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Periodic Research

Effect of different levels of effluent and inorganic fertilizer with and without FYM on growth and yield of okra in lateritic soil of Konkan

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Abstract

A field experiment on the effect of effluent, FYM and inorganic fertilizers on growth and yield of okra in lateritic soils of Konkan was conducted at Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri during *Kharif*, 2012. Effect of application of effluent concentrations @ 25, 50, 75 and 100 per cent with 100, 75, 50 and 25 per cent RDF and FYM @ 15 t ha^{-1} on growth parameters, yield attributing characters and yield of okra was studied in randomized block design comprising of nine treatment combinations with three replications. In general, the application of lower dose of effluent *i.e*. 25 per cent effluent + 100 per cent RDF + FYM @ 15 t ha^{-1} recorded the higher values for the growth parameters, yield attributing characters and produced significantly highest green fruit yield (71.72 q ha^{-1}) and dry matter production (16.68 q ha^{-1}) and found to be suitable for okra in lateritic soils of Konkan.

Keywords: Okra, effluent, FYM, growth, yield, lateritic soils

Introduction

Okra is popular and nutritious vegetable, grown for its tender fruit as fresh market consumption. In India the total area under okra crop is about 4.98 lakh ha with annual production of 57.84 lakh tonnes in 2010-11 (Anonymous 2011). Fertilizers and organic manures play an important role in increasing production, improving quality of vegetables and sustaining soil fertility. The lateritic soils of Konkan, Maharashtra are the best suited for okra cultivation, but extremely suffers by low yield especially due to acidic soil condition, deficiency of major nutrients (N and P) and lack of affordability of farm inputs.

In Maharashtra, molasses is one of the most significant and economically important by-products of sugar industries. Molasses, which primarily constitutes a large fraction of fermentable sugar is diluted three times with water and allowed to ferment in presence of yeast cell culture either by batch or continuous process of fermentation. At the end of fermentation and distillation, a large quantity of effluent (spent wash) is generated. Yeast cells are separated from the spent wash to get yeast sludge. This liquid is dark brown in colour with unacceptable odour.

The increasing cost of fertilizers and most essential nutrients also demand the attention as spent wash contains high amount of nutrients like nitrogen, phosphorus, potassium, calcium and sulphur. In addition, it contains sufficient amount of micronutrients like iron, zinc, copper and manganese. In certain cases, the diluted effluents enhanced the growth of the plants, which might be due to the presence of phenolic compounds rendering the beneficial effect on the plant growth. Keeping this in view, the present investigation was planned.

Material and Methods

The field experiment was conducted on lateritic soil at Central Experiment Station, Wakawali, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during Kharif season 2012. The soil is classified into Pangari series, which is a member of fine loamy mixed, isohyperthermic family of Typic Ustorthents (Bhattacharjee et al. 1978). The soil had pH 5.62, electrical conductivity 0.13 dS m^{-1}, organic carbon 2.25 g kg^{-1}, available N 247.74 kg ha^{-1}, available P_2O_5 9.84 kg ha^{-1} and available K_2O 202.94 kg ha^{-1}.

Based on the irrigation requirement of the crop, per plot quantity of the effluent (composite sample of digester over flow) collected from the Yeast Company, Chiplun, Dist.-Ratnagiri, as per the treatments i.e. 25, 50, 75 and 100 per cent was calculated, diluted with water and applied as onetime pre-sown application to the respective ploughed experimental plots before sowing. The soils of the treated plots were thoroughly mixed by cultivator to facilitate aeration and oxidation and then the ridges and furrows were prepared. After fertilizer application, the sowing was done by dibbling three seeds per hill with 60 cm x 60 cm spacing. The effluent was analyzed for different chemical parameters (Table 1) using standard methods.

The field experiment was laid out in randomized block design comprising of nine treatment combinations with three replications where effluent concentrations @ 25, 50, 75 and 100 per cent with 100, 75, 50 and 25 per cent RDF i.e. N:P:K @100:50:25 kg ha^{-1} and FYM @ 15 t ha^{-1} were applied. The nine treatments were 100% RDF (T_1), 25% Effluent + 100% RDF (T_2), 25% Effluent + 100% RDF + FYM (T_3), 50% Effluent + 75% RDF (T_4), 50% Effluent + 75% RDF + FYM (T_5), 75% Effluent + 50% RDF (T_6), 75% Effluent + 50% RDF + FYM (T_7), 100% Effluent + 25% RDF (T_8) and 100% Effluent + 25% RDF + FYM (T_9). Nitrogen in three splits i.e. 33 per cent N at the time of sowing and remaining 67 per cent as top dressing in two equal splits i.e. 30 and 60 days after sowing by placing it in the ring 3-5 cm deep around the plants were applied. Phosphorus @ 50 kg ha^{-1} and potassium @ 25 kg ha^{-1} were applied in a single basal dose at the time of sowing. Biometric observations were recorded at harvest to study the effects of various treatments on growth and yield contributing characters of the crop

Table 1
Chemical properties of the effluent used in the study

Characteristic	Value
pH	7.45
EC (dS m^{-1})	31.33
Organic carbon (%)	0.741
Total Nitrogen (%)	0.26
Total Phosphorus (%)	0.016
Total Potassium (%)	0.29
Calcium (%)	0.048
Magnesium (%)	1.63
Iron (ppm)	93.54
Copper (ppm)	1.95
Zinc (ppm)	0.96
Manganese (ppm)	13.58
Chloride (meq L^{-1})	13.00
Sodium (%)	0.75

Result and Discussion

Growth Parameters

The growth parameters *viz*., plant height, number of leaves per plant and yield attributing characters *viz*., number of fruits per plant, length of fruits and fresh fruit weight per plant recorded during the study indicated that these parameters were significantly affected due to application of different level of effluent and inorganic fertilizer with and without FYM (Table 2). The maximum plant height (209.53 cm), number of fruits per plant (15.72) and fresh fruit weight per plant (242.53 g) were found with the treatment 75% effluent + 50% RDF + FYM (T_7), while number of leaves per plant (9.53) and length of fruits (14.79 cm) were recorded with the treatment 100% effluent + 25% RDF + FYM (T_9) and 50% effluent + 75% RDF (T_4), respectively.

