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Division of Crop Production

Annual Report of the AICRP on Sugarcane (2012-13)

AS 42: Agronomic evaluation of promising genotypes of sugarcane

(S.K. Shukla and Ishwar Singh)

The experiment was conducted to evaluate three sugarcane genotypes (CoH 06265, CoS 06247 and CoH 06266) under three NPK levels (112.5, 45, 45; 150, 60, 60 and 187.5,75,75 kg/ha) with a view to identifying suitable genotype under various fertiliser schedules in spring season. Initial soil chemical analysis indicated that soil was low in organic carbon (0.42%), and available nitrogen (242 kg/ha); medium in phosphorus (42.3 kg P_2O_5/ha) and potassium (273 kg K_2O /ha) contents.

Sugarcane genotype, CoH 06265 produced the highest number of millable cane (97700/ha) followed by CoS 06247 (90200/ha) and CoH 06266 (86100/ha -Table 1). The highest cane length (235.6 cm) was recorded with genotype CoS 06247 but thicker canes (2.62 cm diameter) were harvested with the genotype CoH 06265. Thus both the genotypes could not yield significant difference in individual cane weight. Genotype, CoH 06266 recorded the lowest mean cane weight (806 g). Although, significantly highest sucrose content (17.98%) was analysed in the genotype, CoH 06266 but the higher cane (76.37 tonnes/ha) and sugar yields (9.36 tonnes/ ha) was obtained with genotype CoH 06265. It was followed by CoS 06247 (71.10 and 8.68 tonnes cane and sugar yields/ha, respectively).

Mean number of millable canes, individual cane length, diameter, weight and cane and sugar yields significantly increased up to application of 150, 60, 60 kg NPK/ha. Recommended level of NPK i.e., 150, 60 and 60 kg /ha fetched significantly higher cane (72.69 t/ha) and sugar yields (8.89 t/ha) which was at par with 125% NPK levels. Different fertility levels could not influence the juice quality parameters significantly.

Significant interaction of sugarcane varieties and fertility levels was observed on sucrose % juice (Table 2). The sucrose content in juice in sugarcane variety CoH 06265 decreased with increasing levels of fertility. However, other two varieties viz., CoS 06247 and CoH 06266 maintained juice quality up to application of 187.5, 75, 75 kg NPK/ha.

Table 1: Influence of different treatments on growth, quality and yield of sugarcane crop

Treatment	Millable canes (000/ha)	Cane length (cm)	Came diameter (cm)	Cane weight (g)	°Brix	Pol % Juice	Purity%	Cane yield (t/ha)	CCS (t/ha)
Genotypes									
CoH 06265	97.7	195.9	2.62	1126	20.03	17.71	88.39	76.37	9.36
CoS 06247	90.2	235.6	2.37	1140	19.98	17.66	88.38	71.10	8.68
CoH 06266	86.1	208.1	2.10	806	20.40	17.98	88.15	65.12	8.09
SE	1.25	2.65	0.084	16.6	0.11	0.09	0.26	1.61	0.17
CD (P=0.05)	3.60	7.80	0.26	48.9	NS	0.27	NS	4.82	0.52
Fertility levels (NPK kg/ha)									
112.5,45,45	87.8	206.3	2.28	896	20.25	17.89	88.38	66.5	8.22
150,60,60	92.8	215.3	2.40	1090	20.15	17.86	88.39	72.69	8.89
187.5,75,75	93.4	217.9	2.37	1086	20.0	17.59	88.16	73.4	8.90
SE	1.25	2.65	0.084	16.6	0.11	0.09	0.26	1.61	0.17
CD (P=0.05)	3.60	7.80	0.26	48.9	NS	0.27	NS	4.82	0.52

Table 2: Interaction effect between sugarcane varieties and fertility levels on (NPK kg/ha) on pol per cent juice

