

Screening of some Sugarcane Cultivars for Nutrient (NPK) Absorption and Yield under Waterlogged condition

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Considerable area under sugarcane is gone to waterlogging during the rainy season, especially in the heavy and wet land soils of coastal Andhra Pradesh which result in poor soil aeration and reduced oxygen supply for the plant roots adversely affecting the spread and efficiency of roots ultimately leading to poor uptake of nutrients, growth and loss in cane weight. Mohan Naidu (1992) attributed anaerobic break down of sugar that leads to production of phosphoenol pyruvate which in turn increases acetaldehyde accumulation in roots leading to accumulation of ethanol at toxic levels in plants which lack tolerance to flooding. However, some of the sugarcane varieties like Co 975 perform well under waterlogging conditions. Hence, it is worth screening promising sugarcane clones which can take more nutrients even under waterlogged conditions and produce higher sugarcane yields.

Twenty one sugarcane cultivars were screened during 1991- 92 and 1992-93 seasons by artificially simulating wayerlogged conditions duting rainy season (August to October) to a constant depth of 45 cm. Nitrogen (3-6 leaves), phosphorus and potassium (3-6 sheaths) were determined at the end of formative phase (120 days), grand growth period (240 days) and at harvest (Piper, 1967). Uptake of N,P and K by whole cane was determined at the end of grand growth period besides recording the cane and sugar yield at the time of harvest.

The per cent concentration and uptake of nitrogen, phosphorus, potassium and their effect on cane and sugar yields during 1991-92 and 1992-93 were given in Tables 1 and 2 respectively.

The nitrogen content in the 3-6 leaves (index tissues) tended to decrease as the age of the crop advanced in all the clones during both the seasons. During 1991-92, Co 6907 recorded maximum leaf N at 120 d, but at the end of grand growth period Co 8220 had maximum leaf N followed by Co 6907, 86A 444 and F-11. Co 8220 continued to maintain higher leaf N at harvest, but was at par with Co 7219, 82V 12, F₁-11, Co 6907, 86A 444, 87A 13, 86A 175 and 86A 416 and significantly higher compared to the other clones. During 1992-93, varieties 86249, 88A 189, CoT 8201,

Table 2. Nutrient concentration in the index tissues, uptake and yield of sugarcane under waterlogged condition (1992-93) ^a

Variety	Percent N in 3-6 leaves at			Percent phosphorus in 3-6 sheaths at			Percent potassium in 3-6 sheaths at			Uptake in kg/ha at 240 days			Cane yield (t/ha)	Sugar yield (t/ha)
	120 days	240 days	Harvest	120 days	240 days	Harvest	120 days	240 days	Harvest	N	P	K		
Co 7219	1.95	1.79	1.53	0.090	0.094	0.083	1.93	1.95	1.80	98.6	23.3	134.5	90.63	11.37
Co 86249	2.03	1.84	1.56	0.098	0.105	0.089	2.05	2.15	1.93	188.5	39.2	223.2	109.72	14.28
85A261	1.95	1.77	1.51	0.092	0.094	0.081	1.95	1.93	1.80	114.2	26.2	175.1	93.06	12.28
Co 82059	1.96	1.76	1.52	0.090	0.092	0.083	1.95	1.90	1.83	123.7	29.4	195.7	70.84	9.16
Co 85036	1.96	1.77	1.54	0.089	0.094	0.084	1.95	1.95	1.85	149.6	35.1	232.2	87.85	11.24
88A189	2.03	1.83	1.61	0.102	0.106	0.088	2.05	2.15	1.90	176.9	38.0	222.8	104.17	12.99
C 81555	1.95	1.77	1.54	0.091	0.090	0.081	1.93	1.88	1.83	135.7	30.4	202.9	70.49	9.27
88 A 36	1.94	1.77	1.53	0.089	0.085	0.082	1.90	1.93	1.80	80.4	16.4	124.0	75.11	9.85
88A172	1.94	1.76	1.51	0.089	0.091	0.082	1.93	1.93	1.85	131.9	29.3	193.7	82.64	10.81
87A263	1.94	1.77	1.52	0.090	0.091	0.081	1.95	1.85	1.85	125.4	29.3	183.8	59.38	7.93
CoT 8201	2.03	1.85	1.60	0.101	0.107	0.087	2.05	2.08	1.93	165.7	33.2	201.3	105.91	14.70
88 A 214	2.03	1.83	1.61	0.102	0.107	0.088	2.05	2.13	1.95	161.3	33.0	212.4	91.67	12.94
Co 6907	2.03	1.83	1.59	0.103	0.105	0.089	2.03	2.10	1.93	183.2	37.4	231.5	92.01	11.34
88 A 75	1.96	1.76	1.52	0.089	0.091	0.082	1.93	2.00	1.83	117.8	25.0	161.5	66.32	9.20
C 83089	2.03	1.84	1.60	0.102	0.098	0.091	2.08	2.13	1.90	135.6	27.6	168.5	103.13	12.71
Co 85033	1.95	1.77	1.52	0.091	0.092	0.082	1.85	2.00	1.83	114.5	25.6	172.0	64.48	7.52
88 A 162	1.95	1.76	1.53	0.093	0.096	0.083	1.88	1.90	1.88	131.1	27.9	184.8	70.83	9.17
Co 87045	1.96	1.77	1.54	0.092	0.096	0.083	1.85	1.95	1.83	118.0	25.0	171.3	67.36	7.98
84 A 125	2.03	1.84	1.60	0.102	0.106	0.089	2.05	2.18	1.93	170.3	38.2	247.4	97.92	12.59
Co 86032	1.96	1.76	1.53	0.090	0.094	0.082	1.90	1.90	1.83	122.8	26.0	173.7	85.07	11.65
83 V 15	2.03	1.84	1.61	0.103	0.107	0.088	2.05	2.18	1.93	190.3	38.4	244.8	93.75	12.18
CD	0.03	0.03	0.04	0.0045	0.0098	0.0049	0.092	0.116	0.071	—	—	—	12.18	1.84

