Field Application Of *Spodoptera Litura* Nucleopolyhedrovirus For Controlling, Armyworm, *Spodoptera Litura* On On *Brassica Rapa*

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Introduction

The armyworm, *Spodoptera litura* (Fabricius) (Lep., Noctuidae), is a polyphagous insect pest of many vegetables, food crops and seedlings of forest plantation species in the tropical and subtropical regions of Asia. In the field, *S. litura* larvae are prone to infection by a *S. litura* nucleopolyhedrovirus (SpltNPV) The virus is very pathogenic and specific to its host Even though the virus can cause natural epizootics in *S. litura* population, effectiveness of the virus in regulating the pest population is dependent on the probability of the pest contracting the virus under environmental conditions favouring infection. Thus knowledge on these environmental factors must be first understood before successful pest management using virus can be achieved. To initiate an infection, the virus must remain infective for a considerable period of time before being ingested by its host. Lack of persistence in the environment is one of the problems that hinders the use of baculovirus as a biopesticide. Viruses are inactivated rapidly on exposure to sunlight. Upon ingestion, the virus must be able to replicate in the cells of its host, consequently debilitate and ultimately kill the host. The virus activity in the host cells is affected among others by ambient temperature of the host larvae habitat. Even though most infections are favoured by high ambient temperatures as have been shown by several authors, there are cases where high temperature inhibited virus infection. Although effects of environmental factors on baculoviruses have been thoroughly understood, heretofore no information pertaining to its virulence and effectiveness in controlling the pest in the field was available. In this experiment virus was formulated with the UV protectant material tinopal and its infectivity in the field after a single application was evaluated and compared with the standard chemical

Materials and Methods

Two beds (14 m × 1.5 m) were planted with *Brassica rapa* L.. Each bed was divided into 2 blocks and 5 plots were assigned in each block. Each plot contained 50 plants. Five treatments, (i)Virus (4×10^{12} PIBs/ha), (ii) Virus (4×10^{12} PIBs/ha) + 0.5% polyglycol, (iii) Virus (4×10^{12} PIBs/ha) + 0.5% polyglycol + 1% tinopal, (iv). Nurelle-D and (v) Control were randomizedly assigned to each plot in 4 blocks All treatments were formulated as liquid and sprayed using a single cone nozzle sprayer in the evening under windless condition to prevent drift of PIBs. The plants were sprayed evenly from all sides. Only single application was made to all the treatments . On the following day of spraying, 125 first instar larvae of *S. litura* were released in each plot. Leaf damage was rated 10 days of after infestation by using scores 0, 1, 3, 5, 7, 9, 10 for 0%, 1-10%, 11-20%, 21-50%, 51-70%, 71-90% and 91-100% leaf damage, respectively. After leaf damage had been rated, 30 plants from each plot were harvested randomly and fresh weight of each plant was recorded. Data for the yield and leaf damage indices of different treated plots were analyzed by ANOVA and treatment means were compared using DMRT.

Results and Discussion

The results from the experiment show that yield of *B. rapa* varied with the treatments applied to each plots. Plots treated with chemical and all viral formulations gave significantly higher yield than the yield from the control plot ($F = 7.04$, $P = 0.004$) . Nurelle-D treated plot gave the highest yield (17375 kg/ha). The second highest yield was obtained from the plot that had been treated with virus + polyglycol + tinopal (17300 kg/ha). Virus + polyglycol produced 13825 kg/ha yield and virus alone treated plot (without any adjuvant) produced 13725 kg/ha. The lowest yield was recorded from the control plot (9650 kg/ha). Nurelle-D treated plot produced 75 kg/ha higher yield than the virus + polyglycol + tinopal treated plot, 3550 kg/ha from the virus + polyglycol treated plot and 3650 kg/ha higher than the virus alone treated plot. Differences among the yields from Nurelle-D, virus + polyglycol + tinopal, virus + polyglycol and virus alone treated plots were not significant. Virus formulated with polyglycol and tinopal produced 20% (3475 kg/ha) higher yield compared with virus + polyglycol formulation and 21% (3575 kg/ha) higher compared with virus alone (without any adjuvant) treated plot. Virus + polyglycol + tinopal sprayed plot gave 44% (7650 kg/ha) increased in yield than the control plot. Virus + polyglycol plot produced 30% (4175 kg/ha) increased yield than the control plot. Virus alone sprayed plot increased 30% (4075 kg/ha) in yield as compared with that of the control plot. Damage indices of all the treated plots were significantly different compared with that of control plot Among all virus

