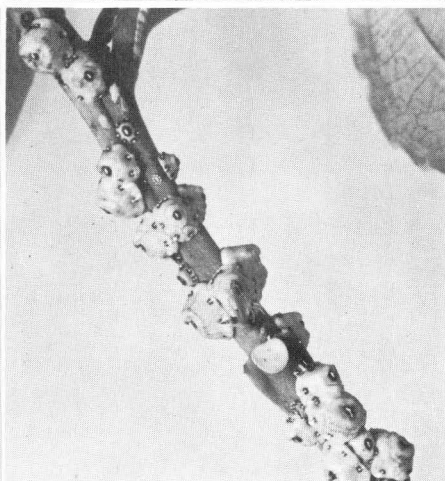
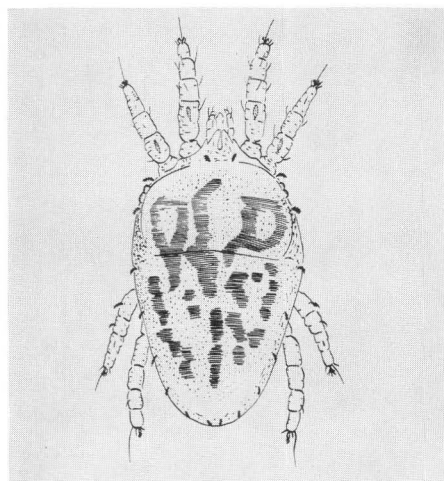


# Passion Fruit Pests and Their Control



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# Passion Fruit Pests and Their Control

T. NISHIDA and F. H. HARAMOTO

## PURPOSE OF THE CIRCULAR

The control of pests of the yellow passion fruit (*Passiflora edulis* f. *flavicarpa* Degener), called "liliko'i" in Hawaii, is an important phase in the commercial production of this crop in Hawaii. The purpose of this circular is to help growers recognize the pests and to suggest measures for their control. This circular also will be helpful to growers in recognizing the important pollinating insects which must be protected from sprays used in the control of pests.

Insects and mites are frequently found on the passion fruit. Some are pests because they feed on the plant; others are beneficial because they pollinate the flowers. The main problem in controlling pests of passion fruit is destruction of the pests and, at the same time, preservation of the pollinating insects.

The most economic way of growing passion fruit is, no doubt, to do so without the use of a spray of any kind. There are small backyard and other isolated areas where this is being done. However, under large-scale, continuous, "plantation type" production where relatively large investments are involved, the use of pesticides becomes a necessity. This circular is written for this type of passion fruit production.

## PASSION FRUIT PESTS

### Important pests

The pests of passion fruit are mites, fruit flies, thrips, aphids, anthribid beetles, and mealy bugs. The major pests are broad mites, carmine spider mites, red and black flat mites, barnacle scales, and fruit flies. These pests are shown in figures 1 to 8.

### Occurrence of pests varies with location and season

The occurrence of these pests varies with the location of the orchards and the season of the year. Broad mites are common throughout the year in the wet, cool areas and, during the winter months, in the dry hot areas. The carmine spider mites and the red and black flat mites are usually abundant throughout the year in the dry areas and, during the summer months, in the cool, wet areas. Fruit flies are usually injurious to young passion fruits in areas where wild guavas and other host fruits are present. The flies tend to move into passion fruit orchards after the fruiting season of the wild hosts.

