Andhra Pradesh J Agril. Sci : 10(1): 10-14, 2024

INFLUENCE OF HIGHER DOSES OF FERTILIZERS ON GROWTH, YIELD AND ECONOMICS OF SUGARCANE

SAHAJA DEVA*, YALLATURU PEERU SAHEB, PRASANNA LAKSHMI RAVURI, K. MADHURI AND M.K. JYOSTHNA

Scientist (Agronomy), Regional Agricultural Research Station, Tirupati-517 502.

Date of Receipt: 24-12-2023 Date of Acceptance: 18-02-2024

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 106.4 t ha^{-1} were recorded in Treatment plot with 3.6 per cent yield increase over farmers practice (102.7 t ha^{-1}). Treatment plot was recorded 6.5 per cent higher jaggery yield (11.4 t ha^{-1}) compared to farmers practice (10.7 t ha^{-1}). Net returns of ₹ 231468 and 219250 ha^{-1} were recorded in Treatment plot and farmers practice, respectively. Benefit-Cost ratio was significantly higher in Treatment plot (2.02) compared to farmers practice with 1.91.

KEYWORDS: Economics, Fertilizers, Growth, Sugarcane, Yield.

INTRODUCTION

Sugarcane is one of the most important commercial crops in India. Sugarcane contributes 60 per cent of total sugar production in India. Whereas, 40 per cent of sugar production was 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 jaggery is 15 kilograms 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 and Kashmir. Major sugarcane growing states are Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Telangana and Madhya Pradesh occupying 40 per cent of the total area in the country (Govindaraj *et al*., 2017). In Andhra Pradesh, Sugarcane crop was grown in 40,000 ha with production of 3.12 mt during 2022-23. In Chittoor district, sugarcane is grown in an area of 134 ha during 2021. Many by products like sugar, jaggery, brown sugar, molasses and filter mud are preparing with sugarcane. Cane yield and sugar content is being influenced by different factors like varieties, environmental conditions, land, management practices, plant protection measures, irrigation and water quality and varieties. Sugarcane suffers from different biotic and abiotic stresses like pests, diseases, drought, salinity, waterlogging which leads to deterioration of sugar quality and huge yield losses (Nair, 2011). In Chittoor district, farmers are using very less fertilizers in sugarcane crop because of which crop is not receiving required amount of nutrients which in turn causes reduction cane yield as well as reduced sugar recovery. There is a need to increase the dose of fertilizer application to sugarcane crop for enhancing productivity and quality of Sugarcane. As a part of this, fertilizer dose recommended by RARS, Tirupati was adopted in the district.

MATERIAL AND METHODS

The On-Farm trials were conducted by Krishi Vigyan Kendra, Kalikiri during late *Rabi*/summer during 2020-21 and 2021-22 to assess the influence of fertilizers doses on growth, yield and economics of sugarcane. Sites for the on-farm testing were selected where Sugarcane is grown as a major crop. A total of 1401 and 1435 mm of rainfall was received in the study area during 2020 and 2021, respectively. In treatment plot, crop was supplied with 125% RDNP and Zn and 100% K and B (281:125:120 kg NPK, 156 kg Zn and 31 kg Borax/ha**)**. In control plot (Farmers practice), crop was supplied with FYM-30 t ha^{-1}, Urea: 600 kg ha^{-1}, SSP: 700 kg ha^{-1}, MOP: 300 kg ha^{-1} (276:112:180 kg NPK ha^{-1}). In Treatment plot entire phosphorus, potassium, zinc and Boron was applied as basal. Nitrogen was applied in two equal split doses at 45 and 90 DAP. In farmers practice, entire dose of fertilizers were applied at 30 DAP. Trials were conducted in 2.0 ha area in five farmers fields during each year in Jogivariaplli village of Sodum mandal. Soils of the study area are sandy loam in

*Corresponding author, E-mail:

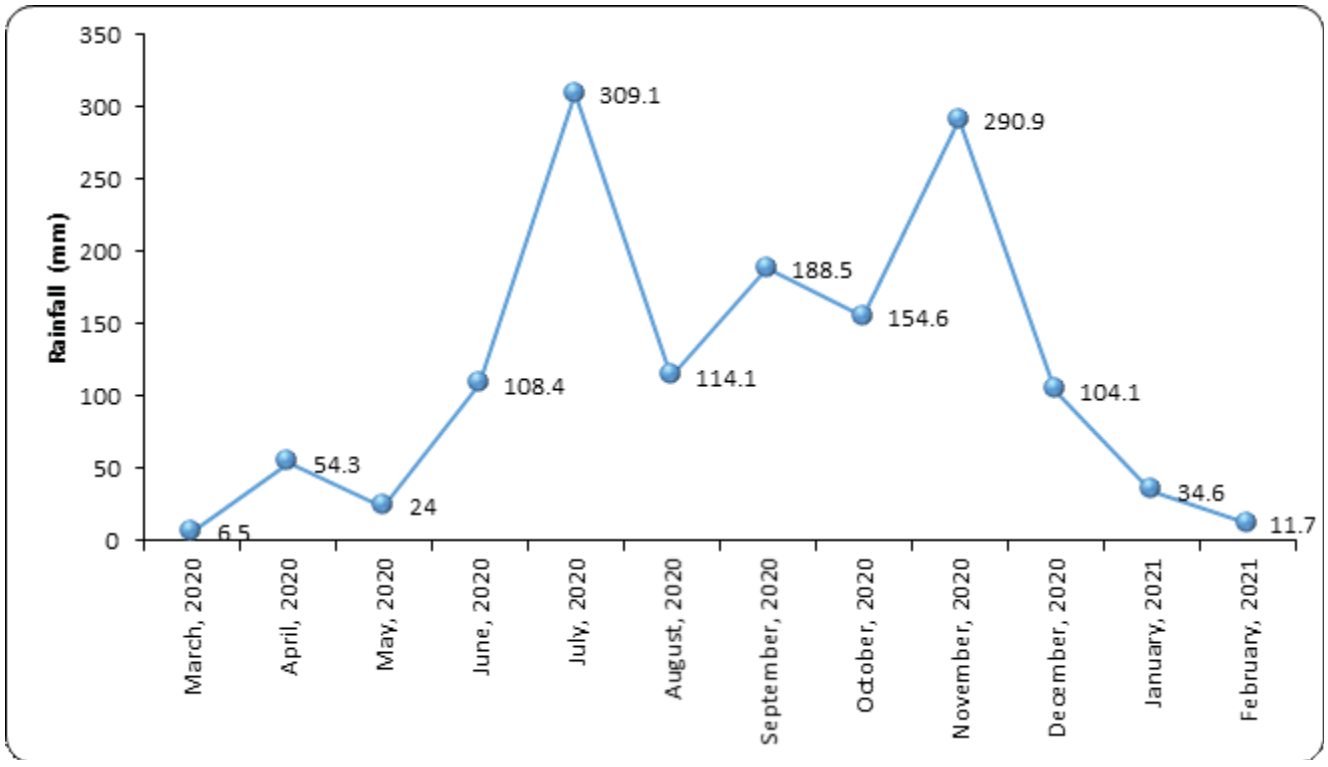

Fig. 1. Rainfall pattern during crop growth period, 2020-21.

