

Research Notes

Yield and quality of sugarcane as influenced by organic manures and chemical fertilizers on long term basis

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Sugarcane is the major crop cultivated in the north eastern region of Tamil Nadu to the extent of 1.08 lakhs hectares occupying 4.2 per cent of total cultivable area. Balanced application of fertilizer nutrients in combination with organic manures paved the way for sustaining higher yield and quality of sugarcane besides improving the fertility status of soil. Sugarcane is an exhaustive crop which depletes the native plant nutrients status of the soil due to the high removal of nutrients required for growth and development of sugarcane. The soils of north eastern region of Tamil Nadu which are under intensive sugarcane cultivation from time immemorial were subjected to decline in soil fertility due to the inadequate supply of organic manures and over dependence of chemical fertilizers. As a result of the imbalance in the use of organic manures and fertilizer nutrients, have led to deleterious affect on soil productivity, yield and quality of sugarcane. A permanent manurial experiment was started in Sugarcane Research Station, Cuddalore since 1963 to evaluate the long-term use of manures and fertilizers on yield and quality of sugarcane in the Cuddalore region of Tamil Nadu.

The 20th plant crop of sugarcane CoSi 95071 was tested in the permanent manurial experiment during the year 2001-2002 in a split plot design with eight main plot

and six sub plot treatments replicated twice in a sandy clay loam soil at Sugarcane Research Station, Cuddalore. The main plot treatments consist of different combinations of recommended levels of phosphorus, potassium and compost each @ 63.5, 110 kg ha⁻¹ and 25 kg ha⁻¹ respectively. The subplot treatments consist of various levels of nitrogen @ 210, 280 and 350 kg ha⁻¹ in the form of prilled urea and neem cake blended urea. The nitrogen and potassium were applied in three equal splits on 30, 60, 90th day after planting and phosphorus and compost were applied as basal dose. The effect of various levels of nitrogen and its interaction with P, K and organic manures on yield and quality of sugarcane were evaluated. Five numbers of sugarcane samples at harvest were collected at random from each treatment plot and the juice was extracted and analyzed for various quality parameter (Varma 1998). The effect of organic manures and fertilizer nutrients on quality of juice was evaluated.

The cane yield of 20th plant crop of CoSi 95071 was significantly increased due to the soil application of various levels of nitrogen in combination with recommended dose of P, K and compost. Among the various subplot treatments involving graded levels of nitrogen, application of N @ 350 kg ha⁻¹ in the form of neem cake blended

Table 1. Yield of sugarcane (t ha⁻¹) as influenced by organic manure and fertilizers (CoSI 95071, 20th plant crop)

N levels kg ha ⁻¹	(Mean of two replications)								Mean
	M1 Control	M2 K alone	M3 P alone	M4 P & K	M5 Compost (c)	M6 C&K	M7 C&P	M8 C, P&K	
S1) 210 as Urea	70.22	74.21	74.53	76.55	79.10	79.70	80.51	87.67	77.81
S2) 210 as NCBU	72.61	76.01	76.16	79.60	81.65	82.17	85.51	92.87	80.82
S3) 280 as Urea	74.06	78.66	78.51	81.61	85.20	85.82	87.52	96.96	83.54
S4) 280 as NCBU	75.60	80.20	83.11	87.18	89.16	87.99	89.76	99.50	86.56
S5) 350 as Urea	76.71	82.81	86.03	88.16	90.31	90.31	95.60	102.01	88.99
S6) 350 as NCBU	81.25	85.30	89.36	90.70	92.21	93.87	99.35	105.40	92.18
Mean	75.07	79.53	81.28	83.96	86.27	86.64	89.70	97.40	

