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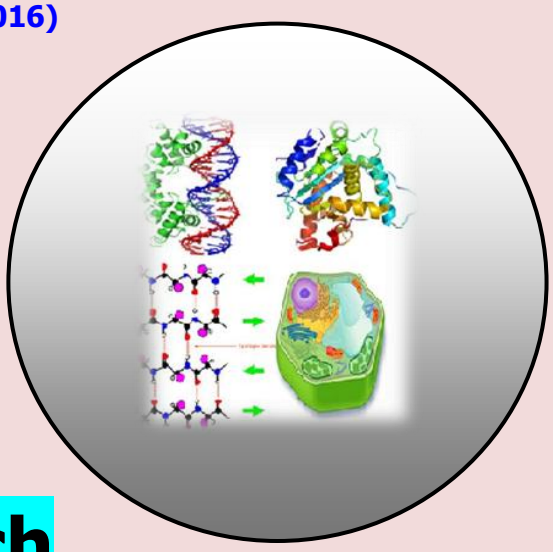

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RESEARCH PAPER

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Morpho-physiological response of Sugarcane Varieties to Inorganic and Organic Chemical Pretreatments

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ABSTRACT

In order to establish the possible influence(s) of inorganic and organic Chemicals pretreatments on Morpho-physiological changes, germination, tillering and cane yield in Sugarcane cultivars (COS 8272, CO 0238, COS 8279, CO 5011), Water, Hot water (52^{0}C), Bavistin (0.1%), Dormex (0.1%), Neem leaf extract (5%), lantana leaf extract (5%), lime (1%) and Azotobacter culture (5%) were applied as pretreatments on cane setts separately. Best cane germination (21% more) at 50 AP obtained for Azotobacter soaked setts statistically equal to lime soaking followed by dormex and Neem leaf extract soakings. Variety CO 5011 responded most for germination improvement. The interaction CO 5011 X Azotobacter found best for germinability. Profuse tillering was significantly noted by soaking setts in Azotobacter statistically equal to that of 1% dormex soaking possibly due to stimulation of enzymes release for growth promotion and metabolism in apical bud. 37.60% more cane yield was noted by Azotobacter sett soaking followed by lime, Neem leaf extract, Lantana leaf extract sett soakings. Highest cane yield was recorded by the interaction CO 5011 X Azotobacter sett soaking.
Key Words: Morpho-physiological, Cane yield, Sugarcane, Chemicals pretreatments (sett soaking).

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is the leading third largest crop next to rice and wheat production in the world (Kinkema et al. 2014). India is world second largest producer after Brazil producing nearly 15% and 25% of global sugar and sugar cane respectively. In India, Sugarcane is mainly cultivated in Uttar Pradesh (47.05%) and main state revenue generating crop (Kumar 2009).Besides providing employment opportunities to rural masses it is a hardy subtropical popular crop. Various efforts directed at improving cane yields through fertilizers, pests and disease control and improved cultural practices (Afolabi 1999, Singh et al. 2018 Praharaj et al. 2017). Pretreatments had hitherto been used in developing countries for improving the germination and development of Sugarcane crop. Adeyann and Afolabi 2012, Kumar et al. 2010, Singh et al. 2015, 2016, 2018 reported positive impact of sett soaking in chemicals on growth, yield and juice quality of Sugarcane. Present study deals with some more inorganic and organic chemicals as sett pretreatments for Sugarcane production and determines their influence on germination, tillering capacity and cane yield in four sugarcane cultivars.

MATERIALS AND METHODS

The experiment was conducted in sandy loam soil of sub-tropical agro-climatic zone at Agricultural farm of G.F. College, Shahjahanpur.242001 U.P. India. Single eyed nodes pieces dipped in 1% solution of profonil of Sugarcane varieties (COS 8272, CO 0238, COS 8279, CO 5011) were taken. The seed cane were soaked in

water, hot water (52^0C), Bavistin (0.1%), Dormex (0.1%), Neem leaf extract (5%), Lantana leaf extract (5%), Lime (1%) and Azotobacter culture (5%) of aqueous solution for one hour. Each treatment replicated thrice sown in micro plots of 5x2 meters, seed rate (90x45cm) row to plant spacing with a uniform basal dose of 150 kg N, 60kg P, and 80 kg K per hectare in a factorial randomized block design applied before seed planting. Data recorded for germination (at 40 and 50 DAP) tillering (at 90,120,150and 180 DAP) and cane yield (t/ha) at harvest, grown according to standard agricultural practices of the crop. The crop was sown on 24 February 2016 and harvested for early varieties (COS 8272, CO 0238), on 20 January 2017 and 5 March 2017 for late varieties (COS 8279, CO 5011).

