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Response of finger millet (*Eleusine coracana* (L.) Gaertn) varieties to different fertilizer levels under Cauvery command area of Karnataka (Zone-6)

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Abstract
A field experiment was carried out to evaluate the performance of pre-released finger millet genotypes at different fertility levels under irrigated condition. This experiment was conducted during *kharif* 2022 at Zonal Agricultural Research Station, Mandya district. The experiment was laid out in split plot design with four fertility levels as main plot treatments *viz*., F_0-Absolute control, F_1- 75 per cent of recommended dose of fertilizers (RDF), F_2- 100 per cent RDF and F_3- 125 per cent RDF and four varieties as sub plot treatments *viz*., V_1- PR-1731, V_2- GPU-67, V_3- VL-376 and V_4- PR-202 replicated thrice. Among the different fertilizers levels, application of 125 per cent RDF recorded significantly higher grain and straw yield (3005 and 6173 kg ha^{-1}, respectively) as compared to absolute control Among the finger millet genotypes tested, PR-1731 variety recorded significantly higher grain and straw yield, respectively as compared to other check varieties. Among the finger millet genotypes tested, PR-1731 variety recorded significantly higher nutrient uptake of N, P and K by grain and straw as compared to other check varieties. The data on economics indicated that among the different genotypes evaluated higher gross returns (Rs.60509 ha^{-1}), net returns (Rs.17380 ha^{-1}) and B: C ratio (1.37) was obtained with PR-1731 variety as compared to other check varieties. Between the different fertility levels tested higher gross returns (Rs. 70370 ha^{-1}), net returns (Rs. 23860 ha^{-1}) and B: C ratio of 1.51 was obtained with application of 125 per cent of recommended dose of fertilizers. From the present investigation it was clear that, the finger millet variety PR-1731 has responded to application of 125 per cent of RDF.

Keywords: Finger millet, fertilizer levels, economics, nutrient uptake

Introduction
Among small millets, finger millet (*Eleusine coracana* (L.) Gaertn) is one of the most important nutri millet crop of India. Finger millet is superior in quality as compared to that of other important cereal crops such as rice and wheat hence it is called as "Nutri-cereals". It is one of the staple food crop grown by subsistence farmers in the semi-arid tropics of South Asia and Africa. Under rainfed conditions, it also flicker of hope for small and marginal farmers due to its short duration nature with drought tolerance (Shubhashree *et al*., 2022) [10].
In India, finger millet is cultivated mainly in the states of Karnataka, Tamilnadu, Andhra Pradesh, Odisha, Jharkhand, Uttaranchal, Maharashtra and Gujarat in an area of 1.2 million ha with an annual production and productivity of 2.06 million tones and 1700 kg ha^{-1}.
To increase the production level, the soil nutrients has to be maintained throughout the cropping season with addition of manures or application of fertilizers. According to Jogarao, *et al*. (2019) [7] lack of high yielding cultivars, low moisture stress, more pest and diseases incidence and poor fertility conditions and crop management practices such as imbalanced fertilizer rate has led to low yields of finger millet. Among the major plant nutrients nitrogen and phosphorus are the most determinant nutrients as they are required in large quantity by the crop. But still many farmers are not in practice of using adequate quantities of fertilizers to cultivate the crop. Therefore, now a day's more emphasis has been given to nutrient management in finger millet to increase the production levels and to achieve nutritional security. Nutrient management helps in supply of balanced nutrition to crop and thus helps to sustain the yield levels (Babalad, 1999) [1]. This implies that effort has to be made to improve the production and productivity of finger millet through application of appropriate fertilizer.
The recently released varieties are very responsive to exogenous application of fertilizers and hence their performance under different fertility levels needs to be studied. With this background a field experiment was undertaken to study the effect of application of different level of fertilizer on growth, yield and economics of finger millet (*Eleusine coracana* (L.) Gaertn).

Materials and Methods

A field experiment was conducted in Zonal Agricultural research station, V.C. Farm, Mandya during kharif 2022.The experimental site was geographically positioned between $11^0$30' to $13^0$05' N latitude and $76^0$5' to $77^0$45' East longitude in the Cauvery command area of Karnataka at an altitude of 697 metres above the mean sea level. Initial soil samples were analysed by adopting standard procedures coated by. The experimental soil is red sandy loam with neutral pH (7.2). The soil was low in available nitrogen (203.2 kg ha $^{-1}$), medium in phosphorus (20.5 kg ha $^{-1}$) and medium in available potassium (224.28 kg ha^{-1}).

