International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(5): 2929-2931
© 2019 IJCS
Received: 01-07-2019
Accepted: 03-08-2019

Lakshmi Prasanna Koncha
Department of Soil Science, College of Agriculture (Mahatma Phule Krishi Vidyapeeth), Rahuri, Maharashtra, India

Vinitha Chandupatla
Department of Soil Science, College of Agriculture (Mahatma Phule Krishi Vidyapeeth), Rahuri, Maharashtra, India

Sheshpal R Rathod
Department of Soil Science, College of Agriculture (Panjabrao Deshmukh Krishi Vidyapeeth), Nagpur, Maharastra, India

Darshana Kadam
Department of Soil Science, College of agriculture (Mahatma Phule Krishi Vidyapeeth), Kolhapur, Maharashtra, India

Utkarsha Amolic
Department of Soil Science, College of agriculture (Mahatma Phule Krishi Vidyapeeth), Kolhapur, Maharashtra, India

Corresponding Author:
Lakshmi Prasanna Koncha
Department of Soil Science, College of Agriculture (Mahatma Phule Krishi Vidyapeeth), Rahuri, Maharashtra, India

Response of crop nutrient solution on nutrient uptake and residual soil fertility at harvest of preseasonal sugarcane grown on Inceptisol

Lakshmi Prasanna Koncha, Vinitha Chandupatla, Sheshpal R Rathod, Darshana Kadam and Utkarsha Amolic

Abstract
An experiment was conducted at STCRC Research Farm, MPKV, Rahuri, during 2017-19 to find out the response of crop nutrient solution on nutrient uptake and residual soil fertility of preseasonal sugarcane grown on Inceptisol. The experiment was laid in randomized block design consists of ten treatments with three replications. The total uptake of nitrogen, phosphorous, potassium and micronutrients were significant (209.79, 61.81 and 207.40 kg ha^{-1} respectively and Fe, Mn, Zn and Cu (4865.99, 3130.22, 1463.29 and 359.38 g ha^{-1} respectively**).**The residual properties at harvest of sugarcane *viz*., soil pH, EC and organic carbon were non-significant in treatment of crop nutrient solution fertilizer grade. The residual available nitrogen, phosphorous, potassium and micronutrients were significant as compared to general recommended dose of fertilizers. The highest soil available Phosphorus, Potassium and DTPA-micronutrients was recorded in the treatment 50% more of RDF (510:255:255:90 kg ha^{-1}) through complex crop nutrient solution grade fertilizer (CNS grade), urea, bensulf and 20 t ha^{-1} FYM.

Keywords: Nutrient uptake and residual soil fertility of preseasonal sugarcane

Introduction
Sugarcane (*Saccharum* spp. hybrid complex) is the premier sugar crop of India and occupies about 4.88 mha area and contributing about 7.5% of the gross value of agricultural production in the country with an annual sugarcane production of 342.38 mt (Anonymous, 2012) [1]. With the fast increasing population, the demand for sugar is consistently increasing and it is estimated that by 2020, the total sugarcane requirement of our country would be nearly 625 MT (Manimaran *et al*., 2009) [3]. To fulfil the increased sugar demand with shrinking resources, it is necessary to increase yield per unit area. Judicious use of fertilizers provides one of the quickest means of increasing sugarcane production. Basically nitrogen, phosphorous and potash which are essential for the existence of plant supply of adequate plant nutrient is thus, the most important resource to augment the yields per unit area. Therefore, keeping in view to asses the response of crop nutrient solution on nutrient uptake and residual soil fertility of preseasonal sugarcane grown on Inceptisol were studied in present investigation.

