Studies on Bioenergy Conservation Potential of Sugarcane (Saccharrum Spp) Varieties

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***Abstract*- The present Investigation was carried out at Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand during 2005-06 .The experimental material consisted of seven checks viz.CO-1148 ,CoS-8436,CoJ-64, CoS-767,CoP-84211,CoP-84212, and CoP-90223.The observation were recorded on germination, no of tillers, NMC, cane height, cane thickness, cane weight, Brix percent, Sucrose per cent ,Juice extraction %,Juice purity %,CCS %, commercial Cane Sugar (CCS t/ha) and cane yield(t/ha). The study revealed that variety CoP-90223 followed by CO-1148, CoS-8436, CoJ-64 were performed excellent in all the yield and quality characters. The quality character commercial Cane Sugar (CCS t/ha) revealed the fact that variety CoP-90223 followed by CO-1148, CoS-8436, CoJ-64 are helpful in the harnessing of bio-energy molecule sugar per unit area. On the basis of results it can be concluded that variety CoP-90223 followed by CO-1148, CoS-8436, CoJ-64 are promising varieties recommended on the state based on the trial held for the screening of varieties. The top three varieties are highly helpful in conserving bioenergy on the form of sugar apart from other grown varieties. With their specific C4 plant type nature sugarcane has excellent feature of sugar conservation with minimal loss.**

I. INTRODUCTION

Sugarcane (*Saccharum sp*. Complex) is important cash crop of India. It is also known as Ganna or *Ekh* in vernacular language. Sugarcane belongs to the family *Poaceae*, Sub family *Panicoidae*, Supertribe *Andropogenae*, Subtribe *Saccharanineae* and Genus Saccharum (Watson *et al.*, 1985). It has (2n = 80-120) which varied from species to species. It has basic chromosome number (X = 6,8,10). The cultivated varieties in India *are* the interspecies hybrids inheriting genes and characteristics from *S. officinarum*, *S. barberi* and *S. spontaneum* (Rao *et al.*, 1983). It is widely grown is tropical and subtropical areas of the world. The important sugarcane producing countries in the world are India, Brazil, Cuba, Mexico, Pakistan, Philippines, Burma, Srilanka, Indonesia, Hawaii, Central America, Egypt, South Africa, Australia and Thailand. It is the source of sugar production in the country mainly in the form of crystal sugar, gur, jaggery and khandsari. Baggase, the byproduct of sugarcane is used as fuel for fire, electricity generation and also for pulp, paper and card board making. Molasses as by product of sugarcane is being used to produce alcohol, ethanol and other organic chemicals. In India, sugarcane is cultivated in diverse agro climatic condition in an area of 3.99 mha with a total cane production of 236 mt. (Indian sugar, 2005). Uttar Pradesh stands first both in area (2.03 million ha) and production (112 million t) of sugarcane in the country. But the productivity and sugar recovery per cent (55.5 t/ha and 9.81%) in U.P. are lower than national average (59.1 t/ha, 10.22 %). The productivity of sugarcane in Uttaranchal is (59.8t/ha) but sugar recovery (9.75%) per cent in Uttaranchal is lower than the national average. To increase sugarcane and sugar recovery per cent in Uttar Pradesh and Uttaranchal, high yielding varieties, high sugared varieties with good ratooning ability, and resistance to various disease and insects, pests are required. For the increase in the area under adoption of improved varieties a study was conducted to evaluate the performance of standard check varieties at the centre. In view of the above facts present investigation was carried out at Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar during 2005-06 in RBD analysis with the objective to evaluate the mean performance of check varieties.

