Response of Fruit Fly, *Bactrocera dorsalis* Complex on Methyl Eugenol Derived From Basil Plant, *Ocimum sanctum* L.

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Abstract. Fruit fly is one of the major pests that attack horticultural commodities, as well as the insect becomes a major pest in mango plantation all over the world. The objective of this research was to study the response of fruit fly on methyl eugenol (ME) derived from basil plant used as attractant. The response test was conducted on 5 concentrations of ME (0.1 mL; 0.2 mL; 0.,3 mL; 0.4 mL; and control treatment/commercial eugenol = Petrogenol 0.2 mL) as laboratory test using Olfactometer, semi field trial using screencage (2m x 2m x 2 m), and field treatment. The semi field trial was conducted by placing a mango tree with ± 1 m of heigh and placing a sticky trap inside. Each of the screencage was infested by 50 male fruit flies. Those two experiments were arranged in Completely Randomized Design consisted of 5 treatments and 5 replications. The field experiment was conducted in mango plantation at Panyingkiran, Majalengka which was arranged in the Randomized Block Design with 5 treatments and 5 replications. The plastic bottle trap was used in the field test that was placed on the height of ± 1.5–2 m above soil surface. The result of laboratory test on Olfactometer showed that all of fruit fly gave response to the ME concentrations where the highest concentration the lowest of male insect were caught. On the concentration of 0.1 mL and 0.2 ml, the insect was more responsive compare to control treatment. In the semi field trial, the concentration of 0.2 mL showed the highest response with the highest number of insect trapped (30%). Field treatment indicated that the highest captured was on the concentration of 0.2 mL with the average of insect captured of 226 fruit flies. Titer Analysis of methyl eugenol from basil plant with Gas Kromatografi (GC) it's 82.29%, whereas level of methyl eugenol from commercial attractant as high as 94.09%.

Key Words : fruit fly, methyl eugenol, basil plant.

INTRODUCTION

Fruitfly, *Bactrocera* spp. (Diptera : Tephritidae) is one of potential pest that very detrimental horticultural production, either through amount or quality (Rouse *et al.*, 2005; Copeland *et al.*, 2006). This Pest becomes key pest at mango orchard around the world (Pena, *et al.*, 1998; Vargas *et al.*, 2005), entered in Indonesia (Sodiq, 1993; Soesilohadi, 2002; Siwi dkk., 2006). From some fruit fly

types, *Bactrocera dorsalis* Complex is all the much generate loss. Damage of fruit can reach 100% (White and Elson-Harris, 1992; Sodiq, 1993; Soesilohadi, 2002; USDA-ARS, 2002; Revis *et al.*, 2004; Robacker *et al.*, 2005). Even this consequence of fruit fly attack, some fruits types that exported to Japan in 1981 altogether refused because invested by this pest (Priyono, 2002).

Effort to overcome problem is referred better aimed at integrated pest management. Alternative that have prospect for developed is usage attractant (Epsky and Heath, 1998; Manrakhan and Price, 1999; Bueno and Jones, 2002; Gopaul and Price, 2002; Rouse *et al.*, 2005). Attractant is one of tool to monitor pest population and at the same time applicable to depress population *Bactrocera* spp. (Bueno and Jones, 2002; Michaud, 2003).

Enticing Substance that contain single component (males lure) called pharapheromone that only effective to captivate male fruit fly. Methyl eugenol compound have characteristic in common with pharapheromone that can attract male insect (Iwahashi *et al.*, 1996; Manrakhan and Price, 1999). According to Nurdijati *et al.* (1996); Kardinan dkk. (1999); Miele *et al.* (2001) and Kothari *et al.* (2005) basil plant have prospect as methyl eugenol source.

The objective of this research was to study the response of fruit fly on methyl eugenol (ME) derived from basil plant used as attractant.

MATERIALS AND METHOD

This Research is conducted in Entomological Laboratory, Department of Plant Protection Faculty of Agriculture, Padjadjaran University and at mango orchard of farmer property in Kabupaten Majalengka.

Rearing of Insect

Test Insect as used in this research is collected from mango orchard of farmer property in Kabupaten Sumedang and Majalengka. Rearing of insect is

conducted in. Entomological Laboratory, in temperature condition 26^{o} C ± 2^{o} C and relative humidity 70-80 % and photoperiod 12 : 12.

