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Phaleriapapuena as a Biopesticide to Control of Spodopteralitura Attack in Phaseolus radiate Plants

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Abstract:*Phaleriamacrocarpa, commonly known as Mahkotadewa is a medicinal plant that is indigenous to Indonesia and Malaysia. The increasing of mung bean production limited bySpodopteralitura attack which reduce up to 80% of total production. Phaleriamacrocarpa was one an alternative to suppress the attack of Spodopteralitura. The aim this research are to determine and trials effect of flesh and whole fruit of Phaleriapapuenaextraxt to control of Spodopteralituraattact in Phaseolusradiata. This research was conducted at the Laboratory of UIN SunanGunungDjati Bandung and also in BanjarwangiGarut Regency, West Java Province from April to June 2018. This study used a simple randomized block design with 11 treatments and 3 replications namely: treatment without P papuena extract (control); 20 %, 22.5%, 25%, 27.5% and 30% flesh of P papuena fruit extract respectively; 20%, 22.5 %, 25 %, 27.5 % and 30 % fruit extract of whole P papuena. The results of the research showed that the treatment of 30% the whole of P papuena fruit extract concentration affected the mortality of S litura larvae, crop damage intensity and seed weight but it did not affect significantly to the plant height and harvest index.*

Keywords:*Spodopteralitura, mortality, mung bean, Phaleriapapuena.*

INTRODUCTION

The increasing of mung bean production was limited by *Spodopteralitura*attack which reduce up to 80% of total production (Pangan, 2014). *Spodopteralitura*is a serious pest causing losses 25.8 to 100 per cent of production crops [2]..*Spodopteralitura*alsoa polyphagous noctuid with high reproductive capacity and able to migrate over large distances in the adult stage, so wide in geographical range of distribution [3]. *S litura*larvae are foliage feeders, but occasionally damage fruits; female moths also enter into greenhouses through damaged polysheets and lay eggs in large masses [4]. *S. litura*alsohas been found to infest sweet pepper, tomato and cucumber in polyhouses with infestation levels of 25.0-75.0 per cent [5], also reported *S. litura*causing damage to various crops grown under protected environments and as a sporadic pest of potato [6].

In developing countries, pesticides use has certainly to improving agricultural production, both yield and quality [7].Sinthetic pesticide was effective to pest control, but if applicated without adhering safety and recommendation practice affect to human health risk, environment such as resistancy, and kill non target organism [8], [9]. Public health aspect of awareness about the effects of pesticides on foods safety and on the environment has increased to search for alternatives to widely used chemical pesticides, including biopesticides. Biopesticides are natural materials products from animals, plants, and bacteria, as well as certain minerals, that are used for pest control [10]. Previous researcher has been explore biopesticide from various plant to control insect attack, such as extract of the species *Clitoriaternatea* (butterfly pea), target *Helicoverpa*spp, [11], Alkaloid compound oxymatrine, target *Spodopteralitura*, *Helicoverpaarmigera*, *Aphis*

gossypii, [12], stilbenes isolated from grapevine extracts, target *S. Littoralis*, [13] and Olive mill waste, target Various pests, [14].

*Phaleria*sp, commonly known as mahkotadewa is a medicinal plant that is indigenous to Indonesia and Malaysia. The fruit of Mahkota Dewa acted as antibacterial agent [15], the essential oil of Mahkota Dewa fruit has acute poison effect against storage pest *Sitophilus oryzae*[16]. Seed of *P macrocarpa*cannot be consumed directly because its high toxicity which can cause swelling, numbness and unconsciousness, the seeds can be used as an external medicine for the treatment of skin conditions and for ornamental cultivation purposes, which act as a traditional biopesticide [17]. Isolation of *Phaleriasp*result several classes of compounds such as benzophenones, terpenoids, xanthones, lignans, acids and sugars [17]. Published paper of using *P papuena* to control worm attact to plants, especially *Spodopteralitura*(army-worm) to *Phaseolusradiata* is limited. The aim this research are to determine and trials effect of flesh and whole fruit of *Phaleriapapuena*extraxt to control of *Spodopteralitura*attact in *Phaseolusradiatus*.

