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Long Term Effect of Integrated Nutrient Management on Growth and Yield of Finger Millet (*Eleusine coracana* G.) in Eastern Dry Zone of Karnataka, India

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A B S T R A C T

A field experiment on "Long term effect of integrated nutrient management on finger millet (*Eleusine coracana* G.) growth and yield was recorded at AICRPDA, GKVK, UAS, Bengaluru, during *kharif 2018* with 8 treatments, replicated thrice laid out in RCBD. The results of the field experiment revealed that growth and yield parameters of finger millet such as plant height (96.53 cm), number of tillers per hill (7.60), number of ear heads per hill (7.37), number of fingers per ear head (6.61), test weight (3.56 g) and total dry mater production (82.67g per hill) were higher with the application of FYM @ 10 t ha^{-1} + 100% RDF. The grain (20.96 q ha^{-1}) and straw (25.40 q ha^{-1}) yield was found to be higher with the application of 10 tonnes FYM ha^{-1} and 100% RDF. This clearly indicated that application of organic and inorganic sources of nutrients increases growth and yield of finger millet as compare to inorganic only.

Introduction

Long-term experiments are those, which are conducted on the same set of experimental units over a sequence of years with pre-planned sequence of treatments or crops or both on crop productivity, soil health and economics. Long-term fertilizer experiments provide valuable information on agricultural sustainability, environmental quality, nutrient uptake and physico-chemical changes of soil. Besides, providing information on better understanding of soil and plant processes, it also provides data on benefits to farmers, policy makers and extension functionaries.

Intensive cultivation, growing of exhaust crops, use of imbalanced and inadequate fertilizers, restricted use of organic manures which have made the soils not only deficient in nutrients but also deteriorate soil health resulting decline in crop response to recommended dose of NPK fertilizers. Under such conditions, integrated nutrient management assumes greater significance and

plays a vital role in maintenance of soil health and sustainable productivity.

A long-term fertilizer trial established during 1978 at All India Co-Ordinated Project on Dryland Agriculture, GKVK, Bengaluru provides some direction for better management of finger millet-groundnut cropping system. The continuous dressing of organic manure and crop residues could undoubtedly match the nutrient requirement of crop plants, where nutrient demands are comparatively smaller but will be inadequate under finger millet-groundnut cropping system in the long run. However, integrated use of organics, crop residues and chemical fertilizers has been found promising not only in maintaining and sustaining high productivity but also in providing stability to crop production. In this context, combination of organic with inorganic nutrients and crop residues at different levels were evaluated finger millet growth and yield as a test crop.

Materials and Methods

Experimental site

The experiment was a permanent trial under dryland agricultural project. It was initiated as a long term integrated nutrient management trial during 1978, with different nutrient levels of recommended dose of fertilizer and FYM as an organic nutrient source. Later one more source of organic manure (maize residue) was introduced during 1984 considering the reduced availability of FYM. Totally, 40 years of experimentation was maintained previously during *kharif*2018. Finger millet in mono-cropping was tested. The land was left fallow during summer season of all the years. The soils of Dryland Agriculture Project represent the typical lateritic area of Bengaluru plateau and belong to *Vijayapura series*, which is a dominant soil series of Bengaluru plateau. As per USDA classification, soils are classified as fine, *Kaolinitic, isohyperthermic, Typic Kandiustalf*. These soils are yellowish red, lateritic and are derived from granite-gneiss under sub-tropical semi-arid climate. They are very deep, well drained sandy clay loam occurring in nearly level to gently sloping lands. Initial physio-chemical properties of experimental soil given in Table 1.