treated plots, virus + polyglycol + tinopal treated plot provided the best protection of *B. rapa* against *S. litura* larvae and gave 2% less damage than the virus alone and 9% less than the virus + polyglycol treated plot. The highest damage among the virus treated plots was observed in the virus + polyglycol treated plot (36% damage index) and the damage was 7% higher than the virus alone treated plot and 9% higher than virus + polyglycol + tinopal treated plot. Even though these plots suffered damages from *S. litura* infestation, the damages however, were significantly less compared with that of control plot. All the viral formulations were as effective as chemical pesticide (Nurelle-D) in controlling *S. litura* artificial infestation at early larval stage. Virus applied at 4×10^{12} PIBs/ha with or without protectant increased the yield and reduced the pest damage.

Conclusions

This study clearly shows that SpltNPV could be developed as a biopesticide and it can used effectively for controlling *S. litura*.

Benefits from the study

SpltNPV-based biopesticide is an environmentally safe product. It poses no threat to human and the environment and offer an alternative to chemical insecticides in the management of vegetable pests.

Patent(s), if applicable :

Nil

Stage of Commercialization, if applicable:
Nil

Project Publications in Refereed Journals

1. Sajap, A.S. J.R. Kotulai, H.A. Kadir and M.Y. Hussein. 1999. Impact of prey infected by nuclear polyhedrosis virus on a predator, *Sycanus leucomesus* (Hemiptera: Reduviidae) J. Appl. Entomol.123:93-98

2. Sajap, A.S., J.R. Kotulai, L.W. Hong, M.A. Bakir, A.S. Norani and H.A. Kadir. 2000. Pathogenicity and characteristics of *Spodoptera litura* nucleopolyhedrovirus from Peninsular Malaysia. Pertanika J. Trop. Agric. 23:23-28.

3. H. Mohd Norowi, A. K. Hussan and . A. S. Sajap. 2002. Field efficacy of nucleopolyhedrovirus against armyworm, *Spodoptera litura* on tobacco. J. Trop. Agric. And Food Sc. 30:23-27

Project Publications in Conference Proceedings

1. Mohd. Norowi, A.K. Hussan and A.S. Sajap. 2000. The performance of nuclear polyhedrosis virus as a biological control agent of armyworm in tobacco field. Plant Resource Management Conference. Nov.2000, Kuching, Sarawak

2. Bakir, M.A, A.S. Sajap, A.K. Hussan,N.A. Samad and M.Y. Hussein. 2000 Evaluation of materials as U-B protectants of nucleopolyhedrovirus of armyworm, *Spodoptera litura* Fab. (Lepidoptera: Noctuidae), 5th Graduate Congress, Department of Biological Sciences, The National University of Singapore, Dec. 2000, Singapore.

3. Bakir, M.A., A.S. Sajap, H.A. Kadir, N.A. Samad and M.Y. Hussein.2001. Field trial with single application of *Spodoptera litura* nucleopolyhedrovirus (SpltNPV) for controlling *Spodoptera litura* on *Brassica rapa*. 4th Asia-Pacific Conference of Entomology. Kuala Lumpur. Aug. 2001

Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
Mohammad Abdul Bakir	Nucleopolyhedrosis of *Spodoptera litura* :Influence of environmental factors on efficacy and improvement for field application.	Microbial Control	Ph.D	2001

Lau Wei Hong	Characterization of granulovirus and nucleopolyhedroviru s isolated from *Spodoptera litura*	Insect Pathology/ Virology	Ph.D	2002

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