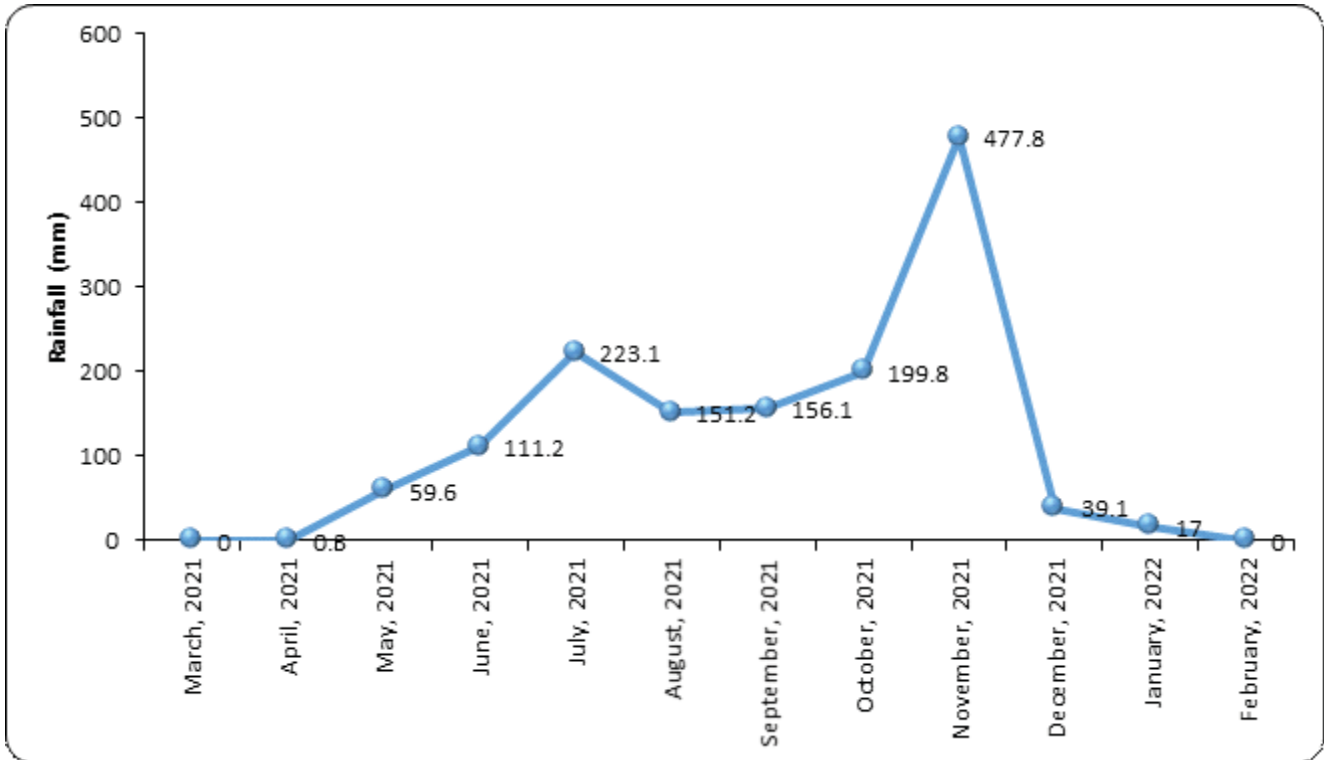

Fig. 1. Rainfall pattern during crop growth period, 2021-22.

Table 1. Growth and 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)	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
T_1	317.0	310.0	311.0	308.2	8.4	8.3	27.5	27.0	25.5	24.5	5.3	5.4
T_2	265.0	273.1	245.6	253.5	8.1	8.1	24.0	24.5	21.9	22.5	4.9	5.1
Mean	291.0	291.6	278.3	280.9	8.3	8.2	25.8	25.8	23.7	23.5	5.1	5.3

T1: 125% RDNP and Zn and 100% K and B (281:125:120 kg NPK, 156 kg Zn and 31 kg Borax ha^{-1}).
T2: (Farmers practice): FYM-30 t ha^{-1}, Urea: 600 kg ha^{-1}, SSP: 700 kg ha^{-1}, MOP: 300 kg ha^{-1} (276:112:180 kg NPK ha^{-1}).

Table 2. Cane yield and jaggery yield of sugarcane in treatment plot and farmers practice

Year	Cane weight (kg)		Cane yield (t ha^{-1})		Jaggery yield (t ha^{-1})		Jaggery yield (kg)/ tonne of cane	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
T1	2.6	2.6	109.0	103.8	11.7	11.1	107.3	106.9
T2	2.4	2.4	108.0	97.4	11.5	9.9	106.5	101.6
Mean	2.5	2.5	108.5	100.6	11.6	10.5	106.9	104.3

T1: 125% RDNP and Zn and 100% K and B (281:125:120 kg NPK, 156 kg Zn and 31 kg Borax ha^{-1}).
T2: (Farmers practice): FYM-30 t ha^{-1}, Urea: 600 kg ha^{-1}, SSP: 700 kg ha^{-1}, MOP: 300 kg ha^{-1} (276:112:180 kg NPK ha^{-1}).

texture with low available nitrogen and phosphorus, high in potassium, deficit in zinc and iron. Plantings were done during the month of March-April during both the years. Atrazine 50% WP @ 1.0 kg ha^{-1} as PE was applied with the help of Knapsack sprayer to control weeds. Propping was done 4 times at regular intervals whenever required to prevent crop lodging. The data recorded on various parameters like cane length, milleable cane length, girth, number of internodes, number of milleable 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 both the years were calculated.

RESULTS AND DISCUSSION

Growth and Yield attributes

Growth and yield attributes *viz.,* total cane height, milleable cane height, girth, no. of internodes, no. of milleable internodes, internode length, cane weight were higher in treatment plot (Table 1 and 2). Total cane length and milleable cane length of Treatment plot was 313.5 and 309.6 cm on mean basis. Whereas, in farmers practice269.1 and 249.6 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, 27.3 and 25.0 internodes and milleable internodes were observed in treatment plot; 24.3 and 22.2 internodes and milleable internodes were observed in farmers practice. Internode length was more in treatment plot (5.4cm) compared to farmers practice (5.0 cm). Cane weight of 2.6 and 2.4 kg were recorded in treatment plot and farmers practice. The improved status of growth and yield parameters might be due to balanced nutrition for enhancing crop growth in treatment plot. The results are in accordance with Nagamadhuri *et al*. (2011), Sarala *et al*. (2015) and Sarala *et al*. (2020).