Varieties/Fertility levels	F1 (112.5,45,45)	F2 (150,60,60)	F3 (187.5,75,75)	Mean
CoH 06265 (V_1)	18.06	17.8	17.26	17.71
CoS 06247 (V_2)	17.70	17.47	17.80	17.66
CoH 06266 (V_3)	17.93	18.31	17.71	17.98
Mean	17.89	17.86	17.59	
	S E m±	CD (P=0.05)		
Varieties (V)	0.09	0.27		
Fertility levels (F)	0.09	0.27		
Varieties x fertility levels (V x F)	0.16	0.48		

AS 63: Plant Geometry in relation to mechanization in sugarcane

(A.K. Singh, T.K. Srivastava, K.P. Singh and Akhilesh Kr. Singh)

Field experiment was conducted to workout optimum plant geometry of different varieties for use of farm machinery. The experiment consisted of 12 treatment combinations with 3 planting geometries viz., 120, 150 and 120:30cm row spacings and 4 varieties viz., CoS 96275, CoSe 92423, CoS 94257 and CoLk 94184. The experiment was laid out in split

plot design allocating plant geometry in main plot and varieties in sub plots. The treatments were replicated thrice in the experiment.

The data on sugarcane growth, yield attributes and yield indicate that significantly highest shoot population (155.8 thousands/ha), number of millable canes (133.4 thousand/ha) and cane yield (75.6 t/ha) was observed at 30x120 cm row spacing (Table 1). Variety CoSe 92423 recorded significantly highest yield (68.3 t/ha) to CoS 96275 and CoS 94257, however it was found similar to CoLk 94184 (67.0 t/ha). The quality parameters were not affected by plant geometry but significantly highest sugar yield was obtained at 30x120 cm spacing. Different genotypes showed significant variation for different quality observations. Significantly highest brix (21.69), pol % (18.33) with purity of 84.53% and CCS % (12.4) was harnessed by CoLk 94184. This genotype also fetched highest sugar yield (8.30 t/ha), which was closely followed by CoSe92423.

Table 1: Effect of plant geometry and varieties on growth, yield attributes and yield of sugarcane

Treatment	Germina-tion 45 DAS	Shoot count 180 DAP	NMC (000/ha)	Cane length (cm)	Cane girth (cm)	Av. Cane weight (g)	Cane yield (t/ha)
Planting Geometry							
Row spacing							
120 cm	40.6	129.7	101.2	186.7	2.50	0.83	64.0
150 cm	40.1	108.7	85.0	186.9	2.63	0.98	55.4
120:30 cm	41.1	155.8	133.4	186.3	2.53	0.85	75.6
CD (P = 0.05)	NS	14.28	11.26	NS	NS	NS	7.38
Genotype							
CoS 96275	40.2	124.0	99.0	177.0	2.45	0.74	61.7
CoSe 92423	44.4	135.0	112.8	193.0	2.75	0.97	68.3
CoS 94257	40.9	135.3	98.3	182.9	2.75	0.96	63.0
CoLk 94184	36.8	131.2	116.3	193.7	2.26	0.88	67.0
CD (P = 0.05)	3.67	7.60	6.26	8.26	0.11	0.20	4.29

Table 2: Effect of planting geometries and genotypes on quality attributes and sugar yield

Treatment	^{0}Brix	Pol (%)	Purity (%)	CCS (%)	CCS (t/ha)
Planting Geometry					
Row spacing					
120 cm	20.03	16.96	84.75	11.48	7.34
150 cm	19.91	17.08	85.72	11.64	6.45
120:30 cm	20.03	17.16	85.82	11.69	8.82
CD (P = 0.05)	NS	NS	NS	NS	0.97
Genotype					
CoS 96275	20.03	17.02	85.00	11.55	7.11
CoSe 92423	17.94	15.46	86.23	10.57	7.24
CoS 94257	20.30	17.44	85.96	11.89	7.50
CoLk 94184	21.69	18.33	84.53	12.40	8.30
CD (P = 0.05)	1.74	1.29	1.13	1.22	0.86

