Journal of Natural Resource Conservation and Management
Vol. 2, No. 2, pp 110-113, 2021
doi: 10.51396/ANRCM.2.2.2021.110-113

Short Communication

Influence of Soil Test Crop Response based organic manure and inorganic fertilizers on yield of okra (*Abelmoschus esculentus* L. Moench)

V.R. Mageshen[1]*, U. Bagavathi Ammal[2] and Pradip Dey[3]

[1]Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore, India; [2]Department of Soil Science and Agricultural Chemistry, PAJANCOA, Karaikal, India; [3]AICRP (STCR), Indian Institute of Soil Science, Bhopal, Madhya Pradesh, India
**Corresponding author Email: mageshsmart2@gmail.com*

Received : October 11, 2021
Revised : December 20, 2021
Accepted : December 26, 2021
Published : December 31, 2021

ABSTRACT

Long-term food security needs a balance between increasing crop production, restoring soil fertility, and as well as sustaining environmental health. The most logical way to meet this balance is the integrated use of both inorganic and organic sources of plant nutrients. Therefore, a field experiment was laidout in randomized block design with 10 treatments which were replicated thrice. The soil (post harvest), plant and fruit samples were drawn at different stages of crop growth and were analyzed for various parameters. The biometrical observations were also taken and the final fruit yield was recorded. The experimental results revealed that STCR + IPNS- 180 q ha^{-1} treatment recorded maximum fruit yield and dry matter production followed by other treatments. Thus, the application of organic and inorganic fertilizer can favourably improve yield and dry matter production. The Soil Test Crop Response based Integrated Plant Nutrient System package is useful to recycle farm wastes, sustain soil health, conserve biodiversity and upgrade the farmers socio economic status.

Keywords: Food security, integrated, Organic, Sustainable, Profitable, Yield

INTRODUCTION

For successful production of the food, the ultimate thing is the proper maintenance of the growing media, most probably the soil, hence, the soil is regarded as soul of infinite life. The long term food security requires a balance between increasing crop production, maintaining soil health and environmental sustainability (Malik *et al.*, 2021). The most logical way to maintain this balance is integrated use of both inorganic and organic sources of plant nutrients. In the conventional method of fertilization, blanket fertilizer application is practiced without considering the soil fertility which may lead to either over usage or under usage of fertilizers resulting in relatively lower economic and efficient fertilizer use (Bhardwaj *et al.*, 2021). Okra contains proteins, carbohydrates and vitamin C (Gopalan *et al.,* 2007) and plays a vital role in human diet (Kahlon *et al.,* 2007). The potential yield is still not achieved because of various reasons including imbalanced use of inorganic fertilizers with more of nitrogen, less of phosphorus and potassium and virtual absence of micronutrients (Bhardwaj *et al.*, 2020). The yield gap could be further reduced by adopting proper nutrient management technologies. Therefore, Integration of nutrient should be given proper attention to maintain or increase yields and sustain productivity.

At this juncture, the inductive cum targeted yield concept (Ramamoorthy *et al.*, 1967) which is a unique field experimental approach as followed in All India Coordinated Research Project for investigation on Soil Test Crop Response Correlation Studies (AICRP-STCR) has evolved through

creating a macrocosm of soil fertility variability within a microcosm of an experimental field is highly appropriate for prescribing balanced nutrition to crops. Based on the aforementioned discussion, an experimental study was conducted to investigate the yield of okra based on applications of both organic and inorganic sources of nutrients.

MATERIAL AND METHODS

To investigate the effect of different levels of NPK and STCR-IPNS on the yield of okra, a field experiment was conducted during the Kharif season of 2018 at Karikalampakkam village in Nettapakkam commune of Pondicherry district. The study area comes under coastal alluvial plain classified as fine, mixed isohyperthermic, Typic Ustropept with an area of 12.72 percent. According to agro-climatic zonal classification, the study area is located at 11°56′ North latitude and 79°66′ East longitude. The pH of the soil was almost neutral (6.96) and the EC suggested that the soil was non-saline (1.17 dS m^{-1}). The soil was low in available nitrogen (212 kg ha^{-1}) and organic carbon (4.20 g kg^{-1}) and medium in available phosphorous (20.60 kg ha^{-1}) and available potassium (196 kg ha^{-1}). The experiment was laid out randomized block design (RBD) with 10 treatments which were replicated three times. The treatments included (Table 1): farmer's practice, FYM alone @ 12.5 t ha^{-1}, blanket recommendation, STCR-NPK alone @ 160, 170, and 180 q ha^{-1} yield target, and STCR-IPNS @ 160, 170 and 180 q ha^{-1} yield target and control treatments. The experiment was conducted using okra (Hybrid gold plus) as a test crop to investigate the effect of the addition of STCR-NPK alone or in combination with organic manure. The yield of the plant was recorded subjected to statistical scrutiny following the procedure outlined by Gomez and Gomez (1976).

