

Field Evaluation of New Fungicide Molecule (Amistar Top 325 Sc) Against Sugarcane Smut Incited by *Sporisorium scitamineum*

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ABSTRACT

Sugarcane smut is one of the most serious diseases of sugarcane. Affected cane is severely stunted and production losses of 30-100% are common in susceptible varieties. A new molecule of Amistar Top 325 SC was tried against rust of sugarcane. Field evaluation of two season results revealed that, spraying Amistar Top 325 SC @1.25 ml/lit found very effective on Smut which recorded 92.67 and 84.68 per cent disease reduction over untreated check in first and second season respectively. This was at par with Amistar Top 325 SC@1.0 ml/lit (92.67 and 83.40%). Untreated check recorded a PDI of 27.30 and 23.50 at 210 Days after planting in first and second season respectively. The yield parameters like Brix percentage, Sucrose, Commercial Cane Sugar (CCS) and NMC/clumps were also recorded higher values in all the doses of Amistar Top 325 SC followed by standard checks when compared with untreated control in both seasons.

Key words: Amistar Top 325 SC, sugarcane, smut

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INTRODUCTION

Sugarcane (*Saccharum* spp.) is a crop used to produce sugar in many tropical and sub-tropical countries, characterized by a long growing season and adaptation to large-scale farming [4]. Sugarcane production is affected by important diseases, with sugarcane smut, caused by *Sporisorium scitamineum*, occurring across all growing areas globally [7]. Infected plants show profound metabolic modification, resulting in the development of a whip-shaped structure (sorus) at the stalk apex, which contains a mixture of plant tissues and fungal hyphae. The disease can cause significant losses in cane tonnage and juice quality; its development and severity depend on the environmental conditions and the resistance of the sugarcane varieties.

In addition to cane tonnage losses, smut also appears to reduce cane quality. However, loss may be quite severe in susceptible varieties under conditions suitable for disease development [1]. Rao *et al.* [8] reported loss in yield (68 to 80%) and juice quality (32%) in susceptible varieties which was further increased in ratoons. The decrease in cane yields is due to decreased number of millable canes and size of cane girth. Smut epidemics in various countries suggest that disease severity is associated with hot dry climates where crop may experience water stress (Singh *et al.*, 1988)^o. Growing resistant varieties is the best method to curtail the disease. Breeding and selection process in sugarcane are

cumbersome. Though hot water treatment is suggested for the control of smut disease. Wada *et al*, [12] suggested effective strategies for the management of sugarcane smut viz., pre-plant heat therapy of planting setts; pre-plant fungicidal dips of planting setts and screening of sugarcane clones for identification of resistant varieties. The need for continuing tests of different fungicides with varying modes of action for smut control has been discussed by Wada [11]. Hence, a study was made to evaluate sett treatment with new fungicide molecule (Amistar Top 325 SC) to control sett borne infection of smut for two consecutive seasons.

MATERIALS AND METHODS

A new formulation of Amistar Top 325 SC (Azoxystrobin 18.2% + Difenconazole 11.4% SC) of M/s Syngenta India Limited, Pune – 45 was used for all studies in the present investigation. The new formulation was compared with two fungicides viz., Carbendazim 50 WP and Mancozeb 75 WP. Two field trials were conducted to test the bio-efficacy of Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC) against Sugarcane rust disease by using the variety Co91017.

