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THE BIOLOGICALTEST OF FORMULATION OF SUBCULTURE *Helicoverpa armigera* Nuclear PolyhedrosisVirus(*Ha*NPV) against *Crocidolomia pavonana* Fab. LARVAE POPULATIONTHAT EXPOSED TO CABBAGE (*Brassica oleracea* var. capitata L.)

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ABSTRACT

The biologicaltest of formulation of subculture *Helicoverpa armigera* Nuclear Polyhedrosis Virus(*Ha*NPV) against *Crocidolomia pavonana* Fab.larvae population that exposed to cabbage (*Brassica oleracea* var. capitata L.) has been done. The subculture *Ha*NPV was formulated in liquid preparations, powders, cornstarch and talc carrier materials, sprayed to *C. pavonana* larvae population that exposed at cabbage as a pilot project. The method of research used an experimental method, with randomized block design consists of single factor *Ha*NPV and five level formulation there were (p) (liquid dosage forms (p1), powder (p2), and mixed with a carrier such as cornstarch (p3) and talc powder (p4) as well as the provision of water control without virus (p0)) with 8 replications. The density of virus $4x10^7$ polyhedral/ml. The results was statistically analyzed with ANOVA ($p<0,05$), showed that all formulation *Ha*NPV subculture have equal ability to caused high mortality of *C. pavonana* larvae population.

Key words: Cabbage, *Crocidolomia pavonana*, Formulation,HaNPV, Mortality

INTRODUCTION

Cabbage (*Brassica oleracea*var. capitata L.) of Cruciferaefamilia is one of a very popular vegetable plants. The part that is characteristic of this plant and used for consumption, namely the head of the leaves (crop). Part of the cabbage crop of these plants are often attacked by insect pests. Insect pests of cabbage the most destructive is *Crocidolomia pavonana* Fab. (Pracaya, 2000; Sastrosiswojo, 1981).

Physical quality of cabbage plants set prices, so farmers in Indonesia are spraying crops with synthetic insecticides which excessive amounts of cabbage that was not damaged by insect pests. The use of synthetic insecticides cause many negative effects. Prayogo & Suharsono (2005), states that the impact of the use of synthetic insecticides namely environmental pollution and accumulation of insecticidal toxins in the food chain. One alternative for the control of insect pests using biological agents, that is virus. Insect virus mainly from Baculovirus group has great potential as a biological agent because this virus has the ability to kill specific insects and are harmless to vertebrates, especially mammals and humans (Indrayani*et al*, 1993).

Nuclear Polyhedrosis Virus (NPV) is a pathogenic strain of Baculovirus group which is a natural pathogen for group class Insecta Lepidoptera (Maramorosch & Sherman, 1985). *Ha*NPV obtained through propagation or the production to do with method of in vivo. In vivo methods for *Ha*NPV done conventionally using larvae of S. *litura* as a substitute host spread of the virus. *Ha*NPV production of substitute host called *Ha*NPV subculture. Pathogenicity of

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*Ha*NPVsubculture appears to have remained stable (Indrayani*et al.*, 1993; Miranti, 2008). *Ha*NPV subculture can be formulated in liquid and powder dosage forms with different material (carrier), especially to maintain the stability of the effectiveness of the virus during the storage period. Generally, carriers are often used to manufacture virus formulation is organic matter and minerals (Arsyad, 2009). Materials that can be used include talc powder and cornstarch because it is a protective, potentially as a carrier in the formulation *Ha*NPV (Foster, 2012).

MATERIALS AND METHODS

Infection the larvae of *Spodopteralitura* with preparation *Ha*NPV subculture

Spodoptera litura larvae used in this study to be made into a *Ha*NPV subculture are the fourth instar larvae of 800 tails. Larvae of S*. litura* then maintained in the different groups in the zalp pots each containing 3 larvae. Then the larvae were fed cabbage that has been mixed with the virus using a density of $4x10^7$ polyhedra / ml. Cadaver larvae of S*. litura* collected and made into a *Ha*NPV subculture. Virus production was calculated by using the hemocytometer to obtain the amount of virus polyhedra, in accordance with the treatment being tested.

Formulation of *Ha*NPV

HaNPV of formulation in the form of powder preparation is done in a way that is *Ha*NPV suspension dried at room temperature (about 25º C) for 24 hours, until the virus powder is formed. *Ha*NPV in a liquid preparation made by means *Ha*NPV in stock be diluted with aquadest until a density that will be used, that is 4×10^7polyhedra / ml. HaNPV formulated in the form of flour prepared by mixing virus liquid of known density of virus with talc and cornstarch flour each 100 gr until blended. Then aerated for 24 hours (free sunlight). Once dry, the mashed mixture, and filtered with a sieve the flour until it forms a powder formulations virus (Arifin, 1993).