RESULTS AND DICUSSION

Results obtained from the above experiments were subjected to statistical analysis and presented in Tables. 1-7. Based on the results generated (%) germination increased significantly by all the pretreatments cane-sett soakings (Tables 1 and 2) and varietal response. Maximum value was recorded in Azotobacter treatment followed by lime and Dormex. Increase in % germination was due to seed cane soakings impact in sugarcane varieties seems to be a necessary agronomic practice in this crop as reported (Divedi and Sinha, 1993) a Critical moisture level of apical bud is must for rapid germination irrespective of adequate soil moisture especially for sprouting and early shoot growth. Hence, sett water is an important determinant for promotion in Sugarcane germination. Increased highest (21%) germination was noted by Azotobacter, a free-living gram-positive aerobic, soil dwelling, nitrogen fixing bacterium, which is used as a biofertilizer in the cultivation of most-crops which may produce large quantities of capsular slime. It perhaps produces some substances which check the plant pathogens acting as a biological control agent also fixing atmospheric nitrogen in the rhizosphere.

Table 1. Effect of some inorganic and organic chemicals sett soakings on germination (%) at 40 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments								Mean
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	17.50	19.90	20.10	21.30	22.30	21.30	21.00	22.00	20.68
CO 238	24.80	26.00	26.89	27.10	28.10	25.10	26.00	25.10	26.14
COS 8279	27.50	28.50	29.30	29.50	30.50	29.50	29.30	30.10	29.28
CO 5011	25.30	27.80	28.30	29.30	29.90	28.30	26.90	30.20	28.25
Mean	23.78	25.55	26.15	26.80	27.70	26.05	25.80	26.85	

C.D. at 5%
Treatment = 1.15**
Varieties = 0.81**
Treatment X Varieties = N.S

* Significant
N.S. Non-significant

This resulted not only in increased germination, tillering (Tables 1-6) and cane yield (Table 7) as a result of improved soil-fertility status required and beneficial for profused early vegetative growth of Sugarcane crop. Similarly, pretreatments proved stimulatory for apical bud establishment during germination particularly lime cane-sett soaking which releases ca++ as co-factor for amylase activity that plays great roles in starch and sugar metabolism as well as other biochemical changes during Sugarcane development (Adeyenn and Afolabi 2012).

Table 2. Effect of some inorganic and organic chemicals sett soakings on germination (%) at 50 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments								Mean
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	24.40	26.80	27.10	30.10	29.80	28.40	29.10	33.40	28.64
CO 238	30.30	32.60	34.10	33.80	34.60	34.10	35.10	36.30	33.86
COS 8279	36.50	38.10	39.10	40.10	38.10	37.10	38.20	42.00	38.65
CO 5011	35.80	38.00	37.90	39.90	40.10	41.00	41.90	42.10	39.59
Mean	31.75	33.88	34.55	35.98	35.65	35.15	36.08	38.45	

C.D. at 5%
Treatment = 1.21**
Varieties = 0.85**
Treatment X Varieties = N.S
* Significant
N.S. Non-significant

Table 3. Effect of some inorganic and organic chemicals sett soakings on tiller no / plant at 90 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments								Mean
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	8.10	8.90	9.10	9.90	8.90	9.20	9.00	9.12	9.03
CO 238	8.10	8.60	8.90	9.10	9.00	8.90	8.76	9.10	8.81
COS 8279	6.10	6.90	6.80	7.33	6.90	6.80	6.30	7.10	6.78
CO 5011	8.10	8.30	8.80	9.10	8.30	8.30	8.50	9.10	8.56
Mean	7.60	8.18	8.40	8.86	8.28	8.30	8.14	8.61	

