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## Further Species Crosses in the Genus Cucurbita

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## FURTHER SPECIES CROSSES IN THE GENUS CUCURBITA

EDWARD F. CASTETTER

During the past few years attempts have been made to cross the three cultivated species of the genus *Cucurbita*. There was used in *Cucurbita maxima* a pure line of Hubbard squash, known as the "Kitchenette"; in *Cucurbita Pepo* a pure line of the Connecticut Field pumpkin, and in *Cucurbita moschata* a pure line of the Large Cheese pumpkin.

The first attempts at crossing were with the Kitchenette squash and Connecticut Field pumpkin. Using the Kitchenette as the pistillate parent, numerous fruits were secured with little difficulty, although few viable seeds were obtained. When reciprocal pollinations were made fruits were easily secured but in no case were any viable seeds found.

The  $F_1$  generation of the first mentioned cross possessed vegetative characters similar to those of the Connecticut Field pumpkin. The shape of the fruits, however, was intermediate between that of both parents; the distinct warts and green color closely resembled the Kitchenette, while the fruit stalk was very much like that of the Connecticut Field pumpkin. All  $F_1$  fruits were sterile.

The second series of pollinations was made between the Kitchenette squash and Large Cheese pumpkin. Using Kitchenette as the pistillate parent numerous fruits containing many fertile seeds were obtained. Vegetatively the  $F_1$  plants had characters intermediate between those of both parents. The fruits resembled the pistillate parent in color (green) but the flat shape and hard fruit stalk showed a close resemblance to the staminate parent. Whether the  $F_1$  fruits are entirely sterile has not yet been determined. No pollinations have thus far been made using the Large Cheese pumpkin as the pistillate parent.

Pollinations in a third series were made between the Connecticut Field as the pistillate and Large Cheese as the staminate parent. Fruits were easily secured; they contained very few fertile seeds, however. The  $F_1$  plants in their vegetative characters showed considerable resemblance to the pistillate parent. The fruits were elongated cylindrical in shape, were mottled yellow and green in

color and had a hard flaring fruit stalk. Whether these  $F_1$  fruits contain fertile seeds has not yet been determined. Making reciprocal pollinations by using the Large Cheese pumpkin as the pistillate parent has thus far not been carried on to sufficient extent to ascertain whether fruits and fertile seeds can be secured.

## PAIRED OVULES OF VALLISNERIA

ROBERT B. WYLIE

In studying *Vallisneria spiralis* abnormal ovules were often noted. The most frequent abnormality is the occurrence of symmetrical double or paired ovules. Upon a common funiculus are borne two nucelli each possessing an inner integument, the whole enclosed by a single outer integument (Figs. 1, 2, 3). Malformations occur rarely and most of them are sterile. In Fig. 7 is shown an ovule having normal integuments with some suggestion of doubling in the nucellus but with plain dominance by the functional or larger part.

The orthotropous ovules of this species are attached to the walls of the elongated ovaries in great numbers, several hundred to the flower. In securing material for study, the ovules were usually removed from the ovaries before fixation. The ovarian cavity is filled with a thick gelatinous substance, and as previously recorded, if the ovary is cut across this mass may be squeezed out carrying with it the ovules. Since the contents of many flowers were mixed together in the preserving solution, there could be no means of determining the source and distribution of these abnormalities noted.

The normal ovule of *Vallisneria* is orthotropous with symmetrical disposition of its parts (Figs. 4, 5). The double ovules noted above are joined below in a single and somewhat enlarged funiculus. Both members seem to function regularly as normal ovules (Figs. 1, 2, 3, 6). A common outer integument differentiating near the base encloses both ovules and narrows above into a flattened outer micropyle. Within this envelope the members of the pair lie parallel and are considerably flattened together (Fig. 6) but showing an obvious division between them. Each half also possesses an individual micropyle since the inner integument constricts to a narrow opening at the tip of each nucellus. The micropyle is thus single as related to the outer integument but within is double with two laterally separated openings through the inner integument of each half. The pollen tubes are therefore forced into a sigmoid curve in order to enter the embryo sacs.

DESCRIPTION OF FIGURES. PLATE I

1. Paired ovules, median longitudinal section, containing embryos of same size.
2. Paired ovules, mounted whole, as seen by transmitted light.
3. Section through paired ovules, fertilization stage.
4. Section through normal ovule early post fertilization.
5. Transverse view of normal ovule.
6. Transverse view of paired ovules.
7. An abnormal ovule with divided nucellus surrounded by normal integuments.

