J.Biol.Control, 6 (1), 22-25, 1992

Efficacy of Nuclear Polyhedrosis Virus Against *Spodoptera litura* (Fab.) on Tobacco (*Nicotiana tabacum* L.) in Different Locations of Tamil Nadu, India

N.DHANDAPANI, M.KALYANASUNDARAM,
P.C.SUNDARA BABU AND S.JAYARAJ
Department of Entomology
Tamil Nadu Agricultural University
Coimbatore - 641 003.

ABSTRACT

Field experiments conducted against *Spodoptera litura* (Fab.) with nuclear polyhedrosis virus (NPV) on tobacco (*Nicotiana tabacum* L.) in twelve different locations of Tamil Nadu indicated that two rounds of application at 250 larval equivalents (LE)/ha with crude sugar 2.5 kg/ha at 10 days interval was significantly superior to untreated control in reducing the larval population, irrespective of the locations tested.

KEY WORDS : NPV, *Spodoptera litura,* Tobacco

Spodoptera litura (Fab.) is an important pest of tobacco (*Nicotiana tabacum* L.) which is grown over 3.84 lakhs ha in India and is the most important narcotic crop of the world. This pest causes complete defoliation resulting in great yield loss. Many commonly used insecticides have failed to check the population (Jayaraj and Santharam, 1985). Also, the toxic chemicals sprayed for its control leave residues on the leaves which are used for chewing and smoking. Among the alternative methods, biological control is ecologically sound and effective. In India, a nuclear polyhedrosis virus (NPV) was reported by Ramakrishnan and Tiwari (1969) to infect the larvae of this insect. The field efficacy in small plots was reported by Santharam and Balasubramanian (1980). In the present study, efforts were made to utilize the NPV with bigger plots (0.4 ha) in different locations of Tamil Nadu, India.

MATERIALS AND METHODS

The NPV maintained in the Department of Entomology, Tamil Nadu Agricultural University, Coimbatore was propagated in late fourth instar larvae of *S.litura*. The larvae were inoculated with the virus by oral administration of 0.1 μl of the virus suspension containing 10^6 polyhedral inclusion bodies (PIB) using a microsyringe (Top syringe manufacturing company, Bombay, India) and allowed to feed on castor bean leaves. After 5-7 days of inoculation, the virus-killed larvae were collected in glass distilled water and polyhedra allowed to sediment for several days. The virus sediment was then removed by passing through several layers of muslin and finally purified by differential centrifugation in a R_4 Remi-centrifuge as described by Jayaraj *et al.* (1980).

Twelve field experiments were conducted in 75 days old 'Vazhaikkappal' tobacco in different villages of Coimbatore and Periyar districts of Tamil Nadu, India during 1990-1991. In each experiment, 0.40 ha area was marked with five replications in a randomized block design. The spraying of NPV @ 250 larval equivalents (LE)/ha with crude sugar 2.5 kg/ha was given in the evening hours with a backpack hydraulic sprayer (Aspee, Bombay) with a hollow cone nozzle using Ca.1000 lit. of spray fluid/ha. Two sprayings were given at 10 days interval starting the first round 75 days after planting (DAP) when there was a

high incidence of *S.litura* larvae. An untreated control plot was also maintained in each location. Observations on larval populations were recorded in randomly selected twenty tagged plants in each replication prior to and seven days after each spraying and compared with untreated controls by conducting 't' test. After harvest, cured leaf weight in treated and control plots was recorded, and the average yield was compared district wise.

RESULTS AND DISCUSSION

In all the locations, the pre-treatment count taken on 75 DAP on larval population showed that the variations in treated and control plots were not significant (Table 1). But the observations taken seven days after first and second sprayings indicated that NPV applied plots were significantly superior in reducing the larval population compared to untreated controls (Table 1). There were steady reductions in the larval numbers after each application of the virus. The mean cured leaf yield was significantly higher in both the districts in the virus treatment than untreated control (Fig. 1, 2).

Use of NPV against field population of *S.litura* on different crops like banana (Santharam *et al.*, 1978), cauliflower (Chaudhari and Ramakrishnan, 1980; Jayaraj *et al.*, 1980) and chillies (Dhandapani and Jayaraj, 1989) has been reported earlier. Ramakrishnan (1976) and Santharam and Balasubramanian (1980) reported the use of NPV on tabacco. Addition of crude sugar could increase the effectiveness of NPV by acting as a phagostimulant, and increase the acquisition of the virus (Dhandapani *et al.*, 1987). Due to the incubation period of the virus (Jacob and Subramanian, 1972), the larval population reduction was comparatively less within seven days after first application.

