Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 640-644

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804
NAAS Rating 4.95

FULL LENGTH ARTICLE **OPEN ACCESS**

Effect of Tank Silt and Organic Manures on Soil Moisture, Nutrients Availability in Soil, Yield and Uptake of Okra.

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ABSTRACT

The application of tank silt and organic manures improves soil moisture content in root zone (0-15 and 15-30 cm) at tank silt @ 10 t ha^{-1} significantly superior over rest of the treatment at fifteen days interval. The bulk density and soil pH decrease while organic carbon and available N,P,K increased with the application of tank silt and FYM . The maximum NPK and DTPA extractable micronutrient was reported at application tank silt @ 5t /ha + FYM @ 2.5 t/ha + RDF followed by tank silt @ 5t/ha + RDF. The combination of tank silt and organic manures (FYM) significantly increased the yield. The maximum yield of okra was noticed at treatment tank silt applied @ 5t /ha + FYM @ 2.5 t/ha+ RDF. The uptake of the okra significantly increased with application of tank silt and organic manures. From above, however concluded that application of tank silt in combination with organic manures (FYM) and RDF improve the nutrients availability, yield and quality of okra as compare to its alone application.

Key word: *Okra, Tank silt, organic manure, yield and nutrient uptake*

Received 22.07.2017 Revised 12.08.2017 Accepted 21.08. 2017

INTRODUCTION

Okra (*Abelmoschus esculentus* L.) is one of the most popular vegetable crops grown widely in subtropical region of the world. It belongs to family malvaceae , and it is commonly known as bhindi. Okra requires heavy nutrients for its potential production. However, the use of expensive commercial fertilizers as per a requirement of the crop is not much affordable to the average farmers. Tank sediments have 20 percent higher nutritive value over their respective cultivated catchment soil (Anonymous, 2003 and Vaidya and Dhawan 2014). Tank sediments can be used preferably in the fields of respective catchment to build up their productivity. Addition of tank sediments to cultivated fields improves the physico-chemical properties of the soil which results in good crop growth and higher yields. Kabir *et al.*(1991), Ramesh (2001) and Anonymous (2003) observed higher crop yield with the addition of sediment desilted from the tanks to agricultural fields appear to be an economically viable option for returning the plant nutrients back to the soil . With this view present investigation was carried out

Materials and methods:

The pot culture experiment was conducted at farm department of Soil Science and Agricultural Chemistry, College of Agriculture, Latur during *kharif* season 2015-16 under Inceptisols with various treatments T_1- Control, T_2- 100% RDF, T_3- Tank silt @10t/ha + RDF, T_4- Tank silt @ 2.5t/ha + RDF, T_5- Tank silt @5t/ha + RDF, T_6- Tank silt @ 2.5t/ha + FYM @ 2.5t/ha + RDF, T_7- Tank silt @ 5t/ha + FYM @ 2.5t/ha +RDF, T_8- FYM @ 2.5t/ha + RDF. The experiment was laid out in RBD design. The size of each pot 40 inches deep and 8 inches width and the pot filled with medium texture sand up to 2 to 3cm depth at bottom then filled soil as per various layer of experimental site soils up to 0-40 cm from different plots. Pots were filled with 14 kg soil. The okra variety Parbhani ok 4 seeds were dibbled per pot and retained two seedlings after germination in each pot. The crop was raised following recommended agronomic practices. The recommended dose of chemical fertilizers was applied at the time of sowing. The organic manures were applied through FYM. The nutrients composition of tank silt and initial soil sample was analysed. The nutrients composition of tank silt were 117, 23. 5 and 482 available NPK kg/ha respectively and initial soil sample were 156, 8.1 and 356 available NPK kg/ha respectively. Intercultural operations like thinning, weeding, spraying of insecticides, fertilizer application and schedule of irrigation for okra crop was carefully followed. Harvesting was started at 45 days after sowing and matured fruits were picked at three to four days interval from individual pot. The soil samples were collected at 0 to 15 cm and 15 to 30 cm depth for soil moisture content at fifteen days interval and 0- 30 cm depth were collected at harvesting and analyzed for pH, EC, OC and available NPK as per standard procedure..