AS 64: Response of sugarcane crop to different plant nutrients in varied agro-ecological situations

(C. Gupta, S.K. Shukla and A.K. Singh)

Field experiment was initiated during April 2012, to study the response of sugarcane to different nutrients. Twelve nutrient treatments in RBD having three replications with sugarcane (Cv. CoSe 92423) was planted. The recommended fertilizer dose was 150 kg N, 60 kg P_2O_5 and 60 kg K_2O ha^{-1}. The other nutrient 40 kg S, 25 kg $ZnSO_4$, 10 kg $FeSO_4$ and 5 kg $MnSO_4$ ha^{-1} were applied as per the treatment.

Initially soil was low in organic carbon (0.44%), available nitrogen (236.8 kg ha^{-1}), phosphorus (18.39 kg P_2O_5 ha^{-1}) and medium in potassium (285.91 kg K_2O ha^{-1}) contents. Germination, shoot population and number of millable canes (NMC) were not affected by various nutrients applied (Table 1).Cane yield (t/ha) was influenced significantly by various nutrient management treatments. Highest cane yield (75.56 t/ha) was recorded with treatment T10 (NPK+S+Zn+Fe) followed by the treatment T6 (NPK+Zn) with cane yield (72.77 t/ha) and T9 (NPK+S+Zn), cane yield (70.35 t/ha) as compared to other treatments. Lowest cane yield was recorded with control plot (52.69 t/ha). The initial lower soil organic carbon content and available nitrogen, phosphorus and medium potassium nutrients affected cane yield in treatments, where nutrient were applied alone (N or NP or NPK) as compared to in combination of NPK with other nutrient like S, Zn, Fe and Mn. Cane quality parameters were not affected by any of the nutrient applied.

Table 1. Growth, yield and juice quality parameters of sugarcane to different nutrients

Treatment	**Germination (%)**	**Shoot count ('000/ha)**		**NMC ('000/ha)**	**Cane yield (t/ha)**	**Juice quality parameters at harvest (%)**		
		90 DAP	**120 DAP**			**Brix**	**Sucrose**	**Purity**
T1 Control	44.9	139.9	110.9	77.4	52.69	20.52	17.83	86.91
T2 N	39.9	128.3	113.2	80.3	61.16	20.38	17.95	88.08
T3 NP	33.7	108.7	105.3	73.8	58.39	20.81	18.16	87.26
T4 NPK	40.4	119.1	107.0	83.9	58.40	20.86	18.20	87.26

T5 NPKS	33.5	107.8	103.3	78.1	65.33	20.19	17.68	87.57
T6 NPKZn	37.6	107.8	97.9	76.7	72.77	20.32	17.92	88.24
T7 NPKFe	37.7	131.2	107.5	76.8	62.19	20.20	17.68	87.55
T8 NPKMn	32.6	108.2	102.0	81.2	60.99	20.25	17.58	86.83
T9 NPKSZn	35.4	117.9	103.3	78.3	70.35	20.36	17.74	87.12
T10 NPKSZnFe	28.8	100.2	92.6	72.2	75.56	20.42	17.85	87.38
T11 NPKSZnFeMn	35.9	108.3	98.3	69.9	63.62	20.64	17.92	86.83
12 FYM 20 t/ha	36.9	110.9	99.8	78.6	67.36	20.39	17.66	86.62
CD (5%)	NS	NS	NS	NS	12.51	NS	NS	NS

DAP: Days after planting

AS 65: Enhancing Sugarcane Productivity and Profitability under Wheat – Sugarcane Cropping System

(Ishwar Singh and S. N. Singh)

