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Field efficacy of nuclear polyhedrosis virus against the red hairy caterpillar, *Amsacta albistriga* (Walker) (Lepidoptera: Arctiidae) on groundnut in Karnataka

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ABSTRACT: Field experiments at Pavagada, Karnataka during August 2003, indicated that *Amsacta albistriga* NPV @ 1.5 x 10^{12} POB/ ha was as effective as chlorpyriphos @ 20g a. i. / ha against red hairy caterpillar. For an environmentally friendly approach *Aa*NPV can be used as an effective component of IPM packages for the control of red hairy caterpillars in the endemic areas of Karnataka.

KEY WORDS: *Amsacta albistriga*, nuclear polyhedrosis virus, groundnut ecosystem

INTRODUCTION

Amsacta is economically the most important genus of Arctiinae in India. It includes the red hairy caterpillar *Amsacta albistriga* (Walker), *A. moorei* (Butler) and *A. lactinea* (Cramer). *A. albistriga* is a serious pest in South India whereas *A. moorei* is serious in North India.

In Karnataka the red hairy caterpillar (RHC) is a seasonal, endemic and polyphagous pest occurring in the districts of Bagalkote, Belgaum, Bellary, Chikmagalur, Chitradurga, Davanegere, Gadag, Gulbarga, Kolar, Koppal, Raichur, Mandya and Tumkur. It causes extensive damage to castor, cotton, cowpea, groundnut, horsegram, sorghum, and several other cultivated and uncultivated plants. This pest has a single generation in all the places mentioned above except in Pavagada where it has two generations.

The use of conventional pesticides has failed to check the rapid build up of this pest. The Department of Agriculture has spent over Rs.5.7 million between the years 2000-2004 for activities such as picking of larvae, trapping moths, raising trap crops, etc. (personal communication, Department of Agriculture, Pavagada). But all these methods have not been successful in controlling this pest. Use of biocontrol agents such as baculoviruses, fungi and bacteria could be a viable alternative. Jacob and Subramaniam (1972) for the first time isolated a nuclear polyhedrosis virus from the larvae of *A. albistriga*. Since then both

laboratory and field studies have been carried out in Tamil Nadu to test the efficacy of the virus against the RHC (Jayaraj *et al.*, 1976; Chandramohan and Kumaraswami, 1979; Rabindra and Balasubramanian, 1980; Baskaran *et al.*, 2001). Keeping in view the efficacy of *Aa*NPV against *A.albistriga* as reported from Tamil Nadu, a field experiment was conducted to study the efficacy of NPV against the RHC in groundnut during August, 2003.

MATERIALS AND METHODS

The field trial with five treatments (Table 1) replicated four times was taken up in a farmer's field of groundnut (TMV 2 variety) in Kottagudda village of Pavagada taluk, Tumkur district during August, 2003 where the occurrence of RHC was noticed. An experiment was laid out in a randomized block design with a plot size of 4 x 2.5 meters (with a gutter of one meter between blocks). The larvae were in 3-4 instar. Thick polythene sheets were erected all around each plot to prevent the larvae from migrating to other plots. The treatments were applied only once with a knapsack sprayer using 500 litres of water/ha.

Fifth and sixth instar larvae of the RHC were collected in large numbers and fed with castor leaves inoculated with *Aa*NPV @ 5 x 10^8 POB/ml on the first day. From the next day onwards the larvae were fed castor leaves without *Aa*NPV. The dead larvae (6-8 days after inoculation) were collected in plastic containers. These larvae were macerated and semipurified by differential centrifugation. The strength of the polyhedral occlusion bodies was estimated using a Neubauer haemocytometer. The stock culture contained 5x10^{10} POB/ml. This was further diluted to three different concentrations of 1x10^7, 2x10^6 and 4x10^5 POB/ml. Crude sugar @ 1 per cent and Triton X 100 @ 0.1 per cent were added to the spray fluid. Chlorpyriphos @ 20g a. i./ ha was included as a chemical insecticide check. The control plots were sprayed with just water containing 1 per cent crude sugar and 0.1 per cent Triton-X 100. The treatments were given in the evening hours after 1800 h. Pre and post treatment counts of larvae of *A. albistriga* on 20 randomly selected plants were taken immediately before spraying and 5, 7 and 10 days after treatment (DAT). The data were subjected to statistical analysis of variance after applying suitable transformations and means were compared with Duncan's multiple range tests.

RESULTS AND DISCUSSION

Results of the field experiment clearly showed the efficacy of the NPV against the RHC on groundnut (Table 1).

Data on the larval population recorded five days after treatment showed significant reduction in all the NPV as well as chlorpyriphos treatments. The reduction in larval numbers over control was about 55 per cent in the virus treatments. Chlorpyriphos, however, recorded a significantly higher reduction of 70.2 per cent. On the seventh day, there was further reduction in larval numbers, the highest dose of NPV (1x10^7 POB/ml) recording a reduction of 65.2 per cent which was however on par with those in the lower doses. Chlorpyriphos continued to record a significantly higher reduction (71.9%) than the virus treatments. On the 10th day there was further reduction in larval numbers with the highest dose of NPV recording 94.0 per cent reduction, which was on par with chlropyriphos (97.6 %).

The field efficacy of the NPV against the RHC on groundnut has been established through experiments on farmers' fields in Tamil Nadu by Chandramohan and Kumaraswamy (1979) and Rabindra and Balasubramanian (1980).

In the present study, chlorpyriphos (preferred for use locally by the farmers) gave faster control of the pest than did the NPV. It should, however, be borne in mind that application of chemical insecticides can destroy the natural enemies of *A. albistriga* like *Telenomus manolus* Nixon (Sundaramurthy *et al.*, 1976), *Apanteles colemani* Viereck, *A. creatonoti* Viereck, *Palexorista solennis* (Walker) and *Exorista xanthaspis* Wiedemann (Gunathilagaraj and Babu, 1987) and other beneficial fauna in the groundnut ecosystem. The NPV would be an ecologically sound alternative and the use of

Table 1. Field efficacy of *Aa*NPV on red hairy caterpillar larvae

Treatment	Larvae*/ 20 plants days after treatment			
	Pretreatment	5	7	10
*Aa*NPV@ 1 x 10^7 POB/ml	28.50[a]	11.75[b](54.8)	7.75[b](65.2)	1.25[a](94.0)
*Aa*NPV@ 2 x 10^6 POB/ml	29.00[a]	11.75[b](54.8)	8.75[b](60.7)	3.25[b](84.3)
*Aa*NPV@ 4 x 10^5 POB/ml	28.50[a]	11.5[b](55.8)	10.25[b](53.9)	3.75[b](81.9)
Chlorpyriphos @ 20 g a.i./ha	29.50[a]	7.75[a](70.2)	6.25[a](71.9)	0.50[a](97.6)
Control	32.25[a]	26.00[c]	22.25[c]	20.75[c]

* Figures in parentheses represent per cent reduction over control.

** Means followed by the same letter are not significantly different (p=0.05) by DMRT.

more virulent strains of NPV (Rabindra, 2000) should give better control of the pest.

Application of the virus at the right concentration and time when the pest is in the early stages of first and second instars can give better control of the pest and crop damage. Since moths are attracted to light in huge numbers, light traps can be used soon after the first monsoon showers during the months of July-August to monitor adult emergence for timing of NPV sprays. Even if the crucial stage is missed, spraying the virus can still infect the older larvae and initiate epizootics in the subsequent generation and bring about long term control of the pest (Rabindra and Balasubramanian, 1980).

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