Table 2:
Effect of different level of effluent and inorganic fertilizer with and without FYM on growth, yield contributing characters of okra at harvest

Tr. No.	Treatments	Plant height (cm)	Number of leaves $plant^{-1}$	No. of fruits $plant^{-1}$	Length of fruits (cm)	Wt. of fruits $plant^{-1}$ (g)
T_1	100% RDF	146.27	5.47	9.85	12.81	135.60
T_2	25%E + 100% RDF	184.07	9.40	14.52	14.64	207.34
T_3	25%E + 100% RDF + FYM	194.00	7.27	15.19	14.75	218.96
T_4	50%E + 75% RDF	187.27	7.73	14.26	**14.79**	187.28
T_5	50%E + 75% RDF + FYM	209.20	8.73	14.26	14.41	211.65
T_6	75%E + 50% RDF	203.87	7.13	14.80	14.05	224.17
T_7	75%E + 50% RDF + FYM	**209.53**	8.73	**15.72**	14.19	**242.53**
T_8	100%E + 25% RDF	175.93	8.73	12.00	14.36	185.41
T_9	100%E + 25% RDF + FYM	173.93	**9.53**	13.92	14.41	220.09
S.E.m ±		6.25	0.41	0.60	1.78	9.81
C.D. (P=0.05)		18.75	1.24	1.81	0.53	29.42

Note **:** E = Effluent

Green Fruit Yield and Dry Matter Production

(q ha^{-1})

Among the various treatments, treatment T_3 consisting 25 per cent effluent + 100 per cent RDF + FYM produced significantly highest fruit yield (71.72 q ha^{-1}) and dry matter production (16.68 q ha^{-1}), but found to be at par with all other treatments except T_1, T_8 and T_9 in case of fruit yield, indicating thereby that the higher doses of effluent application resulted in poor fruit setting and decrease in the yield (Table 3). The factory effluent contains high level of plant nutrients which are made available to the plant, thus

resulting in better growth and development of the crop (Suganya and Rajannan, 2009).

Green fruit yield of okra was increased with the application of FYM over sole use of chemical fertilizers in different effluent combinations. The close scrutiny of the data indicated that the application of FYM increased the green fruit yield and dry matter production over no application. The beneficial effect of organic manures on yield might be due to additional supply of plant nutrients as well as improvement in physical and biological properties of soil (Datt *et al*. 2003). Dademal (2000) also recorded similar fruit yield of okra with the combined application of chemical fertilizer (150: 75: 75 kg NPK ha^{-1}) + FYM @7.5 t ha^{-1} in lateritic soil.

Table 3.
Effect of different level of effluent and inorganic fertilizer with and without FYM on fruit yield and dry matter of okra

Tr. No.	Treatments	Green fruit yield (q ha^{-1})	Dry matter production (q ha^{-1})
T_1	100% RDF	28.47	6.28
T_2	25%E + 100% RDF	60.05	11.83
T_3	25%E + 100% RDF + FYM	71.72	16.68
T_4	50%E + 75% RDF	60.11	12.26
T_5	50%E + 75% RDF + FYM	64.96	16.09
T_6	75%E + 50% RDF	64.68	9.63
T_7	75%E + 50% RDF + FYM	64.37	16.52
T_8	100%E + 25% RDF	46.87	6.09
T_9	100%E + 25% RDF + FYM	48.37	15.82
S.E. m ±		4.05	0.63
C.D. (P=0.05)		12.15	1.91

Note **:** E = Effluent

Conclusion

On the basis of data obtained from the present investigation, it may be concluded that the application of lower dose of effluent *i.e*. 25 per cent effluent + 100 per cent RDF + FYM @ 15 t ha^{-1} had recorded the higher values for the growth parameters, yield attributing characters and yield and found to be suitable for okra in lateritic soils of Konkan.

References

1. Anonymous (2011) A Report by National Horticulture Mission Annulus.
2. Bhattacharjee, J.C., Deshmukh, P.L., Kalbande, A.R. and Vaidya, G.S. (1978) Report on Detailed Soil Survey of Konkan Krishi Vidyapeeth Farm Dapoli, District Ratnagiri, Maharashtra. Report No. 409 (ICAR). N.B.S.S. and L.U.P., ICAR, New Delhi.
3. Dademal, A.A. (2000) Studies on nutrient management for okra [*Abelmoschus esculentus* (L.) Moench] with relation to its growth, yield response, nutrient uptake and changes in nutrient availability on lateritic soil of Konkan. M.Sc. (Ag.) *Thesis* submitted to K.K.V., Dapoli.
4. Datt, N., Sharma, R.P. and Sharma, G.D. (2003) Effect of supplementary use of farmyard manure along with chemical fertilizers on productivity and nutrient up-take by vegetable pea (*Pisum sativum var arvense*) and build up of soil fertility in Lahul valley of Himachal Pradesh. *Journal of the Indian Society of Soil Science*. **73**, 266-268.
5. Suganaya, K. and Rajannan, G. (2009) Effect of one time post-sown and pre-sown application of distillery spentwash on the growth and yield of maize crop. *Botany research International.* **2** (4): 288-294.