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Field efficacy of granulosis virus for the control of sugarcane early shoot borer, *Chilo infuscatellus* Snellen

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ABSTRACT: **Studies on the efficacy of granulosis virus against sugarcane early shoot borer, *Chilo infuscatellus* Snellen indicated that the treatments granulosis virus at 10^9 IBs/ml, granulosis virus at 10^9 IBs/ml + endosulfan 0.07 per cent, granulosis virus at 10^5 IBs/ml and granulosis virus at 10^{12} IBs/ml, respectively were found highly effective in checking the pest and recorded more number of mill able canes, cane yield and juice sucrose.**

KEY WORDS: *Chilo infuscatellus*, granulosis virus, sugarcane

INTRODUCTION

The Sugarcane early shoot borer, *Chilo infuscatellus* Snellen is a key pest in early stages of sugarcane growth, which causes economic losses to the cane grower and to the sugar industry. With a view to manage this serious pest, the present investigations have been under taken at the Department of Entomology, Regional Agricultural Research Station, Anakapalle, Andhra Pradesh. In recent years, application of granulosis virus is reported to bring down the pest population below the economic threshold (Easwaramoorthy and Santhalakshmi, 1991). Application of granulosis virus @ 10^7 IBs/ml twice on 35 and 50 days after planting was sufficient for effective control of the early shoot borer (Parameswaran *et al.*, 1991). No research has been done on this aspect in Andhra Pradesh. It is, therefore, necessary to generate information on efficacy of granulosis virus against the early shoot borer.

MATERIALS AND METHODS

Mass multiplication and purification of the granulosis virus was done as described by Easwaramoorthy and Santhalakshmi (1988). Granulosis virus culture was obtained from Sugarcane Breeding Institute, Coimbatore, Tamil Nadu. The culture was further mass multiplied in the Entomology Laboratory, Regional Agricultural Research Station, Anakapalle. The granulosis virus was mass multiplied in the laboratory by oral feeding of third and fourth instar shoot borer larvae. Diseased larvae collected in distilled water were allowed to decay at room temperature for two weeks. The cadavers were macerated and filtered through muslin cloth and the filtrate was purified by alternate cycles of low (500 rpm) and high (10,000 rpm) speed centrifugation. Finally, the virus was sedimented at 17,000 rpm for 30 minutes at 5^0 C. Inclusion bodies (IBs) were counted under phase contrast microscope

using Petroff Hauser and Hebber counting chamber (depth 0.02mm).

Two field experiments were conducted during 1994-95 and 1995-96 to study the efficacy of granulosis virus for the control of early shoot borer. The experiments were conducted with a variety Co T 8201 in randomised block design with seven treatments replicated thrice. The gross plot size was 10.0R X 10.0m X 0.8m (80m^2) with a net plot size of 8 rows X 10.0 X 0.8m (64 m^2). The treatments are common for the two years of study. The particulars of treatments are furnished below:

T_1 - GV @ 10^5 IBs/ml

T_2 - GV @ 10^9 IBs/ml

T_3 - GV @ 10^{12} IBs/ml

T_4 - Endosulfan at 0.07%

T_5 - Endosulfan at 0.035%

T_6 - GV @ 10^9 IBs/ml + endosulfan at 0.07%

T_7 - Untreated control

Granulosis virus and endosulfan were sprayed four times individually and in combination at 30, 50, 60 and 80 days after planting @ 450, 675, 900 and 1200 litres of spray fluid per hectare, respectively. Granulosis virus was applied with 0.1 per cent teepol in all the treatments and the spray was directed to the stem and leaf whorls. Data on incidence of early shoot borer, per cent dead hearts were counted on whole plot basis at 45, 60, 90 and 120 days after planting. Cumulative incidence of early shoot borer upto 120 days was also calculated. The canes were taken from each sub plot and weighed, the juice was extracted and its weight was recorded. The juice was subjected Horne's dry lead acetate method and estimated the Brix (total solids), pol (sucrose per cent) adopting the procedure suggested by Meade and Chen (1977). Data on total number of millable canes and cane yield were also recorded and subjected to statistical scrutiny following Randomised Block Design (Panse and Sukhatme, 1967). The data, wherever, expressed in percentages were transformed into Arc Sin $\sqrt{}$ percentages and then statistically analysed.

RESULTS AND DISCUSSION

Data on efficacy of granulosis virus (GV) for the control of early shoot borer during 1994-95 and 1995-96 are presented in Table 1. Cumulative incidence of early shoot borer calculated upto 120 days after planting revealed that the treatment GV @ 10^9 IBs/ml was the foremost effective treatment in checking the pest.