RESULTS AND DISCUSSION

Soil moisture content:

Soil moisture content was significantly improved with the application of tank silt and in combination with FYM at different growth stages of Okra (Table 1). The maximum soil moisture content at 0-15cm and 15-30cm.depth was found at treatment T_3 (Tank silt @ 10 t ha^{-1} + RDF) followed by T_7 (Tank silt @ 5 t ha^{-1} + FYM @ 2.5 t ha^{-1} + RDF) and which was significantly increase with other treatments. This is due to application of tank silt and FYM. Osman (2007) reported that the application of tank silt and green leaf manures and crop residue in set furrows improved the soil moisture, in Inceptisol. Vaidya and Dhawan (2015) reported that the tank silt hybridization with shallow soils improve the water holding capacity of the soil similar result was reported by Yadahalli and Gurappa (2008).

Physical and Chemical Properties of soil

The bulk density varies from 1.63 to 1.69 mg cm^{-3} under different treatments of tank silt and its combination with FYM and which was found non significantly affected. The lowest value of bulk density was noticed in treatment T_7 (Tank silt @ 5 t ha^{-1} + FYM @ 2.5 t ha^{-1} + RDF). The pH and EC of soil found to be in the range of 7.60 to 7.73. and 0.20 to 0.31 dsm^{-1} and which was not affected significantly due to application of different doses of tank silt and FYM. The organic carbon content of soil was found to be in range of 0.54 to 0.81 per cent . The maximum organic carbon content in soil was noticed in treatment T_7 (Tank silt @ 5 t ha^{-1} + FYM @ 2.5 t ha^{-1} + RDF)followed by T_3 and T_5 . The organic carbon content in soil was significantly increased over all treatment. This indicated that the application of tank silt in combination with FYM improve organic carbon in soil comparative than its alone application in soil. Similar observation also reported by Jeyamangalam *et al.* (2012) improvement of organic carbon due to addition of tank silt and organic manure in soil and also reported by Osman (2007). The calcium carbonate content was decreased in all the treatment than the control. The effect of different doses of tank silt and FYM on $CaCo_3$ content in soil was found non significant and which was varies from 8.70 to 13.00 per cent. The application of organic manure (FYM) reduced the $CaCo_3$ content in soil might be due to addition of sufficient organic matter in the soil. (Jenkinson and Johnson, 1977).

Available nutrient status

The available NPK in soil was found in the range of 160.67 to 250.00, 8.24 to 19.51 and 613.00 to 841.33 kg ha^{-1} respectively, among the various treatments application of Tank silt @ 5tha^{-1} + FYM 2.5 tha^{-1} +RDF (T7) showed significantly higher N PK (250.00, 8.24 and 841.33 kg ha^{-1}respectively) and found at par with T_5 (Tank silt @5t/ha + RDF) and superior over rest of the treatments. In treatment T_1 (control) observed minimum NPK (Table 1). Similar results also reported by Ramesh *et al.* (2011) the availability of NPK due to fertilizer combination with organic manures which is largely attributed to mineralization and organic recycling. Jeyamangalam *et al*. (2012) studied that NPK content was maximum with tank silt + coir pith + fertilizers combination.The significant effects of tank silt and organic manure in combination with RDF on the micronutrients viz. Fe, Mn, Zn, Cu are presented in table 4. application of T_7 (Tank silt @ 5t/ha+ FYM @ 2.5t/ha+RDF) treatment showed significantly superior over all other treatments for availability of Fe (6.84 mg kg^{-1}), Mn (6.00 mg kg^{-1}), Zn (1.41 mg kg^{-1}), Cu (2.63 mg kg^{-1}) and was at par with T_3 (Tank silt @10t/ha + RDF)and T_5(Tank silt @ 5t/ha+ RDF). and minimum concentration of all these micronutrient was observed in T_1 (control).Similar result reported by Ramprasad *et al. (*2009) the application of tank silt in the soil helps in retention of nutrients in soil and increases the fertility status of soil. Vaidya and Dhawan (2014) reported that the tank silt having 15 to 20 % maximum nutritional status that the soils of adjoining area of the tank which helps to increase the nutritional status of soil.