Experimental details

The test crop selected was finger millet, variety GPU 28. Experiment was carried out following randomized complete block design (RCBD) with 8 treatments and three replications. Treatment details are T_1: absolute control, T_2: 100% RDF, T_3: FYM @ 10 t ha^{-1}, T_4**:** FYM @ 10 t ha^{-1} + 50% RDF, T5**:** FYM @ 10 t ha^{-1} + 100% RDF, T_6**:** Maize residue @ 5 t ha^{-1}, T_7**:** Maize residue @ 5 t ha^{-1} + 50% RDF, T_8**:** Maize residue @ 5 t ha^{-1} + 100% RDF

Sources of fertilizer's

Two organic sources were used in our experiment such as FYM (Farmyard manure) and Maize Residue at the rate of 10 t ha^{-1} and 5 t ha^{-1} respectively. Whereas inorganic sources includes urea, DAP, MOP.

Plant growth observation

Plant growth parameters like plant height, number of tillers per plant number of ear heads per hill and numbers of fingers per ear head were recorded at harvest by employing standard procedures

Yield observation

Yield and yield attributes such as test weight, total dry mater, grain and straw yield were recorded at harvest as per standard protocol.

Results and Discussion

Effect of long-term integrated nutrient management on growth parameters of finger millet

The results of the field experiment carried out during *kharif, 2018*, to study the effect of long-term integrated nutrient management on the growth parameters of finger millet are presented in Table 2.

Plant height (cm)

The results of the present investigation revealed that T_5 (FYM @ 10 t ha^{-1} + 100% RDF) recorded significantly higher values for plant height (96.53 cm), followed by treatment T_4 (FYM @ 10 t ha^{-1} + 50% RDF) where plant height (80.13 cm) was recorded, T_8 (Maize residue @ 5 t ha^{-1} +100% RDF) (79.43 cm) which was on par with the treatment T_4, where as absolute control recorded lower plant height (43.33 cm), The increase in the plant height might be due to enhanced sugar translocation and turgor pressure in plant cell that leads to cell enlargement and multiplication (Hooda (2002) and Abbasi *et al.*, (2014).

Number of tillers / hill

The results of the present investigation revealed that recorded significantly higher values for No. of tillers/hill (7.6), followed by treatment T_4 (FYM @ 10 t ha^{-1} + 50% RDF) where (5.73), was recorded, T_8 (Maize residue @ 5 t ha^{-1} +100% RDF) (5.90) which was on par with the treatment T_4, where as absolute control recorded lower No. of tillers/hill (1.67).

Combined application of organic matter and chemical fertilizers increased number of fingers per ear head in finger millet (Gangadhar Nanda, 2015).

Number of ear heads / hill

Significantly higher values for No. of ear heads/hill (7.37) was recorded in T_5 (FYM @ 10 t ha^{-1} + 100% RDF), followed by treatment T_4 (FYM @ 10 t ha^{-1} + 50% RDF) where as absolute control recorded lower No. of ear heads / hill (1), greater availability of macro and micronutrients from FYM and inorganic sources of nutrients, which helped in acceleration of various metabolic processes (Umesh (2002), Govindappa (2003)).

Number of fingers per ear head

Significantly higher values for number of fingers per ear head (6.61) noticed in T_5 (FYM @ 10 t ha^{-1} + 100% RDF), followed by treatment T_4 (FYM @ 10 t ha^{-1} + 50% RDF) where as absolute control recorded lowest number of fingers per ear head (3.40), The possible reason could be due to N, P_2O_5 and K_2O which improves root growth and tillering, resulting in increase in amount of interception of photo synthetically active radiation and greater photosynthesis by crop (Gill and Singh, 1985) (Dhurandher and Tripathi, 1999).

Effect of long-term integrated nutrient management on yield parameters of finger millet

The results of the field experiment carried out during *kharif, 2018*, to study the effect of long-term integrated nutrient management on the yield parameters of finger millet are presented in Table 3.

Test weight

1000 seed weight of finger millet varied significantly among the different treatments. Significantly higher test weight (3.56 gm) was recorded with the application of FYM @ 10 t ha^{-1} + 100% RDF. (T_5). Kalaivanan and

Hattab (2016) reported that the increase in 1000 seed weight might be due to rapid nitrogen mineralization from organic sources with adequate supply of inorganic nitrogen leading to increased nutrition of crop that resulted in translocation of photo-syntheses to seeds, which ultimately recorded more test weight of seeds.