A field experiment was laid out to test the bio-efficacy of Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC) against major diseases of Sugarcane. The trial was laid out in a randomized block design (RBD) with three replications with a plot size of 5m x20m. The fungicides were applied as sett treatment just before planting. The setts were soaked with different treatments for 15 min and incubated for half an hour under shade condition before planting. The treatments included were as follows:

Trt.	Treatments	Dose rate g.ai/ lit of water (on w/w basis)	Dose rate Product (ml/lit of water)
T1	Untreated Check	-	-
T2	Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC)	0.22 (0.14 + 0.08)	0.75
T3	Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC)	0.30 (0.18 + 0.11)	1.00
T4	Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC)	0.37 (0.23 + 0.14)	1.25
T5	Amistar Top 325 SC (Azoxystrobin 18.2%+Difenconazole 11.4% SC)	0.75 (0.46 + 0.29)	2.50
T6	Azoxystrobin 23% SC (Amistar 25 SC)	0.23	1.00
T7	Difenconazole 25 EC (Score 25 EC)	0.125	0.50
T8	Carbendazim 50 WP	0.5	1.0
T9	Mancozeb 75 WP	2.25	3.0

The test fungicide Amistar Top contains Azoxystrobin 20% + Difenconazole 12.5 % on w/v basis which is equal to Azoxystrobin 18.2 % + Difenconazole 11.4% on w/w basis. Amistar contains Azoxystrobin 25% on w/v basis which is equal to Azoxystrobin 23% on w/w basis. Carbendazim 50 WP and Mancozeb 75 WP were used as standard check chemicals and compared with untreated check. The smut disease incidence was recorded by counting the total number of stalks and smutted whips per plot and worked out per cent disease incidence.

Statistical analysis

All the experiments were of Randomized Block design (RBD) and repeated twice. Data were subjected to analyses of variance and treatment means were compared by an appropriate Duncan's multiple ranges test ($P < 0.05$). The IRRISTAT package version 92-1, developed by the International Rice Research Institute Biometrics Unit, Philippines, was used for analysis [2].

RESULTS AND DISCUSSION

Efficacy of Amistar Top 325 SC against Smut disease in Sugarcane

In the present study, the results indicated that all the fungicide conc. tested, reduced the smut disease significantly over untreated control in both the season. During the first season, application of Amistar Top 325 SC@1.25 ml/lit found very effective on smut which

recorded 92.67 per cent disease reduction over untreated check at par with Amistar Top 325 SC@1.0 ml/lit (92.67%) followed by Amistar Top 325 SC@0.75 ml/lit (81.68%), Azoxystrobin 23 SC@1.0 ml/lit (76.92%), Difenoconazole 25 EC @ 0.5 ml/lit (61.17 %), Carbendazim 50 WP @1.0g/lit (49.81%) and Mancozeb 75 WP@3.0 g/lit (13.18%). Untreated check recorded a PDI of 27.30 at 210 DAP (Table 1). Similarly in second season also, application of Amistar Top 325 SC @ 1.25 ml/lit found very effective on Smut which recorded 84.68 per cent disease reduction over untreated check at par with Amistar Top 325 SC@1.0 ml/lit (83.40%) followed by Amistar Top 325 SC@0.75 ml/lit (72.76%), Azoxystrobin 23 SC @1.0 ml/lit (68.08%), Difenoconazole 25 EC @ 0.5 ml/lit (47.23 %), Carbendazim 50 WP @1.0g/lit (36.17%) and Mancozeb 75 WP@3.0 g/lit (10.63%). Untreated check recorded a PDI of 23.50 at 210 DAP (Table 2).

Influence of Amistar Top 325 SC on Sugarcane yield

Amistar Top 325 SC@ 1.25 ml/lit of water recorded significantly higher sugarcane yields of 89.3t/ha at par with Amistar Top 325 SC@1.0 ml/lit (88.7 t/ha) followed by Amistar Top 325 SC @0.75 ml/lit (83.2 t/ha), Azoxystrobin 23SC@1.0 ml/lit (82.50 t/ha), Difenoconazole 25 EC @ 0.5 ml/lit (78.90 t/ha), Carbendazim 50 WP@1.0 g/lit (76.8 t/ha),and Mancozeb75 WP @ 3.0g/lit (74.30 t/ha)as against 66.40 t/ha in untreated check (Table 4). The yield parameters like Brix percentage, Sucrose, Commercial Cane Sugar (CCS) and NMC/clumps were also recorded higher values in all the doses of Amistar Top 325 SC followed by standard checks when compared with untreated control (Table 3).

