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Full Length Research Article

Status and impact of organic and inorganic sources of nutrients on growth and yield of sugarcane

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Abstract: Field experiment were conducted to evaluate the impact of integrated plant nutrient system (IPNS) on the yield and yield attributes of sugarcane at Experimental Farm, Annamalai University, Annamalainagar during summer 2010. The combined application of organic and inorganic sources of nutrients showed significant effect on the yield and yield attributes like plant height, millable cane height, number of internodes per cane and cane girth (cm) of sugarcane. The results showed that application of recommended dose of fertilizer along with vermicompost and foliar application of ZnSO4 @ 0.5 on 25 DAS compared to other treatments.

Key words: Sugarcane, Organic manure, nutrient management, Biofertilizers and Inorganic fertilizers.

INTRODUCTION

Sugarcane is widely grown in tropical and subtropical regions of the world and is one of the most important cash crops India. It play pivotal role in both agricultural and industrial economy of our country. India is one of the largest producers of sugar and is in compete with Brazil for fist CNP productivity. India share in sugar production is about 13 per cent of the world and 41 per cent of sugar production of Asia (Chinnusamy and Jayanthi, 2004). In India, sugarcane is grown under different agro climatic conditions and occupies abot 22 per cent area of (4.4 m ha) of the GCA with an average productivity of 68.2 t ha^{-1} areas the productivity of the soils has declined due. In many sugarcane growing to intensive cropping and lack of proper soil fertility management practices. The soil productivity can be restored through rationalized integrated nutrient management (INM) involving organic manures, fertilizers and biofertilizers. The excess se of inorganic fertilizers result has also been found to in higher cost of cultivation and negative net realization. Hence, the present investigation was carried out maximizing the productivity of sugarcane through INM techniques. Nitrogen plays an important role in various metabolic process of plant. N is an essential constituent of protein and chlorophyll and is present in many other compounds helps in plant metabolism. Phosphorus is an essential constituent of nucleic acids and stimulates root growth as well as improving the plant growth. The association of organic manures along with biofertilizer helps in improving fertility of soil and is a cost effective method. Vermicompost is a recent innovation in composting technology for sustainable production. It is a mixture of earthworm's castings, organic, materials humus and other organisms, crop residues, animal wastes, dairy and poultry wastes, food industry wastes, sugarcane trashes, sludge can all be recycled to produce vermicompost.

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Micronutrients play an important role in highly effective in correcting chlorosis of young leaves, improving manufacturing qualities of the juice and increasing cane and sugar yield significantly. Micronutrients improved the yield of commercial cane sugar (CCS) over control. CCS as a percentage of cane was increased significantly by foliar application $FeSO_4$ @ 2% by thrice during tillering stage. Nitrogen is most important in yield and quality formulation in crops through manifestation of growth and development (Singh *et al.,* 2013). INM helps to restore and sustain soil fertility and crop productivity. It may also help to check the emerging deficiency to nutrients other N, P and K. Further, it enhances the efficiency of fertilizers. the INM favourably affects the physical, chemical and biological environment of soil thus ultimately increase the soil fertility. The integrated use of organics and inorganic fertilizers has received considerable attention in the past with a hope of meeting the farmers economic need as well as maintaining favourable ecological conditions on long term basis (Kumar *et al.,* 2007). Many of the research scientists have concluded that significantly improvement in highest plant height, tillers, millable canes, cane and sugar yield were registered with combined application of organic manures (pressmud) with inorganic fertilizers (Bokhtiar *et al.,* 2001) and Mathew and Vargheese (2005) and Vijayakumar and Verma (2002).

MATERIALS AND METHODS

A field experiment was carried out at Experimental Farm, Annamalai University, Annamalainagar. The soil of experimental site is low in available N, medium in P and high in K_2O. Experiment was laid out in RBD design with three replications with a plot size of 5 × 4 m. Two bedded sets were used as seed material all crop management practices were followed as per treatment schedule at different crop growth stages. Statistical analysis were done Gomez and Gomez (1984).

