AN COMPREHENSIVE APPROACH OF INTEGRATED PLANT NUTRIENT SUPPLY SYSTEM FOR SUSTAINING GROWTH AND YIELD OF SUGARCANE

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ABSTRACT

Field Experiments were conducted at two different locations *viz.*, Experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar (location I) and second trial was conducted in the farmer field at Rajendirapattinam village of Vridhachalam Taluk (location II), Cuddalore district, Tamilnadu during 2012 -2013 to evaluate the effect of RDF in conjunction with different organics *viz.,* farmyard manure, green manure, vermicompost, pressmud compost, poultry manure with and without micro nutrient and azophos. The treatments were tested in randomized block design with three replications.The results of the study revealed that the application of recommended dose of fertilizer (275:62.5:112.5 kg of NPK ha^{-1}) + pressmud compost (5 t ha^{-1}) + micronutrient (50 kg ha^{-1}) + azophos (2 kg sett treatment + 10 kg soil application ha^{-1}) for the sugarcane crop proved to be more promising in improving the growth and yield parameters and in addition maintaining the soil productivity, improving the eco-system.

Key words: Sugarcane, IPNS , growth and yield, organic sources.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is an important commercial crop in India and plays pivotal role in agricultural and industrial economy of our country. Sugarcane occupies an area of 20.1 million hectares in the world with a total production of 1318.1 million tonnes and productivity of 65.5 t ha^{-1}). Asia occupies the highest area of 9.08 million hectares and contributes 42 per cent to the world's sugarcane production.

Sugarcane being a long duration, exhaustive crop removes considerably higher amount of plant nutrients from the soil. On an average, sugarcane crop, yielding 100 tonnes, removes 208, 53 and 280 kg per hectare of N, P_2O_5 and K_2O, respectively from the soil. Hence it is essential to replenish the depleted soil with plant nutrients at desired levels to restore and sustain the fertility/productivity of soils through integrated nutrient management system

Materials and methods:

The field experiment was conducted during 2012-2013 at two different locations *viz.*, Experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar (location I) and second trial was conducted in the farmer field at Rajendirapattinam village of Vridhachalam Taluk (location II), Cuddalore district, Tamilnadu. The experimental soils were clay loam in texture having a pH of 7.2 and 7.0. The fertility status was low in available N, (236.0 and 227.62 kg ha^{-1}), medium in available P (21.80 and19.12 kg ha^{-1}) respectively and high in available K (285 and 279 kg ha^{-1})at two different locations. The organic carbon was 0.54 and 0.52 per cent.The treatments consisted of different sources of organic manures and recommended dose of fertilizers *viz.*, T_1 - Control, T_2 - RDF (275: 62.5: 112.5 kg N P K ha^{-1}), T_3 – RDF + farmyard manure @ 12.5 tonnes ha^{-1}, T_4 – RDF + pressmud compost @ 5 tonnes ha^{-1}, T_5 – RDF + green manure (Sunnhemp) @ 25 kg of seed ha^{-1}, T_6 – RDF + vermicompost @ 5 tonnes ha^{-1}, T_7 – RDF + poultry manure @ 5 tonnes ha^{-1}, T_8 – RDF + farmyard manure + micro nutrient + azophos (Sett treatment @ 2 kg + soil application @ 10 kg ha^{-1}), T_9 – RDF + pressmud compost + micro nutrient + azophos (Sett treatment @ 2 kg + soil application @ 10 kg ha^{-1}), T_{10} – RDF + green manure (Sunhemp) + micro nutrient + azophos (Sett treatment @ 2 kg + soil application @ 10 kg ha^{-1}), T_{11} – RDF + vermicompost + micro nutrient + azophos (Sett treatment @ 2 kg + soil application @ 10 kg ha^{-1}) and T_{12} – RDF + poultry manure + micro nutrient + azophos (Sett treatment @ 2 kg + soil application @ 10 kg ha^{-1}).

Results and Discussion

Growth attributes:

From the above investigation the treatment T_9 - recommended dose of fertilizer + pressmud compost + micro nutrient + azophos (S+S) recorded the maximum values for plant height 387.25 and 387.60 cm (Table 1) at harvest was due to the supply of mineral N, which was dominant at early stages of tillering for its rapid nutrient availability and supply to the crop. The above treatment also excelled all other treatments by registering the higher values for LAI and DMP (Table 1). This was mainly due to pressmud compost which contains in an readily available form of plant nutrient which enhanced faster cell elongation, cell division and was associated with desirable effects of pressmud compost which also favorably altered the soil physical, chemical and biological properties which inturn also increased the soil organic matter, moisture holding capacity and concentration of N, P, K, Cu, Zn, Fe, and Mn which ultimately promoted the higher growth attributes *viz.*, LAI and DMP. This was in accordance with the reports of Rangaraj *et al.* (2007).

Yield Attributes:

The integrated application of recommended dose of fertilizer + pressmud compost + micro nutrient + azophos registered an increased yield parameters and yield. The increase in cane and sugar yield of 166.65 and 172.98 t ha^{-1} (Table 2) and 16.33 and 16.52 per cent, over control was observed in the experimental field and farmer field, respectively.