Material and Methods
The field experiment was conducted in the preseasonal sugarcane during year 2017-19 on Preseasonal sugarcane in Inceptisol soils at STCRC Research Farm, Department of Soil Science and Agricultural Chemistry, Mahatma Phule Krishi Vidyapeeth, Rahuri. Geographically the location of experimental site was N 19° 21' 513'' latitude and E 074° 39' 029'' longitude. The soils of experimental plot was dominant with montmorillonite type of clay mineral, medium deep black soil. The texture of soil was clay with slightly alkaline pH 7.85, EC 0.25 dS m^{-1} low in available nitrogen (238.38 kg/ha), medium in available Phosphorus (15.2 kg/ha), very high in available Potassium (504 kg/ha), organic carbon (0.72%), $CaCO_3$ (6.80%).The experiment was planned with 10 treatments and 3 replications in Randomised block design. The treatments consists of T_1: Farmers practice (300:150:150 kg ha^{-1}), T_2: GRDF (340:170:170 kg ha^{-1} + 20 t ha^{-1} FYM), T_3: RDF (340:170:170:60 kg ha^{-1} Cu + Zn + Mg + Mn + Fe + B + Cu), T_4: Farmers practice through CNS grade (300:150:150 kg ha^{-1}), T_5: RDF (340:170:170:60 kg ha^{-1}) through CNS grade, T_6: 25% more of RDF(425:212: 212:75 kg ha^{-1}) through CNS grade, T_7: 25% less of RDF (255:128:128 :45 kg ha^{-1}) through

CNS grade, T_8: 50% more of RDF (510:255:255:90 kg ha^{-1}) through CNS grade, T_9: 50% less of RDF (170:85:85:30 kg ha^{-1}) through CNS grade, T_{10}: Absolute control and FYM application @ 20 t ha^{-1} to all treatments except treatment Farmers practice and absolute control

Results and Discussion

Total Nutrient Uptake

The total uptake of nitrogen, phosphorus and potassium by preseasonal sugarcane at harvest was increased significantly influence by the application of complex fertilizer CNS grade. The total uptake of nitrogen, phosphorus and potassium were significantly higher in the treatment 50% more of RDF (510:255:255:90 kg ha^{-1} N, P_2O_5, K_2O and S) through CNS grade, urea and bensulf (209.79, 61.81 and 207.40 kg ha^{-1} respectively) followed by RDF (340:170:170:60 kg ha^{-1} N, P_2O_5 and K_2O and S) + Mg, Zn, Mn, Fe, B and Cu (206.54, 40.57 and 193.84 kg ha^{-1}, respectively) and statistically on par with rest of the treatments except at absolute control (132.88, 29.53 and 87.45 kg ha^{-1}, respectively) and 50% less of RDF (170:85:85:30 kg ha^{-1} N, P_2O_5, K_2O and S) through complex CNS grade, urea, bensulf (142.29, 30.43 and 106.52 kg ha^{-1}, respectively). The higher uptake of nitrogen, phosphorous and potassium might be because of higher biomass production of cane and top which contribute to higher uptake of nutrients. Similar results were also recorded by Srinivas *et al*. (2003) [5]

Table 1: Effect of crop nutrient solution grade fertilizer on total uptake of preseasonal sugarcane at harvest

Tr. No.	Treatment	Total macro nutrient uptake (kg ha^{-1})			Total micronutrient uptake (g ha^{-1})			
		N	P	K	Fe	Mn	Zn	Cu
T_1	Farmers practice (300:150:150 kg ha^{-1})	155.02	36.12	165.89	1444.21	1406.3	557.03	266.56
T_2	GRDF (340:170:170 kg ha^{-1} + 20 t ha^{-1} FYM)	198.75	36.14	175.76	1921.53	1781.8	620.94	279.87
T_3	RDF (340:170:170: 60 kg ha^{-1} + Zn + Mg + Mn + Fe + B + Cu)	206.54	40.57	193.84	3056.29	2712.7	1000.38	301.86
T_4	Farmers practice through CNS grade (300:150:150 kg ha^{-1})	184.25	41.13	182.00	2815.02	2549.3	837.17	293.87
T_5	RDF (340:170:170: 60 kg ha^{-1}) through CNS grade	176.90	52.35	185.38	3592.94	2837.9	1048.65	313.65
T_6	25% more of RDF (425: 212: 212: 75 kg ha^{-1}) through CNS grade	186.66	48.85	175.60	4393.61	3100.2	1259.08	329.84
T_7	25% less of RDF (255:128:128 :45 kg ha^{-1}) through CNS grade	176.83	39.66	144.20	2427	2414.1	757.15	285.58
T_8	50% more of RDF (510:255:255 :90 kg ha^{-1}) through CNS grade	209.79	61.81	207.40	4865.99	3130.2	1463.29	359.38
T_9	50% less of RDF (170:85:85:30 kg ha^{-1}) through CNS grade	142.49	30.43	106.52	1376.8	1108.3	431.2	260.46
T_{10}	Absolute control	132.88	29.53	87.45	1107.02	984.70	409.86	176.64
	$SE_m\pm$	18.82	5.34	20.26	418.20	241.33	48.02	21.22
	CD at 5%	56.37	16.11	60.67	1242.53	717.04	142.69	63.07