@P=0.05

88A 214, Co 6907, CoC 83089, 84A 125 and 83V 15 recorded significantly higher per cent N at all the three stages of crop growth. Clone 88A 172 recorded significantly lower N composition in the index tissue. This was reflected insignificantly higher uptake of N (at 240 days) by Co 8220 and 86249 during 1991-92 and 1992-93 seasons respectively.

During 1991-92, Co 7219 and Co 6907 recorded higher sheath phosphorus content at the end of formative phase. However, at the end of growth period, Co 6907 recorded significantly higher sheath P than Co 7219 and continued to maintain significantly higher sheath phosphorus at harvest. During 1992-93, sugarcane varieties Co 86249, 88A 189, CoT 8201, 88A 214, Co 6907, CoC 83089, 84A 125 and 83V 15 recorded significantly higher sheath P at the end of formative phase, grand growth period and harvest. Significantly lower sheath P was recorded by 88A 36 at 120 and 240 d and 87A 263 at harvest. Perumal (1981) reported drastic reduction in P index under waterlogged condition. The highest P uptake was recorded by Co 8220 followed by Co 7219 and Co 6907 was recorded during 1991-92. Similarly 86249 registered the highest uptake of phosphorus during 1992-93 season.

Clones 83A 261 and 83A 21-10 recorded higher sheath K at the end of formative phase during 1991-92. Co 6907, 86A 444, 86A 175, 86A 146, 83A 216-9, 86A 416, Co 8021, Co 8220 had higher sheath K at the end of grand growth stage. However, Co 7219 and Co 6907 maintained comparatively higher sheath K at harvest. During 1992-93, sugarcane varieties Co 85033, 87A 263 and 88A 36 recorded significantly lower sheath potassium at 120, 240 d and harvest stages respectively. Co 8220 recorded the highest K uptake during 1991-92. Uptake of nutrient is a function of nutrient concentration and dry matter production. Hence, these sugarcane varieties/clones having higher uptake due to better root system inspite of anaerobic conditions might have performed well under waterlogged conditions.

Variety Co 8220 gave significantly the highest cane and sugar yield, during 1991-92 but was at par with 82V 12 and F_1 -11. 83A 56-3 and 86A 441 produced significantly lower cane and sugar yield. During 1992-93, Co 86249 registered significantly the highest cane yield but was at par with CoT 8201, CoC 83089 and 88A 189. Clone 87A 263 produced significantly the lowest cane yield. However, CoT 8201 recorded significantly the highest sugar yield but was at par with Co 86249, 88A 189 and 88A 214. Co 85033 was recorded significantly the lowest sugar yield.

Thus, varieties/ clones which had higher concentration of nitrogen, phosphorus and potassium in the index tissues during critical growth phases (especially during grand growth period) and higher uptake of these nutrients at the end of grand growth period even under waterlogged conditions produced higher cane and sugar yields.

Prasada Rao *et al.* (1991) and Kathiresan (1992) categorised CoC 90063, CoC 772, Co 62175, CoT 8201, Co 7219 Co 7706 tolerant to waterlogging.

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