Raised nursery beds of 25' long, 4' width and 4'' height of nurseries were raised for the different finger millet genotypes. 20 days old seedlings were used for transplanting in the main experimental plot with a gross plot size of 4.50 m x 4.20 m. The experiment was laid out using split plot design with four fertility levels as main plot treatments namely, F_0-Absolute control, F_1- 75 percent of recommended dose of fertilizers (RDF), F_2- 100 percent RDF and F_3- 125 percent RDF and four varieties as sub plot treatments viz, V_1- PR-1731(FMV-1194), V_2- GPU-67, V_3- VL-376 and V4- PR-202 replicated thrice. The seedlings were transplanted in 30 cm rows apart with intra-row spacing of 10 cm. Fertilizers were applied as per the treatments. The RDF used was 100:50:50 kg N: P_2O_5: K_2O per ha. Fifty percent of the recommended nitrogen, complete phosphorus and potassium were applied as basal dose at the time of transplanting. Necessary plant protection measures were taken as per the requirement. Periodical observations were recorded during the course of experimentation. The data so obtained were subjected to statistical analysis as per the standard procedures given by Gomez and Gomez (1984) [6].

Results and Discussion

Growth and yield attributes

The data pertaining to growth and yield attributes is presented in the Table 1. The results indicates that among the different fertilizer levels, significantly higher plant height of 80.70 cm was obtained with 125 percent of RDF compared to other fertilizer levels. However, it was on par with 100 percent of RDF application (78.30 cm). Increased plant height with increasing levels of nutrients was reported by Gupta *et al*., 2012 [5] and Nigade *et al*., 2013 [9] and Shubhashree *et al*., 2022 [10].

Similarly, it was observed that significantly higher number of productive tillers per plant (3.40) was obtained with 125 percent of RDF and was on par with 100 percent of RDF (3.20). The results are in conformity with Nigade *et al*. (2013) [9] and Shubhashree *et al.* (2022) [10]. In absolute control, the lowest plant height (60.6 cm) and number of tillers per plant (2.20) were observed. Similar trend was noticed with the yield attributing characters. Finger millet showed a positive response to application of varied levels of fertilizers which led to improvement in growth and yield attributing characters. Among the different finger millet genotypes, significantly higher plant height (79.0 cm), number of tillers (2.80) was observed with PR-202 genotype followed by FMV-1194 (73.90 cm and 3.10, respectively). However, all the growth and yield attributing parameters of FMV-1194 variety was on par with that of all the check varieties. Nigade *et al*. (2013) [9] and Shubhashree *et al*. (2022) [10] also reported the similar results.

Grain and straw yield

Among the different fertilizers level, application of 125 percent RDF recorded significantly higher grain yield (3005 kg ha^{-1}) and straw yield (6173 kg ha^{-1}) as compared to absolute control and on par yields were observed with application of 100 percent of recommended dose of fertilizers (Table-1). Among the finger millet genotypes tested, PR-1731 variety recorded significantly higher grain and straw yield of 2631 and of 5272 kg ha^{-1}, respectively compared to other check varieties.GPU-67 check variety recorded on par grain and straw yield of 2543 and 5024 kg ha^{-1}, respectively. This might be due to more number of leaves at all the growth stages of crop which ultimately resulted into higher photosynthetic activity and the synthesis of higher amount of photosynthates by crop and increased absorption of nutrients has helped in enhancing the growth and yield attributing characters and ultimately resulted in higher grain yield. The results are in conformity with Shubhashree *et al*. (2022) [10].

Nutrient uptake by grain and straw

Application of 125 percent of RDF recorded the maximum uptake of N (41.32 Kg/ha and 28.73 Kg/ha), P (12.51 kg/ha and 7.97 kg/ha) and K (11.35 kg/ha and 42.22 kg/ha) in both Grain and straw respectively as compared to other treatments (Table-2). However, application of 100 percent RDF recorded on par uptake of N (37.64 kg/ha and 26.40 kg/ha), P (11.31 kg/ha and 7.19 kg/ha) and K (9.13 kg/ha and 38.901 kg/ha) in both grain and straw.