II. MATERIAL AND METHODS

The present experiment was conducted at the Crop Research Centre of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (Uttarakhand) during the year 2005-06.The experimental material consisted of seven checks viz. Co 1148, CoJ 64, CoS 8436, CoS 767, CoPant 90223, CoPant 84212 and CoPant 84211. The experimental was planted in Randomized Block Design with six replications on April 7, 2005. The plot size of each entry represented 4 rows of 5 meter length spaced at 0.75 meter apart. The fertilizers were applied at the rate of 150 kg N per ha and 60 kg P_2O_5 per ha. Half of the nitrogen dose was given at the time of planting, one fourth dose after 75 days and remaining one fourth after 100 days of planting. The various cultural operations and two irrigations were given as and when required. An average 40 cm setts (13 setts) with five bud eye are used to sow one row of 5 metre with the total of 65 eyes per row.The observations on germination % at 45 days and tillers number at 120 days in thousands per hectare were recorded on per plot basis. The number of millable cane (NMC) in thousand and cane yield in tonnes per hectare were also recorded on per plot basis at the time of harvesting. Ten randomly selected plants from each plot were used for recording data on cane height (cm), cane diameter (cm) and single cane weight (kg), juice weight (kg). The cane quality analysis for juice brix percent, juice sucrose percent, Juice purity percent , Juice extraction percent , Commercial cane sugar percent (CCS %), Commercial cane sugarcane (CCS) yield were recorded at 10 months of crop age (in January) and 12 month age (in March)following the procedure as per Spencer and Meade (1955) .Pol or Sucrose

(%)was calculated by the extraction of cane juice and its further clarification with lead sub acetate and the clear juice was polarized in polarimeter installed in the laboratory. After adjusting the refracted light, the pole or sucrose (%) was determined from the hydrometer Brix (uncorrected) and corresponding Pol. Reading by referring to the Schmitz table.

Purity (%) = Sucrose (%)/Corrected brix (%) x 100

CCS (%) = [S-(B-S) x 0.4] x 0.73

Where CCS = Commercial Cane Sugar,

S = Sucrose (%) juice, B = Brix (%) juice.

The replication wise mean values of different varieties for various characters for analysis in randomized block design by using the formula used by (Cochran and Cox, 1962).

III. RESULTS & DISCUSSION

Analyses of variance for cane yield and quality characters are presented in Table 1 and Table 1 (contd). Mean squares due to treatments or genotypes were highly significant for all the characters ,which indicated that there were differences among the genotypes for all the characters' namely, germination percent at 45 days, number of tillers at 120 days, number of millable canes at 300 days, juice sucrose percent at 10 months, juice purity percent at 10 months , CCS percent at 10 month, juice sucrose percent at 12 months, juice purity percent at 12 months , CCS percent at 12 month, cane yield and CCS yield at harvest.

The present study showed that high germination percent was recorded in variety CoJ-64(80%), followed by Co-1148(77%), CoP-90223(77%), CoS-767(75 %),CoS-8436(69%), and least recorded in CoP-84211(56%),CoP-84212(54%). It indicates that CoJ-64 has high germination potential.

High number of tillers in thousand per hectare (000/ha) were recorded in variety CoJ-64(226), followed by Co-1148(217), CoP-90223(217), CoS-767(212), CoS-8436(195), and least recorded in CoP-84211(157), CoP-84212(153).

High number of millable canes (NMC) in thousand per hectare (000/ha), were recorded in variety CoJ-64(83), followed by Co-1148(80), CoP-90223(80), CoS-767(78), CoS-8436(72), and least recorded in CoP-84211(58), CoP-84212(56).

High sucrose percent juice at 10 months recorded in variety CoP-84211(16.12%) followed by CoJ-64(16.09%), CoP-84212(15.29%), CoS-8436(15.21%), and least recorded in, Co-1148(14.73%), CoS-767(14.50%), and CoP-90223 (14.14%).

Juice purity percentage at 10 month recorded in variety CoP-90223(85%), CoS-767(84%), followed by CoS-8436(83%), Co-1148(83%), CoP-84212(82%) and least recorded in CoJ-64(80%), CoP-84211(79%).