Total Micronutrient Uptake

The total micronutrient uptake by preseasonal sugarcane at harvest was increased significantly with the application of nutrients through CNS grade, urea, bensulf along with 20 t ha^{-1} FYM, over control are reported in table 1. Significantly the highest Fe, Mn, Zn and Cu uptake by preseasonal sugarcane at harvest were recorded in the treatment 50% more of RDF (510:255:255:90 kg ha^{-1} N, P_2O_5 and K_2O) through CNS grade, urea, bensulf along with 20 t ha^{-1} FYM (4865.99, 3130.22, 1463.29 and 359.38 g ha^{-1}, respectively). Whereas, the uptake of Fe, Mn and Cu was on par with the treatment 25% more of RDF (425: 212: 212:75 kg ha^{-1} N, P_2O_5, K_2O and S) through CNS grade (4393.61, 3100.27, 1259.08 and 329.84 g ha^{-1}, respectively). The lowest Fe, Mn, Zn and Cu uptake by preseasonal sugarcane at harvest were recorded in the treatment absolute control (1107.02, 984.703, 409.86 and 176.64 g ha^{-1}, respectively).The application of complex fertilizer CNS grade increased the micronutrient uptake by preseasonal sugarcane could be due to increased concentration of micronutrients in soil solution and improvement in physico-chemical properties of soil which might be resulted in improving the availability of micronutrients to plants.

Table 2: Residual effect of crop nutrient solution grade fertilizer on soil properties at harvest of preseasonal sugarcane

Tr. No.	Treatment	Residual soil properties		
		pH (1: 2.5)	EC (dS m^{-1})	O.C. (%)
T_1	Farmers practice (300:150:150 kg ha^{-1})	7.91	0.32	0.55
T_2	GRDF (340:170:170 kg ha^{-1}+ 20 t ha^{-1} FYM)	7.85	0.30	0.50
T_3	RDF (340:170:170: 60 kg ha^{-1} + Zn + Mg + Mn + Fe + B + Cu)	7.85	0.26	0.50
T_4	Farmers practice through CNS grade (300:150:150 kg ha^{-1})	7.81	0.26	0.47
T_5	RDF (340:170:170: 60 kg ha^{-1}) through CNS grade	7.85	0.32	0.49
T_6	25% more of RDF (425: 212: 212: 75 kg ha^{-1}) through CNS grade	7.86	0.32	0.46
T_7	25% less of RDF (255:128:128 :45 kg ha^{-1}) through CNS grade	7.88	0.30	0.45
T_8	50% more of RDF (510:255:255 :90 kg ha^{-1}) through CNS grade	7.79	0.28	0.49
T_9	50% less of RDF (170:85:85 :30 kg ha^{-1}) through CNS grade	7.88	0.31	0.55
T_{10}	Absolute control	7.82	0.28	0.49
	$SE_m\pm s$	0.05	0.02	0.023
	CD at 5%	NS	NS	NS