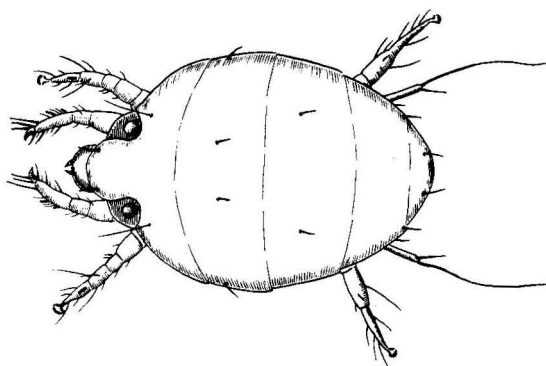
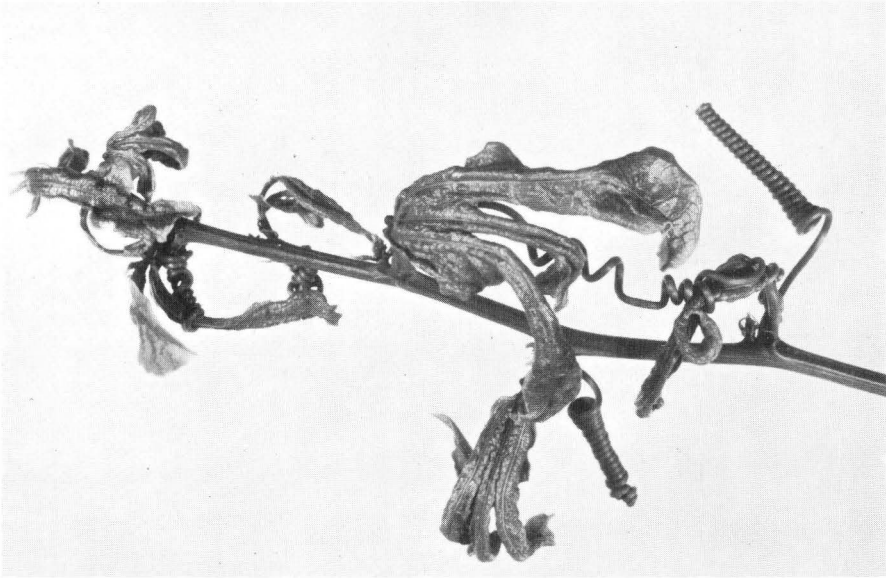


Figure 1. A female broad mite enlarged about 180 times. This mite is pale white to tan in color.



**Figure 2.** Damage to terminal shoot by the broad mite. Deformed leaves and stunted growth are characteristic symptoms of attack.

### **Pests found on different parts of plant**

One of the important things to remember about the various types of passion fruit pests is that they attack different parts of the plant. Broad mites are found on the terminal growth, which can be severely deformed by their attack (figure 2). The carmine spider mites are present on the lower surface of mature leaves. The attack by this mite can be recognized by the pale yellow stipplings on mature leaves. The red and black flat mites are found on the vines. This mite is the most damaging pest because it causes scarification of the bark, which ultimately leads to leaf drop and dieback of the vines (figure 5). Adult fruit flies often roost on the lower surface of leaves. They lay their eggs in young fruits, causing them to become shrivelled and deformed (figure 7).

### **Increase of pests may be caused by man**

The increase of some pests may be caused by certain insecticides. For example, the increase of the barnacle scale and the carmine spider mite is usually associated with the use of DDT. The reason for this increase is not known definitely. In many cases the increase is believed to be due to the destruction of natural enemies.

