In California, the fig, like many other fruits, was introduced when the mission at San Diego was established in 1769. Commercial culture started in 1885 and dried Adriatic figs were shipped east in 1889; but these were inferior in eating quality to imported Smyrna-type figs. Smyrna figs, which require pollination to set fruit, were introduced into California in 1881-1882, but it was not until about 1900—that the efforts of George Roeding of Fresno and L. 0. Howard and Walter Swingle of the USDA—that the fig wasp, Blastophaga psenes L., was established and used successfully to transfer caprifig pollen to Smyrna-type figs to obtain fruit-set (a process called “caprification”). This success stimulated interest in commercial production of Calimyrna (Sari Lop, California Smyrna) figs in California, and acreage expanded in the early 1900s.

Pollination of Calimyrna figs involves complex symbiotic relationships between caprifigs and the fig wasp. Over the years, University of California researchers have investigated and described these relationships. They have also studied methods of using fig wasps in the commercial production of Calimyrna figs, while insuring that the crop is protected from fruit diseases that can be transmitted by Blastophaga.

Gustav Eisen described the fig wasp life cycle and its relationship to caprifigs in 1901. Ira Condit, U.C. Subtropical Horticulturist, added further descriptions in 1918 and 1920. Their descriptions of caprification, a horticultural word used to describe the pollination process in figs, illuminated the complex relationships of plant and insect.

**Caprification**

A unique relationship between plant and insect

Marvin Gerdsis □ Jack Kelly Clark

*By transferring pollen from inedible caprifigs to edible Smyrna-types, a tiny wasp helps create an important commercial crop.*
these flowers must be pollinated from an external source, and nature has provided the very specialized fig wasp to transfer pollen from the male caprifig to Calimyrna fruits. Without caprification, Calimyrna figs grow to ½ to ¾ inch in diameter and then turn yellow, shrivel, and drop before maturing.

The caprification process occurs from the end of May into June. Adult female wasps emerge from caprifigs and enter Calimyrna figs, seeking egg-laying sites. In the process, pollen carried on the wasp bodies is spread to female flowers and results in fertilization and the production of viable seeds. Eggs are not laid in female flowers of Calimyrna figs because the flower structure is not suited to oviposition by the wasp.

The fig wasp relies on caprifigs to reproduce and complete its life cycle. It completes three life cycles per year, coinciding with the three caprifig crops: profichi (spring) crop; mammoni (summer) crop; and mamme (winter) crop. Female adults emerge from maturing caprifigs seeking egg-laying sites in the succeeding overlapping crop. They proceed by seeking caprifigs, which they enter to deposit eggs on modified female flowers (gall flowers) suited to fig-wasp egg laying. In the ovaries of these flowers, the larvae hatch and develop. Adult male wasps emerge from the gall flowers first and fertilize the females before they leave the galls. After mating, adult female wasps migrate in search of the succeeding caprifig crop and the cycle continues.

**Further studies**

U.C. Plant Pathologist P. D. Caldis described an internal fig rot problem in 1925 and 1927. He suggested the name endosepsis for the fungus disease caused by *Fusarium moniliforme* (Sheld.) Snyder and Han-
Caprifigs are placed in slotted paper bags in Calimyrna orchards. Female wasps that emerge from these figs will enter the edible Calimyrna figs in search of suitable egg-laying sites.

Female wasp emerges from the eye of a caprifig. She will then fly to another fig to lay her eggs (15x life-size).

Female wasp enters the eye of a Calimyrna fig (17x life-size).

Section of a Calimyrna fig showing the many long-styled ovaries lining its interior (3x life-size).

Female wasps try to lay their eggs in female flowers inside the Calimyrna fig but fail because the styles are too long. While struggling to lay their eggs, the wasps transfer pollen to the flowers, thus ensuring fruit-set (14x life-size).

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