Andhra Pradesh J Agril. Sci : 1(2): 78-81, 2015

RESPONSE OF PRE-RELEASED EARLY MATURING SUGARCANE VARIETIES TO DIFFERENT LEVELS OF NITROGEN FERTILIZER

N.V. SARALA*, N. SABITHA, M. SUBBA RAO, M. HEMANTH KUMAR, B. VAJANTHA AND V. GIRIDHAR

Agricultural Research Station Perumallapalle 517 505, Chittoor (Dt.), A.P.

ABSTRACT

Field trials were conducted at Agricultural Research Station, Perumallapalle, during 2012-13 and 2013-14 to evaluate the response of promising early maturing sugarcane varieties to different levels of nitrogen. Six early maturing varieties, *viz.,* 2003V46, 2006T3, 2006T36, 2006T19, 2006T23 and 2006T8 were tested at five nitrogen levels, i.e. 0, 75, 100, 125 and 150 per cent of recommended dose of nitrogen (RDN: 224 kg ha^{-1}). Application of nitrogen at 125 per cent RDN produced significantly greater number of millable canes, stalk yield and sucrose per cent. However, the effect of nitrogen levels on juice sucrose per cent was not significant. Hence, application of nitrogen at 280 kg ha^{-1} (125% RDN) is the most economical and viable nitrogen level for the plant cane in sandy loam soils of Southern agro climatic zone of Andhra Pradesh. Among the six early varieties, 2006T36 followed by 2006T19 responded well to the applied nitrogen and recorded higher cane yield.

KEY WORDS: Sugarcane early varieties, Nitrogen levels, Cane yield, Juice quality

INTRODUCTION

Sugarcane is an important commercial crop in Andhra Pradesh. Most of the soils in the Southern agro climatic zone of Andhra Pradesh, where sugarcane is grown low in available nitrogen. This was coupled with long term monocropping and more number of ratoons. The nitrogen fertilizer is costly and its indiscriminate management such as inappropriate rate, time and method may lead to poor crop performance and yield besides, it may results in loss of nitrogen due to leaching, denitrification and ammonium volatilization with serious environmental pollution. Nitrogen has been considered as the most limiting nutrient in sugarcane farming. Different sugarcane varieties have different yield potentials and other specific attributes (Stevenson *et al*. 1992). The new varieties developed have improved cane and sugar yields, resistance to pests and diseases, good milling qualities and adaptability to local growing conditions. These varieties are expected to yield as per the potential when cultivated in the recommended agro ecological zones with appropriate agronomic practices. Variation in the varietal response to nitrogen was reported by Rama Krishna Rao *et al.* (1989) and Srinivas *et al.* (2003). One of the causes of declining sugarcane yield is speculated to be declining soil fertility as a result of depletion of the essential plant nutrients, *viz*. N, P and K (Bell *et al*., 2001; Gerside and Bell, 2003) with low rates of replenishment. These macronutrients play a major role in sugarcane physiology, growth and development Malavolta, 1994 and Rice *et al.,* 2002). Nitrogen is essential for photosynthesis, sugar production and growth. This study was undertaken to determine the optimum nitrogen fertilizer rate for increased and sustained cane yields for promising sugarcane varieties

MATERIAL AND METHODS

The field experiments were conducted at Agricultural Research Station, Perumallapalle, Andhra Pradesh, during 2012-13 and 2013-14. The soil of the experimental field is sandy loam in texture, neutral in pH, normal in EC, low in available nitrogen (190 kg ha^{-1}) medium in available phosphorus (14 kg ha^{-1}) and high in available potassium (279 kg ha^{-1}). The experiment was designed in a split plot with three replications. Six promising early maturity varieties, *viz*. 2003V46, 2006T3, 2006T36, 2006T19, 2006T23 and 2006T8 were included in the study

