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Efficacy of Nuclear Polyhedrosis Virus Formulation for the Control of *Spodoptera litura* (Fab.) on Chillies

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ABSTRACT

Results of the field experiment on the control of *Spodoptera litura* (Fab.) on Chillies *(Capsicum annuum* L.) with nuclear polyhedrosis virus (NPV) and certain insecticides revealed that two rounds of application of the virus as a water dispersible power (WDP) or unformulated virus at 250 larval equivalents (LE) / ha at 10 days interval was as effective as fenpropathrin 200 g a.i / ha or fenpropathrin 100 g a.i / ha + NPV (WDP) 125 LE / ha in reducing the larval population and fruit damage. NPV was also as effective as chlorpyriphos 250 g a.i/ha + fenitrothion 188 g a.i/ha in reducing the fruit damage by *S. litura*.

KEY WORDS : NPV formulation (WDP), *Spodoptera litura*, field efficacy, chillies

Chillies *(Capsicum annuum* L.) is grown over 83,000 ha in Tamil Nadu and is the most important spice crop of the state. The polyphagous noctuid pest *S. litura* is a serious pest on chillies in several parts of Tamil Nadu. The caterpillar bores into the fruits causing damage and affected fruits shed resulting in severe yield loss. Many commonly used insecticides have failed to check this menace (Jayaraj and Santharam, 1985). In India, a nuclear polyhedrosis virus (NPV) was reported to infect this larvae by Ramakrishnan and Tiwari (1969). The effectiveness of this NPV against field population of *S. litura* on different crops like banana (Santharam *et al.* 1978), castor (Mahadevan, 1978), cauliflower (Chaudhari and Ramakrishnan, 1980), blackgram (Mahadevan and Kumaraswami, 1980), tobacco (Ramakrishnan, 1976, Santharam and Balasubramanian, 1980; Ramakrishnan *et al.* 1981) and cotton (Jayaraj *et al.* 1980), has been reported earlier. Chaudhari and Ramakrishnan (1979) prepared a wettable powder formulation of NPV of *S. litura* which on bioassay found to be as effective as unformulated virus. Hence the virus was tried on chillies against *S. litura* and compared with certain insecticides in the present investigation.

MATERIALS AND METHODS

The nuclear polyhedrosis virus maintained in the Department of Agricultural Entomology, Agricultural College and Research Institute, Madurai was propagated in fifth instar larvae of *S. litura* following the method described by Jayaraj *et al.* (1980). The diseased cadavers were homogenized in a blender, filtered through a cheese cloth and the polyhedra separated by differential centrifugation. A double-ruled improved Neubaur haemocytometer was used to assess the number of polyhedra in the suspension. The virus was then formulated as a water Dispersible Power (WDP). An appropriate quantity of NPV suspension containing 6×10^{11} POB was sedimented by centrifugation and suspended in 5 ml of distilled water and to this was added 5 g of filler material (China clay-Kerala clays Chemicals Ltd., Cannanore) and made into a slurry by thorough mixing. The slurry was dried over calcium chloride in a desiccator for 2-3 days. Wetting and dispersing agents (Tamol-FB and Tamol-FD) were added at 1 per cent level and this preparation was then mixed with 93 g of the filler and mixed thoroughly in a blender (Dhandapani and Kumaraswami, 1982). This WDP containing 6×10^{11} POB (100 larval equivalents LE) in 100 g was used in this experiment.

A field experiment was conducted in a farmer's field at Narasingapuram village of Madurai district to evaluate the efficacy of formulated NPV and to compare with unformulated NPV on chillies (variety K1). The plot size was 8 x 5 m with gangway of 2 m all around. The treatments were replicated four times in a randomized block design. The applications were made in the evening hours with a knapsack sprayer using a spray fluid of 500 litres per ha. Teepol 0.1 per cent was added to all the treatments except for treatment involving the virus formulation. Two sprays were given at an interval of 10 days starting the first round 135 days after transplanting when there was a high incidence of *S. litura* larvae.