The integrated nutrient management approach had significance on the brix, pol, CCS percent and purity coefficient in sugarcane crop. The treatment T_9 - recommended dose of fertilizer + pressmud compost + micro nutrient + azophos (S+S) recorded better quality parameters when compared to other treatments (Table 2). The application of recommended dose of fertilizer along with pressmud compost increased the availability of soil NPK and the higher uptake and consequent improvement in yield and yield parameters of sugarcane. The above findings are in concordance with the earlier findings of Shankariah and Kalyana murthy(2005).

The increased yield in the treatment T_9 could be attributed as a result of favourable neutro-physiological condition offered through integrated nutrient management supply system by utilizing cheaply available inputs like pressmud compost and biofertilizers. This present finding were in concomitance with the findings of Sundara *et.al*,(2002).

Conclusion

Hence the application of recommended dose of fertilizer (275:62.5:112.5 kg of NPK ha^{-1}) + pressmud compost (5 t ha^{-1}) + micronutrient (50 kg ha^{-1}) + azophos (2 kg sett treatment + 10 kg soil application ha^{-1}) for the sugarcane crop appears to be more promising in improving the growth and yield parameters culminating in increased yield of sugarcane and such system would also reduce the cost of farming in addition to maintaining the soil productivity, improve the eco-system, for achieving sustainable yield in sugarcane crop.

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Table 1. Effect of integrated plant nutrient supply system on growth attributes of sugarcane.

Treatments	Plant height (cm)		Leaf area index (cm)		Dry matter production (t ha^{-1})	
	Location – I At harvest	Location – II At harvest	Location – I At harvest	Location – II At harvest	Location – I At harvest	Location – II At harvest
T_1 Control	351.02	361.54	4.19	4.31	40.54	42.84
T_2 RDF (275: 62.5: 112.5 kg N P K ha^{-1})	359.01	369.51	4.51	4.58	42.27	43.17
T_3 RDF + FYM @ 12.5 t ha^{-1}	368.60	378.73	5.24	5.26	43.71	44.62
T_4 RDF + PC @ 5 t ha^{-1}	373.04	380.39	5.31	5.40	44.89	45.04
T_5 RDF + GM (seed) @ 25 kg ha^{-1}	366.78	375.55	4.88	5.11	42.30	43.14
T_6 RDF + VC @ 5 t ha^{-1}	370.83	379.71	5.25	5.30	43.81	44.87
T_7 RDF + PLM @ 5 t ha^{-1}	367.58	376.56	5.06	5.13	44.48	45.48
T_8 RDF + FYM + MN+ Azophos (S +S) @ 10 kg ha^{-1}	379.80	383.41	5.57	5.70	46.01	46.65
T_9 RDF + PC + MN + Azophos (S +S) @ 10 kg ha^{-1}	384.82	387.60	5.81	5.93	47.71	48.92
T_{10} RDF + GM + MN+ Azophos (S +S) @ 10 kg ha^{-1}	376.93	381.78	5.41	5.50	45.29	46.29
T_{11} RDF + VC + MN+ Azophos (S +S) @ 10 kg ha^{-1}	380.64	383.63	5.58	5.78	46.50	47.73
T_{12} RDF + PLM + MN+ Azophos (S +S) @ 10 kg ha^{-1}.	378.63	382.70	5.49	5.61	45.80	47.07
S.Ed	2.05	1.82	0.09	0.04	0.57	0.56
C.D(P=0.05)	4.12	3.66	0.20	0.09	1.14	1.12

Table 2. Effect of integrated plant nutrient supply system on yield of sugarcane

Treatments		Cane yield t ha^{-1}	
		Location – I	**Location – II**
T_1	Control	42.76	44.51
T_2	RDF (275: 62.5: 112.5 kg N P K ha^{-1})	104.28	110.701
T_3	RDF + FYM @ 12.5 t ha^{-1}	117.05	122.09
T_4	RDF + PC @ 5 t ha^{-1}	121.23	127.89
T_5	RDF + GM (seed) @ 25 kg ha^{-1}	112.87	118.67
T_6	RDF + VC @ 5 t ha^{-1}	119.41	124.88
T_7	RDF + PLM @ 5 t ha^{-1}	114.17	120.65
T_8	RDF + FYM + MN+ Azophos (S +S) @ 10 kg ha^{-1}	144.06	147.51
T_9	RDF + PC + MN + Azophos (S +S) @ 10 kg ha^{-1}	166.65	172.98
T_{10}	RDF + GM + MN+ Azophos (S +S) @ 10 kg ha^{-1}	131.08	134.15
T_{11}	RDF + VC + MN+ Azophos (S +S) @ 10 kg ha^{-1}	148.90	150.33
T_{12}	RDF + PLM + MN+ Azophos (S +S) @ 10 kg ha^{-1}.	139.59	144.41
S.Ed		3.60	3.65
C.D(P=0.05)		7.22	7.32