MATERIAL AND METHODS Insects

The larvae of *Spodopteralitura* were collected from farmer planting area of cabbage and reared in the laboratory of plant pest. Fresh of *Brassica chinensis*leaves was supplied ad libitum daily. The fully grown larval were allowed to pupate in box, since growth to imago were transfer to box breeding. The egg laid on leaves were removed from the slits of *B chinensis*leaf margins and were kept in petridishes for hatching. The second instar larvae were used for the proposed experiments.

Extract Solution Preparation

One kg flesh of ripe *P papuena*are pulverize, added 1000 ml of aquadest, hold for 24 hours, then filtering. Solution as an extract stock. Making stock solution from whole of fruit use the same procedure. Different of both part and concentrations of *Phaleriapapuena*extraxt were prepared in laboratory. The treatments are without *P papuena* extract (control), 22.5%, 25%, 27.5% and 30% extract of *P papuena* extract flesh, 20%, 22.5 %, 25 %, 27.5 % and 30 % extract of *P papuena* extract whole of fruit.

Variable Assesment

Each extract of *P papuena*spried to *Phaseolusradiata*according to treatment, furthermore infested with 10 head of *Spodopteralitura* second instar larvae. The variable assessment are (1) Larval mortality, (2) Crop damage, (3) growth and yield of *P radiata.* Variation in all variable in each treatment were analyzed using Analysis of Variance (ANOVA) continued with Duncan Multiple Range Test (DMRT).

RESULT AND DISCUSSION

Larval Mortality

All result in this research are given in TABLE 1. The toxicity of *P papuena*to*Spodopteralitura*is given in Table 1. Increase of concentration of both flesh and whole fruit of *P papuena*cause increase the mortality of *S litura*. 30 % concentration of whole fruit extract effective to kill larvae. Effectiveness of biopesticide was determine to ability of biopesticide to kill up to 80 % of the target organism [18].

The toxicity of *P papuena* in this research higher then to target *Plutelaxylostela*[19]. Part of plant such as leaves, flesh and seed of *Phaleriamacrocarpa* contain alkaloid, saponin, flavonoid, terpenoid and tanin [19], [20], which have toxic effect for animal [21]. Seed is most toxicity [19].

Crop Damage Intencity (CDI)

Contrary to the larva mortality, increasing concentration of *P papuena* extract decrease of crop damage intencity. 30 % concentration both flesh and whole fruit of *P papuena* able to depress crop damage of *Phaseolusradiata* to below 20 %. Crop damage intencity is negative correlation to larval mortality (FIGURE 1), increase of concentration of extract *P papuena*efects to decrease crop damage, but increase larval mortality.

Regression equation of corelation of larval mortality to crop damage is y = -0,244x + 31,112, and determination coefficient is 0,722, it is mean that about 72, 2 percent of crop damage depend on larval mortality. *S litura* larvae are mainly foliage feeders, occasionally damage fruits [4]

Plant Height

No effects of concentration extract of *P papuena* on plant height. Althought crop damage up to 39.26 percent, but the *S litura*attack on the *P radiata*foliage no disruption to photosynthesis activity, the mark of attack are hole or lobe (FIGURE 2).

Product of photosynthesis are photosynthate which need to growth and development plant. On vegetative periods, growth and development plant resulting plant height, rod plant and number of leaf, while on generative periods resulting fruit [22]. Plant height of mungbean at previous study is 48.1 cm [23], 45.6 – 46.0 cm [24]

Harvest Index

As on plant height, no effects of concentration extract of *P papuena* to harvest imdex. Harvest index represents the efficiency of biomass partitioning into yield, and is the ratio between yield and the total above ground biomass [25]. Althought no different effect of concentration extract *P papuena* to harvest index, there are trend the increase harvest index in step to level of concentration extract. Harvest index for mungbean in this study is 0.23 to 0,31, previous study reported that harvest index of mungbean is around 0.3 [26], [27]

