J. Biol. Control 2(2), 137 — 138, 1988.

Compatibility of NPV of *Spodoptera litura* (Fabricius) With Certain Fungicides

S. SACHITHANANDAM, R.J. RABINDRA and S.JAYARAJ
Department of Agricultural Entomology
Centre for Plant Protection Studies
Tamil Nadu Agricultural University
Coimbatore 641 003

From time to time, it has been suggested that microbial insecticides might be combined with chemical pesticides used in agriculture and forestry. Jaques (1985) suggested that the compatibility of insect viruses with pesticide chemicals especially fungicides and insecticides is important because viruses may have to be mixed with other chemicals during practical use in the field to avoid duplication of application operation. Relationships of viruses and pesticides have been reviewed by Benz (1971) and Jaques and Morris (1981). In the present study, the compatibility of *S. litura* NPV with mancozeb, copper oxychloride and carbendazim was studied with a view to find out if NPV and fungicides could be applied together to manage both *S. litura* and foliar diseases.

Fresh virus obtained by inoculating fourth instar larvae of *S. litura* was semi purified by differential centrifugation and counts of polyhedral occlusion bodies (POB) made with the help of a Neubauer haemocytometer. The different treatments (Table 1) were prepared in distilled water. The NPV treatments had a strength of 2 x 10^6 POB/ml. Castor leaves of uniform size were dipped in the different treatments and dried under shade. Petioles of the leaves were kept immersed in a 50 ml conical flask containing water to keep the leaves turgid. Third instar larvae of *S. litura* obtained from a single egg mass were released at the rate of 15 per treatment with three replications and confined in plastic containers (30 x 20 cm). After 24 h of feeding, the larvae were transferred to individual vials containing semisynthetic diet of Shorey and Hale (1965) and plugged tightly with absorbent cotton. While preparing the diet, formalin was excluded since it has antiviral property. Mortality was observed every 6 h after 72 h of treatment and LT_{50} worked out by probit analysis (Finney, 1962) in a Spectrum-I Mini Computer (DCM). The experiment was repeated with the same treatments but the bioassay was done 24 h after preparation.

Table 1. Susceptibility of third instar larvae of *S. litura* to NPV-fungicide mixtures

Treatments	Mean percentage mortality[1] in experiment	
	I[2]	II[3]
NPV	97.8[a]	64.5[a]
NPV + mancozeb 0.15%	93.3[ab]	42.2[b]
NPV + carbendazim 0.025%	86.7[b]	37.8[b]
NPV + copper oxychloride 0.125%	95.6[ab]	42.2[b]
Mancozeb 0.15%	15.6[c]	0.0[c]
Carbendazim 0.025%	15.6[c]	2.2[c]
Copper oxychloride 0.125%	15.6[c]	4.4[c]

1. In vertical columns, means followed by similar letters are not different statistically (P=0.05) by DMRT
2. Bioassay immediately after preparation of treatments at 2 x 10^6 POB/ml in all treatments containing NPV
3. Bioassay 24 h after preparation of treatments

Infectivity of the virus was not affected when it was mixed with mancozeb 0.15% or copper oxychloride 0.125%. But mortality was significantly reduced from 97.78 per cent (NPV alone) to 86.67 per cent (Table 1), when it was combined with carbendazim 0.025%. But when the NPV-fungicide mixtures were tested 24 h after being held at room temperature (29-32°C), mortality was significantly reduced in all the NPV-fungicide mixtures, compared to NPV alone. Glass (1958) observed that the granulosis virus of the red-banded leaf roller *Argyrotaenia velutinana* (Wlk.) was not affected by the fungicides tag, sulfur, captan, ferbam and dichlone and that wettable sulfur sprays used for apple scab control in the field did not inhibit the development of granulosis disease. But he also mentioned that glyodin reduced the incidence of the disease. Keller (1973) also found that the granulosis virus of *Cydia pomonella* (L.) was not inactivated by the fungicides tested. In the present investigation, comparison of LT_{50} showed that when mancozeb was added to the virus, the LT_{50} was slightly increased (Table 2). But it was reduced in the case of carbendazim which however, cannot be

Table 2. Probit analysis of time-mortality response of third instar of *S. litura* to different NPV-fungicide mixtures

Treatments*	Number of insects	Chi² (n-2)	Slope 'b'	LT_{50} (h)	Fiducial limits 95%	
					Lower	Upper
NPV	45	3.28	5.85	105.46	99.32	111.04
NPV + mancozeb 0.15%	45	7.37	4.87	112.68	105.63	119.20
NPV + carbendazim 0.025%	45	3.49	4.11	98.35	89.35	105.91
NPV + copper oxychloride 0.125%	45	10.59	5.57	101.06	94.57	106.84

* Non-significant in all the treatments
@ NPV at 2 x 10^6 POB/ml

considered as an advantage since mortality was significantly reduced.

The present findings that NPV of *S. litura* is not affected by fungicides like copper oxychloride or mancozeb when used immediately after mixing will have some application in the context of simultaneous occurrence of *S. litura* and foliar diseases like leaf spot and rust as copper oxychloride and mancozeb can effectively control the foliar disease like leaf spot and rust of groundnut (Hossain and Mian, 1981; Patil *et al.*, 1983). However, further field studies on the effect of fungicides on the persistence of the virus should be conducted since in the present laboratory studies, it was observed that the activity of the virus was significantly reduced when suspended in the fungicides for 24 h (Table 2).

KEY WORDS : *Spodoptera litura*, NPV, fungicides, compatibility

REFERENCES

Benz, G. 1971. Synergism of microorganisms and chemical insecticides. In: "*Microbial Control of Insects and Mites*" (Burges, H.D. and N.W. Hussey eds.), Academic Press, New York, pp. 327-355.

Finney, D. J. 1962. *Probit analysis*. Cambridge Univ. Press, England, pp. 490.

Glass, E.H. 1958. Laboratory and field tests with the granulosis of the red banded leaf roller. *J. Econ. Ent.*, **51**, 454-457.

Hossain, I. and Mian, M.A.W. 1981. Comparative efficacies of five foliage fungicides in controlling *Cercospora* leaf spot of peanut. *Bangladesh J. Bot.*, **10**, 58-62.

Jaques, R.P. 1985. Stability of insect viruses in the environment. In: "*Viral insecticides for biological control*". (Maramorosch, K., ed.), Academic Press, New York, pp. 285-359.

Jaques, R.P. and Morris, O.N. 1981. Compatibility with other methods of pest control and with different crops. In: "*Microbial Control of Pest and Plant Diseases 1970-1980*". (Burges, H.D. ed.), Academic Press, New York, pp. 695-715.

Keller, S. 1973. Microbial control of the codling moth with specific granulosis virus. *Z. Angew. Ent.*, **73**, 137-181.

Patil, M.B., Jadhav, B.R. and Rane, M.S. 1983. Fungicidal control of groundnut rust. *Indian J. Mycol. Pl. Pathol.*, **13**, 225-226.

Shorey, W.H. and Hale, R.L. 1965. Mass rearing of the larvae of nine noctuid species on a simple artificial medium. *J. Econ. Ent.*, **58**, 522-524.