The field experiment is being conducted at the Research Farm of Indian Institute of Sugarcane Research, Lucknow to enhance the productivity of sugarcane under wheat – sugarcane cropping system. The experiment comprising 9 treatments viz.; T_1: Autumn planted sugarcane, T_2 : T_1+ wheat (1:2), T_3: T_1+ wheat (1:3), T_4: wheat sown on 15th November – late sugarcane, T_5: wheat sown on 15th December – late sugarcane, T_6: wheat sown (three rows) on 15th November under FIRB + sugarcane in furrows at 75 cm in 3rd week of February, T_7: wheat sown (three rows) on 15th November under FIRB + sugarcane in furrows at 75 cm in 3rd week of March, T_8: T_6 with sowing of wheat on 15th December and T_9: T_7 with sowing of wheat on 15th December was laid out in Randomized Block Design with three replications. The experiment started in the month of October with planting/sowing of sugarcane and wheat on their respective dates as per treatment. The observations on initial fertility status of soil, germination percentage of sugarcane, tiller count of wheat at different stages, number of earhead per running meter, no. of grains per earhead, test weight and grain yield of wheat has been recorded. The findings reveals that wheat grain yield was the highest (46.6 q/ha) in November sown wheat in the treatment T4. Wheat yielded almost the same in flat as well as FIRB method. However, wheat sown in the month of November yielded higher than wheatsownin December due to higher number of earheads per running meters, number of grains per earhead and test weight. Wheat (Nov.) + sugarcane (Feb/March) under FIRB method produced higher wheat yield (44.1 q/ha) over wheat (Nov) + sugarcane (Oct) in 3:1 row ratio (40.2 q/ha) as well as 2:1 row ratio (33.5 q/ha)). The sugarcane crop is standing in the field.

AS-66 (AICRP-S): Priming cane node for accelerating germination

(S.N. Singh and T.K. Srivastava)

Results of an experiment planted with the objective of assessing suitable cane node priming technique for accelerating germination indicated that the priming of cane nodes with hot water (50^{o}C) + 3% urea solution for 02 hrs. or cattle dung, cattle urine and water in 1:2:5 ratio and planted directly in the field or after incubation(4 days) gave maximum germination % (78.21%) at 40 days after planting (DAP) as compared to un-primed cane nodes or treating them with hot water (50^{o}C for 2 hrs.) only (52.76%). Conventionally planted crop with 3-bud

setts produced the lowest germination (40.98%). Cane yield was also higher wherever cane nodes were primed and incubated before planting in the field.

Experimental results presented in Table 1 indicated that the priming of cane nodes with hot water (50°C)+ 3% urea solution for 2 hrs (T_3) or cattle dung, cattle urine and water in 1:2:5 ratio and planted directly in the field (T_4) or after incubation (4 days) (T_6) gave maximum germination of cane buds (78.21%) at 40 days after planting (DAP) as compared to un-primed cane nodes (T_1)(56.90%) or treating them with hot water at 50°C for 2 hrs. (T_2) only (48.61%). Conventionally planted crop with 3-bud setts produced the lowest germination (40.98%). Number of tillers and millable canes and yield of cane also exhibited the same trend as the germination of cane buds obtained in different treatments. Accordingly, cane yield obtained under T_3,T_4,T_5 and T_6 treatments was significantly higher to the tune of 9.79 and 8.17% than that of T_1 and T_2 treatments (un-primed cane nodes or treated with hot water only). Conventional planting with 3-bud setts although produced cane yield at par with primed cane node treatments but with the use of huge seed cane (72 q/ha) whereas only 17.52 q/ha seed cane was used in cane node planting method.

