

# **GUAVA FRUIT BAGGING FOR BIRD AND FRUIT FLY DAMAGE CONTROL**

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## **INTRODUCTION:**

Damage from fruit flies and birds are major bottlenecks to growing commercial guava in Hawaii. A guava observational field trial was planted in April 2018 at the Waimanalo Research Station. Screenhouse systems, which are gaining popularity in local vegetable production systems, were implemented as a pest management tool for fresh guava production. Three varieties of guava were planted in the screenhouse: Indonesian White, Ruby Supreme, and Egyptian Pear (Photo 1).



**Photo 1.** Three varieties of guava in a screenhouse in Waimanalo, Oahu.



**Photo 2.** Bird feeding damage.



**Photo 3.** Fruit fly damage (adult female fruit flies laying eggs in fruit).

## **SCREENHOUSE TRIALS:**

Guava is a heavy bearing tropical fruit tree. One of the major limitations of growing guava for the fresh market is getting a premium price to offset the high labor expenses associated with pest management, pruning, etc.



**Photo 4.** Bird damage.

**Photo 5.** Healthy fruit (cross-section of Ruby Supreme).

**Photo 6.** Healthy fruit (exterior of Ruby Supreme).

In previous field trials, using screenhouse systems with guava, figs, and grapes, we were able to significantly minimize fruit fly and bird damage (Photos 9 & 10). However, it was not successful in preventing small insect pests such as white flies (Photos 7 & 8) from entering the screenhouse systems.

Despite the use of contact and systemic insecticides, we were not able to maintain pest levels below economic threshold levels due to exclusion of natural enemies, which are generally larger and not able to pass through the fine screen. We also found it difficult to maintain and manage trees within the screened system.



**Photo 7 & 8.** Whitefly effect on guava leaves inside screen house system.

In 2019, the EZ corner screenhouse unit (Photo 1) was removed and the trees were allowed to grow outside of the screened unit for 6 months and acclimate. The majority of the fruits grown outside of the screenhouse system were damaged from fruit flies and/or birds at color break.

We also found it challenging to manage tree size in screenhouse systems. Trees require continuous trimming to avoid over-crowding, to prevent damage to the screen nettings, and to

ensure good air flow. Future work could include evaluating the effect of added pruning on fruit yield and profitability in screenhouse systems.



**Photo 9 & 10.** Previous field trials evaluating figs (left) and grapes (right) grown in a screen house system.

#### **FRUIT PROTECTION BAG TRIALS:**

Local and national research suggests that fruit bags provide various degrees of fruit quality and pest management improvements. In 2020, we evaluated easily accessible fruit bags for longevity and efficacy in providing pest protection to address stakeholder needs.



**Photo 11, 12 & 13.** Various type of fruit protection bags available commercially. Bags in Photo 11 (left) and 12 (middle) both are made of nylon, but vary in the mesh size and strength. The bag in Photo 13 (right) is made of brown paper.

Fruit protection bags vary in the material type, strength, crop suitability, reusability, and cost. Fruit bags provide excellent protection from fruit flies and birds. Using these bags can help to produce high quality Grade A fresh fruit. Fruit bags work better than screenhouses systems in tropical fruit culture as it allows beneficial insects and other biological control measures to be implemented in the orchard production system. More time is needed to evaluate the efficacy of bags on other fruit crop pests, such as the Oriental flower beetle, weevils, etc.

Informed decision making is important prior to purchase and application of fruit protection bags. We found that fruit bags made of brown paper or nylon mesh (Photo 15 & 16) can be used 1-2 times, depending on rain and wind intensity in the orchard. Screen netting (bird netting) fruit bags can be used multiple times, if they are collected and stored appropriately after each harvest (Photo 14). Fruit bags are breathable and allow airflow and sunlight into the bag. The screen netting bag also allows you to see the fruit clearly as it develops.



**Photo 14, 15 & 16.** Using different type of fruit protection bags for guava. Photo 14 (left) is a screen netting bag. Photo 15 (middle) is a nylon mesh fruit bag. Photo 16 (right) is a brown paper bag.

For fruit trees, the fruiting type (i.e. single or multiple fruit on each branch), and size of fruits at maturity should be taken into consideration prior to purchasing and using fruit bags. Some bags will allow you to wrap a single fruit per bag, and larger bags may enable you to cover multiple fruits at once, which involves less labor when a single bag used for multiple fruits at once.



**Photo 17, 18 & 19.** Evaluate your crop type before selecting and purchasing fruit bags.

Fruit bagging can be a labor intensive task. The temptation to use one bag for multiple (bunch) fruits can conserve time and cost. However, it comes with some added issues, including: fruit maturity may vary in the bunch (multiple fruits covered using a single bag), which could lead to harvest loss due to rot and decomposition (Photos 20 & 22).



**Photo 20.** Harvesting guava fruits at various maturity stage in a single bag can be difficult. Leaves may need to be removed when bagging more than one fruit per bag.



**Photo 21.** Bagging multiple mango fruits per bag can lead to overcrowding.



**Photo 22.** If multiple fruits will be bagged, the bag should be large enough to accommodate the size of all fruits at maturity to avoid damage of the fruit bag and pest invasion.



**Photo 23, 24 & 25.** Fruit bags can be used for a wide array of tropical fruit. Bags should be placed over fruit after fruit set, prior to color break.

**SUMMARY:**

Fruit bags can be used on a wide array of tropical fruit crops in Hawaii (Photo 6, 9, 10, 21 & 25). Fruit bags are a non-chemical, physical barrier pest management tool that growers can use in place of contact and systemic insecticides. Bags are widely available for purchase and provide excellent control of fruit fly and bird damage. Screen is also available locally. Small acreage and backyard growers may opt to sew their own bags. Experimentation is needed to determine the most appropriate type of bag for your fruit type, orchard system, labor availability, and budget.