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Tolerance of some Sugarcane Varieties to Water Logging Condition in Old Himalayan Piedmont Plain Soil of Bangladesh

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ABSTRACT

This study was undertaken to evaluate the performance of the BSRI released some commercial sugarcane varieties to adaptability of superior tolerance to water logging condition in the northern region of Bangladesh. Eight sugarcane varieties viz. Isd 2- 54, Isd 20 (standard), Isd 22, Isd 24, Isd 25, Isd 29, Isd 31 and Isd 34 were tested to find out their tolerance to water logging condition during 2002-2003 and 2003-2004. Results revealed that under Atwari and Salandar sub zones among the varieties tested some were found to have quite degree of tolerance to water logging. The variety Isd 34 was found superior among all the tested varieties with respect to percentage of germination, tiller and millable cane both at Atwari and Salandar sub zones. Highest sugar recovery percent obtained at Atwari in Isd 22 (9.45%) and Isd 25 (9.32%). Same trends were also observed at Salandar sub zone. The variety Isd 31 produced the highest cane yield at Atwari (87.84 t ha-1) and (86.36 t ha-1) in first year. The same trends were also observed at Salandar sub zone in the second year. The variety

Key words: Sugarcane varieties, tolerance and water logging condition.

INTRODUCTION

Sugarcane *(Saccharum officinarum L.)* is one of the most important agro-industrial crops in Bangladesh. It is cultivated on an area about 0.17 million hectares annually with an average cane yield of only 41 tons ha-1 (BBS 1998). Sugarcane is a long duration and exhaustive crop and produces large biomass. It removes considerable amount of nutrients from soil for it's normal growth and development. Most soils in Bangladesh are low in organic matter (OM), generally containing less than 1.5% while 2.5 to 3.0% OM are necessary for suitable crop production (Bhander et al. 1998). Now a day, sugarcane is being cultivated to medium high and low lying areas of Bangladesh. In Bangladesh, one of the reason of low yield of sugarcane is due to water logging problem. Poor drainage system, unplanned construction of culverts and roads are mainly responsible for water logging. Naidu (1992) confirmed that yield loss in cane occurred mainly because of stalk mortality, reduce growth, poor root system, lack of absorption of water, intolerant water logging varieties, lodging, cane breakage and improper drainage systems. Increase in the excessive soil moisture affects the growth and quality of sugarcane due to deficient aeration for oxygen and increase in carbon dioxide under conditions was demonstrated by Karthiresan (1992). The extent of damage of cane yield and quality due to water logging depends on several factors viz. the duration of flooding, the condition of water either moving or stagnant, the stage of growth and the inherent quality for water logging tolerance of cane varieties. Adverse effects of water logging on the cane yield and quality are mainly due to the changes of physiological and chemical properties of soils. Stunted growth of sugarcane for morphological, anatomical, physiological and metabolic changes, decrease in cane yield, deterioration of juice quality and increase in pests and disease attack.

MATERIALS AND METHODS

The experiment was conducted at Atwari sub-zone of Panchager Sugar Mills (PSM) and Salandar subzone of Thakurgaon Sugar Mills (TSM) in farmers plots under northern region of Bangladesh in two consecutive cropping seasons 2002-2003 and 2003-2004.The soil was sandy loam textured with pH 5 and low in organic matter. The experiment comprised of eight sugarcane varieties viz. Isd 2- 54, Isd 20 (standard), Isd 22, Isd 24, Isd 25, Isd 29, Isd 31 and Isd 34. The experiment was laid out in RCBD with three replications and plot size was 8m x 8m,

where row to row distance maintained 1 meter. The cane were planted in the month of third week of December 2002 and 2003.Urea, Triple superphosphate (TSP), Muriate of potash (MOP) and Gypsum were used as the source of N ,P, K and S respectively. The urea was applied in three equal splits, the first split at the settling establishment stage, the second at tiller completion stage 90 DAP (Days after plantation) and the third at grand growth phase 180 DAP. Full amount of TSP, Gypsum and one third of MOP were applied in trenches and thoroughly mixed with soil prior to setts plantation. The rest amount of MOP was applied as first and second top dressing at 90 DAP and 180 DAP respectively. Same doses of fertilizers were applied in the second year. Data were taken in the month of February, March. May, September, December and January. Different data on germination percentage, number of tiller per hectare, number of millable cane, sucrose percent and yield of cane were recorded. The canes were harvested on last week of January 2004 and 2005.