TABLE 1. Larval population of *Spodoptera litura* and fruit damage after different treatments on chillies

Treatment	I round					II round				
	Larvae/5 plants-days after application				Fruit damage (%)	Larvae/5 plants-days after application				Fruit damage (%)
	1	5	7	10		1	5	7	10	
NPV - WDP 250 LE / ha	20.00^{d}	7.75^{c}	5.25^{ab}	8.00^{b}	25.36^{c}	8.25^{c}	3.75^{b}	4.25^{b}	1.00^{ab}	5.62^{b}
NPV - unformulated 250 LE / ha	19.50^{d}	7.00^{c}	5.75^{ab}	9.25^{b}	26.62^{c}	8.75^{c}	3.25^{b}	3.25^{b}	1.25^{ab}	5.88^{b}
Fenpropathrin (Danitol 20 EC) 200g a.i / ha	6.00^{a}	4.25^{a}	4.00^{a}	6.75^{ab}	9.24^{a}	2.25^{a}	1.25^{a}	0.25^{a}	0.00^{a}	3.62^{a}
Fenpropathrin 100g a.i / ha + NPV - WDP 125 LE / ha	10.75^{c}	3.75^{a}	2.75^{a}	4.25^{a}	16.62^{b}	3.00^{ab}	1.75^{a}	0.50^{a}	0.25^{a}	5.79^{b}
Chlorpyriphos 250 g a.i / ha + fenitrothion 188g a.i/ha	8.25^{b}	5.50^{b}	6.25^{b}	8.50^{b}	17.52^{b}	3.75^{b}	2.50^{ab}	1.25^{ab}	2.25^{b}	6.82^{b}
Control	20.25^{d}	22.50^{d}	18.50^{c}	20.75^{c}	41.66^{d}	20.25^{d}	12.75^{c}	10.50^{c}	6.25^{c}	30.54^{c}

In a column Means followed by comon letters are not significantly different at 0.05 per cent level by DMRT

Larval population was recorded at periodic intervals on five randomly tagged plants selected in each plot omitting the border rows. Fruit damage was recorded from the same plants. The data on the larval population and percentage fruit damage were converted to $\sqrt{x+0.5}$ and angles respectively and after analysis of variance, the means were separated by DMRT.

RESULTS AND DISCUSSION

The pre-treatment count showed that the larval population ranged from 18.25 to 22.50 per five plants and the variations in different plots were not significant. One day after the first round, there was a significant reduction in the larval population in all the treatments except NPV-applied plots. But significantly minimum larval numbers were recorded in fenpropathrin applied plots (Table 1). In the subsequent days, it was found that combination of NPV and fenpropathrin @ 100 g a.i/ha was on par with fenpropathrin @ 200 g a.i/ha. in reducing the larval number when compared to NPV alone. But the observations taken on different days after each application indicated that NPV applied as WDP formulation was as good as that of unformulated virus. Data recorded on tenth day after the first round showed that the larval number increased irrespective of the treatments compared to the data on seventh day. Hence a second spray was given on the tenth day. Almost a similar trend as that of the first round was noticed after second round, also. In control plots too, there was a reduction in the larval population in each subsequent count, but it was not so drastic as in treated plots.

Efficacy of combination of NPV with insecticides in reducing larval population of *S. litua* in other crops has been reported earlier (Ramakrishnan, 1976; Jayaraj *et al.* 1980; Santharam and Balasubramanian, 1980; Ramakrishnan *et al.* 1981). The effectiveness of chlorpyriphos-fenitrothion combination against *S. litura* on cotton was reported by Jayaraj *et al.* (1980).

The damage was minimum in plots receiving fenpropathrin. Next in the order of efficacy was chlorphriphos-fenitrothion treatment in which the percentage reduction over control plots was 57.95 per cent which was on par with NPV-fenpropathrin combination (Table 1). But after the second round, NPV-fenpropathrin applied as half the dose was on par with NPV applied as full dose both in the form of WDP as well as unformulated one indicating that the bioefficacy is not lost in the formulation.

Ethiraju (1986) developed wettable power (WP) and dust formulation in the laboratory and evaluated against *S. litura* and found that WP formulation was as effective as unformulated virus

but significantly better than dust. Sachithanandam (1988) while evaluating these formulations against *S. litura* on groundnut found that NPV WP at 750 LE/ha could give effective control.

The use of NPV in chillies has great scope since most of the dead larvae remain on the plant with their integument ruptured, releasing NPV laden haemolymph. This may lead to fresh infection among healthy individuals of subsequent broods and may ultimately result in the epizootic spread of the disease. This is possible because an epizootic form of natural occurrence of this NPV of *S. litura* on daincha *(Sesbania bispinosa)* crop inflicting 90 per cent mortality of the larvae was recorded by Dhandapani *et al.* (1982).

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