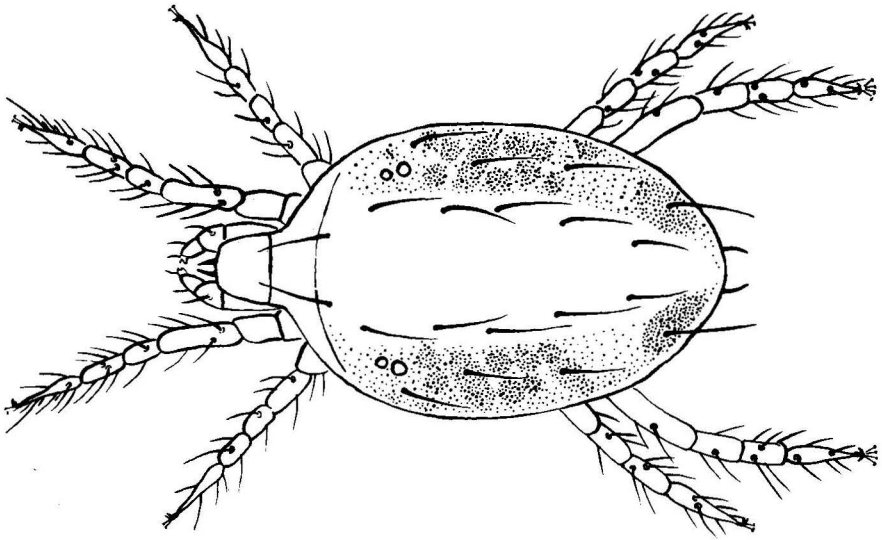


Figure 3. A female carmine spider mite enlarged about 150 times. Small yellow stipplings on the mature leaves are characteristic symptoms of attack.

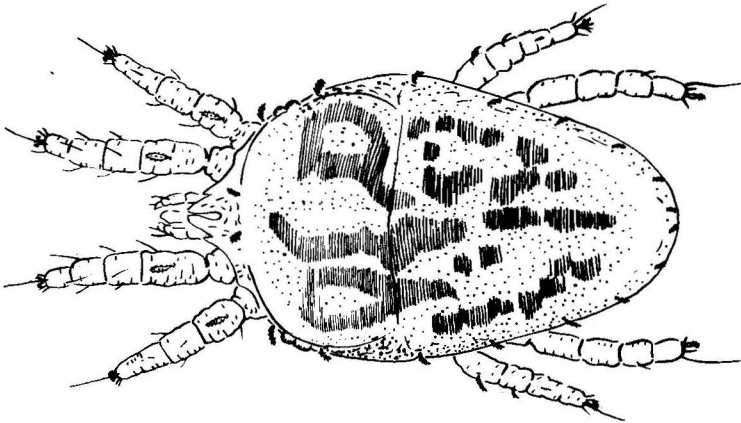


Figure 4. A female red and black flat mite enlarged about 220 times. As the name indicates, the color of this mite is red and black. The scarified bark of the mature vines, the yellowing of the mature leaves, and the dieback of the vines are the characteristic symptoms of attack.

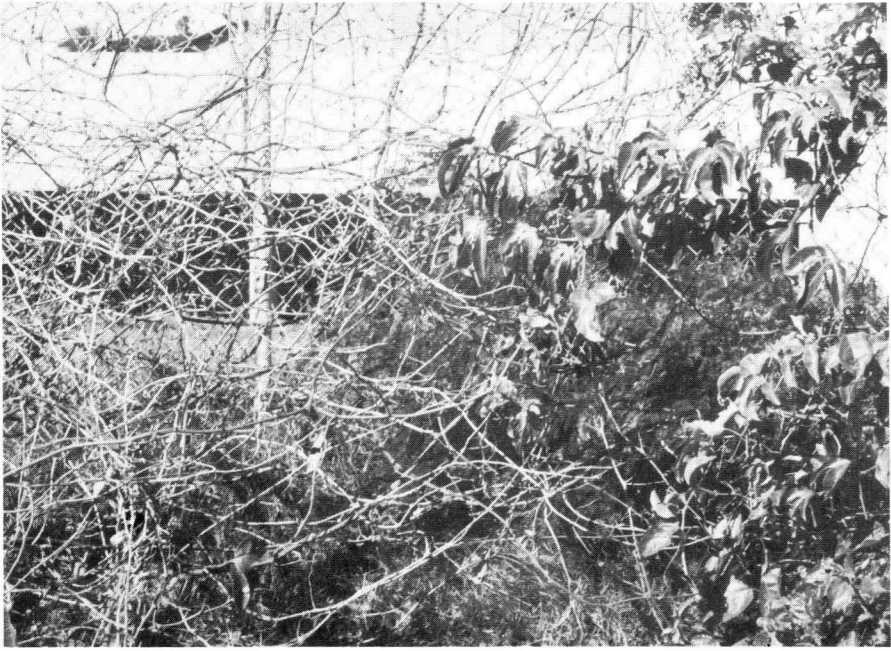


Figure 5. Dieback of passion fruit vines caused by the red and black flat mite. Note defoliated dead vines on the left, and living vines on the right.