Main plot (M)	SEd	CD (P=0.05)
Sub plot (S)	0.026	0.062
M x S	0.016	0.034
	0.050	0.107

urea recorded the highest yield of 92.18 t ha⁻¹, and was found to be significantly superior to the rest of the treatments, whereas the lowest yield was recorded in the treatment that received N @ 210 kg ha⁻¹ in the form of prilled urea (77.81 t ha⁻¹). The results also revealed that with increase in levels of nitrogen ranging from 210 to 350 kg ha⁻¹, the sugarcane yield also found to increase from, 77.81 to 92.18 t ha⁻¹. Yadav (1980) and Achuthan *et al.* (1989) also reported that the yield of sugarcane mainly depends on the tiller population, which is linearly related to the increase in levels of nitrogen application and ultimately increase the yield of cane. The nitrogen uptake of sugarcane increased upto grand growth phase and the demand of nitrogen by sugarcane increased with increase in various growth stages of crop. The interaction of nitrogen with P, K and organic manures on sugarcane yield was found to be significant and the cane yield ranged from 70.22 to 105.40 t ha⁻¹, the highest yield was recorded in the treatment that received N @ 350 kg ha⁻¹ as neem cake blended urea in combination with recommended dose of P, K and compost which was found to be significantly superior to the rest of the treatments, whereas the lowest yield was recorded in the treatment that received N @ 210 kg ha⁻¹ as prilled urea alone. Chithra *et al.* (1992) also reported similar results while evaluating the influence of

Table 2. Sugarcane juice quality (Brix %) as influenced by organic manure and fertilizers (CoSi 95071.20th plant crop)

N levels kg ha ⁻¹	(Mean of two replications)										Mean
	M1 Control	M2 K alone	M3 P alone	M4 P & K	M5 Compost (c)	M6 C&K	M7 C&P	M8 C, P&K			
S1) 210 as Urea	17.31	17.61	17.91	18.21	17.59	17.70	17.81	18.24	17.79		
S2) 210 as NCBU	18.03	18.22	18.06	18.47	17.91	17.97	17.90	18.61	18.14		
S3) 280 as Urea	18.55	18.65	18.66	18.61	18.75	18.79	18.94	18.77	18.70		
S4) 280 as NCBU	18.81	18.74	18.67	18.67	18.76	18.77	18.94	18.81	18.77		
S5) 350 as Urea	18.75	18.78	18.81	18.93	18.90	18.95	18.97	18.91	18.87		
S6) 350 as NCBU	18.75	18.75	18.81	18.93	18.92	18.92	19.06	18.96	18.88		
Mean	18.36	18.45	18.48	18.63	18.47	18.51	18.58	18.71			
		SEd	CD (P=0.05)								
Main plot (M)		0.017									
Sub plot (S)		0.008									
M x S		0.028									

neem cake blended and prilled urea on the yield of sugarcane. The increase in yield of sugarcane might be attributed to the balanced fertilization of sugarcane with fertilizers, nutrients and organic manures besides the use of urea coated with neem cake as a source of slow release nitrogenous fertilizers (Table 1).

The results of the various juice quality parameters such brix, pol, purity and CCS per cent were significantly increased due to the graded levels of nitrogen in combination with P, K and compost and the value ranged from 17.31 to 18.96, 15.46 to 18.25, 89.31 to 96.25 and 11.03 to 13.47 per cent respectively. The highest values for all the juice quality parameters were recorded in the treatments that received N (*a* 350 kg ha⁻¹ in the form of neem cane blended urea in combination with recommended dose of P, K and compost whereas the lowest values were recorded in N @ 210 kg ha⁻¹ as prilled urea alone. It was also observed that with increase in levels of N in combination with P, K and compost the juice quality parameters such as brix, pol and CCS per cent showed increase in trend, whereas the purity of the juice varied considerably. Chithra (1992) also reported similar results while evaluating the influence of graded levels of nitrogen in combination with P, K and organic manures on juice quality parameters of sugarcane.