Total dry matter production (g hill^{-1})

The total dry matter production (g hill^{-1}) varied significantly among the different treatments. Significantly higher total dry matter production (g hill^{-1}) (82.67) was recorded with the application of FYM @ 10 t ha^{-1} + 100% RDF (T_5). Lower value was recorded for the absolute control (1.11 g hill^{-1}) the positive effect of farmyard manure in increasing the nutrients uptake leading to higher dry matter production as reported by Jayabharath and Sharanappa (2003), Avinish and Kushwaha (2006).

Grain and straw yield

Significant variations were observed in grain and straw yield of finger millet between the treatments. Significantly higher grain yield (20.96 q ha^{-1}) and straw yield (25.46 q ha^{-1}) was obtained with FYM @ 10 t ha^{-1} + 100% RDF (T_5). The positive effect of increase in grain and straw yield of finger millet might be due higher and balanced supply of plant nutrients through organic sources and inorganic fertilizers (Rangaraj *et al*., 2007 and Selvamurugan *et al*., 2013).

Table.1 Physical and chemical properties of soil prior to the experiment in 1978

Physical properties	
Coarse sand (%)	42.00
Fine sand (%)	30.50
Silt (%)	6.20
Clay (%)	21.20
Textural class	Sandy clay loam
Maximum water holding capacity (%)	29.40
Pore space (%)	41.80
Volume expansion (%)	2.40
Bulk density (Mg m^{-3})	1.64
Chemical properties	
pH	5.00
EC (dS m^{-1})	0.20
Organic carbon (%)	0.40
Available nitrogen (kg ha^{-1})	200.0
Available phosphorus (kg ha^{-1})	8.70
Available potassium (kg ha^{-1})	132.80
Exchangeable calcium (cmol (p^{+}) kg^{-1})	2.30
Exchangeable magnesium (cmol (p^{+}) kg^{-1})	0.75
Exchangeable potassium (cmol (p^{+}) kg^{-1})	0.30

Table.2 Effect of long-term integrated nutrient management on growth and yield of finger millet

Treatments	Plant height (cm)	No. of tillers/ hill	No. of ear heads/hill	No. of fingers/ ear head
T_1: Absolute control	43.33	1.00	1.67	3.40
T_2: 100% RDF	67.50	4.33	4.30	5.20
T_3: FYM @ 10 t ha^{-1}	73.10	4.57	4.70	5.32
T_4: FYM @ 10 t ha^{-1} + 50% RDF	80.13	5.73	6.17	6.06
T_5: FYM @ 10 t ha^{-1} + 100% RDF	96.53	7.60	7.37	6.61
T_6: Maize Residue @ 5 t ha^{-1}	61.53	4.37	4.00	5.07
T_7: Maize Residue @ 5 t ha^{-1} + 50% RDF	77.50	5.57	5.67	5.77
T_8: Maize Residue @ 5 t ha^{-1} + 100% RDF	79.43	5.67	5.90	5.90
S.Em±	**3.59**	**0.32**	**0.32**	**0.30**
CD @ 5%	**10.89**	**0.97**	**0.99**	**0.92**

Table.3 Effect of long-term integrated nutrient management on yield parameters of finger millet

