J. Biol. Control, 2 (1), 26—28, 1988

Efficacy of Granulosis Virus in the Control of Shoot Borer, *Chilo infuscatellus* Snellen

S. EASWARAMOORTHY AND G. SANTHALAKSHMI
Sugarcane Breeding Institute, Coimbatore 641 007.

ABSTRACT

Field experiments were conducted during 1984—85 crop season at Vadapathimangalam, Thanjavur district, Tamil Nadu and 1985—86 crop season at Sameerwadi, Bijapur district, Karnataka to evaluate the efficacy of granulosis virus (GV) in the control of sugarcane shoot borer, *Chilo infuscatellus* Snell. in comparison with insecticides. At Vadapathimangalam, shoot borer incidence was significantly less in plots treated with sevidol. Application of GV at 10^9 and 10^7 inclusion bodies/ml and carbofuran at 1 and 2 kg a.i./ha also reduced shoot borer incidence significantly compared to control. At Sameerwadi, gamma HCH @ 1 kg a.i./ha alone and in combination with GV reduced shoot borer incidence significantly. GV applied at different doses also brought down shoot borer incidence significantly compared to control. Data collected at harvest showed that though all the treatments recorded higher number of millable canes (NMC), cane yield and commercial cane sugar/plot (CCS/plot) compared to untreated control, the differences, however, were not significant.

KEY WORDS: *Chilo infuscatellus*, control, granulosis virus.

The sugarcane shoot borer, *Chilo infuscatellus* Snell. is widely distributed in all sugarcane growing areas in India (Avasthy and Tiwari, 1986). The infestation reduces cane population and yield (Gupta, 1959) and sugar recovery (Patil and Hapase, 1981). Attempts were made to control the pest with bio-control agents like *Trichogramma* spp. (Sithanantham and Navarajan Paul, 1978) and *Sturmiopsis inferens*) Tns. (David and Easwaramoorthy, 1985) with some degree of success.

A granulosis virus (GV) was reported from *C. infuscatellus* (Easwaramoorthy and David, 1979) which is widely distributed in Tamil Nadu and Pondicherry (Easwaramoorthy and Jayaraj, 1987). The virus was highly pathogenic in laboratory studies (Easwaramoorthy, 1984) and preliminary field evaluation had given encouraging results (Easwaramoorthy and Jayaraj, unpubl.). Further studies were conducted to confirm the efficacy of the GV under Tamil Nadu and Karnataka conditions and the results are presented in this paper.

MATERIALS AND METHODS

The GV 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°C. Inclusion bodies (IB) were counted under a phase contrast microscope using Petroff Hauser and Helber counting chamber (depth 0.02 mm).

A field experiment was laid out with a shoot borer susceptible variety (Co 6304) at the Research Farms of M/s. Thiru Arooran Sugars Ltd., Vadapathimangalam, Thanjavur district, Tamil Nadu during 1984-85 and another with Co 419 at the Research Farms of the Karnataka Institute of Applied Agricultural Research, Sameerwadi, Bijapur district, Karnataka during 1985-86. The experiments were conducted in randomised block design with seven treatments and three replications. The plots consisted of 30-seven metre rows (210m^2) at Vadapathimangalam and 10-five metre rows (50 m^2) at Sameerwadi. At Vadapathimangalam, the efficacy of virus application was compared with soil application of carbofuran and whorl application of sevidol. Soil application of gamma HCH was not tried in this trial, as soil at Vadapathimangalam is alkaline with a pH greater than 8.5 and HCH is degraded

TABLE 1. Effectiveness of virus and insecticides in the control of shoot borer on CO. 6304 at Vadapathimangalam.

	Treatments	Mean % deadhearts*	Plot yield @ (kg)	CCS/plot @ (kg)
1.	Virus 10^9 IBs/ml	12.2b	889.7	106.0
2.	Virus 10^7 IBs/ml	13.1bc	1016.5	125.7
3.	Virus 10^7 IBs/ml Carbofuran 1 kg a.i./ha	12.3b	990.0	116.2
4.	Carbofuran 1 kg a.i./ha	11.8b	892.7	110.7
5.	Carbofuran 2 kg a.i./ha	14.7c	921.2	108.0
6.	Sevidol 1 kg a.i./ha	9.2a	895.8	111.7
7.	Control	21.5d	882.5	106.5

*Means followed by similar letters are not different statistically (P = 0.05) by L.S.D.
@ Differences between the means not significant.

quickly in such soils. Virus was applied four times at 35, 50, 65 and 80th day after planting. At Sameerwadi, virus applications were done on 40, 55, 70 and 85th day and soil application of gamma HCH was done on 40th day after planting. Virus was applied with 0.1 per cent teepol in all the treatments and the spray was directed to the stem and leaf whorls. Counts were made five times at fortnightly intervals from 35th/40th day by recording total number of shoots and deadhearts in each plot. Since, there was no significant variation between periods, the data over the periods were pooled and analysed. At harvest, data on cane yield and quality attributes were collected. The commercial cane sugar/plot (CCS/plot) was computed using standard procedures.

Data on per cent infestation of the borer were transformed to their corresponding angles (arc sine $\sqrt{\text{percentage}}$) and all data were compared using 'F' test of significance.

RESULTS AND DISCUSSION

In both the locations, virus-applied as well as insecticide-applied plots registered significantly less shoot borer infestation compared to control (Table 1 and 2).