Balasubramanian *et al.* (1988) reported differences in chemical pesticide suscep-

Table 1. Effect of NPV against *Spodoptera litura* larval population on tobacco in different locations.

Location	Mean larval population / 5 plants					
	Pre-treatment*		I round - ** 7 DAT@		II round - ** 7 DAT	
	NPV	Control	NPV	Control	NPV	Control
I. Coimbatore district:						
Salai vembu (SA)	8.2	8.0	5.2	11.0	1.2	3.2
Jadayam palayam (JA)	9.2	9.0	6.0	9.2	1.4	6.0
Thimmampalayam pudur (TH)	10.2	11.0	6.0	11.0	1.2	6.0
Pungam palayam (PU)	12.0	11.0	5.8	11.2	1.0	6.0
Pattaikaran pudur (PA)	8.3	9.0	4.2	10.0	1.0	5.0
Kittam Palayam (KI)	9.6	9.2	3.0	10.0	1.2	4.2
II. Periyar district						
Sathiyamangalam (ST)	9.8	9.0	6.0	9.2	1.2	6.8
Mathippaanur (MA)	10.8	11.0	7.0	10.8	1.0	9.8
Kottuveeram palayam (KO)	9.8	10.0	5.0	9.8	1.0	9.2
Ekkarai Negamam (EK)	6.0	7.0	4.0	7.2	0.5	7.6
Ukkaram (UK)	11.2	10.4	6.0	9.5	1.0	6.2
Vandipalayam (VA)	10.8	10.0	4.0	10.2	1.0	5.0

@ DAT - Days after treatment
* Difference between the means of NPV and Control not significant (5%)
** Difference between the mean significant (5%)

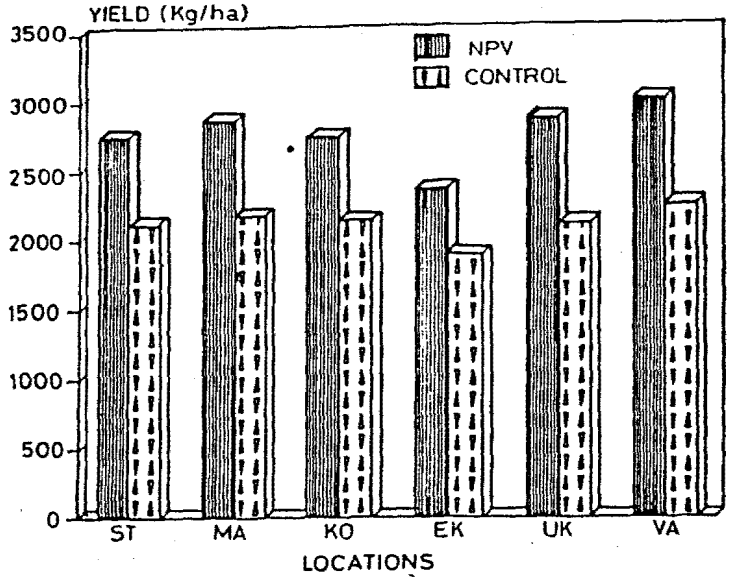

Fig .1. Yield of Tobacco (ca. kg/ha) in *Spodoptera* NPV- treated and untreated plots in certain locations in Periyar District - Tamil Nadu

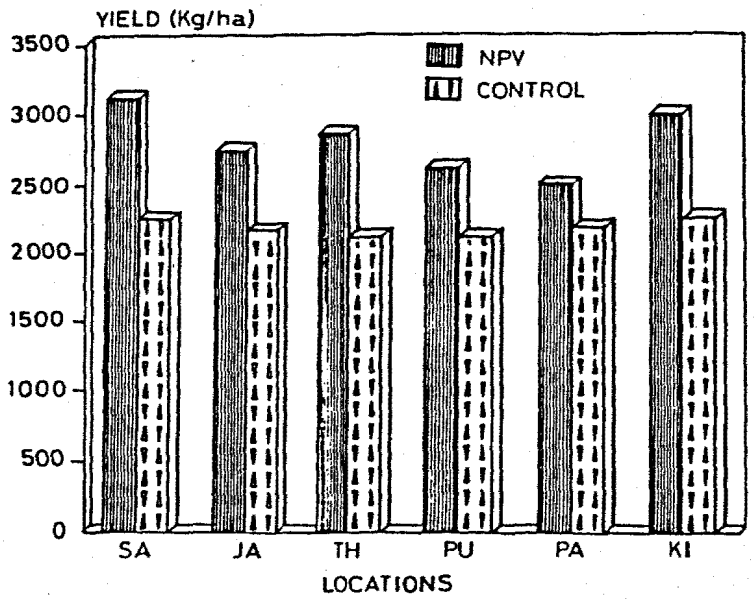

Fig .2. Yield of Tobacco (ca. kg/ha) in *Spodoptera* NPV -treated and untreated plots in certain locations in Coimbatore District - Tamil Nadu