Treatments	Test weight (g)	Total dry matter production (g $hill^{-1}$)	Yield (qha^{-1})	
			Grain	Straw
T_1: Absolute control	2.03	1.11	0.94	1.79
T_2: 100% RDF	3.11	38.18	11.64	18.63
T_3: FYM @ 10 t ha^{-1}	3.17	42.17	12.58	22.18
T_4: FYM @ 10 t ha^{-1} + 50% RDF	3.47	56.87	18.09	21.73
T_5: FYM @ 10 t ha^{-1} + 100% RDF	3.56	82.67	20.96	25.40
T_6: Maize Residue @ 5 t ha^{-1}	3.06	28.80	7.64	12.90
T_7: Maize Residue @ 5 t ha^{-1} + 50% RDF	3.28	46.13	15.45	20.65
T_8: Maize Residue @ 5 t ha^{-1} + 100% RDF	3.32	50.17	16.37	21.28
S.Em±	**0.20**	**2.77**	**0.72**	**0.99**
CD @ 5%	**0.60**	**8.40**	**2.19**	**3.01**

In conclusion, application of organic fertilizers along with inorganic fertilizers had positive impact on crop growth and yield of finger millet and maintained good soil health. Among all the treatments imposed application of FYM @ 10 t ha^{-1} + 100% RDF (T_5) was found to increase the growth and yield of finger millet.

References

Abbasi, G., Anwar, U. H., Moazzam, J., Muhammad, A. U. H., Shafaqat, A., Ahmad, M., Akhtar, F., Muhammad, A. I., Hamid, N. K. and Muhammad, A. K., 2014, Enhancement of maize production through integrated plant nutrient management in arid climate. *J. Pure and App. Sci*., 24-33(1-2): 7-16.

Avinish Kumar and Kushwaha, H. S., 2006, Response of pigeonpea (*Cajanus cajana* L.) to sources and levels of phosphorus under rainfed conditions. *Indian J. Agron*., 51(1): 60-62.

Dhurandher, R. L. and Tripathi, R. S., 1999, Impact of sowing method and N- levels on productivity of late duration rice cultivars in *Vertisol*. *Haryana J. Agron.*, 15(1): 1-5.

Gangadhar Nanda, 2015, Effect of different compost levels and inorganics on the performance of basmati rice (*Oryza sativa* L.) cv. Hubr 10-9. *M.Sc.(Agri) Thesis, Inst. Agri. Sci,* Banaras Hindu university, Varanasi.

Gill, H. S. and Singh, H., 1985, Effect of Mixtalol and Agromix in relation to varying levels of N on growth and yield of paddy, PAU. *J. Res.*,22(4): 617-623.

Govindappa, 2003, Efficacy of different organic manures and inorganic fertilizer on growth yield of rain fed finger millet. *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Bangalore.

Jayabharath, P. and Sharanappa, 2003, Composted poultry waste and fertilizer levels effect on yield and nutrient uptake of sunflower (*Helianthus annuus*) and residual NPK status. *J. Oilseeds Res.*, 20: 129-130.

Kalaivanan, D. and Hattab, O. K., 2016, Recycling of sugarcane industries by-products for preparation of enriched pressmud compost and its influence on growth and yield of rice (*Oryza sativa* L.). *Int. J. Recycl Org Waste. Agricult*., 5: 263–272.

Nehra, A. S. and Hooda, I. S., 2002, Influence of integrated use of organic manures and inorganic fertilizers on lentil and mung bean yields and soil properties. *Res. Crops*., 3(1): 11-16.

Rangaraj, T., Somasundaram, E., Mohamed Amanullah, M., Thirumurugan, V., Ramesh, S. and Ravi, S., 2007, Effect of agro-industrial wastes on soil properties and yield of irrigated finger millet (*Eleusine coracana* L. Gaertn) in Coastal Soil. *Res. J. Agric. & Biol. Sci*., 3(3): 153-156.

Selvamurugan, M., Doraisamy, P. and Maheswari, M., 2013, Effect of biomethanated distillery spentwash and pressmud biocompost on growth, yield and quality of sugarcane.*J. Int. Environmental Application and Science*., 8(4): 511-519.

Umesh, M. R., 2002, Assessment of inter cropping, advantage of finger millet with castor and redgram under integrated nutrient supply levels. *M.Sc.(Agri.)* Thesis, University of Agricultural Science, Bangalore.

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