RESULTS AND DISCUSSION

Fruit yield

The fruit yield was significantly higher in the plot which received STCR + IPNS – 180 q ha^{-1} (17. 95 t ha^{-1}) compared to STCR-NPK alone 180 q ha^{-1} (17. 25 t ha^{-1}) and 170 q ha^{-1} (16. 35 t ha^{-1}). The least fruit yield was registered in control plots (9. 35 t ha^{-1}) followed by FYM alone treatment ((11. 2 t ha^{-1}) and farmer's practice treatment (13.5 t ha^{-1}), which were significantly different from each other (Table 2). An increase in fruit yield may be due to an increase in the number of leaves which worked as an efficient photosynthesis structure and produced a high amount of carbohydrates in the plant system. More branches that had borne more flowers resulted in a higher number of fruits per plant, more fruit yield, and better yield attributes (Nanthakumar and Veeraraghavathatham, 1999). Increased dry matter accumulation is considered to be a prerequisite for obtaining a better economic yield, provided the accumulated photosynthates are transported from the source to the sink. Among the same yield targets, the STCR-IPNS treatments recorded relatively higher fruit yield than those under STCR-NPK alone due to the cumulative effect of FYM and inorganic fertilizers on increased yield attributes which have resulted in higher yield. The use of organic manures alone suffers from the drawback of the low content of nutrients and its slow release. Therefore, to get maximum economic yield from okra, an integrated approach was most beneficial (Anburani and Manivannan 2003). The reason for the higher yield observed in FYM treated plots when compared to control plots might be due to the creation of good

Table 1. Fertilizer doses applied for field experiment

S. No.	Treatment details	N (kg)	P_2O_5 (kg)	K_2O (kg)	FYM (t ha^{-1})
1	T_1-Control	0	0	0	0
2	T_2- FYM alone	-	-	-	12.5
3	T_3-Farmer's Practice	150	125	125	6.25
4	T_4-Blanket Recommendation	200	100	100	12.5
5	T_5-STCR-NPK alone-160 q ha^{-1}	276	114	106	0
6	T_6-STCR-NPK alone-170 q ha^{-1}	296	125	115	0
7	T_7-STCR-NPK alone-180 q ha^{-1}	316	136	124	0
8	T_8-STCR+IPNS-160 q ha^{-1}	226	86	63	12.5
9	T_9-STCR+IPNS-170 q ha^{-1}	246	96	72	12.5
10	T_{10}-STCR+IPNS-180 q ha^{-1}	266	107	81	12.5

STCR recommendation based on initial soil test values kg ha^{-1}; 212:20.6:196 available N, P, and K kg ha^{-1}, respectively.

soil conditions i.e., reduction in soil compaction and improved aeration which favours better root proliferation (Havlin *et al.*, 2009), conducive chemical and biological properties upon FYM application as compared to control (Geetha Kumari *et al.*, 2011).

Dry matter production

The dry matter production was found to be significantly influenced by the different treatments is given in Table 2. The least dry matter production was recorded in control plots (1652 kg ha^{-1}) followed by FYM alone treatment (2010 kg ha^{-1}) and farmer's practice treatment (2285 kg ha^{-1}). Highest DMP was associated with the plots which received STCR + IPNS treatments and it was significantly different from all the other treatments followed by blanket recommendation and STCR-NPK alone treatments (Table 2). The word dry matter production denotes the total biomass produced by the plant during its life cycle. The highest DMP recorded in STCR-IPNS treatments might be due to the availability of nutrients in a right proportion which improves the photosynthetic activity, light interception, dry matter production, accumulation and partitioning (Govindhan *et al.*, 1995).

