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Comparative Efficacy of Carbofuran and Pressmud in Controlling Nematodes of Sugarcane

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ABSTRACT

An attempt was made to compare the efficacy of three nematicides and pressmud amendment in controlling the nematode pests of sugarcane. Before planting, furrow soil was treated with three formulated products of carbofuran namely Furadan 5G, Rugby 10G, Alphafuran 5G at 2kg a.i./ha and Pressmud as an organic amendment at 20 ton/ha. All nematicides and the pressmud caused significant decrease in nematode populations and increase in cane yield as compared to control. They gave 71.67, 64.37, 57.08 and 54.07% reduction in nematode populations, and 40.51, 34.34, 29.67, 28.70% increases in cane yield respectively. The efficacy of all treatments was not statistically different. However, Furadan 5G was found to be the best options for its better performance among the treatments, as it showed statistically similar result compared to the chemical nematicides.

Key words: Nematicides, organic amendment, nematodes, sugarcane

INTRODUCTION

Control of plant parasitic nematodes of sugarcane is important because they not only directly injure the root systems but also they are associated with many fungal disorders of sugarcane roots (Nath *et al.*, 1976). At least 50 species of nematodes under 30 genera are associated with sugarcane roots in different sugarcane growing countries of the world (Winchester, 1969). Nematodes affect sugarcane growth in various ways. Khan (1962) found that *Pratylenchus zeae* reduced sugarcane germination and caused pathological symptoms in the roots. *Hoplolaimus indicus* causes erratic stand and stunting in sugarcane seedlings, associated with poorly developed and rotted roots (Nath *et al.*, 1975). The nematode pest cause considerable reduction in fresh and dry weight of shoots and roots, stalk length, and cane yield (Rao and Swarup, 1975). Williams (1969) reported that root-knot nematodes *Meloidogyne* spp. are very common in sugarcane fields causing root damage. Singh (I960) indicated that nematodes in the root zones of sugarcane plants might help in the penetration of inoculums of wilt. The low yield of sugarcane in Bangladesh is also attributed to poor growth of cane resulting from shallow, reduced, thickened and distorted root system which is caused by the parasitic nematodes to a large extent (Iqbal *et. al.*, 2005). Association of parasitic nematodes with sugarcane in Bangladesh was reported by Timm and Ameen (1960) and Mc Aleese (1982). According to Mian and Tsuno (1988) at least 8 genera viz. *Hoplolaimus, Criconemoides, Helicolylenchus, Zygotylenchus, Hemicycliophora, Meloidogyne, Tylenchus* and *Xiphinema* are associated with sugarcane

in Bangladesh. They identified *Hoplolaimus indicus* as the most predominant nematode species in sugarcane fields. Williams (1969) reported that root-knot nematodes *Meloidogyne* spp. are very common in sugarcane fields.

Since nematodes cause physiological starvation, severe stunting and eventual yield decline, it is necessary to develop control methods to minimize loss due to nematode attack on sugarcane. Nematicides are widely used to control nematode pests of sugarcane. Among the recommended nematicides different formulations of Carbofuran are used in many countries. It was reported that Furadan 3G, a formulated product of Carbofuran controlled white grubs and nematodes of sugarcane effectively including better root development with nutrient uptake (Miah *et al.*, 1983; Miah and Akhter, 1985; Biswas *et al.*, 1986; Miah *et al.*, 1986).

Although nematicides are widely used in controlling nemic pests of sugarcane but it is desirable to find out alternative means to reduce the use of chemicals for eco-friendly and sustainable agricultural practice. There are reports on the use of organic amendment to soil against nematode pests of sugarcane and other crops (Recuenco, 1980). Pressmud is a by-product of sugar mills found to be an effective soil amending material to control nematodes and to increase plant growth (Jonathan *et. al.*, 1991). Rosenfeld (1955) reported that pressmud reduced nemic diseases of sugarcane through its effect on the increase of root area, surface, and improvement of soil texture, correction of pH and manipulation of temperature. The present piece of work was conducted to compare the efficacy of three nematicides and pressmud amendment in controlling the nematode pests of sugarcane.

