

Parthenocarpy in Caprifigs¹

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Parthenocarpy in figs and caprifigs was discussed in a previous paper (2). In that account it was not stated that development of caprifigs inhabited by the fig wasp (*Blastophaga psenes* L.) is a good illustration of stimulative parthenocarpy. The statement was made, however, that "two seedling caprifigs which are completely parthenocarpic have recently been found among several hundred others in our seedling fig plots at Riverside, California". This vegetative parthenocarpy, with especial reference to seedling caprifigs, seems to be worthy of further discussion.

Vegetative parthenocarpy in caprifigs has long been known in Europe and in California, and one variety, the Cordelia or Croisic (3), is propagated and grown to a limited extent for its edible fruit.

Three Kinds of Parthenocarpic Caprifigs

In seedling caprifigs three general kinds or degrees of parthenocarpic development may be recognized. The first kind results in the production of figs commonly known to growers as "blanks". Eisen (6) called these figs "polleniferous"; Condit and Flanders (5) applied to them the term "uninhabited figs", since the pistillate flowers do not harbor the blastophaga. Moreover, these pistillate flowers remain entirely undeveloped. The variety Roeding No. 1 is a good example of this class of caprifig. It is no longer grown because a large proportion of its crop consists of "blanks".

In the second class of parthenocarpic caprifigs, the syconium wall or meat of the fig remains pithy and dry until maturity. The stamens usually develop properly and produce an abundance of pollen. In some figs the anthers become atrophied and appear rusty or black in the mature fruit. The development of the ovaries of the pistillate flowers into seedlike bodies or cenocarps differentiates this class from the first. These cenocarps gradually develop a sclerified ovary wall and have the appearance of seeds, but they

are really empty achenes, and resemble very closely the ovaries normally inhabited by blastophagas.

In the third kind of parthenocarpic caprifigs, cenocarps develop as in class two. As the figs approach maturity, however, the spongy wall of the syconium and the parenchyma cells of the pistillate flowers gradually become pulpy and develop a certain amount of sugar. These caprifigs are in most respects similar to edible figs. It is to this class that the Cordelia belongs. The only objection to these caprifigs from the standpoint of edibility is the presence of stamens and the mass of dry pollen in the mature fruit

In the parthenocarpic caprifigs of the second and third classes, the number of cenocarps varies greatly. Actual counts made of cenocarps in two typical figs from each of 24 different seedlings show that the number ranges from 36 to 1,592 per fig, the average count being 584. These figures compare favorably with the number of sterile and fertile achenes found in edible figs of named varieties [see Condit (4), pp. 40 and 44]. The number of staminate flowers in a single caprifig varies from 70 to 294 and averages 180.

Characteristics

Some standard varieties of caprifigs are invariably white inside regardless of the presence of blastophagas; others are pink inside when uninhabited by fig insects, and various shades of violet when inhabited. The same color condition is found in parthenocarpic caprifigs, some seedlings bearing syconia which are pink or violet inside. The intensity of the violet color is a characteristic of the individual seedling and is not dependent upon the number of cenocarps present.

Blastophagas enter parthenocarpic caprifigs and oviposit in the pistillate flowers. As explained in a previous article (1), both the cells of the stigmatic surface and those lining the stylar canal are injured and become discolored as the result of oviposition by the fig wasp. In the same syconium these discolored flowers can be readily distinguished from flowers with white, succulent stigmas uninjured by the wasp. However, the inhabited caprifigs can not be distinguished from the uninhabited by external appearances. Uninhabited caprifigs are of no value to the grower since there are no blastophagas present to distribute the pollen. The reason for the practical

worthlessness of a parthenocarpic caprifig is therefore obvious. In a good caprifig variety the "blanks" shrivel and drop before the inhabited figs are ready to mature. A grower can then estimate the crop available for caprifigation.