RESULTS AND DISCUSSION

Sugarcane yield and its of the parameters viz. germination (%), tiller, millable cane, recovery (%) and yield of cane are shown in the Table 1 and Table 2. At Atwri sub zone-At Salandar sub zone- it is revealed that the variety Isd 34 produced significantly higher germination (35.57%) and (35.17%) was observed in Isd 25 followed by (33.93%) in Isd 24, number of tillers (182.70 x 103 ha^{-1}) and higher number of millable cane (121.92 x 103 ha^{-1}) was observed in Isd 34 followed by number of tiller (149.10 x 103 ha^{-1}) in Isd 31 and millable cane (112.85 x 103 ha^{-1}) in Isd 31 where standard variety Isd 20 was the tiller (144.44 x 103 ha^{-1}) and millable cane (104.64 x 103 ha^{-1}). Such improvement in tiller and millable cane production might be due to that inorganic nutrients applied in combination with organic sources were better utilized than inorganic sources alone. These finding was also in agreement with the results of Chatterjee et. al., (1979). In case of recovery percentage, insignificantly higher (8.95%) was observed in the variety Isd 22 followed by (8.90%) in Isd 24 where standard variety Isd 20 was (8.17%). Significantly higher yield was observed (90.64 t ha-1) in Isd 31 followed by (83.73 t ha-1) in Isd 24 where was standard variety Isd 20 (78.77 t ha^{-1}). This was in agreement with the findings of Hossain *et. al.*, (1989). At Atwri sub zone-As the result reported in Table 2, it was observed that the higher germination (42.38%) was observed in Isd 34 followed by (34.19%) in Isd 31, (34.29%) in Isd 25 at Atwari. Same trend was observed in Salandar sub zone. Significantly higher number of tiller (178.00 x 103 ha^{-1}) was observed in Isd 34 followed by (148.00 x 103 ha^{-1}) in Isd 31 where standard variety Isd 20 was (144.00 x 103 ha^{-1}) at Atwari sub zone. In case of millable cane, significantly higher millable cane (116.00 x 103 ha^{-1}) was observed in Isd 34 followed by (99.00 x 103 ha^{-1}) in Isd 31 where standard variety Isd 20 was (106.00 x 103 ha^{-1}) at Atwari. Same trend was observed in Salandar sub zone. Regarding recovery percentage, higher recovery percentage (9.32%) was observed in Isd 25 followed by (8.98%) in Isd 22 where standard variety was (8.95%) at Atwari sub zone. In salandar, higher recovery percentage (9.77%) was observed in Isd 22 followed by (9.16%) in Isd 25 where standard variety was (9.15%). In case of cane yield in Atwari sub zone, significantly higher yield was observed (87.26 t ha^{-1}) in Isd 20, (86.36 t ha^{-1}) in Isd 31 and (83.95 t ha^{-1}) in Isd 34 followed by (80.85 t ha^{-1}) in Isd 24. In Salandar, higher yield was observed (89.00 t ha^{-1}) in Isd 20 and (88.83 t ha^{-1}) in Isd 31 followed by (82.12 t ha^{-1}) in Isd 24.

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Table 1: Yield and Yield Attributes of the tested sugarcane varieties under water logged condition, Salandar Farm,TSM, Thakurgaon and Atwari Sub-Zone, PSM, Panchagarh 2002-2003.

Treatments	Germination (%)		No. of Tiller (X $10^3 ha^{-1}$)		No. of Millable cane (X $10^3 ha^{-1}$)		Recovery (%)		Yield (t ha^{-1})	
	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar
lsd 2/54	31.48 c*	32.34 ab	78.40 e	77.20 g	59.20 d	55.60 e	7.57	8.14	41.92 e	33.38 h
lsd 20	34.82 b	30.90 bc	150.40 bc	144.44 c	123.30 a	104.64 c	8.95	8.17	81.25 b	78.77 d
lsd 22	34.65 b	32.69 ab	114.08 d	109.34 f	91.94 c	88.16 d	9.45	8.95	64.16 d	49.06 g
lsd 24	27.44 d	33.93 ab	135.68 c	120.84 e	92.37 c	90.08 d	8.23	8.90	82.40 b	83.73 b
lsd 25	35.05 b	35.17 a	151.68 bc	140.00 d	91.56 c	89.28 d	8.67	8.68	68.67 c	63.57 f
lsd 29	25.02 e	28.54 cd	140.80 c	124.10 e	90.40 c	84.32 d	8.86	8.18	72.26 c	67.15 e
lsd 31	34.55 b	26.48 d	159.36 b	149.10 b	109.70 b	112.85 b	8.19	8.13	87.84 a	90.64 a
lsd 34	42.82 a	35.57 a	194.88 a	182.70 a	126.34 a	121.92 a	8.27	8.57	87.63 a	80.77 c
LSD (5%)	0.95	3.09	17.08	3.29	5.48	5.84	NS	NS	3.80	1.56

NS-Non-significant

*Figures accompanied by the same letters are not significantly different

Table 2: Yield and Yield Attributes of the tested sugarcane varieties under water logged condition in Salandar Farm,TSM, Thakurgaon and Atwari Sub-Zone, PSM, Panchagarh,2003-2004.

Treatments	Germination (%)		No. of Tiller (X $10^3 ha^{-1}$)		No. of Millable cane (X $10^3 ha^{-1}$)		Recovery (%)		Yield (t ha^{-1})	
	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar	Atwari	Salandar
lsd 2/54	33.31 bc*	33.73 b	90.00 f	82.00 f	73.00 e	70.00 e	8.62	8.46	46.85 e	45.55 g
lsd 20	32.17 c	33.67 b	144.00 bc	139.07 b	106.00 b	101.00 a	8.95	9.15	87.26 a	89.00 a
lsd 22	33.50 bc	33.12 b	106.00 e	95.00 e	84.00 d	76.00 c	8.98	9.77	63.62 b	53.46 f
lsd 24	29.69 d	28.36 c	131.00 d	105.00 d	82.00 d	76.00 cd	7.67	8.04	80.85 ab	82.12 b
lsd 25	34.29 b	33.03 b	138.00 cd	111.00 d	81.00 d	76.00 cde	9.32	9.16	67.37 cd	62.27 e
lsd 29	27.70 e	26.81 c	137.00 cd	118.00 c	80.00 d	71.00 de	8.05	8.52	70.33 c	68.08 d
lsd 31	34.19 b	33.40 b	148.00 b	133.00 b	99.00 c	92.00 b	8.34	8.23	86.36 a	88.83 a
lsd 34	42.38 a	39.61 a	178.00 a	148.00 a	116.00 a	106.00 a	8.89	8.77	83.95 a	80.67 bc
LSD(5%)	1.76	1.98	8.44	7.32	5.06	5.35	NS	NS	5.46	2.71

NS-Non-significant

*Figures accompanied by the same letters are not significantly different

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