



Performance of Nutrient mixture on growth, yield and economics of Sugarcane

Sahaja Deva¹, Prasanna Lakshmi Ravuri², Yallaturu Peeru Saheb³ and

MK Jyosthna⁴

¹Scientist (Agronomy), Agricultural Research Station, Ananthapuramu, ³Subject Matter Specialist (Crop Protection), Krishi Vigyan Kendra, Kalikiri, ²Assistant Professor (Entomology), ⁴Associate Professor (Pl.Pathology), S.V. Agricultural college, Tirupati

ABSTRACT: The On-Farm trials were conducted by Krishi Vigyan Kendra, Kalikiri during late *Rabi*/summer, 2020-21 and 2021-22 to assess the influence of higher doses of fertilizers on growth, yield and economics of Sugarcane. Results revealed that total cane height, milleable cane height, no. of internodes, no. of milleable internodes, internode length, cane weight were higher in treatment plot which were the major yield attributing characters. On an average, mean yield of 105.1 t/ha were recorded in Treatment plot with 6.1% yield increase over farmers practice (99.1 t/ha). Treatment plot was recorded 6.0% higher jaggery yield (10.6 t/ha) compared to farmers practice (10.0 t/ha). Net returns of 228328 and 197375 Rs.ha⁻¹ were recorded in Treatment plot and farmers practice, respectively. B: C ratio was significantly higher in Treatment plot (2.02) compared to farmers practice with 1.88.

Keywords: Economics, Growth, Micronutrient mixture, Sugarcane, Yield

INTRODUCTION:

Sugarcane is one of the most important commercial crops in India. Sugarcane contributes 60% of total sugar production in India. Whereas, 40% of sugar production is with Beetroot. In developed countries like Japan, USA and USSR on an average one person takes 45 kg of sugar. However, sugar intake per person including jiggery is 15 kilos in India. Sugarcane is being grown in 102 countries. Most important sugarcane growing countries are India, Brazil, Cuba, USA, USSR, Indonesia, Japan and Taiwan. In India Sugarcane is growing

in all states except Jammu & Kashmir. Major sugarcane growing states are Maharashtra, Karnataka, TamilNadu, Andhra Pradesh, Orissa, Telangana and Madhya Pradesh occupying 40% of the total area in the country (Govindaraj *et al.*, 2017). In Andhra Pradesh, Sugarcane crop was grown in 86 thousand ha with production of 67 lakh ha during 2019-20. In Chittoor dt, sugarcane is grown in an area of 134 ha during 2021. Many by products like sugar, jiggery, brown sugar, molasses and filter mud are preparing with sugarcane. Yields and sugar content is being influenced by different factors like environmental conditions, land, management practices, plant protection measures, fertilizer management, irrigation water quality and varieties. In Chittoor district micronutrient deficiencies are very common which leads to hidden hunger, a phenomena where there are no visible symptoms of micronutrient deficiencies. Micronutrient absorption by plants influenced by various factors like soil type, crop variety and plant age. Most of the farmers are not applying micronutrients to sugarcane. The application of micronutrients may increase the yields of Sugarcane. In order to assess the performance of micronutrient mixture developed by RARS, Tirupati; the On Farm Trials were conducted in farmers fields of Chittoor district.

MATERIALS AND METHODS:

The On-Farm trials were conducted by Krishi Vigyan Kendra, Kalikiri during late *Rabi*/summer, 2020-21 and 2021-22 to assess the performance of nutrient mixture on growth, yield and economics of Sugarcane. Sites for the on-farm testing were selected where Sugarcane is grown as a major crop. In treatment plot crop was supplied with 2% Foliar spray of Nutrient mixture (Iron, manganese, zinc, boron, potash) at 45 and 90 DAP + 100% RDF (90:40:48 kg NPK/ac at 45 and 90 DAP). In control plot (Farmers practice), crop was supplied with FYM- 12 t/ac, Urea: 240 kg/ac, SSP: 280 kg/ac, MOP: 120 kg/ac (110.4:44.8:72 kg NPK at 30 DAP). Trials were conducted in 2.0 ha area in five farmers fields during each year in Jogivariaplli village of Sodem mandal. Soils of the study area are sandy loam in texture with low available