Another noteworthy character of a good caprifig tree is an abundant profichi or June crop. In this crop, from winter buds, the caprifig tree will produce 100 to 1,000 times as many syconia as trees bearing edible figs. On the other hand, caprifigs of the mammoni or summer crop are few in comparison with the abundant second or main crop of edible figs. It is expected that eventually one or more parthenocarpic caprifigs will be found bearing a heavy crop of pulpy profichi in which the stamens are absent or so reduced in number that the figs may be marketed as fresh, figs.

The possible line of evolution of the edible fig is indicated by characteristics of these parthenocarpic caprifigs. Natural selection through countless generations of chance seedlings may have evolved a type of fig without stamens or with only rudimentary ones, and pistillate flowers with the style three times the length of the style found in caprifigs. Trees bearing such figs would be notable for their abundant crop of edible first-crop figs or brebas. This is one of the characters of the class of figs known as White San Pedro, which includes such varieties as Dauphine, King, and Blanquette. These figs are useful for culture in cool climates in which the breba crop is the important one or possibly the only one which matures well during the season.

The quality of edible caprifigs naturally varies considerably — some are rather dry and punky, others are soft and have the consistency of good varieties of fresh figs. The sugar content of five parthenocarpic caprifigs (four seedlings and Cordelia) is shown in Table I, in comparison with that of Mission, a standard variety of the common type. Although the average sugar content of the caprifigs is not as high as that of the Mission, it is high enough to make them palatable as well as nutritious. The combination of heavy crop and good sugar content suggests the possibility of raising parthenocarpic caprifigs for the production of by-products such as hog and cattle feed, syrup, and alcohol.

TABLE I—Sugar Content of Figs (as Invert Sugar)*
TABLE I—SUGAR CONTENT OF FIGS (AS INVERT SUGAR)*

Fig Number or Variety	Moisture (Per Cent)	Total Sugars (Per Cent)		Reducing Sugars (Per Cent)		Sucrose (Per Cent Difference)	
		Moist Basis	Dry Basis	Moist Basis	Dry Basis	Moist Basis	Dry Basis
Caprifig:							
Seedling 35-2	85.27	8.51	57.77	8.42	57.16	0.09	0.61
Seedling 75-29	84.85	8.33	54.97	8.05	53.12	0.28	1.85
Seedling 75-97	85.34	9.79	66.76	9.42	64.24	0.37	2.52
Seedling 75-4	85.88	9.94	70.38	9.65	68.33	0.29	2.05
Cordelia	83.47	10.41	62.97	9.72	58.80	0.69	4.17
Mission	83.79	12.34	76.10	11.50	70.92	0.84	5.18

*Analyses by W. B. Sinclair and Paul R. Crandall.

Parthenocarpic caprifigs are seldom found in the progenies of crosses involving Smyrna-type figs as the female parent. Of those which are found, none reach the third or pulpy stage mentioned above. On the other hand, a considerable percentage of parthenocarpic caprifigs occurs in progenies resulting from crosses of common figs. The significance of parthenocarpy in relation to fig breeding is therefore evident. In breeding for improved caprifigs, parthenocarpy in either parent is undesirable. In breeding for improved edible figs of the common type which are parthenocarpic in one or more crops, complete parthenocarpy and pulpiness of fruit are characters very desirable in both parents.

Summary

Vegetative parthenocarpy is well exemplified in common figs and in some caprifigs. Three kinds or degrees of parthenocarpy are found in caprifigs — in the first, no cenocarps or seedlike bodies occur; in the second, cenocarps are found but the syconia are dry at maturity; in the third, numerous cenocarps occur and the mature syconia are pulpy and more or less edible, a character which suggests the possibility of growing these figs for stock feed or for by-products. As many as 1,592 cenocarps have been counted in one syconium. Parthenocarpic caprifigs may or may not be inhabited by the fig wasp (*Blastophaga psenes* L.). Many of these figs contain an abundance of pollen which can well be utilized in fig breeding if both male and female parents have desirable characters.

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