MATERIALS AND METHODS

Three fungicides namely Furadan 5G (carbofuran), Rugby 10G (carbofuran) and Alphaluran 5G (carbofuran), and one organic material Pressmud were tested in the experiment. The nematicides were used at the rate of 2kg a.i./ha. Pressmud was applied at 20 tons per hectare. Half of all the nematicides and full doses of pressmud were applied in the furrow before planting. The rest half of the nematicide was applied after 3-4 months of planting.

The experiment was conducted during three consecutive cropping seasons of 1999-2000, 2000-2001 and 2001-2002 at Regional Sugarcane Research Station farm, Thakurgaon. The site had a long history of nematode infestation in sugarcane fields. The experiment was laid out in randomized complete block design (RCBD) with three replications. Unit plot size was 5m x 8m. The sugarcane variety Isd 31 was used as planting material. Standard agronomic practices were followed to grow sugarcane. Intercultural operations were done as and when necessary. Nematode population in soils of experimental plots was determined 20 days after planting and at harvest. To extract nematodes, soil samples containing fragments of roots were collected. Modified Whitehead's tray method of nematode extraction was followed (Whitehead and Hemming, 1965). Yield of millable cane was recorded at harvest. The pooled data of three consecutive years were analyzed statistically and means were compared using DMRT test.

RESULTS AND DISCUSSION

Pre-plant soil treatments with Furadan 5G, Rugby 10G and Alphafuran 5G at the rate of 2kg/ha and pressmud at 20 t/ha caused remarkable reduction in nematode populations in every year. Average nematode population of three consecutive years showed that the reduction was significant as compared to control. The efficacy of all four treatments to reduce nematode population was statistically similar. However, the highest reduction of 71.67% was achieved with Furadan 5G, which was followed by Rugby 10G and Alphafuran 5G. The lowest reduction of 54.07% was obtained with pressmud (Table 1).

Table 1. Effects of nematicides and organic amendment in controlling nematode in sugarcane in three consecutive years

Nematicide and organic amendment with dose per ha.	No. of nematode per kg soil and root			Mean*	Reduction over control (%)
	1999-2000	2000-2001	2001-2002		
Control	290	280	130	233 a	-
Furadan 5G @ 2 kg a.i.	80	70	50	66 b	71.67
Rugby 10G@ 2kg a.i.	100	70	80	83 b	64.37
Alphafuran 5G @ 2 kg a.i.	70	170	130	123 b	57.08
Pressmud @ 20 ton	110	110	160	126 b	54.07

*Figures having a common letter do not differ significantly (P=0.05).

All of the treatments gave significantly higher yield of millable cane as compared to control. The highest yield was obtained with Furadan 5G, which was followed by Rugby 10G, Alphafuran 5G and pressmud. They gave 40.51, 34.34, 23.67 and 28.70% increase in cane yield over control. However, differences in cane yield under all treatments were not significant (Table 2).

Results of the present investigation clearly indicate that pre-plant application of nematicides or organic amendment like pressmud may decrease nematode populations in soil and increase yield of sugarcane. Suppression of nematodes with nematicidal treatments was also obtained by other investigators. Recuenco (1980) found that nematicides like Temik 15G, Furadan 3G, Basudin 10G, and organic amendments such as filter cake, sawdust, rice hull and bagasse considerably suppressed populations of *Pratylenchus, Tylenchorhynchus, Rotylenchus, Criconemoides, Helicotylenchus* and *Hoplolaimus* attacking sugarcane. Based on the findings of the present investigation it may be concluded that Furadan 5G (carbofuran), Rugby 10G (carbofuran) and Alphafuran 5G (carbofuran), and Pressmud are potential materials for pre-plant soil treatment against nematode pests of sugarcane.

Table 2. Effects of nematicides application and organic amendment on yield of sugarcane in three consecutive years

Nematicide and organic amendment with dose per ha.	Yield of cane (t/ha)			Mean*	Reduction over control (%)
	1999-2000	2000-2001	2001-2002		
Control	36.16	68.75	30.62	45.18 b	-
Furadan 5G @ 2 kg a.i.	66.37	88.33	38.41	64.37 a	40.51
Rugby 10G@ 2kg a.i.	58.58	83.75	42.33	61.55 a	34.34
Alphafuran 5G @ 2 kg a.i.	54.08	85.92	38.21	59.40 a	29.67
Pressmud @ 20 ton	53.58	82.83	40.48	58.96 a	28.70

*Figures having a common letter do not differ significantly (P=0.05).

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