Yield and Uptake of NPK: The results indicated that okra fruit yield increased significantly due to application of different doses of tank silt and organic manure (Table 1 and Fig 2). Treatment T_7 (Tank silt @ 5t/ha + FYM @ 2.5t/ha +RDF) produced maximum fruit yield per hectare (102.29 q/ha^{-1}) which was at par with T_5 (Tank silt @5t/ha + RDF) and significantly superior over rest of the treatments. Minimum yield per hectare (41.00 q/ha^{-1}) was recorded with treatment T_1 (control). Similar observations were noticed by Krishnappa *et al*. (1998) and recorded that significant increase in crop yields an application of tank silt. The percent increase in crop yield was 60.0 (groundnut), 77.0 (Maize), 80.0 (Rainfed ragi), 80.0 (Tomato) and 80.0 (Mulberry) as compared to without application of tank silt .

The total uptake of NPK was found maximum in treatment T_7 (Tank silt @ 5t/ha + FYM @ 2.5t/ha +RDF) and minimum uptake of N (19.18 kg ha^{-1}) was found in T_1 (control) and was significantly superior over all other treatments (Table 3 anf Fig 1) . Similar observation also noticed by Binitha (2006) who reported that higher NPK uptake was recorded at 30,60, and 90 days on application of tank silt @ 20t ha^{-1} followed by 10t ha^{-1} over control . Jayamangalam *et al*. (2012) reported the application of tank silt and organic manures improve the uptake of N, P and K.This study showed that the application of tank silt @ 5t ha^{-1} + FYM @ 2.5t/ha + RDF significantly superior over T_1 (control), T_2 (100% RDF) and T_8 (FYM @ 2.5 t/ha) in soil moisture content at 30, 60 and 90 DAS, availability of nutrients, yield and uptake of NPK in okra. This indicated that the application of tank silt in combination with FYM along with RDF improves the soil moisture, yield and uptake of okra as compared to its alone application.

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Table 1: Effect of tank silt and organic manure of soil moisture (%)

Treatment	30 DAS		60 DAS		Harvesting	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
T_1– Control	13.18	18.61	13.42	16.54	7.32	10.56
T_2- 100% RDF	14.26	20.37	14.24	18.32	7.66	10.84
T_3- Tank silt @10 tha^{-1} + RDF	20.87	23.58	18.82	22.64	11.65	16.72
T_4- Tank silt @ 2.5 tha^{-1} + RDF	15.36	21.64	15.44	20.10	9.31	16.35
T_5- Tank silt @5 tha^{-1} + RDF	17.15	22.85	16.72	20.26	11.53	13.35
T_6- Tank silt @ 2.5 tha^{-1} + FYM @ 2.5 tha^{-1} + RDF	16.36	21.81	16.54	20.42	10.76	13.21
T_7- Tank silt @ 5 tha^{-1} + FYM @2.5 tha^{-1} +RDF	18.25	22.70	18.64	21.84	11.49	16.42
T_8- FYM @ 2.5 tha^{-1} + RDF	15.18	21.42	16.12	19.92	8.21	12.68
Genral mean	16.33	21.62	16.12	20.01	9.54	13.77
SE (m) ±	0.092	0.239	0.057	0.061	0.065	0.080
CD at 5 %	0.279	0.725	0.172	0.185	0.196	0.242

Table 2. Effect of tank silt and organic manure on physical, chemical and available nutrient status in soil.

Treatments	BD (Mg/m^3)	PH	EC (dsm^{-1})	OC (%)	$CaCo_3$ (%)	Available Macronutrients ($kg\ ha^{-1}$)			Available Micronutrients ($mg\ kg^{-1}$)			
						N	P	K	Fe	Mn	Zn	Cu
T_1– Control	1.68	7.73	0.31	0.54	13.00	160.67	8.24	613.00	5.24	4.62	1.05	1.97
T_2- 100% RDF	1.67	7.70	0.30	0.65	12.50	179.00	9.72	675.67	5.37	4.72	1.12	2.13