Eur. Chem. Bull. 2023, 12(Special Issue 8),4154-4161

nitrogen and phosphorus, high in potassium, deficit in zinc and iron. Plantings were done during the month of March-April. For weed management atrazine 50% was sprayed by mixing 2 kg in 200 litres of water in one acre area. Propping was done 4 times at regular intervals whenever required to prevent crop lodging. The data recorded on various parameters like cane length, malleable cane length, girth, no. of internodes, no. of malleable internodes, internode length, cane weight and cane yield by cutting cane to the base. Jaggery yield was recorded by preparing jaggery in the field itself. To calculate economics prices of inputs and outputs during the year when trials were conducted were taken into consideration.

Table 1: Rainfall data during crop growth period

Month	Normal (mm)	Actual (mm)	Deviati on (%)	Month	Norma l (mm)	Actual (mm)	Deviati on (%)
March, 2020	7.7	6.5	-15.6	March, 2021	7.7	00	-100
April, 2020	17.6	54.3	208.5	April, 2021	17.6	0.3	-98.3
May, 2020	61.7	24.0	-61.1	May, 2021	61.7	59.6	-3.4
June, 2020	78.7	108.4	37.7	June, 2021	78.7	111.2	41.3
July, 2020	101.9	309.1	203.3	July, 2021	102	223.1	118.9
August, 2020	117.4	114.1	-2.8	August, 2021	117.4	151.2	28.8
September, 2020	141.4	188.5	33.3	September, 2021	141.1	156.1	10.4
October, 2020	162.7	154.6	-5.0	October, 2021	162.7	199.8	22.8
November, 2020	162.7	290.9	78.9	November, 2021	162.6	477.8	193.8
December, 2020	70.1	104.1	48.5	December, 2021	70.1	39.1	-44.2
January, 2021	7.8	34.6	343.6	January, 2022	7.8	17.0	117.9
February, 2021	4.3	11.7	172.1	February, 2022	4.3	0	-100

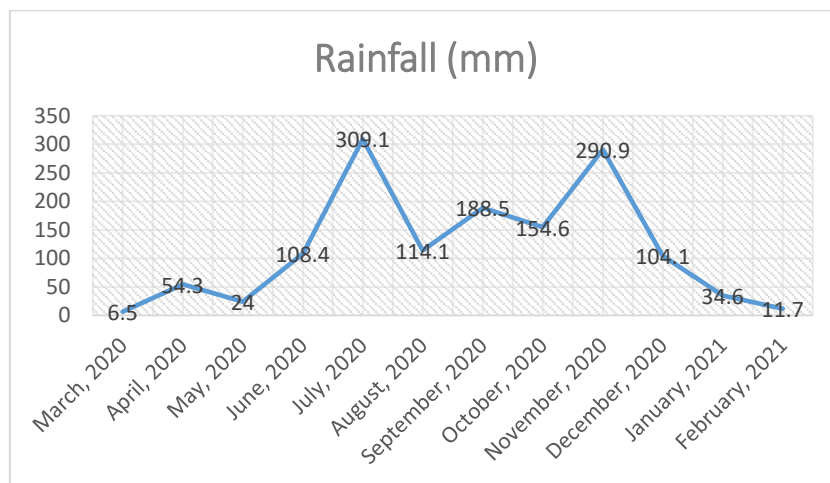


Fig. 1 Rainfall pattern during crop growth period, 2020-21

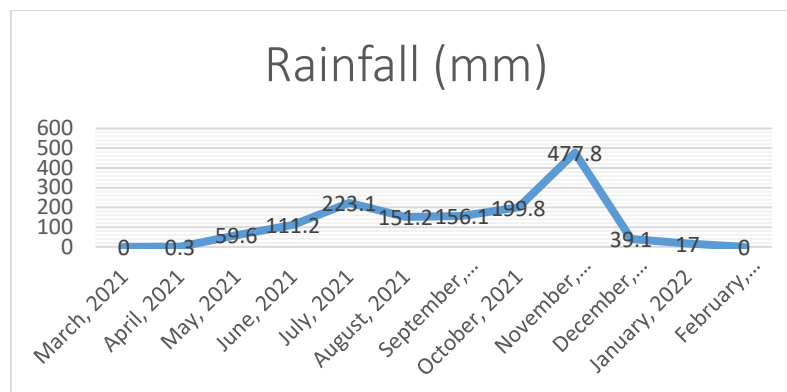


Fig. 2 Rainfall pattern during crop growth period, 2021-22

RESULTS AND DISCUSSION:

Yield attributes:

Total cane height, milleable cane height, girth, no. of internodes, no. of milleable internodes, internode length, cane weight were higher in treatment plot (Table 2 and 3). Total cane length and milleable cane length of Treatment plot was 308.5 and 302.6 cm on mean basis. Whereas, in farmers practice 274.6 and 255.0 cm total and milleable cane length was recorded. Girth of the cane was more in treatment plot (8.4 cm) compared to farmers practice (8.1 cm). On an average, 26.2 and 24.8 internodes and milleable internodes were observed in treatment plot; 25.0 and 22.5 internodes and milleable internodes were observed in farmers practice. Internode length was more in treatment plot (5.4 cm) compared to farmers practice (5.1 cm). Cane weight of 2.6 and 2.5 kg were recorded in treatment plot and farmers practice. Micronutrients helped in increasing height and internodes in the cane. These results are in conformity with findings of Estevao Vicari Mellis *et al.*, 2016. Zinc helps in enhancing plant growth due to more vegetative development due to availability of balanced zinc nutrition.

Table 2: Yield attributes of sugarcane in treatment plot and farmers practice

Year	Total cane height (cm)		Milleable cane height (cm)		Girth (cm)		No. of internodes		No. of milleable internodes		Internode length (cm)	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
2020-21	308.0	275.2	300.0	255.7	8.1	8.1	26.5	25.0	25.0	22.9	5.4	5.0
2021-22	309.0	273.9	305.2	254.2	8.1	8.0	25.9	25.0	24.5	22.0	5.4	5.1
Mean	308.5	274.6	302.6	255.0	8.1	8.1	26.2	25.0	24.8	22.5	5.4	5.1

T1: 2% Foliar spray of Nutrient mixture (Iron, manganese, zinc, boron, potash) at 45 and 90 DAP + 100% RDF (90:40:48 kg NPK/ac at 45 and 90 DAP)

T2 (Farmers practice): FYM-12 t/ac, Urea: 240 kg/ac, SSP: 280 kg/ac, MOP: 120 kg/ac (110.4:44.8:72 kg NPK at 30 DAP)

Table 3: Cane Yield and Jaggery yield of of sugarcane in treatment plot and farmers practice

Year	Cane weight (Kg)		Cane yield (t/ha)		Jaggery yield (t/ha)		Jaggery yield (kg)/tonne of cane	
	T1	T2	T1	T2	T1	T2	T1	T2
2020-21	2.6	2.5	108.8	108.0	11.7	11.6	107.5	107.4
2021-22	2.6	2.5	101.3	90.2	9.5	8.4	93.8	93.1
Mean	2.6	2.5	105.1	99.1	10.6	10.0	100.7	100.3

T1: 2% Foliar spray of Nutrient mixture (Iron, manganese, zinc, boron, potash) at 45 and 90 DAP + 100% RDF (90:40:48 kg NPK/ac at 45 and 90 DAP)

T2 (Farmers practice): FYM-12 t/ac, Urea: 240 kg/ac, SSP: 280 kg/ac, MOP: 120 kg/ac (110.4:44.8:72 kg NPK at 30 DAP)

Yield:

Cane yield:

Perusal of the data presented in table 3 and 4 proved that there was significant difference in terms of cane yield during both the years and mean in treatment plot and farmers practice. Treatment plot has recorded significantly highest cane yield compared to farmers practice. During 2020-21, cane yield of 108.8 t/ha was recorded in Treatment plot. Whereas, in Farmers practice cane yield of 108.0 t/ha was recorded. During 2021-22 cane yield of 101.3 and 90.2 t/ha were recorded in Treatment plot and Farmers practice varieties; respectively. On an average, mean yield of 105.1 and 99.1 t/ha were recorded in Treatment plot and Farmers

practice. When compared to farmers practice there was 6.1% increase in cane yield in Treatment plot. Yield is a dependent variable on various parameters like cane length, weight, girth, internodes etc., which were higher in Treatment plot that lead to higher yield compared to farmers practice. Micronutrients increase crop yield, zinc is the principle micronutrient to sugarcane producer. These findings are similar to the findings of Naga Madhuri *et al.*, 2013, Fernanda forli *et al.*, 2017 and Abdul majeed *et al.*, 2022.

Jaggery yield:

Jaggery yield was significantly higher in Treatment plot compared to farmers practice. On an average, Treatment plot was recorded 6.0% higher jaggery yield (10.6 t/ha) compared to farmers practice (10.0 t/ha). In Treatment plot 100.7 kg of Jaggery was produced from one tonne of Sugarcane. Whereas, in case of farmers practice 100.3 kg of Jaggery was produced from one tonne of Sugarcane.

Table 4: Summary of one way ANOVA in comparing yield of sugarcane in treatment plot and farmers practice

Particulars	Treatments	N	Mean	Std.Deviation	t-value	p-value
Cane yield	T1	5	105.1	2.40	2.31**	0.004
	T2	5	99.1	1.68		
Jaggery yield	T1	5	10.6	0.16	2.31**	0.004
	T2	5	10.0	0.13		

*Significant at 5% level, **Significant at 1% level

T1: 2% Foliar spray of Nutrient mixture (Iron, manganese, zinc, boron, potash) at 45 and 90 DAP + 100% RDF (90:40:48 kg NPK/ac at 45 and 90 DAP)

T2 (Farmers practice): FYM-12 t/ac, Urea: 240 kg/ac, SSP: 280 kg/ac, MOP: 120 kg/ac (110.4:44.8:72 kg NPK at 30 DAP)

Economics:

Based on average prices of inputs and output commodities prevailed during each year of assessment, values of economic indicators like gross cost of cultivation, gross returns, net

returns and B:C ratio were calculated and presented in table 6. Gross returns, net returns and B:C ratio were substantially higher compared to farmers practice (Table 5). Gross returns of 451838 Rs.ha⁻¹ were recorded in Treatment plot and 422375 Rs.ha⁻¹ in farmers practice. Net returns of 228328 and 197375 Rs.ha⁻¹ were recorded in Treatment plot and farmers practice, respectively. B: C ratio was significantly higher in Treatment plot (2.02) compared to farmers practice with 1.88. Higher net returns and B:C ratio in Treatment plot was due to higher cane and jaggery yields.

Table 5: Economics of sugarcane in treatment plot and farmers practice

Year	Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		B: C ratio	
	T1	T2	T1	T2	T1	T2	T1	T2
2020-21	223510	225000	429925	423500	206415	198500	1.92	1.88
2021-22	223510	225000	473750	421250	250240	196250	2.12	1.87
Mean	223510	225000	451838	422375	228328	197375	2.02	1.88

T1: 2% Foliar spray of Nutrient mixture (Iron, manganese, zinc, boron, potash) at 45 and 90 DAP + 100% RDF (90:40:48 kg NPK/ac at 45 and 90 DAP)

T2 (Farmers practice): FYM-12 t/ac, Urea: 240 kg/ac, SSP: 280 kg/ac, MOP: 120 kg/ac (110.4:44.8:72 kg NPK at 30 DAP)

CONCLUSION: It has been concluded there was significant difference in cane yield (105.1 t/ha) and jaggery yield (10.6 t/ha) in Treatment plot compared to farmers practice (99.1 t/ha and 10.0 t/ha). B: C ratio of 2.02 was recorded in treatment plot which was higher compared to farmers practice with 1.88. Sugarcane crop when received with required amount of macro and micronutrient supplying fertilizers gives significantly higher yield and higher B: C ratio.

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