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Pot Culture Studies on the Efficacy of NPV Formulations against the Tobacco Cut Worm *Spodoptera litura* (F.) larvae on groundnut

S. SACHITHANANDAM, R.J. RABINDRA and JAYARAJ.

Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore 641 003

ABSTRACT

Wettable powder and dust formulations of nuclear polyhedrosis virus @ 4-6 x 10^6 POB/pot were as effective as chlorpyriphos 0.04% spray or carbaryl 5% dust against third instar larvae of *Spodoptera litura* (F.) on groundnut plants in pots. The virus formulations however were inferior to the unformulated virus. At higher doses, the wettable powder (0.8 x 10^8 POB/pot) and dust (1.2 x 10^8 POB/pot) formulations gave control equivalent to unformulated virus (0.8 x 10^8 POB/pot). The leaf damage could be significantly reduced in all the treatments.

KEY WORDS : NPV, Wettable powder, dust, *Spodoptera litura*, groundnut

Baculoviruses are by far the most important among the entomopathogens and can be regarded as ecologically non-disruptive control agents in view of their relative specificity. Successful control of *Spodoptera litura* (F.) with the nuclear polyhedrosis virus (NPV) at 100-250 larval equivalent (LE) / ha has been reported on crops like tobacco (Ramakrishnan, *et al.*, 1981), banana (Santharam *et al.*, 1978), cauliflower (Chaudhari and Ramakrishnan, 1980) and cotton (Jayaraj *et al.*, 1980). Chaudhari and Ramakrishnan (1979) tested a wettable powder preparation of NPV of *S. litura* and in laboratory tests, it was as effective as unformulated virus. In the present study, the efficacy of dust and wettable powder formulations of NPV were tested against *S. litura* larvae on groundnut plants under glass house condition at the Tamil Nadu Agricultural University, Coimbatore.

MATERIALS AND METHODS

The nuclear polyhedrosis virus was propagated in the fourth instar larvae of *S. litura* and counts of polyhedral occlusion bodies (POB) were made with a haemocytometer. The wettable powder and dust formulations were prepared with talc as base and Dedinol a commercial wetting and dispersing agent (for WP) following the methods of Ethiraju *et. al.* (1988). Pot culture studies were conducted to evaluate the efficacy of these formulations of NPV in comparison with the unformulated NPV and insecticides against third instar larvae of *S. litura*. NPV dusts and wettable powders (WP) were formulated to carry 375 LE and 250 LE / 25 and 2.5 Kg of filler respectively. POL 2 groundnut was sown in pots and on the 31st day, four plants were retained per pot and the treatments (Table 1) were applied. The NPV dust was applied with the

TABLE 1 **Efficacy of NPV formulations against third instar larvae of *S. litura* on groundnut plants in pot culture. Experiment I**

Treatments	Dose POB/ mg* per pot	Percentage	
		Mortality	Leaf damage
NPV dust	4 x 10^7	56.67[b]	47.80[abc]
NPV dust	6 x 10^7	56.67[b]	56.71[cd]
NPV WP	4 x 10^7	60.00[b]	53.23[bcd]
NPV WP	6 x 10^7	60.00[b]	72.84[d]
NPV (unformulated)	4 x 10^7	76.67[a]	40.10[abc]
Chlorpyriphos (20 EC) 0.04%	8	63.33[b]	19.38[a]
Carbaryl 5% dust	60	60.00[b]	24.10[ab]
Control	-	0.00[c]	100.00[e]

*Pesticides used

In vertical columns, means followed by similar letters are not different statistically (P = 0.05) by DMRT

TABLE 2. Efficacy of NPV formulations against third instar larvae of *S. litura* on groundnut plants in pot culture. Experiment II

Treatments	Dose POB/ mg* per pot	Percentage	
		Mortality	Leaf damage
NPV dust	0.8×10^8	63.33[c]	40.38[b]
NPV dust	1.8×10^8	70.00[bc]	45.99[b]
NPV WP	0.8×10^8	76.67[bc]	46.25[b]
NPV WP	1.2×10^8	90.00[a]	29.22[ab]
NPV (unformulated)	0.8×10^8	80.00[ab]	31.02[ab]
Chlorpyriphos (20 EC) 0.04%	8	83.33[ab]	17.55[a]
Carbaryl 5% dust	60	63.33[c]	25.00[ab]
Control	-	0.00[d]	85.97[c]

*Pesticides used

In vertical columns, means followed by similar letters are not different statistically (P = 0.05) by DMRT

help of a small muslin dusting bag. The sprays were given with a hand atomiser using a spray fluid of 20 ml./pot. The treatments including the control were replicated thrice.