Table 1. Effect of different treatments on growth and yield attributing characters of plant sugarcane

Treatments	Plant height (cm)	Millable cane height (cm)	No. of internodes per cane	Cane girth (cm)
T_1 – Control	278	211	24	2.36
T_2 – Recommended dose of fertilizer (250:125:125 kg of NPK ha^{-1})	264	200	21	2.39
T_3 – RDF + FYM @ 15 kg ha^{-1}	261	195	21	2.38
T_4 – RDF + Pressmud @ 25 t ha^{-1}	272	207	23	3.40
T_5 – RDF + Poultry manure @ 15 t ha^{-1}	266	202	23	2.37
T_6 – RDF + Biofertilizers (Azotobacter and PSB)	272	205	23	2.41
T_7 – RDF + FYM @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA)	257	193	21	2.40
T_8 – RDF + Pressmud (filter cake) @ 25 t ha^{-1} + $FeSO_4$ @ 2% (FA) on 25 DAS	238	219	27	2.43
T_9 – RDF + Poultry manure @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA) on 25 DAS	261	206	21	2.36
T_{10} – RDF + Biofertilizer (Aztobacter and PSB) + $FeSO_4$ @ 2% (FA)	276	212	21	2.32
S.Ed.	7.5	2.5	NS	NS
CD (P=0.05)	15.0	5.0	0.7	3.05

Table 2. Effect of integrated nutrient management techniques on NMC and yield of sugarcane components at harvest of plant sugarcane

Treatments	NMC / ha	Yield (t ha^{-1})	
		Cane	Trash
T_1 – Control	100516	87.6	24.4
T_2 – Recommended dose of fertilizer (250:125:125 kg of NPK ha^{-1})	92161	81.4	22.1
T_3 – RDF + FYM @ 15 kg ha^{-1}	93466	79.4	19.8
T_4 – RDF + Pressmud @ 25 t ha^{-1}	98756	87.2	24.7
T_5 – RDF + Poultry manure @ 15 t ha^{-1}	95869	84.8	23.8
T_6 – RDF + Biofertilizers (Azotobacter and PSB)	102701	89.4	23.6
T_7 – RDF + FYM @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA)	86244	76.5	23.2
T_8 – RDF + Pressmud (filter cake) @ 25 t ha^{-1} + $FeSO_4$ @ 2% (FA) on 25 DAS	90143	93.8	26.2
T_9 – RDF + Poultry manure @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA) on 25 DAS	87269	78.9	15.9
T_{10} – RDF + Biofertilizer (Aztobacter and PSB) + $FeSO_4$ @ 2% (FA)	105519	73.6	18.6
S.Ed.	2902	4.8	2.1
CD (P=0.05)	5986	9.6	4.3

Economics of different treatments were calculated on the basis prevailing market prices during the experimental period, sets were planted at the depth of 0-15 cm in the soil. The treatment schedule were: T_1 – Control, T_2 – Recommended dose of fertilizer (250:125:125 kg of NPK ha^{-1}), T_3 – RDF + FYM @ 15 kg ha^{-1}, T_4 – RDF + Pressmud @ 25 t ha^{-1}, T_5 – RDF + Poultry manure @ 15 t ha^{-1}, T_6 – RDF + Biofertilizers (Azotobacter and PSB), T_7 – RDF + FYM @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA), T_8 – RDF + Pressmud (filter cake) @ 25 t ha^{-1} + $FeSO_4$ @ 2% (FA) on 25 DAS, T_9 – RDF + Poultry manure @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA), on 25 DAS, T_{10} – RDF + Biofertilizer (Aztobacter and PSB) + $FeSO_4$ @ 2% (FA). The experimental data on observations were statistically analyzed by adopting the procedure for Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

Application of Recommended dose of fertilizer + Vermicompost @ 15 t ha^{-1} + $FeSO_4$ @ 2% (FA) @ (T_8) on 25 DAS recorded maximum value of plant height, millable cane weight (cm), no. of internodes per cane, and cane girth (cm) are shown in Table 1. Compared with rest of the treatments due to use of organic manure has positive effect on cane yield and soil properties. This was due to integrated use of inorganics and organics which gave markedly higher productivity besides bringing out a general improvement on soil fertility status than that of chemical fertilizers alone. Similar results were reported by Rakkiyappan *et al.* (2001), Bokhtiar and Sakurai (2004), Srivastava (2005), Kanjana *et al.* (2007), Sammauria *et al.* (2009), Singh *et al.* (2009), Sreelatha *et al.* (2011), Shinde *et al.* (2013), Kumar (2012), Charumathir *et al.* (2012), Munir *et al.* (2009), Saini *et al.* (2006) and Singh *et al.* (2009) five per cent probability level to draw statistical calculations.

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