Similarly in second season also, the test fungicide, Amistar Top 325 SC@ 1.25 ml/lit of water recorded significantly higher sugarcane yields of 93.45t/ha at par with Amistar Top 325 SC@1.0 ml/lit (93.1 t/ha) followed by Amistar Top 325 SC @0.75 ml/lit (90.1t/ha), Azoxystrobin 23 SC @1.0 ml/lit (87.40 t/ha), Difenoconazole 25 EC @ 0.5 ml/lit (80.40 t/ha), Carbendazim 50 WP@1.0 g/lit (78.2t/ha), and Mancozeb75 WP @3.0g/lit(75.7 t/ha)as against 68.8 t/ha in untreated check. The yield parameters like Brix percentage, Sucrose, Commercial Cane Sugar (CCS) and NMC/clumps were also recorded higher values in all the doses of Amistar Top 325 SC followed by standard checks when compared with untreated control (Table 4).

Table 1. Efficacy of Amistar Top 325 SC on Smut disease in Sugarcane : I season

Trt.	Treatments (ml/lit of water)	Smud (% disease incidence)* at	Disease reduction over control (%)
		210 DAP	
T1	Untreated Check	27.30 ^f (31.50)	-
T2	Amistar Top 325 SC @ 0.75 ml	5.10 ^b (13.05)	81.68
T3	Amistar Top 325 SC@ 1.0 ml	2.00 ^a (8.13)	92.67
T4	Amistar Top 325 SC @ 1.25 ml	2.00 ^a (8.13)	92.67
T5	Azoxystrobin 23% SC @ 1.0 ml	6.30 ^b (14.54)	76.92
T6	Difenoconazole 25%EC @ 0.5 ml	10.60 ^c (19.00)	61.17
T7	Carbendazim 50 WP @ 1.0 g	13.70 ^d (21.72)	49.81
T8	Mancozeb 75 WP @3. 0 g	23.70 ^e (29.13)	13.18
	CD (0.05)	1.56	-

* Mean of three replications, Values in the parentheses are arc sine transformed values.

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT.

Fungicides are often a vital part of disease management as they control many diseases satisfactorily [5]. The role of fungicides in modernizing and changing the condition of agriculture is quite significant [10]. Fungicide acts by binding with b-tubulin polymers of

pathogens which take part in a key role in nuclear partition and result in reticence of polymerizing activity of microtubules. These also cause barrier in diverse dictatorial cellular activities including mitosis, meiosis and cell form preservation etc. [6]. Horst, [3] reported that fungicides have different kind of action on plants to retard fungal development such as action on unspecific site, on cell membranes, on energy production, on nuclear division, on metabolism of sterol and synthesis of chitin. Better crop stands have been achieved from enhanced germination obtained by treating seed pieces with a fungicide before planting.

Table 2. Efficacy of Amistar Top 325 SC on Smut disease in Sugarcane : II season

Trt.	Treatments (ml/lit of water)	Smut (% disease incidence)* at	Disease reduction over control (%)
		210 DAP	
T1	Untreated Check	23.50 ^f (29.00)	-
T2	Amistar Top 325 SC @ 0.75 ml	6.40 ^b (14.65)	72.76
T3	Amistar Top 325 SC@ 1.0 ml	3.90 ^a (11.39)	83.40
T4	Amistar Top 325 SC @ 1.25 ml	3.60 ^a (10.94)	84.68
T5	Azoxystrobin 23% SC @ 1.0 ml	7.50 ^b (15.89)	68.08
T6	Difenoconazole 25%EC @ 0.5 ml	12.40 ^c (20.62)	47.23
T7	Carbendazim 50 WP @ 1.0 g	15.00 ^d (22.79)	36.17
T8	Mancozeb 75 WP @3. 0 g	21.00 ^e (27.27)	10.63
	CD (0.05)	1.49	-

* Mean of three replications, Values in the parentheses are arc sine transformed values. In a column, means followed by a common letter are not significantly different at the 5% level by DMRT.