Soon after treatments were applied, third instar larvae of *S. litura* reared from a single egg mass were released on the plants at the rate of 10/pot. After releasing the larvae, the plants were covered with transparent polyester cages to avoid the migration of the larvae. Mortality of larvae and leaf damage were recorded daily from the second day of treatment till the 10th day. Since in the first experiment, the NPV formulation at even a higher dose equivalent to 375 LE/ ha did not prevent the damage to the plants appreciably, a second experiment was conducted with higher doses of virus. In this experiment NPV formulations were tested at doses equivalent to 500 and 750 LE/ha (Table 2). The methods followed were as in the previous experiment.

RESULTS AND DISCUSSION

The results of the first experiment revealed that the WP and dust formulations were not effective in producing the desired mortality of larvae as well as in reducing the leaf damage (Table 1). The mortality rates recorded in the different NPV formulations were significantly lower than that of the unformulated virus. Even in the unformulated virus applied at 4×10^7 POB/ pot, the mortality was only 76.67 per cent and the leaf damage was 40.10 per cent which are unacceptable. In the second experiment, NPV WP at (1.2×10^8 POB / pot) was found to give appreciable mortality (90.0%) which was as good as NPV unformulated virus at 8×10^7 POB / pot as well as chloypyriphos and carbaryl treatments (Table 2). Leaf damage however was minimum in chlorpyriphos treatment but NPV WP at 1.2×10^8 POB / pot as well as unformulated virus and carbaryl were on par with chlorpyriphos (Table 2). Results of both the experiments have clearly shown that the virus particularly at a higher concentration was as good as chemical pesticides. The NPV WP formulations at the higher concentration was significantly better than the NPV dust formulation. Ethiraju *et al.* (1988) also found WP formulations to be better than the dust formulation of NPV against *H. armigera.* Similar findings were reported by Okada (1977). Thompson and Steinhaus (1950) also found the aqueous suspension of the polyhedra to be more effective for control of lepidopterous larvae than a dust formulation. Laboratory studies have shown that the addition of 1.0 per cent chickpea flour or 2.0 per cent castor leaf extract to virus suspension caused significantly greater mortality than the virus in water suspension (Rabindra, unpublished data). Such adjuvants can also be incorporated into dust formulations to act as gustatory stimulants to enhance the virus uptake (Montoya *et al.* 1966). Better formulation methods ensuring good flowability of dusts and even distribution of the POB should be tried to improve the efficacy.

REFERENCES

Chaudhari, S. and Ramakrishnan, N. 1979. Propagation and comparative efficacy of different preparations of a baculovirus of *Spodoptera litura* (Fabr.). *Bull. Ent.*, **20**, 86-93.

Chaudhari, S. and Ramakrishnan, N. 1980. Field efficacy of baculovirus and its combination with sublethol does of DDT and endosulfan on cauliflower against tobacco caterpiller *Spodoptera litura* F. *Indian J. Entomol.*, **42**, 592-596.

Ethiraju, S., Rabindra, R.J. and Jayaraj, S. 1987. Laboratory evaluation of certain formulations of nuclear polyhedrosis virus against the larvae of *Heliothis armigera*. *J. Biol. Control*, **2**, 21-25.

Jayaraj, S., Santharam, G., Narayanan, K., Sounderarajan, K. and Balagurunathan, R. 1980. Effectiveness of the nuclear polyhedral virus against field populations of the tobacco caterpillar *Spodoptera litura* on cotton. *Andhra agric. J.*, **27**, 26-29.

Montoya, E.L., Ignoffo, C.M. and McGarr, R.L. 1966. A feeding stimulant to increase the effectiveness of and field test with a nuclear polyhedrosis virus of *Heliothis*. *J. Invertebr. Pathol.*, **8**, 320-324.

Okada, M. 1977. Studies on the utilization and mass production of *Spodoptera litura* NPV for control of the tobacco cut worm, *Spodoptera litura* (F.) *Rev. Pl. Prot. Res.*, **10**, 102-128.

Ramakrishnan, N., Chaudhari, S., Kumar, S., Rao, R.S.N., and Sathyanarayanan, S.V.V., 1981. Field efficacy of nuclear polyhedrosis virus against the tobacco caterpillar, *Spodoptera litura* F. *Tobacco Res.*, **7**, 129-134.

Santharam, G., Regupathy, A., Eswaramoorthy, S. and Jayaraj, S. 1978. Effectiveness of NPV against field populations of *Spodoptera litura* (F.) on banana. *Indian J. Agric. Sci.*, **48**, 676-678.

Thompson, C.G. and Steinhaus, E.A. 1950. Further test using a polyhedrosis virus to control the alfalfa caterpillar. *Hilgardia*, **19**, 411-450.