

Biological Test of Formulation of Subculture *Helicoverpa armigera* Nuclear Polyhedrosis Virus (*HaNPV*) on Mortality of *Spodoptera litura* Larvae infested to cabbage (*Brassica oleracea* Var. *capitata* Linn.) Plantation

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ABSTRACT

Helicoverpa armigera Nuclear Polyhedrosis Virus (*HaNPV*) is one of the biological agents that could be used for the development of organic farming in Indonesia. One of the organic agricultural food products which have high economic value is cabbage, *HaNPV* effective to control the population of several species of insect pests, can be used instead of synthetic insecticides in agricultural development efforts of organic cabbage. *HaNPV* formulation can be used as a way to maintain the virulence properties of the virus and facilitate the storage and application. The preparation of subculture *HaNPV* formulations was in liquid, powders, cornstarch and talk carrier material. The design experimental was used randomized block design consists single factor (type *HaNPV* formulation consisting of powder formulations, liquid formulation, formulation in cornstarch, and talc formulation including water formulation without virus as a control), with eight replications. The results showed that all of the formulations of subculture *HaNPV* causing larvae mortality at range 97.4% -100%. The highest mortality of larvae occurred in cabbage plants are protected by *HaNPV* carrier liquid and talk preparations by 100% each.

Keywords: Formulations *Helicoverpa armigera* Nuclear Polyhedrosis Virus (*HaNPV*), subculture, *Spodoptera litura*, *Brassica oleracea* Var. *capitata* Linn.

INTRODUCTION

Biological control use insect Pathogenic is one of alternative control plant pests. The use of biological agents can provide a lot of excesses, among others in tackling environmental problems and develop organic farming system (Organic agriculture). One of the products organic agriculture which has high economic value so much interested in Indonesia is to be cultivated cabbage (*Brassica oleracea* var. *Capitata* Linn.). weakness the cultivation of cabbage plant is how many organisms buggers plant such as *Spodoptera litura* (armyworm). Larvae of *S. litura* causing damage to range 12.5% -20% on cabbage (Hendra *et al.*, 2003).

As a pest, *S. litura* still are controlled with insecticide chemical, which can cause environmental pollution and impact in the long term can lead to pest resistance. *Helicoverpa armigera* Nuclear Polyhedrosis Virus (*HaNPV*) is one of the biological agents that can be used as bioinsektisida alternative the use of a more environmentally friendly and able to control insect pests. The results of field research carried out at the University of Padjadjaran garden experiment, showed that the mortality in *S. litura* reaches 100% (Nasution, 2013).

Bioinsektisida can be formulated with a carrier material to share, it aims to preserve stability and the prevention of contamination virus during in storage. Formulating a biological agents, thing to considered that the carrier is not antagonistic, easily soluble in water, and is able to spread evenly throughout the surface of the plant (Putri, 2012). Formulation biological agents of a better in the form of wettable powder, because in addition to easy storage and application, effectiveness to stand in long time (Naratanan, 1987 *In: Bedjo*, 2005).

Research for the formulations of *HaNPV* is increasing, formulation can use water, powder, cornstarch, and talc. In this research a try some of the materials to used a carrier. This research aims to get the best *HaNPV* types of formulations with different carriers in causing mortality in *S. litura* on cabbage plants that were exposed

MATERIALS AND METHODS

The design experimental was used randomized block design consists single factor (type *HaNPV* formulation consisting of powder formulations, liquid formulation, cornstarch formulation, and talc formulation including water formulation without virus as a control), with eight replications. Experimental parameters measured were larvae mortality of *S. litura* for 20 days of observation. Research results then analyzed using Analysis of Variance (ANOVA), and if there are significant differences in outcome data, followed by Duncan's multiple range test on standard 5 %.

The first phase, *HaNPV* subcultures derived from cadaveric *S. litura* infected *HaNPV* dead. Virus suspension was obtained by using the method of Indrayani *et al.* (1993) which has been modified. Amount polyhedra of calculated using the haemositometer and the concentration of the virus using methods of Indrayani *et al.* (1993).

The second phase, the formulation of *HaNPV* is sharing the material carrier prepared in accordance with concentrations used, the 4×10^7 PIB/ml (liquid) and 4×10^7 PIB/g (powder). The third phase, preparation of cabbage plants with maintenance procedures for seed, planting, watering, weed, and fertilization.

The fourth phase, implementation of the research conducted on cabbage plants were 10 weeks old, then *HaNPV* formulation is given 12 hours before exposure larvae of *S. litura*. Mortality is calculated every day and treatment formulations done every four day, during the 20 days of observation.

RESULTS AND DISCUSSION

Results of statistical analysis indicates that treatment of spraying and spreading *HaNPV* formulations in liquid dosage form, powder, cornstarch and a talk on the larvae of *S. litura* very influential on on mortality (Table 1). All the preparation in the form of *HaNPV* formulations has the same level of effectiveness in causing mortality in larvae of *S. litura* (Table 2).

Tabel 1. Results of Analysis of Variance for S. Mortality litura in each treatment.

Source of diversity	Degree of freedom	Sum of squared	Middle Squared	F Count	F Table 5%
Repeated	7	345,89	49,41		
Treatment	4	10968,4	2742,1	120,565*	2,71
Galat	28	636,82	22,74		
General	39	11951,1			

* = Significant at 5%

Table 2 it can be seen that the formulation of the virus in carrier have the same ability in protecting the stability of the virulence of the virus it carries. Duncan's Multiple Range Test results indicates that can *HaNPV* control population of *S. litura* on cabbage plants that were exposed to causing mortality at range 97.34% - 100%.

Tabel 2. Duncan's Multiple Range Test results against *S. Mortality litura* on each treatment.

Treatment	Mortality in Larvae ^a
Control	57,58 b
Powder	98,21 a
Liquid	100 a
Cornstarch	97,34 a
Talc	100 a

^a Average of followed by the same letter are significantly different at 5% level

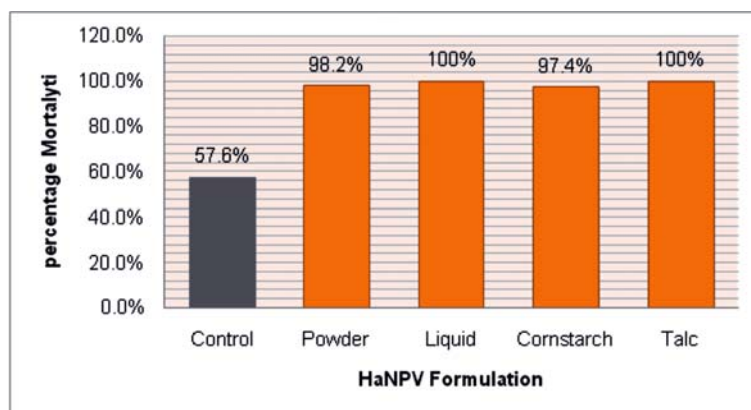


Figure 1. Percentage Mortality of *S. litura* on each treatment formulation HaNPV

Figure 1 indicates that the mortality of larvae of *S. litura* Highest *litura* resulting from the use of formulation HaNPV in liquid and talk with 100% each.

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