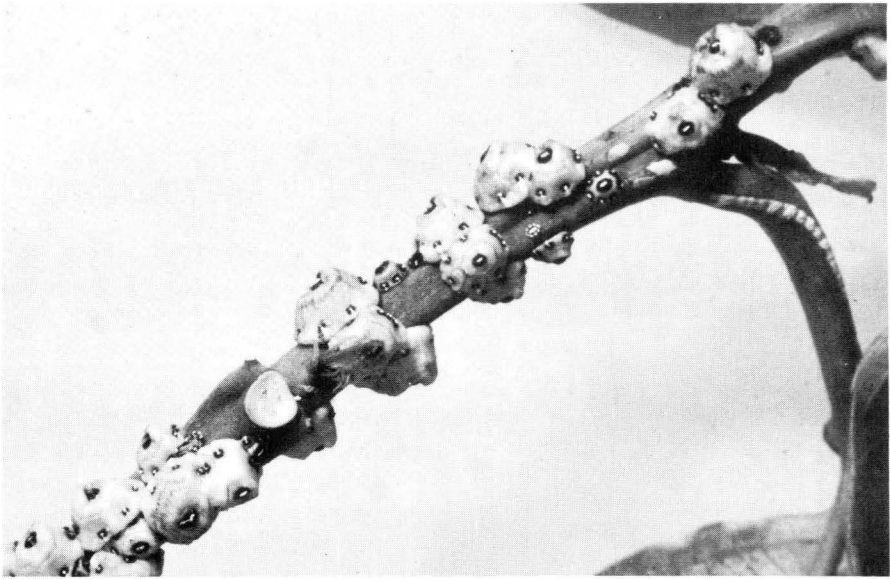


Figure 6. Barnacle scales on passion fruit vine enlarged about two times. These large, whitish scales can easily be seen with the naked eye. Vines infested by this scale are usually covered with black sooty mold. Defoliation and dieback of the vines can also be caused by this scale, when abundant.

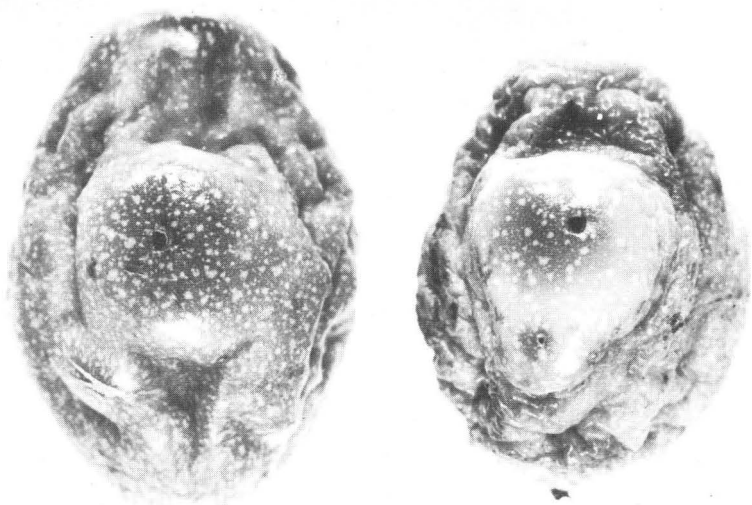


Figure 7. These shrivelled passion fruits were stung by fruit flies (see figure 8). Very young fruits, when stung by fruit flies, usually fall to the ground; fruits stung later remain on the vine, but become deformed.

