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SHORT COMMUNICATION

Effects of Some Selected Organocarbamate and Organophosphate Insecticides in Controlling White Grubs and Yield of Sugarcane

M. N. A. Siddiquee, M. Begum, M. Abdullah and T. Ahmed
Bangladesh Sugarcane Research Institute,
Ishurdi, Pabna, Bangladesh

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Experiment was conducted with different Organocarbamate namely, carbodril 3G, kildan 3G, carbomot 5G, borer 5G, agrodan 5G, ecofuran 5G, foster 5G, crown 20SC and organophosphate namely, vitacan 15G, krisban 50%WP and guilquin 25EC to evaluate their effectiveness against white grubs and their effects on the yield of sugarcane. The experiment was carried out at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon during the cropping season 2006-2007. It was found that all the test insecticides applied in March and May significantly reduced range from 76.76 - 87.88% and 82.35 -97.09% compared to check plots. Increased cane yield over control was recorded among the treatments ranging from 26.43-67.14 percent.

White grubs are one of the major soil pests of sugarcane in Bangladesh (Anon., 1979). Among soil pests white grubs play considerable role in damaging canes. Seventeen species of white grubs have so far been recorded in Bangladesh causing damage every year (Anon., 1981; 1984). Among these, *Brahmina* sp., *Holotrichia* sp., *Anomala* sp. and *Adoretus versutus* are most damaging. Different species of white grubs attack sugarcane at the same time (February to May) and cause severe damage resulting in loss of yield. Due to white grubs 20-100% infestation occurs in the field and loss due to white grubs was reported to be 23.07 to 38.17 t ha^{-1} (Miah *et al.*, 1983). Patil and Hapase (1981) reported yield loss might be as high as 80-100% by white grubs. Its attack is mainly confined to the non- flooded sandy/ sandy loam soils of northern cane growing areas particularly of Panchagar, Thakurgaon and Setabganj Sugar Mills Ltd. (AEZ-1), Rangpur Sugar Mills (AEZ-3) and Rajshahi sugar Mills Ltd. (AEZ-11). The period of attack by white grubs from the month of March to September but severe in March to April targeting sugarcane roots in the soil. Miah *et al.* (1986) reported that among different chemicals Furadan (Carbofuran) and Ekalux (Quinalfos) at 2.0 kg ai ha^{-1} effectively controlled white grubs. Mostafa *et al.* (1986) reported carbofuran (2, 3-dihydro-2, 2-dimethyl benzofuran-7yl methylcarbamate) is a broad-spectrum systemic insecticide. Alam *et al.* (2001) reported that these chemicals are less toxic and less hazardous to the environment compared to chlorinated hydrocarbons. The carbamate insecticides have both properties of killing insects by contact as well as systemic actions. The short life of carbofuran in soil is supported by Chowdhury *et al.* (2002) who reported that carbofuran after 30 days of application left no residues in soil indicating complete degradation of the pesticides.

Therefore, the present study was taken to evaluate the control efficacy of some new organocarbamate and organophosphate insecticides in reducing white grubs' population and their effects on the yield of sugarcane.

The experiment was set up at Mohan farm under Thakurgaon Sugar Mills Ltd., Thakurgaon, Bangladesh during the cropping season 2006-2007. The experiment was laid out in Randomized complete block design (RCBD) with three replications. There were 12 treatments including one control. The treatment furadan 5G (March + April) was considered as standard. The plot size was 6m x 6m. Block to block distance was 2m and plot to plot distance was 1m. The variety lsd 32 was used as planting material and planting was done through conventional sett placement (end to end) in the trenches on November 28, 2006. The test insecticides were granular, wettable powder (WP) and emulsifiable concentrate (EC) in formulation with the dosages @ 2.00 kg, 2.25 kg and 2.50 Litre ai ha^{-1}. The application of insecticides was done twice, one in March and the other in April. Before irrigation, soil ridges surrounding individual plots were made to protect the flow of water from one plot to another. The fertilizer application, weeding, mulching and earthing up were done as normal cultural practices. For application of insecticides furrows were made on both sides of cane rows and then insecticides (granular) were applied at the base of the plants and in the space between furrows and mixed with soils followed by irrigation. Data were taken from 5 randomly selected clumps per plot. An area of 60 cm x 60 cm was dug up to a depth of 40 cm with spade. Population of larvae was counted in roots and in soils of these pits. Data were taken twice, one in April and the other in May 2007. The yield of canes per plot was recorded at harvest in December 2007.