Table 1:Effect of cane node priming techniques on the growth, yield and quality of sugarcane

Treatment	**Germination %**				**No. of tillers (000/ha)**	**NMC (000/ha)**	**Cane yield (t/ha)**	**CCS (%) cane**
	10 DAP	**20 DAP**	**30 DAP**	**40 DAP**				
T_1: Un-primed cane node	22.03	31.66	41.04	56.90	174	102	69.49	11.22
T_2: Treating cane node in hot water at 50°C for 2 hours	26.69	33.20	39.84	48.61	176	104	7074	11.09
T_3: Treating cane node in hot water (50°C) and 3% urea solution for 2 hours.	36.87	56.68	62.50	78.35	204	117	76.81	11.18
T_4: Priming cane node with cattle dung, cattle urine and water in 1:2.5 ratio	38.55	48.96	67.80	78.98	208	119	78.80	11.26
T_5 : Conventional 3-bud setts planting	9.05	18.75	30.99	40.98	190	110	75.33	11.20
Primed and sprouted cane	32.96	52.08	70.67	77.31	207	116	77.19	11.08

node (incubated for 4 days after priming)								
CD (P=0.05)	--	--	--	--	14.92	10.44	4.37	NS

AS67: Optimization of fertigation schedule for sugarcane through micro-irrigation technique under different agro-climatic conditions

Sugarcane crop was planted on 22-23 March, 2012 in paired rows planting system at a spacing of 120:30 cm. Drip laterals were placed about 5 cm below the depth of sett placement. Drip and surface irrigations were commenced after one month of planting. The germination after one month of planting was uniform in all the treatments (Table 1). Number of tillers, 90 days after planting were significantly influenced by irrigation treatments and nitrogen levels (Table 2). The number of millable canes (Table 3), sugarcane yield (Table 4) and irrigation water use efficiency (Table 5) were significantly influenced by irrigation treatments bun not by nitrogen doses. None of the juice quality parameters were affected significantly by irrigation and nitrogen treatments (Tables 6, 7 and 8). Cane stalk length at harvest was significantly influenced by irrigation treatment but not affected significantly by nitrogen doses. Cane stalk diameter however, remained unaffected by irrigation and nitrogen treatments both. The results indicate that with drip irrigation significant amount of irrigation water and nitrogen can be saved.

Table 1. Germination (%) 30 days after planting

Irrigation treatment		Nitrogen dose		
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	61	58	64	61.0
I_2 = Sub Surface Drip at 100% PE	59	62	62	61.0
I_3 = Sub Surface Drip at 125% PE	67	56	59	60.7
I_4=Farmers practice surface irrigation	62	59	58	59.7
Mean	62.3	58.8	60.8	
CD 0.05	NS	NS	NS	

Table 2. Tiller count 90 days after planting

Irrigation treatment		Nitrogen dose		
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	375546	366658	344436	362213
I_2 = Sub Surface Drip at 100% PE	331103	371102	335547	345917
I_3 = Sub Surface Drip at 125% PE	364435	337769	308881	337029
I_4=Farmers practice surface irrigation	353325	348880	313326	338510
Mean	356102	356102	325547	
SE± (Irrigation)	8114			
CD 0.05 (Irrigation)	25811			
SE± (Nitrogen)	7027			
CD 0.05 (Nitrogen)	30238			
SE± (Irri.XNitr.)	8114			
CD 0.05 (Irri.XNitr.)	19855			

Table 3. Number of millable canes at harvest

Irrigation treatment		Nitrogen dose		
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	118889	124278	122444	121870
I_2 = Sub Surface Drip at 100% PE	129111	127500	123611	126741
I_3 = Sub Surface Drip at 125% PE	113889	108167	122111	114722
I_4=Farmers practice surface irrigation	115222	112833	112444	113500
Mean	119278	118194	120153	
SE± (Irrigation)	2232			
CD 0.05 (Irrigation)	7102			
SE± (Nitrogen)				
CD 0.05 (Nitrogen)	NS			
SE± (Irri.XNitr.)	2232			
CD 0.05 (Irri.XNitr.)	5463			

Table 4. Sugarcane yield (t/ha)