T_3- Tank silt @10 tha^{-1} + RDF	1.69	7.61	0.30	0.77	10.47	219.33	18.96	766.67	6.36	5.34	1.34	2.47
T_4- Tank silt @ 2.5 tha^{-1} + RDF	1.66	7.67	0.28	0.74	11.60	207.67	17.69	754.67	5.71	5.06	1.23	2.36
T_5- Tank silt @5 tha^{-1} + RDF	1.65	7.67	0.28	0.77	9.47	231.67	19.12	811.67	6.65	5.85	1.36	2.54
T_6- Tank silt @ 2.5 tha^{-1} + FYM @ 2.5 tha^{-1} + RDF	1.64	7.63	0.24	0.75	10.80	210.33	18.37	759.33	5.91	5.25	1.28	2.41
T_7- Tank silt @ 5 tha^{-1} + FYM @2.5 tha^{-1} +RDF	1.63	7.60	0.20	0.81	8.70	250.00	19.51	841.33	6.84	6.00	1.41	2.63
T_8- FYM @ 2.5 tha^{-1} + RDF	1.67	7.67	0.26	0.68	12.00	190.00	16.12	683.33	5.69	5.10	1.21	2.21
Genral mean	1.66	7.67	0.27	0.71	11.07	206.08	15.97	738.21	5.97	5.24	1.25	2.34
SE(m) ±	0.012	0.071	0.030	0.038	0.904	8.040	0.340	20.437	0.20	0.139	0.03	0.07
CD at 5%	NS	NS	NS	0.116	NS	24.387	1.031	61.986	0.62	0.423	0.10	0.21
Initial value	1.7	7.92	0.36	0.52	14.00	156.8	8.16	364	5.19	3.76	0.98	2.67

Table 3. Effect of tank silt and organic manure on yield and nutrient uptake of okra.

Treatments	Yield (q ha^{-1})	Total uptake (kgha^{-1})		
		N	P	K
T_1– Control	41.0	19.1	8.8	67.7
T_2- 100% RDF	54.2	31.3	18.6	107.8
T_3- Tank silt @10t/ha + RDF	82.6	56.8	29.6	176.2
T_4- Tank silt @ 2.5t/ha + RDF	69.6	44.7	23.2	136.0
T_5- Tank silt @ 5t/ha + RDF	96.9	105.8	52.0	300.3
T_6- Tank silt @ 2.5t/ha + FYM @ 2.5t/ha + RDF	74.6	54.6	28.1	170.9
T_7- Tank silt @ 5t/ha + FYM @ 2.5t/ha +RDF	102.2	116.4	58.2	334.6
T_8-FYM @ 2.5t/ha + RDF	63.5	39.2	20.6	120.4
Genral mean	73.1	58.3	29.9	176.7
SE (M) ±	3.65	3.47	1.72	7.91
CD at 5%	11.06	10.5	5.24	24.01

Fig.1: Effect of application of tank silt and organic manure on N, P, K uptake by okra.