Table 3. Influence of Amistar Top 325 SC on yield parameters in Sugarcane: I season

T.No.	Treatments (ml/lit of water)	Yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	NMC/clump
T1	Untreated Check	66.40 ^e	18.60 ^d (25.55)	13.80 ^c (21.81)	10.10 ^c (18.53)	10.04 ^d
T2	Amistar Top 325 SC @ 0.75 ml	83.20 ^b	20.40 ^b (26.85)	17.20 ^b (24.50)	11.00 ^b (19.37)	12.45 ^b
T3	Amistar Top 325 SC@ 1.0 ml	88.70 ^a	21.00 ^a (27.27)	18.20 ^a (25.25)	11.50 ^a (19.83)	13.67 ^a
T4	Amistar Top 325 SC @ 1.25 ml	89.30 ^a	21.20 ^a (27.42)	18.30 ^a (25.33)	11.50 ^a (19.83)	13.88 ^a
T5	Azoxystrobin 23% SC @ 1.0 ml	82.50 ^b	20.50 ^b (26.92)	17.30 ^b (24.58)	11.00 ^b (19.37)	12.48 ^b
T6	Difenoconazole 25%EC @ 0.5 ml	78.90 ^c	20.30 ^{bc} (26.78)	17.00 ^b (24.35)	10.80 ^b (19.19)	11.00 ^c
T7	Carbendazim 50 WP @ 1.0 g	76.80 ^c	20.10 ^c (26.64)	17.10 ^b (24.43)	10.60 ^b (19.00)	10.87 ^c
T8	Mancozeb 75 WP @3. 0 g	74.30 ^d	20.00 ^c (26.57)	17.00 ^b (24.35)	10.60 ^b (19.00)	10.66 ^c
	CD (0.05)	2.15	0.23	0.31	0.38	0.85

* Mean of three replications. Values in the parentheses are arc sine transformed values. In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

Table 4. Influence of Amistar Top 325 SC on yield parameters in Sugarcane: II season

Trt.	Treatments(ml/lit of water)	Yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	NMC/clump
T1	Untreated Check	68.80 ^f	18.82 ^d (25.71)	13.20 ^d (21.30)	9.56 ^d (18.01)	10.32 ^e
T2	Amistar Top 325 SC @ 0.75 ml	90.10 ^b	20.60 ^b (26.99)	16.65 ^b (24.08)	10.70 ^b (19.09)	13.23 ^b
T3	Amistar Top 325 SC@ 1.0 ml	93.10 ^a	21.30 ^a (27.49)	17.70 ^a (24.88)	11.20 ^a (19.55)	14.03 ^a
T4	Amistar Top 325 SC @ 1.25 ml	93.45 ^a	21.32 ^a (27.50)	17.80 ^a (24.90)	11.30 ^a (19.64)	14.12 ^a
T5	Azoxystrobin 23% SC @ 1.0 ml	87.40 ^c	20.60 ^b (26.99)	17.00 ^b (24.35)	10.60 ^b (19.00)	13.02 ^b
T6	Difenoconazole 25%EC @ 0.5 ml	80.40 ^d	20.38 ^{bc} (26.84)	16.40 ^c (23.89)	10.30 ^{bc} (18.72)	12.35 ^{bc}
T7	Carbendazim 50 WP @ 1.0 g	78.20 ^d	20.32 ^c (26.79)	16.20 ^c (23.73)	10.10 ^c (18.53)	12.13 ^{cd}
T8	Mancozeb 75 WP @3. 0 g	75.70 ^e	20.21 ^c (26.72)	16.10 ^c (23.66)	10.00 ^c (18.43)	11.47 ^d
	CD (0.05)	2.42	0.27	0.28	0.36	0.73

* Mean of three replications. Values in the parentheses are arc sine transformed values.

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

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