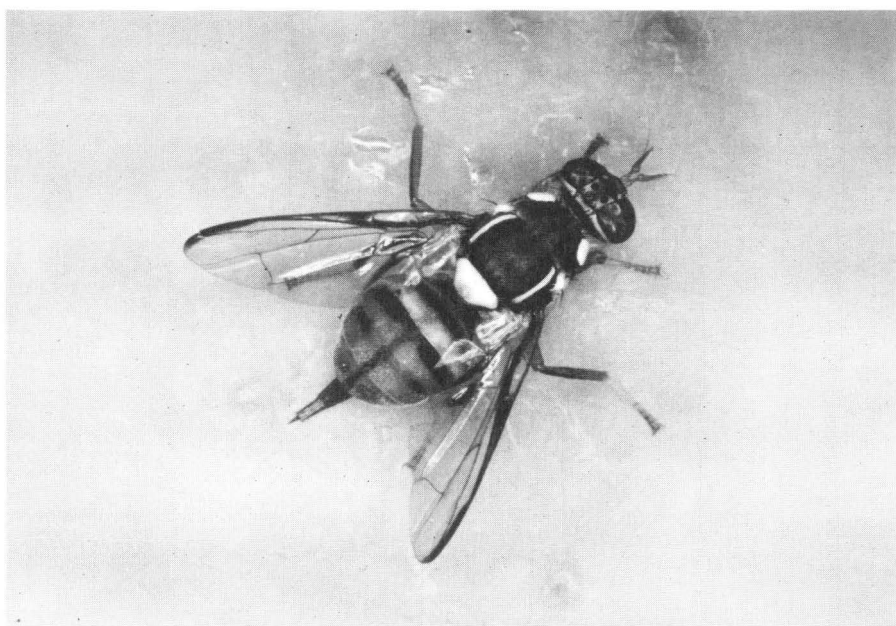


Figure 8. A female oriental fruit fly enlarged about four times.



## **POLLINATING INSECTS**

### **Important pollinators**

The two most important pollinators are the carpenter bee (figure 9) and the honey bee (figure 10). Less frequently, syrphid flies, ants, and other insects also visit the flowers and pollinate them to a certain extent.

### **No fruit set without pollination**

The passion fruit is self-sterile and will not produce fruit without cross pollination. In Hawaii, insects are the most important pollinators. When pollination is inadequate, both the number of fruits that set and the juice content of the fruits are reduced.

### **Pollinating insects most active when flowers bloom**

The insects that pollinate the passion fruit feed on the nectar and pollen. Often they do not nest in the orchard but instead travel long distances in search of food. During the flowering season the pollinating insects are most active in the field when the passion fruit flowers open. Since the passion fruit blooms in the afternoon, pollinators are found in greatest numbers during that period.

### **Importance of different pollinating insects varies**

The species of pollinating insects of passion fruit vary with locality. Carpenter bees appear to do well in dry to moderately dry areas. Honey bees appear to adapt themselves over a wide range of conditions. They are effective in both dry and wet areas.

### **Insects that gather food for young most effective**

A number of insects visit the passion fruit flowers. However, not all are effective pollinators. Those insects that gather nectar and pollen and store them in their nests for their young are the most effective pollinators. Both the carpenter bee and the honey bee have this habit.

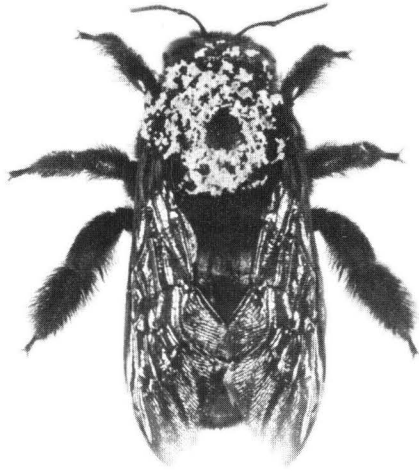


Figure 9. The carpenter bee enlarged about 2 times. This big, black bee with yellow pollen grains on its back may commonly be seen buzzing in passion fruit orchards. It nests in soft woods, such as redwood, sisal, and hau logs.

