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Nitrogen Management through Organic Manures in Sugarcane (Plant)-Sugarcane (ratoon) Cropping Sequence in Southern Agro-Climatic zone of A P

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ABSTRACT

A field experiment was conducted during 2006-2007, 2007-2008 and 2008-2009 with two plant and two ratoon crops in sandy loam soil at Agricultural Research station Perumallapalle to study the effect of fertilizer nitrogen and organic manures on yield and quality of sugarcane plant and ratoon crops. The experiment was laid out in a split plot design and replicated thrice with three main plots viz., No organic manure (M_1), 25 t/ha farm yard manure (M_2), 12 t/ha press mud cake (M_3) and four sub plots viz., nitrogen levels 200kg N/ha (N_1) 250kg N/ha (N_2), 300 kg N/ha(N_3) and 350 kg N/ha (N_4). The experimental results revealed that application of 25 t/ha FYM and 12t/ha PMC recorded higher cane yield over no organic manure application but, statistically non significant. Cane yield and yield attributes were significantly influenced by the nitrogen levels. Highest cane yield was obtained with 350 kg N/ha but it was on par with 300 kg N/ha. The interaction between organic manures and nitrogen levels was not significant. In ratoon crop there was significant increase in cane yields with organic manures over no organic manures. Highest ratoon cane yields were obtained with PMC @ 12t/ha + 350 kg N/ha and it was on par with 25 t FYM/ ha + 350 kg N/ha.

Key words : Fertilizer nitrogen, Organic manures, Sugarcane.

Sugarcane (Saccharum officinarum L.) is a natural renewable agricultural resource that provides sugar, bio-fuel, fiber and manure besides many other byproducts. The crop is grown mainly to produce sugar and also for making gur and khandasari. It is one of the important commercial crops for production of sugar in the world. In recent years the yields of sugarcane are declining in most of the potential sugarcane areas of southern India mainly due to shortage of water, cultivation in poor soils and imbalanced use of chemical fertilizers besides new pest insurgence. Continuous use of inorganic nitrogen fertilizers, mono cropping system, intensive agriculture, limited use of organic manures leads to nutrient depletion by high yielding varieties which inturn resulting in decline in crop productivity. For achieving high cane yield in sugarcane crop, nitrogen management is the one of the most important practices in sugarcane cultivation. Balanced nutrient management not only plays an important role in growth or development of yield attributes, yield and quality characters of sugarcane but also results in sustaining soil health and productivity and beneficial effect of integrated nutrient management in sugarcane crop was reported by (Gangawar et al., 2003). Combined application of available organic manure along with inorganic fertilizers assures high crop productivity on sustainable basis in various cropping systems (Singh and Biswas 2000). Higher fertilizer doses coupled with organic manures proved to be superior in growth, yield and soil health sustainability when compared with exiting recommendation thus to make the sugarcane cultivation remunerative. Hence, there is need to refine the source of nitrogen as inorganic fertilizer up to the desired level. In view of this, the present study was under taken with primary objective to optimize the fertilizer needs for sugarcane with or with out organic manure to enhance the productivity and quality of sugarcane in sandy loam soils of southern zone of A.P.

MATERIAL AND METHODS

Field experiment was conducted during 2006-2007, 2007-2008 and 2008-2009 with two plant crops and two ratoon crops at Agricultural Research Station, Perumallapalle. The experimental field was sandy loam in texture with P^H 7.6, low in organic carbon (0.32%), available N (184.4 kg N/

ha) available P (8.97kg/ha) and available K (315kg/ha).The experiment was conducted in a split plot design with three replications. The main plots were organic manures viz., No organic manure (M_1) 25 t/ha FYM (M_2) and 12 t/ha PMC(M_3) sub plots viz., Nitrogen levels 200 kg N/ha (N_1), 250 kg N / ha (N_2) 300 kg N /ha (N_3) and 350 kg N/ha (N_4). Press mud cake (PMC) was transported from sugar factory before 3 months of application (FYM) and allowed to dry under shade for 1-2 months before soil application. The required quantity of farm yard manure and well dried press mud cake were applied at the time of last ploughing and mixed well in to the soil as per the treatment. Fertilizer nitrogen was applied through urea and it was calculated and applied as per treatment in two split doses one at 45 days after planting second dose at 90 days after planting. Recommended dose of Phosphorus i.e., 112 kg of P_2O_5 through single super phosphate and 112 kg of K_2O through muriate of potash were applied as basal. An early maturing sugarcane variety sarada (93A145) was planted by opening 20 cm deep furrow at 80 cm row spacing as normal row method of planting. Atrazine @ 5 kg /ha was applied as pre- emergence herbicide. All the recommended agronomic practices viz., earthing up T.T.propping were followed throughout the cropping period. At the time of harvesting juice analysis for brix per cent and sucrose per cent was done as per the method given by Spencer and Meade (1995). At the time of harvesting data on yield and yield attributes were recorded and statistical analysis was taken up as per the method given by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

Effect of organic manures on sugarcane yield, yield attributes and juice quality.

During both years of study in sugarcane plant crop application of farm yard manure @25t/ha and press mud cake @ 12t/ha showed positive response on yield attributes and yield of sugarcane. Highest millable cane length, cane diameter and more number of millable canes were recorded with application of organic manures over no organic manure application, but statistically non-significant. Press mud cake application showed higher response in increasing cane yield compared to farm yard manure in both plant and ratoon crops which might be due to higher nitrogen content in press mud cake and low content of nitrogen in farm yard manure. These results are in conformity with Singh *et al.,*(1995), Mehta *et al.,*(1996) and Rao and Veeranna (1998). During both the years of study the maximum sucrose per cent was obtained with application of organic manures though the results were found to be non significant.