Preparing of Methyl Eugenol

Basil Plant are got from area Tomo-Sumedang (to the aid POPT Tomo : Hikmat Sumantri). Methyl eugenol is got from process of basil plant distillation. Process of basil plant distillation is began by prepare raw material have the shape of purple basil plant leaf that its age more than 3 month counted ± 5 kg, hereinafter leaf is referred run dry aerate during 2 till 3 day until wilt. Hereinafter raw material is entered into boiler of water stuffed supplier ± 8 l. Process of basil plant distillation takes place during ±5 hour, from raw material of 5 kg can produce distilled water counted ±3 l and sweet basil oils between 5-30 ml.

Fruit fly Testing to Methyl Eugenol

The response test was conducted on 5 concentrations of ME (0.1 mL; 0.2 mL; 0.,3 mL; 0.4 mL; and control treatment/commercial eugenol = Petrogenol 0.2 mL) as laboratory test using Olfactometer (Susanto and Kusumadewi, 2005), semi field trial using screencage (2m x 2m x 2 m) (Israely and Oman, 2005)., and field treatment. The semi field trial was conducted by placing a mango tree with ± 1 m of heigh and placing a sticky trap inside. Each of the screencage was infested by 50 male fruit flies. Those two experiments were arranged in Completely Randomized Design consisted of 5 treatments and 5 replications. The field experiment was conducted in mango plantation at Panyingkiran, Majalengka which was arranged in the Randomized Block Design with 5 treatments and 5 replications. The plastic bottle trap was used in the field test that was placed on the height of ± 1.5–2 m above soil surface (Papadopoulos *et al.*, 2000; Peck *et al.*, 2004).

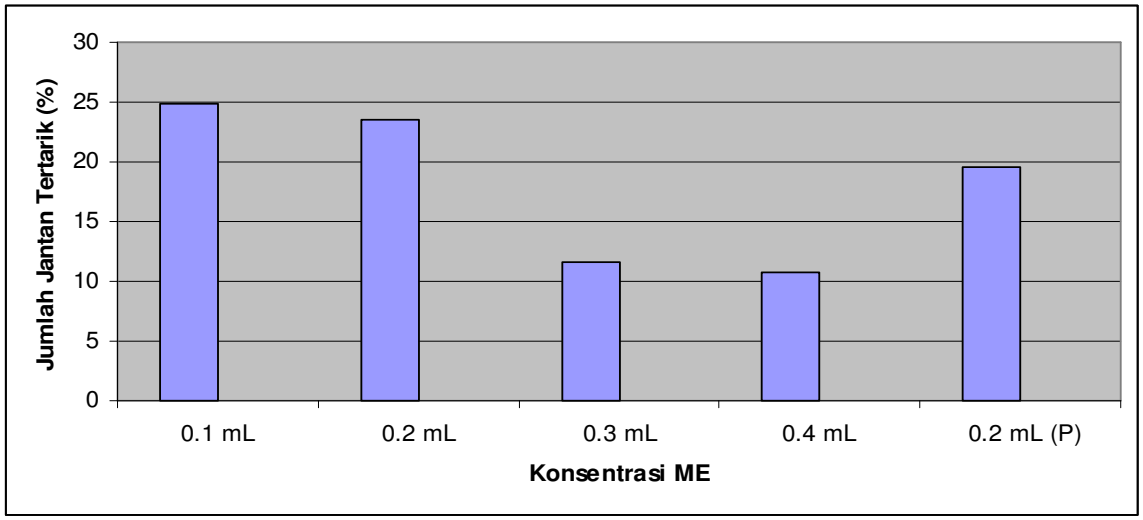
Testing of Methyl Eugenol Titer from Basil Plant.

Testing of level of methyl eugenol from basil plant conducted with Gas chromatography Analysis (GC) that conducted in Balitro Bogor with condition : detector FID, column Silica capillary 30m, 0,25mm, carrier gas Helium, flow rate 1ml/minute, split ratio 1/100, column temperature at program 60 – 200^{o}C with speed 3oC/minute, injector temperature 200^{o}C, detector temperature 250^{o}C and volume of inject 0,2µl. Procedure in common conducted to analysis level of methyl eugenol that circulate in the commercial eugenol (Petrogenol).

RESULT AND DISCUSSION

Interest of male fruitfly to Methyl Eugenol at Laboratory Scale.