*Corresponding author, E-mail: saralaangrau@gmail.com

with five levels of nitrogen viz. 0, 75, 100, 125 and 150 recommended dose of nitrogen (RDN: 224 kg ha^{-1}). Nitrogen was applied in the form of urea in two equal splits at 45 and 90 days after planting. Phosphorus and potassium were applied @ 112 kg ha^{-1} in the form of Single Super Phosphate and Muriate of Potash, respectively as basal. Furrows were made at a spacing of 80 cm and three budded setts @ 40,000 ha^{-1} were planted in the first fortnight of January. Atrazine 2 @ kg a.i ha^{-1} was sprayed as pre-emergence herbicide on the 3rd day after planting of setts. Irrigations were provided as and when necessary. All other agronomic practices like hand weeding, earthing up, trash twist propping *etc*. were carried out according to the recommendations. Yield attributing parameters like number of millable canes, cane length, cane diameter were recorded at the time of harvest. Cane yield was recorded after stripping of the leaves and detopping. Juice quality parameters *viz*. Brix, Sucrose per cent were recorded at harvest by following standard procedures (Spencer and Meade, 1963). Brix was recorded by using hydrometer and sucrose was estimated by pol per cent with polarimeter.

RESULTS AND DISCUSSION

Results pertaining to yield attributes, yield and juice quality parameters are presented and discussed below.

Number of millable cane ha^{-1} (NMC)

Among the varieties, 2006T36 produced the highest NMC followed by 2006T19 due to higher conversion efficiency of tillers into millable canes. A variation in varieties for their response to nitrogen was also reported by Srinivas *et al*. (2003), Shukla (2007). The number of millable canes is a major constituent of cane yield. Tillering which provides the plant with the optimum number of stalks needed for a good yield is known to be affected by the availability of various nutrients. The highest number of millable canes at harvest was recorded with 125% RDN *i.e.* 280 kg N ha^{-1}.

Cane length and diameter

Plant height is also a major parameter of growth and yield. Although length, thickness and shape of the internodes are varietal characteristics, the rate of elongation and length of internodes are influenced by the nutrient availability. Varieties did not differ among them with regard to cane length and diameter. The lengthier canes were recorded when nitrogen is applied @ 150% RDN. The results are in accordance with Naga Madhuri *et al.* (2011) for promising early maturing sugarcane varieties.

Cane yield

The highest cane yield was recorded by the variety 2006T36 followed by 2006T19. Highest shoot population coupled with efficient conversion of tillers into millable canes at harvest in these varieties could have contributed to higher cane yield. Same results have been reported by Srinivas *et al*. (2003). Cane yield was significantly enhanced with increasing levels of nitrogen application from 75 per cent to 150 per cent of RDN (Table 1). Application of nitrogen @ 150% RDN (336 kg N ha^{-1}) resulted in highest cane yield which was on par with 125% RDN and both were significantly higher than 100% and 75% RDN.

Sucrose (%)

For sugarcane, the quality of the crop is assessed by the sugar produced per tonne of cane, Nitrogen has the greatest influence on cane growth, ripening and juice quality (Hussain *et al* 1990). The quality parameter which include sucrose % is not affected by increasing nitrogen application. This could be due to the early application of nitrogen (90 days after planting). Thus the detrimental effect of higher nitrogen on juice quality was minimized before the maturity age of the cane (Gana *et al.,* 2007). Higher quantity of nitrogen fertilizer generally results in luxurious growth and increases percentage of reducing sugars. But as the crop ages and matures, it is expected that nitrogen content will be reduced and there is an increasing conversion of the reducing sugars to sucrose (Hussain *et al.,* 1990).

CONCLUSION

The study revealed that among the varieties, 2006 T36 followed by 2006T19 responded well to the applied nitrogen and recorded the higher cane yield. Application of nitrogen @ 125% RDN *i.e* 280 kg N ha^{-1} is optimum for obtaining higher cane yield in sandy loam soils of Southern agro climatic zone of Andhra Pradesh

REFERENCES

Bell, M.J., Garside, A.L., Haplin, N.V and Berthelsen, J.E. 2001. Yield response to breaking the Sugarcane monoculture. Proceedings of 10th Australian Society of Agronomy conference, January, 2001, Hobart, Tasamania.

