IMPACT OF INTEGRATED APPLICATION OF ORGANICS AND INORGANICS ON YIELD AND QUALITY OF SUGARCANE IN NORTH COASTAL ZONE OF ANDHRA PRADESH

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Abstract: A field experiment was conducted for two consecutive years during 2014-15 and 2015-16 at Regional Agricultural Research Station, Anakapalle, A.P, India to study the effect of integrated application of organics and inorganics on yield and quality of sugarcane. The experiment was laid out in Randomized Block Design with three replications constituting nine treatments viz., T1-50% RDF: T2-100% RDF: T3- Soil test based fertilizer application: T4-FYM @ 20 t/ha + 50% RDF: T5-FYM @ 20 t/ha + 100% RDF: T6-FYM @ 20 t/ha + Soil test based fertilizer application: T7-FYM @ 10 t/ha +Biofertilizer (Azatobacter+ PSB @ 5 t/ha) + 50% RDF: T8-FYM @ 10 t/ha +Biofertilizer (Azatobacter+ PSB @ 5 t/ha) +100% RDF: T9- FYM @ 10 t/ha +Biofertilizer (Azatobacter+ PSB @ 5 t/ha) + Soil test based fertilizer application. The results of two years study revealed that, integrated application of FYM, Biofertilizers and inorganic chemical fertilizers found to be economical and gave higher cane yield than using only inorganic fertilizers. Application of FYM @ 10 t/ha +Biofertilizer (Azatobacter+ PSB @ 5 t/ha) + Soil test based fertilizer application recorded significantly higher cane yield of 67.4 and 95.4 t/ha during 2014-15 and 2015-16 respectively as compared to the application of only inorganic fertilizers or FYM+ inorganic fertilizers but found on par with application of FYM @ 10 t/ha +Biofertilizer (Azatobacter+ PSB @ 5 t/ha) +100% RDF (66.7 and 95.4 t/ha during 2014-15 and 2015-16 respectively).

Key words: Biofertilizers, FYM, Inorganic fertilizers, Sugarcane

Introduction: Sugarcane is one of the important commercial crops of industrial importance next to cotton in India. Sugarcane occupies an area of 5.0 million hectares with an average productivity of 68.6 t/ha though there is a wide variation with productivity across the different regions in India. In tropical region , Andhra Pradesh is one of the important states which produces sugar and jaggery from sugarcane. During 2013-14, sugarcane is cultivated in an area of 1.91 lakh ha with a production of 149.76 lakh tones in Andhra Pradesh (Cooperative Sugar,2014). As sugarcane is long duration crop it is heavy feeder of nutrients from soil. On an average a tone of sugarcane removes 5.0, 1.15 and 5.25 Kg of N, P_2O_5 and K_2O respectively from soil. Soil alone can not supplement such huge quantity of nutrients. Hence, nutrient demand has to be met from other sources also apart from inorganic sources. Use of only organic manures or chemical fertilizers is not advantageous due to their limited availability and high input cost for sustainable crop production. The long term experiments conducted on manures and fertilizers in sugarcane proved that neither the chemical fertilizers alone nor the organic sources exclusively can achieve production sustainability of soil and crop (Singh and Biswas,2000). Integrated use of inorganic fertilizers and organic manures improves the over all availability of nutrients through synergistic effects (Ramalakshmi *et al*., 2013). The present investigation is carried out with a view to economizing inorganic fertilizer through integrated application of organic manures , biofertilizers and inorganic chemical fertilizers during 2014-15 and 2015-16 in N.C zone of A.P.

Materials and Methods: A field experiment was conducted on Sugarcane Cv.2001 A 63 at Regional Agricultural Research Station, Anakapalle, Andhra Pradesh from 2014-15 to 2015-16. Initial soil analysis indicated that the experimental soil was neutral in reaction(pH- 7.57), normal in E.C (0.356 dSm^{-1}), low in organic carbon (0.50), low in available nitrogen (201 Kg N/ha), medium in available phosphorus (40.2 Kg P_2O_5 /ha) and high in available potassium (360 Kg K_2O /ha).

Organic and inorganic nutrients along with Biofertilizers in different combinations, thus constituting nine treatments were studied in Randomized Block Design with three replications. Early maturing sugarcane variety 2001 A 63 (Kanakamahalakshmi) was planted in 90 cm row spacing using three budded setts @ 40,000/ha in the month of February during two seasons. As per the treatments entire dose of phosphorous and potassium and also the FYM was applied as basal in planting furrows. Nitrogen was applied in two equal split doses at 45 and 90 days after planting. Biofertilizer (Azatobacter + PSB) @ 5 Kg/ha was applied 5 days after planting in the furrows when there was an optimum soil moisture. All other agronomic practices like weeding, earthing up, trash twist propping etc., were carried out according to the recommendations for North Coastal Zone of Andhra

Pradesh. Plant protection measures were taken up as and when required. Yield attributes like number of millable canes, cane length and cane yield were recorded at the time of harvest. Juice quality parameters viz., sucrose% was recorded and CCS % and sugar yield were computed at harvest following the standard procedures.

Results and Discussion:

Germination percent: Germination was recorded at 45 days after planting and expressed in % and presented in table-1. At 45 DAP, Application of FYM @ 10 tonnes/ha + Biofertilizer (Azotobactor + PSB) + inorganic nutrient application based on Soil test basis recorded significantly higher germination per cent as compared to no organic treatmental plots but found on par with other treatments during first year of study. On the other hand no significant differences in germination percent was observed during second year of study.