Interest of male fruit fly to methyl eugenol at laboratory scale tested at Olfactometer. Test Result indicates that getting higher methyl concentration examinee eugenol growing low amount of male fruit fly that interested (Picture 1). Though in statistic test not shows a marked difference. Male Fruit fly gave respons to all methyl eugenol concentrations that tested. At concentration 0.1 ml and 0.2 ml male fruit fly that overdrawn high if compared to interest of male fruit fly to methyl eugenol comparator.

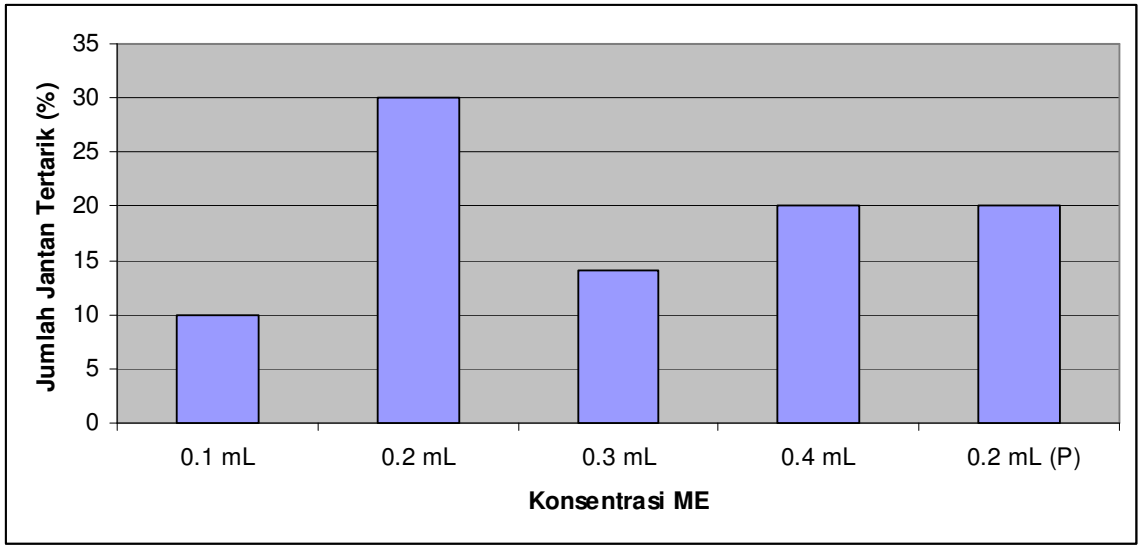


Picture 1. Percentage of Male Fruit fly that interested to Methyl Eugenol at Laboratory Scale

Methyl eugenol compound have characteristic in common with pharapheromone that can attract male fruit fly (Manrakhan and Price, 1999). Methyl eugenol is consumed by male fruit fly, later, sintesed in its body produce sex pheromone that to attract female fruit fly in course of matting (Nishida, 1996).

Interest of Male Fruit fly to Methyl Eugenol at Screen cage Scale

Interest of male fruit fly to methyl eugenol at semi scale natural tested at "outdoor screen cage". Test Result indicates that at methyl eugenol concentration 0.2 ml, amount of male fruit fly that interested show highest amount (30%) (Picture 2). At semi condition natural fruit fly interest to attractant influenced by ecological factor, like wind, irradiating, and temperature. Methyl eugenol is compound volatile and its way will growing responsed by fruit fly at a distance of that growing far if helped by wind.