TABLE 1: Effect of *Phaleriapapuena* on Larva Mortality (LM), Crop Damage Intencity (CDI), Plant Height (PH), Harvest Index (HI) ang Seed Weight (SW)

Variable	Treatments of *Phaleriapapuena*Extract										
	A	B	C	D	E	F	G	H	I	J	K
LM (%)	0^{a}	23.33^{b}	43.33^{c}	46.67^{c}	50.00cd	66.67^{d}	46.67^{c}	56.67^{cd}	56.67^{cd}	66.67^{d}	86.67^{e}
CDI (%)	39.26^{d}	34.61^{cd}	32.98^{c}	24.17^{bc}	21.88^{b}	15.87^{ab}	32.87^{c}	24.08^{bc}	20.29^{b}	17.52^{ab}	8.08^{a}
PH (cm)	40.33^{a}	41.17^{a}	40.83^{a}	43.23^{a}	41.43^{a}	44.90^{a}	40.83^{a}	41.33^{a}	43.33^{a}	43.39^{a}	45.40^{a}
HI	0.23^{a}	0.24^{a}	0.25^{a}	0,26	0.28^{a}	0.29^{a}	0.24^{a}	0.24^{a}	0.26^{a}	0.28^{a}	0.31^{a}
SW (g)	8.33^{a}	10,01^{ab}	10,28^{ab}	10,53^{ab}	10,54^{ab}	11,16^{b}	11,29^{b}	12,33^{bc}	14,42^{cd}	15,20^{d}	17,05^{e}

Note : LM = Larval Mortality, CDI = Crop Damage Intencity, PH = Plant Height, HI = Harvest Index, SW = Seed Weight. A= treatment without *P papuena* extract (control); B = *P papuena* flesh extract 20%, C - *P papuena* flesh extract 22.5%, D = *P papuena* flesh extract 25%, E = *P papuena* flesh extract 27.5%, F = *P papuena* flesh extract 30% , G = *P papuena* fruit extract 20%, H = *P papuena* whole fruit extract 22.5 %, I = *P papuena* whole fruit extract 25 %, J = *P papuena* whole fruit extract 27.5 % and K = *P papuena* whole fruit extract 30 %.

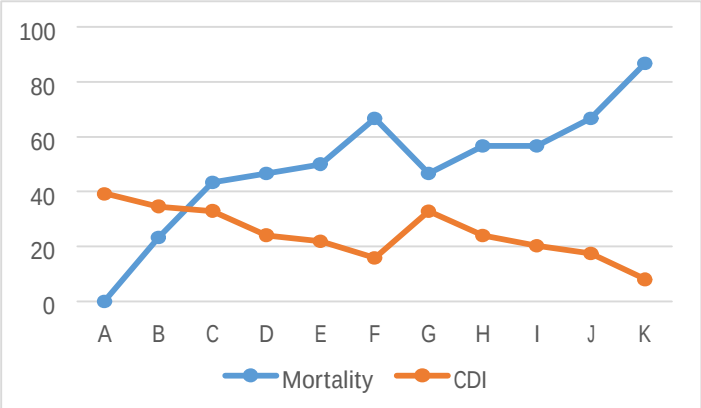

Fig 1: Efects of *P papuena* Concentrationon Larval Mortality and Crop Damage Intencity

Fig 2: Leaf of *P radiata*post attack *S litura*

Seed Weight (g)

Concentration of *P papuena* extract affect to seed weight of *P radiata*. Level concentration trend to increase seed weight, extract from whole fruit result heavier seed weight then flesh. Whole fruit contain flesh and seed, seed of *P papuena*more toxic than the other part such as leaf and flesh [19].

CONCLUSION

Extract of *P papuena* affect to larval mortality, crop damage index and seed weight of *P radiata*. 30 percent of concentration whole fruit is better.

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