

Influence of feeding stimulants on incubation period of nuclear polyhedrosis virus of *Helicoverpa armigera* (Hübner)

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ABSTRACT: Six different feeding stimulants (FS) were evaluated in the laboratory at Akola for increasing the effectiveness of *Helicoverpa armigera* (Hübner) nuclear polyhedrosis virus. Jaggery 0.5 per cent, sucrose 0.5 per cent, egg white 3 per cent and chickpea flour 1 per cent proved effective, reducing the LT_{50} from 175.25 h in virus alone to 103.37, 118.73, 125.97 and 128.29 h with FS, respectively.

KEY WORDS: Feeding stimulants, *Helicoverpa armigera*, incubation period, NPV

Nuclear polyhedrosis virus (NPV) has been the most extensively studied bioagent for its virulence and field efficacy in controlling *Helicoverpa armigera* (Hübner) on chickpea (Rabindra and Jayaraj, 1988). NPV acts relatively slow and usually requires one to two weeks incubation period depending upon host species and its stage to cause lethal infection under normal conditions while larvae continue to feed until a few hours before death (Ramakrishnan and Chaudhari, 1974). Their slow action, inactivation due to UV rays, and glandular secretions of leaves of some host plants

limit their efficacy. Laboratory studies were, therefore, undertaken to find out the suitable feeding stimulant (s) (FS) which could shorten the incubation period by way of higher acquisition of the virus.

The experiment was conducted in the Insect Pathology Laboratory, Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) during 1995-96. Culture of NPV was propagated on field collected third instar *H. armigera* larvae. The counting of polyhedral occlusion bodies (POBs) was done under research microscope using

improved Neubauer haemocytometer (Weber, England) with a depth of 0.1 mm. A dose of 1.08×10^5 POBs/ml was selected (Rabindra and Jayaraj, 1988) and maintained for all the treatments. Feeding stimulants: jaggery, sucrose and chickpea flour were mixed (w/v) in distilled water and filtered through muslin. The cakes were mixed in little quantity of water, kept overnight and filtered through muslin after homogenising thoroughly. Egg white was measured and mixed (v/v) in distilled water (Table 1).

inoculation. The corrected mortality data were subjected to probit analysis (Finney, 1952). The economics of adjuvants was calculated considering current market prices.

The data revealed that the incubation period required to cause fifty per cent mortality of larvae ranged between 103.37 and 211.26h. Narayanan (1979) observed a range of LT_{50} of *HaNPV* from 136.8 to 216h and reported better results with NPV and adjuvants. Jaggery 0.5 per cent was

Table 1. LT_{50} , regression equation and fiducial limits for various feeding stimulants mixed with *HaNPV*

Feeding stimulant	LT_{50} (h)	Time-mortality regression line	Fiducial limits (h)
Jaggery (0.5%)	103.57	$Y = 0.78 + 6.69x$	90.58 - 118.42
Sucrose (0.5%)	118.73	$Y = 2.51 + 3.62x$	117.63 - 119.87
Chickpea flour (1%)	128.29	$Y = -1.18 + 8.48x$	115.96 - 141.84
Cotton seed oil cake (3%)	211.26	$Y = -11.70 + 17.68x$	196.88 - 226.63
Groundnut oil cake (3%)	190.86	$Y = 1.19 + 4.23x$	148.87 - 244.69
Egg white (3%)	125.97	$Y = 2.70 + 3.19x$	98.56 - 161.07
NPV alone	175.25	$Y = -1.49 + 7.25x$	152.34 - 161.07

Y = Probit kill, x = log time (days)

For assessing the effects of FS plus virus and virus alone water-soaked grains (24 h) of chickpea variety ICCV-2 were treated with them. The virus and feeding stimulant applied grains were shade dried and fed to healthy second instar larvae (30 larvae in each treatment) for first 48 h in individual sterilised plastic containers and later with virus + feeding stimulant-free grains daily. Mortality was recorded every 24 h after

the most ideal adjuvant which required minimum time, whereas cotton seed oil cake 3 per cent recorded maximum period. LT_{50} of 142.8 h for *H. armigera* was reported by Satpute (1992) due to the addition of feeding stimulant to the NPV. Effectiveness of jaggery was followed by sucrose 0.5 per cent (118.73 h), egg white 3 per cent (125.97 h) and chickpea flour 1 per cent (128.29 h). Groundnut oil cake 3

per cent (190.86 h) did not play any role in decreasing LT_{50} in comparison with virus alone (175.25 h). Reduction in LT_{50} has been attributed to an addition of adjuvants to the virus (Dhandapani *et al.*, 1993).

Comparing the economics of FS, jaggery and sucrose were observed to be the most economical which cost only Rs. 25 and Rs. 32.50 per hectare, respectively. On the other hand egg white (Rs. 937.50/ha) was costly and chickpea flour and cakes were the moderately economical feeding stimulants.

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REFERENCES

- Dhandapani, N., Jayaraj, S. and Rabindra, R. J. 1993. Effect of sunlight on the efficacy of nuclear polyhedrosis virus against *Helicoverpa armigera* on cotton. *Indian Journal of Plant Protection*, **21**(2): 152-154.
- Finney, D. J. 1952. *Probit Analysis*. Cambridge University, Cambridge, 318 pp.
- Narayanan, K. 1979. Studies on NPV of gram pod borer caterpillar, *Helicoverpa armigera* (Hbn.) (Noctuidae, Lepidoptera), pp. 76-86. In: S. Jayaraj (Ed.). *Microbial Control and Pest Management*. TNAU, Coimbatore, India.
- Rabindra, R. J. and Jayaraj, S. 1988. Evaluation of certain adjuvants for nuclear polyhedrosis virus (NPV) of *Helicoverpa armigera* (Hbn.) on chickpea. *Indian Journal of Experimental Biology*, **26**: 60-62.
- Ramakrishnan, N. and Chaudhari, S. 1974. Effect of nuclear polyhedrosis disease on consumption, digestion and utilisation of food by the tobacco caterpillar, *Spodoptera litura* (Fabr.) (Noctuidae, Lepidoptera). *Indian Journal of Entomology*, **36**: 93-97.
- Satpute, U. S. 1992. Management of *Heliothis armigera* (Hübner) on chickpea, *Cicer arietinum* L. through NPV. Ph.D. thesis, PDKV, Akola, Maharashtra, India.