C.D. at 5%
Treatment = 0.3**
Varieties = 0.21**
Treatment X Varieties = N.S

* Significant
N.S. Non-significant

Similarly dormex (hydrogen cyanamide) a product having hormone like properties also proved stimulatory for better establishment of apical bud during germination (Singh et al. 2016) in Sugarcane crop (Tables 1-2), resulting in better tillering (Table 3-6) and cane yield (Table 7) might be due to early impact on bud break, having positive effect on emergence rate encouraging early growth and increased cane yield. The cultivar CO 5011 seem to be most responsive to all the treatments especially by Azotobacter due to more expressive genetic make up under local conditions as compared to other cultivars.

Table 4. Effect of some inorganic and organic chemicals sett soakings on tiller no / plant at 120 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments								Mean
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	10.40	10.45	10.70	10.80	10.45	10.70	10.80	10.90	10.65
CO 238	10.40	10.50	10.80	10.90	10.50	10.60	10.70	10.90	10.66
COS 8279	8.70	9.80	9.75	9.90	9.30	9.30	9.70	9.90	9.54
CO 5011	8.30	10.40	10.30	10.90	10.30	10.50	10.30	10.90	10.24
Mean	9.45	10.29	10.39	10.63	10.14	10.28	10.38	10.65	

C.D. at 5% Treatment = 0.36** Varieties = 0.26**
Treatment X Varieties = 0.73* * Significant

Table 5. Effect of some inorganic and organic chemicals sett soakings on tiller no / plant at 150 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments							Mean	
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	11.60	11.90	11.95	12.30	11.60	12.10	11.90	13.10	12.06
CO 238	11.10	11.70	12.10	12.40	11.70	11.90	11.80	12.90	11.95
COS 8279	10.70	10.75	10.70	11.40	10.75	10.72	10.73	11.40	10.89
CO 5011	12.40	12.60	12.90	12.90	12.90	12.60	12.80	13.30	12.80
Mean	11.45	11.74	11.91	12.25	11.74	11.83	11.81	12.68	

C.D. at 5% Treatment = 0.48** Varieties = 0.33**
Treatment X Varieties = NS * Significant N.S. Non-significant

Table 6. Effect of some inorganic and organic chemicals sett soakings on tiller no / plant at 180 days in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments							Mean	
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azotobacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	11.20	11.50	11.70	12.10	11.60	11.70	11.90	12.90	11.83
CO 238	11.60	11.90	11.95	12.20	11.70	11.80	11.90	12.75	11.98
COS 8279	9.50	9.60	9.65	10.10	9.66	9.80	9.88	10.11	9.79
CO 5011	12.80	12.95	13.20	13.40	13.01	12.90	12.95	14.30	13.19
Mean	11.28	11.49	11.63	11.95	11.49	11.55	11.66	12.52	

C.D. at 5% Treatment = 0.41** Varieties = 0.29**
Treatment X Varieties = N.S * Significant N.S. Non-Significant

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Table 7. Effect of some inorganic and organic chemicals sett soakings on cane yield (t/ha) at harvest in Sugarcane varieties.

(Mean of three replicates)									
Varieties	Treatments								Mean
	Water	Hot water	Bavistin	Dormex	Neem leaf extract	Lantana leaf extract	Lime	Azoto bacter	
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	
COS 8272	57.00	66.10	63.60	61.80	70.20	71.60	70.50	76.30	67.14
CO 238	54.00	69.30	64.30	64.80	71.30	69.70	73.30	78.50	68.15
COS 8279	61.00	79.80	72.50	73.60	79.60	80.60	79.40	80.40	75.86
CO 5011	62.00	82.00	80.10	79.50	83.50	81.30	81.60	86.70	79.59
Mean	58.50	74.30	70.13	69.93	76.15	75.80	76.20	80.48	

C.D. at 5% Treatment = 2.44** Varieties = 1.73** Treatment X Varieties = N.S
* Significant N.S. Non-Significant

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