(All figures on this plate drawn to common scale of enlargement.)

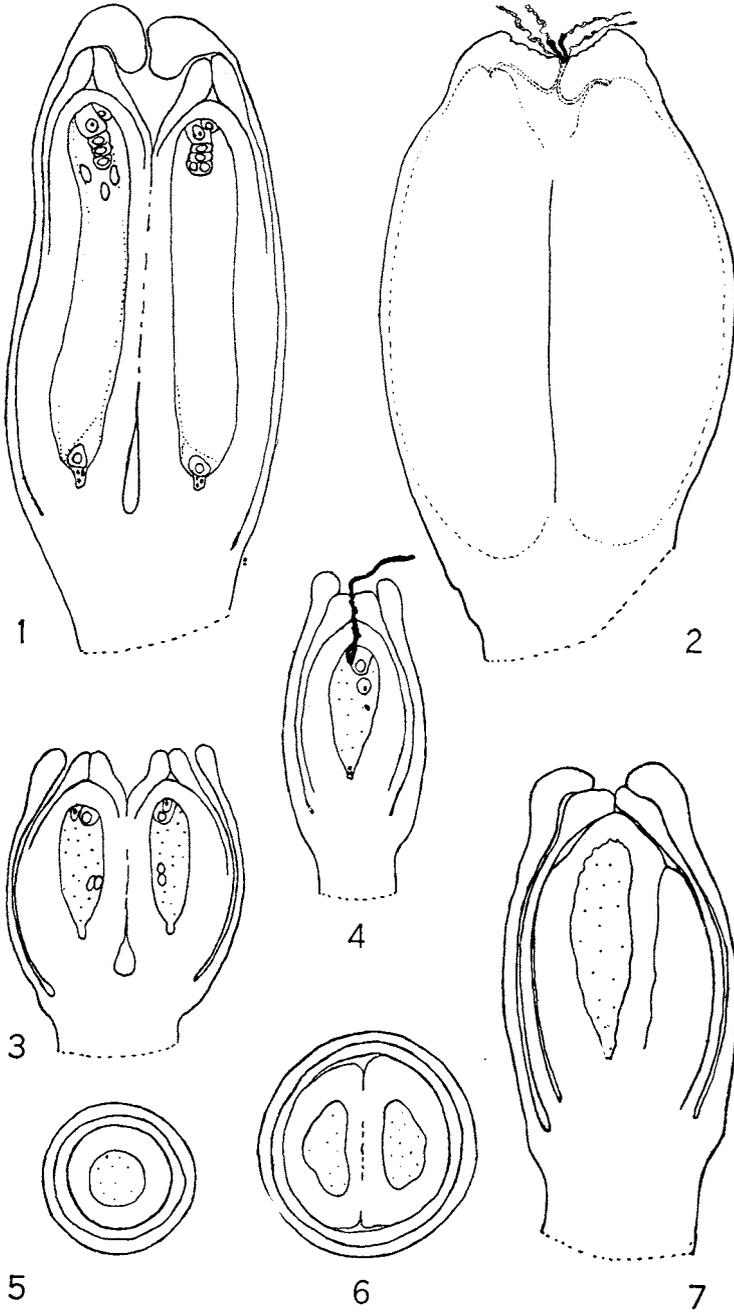


PLATE I

The pollen tubes of *Vallisneria spiralis* are conspicuous (Fig. 4) and, as earlier noted by the writer for *Elodea*, the lower portion of the functional pollen tube persists protruding from the micropyle until the embryo is well developed. Among the numerous pollen tubes extending through the broad micropyle of these double ovules two often show long after fertilization a turgid and darkly staining content while the others are collapsed and empty (Fig. 2).

The two gametophytes of the paired ovule develop normally and mature at the same time (Fig. 3). After fertilization, the embryos of the pair are always seen at approximately the same stage of development (Fig. 1). The ultimate fate of the twins has not been determined as no detailed study has been made of older material. It seems probable though that they would mature into good seeds.

It should be noted that these double ovules are not comparable to paired or multiple embryo sacs within a common nucellus. They represent rather co-ordinate or independent structures, differentiated at an earlier stage of development.

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