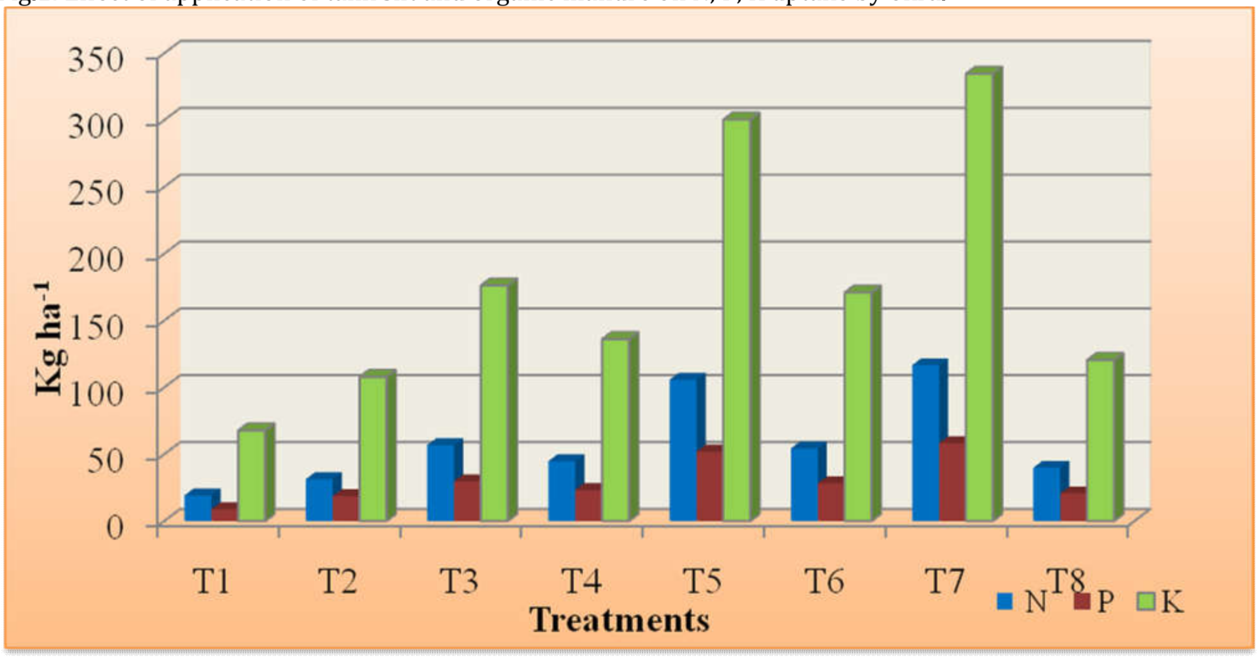
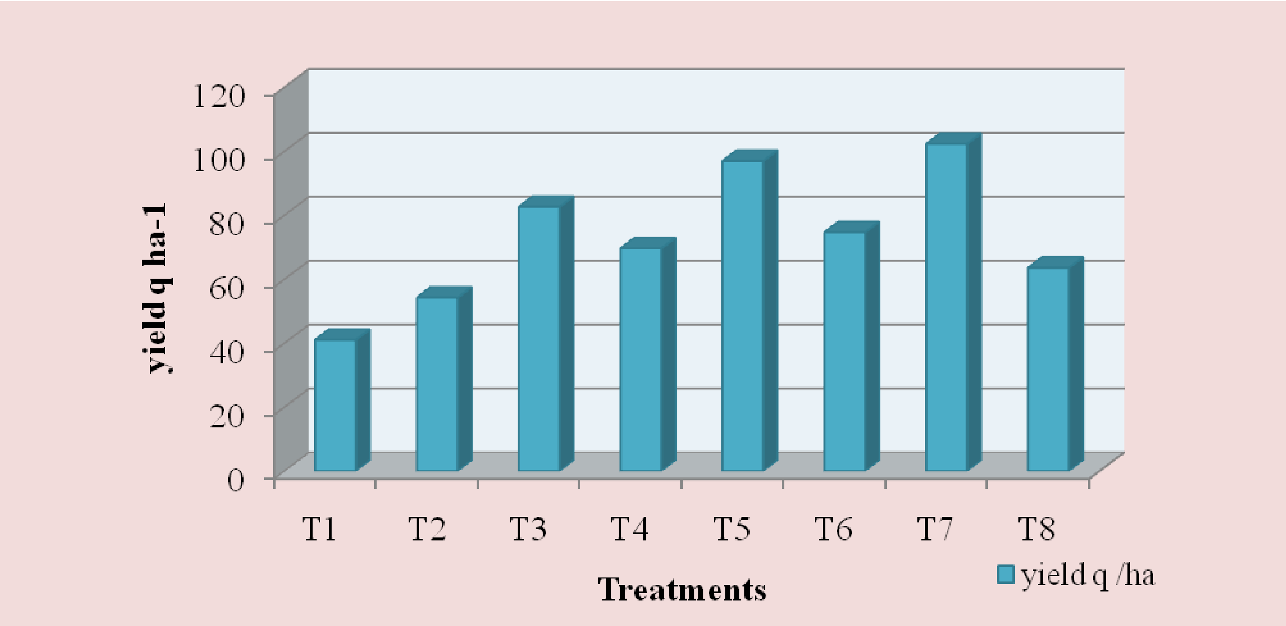


Fig 2 : Effect of tank silt and organic manure on yield of okra (q ha^{-1}).



CITATION OF THIS ARTICLE

P.D. Kadam, P.H. Vaidya , A.S.Dhawan and Ingole A.J. Effect of Tank Silt and Organic Manures on Soil Moisture, Nutrients Availability in Soil, Yield and Uptake of Okra.. Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 640-644