At Vadapathimangalam, per cent deadhearts observed was significantly less in Sevidol-applied plots. Virus @ 10^9 IBs/ml, virus @ 10^7 IBs/ml alone and in combination with carbofuran and carbofuran 1 and 2 kg a.i./ha treatments also showed significantly less shoot borer incidence compared to control. There

TABLE 2. Effectiveness of virus and gamma HCH in the Control of shoot borer on CO. 419 at Sameerwadi.

	Treatments	Mean % deadhearts*	plot yield @ (kg)	CCS/plot @ (kg)
1)	Virus 10^9 IBs/ml	18.1bc	475.1	63.6
2)	Virus 10^8 IBs/ml	22.6c	418.2	53.3
3)	Virus 10^7 IBs/ml	15.0b	465.9	63.4
4)	Virus 10^7 IBs/ml activated carbon	18.5bc	468.8	62.3
5)	Virus 10^7 IBs/ml Gamma HCH 1 kg a.i./ha	10.6a	484.0	64.0
6)	Gamma HCH 1 kg a.i./ha	6.4a	477.5	64.2
7)	Control	26.1d	364.4	50.2

Means followed by the same letters are not different significantly (P = 0.05) by L.S.D.
@ Differences between the means not significant.

was no significant variation in the number of deadhearts observed in the different doses of virus and carbofuran. Foliar application of virus @ 10^7 IBs/ml in combination with soil application of carbofuran @ 1 kg a.i./ha did not show any better control than the individual treatments of virus and carbofuran (Table 1).

At Sameerwadi, control plots recorded a mean per cent incidence of 26.1 (Table 2). Gamma HCH 1 kg a.i./ha alone and in combination with virus application reduced the pest incidence significantly compared to other treatments (6.4—10.6%). Virus applied at different doses also brought down shoot borer incidence significantly compared to control. Addition of activated carbon to the virus did not show any significant improvement in the efficacy of the virus. Earlier, Easwaramoorthy and Jayaraj (unpubl.) also reported the effectiveness of the virus under field conditions. It is evident from both the studies that there was no significant variation in the incidence of the pest, between 10^7 to 10^9 IBs/ml.

The differences in the cane yield and CCS/plot in the different treatments were not significant (Table 1 and 2). This may be due to a rather low level of shoot borer incidence. In control plot itself the infestation level was 21.5% to 26.1% only. Studies conducted at Anakapalle showed that when the incidence of deadhearts did not exceed 22 per cent, the sugarcane varieties were able to overcome the borer infestation, resulting in no apparent reduction in number of shoots or weight of clumps at harvest, provided the mother shoots were healthy (Subba Rao, 1972). Easwaramoorthy and Jayaraj (unpubl.) reported that application of G V and carbofuran significantly increased the NMC, cane yield and CCS/plot and in this experiment, the borer incidence in control plots was 41.6 per cent, while it varied from 25.3 to 31.3 per cent in virus and carbofuran treated plots.

ACKNOWLEDGEMENT

The authors are thankful to Dr. K. Mohan Naidu, Director and Dr. H. David, Head, Division of Entomology, Sugarcane Breeding Institute, Coimbatore and staff and management of Thiru Arooran Sugars, Vadapathimangalam and Karnataka Institute of Applied Agricultural Research, Sameerwadi for facilities provided.

REFERENCES

Avasthy, P.N. and Tiwari, N.K. 1986. The shoot borer, *Chilo infuscatellus* Snellen. In "*Sugarcane Entomology in India*" (David, H., Easwaramoorthy, S. and Jayanthi, R. eds.),Sugarcane Breeding Institute, Coimbatore, p 69-92.

David, H. and Easwaramoorthy, S. 1985. Recent advances in the biological control of sugarcane pests. *Proc. Natl. Sem. Entomoph. Ins.*, Calicut, pp 200-213.

Easwaramoorthy, S. 1984. *Studies on the granulosis viruses of sugarcane shoot borer, Chilo infuscatellus and internode borer, C. sacchariphagus indicus (Kapur).* Ph.D. thesis, Tamil Nadu Agrl. University, Coimbatore

Easwaramoorthy, S. and David, H. 1979. A granulosis virus of sugarcane shoot borer, *Chillo infuscatellus* Snell. (Lepidoptera : Crambidae). *Curr. Sci.*, **48**, 685-686.

Easwaramoorthy, S. and Jayaraj, S. 1987. Survey for the distribution of granulosis virus infection in sugarcane borers, *Chio infuscatellus* Snellen and *C. sacchariphagus indicus* (Kapur). *Trop. Pest Mgment.*, **33**, 200-201.

Gupta, B.D. 1959. Insect pests of sugarcane in India. V. The shoot borer, *Chilotraea infuscatellus* Snell. *Indian Sug.*, **9**, 445-465.

Patil, A.S. and Hapase, D.G. 1981. Research on sugarcane borers in Maharashtra. *Proc. Natl. Sym. Stalk borer*, Karnal, 165-175.

Sithanantham, S. and Navarajan Paul, A.V. 1978. Bio-control of sugarcane borers in India with *Trichogramma* retrospect and prospect. *Pestol.*, **2**, 11-20.

Subba Rao, C. 1972. *Studies on the influence of infestation by early shoot borer, Chilotraea infuscatellus Snell., on subsequent shoot production, their mortality, survival and yield of sugarcane.* M.Sc. thesis Andhra University, Waltair.