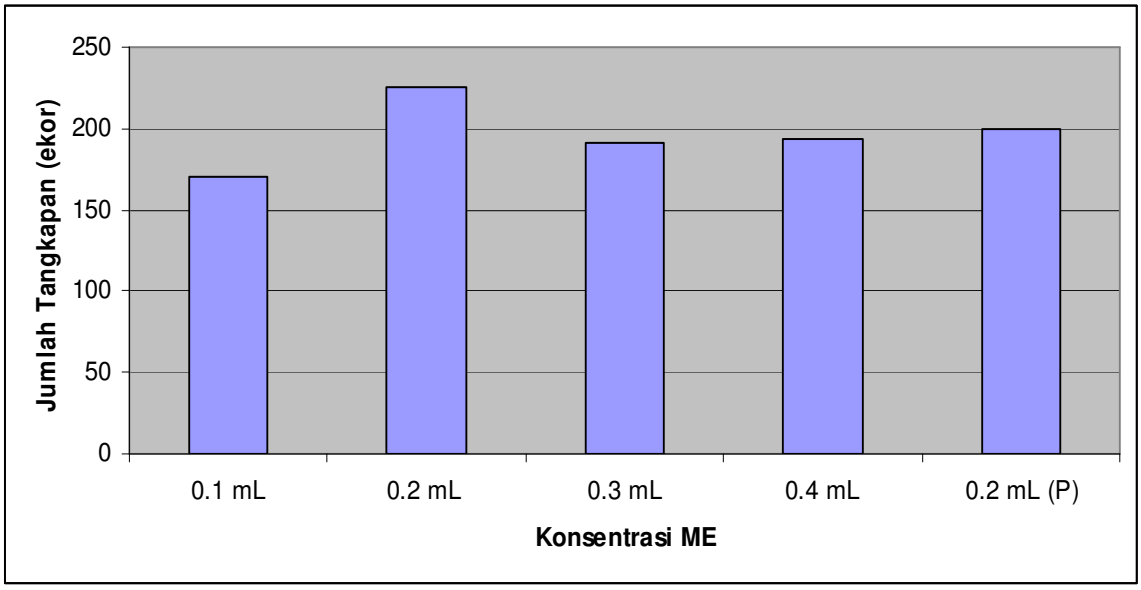
Picture 2. Percentage of Male Fruit fly that interested to Methyl Eugenol at Screen cage Scale

Total of Male Fruit fly that Attract by Methyl Eugenol in the Field

Testing of fruit fly interest field to methyl eugenol is conducted at mango orchard of farmer property in Panyingkiran, Majalengka. Highest caught is

obtained at concentration of basil plant oil 0.2 ml with the average of capture amount 226 tails.

Utilization of attractant besides as the controller, also applicable to detect or monitor of fruit fly population, and confuse pattern of fruit fly matting, gather or behavior eats (Metcalf and Luckmann, 1982; Bueno and Jones, 2002; Michaud, 2003).



Picture 3. Total of Male Fruit fly Caught in the Filed

At this testing used trap of stuffed bottle with water 200 ml to kill fruit fly that caught. Mechanism trapping of *B. dorsalis* into trap seen that *B. dorsalis* that come into trap will directly fly and alight on to cotton surface that has been dropped attractant. *B. dorsalis* are referred hereinafter will walk along encircle cotton with time period that is not certain. In a little while *B. dorsalis* are referred flew circulate and try descend upon wall of trap interior (Kardinan dkk., 1999).

Attractant have the materials of active methyl eugenol this is pertained to "food lure" that means male fly will come interested for eat, not for sexual directly. Male will make every effort to get methyl eugenol before conduct matting. From characteristic of attractant this is fruit fly operation is conducted by depress

population of male fly, until expected along with time of fruit fly population in nature will be downhill, because female not can matting.

Titer of Methyl Eugenol from Basil Plant

Analysis of titer level of methyl eugenol from oil of distillate basil plant conducted with Gas chromatography (GC) that conducted in Balitro Bogor. Analysis Result like can be seen at Table 1.

Tables 1. Result of Analysis Methyl Eugenol Titer

Compound	Titer of Methyl Eugenol (%)
Oil of Basil Plant	**82.29**
Commercial ME (Petrogenol)	**94.09**

Analysis Result shows titer of methyl eugenol from basil plant below titer of commercial methyl eugenol (Petrogenol). Though titer of methyl eugenol from basil plant, field test indicates that fruit fly haul that caught at sweet basil concentration 0.2 ml higher if compared to concentration in common at attractant comparator. This condition indicated that sweet basil have high prospect for developed as the source of natural attractant. This condition are supported by former research that indicate that basil plant have prospect as attractant source (Nurdijati *et al.*, 1996; Kardinan dkk., 1999; Mielle *et al.*, 2001 and Kothari *et al.*, 2005).

CONCLUSION

The result of laboratory test on Olfactometer showed that all of fruit fly gave response to the ME concentrations where the highest concentration the lowest of male insect were caught. On the concentration of 0.1 mL and 0.2 ml, the insect was more responsive compare to control treatment. In the semi field trial, the concentration of 0.2 mL showed the highest response with the highest number of insect trapped (30%). Field treatment indicated that the highest captured was on the concentration of 0.2 mL with the average of insect captured of 226 fruit flies. Titer Analysis of methyl eugenol from basil plant

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