Number of millable canes: Number of millable canes was recorded at harvest and data are presented in table -1. During 2014-15 significant differences in number of millable canes were not observed. How ever application of FYM @ 10 t/ha + Biofertilizer (Azotobactor + PSB) + inorganic nutrient application based on Soil test basis recorded higher number of millable canes (67,300/ha) at harvest. Significant differences were observed in number of millable canes due to different organic and inorganic treatments during 2015-16. Application of FYM @ 10 t/ha + Biofertilizer (Azotobactor + PSB) + inorganic nutrient application based on soil test basis recorded significantly higher number of millable canes (80,100/ha) at harvest. It is an established fact that an increase in tillering ability of sugarcane plant leads to increase the number of millble canes at harvest which is one of the important yield attributes responsible in boosting the productivity of sugarcane (Babu, 2004).

Length of Millable Cane (cm): Length of the millable cane was measured at harvest in cm and data are presented in Table-1. During both the years significantly longest canes were registered in application of FYM @ 10 tonnes/ha + Biofertilizer (Azotobactor + PSB) + inorganic nutrient application based on soil test basis treatment (331.0 and 266.2 cm respectively).

Cane yield: Cane yield was recorded at harvest and the data are presented in table-1. Integrated application of inorganic chemical fertilizers with organic manures had significant impact on cane yield during both the years. Application of FYM @ 10 t/ha + Biofertilizer+inorganic nutrient application based on soil test registered significantly higher cane yield of 67.4 and 95.6 t/ha during 2014-15 and 2015-16 respectively as compared to other treatments but found on par with Application of FYM @ 10 tonnes/ha+ Biofertilizer+ 100%RDF It is inferred that integrated use of organics and inorganics resulted in higher productivity besides improving the soil fertility. Similar observations were also made by Ramalakshmi *et al.*, (2013). The increase in yield of cane with varying levels of application of organic sources with inorganic sources also reported by Bangar *et al.,(*1995).

Juice quality: Per cent juice sucrose values and commercial cane sugar did not vary significantly due to different organic and inorganic treatments during the both the years. Sugar yield was calculated based on CCS% and cane yield. Highest sugar yields were observed in integrated application of FYM, biofertilizer and inorganic chemical fertilizers.

Conclusion: Two years study indicated that integrated application of application of FYM @ 10 t/ha + Biofertilizer + inorganic nutrient application based on soil test or of FYM @ 10 t/ha + Biofertilizer+ 100% RDF (inorganic source) was found beneficial for improving cane yield, juice quality and also the soil fertility in sandy loam soils of north coastal zone of Andhra Pradesh.

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Table:1 - Yield attributes, Yield and quality of sugarcane as influenced by application of different nutrients during 2014-15 and 2015-16

Treatments	Germination (%)		No.of millable canes(000/ha		Length of millable cane (cm)		Juice sucrose (%)		Cane yield (t/ha)		CCS (%)		Sugar Yield (t/ha)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
No organic + 50% RDF	66.3	70.0	60.8	69.2	240.7	292.2	17.2	16.8	58.2	80.4	11.7	12.1	6.8	9.7
No organic + 100% RDF	61.0	71.3	61.3	71.4	249.9	309.5	17.7	17.6	62.8	85.9	12.1	12.8	7.1	11.0
No organic + Soil test based recommendation	64.1	70.4	59.4	72.3	251.2	331.0	16.6	17.6	63.0	86.9	11.3	12.7	7.0	11.0
FYM@ 20 t/ha + 50% RDF	71.8	68.3	63.5	71.8	254.7	311.5	17.0	15.4	60.0	89.7	11.5	11.0	6.9	9.8
FYM @ 20 t/ha + 100% RDF	76.6	74.8	64.5	75.3	256.7	311.2	17.2	16.5	63.5	93.7	11.7	11.8	7.1	11.1
FYM 20 t/ha + inorganic nutrient application based on soil test	76.6	77.8	64.8	77.4	257.8	327.8	17.6	16.8	64.0	94.1	11.7	12.2	7.2	11.0
FYM @ 10 t/ha +(Azotobactor + PSB) + 50% RDF	75.9	71.7	63.5	77.7	257.3	310.7	17.1	18.0	61.7	90.9	11.9	13.0	7.4	11.8
FYM @ 10 t/ha +(Azotobactor + PSB) + 100%RDF	74.7	73.8	66.7	78.8	261.3	310.3	17.0	16.6	66.7	95.4	11.5	12.3	7.7	11.6
FYM@ 10 t/ha + (Azotobactor + PSB) + inorganic nutrient application based on Soil test basis	77.4	74.9	67.3	80.1	266.2	328.2	17.5	16.5	67.4	95.6	12.0	11.8	8.1	11.2
SEm+	3.13	6.13	0.45	0.6	8.0	5.25	0.48	0.40	1.4	1.9	0.43	0.44	0.42	0.53
C.D (0.05)	9.4	NS	NS	1.9	24.0	22.2	NS	NS	4.1	5.7	NS	NS	NS	NS
C.V(%)	7.6	11.3	5.4	7.0	12.3	4.1	4.5	4.1	3.4	6.6	6.5	6.25	8.0	8.4

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