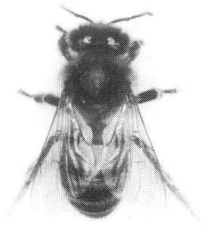


Figure 10. The honey bee enlarged about 2 times. This brown and black bee with pollen on its body and corbicula (pollen sac on hind legs) may be seen moving from flower to flower in passion fruit orchards.

## CONTROL OF PESTS

### Control procedures must be modified

The general procedures for controlling passion fruit pests are outlined below. These are merely guide lines and they should be modified to suit the needs of the individual grower. Trade names are used in this circular only for convenience. This does not constitute an endorsement of any particular product.

### Equipment

1. Good power spray equipment is essential.
2. Spray equipment must be capable of delivering at least 2 to 4 gallons of spray per minute and of developing a pressure of 200 to 300 pounds per square inch at the nozzle.
3. The use of the same equipment for both insecticides and herbicides should be avoided.
4. Cooperative purchase and use of equipment may be of help for small growers whose operations are not big enough to justify the purchase of power equipment.

### Spray materials

1. The following combination spray will control most pests of passion fruit: sulfur, 6 pounds (95% microfine wettable powder); malathion, 3 pounds (25% wettable powder); and triton (or other wetting agent), 0.8 pint (= 1:1000 dilution) per 100 gallons of water. Volck oil (Supreme) at the rate of  $\frac{1}{2}$  to 1 gallon per 100 gallons of water may be used in place of sulfur. Do not use sulfur in combination with oil. To avoid damaging the plants, an interval of at least 3 to 4 weeks should elapse between applications of sulfur and applications of oil.
2. For fruit fly control, use 3 pounds of malathion (25% wettable powder) per 100 gallons of water. Yeast hydrolysate at the rate of 1 pound per 100 gallons of water may be used in the malathion spray if desired.

## **Application of spray**

1. For most effective spraying, arrange plantings so that equipment can pass freely between rows (see Hawaii Agricultural Extension Service, Circular 345, 1956).
2. Direct spray into foliage and vines with sufficient volume and pressure to wet the plant thoroughly.
3. For fruit fly control, direct spray from a distance and let spray drift into the foliage.
4. Do not apply sprays 3 days before harvest.
5. Observe safety precautions when using pesticides (see Hawaii Cooperative Extension Service, Farmers Information Series No. 2).

## **Develop a spray program**

Develop a regular spraying program to be followed from the time of planting to the end of the crop. By means of such a program, pests may be controlled before they reach destructive numbers. However, because the passion fruit is grown under diverse environmental conditions, this program should be modified to suit the needs of the individual grower. Under heavy rainfall conditions, a frequent spray program might be necessary. In areas where mites become abundant during the hot summer months, treatments may be necessary more frequently during this period than in other months. Furthermore, should broad mites become abundant from December through February, when growth of new vegetation is heavy, frequency of applications must be increased accordingly.

## **PRESERVATION OF POLLINATING INSECTS**

### **Timing of spray important**

Since the passion fruit requires cross pollination for fruit set, the importance of pollinating agents cannot be overemphasized. To prevent destruction of pollinating insects, spray during the morning hours, especially during the flowering season (figure 11).

### **Provide nesting places**

Providing nesting places for carpenter bees, such as old redwood posts, sisal logs, or other soft woods to encourage the buildup of the bee population, is a good practice. Placing honey bee hives near passion fruit fields, especially in areas where pollinators are scarce, is recommended.