Irrigation treatments		Nitrogen dose		
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	76.43	75.31	73.76	75.17
I_2 = Sub Surface Drip at 100% PE	80.89	79.75	81.08	80.57
I_3 = Sub Surface Drip at 125% PE	76.47	73.67	74.18	74.78
I_4=Farmers practice surface irrigation	69.08	66.92	63.06	66.35
Mean	75.72	73.91	73.02	
SE± (Irrigation)	1.41			
CD 0.05 (Irrigation)	4.50			
CD 0.05 (Nitrogen)	NS			
CD 0.05 (Irri.XNitr.)	NS			

Table 5. Irrigation water use efficiency (kg/ha-cm)

Irrigation treatment	Irrigation water applied (mm)		Nitrogen dose		
		N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	396.0	1930.13	1901.74	1862.56	1898.14
I_2 = Sub Surface Drip at 100% PE	528.0	1531.94	1510.459	1535.69	1526.03
I_3 = Sub Surface Drip at 125% PE	660.0	1158.67	1116.20	1123.99	1132.95
I_4=Farmers practice surface irrigation	880.0	785.04	760.42	716.54	754.00
Mean		1351.45	1322.20	1309.69	
SE± (Irrigation)		22.32			
CD 0.05 (Irrigation)		71.00			
CD 0.05 (Nitrogen)		NS			
CD 0.05 (Irri.XNitr.)		NS			

Table 6. Brix of juice

Irrigation treatment	Nitrogen dose			
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I1= Sub Surface Drip at 75% PE	19.87	20.11	20.13	20.04
I2 = Sub Surface Drip at 100% PE	20.40	19.61	20.60	20.20
I3 = Sub Surface Drip at 125% PE	20.40	20.11	20.28	20.26
I4=Farmers practice surface irrigation	20.45	20.22	20.01	20.23
Mean	20.28	20.01	20.26	
CD 0.05 (Irrigation)	NS			
CD 0.05 (Nitrogen)	NS			
CD 0.05 (Irri.XNitr.)	NS			

Table 7. Sucrose (%) in juice

Irrigation treatment	Nitrogen dose			
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	17.09	17.70	17.64	17.48
I_2 = Sub Surface Drip at 100% PE	17.92	17.52	17.96	17.80
I_3 = Sub Surface Drip at 125% PE	17.92	17.29	17.72	17.64
I_4=Farmers practice surface irrigation	17.61	17.94	17.89	17.81
Mean	17.63	17.61	17.80	
CD 0.05 (Irrigation)	NS			
CD 0.05 (Nitrogen)	NS			
CD 0.05 (Irri.XNitr.)	NS			

Table 8. Purity (%) juice

Irrigation treatment	Nitrogen dose			
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	85.99	88.02	87.64	87.22
I_2 = Sub Surface Drip at 100% PE	87.84	89.36	87.12	88.11
I_3 = Sub Surface Drip at 125% PE	87.81	85.81	87.35	86.99
I_4=Farmers practice surface irrigation	86.16	88.71	89.42	88.10
Mean	86.95	87.98	87.88	
CD 0.05 (Irrigation)	NS			
CD 0.05 (Nitrogen)	NS			
CD 0.05 (Irri.XNitr.)	NS			

Table 9. Cane stalk length (cm) at harvest

Irrigation treatment	Nitrogen dose			
	N1 = 100% recommended dose of N	N2 = 75% recommended dose of N	N3 = 50% recommended dose of N	Mean
I_1= Sub Surface Drip at 75% PE	258.8	266.7	249.7	258.4
I_2 = Sub Surface Drip at 100% PE	260.7	264.4	267.4	264.1
I_3 = Sub Surface Drip at 125% PE	266.3	241.3	242.3	250.0
I_4=Farmers practice surface irrigation	224.5	235.3	227.5	229.1
Mean	252.6	251.9	246.7	
SE± (Irrigation)	3.69			
CD 0.05 (Irrigation)	11.75			
CD 0.05 (Nitrogen)	NS			
SE± (Irri.XNitr.)	3.69			
CD 0.05 (Irri.XNitr.)	9.04			