Table 2. Effect of different fertilizer doses of NPK and STCR - IPNS on Dry matter production(g) and fruit yield (t ha^{-1})

Treatments	Dry matter production (kg ha^{-1})	Fruit yield (t ha^{-1})
T_1-Control	1652	9.35
T_2- FYM (12.5 t ha^{-1}) alone	2010	11.20
T_3-Farmer's Practice	2285	13.50
T_4-Blanket Recommendation	2830	16.12
T_5-STCR-NPK alone-160 q ha^{-1}	2325	15.20
T_6-STCR-NPK alone-170 q ha^{-1}	2480	16.35
T_7-STCR-NPK alone-180 q ha^{-1}	2630	17.25
T_8-STCR+IPNS-160 q ha^{-1}	3085	15.85
T_9-STCR+IPNS-170 q ha^{-1}	3220	16.20
T_{10}-STCR+IPNS-180 q ha^{-1}	3465	17.95
S.Ed	226	0.82
C.D (P=0.05)		476
1.73		

CONCLUSIONS

The yield reduction in farmers' practice and blanket recommendation compared to STCR-IPNS treatments might be due to mismatching between the nutrient supply and crop requirement without accounting for the initial soil fertility status. When fertilizers are applied based on the STCR equations there is neither excess nor deficient levels of fertilizer doses. Under IPNS, FYM can maintain plant nutrients in available forms for a longer period due to improved soil organic matter (SOM), soil physicochemical as well as biological properties. On the other hand, inorganic fertilizers supply nutrients that are readily soluble in soil solution and thereby make nutrients instantly available to plants. The use of organic manures alone suffers from the drawback of the low content of nutrients and its slow-release characteristics. Therefore, to obtain a maximum economic yield from okra, an integrated approach would be the most viable option.

Acknowledgment

The authors are grateful to Dr. V. Kanthasawmy, the Dean Incharge, PAJANCOA & RI, Karaikal, and our farmer Mr. Kaliyaperumal for taking keen interest and providing encouragement to carry out the present research work

References

Anburani, A., and Manivannan, K. (2003). Effect of integrated nutrient management on growth of brinjal. *Indian Horticulture*, 59: 377-386.

Bhardwaj, A.K., Rajwar, D., Basak, N., Bhardwaj, N., Chaudhari, S.K., Bhaskar, S. and Sharma, P.C. (2020). Nitrogen mineralization and availability at critical stages of rice (Oryza sativa) crop, and its relation to soil biological activity and crop productivity under major nutrient management systems. *Journal of Soil Science and Plant Nutrition*, 20(3):1238-1248.

Bhardwaj, A.K., Rajwar, D., Yadav, R.K., Chaudhari, S.K. and Sharma, D.K. (2021). Nitrogen availability and use efficiency in wheat crop as influenced by the organic-input quality under major integrated nutrient management systems. *Frontiers in Plant Science*, 12:752-764.

Gomez, A. A. and Gomez, R.A. (1976). Statistical procedure for agricultural research with emphasis on rice. IARI. Los Banos, Manila, Philippines, Pp. 294.

Gopalan, C., Ramasastri, B.V. and Balasubramanian, S. (2007). Nutritive value of Indian foods, Published by National Institute of Nutrition (NIN), ICMR.

Govindan, M., Muralidharan, P. and Kumaran, S. S. (1995). Influence of vermicompost in the field performance of bhendi (Abelmoschus esculentus (L). monech.) in a laterite soil. *Journal of Tropical Agriculture,* 23, 1995: 173-174.

Havlin. J. L., Beaton, J. D., Tisdale, S. L., and Nelson, W. L. (2009). Soil fertility and fertilizers- An introduction to nutrient management, 7th Edn. Pearson Education Publishing Company, U.S.A.

Kahlon, T. S., Chapman, M. H. and Smith, G. E. (2007). In vitro binding of bile acids by okra, beets, asparagus, eggplant, turnip, green beans, carrots and cauliflower. *Food Chemistry*. 103, 200: 676-780.

Kumari, G., Mishra, B., Kumar, R., Agarwal, B. K. and Singh, B.P. (2011). Long term effect of manure, fertilizer and lime application on active and passive pools of soil organic carbon under maize- wheat cropping system in an Alfisols. *Journal of Indian Soceity of Soil Science*, 59 (3): 245-250.

Malik, K., Lathwal, O. P., Dhaka, A. K., Tamboli, Y. A., Singh, A., and Kumar, P. (2021). Effect of different sowing methods and varieties on growth and yield performance of wheat crop. *Journal of Natural Resource Conservation and Management*, 2(1), 57-64.

Nanthakumar, S. and Veeraragavatham, D. (1999). Effect of integrated nutrient management on yield and yield attributes of brinjal. South Indian Hort., 47: 42-48

Ramamoorthy, B., Narsimhan, R. L. and Dinesh, R. S. (1967). Fertilizer application for specific yield targets of Sonora-64. *Indian Farming*, 27(4): 43-44.