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Field Efficacy of Nuclear Polyhedrosis Virus of *Adisura atkinsoni* Moore on Field Beans

K. NARAYANAN
Department of Entomology and Nematology
Indian Institute of Horticultural Research, Bangalore 560 089

ABSTRACT

Application of nuclear polyhedrosis virus of *Adisura atkinsoni* Moore in field bean @ 125 LE/ha along with endosulfan 0.035%, twice at 15 days interval significantly reduced the larval population. The virus alone at 250 LE/ha also could reduce the larval population significanlty inside the pods but the larval population on the plants (outside the pod) did not vary significantly from that of control. NPV 250 LE/ha + endosulfan at 0.035% as well as endosulfan 0.07% significantly reduced the pod damage and increased the yield when compared to control. Considering the feeding behaviour of *A. atkinsoni* before and after the application of virus, the importance of assessing the larval infestation inside the pod instead of outside and assessing the yield on seed basis instead of pod basis, is discussed

Key words: *Adisura atkinsoni*, NPV, Biological control, NPV - Insecticide combination, Field efficacy.

The proper timing of virus application against the target insect based on the understanding of insect-virus-plant relationship, involving feeding behaviour, is quite essential while assessing its efficacy. Though the occurrence of a nuclear polyhedrosis virus (NPV) of field bean pod borer, *Adisura atkinsoni* Moore has been reported in India (Godse, 1976), no further study has been conducted on either the host-pathogen relationship or field efficacy of the virus. In the present paper, the results of the field efficacy of NPV against *A. atkinsoni* on field bean assessed based on the feeding as well as damage to the pods and yield are discussed.

MATERIALS AND METHODS

A field trial was conducted with the various treatments *viz*, NPV @ 250 LE/ha (I LE = larval equivalent = 6×10^9 polyhedral occlusion bodies), NPV @ 125 LE/ha + endosulfan 0.035% and endosulfan 0 07% which were randomised and replicated five times. Each replication consisted of five rows of plants/plot and each row had 40 plants. The virus was propagated in *A atkinsoni* larvae reared on artificial diet (Narayanan, 1985). Spraying was done with a knapsack sprayer, using 700 litres of water ha. Triton X100 was used @ 25 ml/ha The treatments were given between 3-5 p.m. to reduce possible photo-inactivation of virus. Three rounds of virus at an interval of 7 days and two rounds of endosulfan, and endosulfan + virus were given at an interval of 15 days. Observations were made on the number of larvae of both *A. atkinsoni* and the plume moth, *Sphaenarches ansioda-*

ctylus Walker present on four plants/plot at weekly intervals. Damage to pods was assessed counting the damaged and undamaged pods. At harvest, the grain yield was recorded.

RESULTS AND DISCUSSION

There was no significant difference between NPV and control plots with regard to the number of live larvae of *A. atkinsoni* present on the entire plant surface including foliage, flowers and pods (Table 1). However, there was a significant reduction in larval number in endosulfan 0.07% as well as NPV 125 LE/ha + endosulfan 0.035% treatments. As demonstrated in many previous tests (Ignoffo *et al.*, 1965; Chapman and Bell, 1967; Kinzer *et al.*, 1976) and corroborated again herein, the larval count which is routinely used to compare chemical insecticide treatments was not a good index of the effectiveness of viral insecticides. This may be due to the inclusion of even living infected larvae in the larval population counts.

Even though, there was no significant difference between the NPV treated and control plots with regard to the number of live larvae of *A. atkinsoni* present on the plant surface, nearly 48 to 32% disease incidence of NPV was noticed in NPV and NPV + insecticide-treated plots. Further, it was observed that under field conditions the infected larvae moved to the top of the plant and death occurred generally over the foliage, flower buds or pods after developing typical wilt symptoms. This phenomenon exhibited by the NPV-infected *A. atkinsoni* larvae, necessitated making further observations on the number of live larvae present inside the pod. For this, total number of live *A atkinsoni* larvae present inside ten pods selected at random was recorded. The data showed that all the treatments were significantly superior to control (Table 1).

It is evident from the present observations as well as from the report of Govindan and Thontadarya (1983) that *A. atkinsoni* larvae are mostly true internal pod borers unlike *Heliothis armigera* (Hubn.). Hence, significant effect of virus was well pronounced in the present experiment when assessed based on the larvae present inside the pod instead of outside, taking into consideration its change in feeding behaviour after the application of virus. Such changes in the feeding behaviour of cabbage butterfly, *Mamestra brassicae* larvae by way of becoming restless and dispersing more widely than healthy has been reported by Entwistle (1983). Further, the low level of *A. atkinsoni* incidence observed in NPV + endosulfan-treated plot is obviously due to the combined action of virus and insecticide. The virus infected larvae of *A. atkinsoni* coming out from the pods are killed more easily by the contact effect of endosulfan applied in the subsequent round. There are reports that viral infections reduce the tolerance of the insect to insecticides by acting as stressors as in the case of *Lymantria dispar* (Benz, 1971). Further, the recent studies on the combined action of NPV of *Mythimna separata* (Wlk.) with endosulfan (Savanurmath and Mathad, 1982) and *H armigera* NPV with sub-lethal dose of endosulfan (Santharam *et al.*, 1981) corroborate with the present observation.

Table 1. Effect of NPV, NPV + insecticide combination and insecticide alone on the larval population of *Adisura atkinsoni* and *Sphaenarches anisodactylus*

Treatments	No. of *A atkinsoni*		*S. anisodactylus*/
	larvae/plant (outside)	larvae/pod (inside)	plant
NPV @ 250 LE/ha	9 25c	0.46a	5.65c
NPV @ 125 LE/ha+ Endosulfan 0.035%	4.00a	0.38a	0.00a
Endosulfan 0.07 %	5.45b	0.34a	0.10a
Control	11.15c	1.38b	4.70b

In a vertical column means followed by similar letters are not different statistically (P=0.05) by L. S. D.

Table 2. Effect of NPV, NPV + insecticide combination and insecticide alone on pod damage and grain yield

Treatments	% Pod damage	Grain yield g/plant
NPV @ 250 LE/ha	42.31b	51.30b
NPV @ 125 LE + Endosulfan 0.03%	31.99a	136.26a
Endosulfan 0.08%	35.59ab	142.98a
Control	53.09c	11.70c

Both endosulfan 0.07% as well as NPV + endosulfan 0.035% could effectively reduce the larval population of the plume moth, *S. anisodactylus* when compared to NPV alone and control (Table 1). The plume moth is known to be highly susceptible to even low doses of endosulfan (Bharadwaj *et al.*, 1978) and the efficacy of NPV + endosulfan 0.035% might obviously be due to only endosulfan and not the NPV since most of the insect viruses are specific in their infectivity (Ignoffo, 1968).

Though NPV @ 250 LE/ha could significantly reduce the pod damage when compared to control, it was not as effective as NPV 125 LE + endosulfan 0.035%. The grain yield in all the treatments was significantly higher compared to control (Table 2). The highest yield (142 98) was observed in endosulfan treated plot and it was on par with NPV + endosulfan. Both these treatments were significantly superior to application of NPV alone @ 250 LE/ha. That NPV + endosulfan is more effective than NPV alone in the control of the other pests like *H. armigera* has been reported earlier (Jayaraj *et al*, 1985).

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