Effect of nitrogen levels on yield, yield attributes and juice quality.

During the both years of study longest millable canes with more cane diameter and highest millable canes were recorded with 350 kg N/ha but it was on par with 300kg N/ha and 250 kg N /ha application. The cane yield increased significantly with successive increase in the levels of nitrogen from 200 to 350 kg N/ha due to increase in number of millable canes, cane length and cane diameter. The beneficial effects of nitrogen on the yield of sugarcane were reported by Mahamuni *et al.,* (1973) Kar and Gupta (1963) and Singh and Tomor (1976), Kadam *et al.,* (1991) and Umat (1964).The sucrose per cent increased slightly with increased levels of nitrogen which was statistically non-significant.

Interaction effect between organic manures and fertilizer nitrogen.

The yield and yield attributes were significantly influenced by the application of different levels of nitrogen. Cane yield increased with successive increase in the levels of nitrogen. The initial requirement of nitrogen to the sugarcane crop is more and it might have been fulfilled from urea. Farm yard manure and press mud cake might have been utilized during grand growth period of the crop. These results are in conformity with the results of Tamilselvan and Jayabal (1993). Sonawane and Sabale (2000). The interaction effect was not significant between organic manures and fertilizer nitrogen levels.

Effect of organic manures and fertilizer nitrogen on yield and yield attributes of ratoon sugarcane.

During both years of study the ratoon cane yields were significantly influenced by the organic manures and fertilizer nitrogen levels. The highest number of millable canes and cane yields were recorded with application of press mud cake along

Table 1. Effect of organic manures and fertilizer nitrogen on yield and quality of sugarcane (plant crop).

Treatment	Millable cane length (m)		Millable cane diameter (cm)		Number of millable canes/ha		Cane yield (t/ha)		Sucrose (%)	
Main: Organic manury	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
M_1: No organic manure	2.51	2.63	2.62	2.67	71996	99566	118.0	115.0	18.96	19.43
M_2:Farm yard manure @ 25 t/ha	2.65	2.72	3.06	2.76	72545	102153	121.0	119.0	19.02	19.26
M_3:Pressmudcake @12t/ha	2.75	2.79	3.13	2.87	73549	105794	126.0	123.0	19.16	19.39
SEm+/-	0.06	0.07	0.014	0.05	1146.5	2378.7	3.5	0.92	0.74	0.12
CD (0.05)	NS	NS	NS	NS	NS	6976.9	NS	NS	NS	NS
Sub : Nitrogen levels										
N_1:200 kgN/ha	2.50	2.52	2.93	2.73	71286	96310	114.8	110.6	19.10	19.05
N_2:250 kgN/ha	2.60	2.63	3.02	2.82	72546	106358	120.4	121.2	19.13	19.47
N_3:300 kgN/ha	2.71	2.76	3.07	2.89	73758	103434	127.4	123.6	19.02	19.48
N_4 :350kgN/ha	2.92	2.86	3.13	2.98	75259	103916	130.2	128.9	19.12	19.14
SEm+/-	0.09	0.08	0.04	0.05	1081	2747	3.54	1.06	0.51	0.40
CD (0.05)	0.26	0.25	0.12	0.17	3202	8056	10.49	3.13	NS	NS

Table 2. Effect of organic manures and fertilizer nitrogen on yield and quality of sugarcane (Ratoon crop).

Treatment	Millable cane length (m)		Millable cane diameter (cm)		Number of millable canes/ha		Cane yield (t/ha)		Sucrose (%)	
Main: Organic manury	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-08	2007-08	2008-09
M_1: No organic manure	2.36	1.89	2.67	2.63	59869	61175	81.2	83.4	18.37	19.24
M_2:Farm yard manure@25t/ha	2.48	1.98	2.84	2.72	62016	72462	89.4	94.7	18.72	19.06
M_3:Pressmudcake@12t/ha	2.49	2.05	2.90	2.78	65352	73426	96.3	99.7	18.58	19.16
SEm+/-	0.05	0.04	0.07	0.01	1768.6	59.5	0.07	0.38	0.29	0.08
CD (0.05)	NS	NS	NS	NS	3498.6	92.3	0.16	1.32	NS	NS
Sub : Nitrogen levels										
N_1:200 kgN/ha	2.41	1.84	2.67	2.55	62612	69554	85.9	96.69	18.47	19.23
N_2:250 kgN/ha	2.47	1.97	2.95	2.95	65468	70433	89.5	98.08	18.66	19.01
N_3:300 kgN/ha	2.50	2.02	2.93	2.93	67762	71369	90.7	100.06	18.86	19.21
N_4 :350kgN/ha	2.69	2.07	2.98	2.98	67636	72986	93.9	102.9	18.98	18.96
SEm+/-	0.03	0.02	0.03	0.03	777.7	162.8	1.15	0.29	0.11	0.04
CD (0.05)	NS	0.03	0.05	0.05	1166	326.9	1.80	0.45	NS	NS
Interaction	NS	NS	NS	NS	sig	sig	sig	sig	NS	NS

with fertilizer nitrogen 350 kg N/ha. This may be because of cumulative effect resulted in increasing the growth contributing characters. Similar results were reported by Patil et al., (1978), Jadhav et al.,(1985) Duraiswamy et al.,(1987) and Hapse (1993).

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