tibility of *S.litura* collected from three locations of Tamil Nadu. In the present investigatiion, there was no differences in virus susceptibility in *S.litura* populations. Even though some of the insecticides like chlorpyriphos (Santharam and Balasubramanian, 1980), chlorpyriphos with fenitrothion (Jayaraj *et al.*, 1980), fenpropathrin (Dhandapani and Jayaraj, 1989) could check this pest, in view of the high cost of chemical pesticides and pesticide residue problems, the use of NPV will be the preferred recommendation. Long term benefits could be achieved through the use of NPV, since most of the dead larvae remain on the plant with their integument reptured releasing NPV laden haemolymph to persist in soil. This may lead to fresh infection among healthy individuals of subsequent broods or in next crop and may ultimately result in the epizootic spread of the disease.

ACKNOWLEDGEMENT

The financial support by Department of Biotechnology, Government of India, New Delhi is gratefully acknowledged.

REFERENCE

BALASUBRAMANIAN,G., CHELLIAH,S. and BALASUBRAMANIAN,M. 1988. Differences in pesticide susceptibility of *Spodoptera litura* Fb. collected from three locations in Tamil Nadu. *Indian J. Pl. Prot.*, **16**, 67-69.

CHAUDHARI,S. and RAMAKRISHNAN,N 1980. Field efficacy of baculovirus and its combination with sub-lethal dose of DDT and endosulfan on cauliflower against tobacco caterpillar (*Spodoptera litura* Fb.). *Indian J. Entomol.*, **42**, 592-596.

DHANDAPANI,N. and JAYARAJ,S. 1989. Efficacy of nuclear polyhedrosis virus formulation for the control of *Spodoptera litura* (Fb.) on chillies. *J.Biol. Control*, **3**, 47-49.

DHANDAPANI,N., JAYARAJ,S. and RABINDRA,R.J. 1987. Efficacy of ULV application of nuclear polyhedrosis virus with certain adjuvants for the control of *Heliothis armigera* (Hbn.) on cotton. *J. Biol. Control*, **1**, 111-117.

JACOB,A. and SUBRAMANIAN,T.R. 1972. Effect of larval age and dosage of virus on the susceptibility of *Spodoptera litera* F. to a nuclear polyhedrosis virus. *Agric. Res. J. Kerala*, **10**, 176-177.

JAYARAJ,S. and SANTHARAM,G. 1985. Ecology-based integrated control of *Spodotera litera* (F.) on cotton. In: "Microbial control and pest management" (S.Jayaraj, ed.), pp.256-264, Tamil Nadu Agric.Univ., Coimbatore, India.

JAYARAJ,S., SANTHARAM,G., NARAYANAN,K., SOUNDARARAJAN,K. and BALAGURUNATHAN,R. 1980. Effectiveness of NPV against field populations of tobacco caterpillar, *Spodoptera litura* on cotton. *Andhra Agric. J.*, **27**, 26-29.

RAMAKRISHNAN,N. 1976. Development of a microbial control agent: Nuclear polyhedrosis virus of *Spodoptera litura* (Fb.). *Proc. of National Acad. Sci. India*, **46** (B), 110-116.

RAMAKRISHNAN,N. and TIWARI,L.D. 1969. Polyhedrosis of *Prodenia litura* F. (Noctuidae: Lepidoptera). *Indian J. Entomol.*, **31**, 191-192.

SANTHARAM,G. and BALASUBRAMANIAN,M. 1980. Note on the control of *Spodoptera litura* Fb. (Lepidoptera:Noctuidae) on tabacco with a nuclear polyhedrosis virus and diflubenzuron. *Indian J. Agric. Sci.*, **50**, 726-727.

SANTHARAM,G., REGUPATHY,A., EASWARAMOORTHY,S. and JAYARAJ,S. 1978. Effectiveness of nuclear polyhedrosis virus against field populations of *Spodoptera litura* on banana. *Indian J. Agric. Sci.*, **48**, 676-678.