

Control of fruit flies pest on organic guava fruit by using organic insecticide

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Key words: organic insecticide, fruit fly, guava fruit

Abstract

Guava fruit (*Psidium guajava*) is a mainstay commodity in Bogor – Indonesia. Its production reaches 15 tons per ha per harvest at every three day interval. Nevertheless, one of the obstacle in securing the productivity is fruit flies pest (*Bactrocera* spp.) which can cause 50% or even up to 100% yield losses. So far, the control measures done by the farmers is by using synthetic insecticide spraying, wrapping fruits, and fencing garden with nets nearly as high as 3 meters to deter attack of fruit flies. Such control measure is expensive and causes problems with insecticide residues in fruits and environments that adversely affect human health and the environment. A technique control that is considered environmentally friendly is by using an organic insecticide made from plants (botanical insecticide), such as basil plant (*Ocimum* spp) and Tea tree (*Melaleuca bracteata*). The use of organic insecticides derived from the distillation of basil (*Ocimum* spp) and tea tree (*Melaleuca bracteata*) leaves containing methyl eugenol ($C_{12}H_{24}O_2$) is effective to control fruit flies in guava orchard, is able to decrease substantively pest attack and consequently increase the farmers income. Since organic insecticide is considered environmentally friendly, therefore its application in organic farming practice is strongly encouraged.

Introduction

Guava fruit (*Psidium guajava*) is a mainstay commodity in Bogor – Indonesia. Its production reaches 15 tons per ha per harvest at every three day interval. Nevertheless, one of the obstacle in securing the productivity is fruit flies pest (*Bactrocera* spp.) which can cause 50% or even up to 100% yield losses, either quantitatively by falling fruit, or qualitatively by rotten fruit caused by infestation of fruit flies larvae into the fruits (Broughton, 2004).

So far, the control measures done by the farmers is by using synthetic insecticide spraying, wrapping fruits, and fencing garden with nets nearly as high as 3 meters to deter attack of fruit flies. Such control measure is expensive and causes problems with insecticide residues in fruits and environments that adversely affect human health and the environment. A technique control that is considered environmentally friendly is by using an organic insecticide made from plants (botanical insecticide), such as basil plant (*Ocimum* spp) and Tea tree (*Melaleuca bracteata*). Essential oil obtained from distillation of basil and tea tree leaves contain methyl eugenol ($C_{12}H_{24}O_2$) acts as attractant for fruit flies. Fruit flies will consume methyl eugenol before matting. Methyl eugenol consumed is as a compound to result sex pheromone in fruit flies body to attract their couple (Nishida, 1996; Nishida and Fukami, 1988). By locating methyl eugenol in the trap, fruit flies get trapped. This technique is considered as environmentally friendly technique, hence can be applied in organic farming practice.

Material and Methods

Preparation of organic insecticide (Attractant)

Organic insecticide is obtained by distillation of basil (*Ocimum* spp) and tea tree (*Melaleuca bracteata*) leaves resulting essential oil containing methyl eugenol ($C_{12}H_{24}O_2$) approximately 80%. There are two formula of botanical insecticide used in the research, i.e. (a) essential oil as attractant of fruit flies which is located in the trap and (b) essential oil mixed with glue (sticky trap) which is smeared on the plastic bottle surface.

Research consisted of two steps:

(1) Preliminary research is done before control with organic insecticides, i.e. by calculating the intensity of the fruit fly infestation in three villages, at guava fruit garden area of approximately 2 hectares each, by

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taking a random sample of 100 pieces of fruit, then separated between damage fruit caused by fruit flies attack and healthy fruits. The intensity of the attack is calculated by the formula:

$$I = \frac{a}{b} \times 100\%$$

a = damage fruit; b = total of fruit observed

(2) Further research is done after treatment with organic insecticide by observing the attack rate changes on garden using organic insecticide, compared to levels of attacks in garden with synthetic insecticide (Farmers practice).

Control technique by using organic insecticides is done in two ways, i.e. (1) by dropping attractant as much as 1 ml on a cotton bud located in the fruit fly traps made from mineral drinking water bottles, then hung them as high as around 2 meters above the ground with 20 traps per hectare, and (2) by mixing attractant with glue (sticky trap), then smear on the mineral drinking water bottle surface then hung them on guava tree as high as around 2 meters above ground level. The number of trap per hectare is 20 traps. Number of fruit fly trapped calculated every 2 weeks with the replenishment of essential oils (attractant) in the bottle traps and sticky traps replacement. This activity is carried out continuously for a year. Observation on the fruit flies attacks is carried out every 3 months.

Result and Discussion

Preliminary Reserach

The data of fruit flies infestation on the fruit at each garden is shown at Table 1.

Table 1. Infestation of fruit flies at each guava garden

Location	Fruit flies infestation (%)
Garden 1	56
Garden 2	61
Garden 3	60

Intensity of fruit fly pests in both gardens is quite high (56% to 61%). It indicated that fruit flies infestation at all gardens is not significantly different (relatively homogenous).

