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Effect of Camphor and Patchouli Oil to Control Fruit Fly Pest (*Bactrocera* sp.) on Chillies (*Capsicum annum* L.)

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ABSTRACT

Fruit flies are the main pests on chili plants that are very difficult to control. These pests greatly affect the production of chili plants by attacking the fruit. Fruit fly pest attacks can result in yield losses of about 23%-60% and can even cause crop failure. Controls that are often carried out today are chemical control, chemical control in the long term can cause environmental damage, pest resistance and pest resurgence. One of the environmentally friendly controls is the use of camphor compounds and patchouli oil which are able to resist the arrival of fruit fly pests without any pesticide residues in agricultural products. The results showed that 1.5 ml of camphor, 1 ml and 1,5 ml of patchouli oil were repellent so that they could be used as an alternative to control fruit fly pests on chili plants.

Keywords : Fruit fly, Camphor, Patchouli Oil, Repellent.

I. INTRODUCTION

Capcisum annum is a leading horticultural commodity in Indonesia which is rich in anti-oxidant compounds and is believed to be able to protect the body from free radicals. Cultivation of chili plants is always a decrease in crop production. This is influenced by several factors, among others, farmers who generally still use varieties with low yield potential, inadequate technical implementation, and disease disorders. Meanwhile, the obstacle in the field that greatly affects production and quality decline is the disturbance of fruit fly pests [1].

Fruit fly pests can cause yield losses of about 23%-60% [2]. One species of fruit fly that is known to be very destructive is *Bactrocera* sp. Symptoms are seen on the fruit stalk, the tip of the fruit and the center of the young chili fruit will turn yellow. If the attack occurs at the base of the fruit (close to the fruit stalk) usually the stalk will turn yellow and the fruit will fall before the fruit fly eggs hatch. Attacks on the tip of the fruit and the center of the fruit cause the chilies to turn yellow and rot and slightly wet. If you pay attention to the infected fruit, there are black dots / small holes punctured by the ovipositor of the female

fruit fly. If split open, inside the fruit there are small fruit fly larvae like white caterpillars.

Some of the controls that have been carried out to control fruit flies are the use of methyl eugenol attractant compounds and the application of chemical pesticides. However, the use of chemical pesticides at the farm level is sometimes excessive so that it can leave residues on chili peppers and damage the environment, while the use of attractants is also not effective because it only attracts male fruit flies. One of the fruit fly control techniques that is easier, safer and quite effective in suppressing the fruit fly pest population is to use a pungent-smelling compound that can make insects refuse to come on chili plants. Some compounds that are repellent and easily available are camphor and patchouli oil. Camphor is a substance derived from the camphor tree whose wood and leaves are steam distilled to obtain essential oils, contains terpenoids with the chemical formula $C_{10}H_{16}O$, also contains volatile naphthalene (smelling smelling) compounds that can help repel insects.

Patchouli plants contain essential oils which are commonly used in various industries of perfume, cosmetics, pharmaceuticals, essences, and others. Patchouli, vetiver and citronella oils have the ability and function as pesticides (pesticide power) so that they can be used as insect repellents [3]. The use of patchouli oil as an active ingredient in the manufacture of insecticides is due to the presence of secondary metabolite compounds that stimulate chemoreceptors so that insects do not like it.

II. METHODS AND MATERIAL

Research Design

This research was carried out using a Separate Plot Design (RPT), namely the repellent type (P) as the main plot consisting of two levels, namely: P1: Camphor and P2: Patchouli Oil. Various volumes of repellent species (A) as sub-plots consisted of 4 levels, namely A0 : Control, A1 : 0.5 ml, A2 : 1 ml, A3 : 1.5 ml.

Preparation of Repellent

Camphor compound as much as 100 grams is mashed then soaked in 100 ml of water, then allowed to stand for 24 hours so that the pungent smell of camphor can come out (Every given). Meanwhile, 300 ml of patchouli oil (3 times given) was obtained from the distillation of the patchouli plant belonging to the farmer.

Repellent Containers

Containers are made of plastic clips measuring 7 x 10 cm, then a small hole is made using a pin with the aim of removing the pungent smell of camphor and patchouli oil, then filled with cotton measuring 5 x 6 cm to store/ absorbs camphor soaking water and patchouli oil.

Installation of Repellent

Repellent from camphor and patchouli oil was injected into the plastic containing cotton after the volume of each treatment. The plastic repellent is hung around the plant by clipping/gluing the plastic to the rope beside the chili plant with each repellent distance of 1 meter and a height of 1 meter from the plant surface so that the aroma can repel fruit flies. Subsequent administration was carried out at an interval of 7 days.

Research Parameters

The observation parameters in this study were the percentage of fruit fly attacks on curly chili plants and the types of fruit flies that attacked curly chilies at the research site.

III. RESULTS AND DISCUSSION

The type of fruit fly that attacks curly chili plants in the study area is *Bactrocera dorsalis* (Figure 1) which has characteristics on the thorax of the scutum which

is reddish brown and black in color and transverse bands on each side of the tip of the scutellum. A narrow costal band that descends at the end of the R and the anal line is very narrow, the abdomen has a black line that runs across terga II, a black line that runs along terga III (1), a black line that runs longitudinally on terga III to V so that it forms the letter T (2) .

