

Efficacy of Sett Treating Fungicides in Sugarcane Production

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ABSTRACT

An experiment was conducted to study the efficacy of two fungicides in respect of germination, plant height, millable canes, weight of canes and fungal colonization in ungerminated setts. The use of Bavistin and Tecto extra showed significant differences on germination and ultimately on yield of sugarcane compared to control. Eleven different fungi representing nine genera were isolated from ungerminated setts. Treatment of setts by both fungicides reduced the fungal colonization on setts by *Acromonium* spp. *A. furcatum* and *A. terricola*, *Ceratocystis paradoxa*, *Drechslera* sp., *Fusarium moniliforme* and *Rhizopus nigricans* over control. The performance of Bavistin 1 g/litre of water reduced pathogenic fungal colonization in setts quantitatively. To ensure good germination and to overcome gappy stands in the field, use of Bavistin @ 1g/litre water for 30 minutes was found more effective and may be recommended for sett treatment.

INTRODUCTION

Low germination of sugarcane and death of young plants results gappy stands in Bangladesh, and reported 31% gap in a survey (Ali *et al.*, 1989). Though germination is influenced by several factors (Subbaro and Prasad, 1960) colonization and rotting of setts by microbes present in the soil, and pathogens present in setts itself (Singh *et al.*, 1984) are very important. A number of diseases are known to be associated with sugarcane setts (Benda and Ricaud, 1977), among them red rot, pineapple and wilt pathogen have found associated to cause poor germination and death of young tillers and plants resulting gappy stands in Bangladesh (Ahmed *et al.*, 1976, 1979, Agnihotri, 1983; Kabir *et al.*, 1988).

To keep setts free from pathogen and ultimately to overcome problem of poor germination, sett treatments with organomercurial compounds are widely adopted and practised (Lal, 1955) which improves germination, and enhances ultimate yield. In Bangladesh, mercurial fungicides Aretan-6 was widely used in mill zones but it has recently been band due to its hazardous effects. As such there is a great need to replace mercurial compounds by non-mercurial systemic fungicides. As the organomercurial compounds may create health hazards, other fungicides, particularly systemic compounds (Benlate, Bavistin and Thiophonate methyl) are being used for sett treatment to control pineapple disease and red rot elsewhere in the world (Steindl, 1970; Mathusamy, 1973; Wang and Jiang, 1973; Chand *et al.*, 1974; Lewin *et al.*, 1976; Reddy, 1977; Yang and Braud, 1977; Singh *et al.*, 1984). Two nonmercurial systemic sett treating chemicals were screened previously and choosen for this study to find out the effect of sett treatment on germination, settling vigour, millable canes, weight of canes and colonization on to setts by fungi in the soil.

MATERIALS AND METHODS

An experiment was conducted with two nonmercurial sett treating fungicides to protect setts and germinating buds. The fungicides were Bavistin (1 H-benzimidazol-2 YL carbamic acid methyl ester) and Tecto Extra (15% Thiabendazole $\pm$ 15% 8-hydroxyguanine). The treatments were as follows:

- A. Bavistin @ 0.75 gm/litre water
- B. Bavistin @ 1.00 gm/litre water
- C. Bavistin @ 1.50 gm/litre water
- D. Tecto Extra @ 5 ml/litre water
- E. Tecto Extra @ 7 ml/litre water
- F. Tecto Extra @ 9 ml/litre water
- G. Control-soaking of setts in water for 5 minutes.

The commercial sugarcane variety L. Jaba-C was used as model crop. The solution was prepared separately for each treatment, and setts were soaked in solution of Bavistin for 30 minutes and Tecto Extra for 5 minutes, and then planted in the field. Soaking of setts in water for 5 minutes was considered as control.