Residual Effect of Crop Nutrient Solution Grade fertilizer on Soil Properties at harvest of Preseasonal Sugarcane

The residual soil properties at harvest of preseasonal sugarcane in respect to pH, electrical conductivity (EC) and organic carbon (OC) as influenced by complex fertilizer CNS grade, bensulf are presented in Table 2. The soil pH, electrical conductivity (EC), and organic carbon (OC) at harvest of preseasonal sugarcane were not influenced by the complex fertilizer CNS grade. However, numerically there were no considerable difference among the treatments for pH, electrical conductivity and organic carbon. The results indicated that application of complex fertilizer CNS grade did not influenced the residual soil pH, electrical conductivity and organic carbon.

Table 3: Residual effect of crop nutrient solution grade fertilizer on soil available nutrients at harvest of preseasonal sugarcane

Tr. No	Treatment	Residual soil available macronutrients (kg ha^{-1})			Residual available micronutrients (µg g^{-1})			
		N	P	K	Fe	Mn	Zn	Cu
T_1	Farmers practice (300:150:150 kg ha^{-1})	216.67	24.67	604.67	4.86	2.70	1.21	0.99
T_2	GRDF (340:170:170 kg ha^{-1} + 20 t ha^{-1} FYM)	211.33	27.33	654.33	4.90	2.82	1.26	1.09
T_3	RDF (340:170:170:60 + Zn + Mg + Mn + Fe + B + Cu kg ha^{-1})	202.00	24.00	645.67	5.02	3.33	1.43	1.16
T_4	Farmers practice through CNS grade (300:150:150 kg ha^{-1})	211.67	26.67	623.33	4.98	3.19	1.38	1.12
T_5	RDF (340:170:170:60 kg ha^{-1}) through CNS grade	224.33	28.00	575.00	5.09	3.48	1.53	1.20
T_6	25% more of RDF (425:212:212:75 kg ha^{-1}) through CNS grade	209.00	27.67	649.67	5.17	3.76	1.79	1.24
T_7	25% less of RDF (255:128:128:45 kg ha^{-1}) through CNS grade	199.00	22.67	568.00	4.94	3.01	1.34	1.12
T_8	50% more of RDF (510:255:255:90 kg ha^{-1}) through CNS grade	213.33	28.33	649.33	5.26	3.96	2.22	1.33
T_9	50% less of RDF (170:85:85:30 kg ha^{-1}) through CNS grade	194.33	21.67	538.33	4.86	2.48	1.17	0.84
T_{10}	Absolute control	189.33	18.00	512.00	4.10	2.37	1.10	0.62
	$SE_m\pm$	3.49	1.88	21.83	0.20	0.22	0.19	0.08
	CD at 5%	10.47	5.63	65.37	0.59	0.66	0.56	0.24

Residual Effect of Crop Nutrient Solution Grade Fertilizer on Soil Available Nutrients at Harvest of Preseasonal Sugarcane

Soil Available Nutrients

The residual soil available nitrogen, phosphorus and potassium were significantly influenced by the complex fertilizer CNS grade are reported in Table 3. The residual soil available nitrogen at harvest of preseasonal sugarcane was significantly more in treatment RDF (340:170:170:60 kg ha^{-1} N, P_2O_5, K_2O and S) through Urea, complex fertilizer CNS grade and bensulf (224.13 kg ha^{-1}) and statistically on par with treatment Farmers practice (300:150:150 kg ha^{-1} N, P_2O_5, K_2O and S) through Urea, DAP (216.67 kg ha^{-1}). However, it was significantly superior over rest of the treatments. Similar observation was also reported by More *et al*. (2007).