Cane and Jaggery yield

Perusal of the data presented in Table 2 and 3 proved that there was significant difference in terms of cane and jiggery yield during both the years and mean in treatment plot and farmers practice. Treatment plot has recorded significantly higher cane and jiggery yield compared to farmers practice. During 2020-21, cane yield of 109.0 t ha^{-1} was recorded in Treatment plot. Whereas, in Farmers practice cane yield of 108.0 t ha^{-1} was recorded. During 2021-22 cane yield of 103.8 and 97.4 t ha^{-1} were recorded in Treatment plot and Farmers practice varieties; respectively. On an average, mean yield of 106.4 and 102.7 t ha^{-1} were recorded in Treatment plot and Farmers practice. When compared to farmers practice there was 3.6% 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. This results are in conformity with findings of Naga Madhuri *et al*. (2013). Jaggery yield was significantly higher in Treatment plot compared to farmers practice. On an average, Treatment plot was recorded 6.5% higher jaggery yield (11.4 t ha^{-1}) compared to farmers practice (10.7 t ha^{-1}). In Treatment plot 107.1 kg of Jaggery was produced from one tonne of Sugarcane. Whereas, in case of farmers practice 104.1 kg of Jaggery was produced from one tonne of Sugarcane.

Economics

Based on average prices of inputs and output prevailed during each year of assessment, values of economic indicators like gross cost of cultivation, gross returns, net returns and Benefit-Cost ratio are calculated and presented in Table 4. Gross returns, net returns and Benefit-Cost ratio were substantially higher compared to farmers practice (Table 3). Gross returns of 464525 ₹ ha^{-1} were recorded in Treatment plot and 447938 ₹ ha^{-1} in farmers practice. Whereas, Net returns of

Table 3. 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	T_1	5	106.4	1.14	2.31**	0.002
	T_2	5	102.7	1.65		
Jaggery yield	T_1	5	11.4	0.29	2.31**	0.002
	T_2	5	10.7	0.21		

T_1: 125% RDNP and Zn and 100% K and B (281:125:120 kg NPK, 156 kg Zn and 31 kg Borax ha^{-1}).
T_2: (Farmers practice): FYM-30 t ha^{-1}, Urea: 600 kg ha^{-1}, SSP: 700 kg ha^{-1}, MOP: 300 kg ha^{-1} (276:112:180 kg NPK ha^{-1}).

Table 4. Economics of sugarcane in treatment plot and farmers practice

Year	Cost of cultivation (₹ ha^{-1})		Gross returns (₹ ha^{-1})		Net returns (₹ ha^{-1})		B: C ratio	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
T_1	230115	221450	429925	499125	199810	263125	1.87	2.17
T_2	225000	218875	423500	472375	198500	240000	1.88	1.94
Mean	227557.5	220162.5	426712.5	485750.0	199155.0	251562.5	1.90	2.10

231468 and 219250 ₹ ha^{-1} were recorded in Treatment plot and farmers practice, respectively. The Benefit-Cost ratio was significantly higher in Treatment plot (2.02) compared to farmers practice with 1.91. The higher net returns and Benefit-Cost ratio were obtained with the application of 125% RDNP and Zn, RDK and B compared to farmers practice.

It has been concluded there was significant difference in cane yield (106.4 t ha^{-1}) and jaggery yield (11.4 t ha^{-1}) in Treatment plot compared to farmers practice (102.7 t ha^{-1} and 10.7 t ha^{-1}). Benefit-Cost ratio of 2.02 was recorded in treatment plot which was significantly higher compared to farmers practice with 1.91. Sugarcane crop when received with required amount of fertilizers gives significantly higher yield and higher B:C ratio.

LITERATURE CITED

Govindaraj, G., Bhagyalakshmi, K.V., Alarmelu. S., Hemaprabha, G., Nagarajan R., Somarajan, K.G., Shanti, R.M., Mohanrj, K., Anna Durai, A., Revindra Kumar and Bakshi Ram 2017. Co-09004 (Amritha): New high sugar and early maturing released for cultivation in Peninsular zone. *Journal of Sugarcane Research*. 7(2): 174-176.

Naga Madhuri, K.V., Hemanth Kuar, M and Sarala, N.V. 2011. Influence of higher doses of nitrogen on yield and quality of early maturing sugarcane varieties. *Sugar Tech*. 13(1): 96-98.

Naga Madhuri, K.V., Sarala, N.V., Hemanth Kumar, M, Subba Rao, M and Giridhar, V. 2013. Influence of micronutrients on yield and quality of sugarcane. *Sugar Tech*. 15: 187-191.

Nair, N.V. 2011. Sugarcane varietal development programmes in India. An overview. *Sugar Tech*. 13: 275-280.

Sarala, N.V., Sabitha, N., Subba Rao, M., Hemanth Kumarm M., Vajantham B and Giridharm V. 2015. Response of prerelease early maturing sugarcane varieties to different levels of nitrogen fertilizer. Andhra Pradesh. *Journal of Agricultural Science*. (2): 78-81.

Sarala, N.V., Hemanth Kumar, M., Vajantha, B and Hemalatha, T.M. 2020. Response of promising midlate maturing sugarcane varieties to different doses of nitrogen fertilizer. *International Journal of Current Microbiology and Applied Sciences*. 9(10): 1096-1102.