Commercial cane sugar (C.C.S.) percent at 10 month recorded in variety CoP-84211(15%) ,CoJ-64(15%) followed by, CoP-84212(14%),CoS-8436(14%), Co-1148(14%), CoS-767(14%),and least recorded in, CoP-90223(13%).

High sucrose percent juice at 12 months recorded in variety CoP-84211(18.86%), CoS-8436(18.53%), followed by CoP-84212(18.27%), CoJ-64(18.21%), and least recorded in, CoS-767(17.57%), CoP-90223(17.53%) Co-1148(17.12%),

Juice purity percentage at 12 month recorded in variety CoP-90223(87%), CoS-767(87%), Co-1148(87%), CoP-84212(87%) followed by CoS-8436(85%), CoJ-64(85%), CoP-84211(85%).

Commercial cane sugar (C.C.S.) percent at 12 month recorded in variety CoP-84211(18%), CoS-8436(18%), followed by, CoP-84212(17%), CoJ-64(17%), CoP-90223(17%), CoS-767(17%), and least recorded in Co-1148(16%).

C.C.S. yields in (t/ha) at 12 month stage crop recorded in variety CoP-90223(17t/ha) followed by CoJ-64(14t/ha), CoS-8436(14t/ha), Co-1148(14t/ha), CoS-767(13t/ha) and least recorded in CoP-84211(12t/ha), CoP-84212(10t/ha).

Cane yields in (t/ha) at 12 month stage crop recorded in variety CoP-90223(101.19t/ha) followed by Co-1148(83.06t/ha), CoS-8436(81.04t/ha),CoJ64(78.41t/ha), CoS-767(77.23t/ha) and least recorded in CoP-84211(66.60t/ha) and CoP-84212(59.40t/ha). The performance of Cane and CCS yield are depicted through graphical representation also indicates the superiority of CoP-90223 and Co-1148 varieties.

IV. CONCLUSION

The performance of varieties were evaluated for cane yield and quality characteristics concludes that three varieties namely Co Pant 90223 ,Co-1148 and CoS-8436 ranked one, two and three for all the respective characters correlates with high ccs yield and cane yield similar reports by Reddy and Khan (1984) .for sugar percent at 10 month and 12 month variety CoP-84211 and CoP-84212 had shown excellent performance and such varieties can be recommended for early and mid season maturing cultivars on the region.CoJ-64 had shown top performance for all the characters except for CCS yield and cane yield.CD value for each character indicates that significant difference exists between varieties for almost all the characters.

TABLE. I ANALYSIS OF VARIANCE FOR DIFFERENT CHARACTERS AT 10 & 12 MONTH AGES.
** SIGNIFICANT AT 5 % LEVEL OF SIGNIFICANCE
* SIGNIFICANT AT 1% LEVEL OF SIGNIFICANCE

Source of variation	D. F	Germ %	Tillers	NMC	Sugar % at 10 month	Juice. Purity % at 10 month	Cane Yield (t/ha)
Replication	5	1.95	16.95	1.90	0.39	6.77	3.55
Treatment	6	677.76 **	5397.29 **	725.20 **	3.46**	28.64 **	677.76 **
Error	30	2.67	21.13	2.86	0.150	4.95	2.67
SEm ±		9.84	27.76	10.17	0.703	2.02	9.84

F Cal Value		253.73	255.37	252.88	23.02	5.77	253.73
F Tab Val.at 5 %		2.420	2.420	2.420	2.420	2.420	2.420
F Tab Val. at 1 %		3.473	3.473	3.473	3.473	3.473	3.473
CV. %		2.32	2.34	2.33	2.56	2.55	3.35
CD at 5 %		0.79	2.21	0.82	0.19	1.07	1.32

TABLE. II: ANALYSIS OF VARIANCE FOR DIFFERENT CHARACTERS AT 10 & 12 MONTH AGES. (CONTD.)
** SIGNIFICANT AT 5 % LEVEL OF SIGNIFICANCE
* SIGNIFICANT AT 1% LEVEL OF SIGNIFICANCE