Phase of the research

Phase of the research that is to prepare them larvae of C. *pavonana* to be used for treatment.Larvae of C. *pavonana* the second instar larvae of 400 tails, separated into 50 containers with each containing 10 larvae.Once the cabbage plants 8-10 weeks after planting, crop cabbage will begin to form, and at the time it was done in accordance with the treatment HaNPV.Exposure conducted during the afternoon by spraying for liquid formulations and the virus spread to all parts of the cabbage crop for virus powder and formulation with a carrier cornstarch and flour talc.Then the larvae were exposed C. *pavonana* each for every 10 tails of cabbage plants. When larvae were exposed to the plant already, each polybag covered by gauze cage. Observations were made one day after application and subsequent *Ha*NPV observed each day for 20 days trial.

Measurement of parameters

Parameters measured were larvae mortality in each treatment. Percentage mortality of larvae of *S. litura* calculated by the formula (Miranti, 2001):

$$\mathbf{M} = \frac{\sum n}{\sum N} \times 100\% \ (2)$$

M is the mortality (%), n is the number of dead larvae (tail), and N is the number of larvae were tested (tail). Supporting parameters are number of individual larvae were able to survive to become pupa and imago during the period of 20 days of observation.

RESULTS AND DISCUSSION

Mortality result of observation *C. pavonana*on cabbage plants that were exposed to the treatment of giving formulations *Ha*NPV sub-culture in liquid preparations, powders, and the carrier in the cornstarch and talc can be seen in Figure 1.

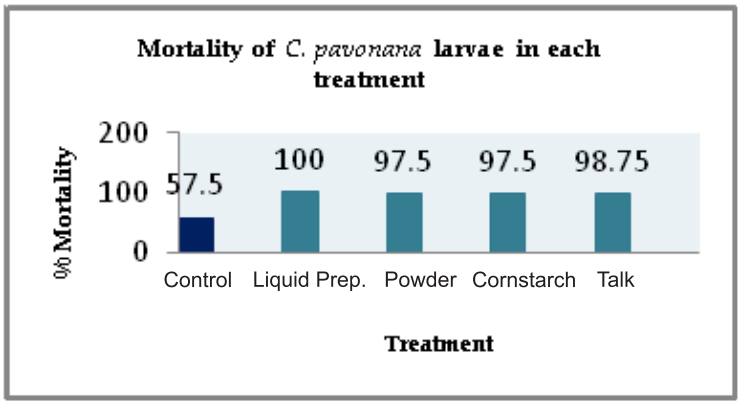

Figure 1. Bar chart of mortality C. pavonana larvae in each treatment

Figure 4.1 shows the percentage of insect mortality of C*. pavonana* the highest *Ha*NPV caused by treatment formulations in the form of liquid preparation that is equal to 100%. At all treatment formulations *Ha*NPV produce a higher percentage of mortality than are control formulation without giving *Ha*NPV, but in the control treatment was also found the percentage of insect mortality in C. pavonana is equal to 57.5%.

Data on the effect of sub-culture *Ha*NPV formulations against larvae mortality of C*. pavonana* on cabbage plants were tested by ANOVA with a level of 5% as in Table 1.

Table 1. ANOVA analysis on mortality of larvae

Source of variation	DF	Sum of squares	Mean squares	F. ratio	F-probability
Between	7	57.5	8.214		
Within	4	10760	2690	58.844	2.71
Error	28	1280	45.714		
Total	39	12097.5			

Statistical test results showed that all the formulations HaNPV treatment in the form of liquid preparations, powders and carrier in cornstarch and flour talc causes high mortality to the insect C. pavonana.Results are visible from the value F-ratio(58.844)> F-probability (2,71). The results of ANOVA test followed by Duncan Multiple Range Test (Table 2) at the level of

5%. The results of Duncan Multiple Range Test showed that the formulation *Ha*NPV in liquid preparations, powders, and the carrier in cornstarch and flour talc provides the same value in causing mortality to *C. pavonana* larvae.The fourth type of formulation *Ha*NPV was effective caused high mortality to larvae of *C. pavonana*.

Table 2. Mortality of *C. pavonana*larvae in each *Ha*NPV subculturetreatment

Treatment	Group
p4	100a
p3	98,75a
p2	97,5a
p1	97,5a
p0	57,5b

**Each the average that have the same letter was stated are not significantly different at the level of 5%.*

Research data show that HaNPV formulations in liquid dosage forms cause mortality C*. pavonana* highest, amounting to 100%.This is because at the time of spraying liquid preparation to plant cabbage, a liquid preparation is hard stick on cabbage leaves have a waxy coating and the liquid will be directly attached and dried on cabbage.Larvae of C*. pavonana* has properties liked the part of the growing point or cabbage crop that contains many amino acids and minerals (Sastrosiswojo & Setiawati, 1993). At the time of larval C*. pavonana*the second instars were exposed at the surface of cabbage leaves, the larvae will toward the cabbage crop.However, because the cabbage crop section contained a liquid preparation that attaches and dries the virus polyhedra will be directly ingested by the larvae.The more polyhedra are ingested, the more virions that infect cells and larval tissues until eventually cause death.

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