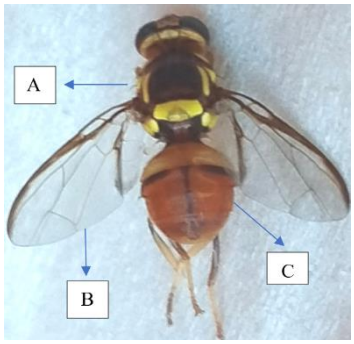

Figure 1. *Bactrocera dorsalis*
A : Thorax, B : Wings, C : Abdomen

The average percentage of fruit fly attacks on chili plants in the field (Table 1) shows that there is an interaction between two types of repellents (main plot) and various volumes (sub-plots) make a very real impact. The average percentage of attacks in the 1st week of observation, P1 (camphor) was lower than P2 (pattern oil) at A1 (0.5 ml), A2 (1 ml), and A3 (1.5 ml). Furthermore, at the 2nd week of observation, P2(Patchouli oil) was lower than P1(camphor) at A1(0.5 ml), and A2(1 ml) but higher than A3(1.5 ml). Then, at week 3, P1 (camphor) was lower than P2 (Patchouli oil) at A1 (0.5 ml), A2 (1 ml), and A3 (1.5 ml).

Table 1. Average percentage of fruit fly attacks on chili plants

Observation	Plot of Main	Plot (%) A0 (0 ml)	A1 (0,5 ml)	A2 (1 ml)	A3 (1,5 ml)	NP-BNT
I	Camphor	6^{g}_{f}	$0,72^{d}_{d}$	$0,4^{b}_{b}$	$0,31^{a}_{a}$	1,34
	Patchouli Oil	$9,5^{h}_{g}$	$1,3^{f}_{f}$	$0,8^{e}_{e}$	$0,7^{c}_{c}$	
II	Camphor	$6,5^{g}_{g}$	$1,21^{f}_{f}$	$0,8^{d}_{d}$	$0,26^{a}_{a}$	
	Patchouli Oil	$8,3^{g}_{g}$	1^{e}_{e}	$0,77^{c}_{c}$	$0,7^{b}_{b}$	
III	Camphor	$7,6^{g}_{g}$	$0,4^{c}_{c}$	$0,3^{b}_{b}$	$0,22^{a}_{a}$	
	Patchouli Oil	$4,3^{f}_{f}$	$1,2^{f}_{f}$	$0,6^{d}_{d}$	$0,6^{e}_{e}$	
NP-BNT	1,07					

Note: The numbers followed by the same letter are not significantly different on the BNT test level 0.05

Based on observations in the field, it was shown that the interaction between the two types of repellents (main plot) by sharing the volume (sub-plots) had a very significant effect on the percentage of fruit fly attacks on curly chili plants. The lowest attack percentage was found in the camphor treatment with a volume of 1.5 ml. This is influenced by the content of camphor which has a very strong odor so that insects refuse to come. Camphor with the active ingredient naphthalene which is a simple aromatic polycyclic hydrocarbon with a distinctive pungent odor or aroma, this smelly compound is feared by insects and pests [4]. A number of studies have shown that camphor has repellent activity, because it contains monoterpenoid compounds which are believed to help plants in defense against insects, capable of interfering with the biochemical and physiological toxic functions of insects [5]. In addition, camphor also contains lignan compounds that affect the specific physiological functions of insects [6].

Patchouli oil treatment was less effective than camphor, although the aroma was quite strong, this was because the evaporation of the oil was faster after application. The strong aroma of patchouli oil will decrease over time. Essential oils from plants undergo evaporation so that their durability is not long [7]. Patchouli leaf essential oil is repellent to *Aedes aegypti mosquitoes* but its repellent power will decrease the longer it is installed [8].

The results showed that the percentage of fruit fly attacks after the control treatment, 0.5 ml and 1 ml camphor was significantly different from the 1.5 ml camphor treatment. This is because the administration of 0.5 ml and 1 ml of camphor is less causing the aroma produced to be less pungent so that it is less effective at repelling fruit fly pests. A higher

DEET concentration indicates the product is effective for a longer period of time. The higher the concentration of the preparation, the greater the repulsion [9].

The results showed that the more pungent aroma produced by several treatments of camphor was able to inhibit fruit fly attacks compared to other treatments. The smell of smell is very influential on the sense of smell of fruit flies, which is the main stimulus to guide insects in searching for food. The chemoreceptor organs are located on the antennae, so insects can find the direction of the smell [10]. Fruit flies have chemical receptors which are chemical taste organs, one of which is chemoreceptors which are related to the problem of taste (tasting process) and smell (smell process) which are important parts of the insect's sensory system associated with various kinds of behavior, such as eating behavior, mating, habitat selection, and so on. The sensitivity of chemical receptors to several substances is very high so that they can detect odors, essential oils which have volatile characteristics can stimulate fruit fly receptors in their activities.

In the second week of observation, patchouli oil at a volume of 0.5 ml and 1 ml showed the lowest attack compared to camphor. One of the causes of this is environmental factors where rainfall is quite high. Fruit flies on fruits and vegetables will increase in a cool climate, high humidity, besides the influence of rainfall is also quite important, where the population of fruit flies in areas with high rainfall will be followed by a population that has high rainfall [11]. High rainfall also causes fruit fly populations to increase because it is possible that rainfall has a relationship with host plant fertilization and fertilization occurs when it rains often [12].

In addition, patchouli oil contains several secondary metabolites, namely patchoulol, phloroacetophenone[13], Pogostone such as alkaloids [14], phenolics (flavonoids), polyacetates, and terpenoids (monoterpenoids and sesquiterpenoids). Compound Patchoul which has a repellent effect against *Tribolium castaneum*, *Lasioderma serricorne*, and *Liposcelis bostrychophila* [13], while the pogostone compound also has a reppellent effect on *Myzus persicae* of 0.015 % at 72 hours after application with a concentration of 125 mg/L [15].

IV. CONCLUSION

Based on the results of the study, it can be concluded that 1.5 ml of camphor, 1 ml and 1,5 ml of patchouli oil were repellent so that they could be used as an alternative to control fruit fly pests on chili plants.

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