Table 1. Response of sugarcane pre-releasing early varieties to varied levels of nitrogen

Treatment	Number of millable canes ha^{-1}	Millable cane length (m)	Millable cane diameter (cm)	Cane yield t ha^{-1}	Sucrose (%)
Varieties					
2006T8	68749	2.28	2.56	91.43	17.18
2006T3	69756	2.33	2.14	89.32	17.70
2006T36	84062	2.45	2.56	114.5	17.89
2003V46	75964	2.48	2.49	104.6	17.94
2006T19	82490	2.62	2.56	106.3	17.82
2006T23	74630	2.53	2.46	98.65	17.14
SEm+/-	5327	0.06	0.04	3.34	0.26
CD @ 5%	NS	NS	NS	10.5	NS
Nitrogen levels					
Control (No nitrogen)	63959	2.03	2.38	62.67	78.17
75% RDN	74843	2.43	2.59	85.92	17.69
100% RDN	80520	2.54	2.81	99.98	17.66
125% RDN	81072	2.68	2.82	106.94	17.42
150% RDN	78489	2.79	2.67	108.64	17.66
SEm±	2060	0.03	0.06	3.34	0.14
CD @ 5%	5327	0.10	0.2	1.73	0.42
V × N	NS	NS	NS	7.32	NS

Gana, A.K., Shebanya, J.A., Ogunlela, V.E., Odian, E.C and Imohin, E.D. 2007. Influence of fertility rates and chemical weed control on the stalk yield (ton/ha) and juice quality of chewing sugarcane at Badegi, Nigeria. *Agricultural Topica EI Sub Tropical.* 40 (4): 171-176.

Garside, A.L. and Bell, M.J. 2003. Management of legume residues to maximize the nitrogen benefits to the following sugarcane Crop. Proceedings of *International Society of Sugarcane Technology*. 26 Sugarcane Agronomy: 16-29.

Hussain, I., Atta, M and Nazir, M.S. 1990. Effect of NPK fertilizer application on the growth, yield and quality of autumn planted sugarcane. *Pakistan Sugar Journal.* 5(1):1-53.

Malavolta, E. 1994. Fertilizing for high yield Sugarcane. *International potash Institute*. Bulletin No. 14 Sugarcane, Brazil.

Naga Madhuri, K.V., Hemanth Kumar, 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.

Ram Krishna Rao, S., Veerabhadra Rao, K and Ramalinga Swamy, K. 1989. Response of early, midlate and late maturing sugarcane varieties to nitrogen application. *Indian Journal Agricultural Sciences.* 59 (1): 11-16.

Rice, R.W., Gilbert, R.A and Lentini, R.S. 2002. Nutritional requirements for Elorida Sugarcane. Florida co-operative extension service pub.Sc.AGR.228 http://edis.ifas.edu.Sc 078.

Shukla, S. 2007 Growth, yield and quality of high sugarcane (*Saccharum officinarum*) genotypes as influenced due to planting season and fertility levels. *Indian Journal of Agricultural Sciences* 77(9): 563-573.

Spencer, G.L and Meade, G.P. 1963. Cane Sugar hand book, 9th Ed. GP Meade, John Wiley and Sons. Inc. New

Srinivas, D., Rao, B.R.B., Suresh, M., Vijayakumar, B and Krishan Reddy, L. 2003. Influence of levels of nitrogen on the yield and quality of early maturing sugarcane varieties. *Co-operative Sugar.* 34(6): 479-482.

Stevenson, A., Van Der Merwe, W., Benninga, W and Allison, J.C.S. 1992. Response of difference sugarcane varieties to greater than normal application of nitrogen. Proceedings of the South African Sugar Technologists Association: 50-53.