Treatments GV @ 10^9 IBs/ml + endosulfan (0.07%) spray and GV @ 10^5 IBs/ml were on par with one another and significantly superior over control. GV @ 10^{12} IBs/ml, endosulfan 0.07 per cent alone and endosulfan 0.035 per cent were significantly superior over control though inferior to the farmer treatments. The treatment GV @ 10^9 IBs/ml registered 68.99 per cent less incidence over control followed by GV @ 10^9 IBs/ml + endosulfan 0.07 per cent (61.14%). Similar trend was observed during 1995-96 season. This indicated that the granulosis virus adversely affected the build up of pest. These observations are in consonance with findings of Easwaramoorthy and Santhalakshmi (1988), who reported that application of granulosis virus at 10^9 and 10^7 IBs/ml reduced the shoot borer incidence significantly. Parameshwaran *et al.* (1992) observed that application of GV at 10^7 IBs/ml at 35 days after planting + endosulfan @ 350 g a.i.ha^{-1} at 50 days after planting reduced the borer infestation effectively. It is concluded from the above findings that the treatments of granulosis virus at 10^9 IBs/ml spray, granulosis virus at 10^9 IBs/ml + endosulfan (0.07%) granulosis virus at 10^5 IBs/ml spray and granulosis virus at 10^{12} IBs/ml were highly effective in checking the early shoot borer. These treatments can be incorporated into the integrated pest management of sugarcane early shoot borer.

Effect of treatments on juice sucrose, number of mill able canes and cane yield

The juice contents of the cane from different treatments were analysed for juice sucrose and data on juice sucrose, purity of juice, number of mill able canes and cane yield were presented in Table 2. The results indicate that GV @ 10^9 IBs/ml spray and GV @ 10^9 IBs/ml + Endosulfan (0.07%) were on

Table 1. Cumulative incidence of early shoot borer upto 120 days after planting

Sl no.	Treatement	Per cent incidence during		Per cent decrease over control during	
		1994-95	1995-96	1994-95	1995-96
1	Granulosis virus at 10^5 Ibs/ml	17.78 (24.93)	22.92 (28.59)	56.13	48.93
2	Granulosis virus at 10^9 IBs/ml	12.57 (20.76)	16.23 (23.71)	68.99	63.84
3	Granulosis virus at 10^{12} IBs/ml	20.10 (26.63)	26.64 (31.06)	50.41	40.64
4	Spraying endosulfan (0.07%)	24.40 (29.59)	36.43 (37.05)	39.79	18.83
5	Spraying endosulfan (0.035%)	30.01 (33.21)	37.79 (37.93)	25.96	15.79
6	Granulosis virus at 10^9 IBs/ml + Endosulfan (0.07%)	15.75 (23.33)	20.55 (26.94)	61.14	54.21
7	Untreated control	40.53 (39.54)	44.88 (42.06)		
	CD (P=0.05)	2.01**	4.06**		

** Significant at one per cent level
Figures in parentheses are arcsine percentages.

Table 2. Effect of granulosis virus on juice sucrose, purity and cane yield

Sl. no.	Treatment	Juice sucrose (%)		Purity (%)		Number of mill able canes/ ha		Cane yield (t/ha)	
		1994-95	1995-96	1994-95	1995-96	1994-95	1995-96	1994-95	1995-96
1	Granulosis virus at 10^5 IBs/ml	17.99	18.62	89.48 (71.08)	91.34 (72.90)	67136	66457	95.78	94.81
2	Granulosis virus at 10^9 IBs/ml	20.35	18.96	92.51 (74.12)	92.22 (73.81)	71719	69270	102.28	98.79
3	Granulosis virus at 10^{12} IBs/ml	18.08	18.19	89.90 (71.59)	91.51 (73.08)	66406	66562	94.43	94.62
4	Endosulfan (0.07%)	17.88	17.82	90.79 (72.36)	90.47 (72.17)	63489	62551	89.55	88.25
5	Endosulfan (0.035%)	17.36	17.35	89.73 (71.43)	87.98 (69.98)	62656	60312	88.42	85.75
6	Granulosis virus at 10^9 IBs/ml + Endosulfan (0.07%)	20.09	18.61	92.26 (73.89)	90.23 (71.79)	69636	66667	99.34	95.08
7	Untreated control	15.07	14.69	88.79 (70.63)	88.60 (70.44)	58645	57031	82.48	80.29
	CD (P=0.05%)	1.19**	2.17**	NS	NS				

* Significant at 5 per cent level
** Significant at 1 per cent level
NS - Non-significant
Figures in parentheses are angular transformed values.

par with one another and foremost superior in recording higher sucrose content of the juice i.e., 20.35 and 20.09 per cent, respectively during 1994-95 season. This might be due to their potential suppression of early shoot borer, resulting in improvement in the quality of juice and better sugar production. Purity of the juice was not significantly higher in any of the treatments in the two experiments. Therefore, it cannot be conclusively established that effective control of early shoot borer contributes for increase in purity of the juice. The above treatments were superior to control in recording higher number of mill able canes (69,270 and 66,667/ha) and cane yield (98.79 and 95.08 t/ha). Similar trend was observed during 1995-96 season. These results are in agreement with the findings of Patil *et al.* (1996) who reported that application of granulosis virus at 10^{10} IBs/ml has recorded more number of mill able canes and more cane yield.

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