The residual soil available phosphorus at harvest of preseasonal sugarcane was not influenced by the complex fertilizer CNS grade. It was statistically on par with each other except 25% less of RDF (255:128:128:45 kg ha^{-1} N, P_2O_5, K_2O and S) through urea, complex fertilizer CNS grade and bensulf (22.67 kg ha^{-1}), 50% less of RDF (170:85:85:30 kg ha^{-1} N, P_2O_5, K_2O and S) through urea, complex fertilizer CNS grade and bensulf (21.67 kg ha^{-1}) and absolute control (18.00 kg ha^{-1}). The highest residual soil available phosphorus was observed in treatment 50% more of RDF (510:225:225:90 kg ha^{-1} N, P_2O_5, K_2O and S) through urea, complex fertilizer CNS grade and bensulf (28.33 kg ha^{-1}). Similar observation was also reported by Pannu *et al.* (1996).

The complex fertilizer CNS grade application to preseasonal sugarcane was significantly influenced the residual soil available potassium. It was significantly higher in treatments RDF (340:170:170 kg ha^{-1}N, P_2O_5, and K_2O) through Urea, DAP and MOP (654.33 kg ha^{-1}) and statistically on par with all the treatments except treatment RDF (340:170:170:60 kg ha^{-1} through CNS grade fertilizer, 25% less of RDF (255:128:128:45), 50% less of RDF (170:85:85:30 kg ha^{-1} through CNS grade fertilizer. Similar observations were also reported by Tiwari *et al*. (2000) and Bhalerao *et al*. (2006) [2].

Soil Available Micronutrients

The residual soil available micronutrients in preseasonal sugarcane at harvest are significantly influenced by the application of complex CNS grade are reported in the Table 3. The residual soil available micro nutrients viz Fe, Mn, Zn and Cu at harvest of preseasonal sugarcane was recorded the highest in treatment 50% more of RDF (510:225:225:90 kg ha^{-1} N, P_2O_5, K_2O and S) through urea, complex CNS grade and bensulf (5.26, 3.96, 2.22 and 1.33 µg g^{-1}, respectively) and statistically on par with rest of the treatments except absolute control. The lowest micronutrients were recorded in absolute control (4.10, 2.37, 1.10 and 0.62 µg g^{-1} respectively). Similar observations were reported by Shukla *et al*. (2008) [4].

Conclusion

The application of nutrient through crop nutrient solution (CNS) grade fertilizer @ 50% more of RDF (510:255:255:90 kg ha^{-1} N, P_2O_5, K_2O and S) was on par with treatment RDF (340:170:170:60 kg ha^{-1}) N, P_2O_5, K_2O & S through CNS grade) and RDF (340:170:170:60 kg ha^{-1} N, P_2O_5, K_2O & S +Zn +Mg + Mn+ Fe+ B+ Cu kg ha^{-1}) for nutrient uptake by preseasonal Sugarcane. The residual soil available nitrogen and phosphorus was more in treatment RDF (340:170:170:60 kg ha^{-1} N, P_2O_5, K_2O & S) and DTPA- micro nutrients. The highest soil available Potassium in treatment 50% more of RDF (510:255:255:90 kg ha^{-1} through CNS grade).

References

1. Anonymous. Economic Survey of India and Company Affairs, Govt. of India, New Delhi, 2012.
2. Bhalerao VP, Jadhav MB, Bhoi PG. Effect of spent wash press mud compost on soil properties, yield and quality of seasonal sugarcane. Indian Sugar 2006, 57-65.
3. Manimaran S, Kalyanasundaram D, Ramesh S, Sivakumar K. Maximizing sugarcane yield through efficient planting methods and nutrient management practices. Sugar Technology. 2009; 11(4):395-397.
4. Shukla SK, Yadav RL, Suman A, Singh PN. Improving rhizospheric environment and sugarcane ratoon yield through bioagents amended farmyard manure in Udic Ustochrept soil. Soil and Tillage Research. 2008; 99:158-168.
5. Srinivas D, Rao BRB, Reddy LK, Mukunda Rao CH, Srinivasulu R. Effect of major, secondary and micronutrients on the yield and quality of Sugarcane. Proceedings of the South Indian Sugarcane and Sugar Associations (SISSTA): 2003, 21-25.