

Why Some Papaya Plants Fail to Fruit

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Papaya plants in home gardens sometimes fail to fruit. The plant may begin to develop fruits, but the fruits drop from the plant when they are about golf-ball size. This is not because the plant is unhealthy or under growth stress. It is a natural abortion of a female flower that had not been pollinated and therefore failed to develop into a fruit.

Papaya plants occur in one of three sexual forms: *male*, *female*, or *hermaphrodite*. These forms are expressed in the plant's flower.

Male flowers have no ovary and do not produce a fruit. They contain stamens bearing pollen that can pol-

linate a papaya flower with an ovary, causing it to produce a fruit. Male papaya plants are somewhat rare in Hawaii, since the "solo" types generally grown here do not produce male plants. Male flowers are conspicuously different from those of the other types because they are borne in large numbers on a branched, drooping flower stalk (peduncle).

Female papaya flowers have an ovary and are borne on the stem of the plant, where the leaf is attached (that is, in the axil of the leaf petiole). Female flowers are bulbous at the base and, before they open, pointed at the tip. The ovary of the female flower must receive pollen from another plant (either a male or hermaphrodite type) before it can be fertilized and produce a fruit containing viable seeds. The pollen is carried in the wind or on an insect. If there is no pollen in the vicinity, the small, developing fruit aborts and falls from the plant. Commercial growers remove female plants from their fields as soon as the first flowers appear and the sex of the plants can be determined.

Hermaphrodite flowers have both an ovary and stamens bearing pollen. They can pollinate themselves and do not require the presence nearby of another papaya plant. They are borne in the leaf axils, like the female papaya flowers.

The hermaphrodite plant is the preferred type of papaya plant for dependable fruit production, but under certain conditions its flower morphology is unstable and subject to "sex reversal." Cool winter weather or high soil moisture can lead to a shift toward femaleness, where the stamens fuse to the carpels or ovary wall. The resulting fruits become severely ridged (carpelloid, or "cat-faced") and hence are deformed and unmarketable. High

The three types of papaya flower



Female
conical bud; petals free; large ovary with prominent stigma; no stamens; does not form fruit unless pollinated



Hermaphrodite
cylindrical bud; petals fused at base; contains both ovary and stamens; self-fertile



Male
slender, spoon-shaped bud; petals fused at base; contains anthers but no ovary; cannot develop into fruit

temperature and water stress can lead to a shift toward maleness, in the form of a reduction in the number of carpels (normally five) comprising the fruit.

Ensuring success in the home papaya planting

Home gardeners should take steps to avoid having only a single papaya plant, in case it turns out to be a female. One way to accomplish this is have several plants in the garden, to ensure the possibility that at least one will be a hermaphrodite with pollen. If space is limited, allow several seedlings to grow to flowering stage in the same planting spot, and then remove all but the healthiest hermaphrodite plant.

Seeds from “solo”-type papaya fruits produce some female and some hermaphrodite plants. Seeds from a hermaphrodite plant will produce seedlings in the ratio of one female to two hermaphrodites. With Hawaii’s traditional “solo” cultivars, it is standard practice for commercial growers to plant three seedlings per hole, which allows more than a 96 percent chance of having a hermaphrodite plant. An exception is the virus-resistant hybrid, ‘UH Rainbow’, seed of which is produced on female plants that yield hermaphrodite and female seedlings in equal proportions. Consequently, it is recommended to allow at least five ‘Rainbow’ seedlings to grow to flowering stage at each planting spot to ensure a 96 percent chance of having a hermaphrodite plant.