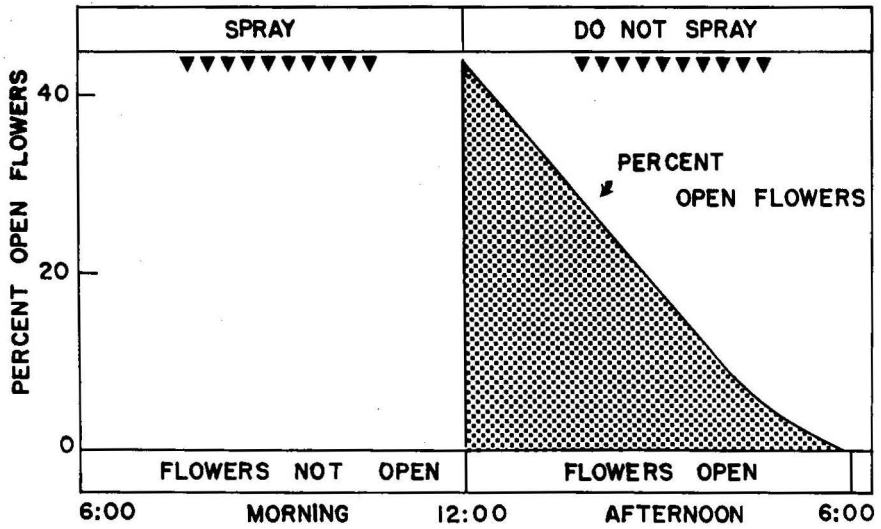
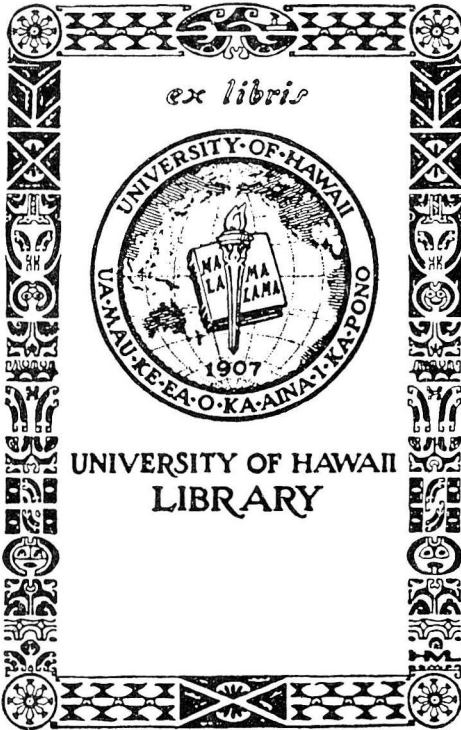


Figure 11. Passion fruit flowers begin opening about 12:00 noon and close at about 6:00 in the evening. To avoid destruction of pollinating insects, spray during the morning hours.

## AVAILABLE PUBLICATIONS ON PASSION FRUIT

- AKAMINE, ERNEST K., *et al.* 1956. PASSION FRUIT CULTURE IN HAWAII. Hawaii Agr. Ext. Serv., Ext. Circ. 345. (Revised)
- AKAMINE, ERNEST K., and GUIDO GIROLAMI. 1959. POLLINATION AND FRUIT SET IN THE YELLOW PASSION FRUIT. Hawaii Agr. Exp. Sta. Tech. Bull. No. 39.
- NISHIDA, TOSHIYUKI. 1958. POLLINATING INSECTS AND THEIR EFFICIENCY AS POLLINATORS OF THE PASSION FRUIT IN HAWAII. Jour. Econ. Ent. 51: 146-149.
- NISHIDA, TOSHIYUKI. 1963. ECOLOGY OF THE POLLINATORS OF PASSION FRUIT. Hawaii Agr. Exp. Sta. Tech. Bull. No. 55.
- SCOTT, FRANK S., JR. 1957. CONSUMER USES OF PASSION FRUIT JUICE. Hawaii Agr. Exp. Sta., Agr. Econ. Rept. 31.
- SEALE, PETER E., and G. DONALD SHERMAN. 1960. COMMERCIAL PASSION FRUIT PROCESSING IN HAWAII. Hawaii Agr. Exp. Sta. Circ. 58.
- TANAKA, TOKUSHI. 1963. NINE SAFETY PRECAUTIONS FOR INSECTICIDE-USERS. Hawaii Cooperative Ext. Serv., Farmers Information Series No. 2.



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