In this experiment, 2000 two-eyed setts were treated for each treatment, and planted in four replicated plots in the field, where individual plot size was 10m $\times$ 10m. In soil bed 200 single budded setts were treated against each fungicidal concentration and planted in four replicated micro plots in the seed bed at SRTI farm. Germination was recorded after 45 d of planting. In case of settling vigour (height) was recorded after 120 d of planting. Millable canes and weight of canes were recorded after 12 months of planting.

For studying colonization on to setts by fungi, 20 ungerminated setts for each treatment were dug out after 45 d of planting, and thoroughly washed with tap water. About 1 cm piece from cut ends of setts were removed by sharp knife, and then plated on PDA medium, and incubated at 28°C $\pm$ 1°C for 7 d. The fungi emerging out from pieces of setts were identified and their frequency was recorded.

RESULTS AND DISCUSSION

a) GERMINATION : Data on germination after 45 d of planting shows significant difference among treatments. Most of the treatments showed significantly higher germination over the control under both field and soil bed condition (Table 1). In Bangladesh, Aretan-6 an organomercurial compound was used for sett treatments to improve germination through controlling sett and soil-borne diseases (Lal, 1955). The results of this experiment in respect of germination show that both Bavistin and Tecto Extra, a systemic fungicides can be a good substitute of organomercuric compounds like Aretan-6 to improve germination under both field and soil bed condition. Similar observation was made by Singh *et al.*, (1984).

b) MORPHOLOGICAL CHARACTERS :

Treatment of setts with Bavistin and Tecto extra significantly increased plant height as measured after 120 d of planting at soil bed condition compared to control, while insignificant difference under field condition (Table 2). But there was no difference between two fungicides and their different doses. The highest number of millable

canes and average stalk weight were obtained in treatment where setts were soaked in Bavistin solution having concentration 1 g/litre of water before planting (Table 2). The treatments of setts by both fungicides at different doses had significant effect over control but no difference between two fungicides was recorded. Results shows that, sett treatment by Bavistin @ 1 g/litre of water was found to be superior in respect of plant height, stalk weight and millable canes.

Table 1. Effect of sett treating fungicides on germination.

Treatments	Germination (%) after 45 d of planting	
	Under field condition	At soil bed condition
A. Bavistin @ 0.75 g/litre water	51.2 a*	68.5 ab
B. Bavistin @ 1.0 g/litre water	49.4 a	74.5 a
C. Bavistin @ 1.5 g/litre water	52.4 a	65.0 bc
D. Tecto Extra @ 5 ml/litre water	52.0 a	59.5 bc
E. Tecto Extra @ 7 ml/litre water	50.5 a	71.0 ab
F. Tecto Extra @ 9 ml/litre water	51.6 a	71.5 ab
G. Control-Soaking in water	42.3 b	48.0 c

*Figure in column with same letters do not differ significantly at 5% level as per DNMR test.

Table 2. Effect of sett treatment on Plant height, millable canes and weight of canes.

Treatments	Plant height after 120 d of planting (cm)		Average millable canes in the field (No.)	Average weight of canes (kg)
	Soil bed Condition	Field Condition		
A. Bavistin @ 0.75 g/litre water	106.9	211.1	1091.5	709.7
B. Bavistin @ 1.0 g/litre water	108.4	211.5	1198.5	720.0
C. Bavistin @ 1.5 g/litre water	113.5	209.3	1186.7	710.0
D. Tecto Extra @ 5 ml/litre water	109.0	206.6	1148.5	617.7
E. Tecto Extra @ 7 ml/litre water	108.0	208.3	1054.5	669.2
F. Tecto Extra @ 9 ml/litre water	106.8	206.6	1055.2	672.2
G. Control (Soaking in water)	96.2	198.5	878.5	585.2

Table 3. Analysis of variance showing the effect of sett treatments on plant height, millable canes and yield.