Data collected in April indicated statistically significant reduction of white grubs population by all the test chemicals. In that time white grubs population ranged from 4.00 to 7.67 per 5 clumps among the treated plots with insecticides whereas control plot showed a population of 33.00. The control efficacy ranged from 76.76-87.88% in which the treatments kildan 3G, agrodhan 5G, foster 5G and crown 20SC @ 2.0 kg ai $ha^{-1}$and krisban 50% WP @ 2.25 L. ai ha^{-1} applied in March and April failed to reach the desired level (80%) of efficacy. After two applications of insecticides (March and April), data collected in May showed that white grubs population varied from 0.33 to 2.67 per 5 clumps among the insecticide treated plots whereas in control plot the population was 11.33. No significant difference was observed among the test insecticides except crown 20SC @ 2.0 kg ai ha^{-1} in respect of white grubs population but all test insecticides significantly differed from control. Most insecticides treated plots showed above 80% efficacy over control which ranged from 82.35-97.09% except crown 20SC which showed 76.43% efficacy. The efficacy of pooled data indicated that all the test insecticides applied in March and May gave over 80% control except crown 20SC (Table-1). The control efficacy (pooled data) ranged from 77.11-88.96%. Miah *et al.* (1986) reported the effects of different chemicals on white grubs, among those chemicals furadan (carbofuran) and ekalux (quinalfos) both at 2.0 kg ai ha^{-1} significantly controlled the pests of which only furadan was recommended for white grubs because it showed 190.89% yield increase over control while ekalux showed 74.83%. Biswas *et al.* (1994) also suggested application of furadan 5G and curaterr 5G (commonly carbofuran) against white grubs @ 2.0 kg ai ha^{-1}. Alam *et al.* (2008) reported that chloropyrifos group vitacon 15G, vitaban 48EC and ranger 20EC@ 2.25 kg ai ha^{-1} gave 92.01%, 91.64% and 88.94% efficacy respectively in controlling soil pest like termite which have similarities with the present study. All these reports support the efficacy of test insecticides in controlling white grubs of sugarcane found in this study.

Table 1. Effectiveness of different insecticides in suppressing White grubs at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2006-2007.

Treatments (Chemicals)	Mean White grubs population (5 clumps plot^{-1})				
	April data	% Efficacy over control	May data	% Efficacy over control	Pooled % efficacy
T_1 - Carbodril 3G @ 2.0 kg ai ha^{-1} (March + April)	6.33b	80.82	2.00bc	82.35	81.59
T_2 - Kildan 3G @ 2.0 kg ai ha^{-1} (March + April)	6.67b	79.79	2.00bc	82.35	81.07
T_3 - Carbomot 5G @ 2.0 kg ai ha^{-1} (March + April)	6.33b	80.82	1.33bc	88.26	84.54
T_4 - Borer 5G @ 2.0 kg ai ha^{-1} (March + April)	6.00b	81.82	1.33bc	88.26	85.04
T_5 - Agrodan 5G @ 2.0 kg ai ha^{-1} (March + April)	7.67b	76.76	1.33bc	88.26	82.51
T_6 - Ecofuran 5G @ 2.0 kg ai ha^{-1} (March + April)	6.33b	80.82	1.67bc	85.26	83.04
T_7 - Foster 5G @ 2.0 kg ai ha^{-1} (March + April)	7.00b	78.79	1.00bc	91.17	84.98
T_8 - Crown 20SC @ 2.0 kg ai ha^{-1} (March + April)	7.33b	77.79	2.67b	76.43	77.11
T_9- Vitacan 15G @ 2.0 kg ai ha^{-1} (March + April)	6.33b	80.82	0.33c	97.09	88.96
T_{10} - Krisban 50%WP @ 2.25 kg ai ha^{-1} (March + April)	7.00b	78.79	1.67bc	85.26	82.03
T_{11}-Guilquin 25EC @2.5L ai ha^{-1} (March + April)	6.00b	81.82	1.67bc	85.26	83.54
T_{12}-Carbofuran 5G @2.0 kg ai ha^{-1} (March + April) (standard)	4.00b	87.88	1.67bc	88.26	88.07
T_0 - Control (untreated)	33.00a	(-)	11.33a	(-)	
LSD (5%)	5.596		1.980		

*Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

Table 2. Effectiveness of different insecticides on the yield of sugarcane at Mohan Farm, Thakurgaon Sugar Mills Ltd, Thakurgaon, 2006-2007.

Treatments (Chemicals)	Yield (t ha^{-1})	Yield increase % over control
T_1 - Carbodril 3G @ 2.0 kg ai ha^{-1} (March + April)	55.09	67.14
T_2 - Kildan 3G @ 2.0 kg ai ha^{-1} (March + April)	50.28	52.55
T_3 - Carbomot 5G @ 2.0 kg ai ha^{-1} (March + April)	45.92	39.32
T_4 - Borer 5G @ 2.0 kg ai ha^{-1} (March + April)	47.03	42.69
T_5 - Agrodan 5G @ 2.0 kg ai ha^{-1} (March + April)	49.17	49.18
T_6 - Ecofuran 5G @ 2.0 kg ai ha^{-1} (March + April)	41.67	26.43
T_7 - Foster 5G @ 2.0 kg ai ha^{-1} (March + April)	49.54	50.30
T_8 - Crown 20SC @ 2.0 kg ai ha^{-1} (March + April)	46.95	42.45
T_9 - Vitacan 15G @ 2.0 kg ai ha^{-1} (March + April)	43.98	33.43
T_{10}- Krisban 50%WP@2.25 kg ai ha^{-1}(March + April)	48.89	48.33
T_{11}- Guilquin 25EC @ 2.5 Litre ai ha^{-1}(March + April)	43.80	32.89
T_{12}- Carbofuran 5G @ 2.0 kg ai ha^{-1} (March + April) (standard)	46.30	40.47
T_0 - Control (untreated)	32.96	(-)
LSD (5%)	NS	