Source of variation	D. F	CCS % at 10 month	Sugar % at 12 month	Juice. Purity. % at 10 month	CCS % at 10 month	CCS (t/ha)	Cane Yield (t/ha)
Replication	5	0.55	0.069	2.86	0.116	0.041	3.55
Treatment	6	1.93**	2.30**	6.80*	1.72**	24.99**	677.76**
Error	30	0.23	0.046	2.70	0.067	0.292	2.67
SEm ±		0.52	0.57	0.98	0.496	1.88	9.84
F Cal Value		8.16	50.09	2.52	25.57	85.49	253.73
F Tab Val.at 5 %		2.420	2.420	2.420	2.420	2.420	2.420
F Tab Val. at 1 %		3.473	3.473	3.473	3.473	3.473	3.473
CV. %		3.42	1.17	1.67	1.48	3.50	3.35
CD at 5 %		0.23	0.10	0.79	0.13	0.26	1.32

TABLE III: CANE YIELD AND ANCILLARY CHARACTER PERFORMANCE OF SUGARCANE TRIAL.

Entry	Germ %	Tillers	NMC	Sugar % at 10 month	Juice Purity. % at 10 month	Cane Yield (t/ha)	Ranking
CoP-90223	77	217	80	14.14	85	101.19	1
Co-1148	77	217	80	14.73	83	83.06	2
CoS-8436	69	195	72	15.21	83	81.04	3
CoJ-64	80	226	83	16.09	80	78.41	4
CoS-767	75	212	78	14.50	84	77.23	5
CoP-84211	56	157	58	16.12	79	66.60	6
CoP-84212	54	153	56	15.29	82	59.40	7
Mean	69	196	72	15.15	82	78.13	
CD at 5%	0.79	2.21	0.82	0.19	1.07	1.32	
CV %	2.32	2.34	2.33	2.56	2.55	3.35	

TABLE IV: CANE YIELD AND ANCILLARY CHARACTER PERFORMANCE OF SUGARCANE TRIAL (CONTD.)

Entry	CCS % at 10 month	Sugar % at 12 month	Ju. Purity. % at 10 month	CCS % at 10 month	CCS (t/ha)	Cane Yield (t/ha)	Ranking
CoP-90223	13	17.53	87	17	17	101.19	1
Co-1148	14	17.12	87	16	14	83.06	2
CoS-8436	14	18.53	85	18	14	81.04	3
CoJ-64	15	18.21	85	17	14	78.41	4
CoS-767	14	17.57	87	17	13	77.23	5
CoP-84211	15	18.86	85	18	12	66.60	6
CoP-84212	14	18.27	87	17	10	59.40	7
Mean	14	18.01	86	17	13	78.13	
CD at 5%	0.23	0.10	0.79	0.13	0.26	1.32	
CV %	3.42	1.17	1.67	1.48	3.50	3.35	

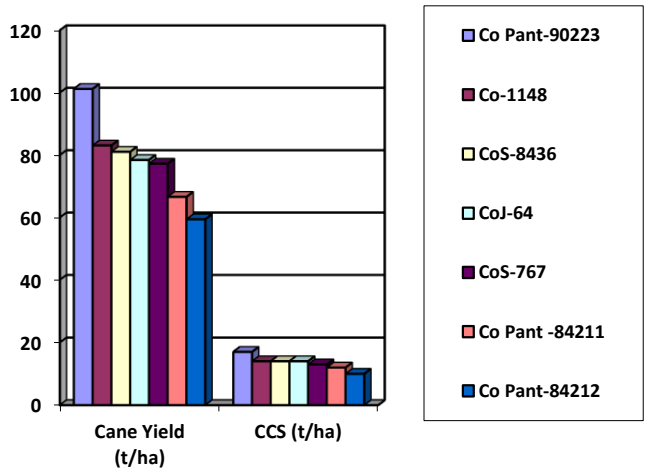

Figure 1: Graph of Cane & CCS yield

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