Sources of Variations	d.f.	MS			
		Plant height at soil bed (cm)	Plant height in field (cm)	Average millable canes in field (No.)	Weight of canes (kg)
Replication	3	279.72	239.84	22585.76	9401.67*
Treatments	6	113.08*	73.17	47812.32**	10412.70*
Error	18	35.93	128.12	8080.18	2818.97
All treatments V_s					
Control	1	552.99**	347.73	204123.43**	32900.01**
Bavistin V_s					
Tecto Extra	1	11.48	—	31828.17	21780.38*
Among Bavistin	2	47.34	—	13773.08	287.17
Among Tecto Extra	2	9.65	—	11688.08	3754.33

*Indicates significant difference at 5% level as per DNMR test.

**Indicates significant difference at 1% level as per DNMR test.

Table 4. Fungi isolated from fungicidal treated and untreated ungerminated setts.

Treatments	Setts colonized (%)													
	A		B		C		D		E		F		G	
	F	S	F	S	F	S	F	S	F	S	F	S	F	S
<i>Acremonium</i> spp.	10	30	10	15	10	20	35	20	15	10	20	20	80	75
<i>Aspergillus</i> spp.	—	—	5	—	—	5	—	—	15	—	15	—	20	10
<i>Alternaria</i> sp.	5	5	—	—	—	—	5	—	—	—	—	5	40	45
<i>Ceratocystis paradoxa</i>	10	10	15	5	10	15	20	5	25	10	10	5	45	40
<i>Curvularia lunata</i>	—	—	—	—	—	—	—	—	—	—	—	—	55	40
<i>Drechslera</i> sp.	5	—	—	5	5	10	5	—	—	15	5	10	10	20
<i>Fusarium moniliforme</i>	10	20	—	10	20	15	20	25	15	15	20	10	65	60
<i>Rhizopus nigricans</i>	5	15	—	10	—	5	5	15	10	—	—	10	10	20
<i>Trichoderma</i> sp.	—	—	—	—	—	—	20	—	—	5	15	5	40	25
Unidentified	5	—	—	—	—	—	5	—	—	5	10	5	20	25

F: Field

S: Soil bed

c) FUNGAL COLONY :

Eleven different fungi representing nine genera, such as *Acremonium* spp. (*A. furcatum* and *A. terricola*), *Alternaria* spp., *Aspergillus* spp. *A. flavus* and *A. niger*), *Curvularia lunata*, *Ceratocystis paradoxa*, *Drechslera* sp., *Fusarium moniliforme*, *Rhizopus nigricans* and *Trichoderma* sp. were isolated from the

pieces taken from cut ends of treated and untreated setts. *Curvularia lunata* were isolated from 55% of the untreated setts. Sett treatment with both fungicides in different doses reduced colonization of setts by *Ceratocystis paradoxa*, *A. furcatum*, *A. terricola*, *Drechslera* sp., *Fusarium moniliforme* and *Rhizopus nigricans*. Treatment with Bavistin @ 1 g/litre of water showed the lowest colonization of *Acremonium* spp., *Ceratocystis paradoxa* and *Fusarium moniliforme* under both field and soil bed condition (Table 4). According to results of this experiment and reports published elsewhere, Bavistin-a systemic fungicides seems to be a good substitute of organomercurial compounds as it is quite effective against several sugarcane fungal pathogens including *Acremonium terricola*, *F. moniliforme* and *Colletotrichum falcatum* (Singh, 1978 ; Lewin *et al.*, 1976). Bavistin has also been successfully used to control pineapple disease elsewhere (Wang and Jiang, 1973 ; Mathusamy, 1973). Tecto Extra is also reported to be effective to control fungal pathogens affecting sugarcane. Lowest pineapple disease (*Ceratocystis paradoxa*) incidence was recorded when treated with Tecto (Thiabendazole, 1000 ppm) than that of Demosan and Benlate (Mathusamy, 1973). In this study the treatment of setts with Bavistin @ 1 g/litre of water for 30 minutes was found effective for germination as well as to reduce pathogenic fungal colonization and may be recommended for sett treatment.

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