NS = Not significant

Results presented in Table-2 showed that insecticide- treated plots inflicted increased yield of cane over the untreated plots though the yield of cane was statistically similar. The yield increase over control in different treatments varied from 26.43-67.14%. The yield of cane ranged from 41.67 to 55.09 t ha^{-1} among insecticide treated plots whereas the control plots (untreated) showed 32.96 t ha^{-1} only. Carbodril 3G had the highest yield of 55.09 t ha^{-1} showing 67.14% increased yield followed by kildan 3G which gave 50.28 t ha^{-1} showing 52.55% increased yield over control and both insecticides (carbotdril 3G and kildan 3G) were superior to all other insecticides in respect of cane yield. Ecofuran 5G had the lowest yield among insecticide treated plots which produced 41.67 t ha^{-1}. The result of the present findings has similarity with work of Miah *et al.* (1986) who reported 190.89% yield increase due to effective control of white grubs and other reasons with furadan 3G (carbofuran). Yield increase in furadan (carbofuran) treatments might be due to profuse root development through increased mitotic index that enhanced nutrient uptake resulting increased cane yield (Miah and Akhter, 1985). An effectiveness or 80% (pest reduction or infestation) in the requirement of as the pesticide technical advisory committee (PTAC, 1980), the government body for approved of an insecticide in Bangladesh. The study reveled that application of chloropyrifos group- vitacan 15G @ 2.0 kg ai ha^{-1}, krisban 50%WP @ 2.25 kg ai ha^{-1} and guilquin 25EC @ 2.50 L. ai ha^{-1}; organocarbamate group - carbodril 3G, kildan 3G, carbomot 5G, borer 5G, agrodan 5G, ecofuran 5G and foster 5G @ 2.0 kg ai ha^{-1} in March and April effectively controlled white grubs and might be recommended for the control of white grubs.

REFERENCES

Alam, M.A.; Siddiquee, M.N.A.; Begum, M.; Abdullah, M. and Hoque, M.A. 2008. Efficacy of some selected insecticides in controlling sugarcane termites. *Bangladesh J. Sugarcane*, **30**: 45-50.

Alam, M.A; Abdullah, M.; Begum,M. and Rashid, M.A. 2001. Efficacy of some new insecticides in controlling sugarcane termites. *Bangladesh J. Sugarcane,* **23**: 26-29.

Anonymous, 1979, Annual report (Special issue), 1973-78. Sugarcane Research and Training Institute, Ishurdi, Pabna, Bangladesh. Annual Report (Special issue), 1973-78. pp.143.

Anonymous, 1981. SRTI Annual report. 1981. Sugarcane Research and Training Institute, Ishurdi, Pabna, Bangladesh. Annual report, 1981. pp.67-79.

Anonymous, 1984. SRTI Annual report. 1984. Sugarcane Research and Training Institute, Ishurdi, Pabna, Bangladesh. Annual report, 1984. pp.79-94.

Biswas, M.M.; Alam, M .A.; Kundu, M.; Abdullah, M. and Mannan, M. 1994. Use of granular insecticides in controlling sugarcane rootstock borer, *Emmalocera depressella* Swinhoe. *Bangladesh J. Sugarcane*, **16**: 95-99.

Choudhury, N.; Malek, M. A.; Ullah, S.M. and Rahman, M. 2002. Fate of [^{14}C] Carbofuran Pesticides studied in a sandy loam soil in laboratory conditions. *J Asiatic Soc. Bangladesh, Sci.*, **28** (1): 19-26.

Miah, M.A.H. and Akhter, S. 1985. Effect of Carbofuran on mitotic index of sugarcane roots. *Indian J Agric. Sci.*, **55**: 55-56.

Miah, M.A.H.; Biswas M.M. and Mannan M.A. 1986. Effect of some insecticides on white grub control and yield of Sugarcane.*Tropical Pest Management*, **32**: 338-340.

Miah, M.A.H.; Khuda, A.K.M.Q.E; Alam, M.A; Biswas, M.M. and Shahjahan, M.1983. Chemical control of white grubs. *Bangladesh J.Sugarcane*, **5**: 1-7.

Mostafa, I. J.; Zyed, M.A.D. and Farghly, M. 1986. Bioavailability to rats of Methomyl and Carbofuran bound residues in sweet potatoes. *Proceerdings of the Final Research Co-ordination Meeting on Pesticides residues in soils, Plants and Food,* Gainesvile, Florida, 25-29March, 1985.IAEA, Vienna. pp. 95-102.

Patil, A. S. and Hapase, D. G. 1981. Research on Sugarcane borers in Maharashtra, Proc. natn. symp. stalk borer, Karnal. pp. 165 - 175.

PTAC-1980.Standards for Selection for Pesticides for Registration in Bangladesh, PTAC, Ministry of Agriculture, Bangladesh, BGP-80/81-5151B-100, p 2.