Further research

On further research, the number of fruit flies trapped is observed every two weeks, both on the bottle trap and the sticky trap, as in Table 2.

Table 2. Average number of fruit flies trapped every two weeks

Control techniques	Average number of fruit flies trapped/trap/2 weeks
Sticky trap	86
Attractant trap	54

The above data showed that both methods used were effective in trapping fruit fly pests. However, sticky trap (mixing of attractant and glue) method is more effective than the use of attractants in the bottle trap.

Intensity of fruit flies observed at every 3 months interval showed that guava orchard (farmers practice, without organic insecticide), infestation of fruit flies fluctuated at approximately 60%, as compared to the garden using organic insecticide, either by using sticky trap or attractant trap showed a considerable

reduction, although in the first 3 months indicated no significant reduction, but in the following 6 months a significant decrease in the level of attack to reach the level of 31% to 35% attacks (Figure 1) is noticed. This figure remain high. However, with continuously control, the attack rate is expected to further decline.

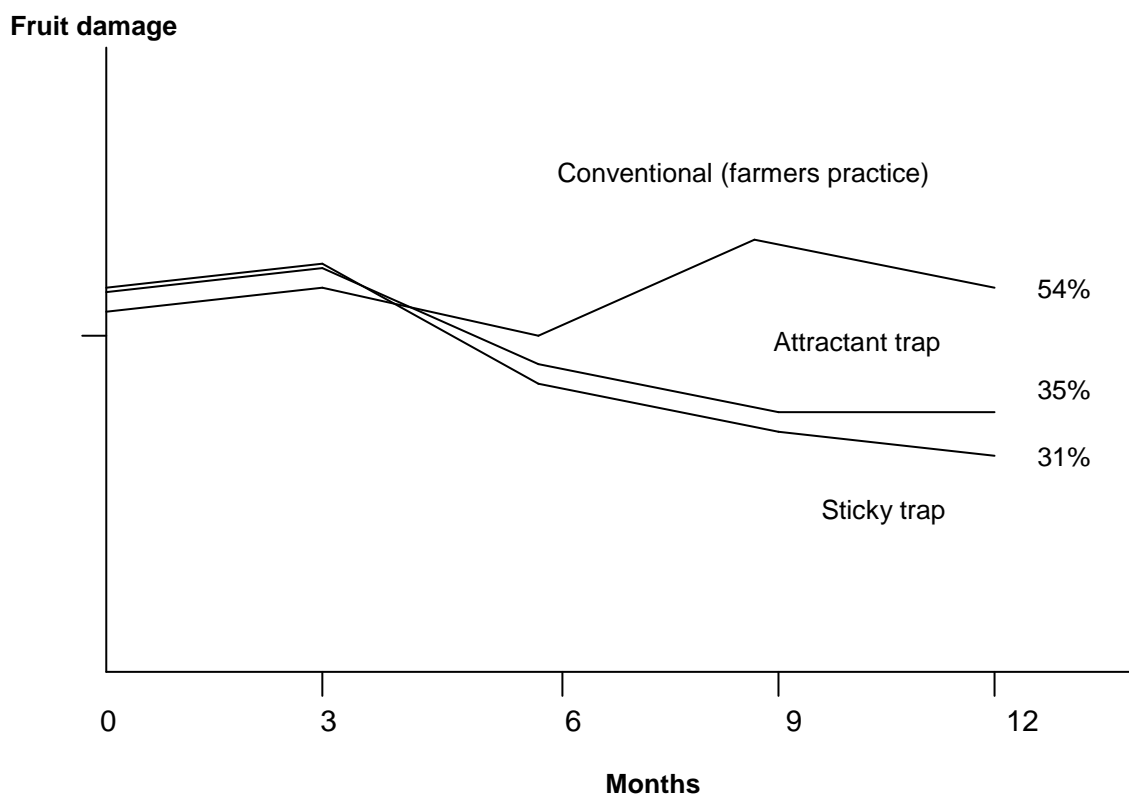


Figure 1. Infestation of fruit flies at guava fruit orchard

The gain benefit by the farmers is not only from the decrease of fruit flies intensity which led to increase in fruits yield, but also saving as cost reduction on synthetic insecticides. Both increase in yields and savings of cost of insecticides let to higher income for the farmers. In addition, using organic insecticides is environmentally friendly, affecting better consumers and environmental health.

Conclusion

The use of organic insecticides derived from the distillation of basil (*Ocimum* spp) and tea tree (*Melaleuca bracteata*) leaves containing methyl eugenol ($C_{12}H_{24}O_2$) is effective to control fruit flies in guava orchard, so that it is able to decrease pest attack and consequently increase farmers income.

Suggestion

Since organic insecticide (botanical insecticide) is environmentally friendly and low in cost, therefore its application to organic farming practice for controlling fruit flies is encouraged.

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