

Efficacy of Nuclear Polyhedrosis Virus Formulations Against *Heliothis armigera* (Hbn.) On Sunflower

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Several attempts have been made to control the gram pod borer *Heliothis armigera* (Hbn.) on different crops with the nuclear polyhedrosis virus (NPV) in India (Jayaraj and Rabindra, 1989). On sunflower, two applications of NPV at 250 LE/ha could effectively control *H. armigera* (Rabindra *et al.*, 1986). Recently, the NPV of *H. armigera* was formulated into wettable powders and dusts and found effective against *H. armigera* larvae in the laboratory (Ethiraju *et al.*, 1988). This communication deals with a pot culture study on the efficacy of NPV formulations against *H. armigera* larvae on sunflower heads.

The NPV was propagated in the fourth instar larvae of *H. armigera* and semi-purified by differential centrifugation. The strength of the polyhedral occlusion bodies (POB) was assessed using a new improved double ruled Neubauer haemocytometer and the virus was formulated into wettable powder and dust formulations following methods described earlier by Ethiraju *et al.* (1988). The wettable powder formulations were prepared using two different commercial wetting and dispersing agents *viz.*, Dedenol and Lissapol and the dust formulations were prepared with either talc or kaolin as the carrier.

Sunflower plants (var. Co 2) were grown in pots (30 x 28 cm) and on the 35th day, two vigorous and healthy plants/pot were retained and the pots were arranged randomly in three replications in the glass house. The different treatments (Table 1) were given after anthesis started (42 days after sowing). Spraying was done using a flit gun, each flower receiving a jet of spray from a single stroke. Dusting was done using a cloth bag with three small pebbles

inside. While dusting, a polythene screen was used around the flowerhead to avoid drift. Third instar larvae of *H. armigera* obtained from a single egg mass were released at the rate of two per flowerhead with the help of a fine camel hair brush after carefully checking and removing spiders and ants if any present on the plants. After releasing the larvae, the heads were covered with a muslin cloth bag (12" x 8") and observations were recorded daily on the mortality of larvae. On the 13th day, damage to flowerhead was recorded. Only those flowerheads in which damage to the seeds was observed were counted as damaged.

The NPV wettable powder formulations were as effective as unformulated virus as seen by the mortality of larvae of *H. armigera* as well as the damage to the sunflower heads. The dust formulations were ineffective, though the one containing kaolin was on par with the unformulated virus with regard to the flowerhead damage (Table 1). The flowerhead damage in the virus treatments was significantly higher than in insecticide treatments. The quick knockdown action of the insecticides is the main reason for the least damage in the insecticide-treated flower heads. The wettable powder (dedenol) recorded only 78.5 per cent mortality and there is scope for improving the efficacy of the virus either by developing a better method of formulation of the virus or by incorporating some phagostimulant adjuvants. Rabindra *et al.* (1986) have also reported that the NPV applied at the rate of 250 LE/ha was as effective as endosulfan against *H. armigera* on sunflower heads. In the present experiment, only third instar larvae were used which may be one of the reasons for the not so very satis-

Table 1. Efficacy of NPV formulations against third instar larvae of *Heliothis armigera* on Sunflower heads

Treatments	% mortality	% flowerhead damage
NPV @ 2x10 ⁶ POB/ml	77.9 ^{ab}	24.0 ^b
NPV wettable powder(Dedenol)	78.5 ^a	23.3 ^b
NPV wettable powder (Lissapol)	60.0 ^b	30.0 ^{bc}
NPV dust (talc) (6x10 ⁷ POB/g)	40.0 ^c	53.3 ^{cd}
NPV dust (kaolin)	46.7 ^c	43.3 ^{bc}
Endosulfan 0.07%	95.0 ^a	3.3 ^a
Carbaryl 10% dust	70.0 ^{ab}	18.0 ^{ab}
Control	0.0 ^d	68.0 ^d

* In a column, means followed by similar letters are not different statistically (P=0.05) by DMRT

factory control of damage. The use of virus for *Heliothis* control on sunflower is a sound approach in the context of its safety to honeybees. The safety of NPV formulations to the honeybees has been established by Muthiah (1988). Sunflowers are frequented by honeybees and other pollinators (Rudnev, 1941; Free and Simpson, 1964; Free, 1970) and the use of insecticides can lead to large scale mortality of honeybees and subsequent reduction in honey yields (Loring, 1978). There is scope for the use of dust formulation of NPV in conjunction with the capitulum rubbing adopted for enhancing seed setting. Since sunflower is grown primarily as a rainfed crop, the use of NPV dust formulations would be an appropriate technology in the management of *H. armigera*.

Keywords : NPV, formulations, *Heliothis armigera*, sunflower

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