is, the pollen is released before the stigmas of the same flower are receptive. Furthermore, although this has not been extensively tested, some, probably many. species also appear to he in some degree self-incompatible, and their flowers produce few or no seeds when they are self-pollinated. In nature these features promote out-crossing to other individuals of the same population. Natural hybridization seems not to be much of a hazard to purity of the species because the isolating factors of geography, season, and pollinators mentioned above function well enough, and other barriers to hybridization and gene interchange have not evolved. But when species from different localities flower at the same time in cultivation, and especially when only one clone of a species is grown, any seeds that are produced spontaneously may be more likely to produce hybrids than to come true. Seed produced in cultivation is notoriously undependable as a true source for some species (*Walther*, 1972).

These conditions make it easy to produce hybrids by artificial crossing, and some of today's cultivars of Echeveria, for example, originated from crosses made in Europe as far back as the 1860's or before (*Walther*, 1972). Intergeneric hybrids in many combinations also are easily made. The first hybrid genus, x Pachyveria *Haage & Schmidt*, was named in 1926 for hybrids between Pachyphytum and Echeveria, although *Morren* (1877) had listed a hybrid with these parents much earlier. Still other hybrid genera have been given special names, generally combining all or pans of the names of their parents.

As part of a program to study and compare the chromosomes of the Mexican Crassulaceae, I have made hundreds of interspecific and intergeneric hybrids. These hybrids connect, directly or indirectly, more than 200 species belonging to as many as nine genera, Cremnophila, Echeveria, Graptopetalum, Lenophyllum, Pachyphytum, Sedum, Tacitus, Thompsonella, and Villadia. Collectively these comprise a biosystematic unit called a comparium, and this is one of the largest known (*Uhl*, 1992). Hybrids between some of these genera have not been reported previously.

Lenophyllum is a small genus of Crassulaceae. and names have been given for six species from southern Texas and northeastern Mexico. However, L. pusillum *Rose* was based on plants admitted to be "not in the best of condition," and later herbarium specimens of stronger plants from apparently the same done seem not distinguish-able from L. texanum. Also, L. weinbergii *Britton* seems not well enough characterized to be distinguishable, and il may represent only a variant of L. guttatum, or it may be a poorly developed form of L. reflexum. L. acutifolium seems distinct enough, and somewhat similar but larger plants probably represent a fifth species not yet named.

Gametic chromosome numbers of 22, 32, 33, and 44 in the 27 collections of Lenophyllum studied to date suggest that the ancestral basic number is 11. although this number has not yet been found. This would mean that the plants studied are all polyploids: tetraploids, hexaploids (or derivatives) or octoploids. Study of the appearance of hybrids and the pairing of their chromosomes at meiosis had provided valuable evidence regarding diploidy and polyploidy in other Mexican Crassulaceae (*Uhl*, 1992). and when the same tests are applied to Lenophyllum they suggest strongly that indeed its species may all be polyploid.

This paper reports seven intergeneric hybrids. all having as parents one or another of four species of Lenophyllum. These were crossed with two diploid species each of Echeveria and Graptopetalum and one diploid species of Pachyphytum. Three additional hybrids between different combinations of the same parental species have not flowered and have not been further studied.

Fig. 1. Graptopetalum pachyphyllum (U1932) x Lenophyllum reflexum (U1917). Note the close resemblance of the flowers to the Lenophyllum pollen parent.

x Lenaptopetalum *Rowley*

Knobloch (1972) published a list of all the intergeneric hybrids in flowering plants known to him, citing some of my hybrids. The list included Graptopetalum bartramii x Lenophyllum acutifolium, a hybrid I made in 1965. From this and other sources in the literature, *Rowley* (1982) compiled a list of intergeneric hybrids of succulent plants that had been reported, giving new hybrid generic names where none had been proposed before. *Knobloch's* report provided the basis for *Rowley's* new name for intergeneric hybrids between Lenophyllum and Graptopetalum. He had earlier proposed x Lengraptophyllum as a name for this combination, but that name did not conform to the rules for naming hybrid genera. *Rowley* had never seen this hybrid, and he cited no specimens.

This report authenticates this hybrid and adds four more between the same parental genera. Herbarium specimens of parents and hybrids are in the Bailey Hortorium of Cornell University, and color photos of two of them are available. Six other attempts to hybridize Lenophyllum and Graptopetalum were not successful. The seed parents are listed first.

Graptopetalum bartramii (U1257, n = 31) x Lenophyllum acutifolium (U1500. n = 22).
Graptopetalum pachyphyllum (*Moran* 10072, n = 30), hybrids with two collections of Lenophyllum guttatum (U1495, n = 33, and U1516, n= 32 + 1).
Graptopetalum pachyphyllum (U1932, n = 30) x Lenophyllum reflexum (U1917, n = 32). (Fig. 1).

Another hybrid, G. pachyphyllum (U1932, n = 30) x L. sp. aff. acutifolium (U2087, n = 22), appears to be authentic, but it has not flowered and is not documented.

Fig. 2. Lenophyllum acutifolium (U1500) x Echeveria affinis (U1073A).

Fig. 3. Pairs of flowers in side and face view. Left: Lenophyllum acutifolium (U1500). Right: Echeveria affinis (U1073A). Center: their hybrid.

x Lenoveria *Uhl* hybr. nov.

This name is proposed for all intergeneric hybrids between Lenophyllum *Rose* and Echeveria *DC*. Besides the three listed below, doubtless other hybrids between Lenophyllum and Echeveria are possible, but fourteen other attempts to hybridize them here were not successful. The following hybrids are documented by pressed specimens and color photos.

Echeveria cf. mucronata (U1373, n = 16) x Lenophyllum guttatum (U1495, n = 33).
Lenophyllum acutifolium (U1500, n = 22) x Echeveria affinis (U1073A, n = 30) (Figs. 2-3).
Lenophvllum sp. aff. acutifolium (*Moran* 13392, n = 22) x Echeveria affinis (U1073A, n = 30).

Fig. 4. Pachyphytum hookeri (*Moran* 13349) x Lenophyllum reflexum (U1917).

Fig. 5. Pachyphytum hookeri (*Moran* 13349) x Lenophyllum reflexum (U1917). Portion of inflorescence with flowers.

x Lenophytum *Uhl* hybr. nov.

This name is proposed for all hybrids between Lenophyllum *Rose* and Pachyphytum *Link, Klotzsch and Otto*. One such hybrid is documented by a pressed specimen and color photos.

Pachyphytum hookeri (*Moran* 13349, n = 32) x Lenophyllum reflexum (U1917, n = 32) (Figs. 4-5).

A hybrid between the same collection of P. hookeri and L. sp. aff. acutifolium (U2087, n = 22) appears authentic but has not flowered and is not otherwise documented. Eight other attempts to hybridize Lenophyllum and Pachyphytum were not successful.

Four attempts to hybridize Lenophyllum with Villadia were unsuccessful, as were three attempts with Sedum. Three attempted crosses between species of Lenophyllum also were not successful. Additional attempts might yet hybridize some of these groups.

Although judgement must be subjective, the impression is very strong that all seven of the hybrids that have flowered resemble their Lenophyllum parent more closely than they do their diploid parent (Fig. 3). This supports a conclusion that their Lenophyllum parents were polyploid and contributed double or multiple doses (sets or genomes) of chromosomes and genes to the hybrids and that only one dose came from their diploid parents. It seems likely that diploids of Lenophyllum with n = 11 once existed, and it is possible that they may yet be found.

References

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