Table 3. Sugarcane juice quality (Pol%) as influenced by organic manure and fertilizers (CoSi 95071.20th plant crop)

(Mean of two replications)

N levels kg ha ⁻¹	M1 Control	M2 K alone	M3 P alone	M4 P & K	M5 Compost (c)	M6 C&K	M7 C&P	M8 C, P&K	Mean
S1) 210 as Urea	15.46	16.11	16.64	17.05	16.84	16.85	17.01	17.21	16.64
S2) 210 as NCBU	16.13	16.40	16.84	17.14	17.10	17.25	17.11	17.45	16.92
S3) 280 as Urea	16.28	16.51	17.04	17.45	17.54	17.46	17.49	17.81	17.19
S4) 280 as NCBU	16.67	16.65	17.13	17.61	17.81	17.79	17.79	17.91	17.42
S5) 350 as Urea	17.30	17.81	17.25	17.81	18.01	17.85	17.91	18.03	17.74
S6) 350 as NCBU	17.34	17.86	17.40	17.95	18.12	18.11	18.00	18.25	17.87
Mean	16.53	16.87	17.05	17.50	17.57	17.55	17.55	17.77	
		SEd	CD (P=0.05)						
Main plot (M)		0.027	0.063						
Sub plot (S)		0.015	0.031						
M x S		0.048	0.102						

Table 4. Sugarcane juice quality (Purity %) as influenced by organic manure and fertilizers (CoSi 95071.20th plant crop)

(Mean of two replications)

N levels kg ha ⁻¹	M1 Control	M2 K alone	M3 P alone	M4 P & K	M5 Compost (c)	M6 C&K	M7 C&P	M8 C, P&K	Mean
S1) 210 as Urea	89.31	91.99	92.90	93.62	95.73	95.19	95.50	94.35	93.57
S2) 210 as NCBU	89.45	89.73	93.24	92.79	95.47	95.98	95.58	93.76	93.25
S3) 280 as Urea	87.76	88.52	91.31	93.76	93.54	93.71	92.67	94.78	92.00
S4) 280 as NCBU	88.61	88.84	91.74	94.31	94.83	96.31	93.92	94.91	92.93
S5) 350 as Urea	92.26	94.83	91.70	94.04	95.28	94.04	94.41	95.24	93.97
S6) 350 as NCBU	92.47	95.23	92.47	94.82	95.77	96.84	94.43	96.25	92.91
Mean	89.97	91.52	92.22	93.89	95.10	95.34	91.92	94.88	
		SEd	CD (P=0.05)						
Main plot (M)		1.300	3.075						
Sub plot (S)		1.103	2.230						
M x S		3.131	6.515						

Table 5. Sugarcane juice quality (CCS %) as influenced by organic manure and fertilizers (CoSi 95071.20th plant crop)

N levels kg ha ⁻¹	(Mean of two replications)										Mean
	M1 Control	M2 K alone	M3 P alone	M4 P & K	M5 Compost (c)	M6 C&K	M7 C&P	M8 C, P&K			
S1) 210 as Urea	11.03	11.63	12.09	12.43	12.40	12.37	12.51	12.59	12.13		
S2) 210 as NCBU	11.52	11.74	12.26	12.45	12.57	12.72	12.59	12.73	12.32		
S3) 280 as Urea	11.52	11.73	12.28	12.73	12.79	12.69	12.68	13.06	12.43		
S4) 280 as NCBU	11.84	11.85	12.36	12.88	13.05	13.04	12.99	13.16	12.64		
S5) 350 as Urea	12.53	13.06	12.46	13.01	13.24	13.05	13.11	13.25	12.96		
S6) 350 as NCBU	12.57	13.12	12.62	13.16	13.35	13.34	13.17	13.47	13.10		
Mean	11.83	12.19	12.34	12.78	12.90	12.87	12.84	13.04			
		SEd	CD (P=0.05)								
Main plot (M)		0.121	0.286								
Sub plot (S)		0.093	0.189								
M x S		0.271	0.566								

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