

The Secret Life of a Fig's Tiny Pollinator: A Hidden Tale

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Obligate mutualism is a type of *symbiotic* relationship in which both species involved are entirely dependent on one another for survival or successful reproduction. In such interactions, the absence of either partner would lead to the inability of the other to complete its life cycle, for instance, fig trees require fig wasps for pollination and the wasps depend on figs to lay eggs and rear larvae.

The story of fig and fig wasp

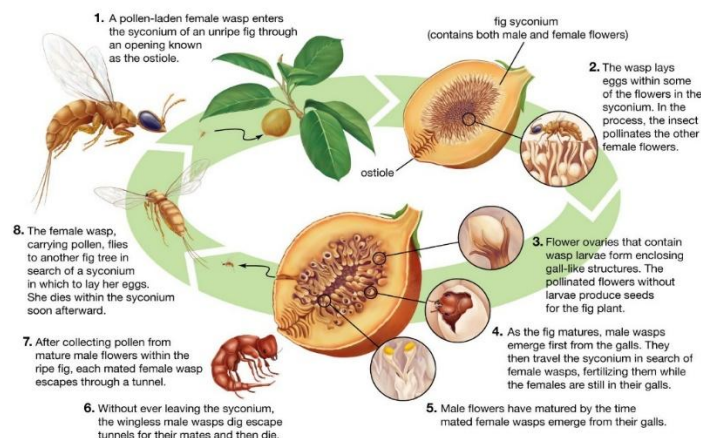
Figs (*Ficus* species) and their pollinating wasps (family *Agaonidae*) participate in a classic example of obligate mutualism, a tightly co-evolved biological partnership in which neither organism can reproduce without the other. Female wasps enter the fig's enclosed inflorescence (called a syconium) through a narrow opening called the ostiole. In doing so, they often lose their wings and antennae, a necessary anatomical adaptation for squeezing through the tight space. Once inside, the wasp deposits eggs in some flower ovules and carries pollen to others. The larvae develop inside galls formed in those ovules; in turn, pollinated flowers grow into seeds. New adult females then emerge carrying pollen, fly to other figs, and repeat the cycle.



Without these wasps, figs cannot produce viable seeds. Without figs, wasps cannot complete their life cycles or rear offspring within appropriate galls.

This mutualism has evolved over tens of millions of years, resulting in extraordinary host specificity, most fig

species associate with a single wasp species and intricate co-adaptations. For example, figs emit species-specific scent cues to attract the right wasp, and females have specialized pollen-carrying structures. Meanwhile, the fig wasp genome exhibits dramatic gene reduction in sensory and detoxification pathways, reflecting its sheltered life entirely within figs,



while the plant develops mechanisms like host sanctions aborting syconia entered by unpollinated or cheating wasps to maintain evolutionary stability in this exclusive relationship.

The Fig Wasp Life Cycle

1. Attraction & Entry

Mature female fig wasps use **species-specific scent cues** to locate receptive fig syconia-hollow, internally flowering structures of the fig tree. Upon locating such a fig, she forces her way through the tight **ostiole**, often losing her wings and antennae in the process.

2. Pollination & Oviposition

Once inside, the wasp lays eggs in certain ovules and deposits pollen in others. Ovules that receive eggs transform into **galls**, providing nourishment for larvae, while the other pollinated flowers develop into **seeds**. During this period, the female dies inside the fig after completing her reproductive role.

3. Larval Development: Eggs hatch into larvae that feed within galls. Their development continues alongside the maturation of the fig, a process that typically spans several weeks.

4. Male Emergence & Mating

Wingless male wasps hatch first. They mate with their still-developing sisters, often while the females are still inside their galls, then chew exit tunnels through the fig wall to allow female emergence. Males die inside the fig shortly afterward.

5. Female Dispersal & New Pollination

Fertilized female wasps exit via the tunnels, collecting pollen from male flowers as they go. With pollen in tow, they fly to locate new receptive figs, sometimes traveling long distances, to repeat the cycle.