Among finger millet genotypes tested, PR-1731 variety recorded significantly higher nutrient uptake of N (34.89 kg/ha and 22.45 kg/ha), P (10.01 kg/ha and 6.02 kg/ha) and K (8.20 kg/ha and 32.10 kg/ha) in both grain and straw as compared to other check varieties. The straw portion utilized higher amounts of potassium than that of grain in all the treatments which may be attributed to greater concentration of K in straw. Since nutrient uptake is the outcome of the nutrient concentration and the crop output, the higher grain and straw yield of these crops resulted in higher NPK uptake. This may be attributed to increased grain and straw yield of the crops and their respective nutrient contents owing to increased availability of nutrients to the crop. The results are in close conformity with the findings of Singh (2012) [11] and Kumar *et al*. (2017) [8].

Economics

The data on economics indicated that between the different fertility levels tested, The highest gross returns (Rs. 69115 ha^{-1}), net returns (Rs. 23860 ha^{-1}) were obtained with application of 125 percent of recommended dose of fertilizers whereas higher B: C ratio (1.44) was obtained with application of 100 percent of recommended dose of fertilizers (Table-3). Among the different genotypes evaluated higher gross returns (Rs.60509 ha^{-1}), net returns (Rs.17380 ha^{-1}) and B: C ratio (1.37) was obtained with PR-1731 variety as compared to other check varieties. This increased economic returns, was due to improvement in grain and straw yield of finger millet. The results are in conformity with that of Chavan *et al*. (2017) [2].

Table 1: Growth, yield and economics of finger millet varieties as influenced by different levels of fertilizers

Treatments	Plant height (cm)	No. of Productive tillers	1000 seed weight (g)	Days to 50% maturity	Days to maturity	Grain yield (kg/ha)	Straw yield (kg/ha)
Fertility levels (F)							
F_0-Absloute control	60.6	2.2	2.62	78.75	115.1	1253	2760
F_1-75% RDF	67.9	2.9	2.82	78.08	114.1	2342	4540
F_2-100% RDF	78.3	3.2	2.88	77.33	113.3	2799	5564
F_3- 125% RDF	80.7	3.4	2.90	77.17	113.2	3005	6173
S.Em ±	1.8	0.07	0.04	0.11	0.16	80	183
C.D.@ 5%	6.1	0.23	0.13	0.37	0.56	275	632
Varieties (V)							
V_1: PR-1731	73.9	3.1	2.99	80.17	116.4	2631	5272
V_2:GPU 67	68.9	2.9	2.92	79.25	115.6	2543	5024
V_3:VL376	65.7	2.9	2.57	71.00	106.4	2176	4287
V_4:PR202	79.0	2.8	2.74	80.92	117.3	2100	4454
S.Em. ±	1.3	0.1	0.04	0.26	0.28	83	218
C.D.@ 5%	3.9	0.22	0.10	0.76	0.81	241	637
F x V							
S.Em ±	2.7	0.15	0.07	0.52	0.55	165	437
C.D.@ 5%	NS	NS	NS	NS	NS	NS	NS

Table 2: Nutrient uptake of finger millet varieties as influenced by different levels of fertilizers

Treatments	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)		
	Grain	Straw	Total	Grain	Straw	Total	Grain	Straw	Total
Fertility levels (F)									
F_0-Absloute control	13.22	5.70	18.92	3.54	0.93	4.47	2.34	11.22	13.56
F_1-75 % RDF	26.56	14.08	40.64	7.73	3.87	11.60	5.12	21.48	26.61
F_2-100% RDF	37.64	26.40	64.04	11.31	7.19	18.50	9.13	38.91	48.04
F_3- 125% RDF	41.32	28.73	70.05	12.51	7.97	20.48	11.35	42.22	53.56
S.Em ±	1.12	0.69	1.12	0.38	0.23	0.73	0.54	1.07	1.52
C.D.@ 5%	3.87	2.39	3.87	1.32	0.80	2.12	1.86	3.71	5.26
Varieties (V)									
V_1: PR-1731	34.89	22.45	57.34	10.01	6.02	16.03	8.20	32.10	40.29
V_2:GPU 67	32.42	20.68	53.10	9.55	5.41	14.96	7.40	30.61	38.01
V_3:VL376	26.33	16.06	42.39	7.99	4.20	12.19	6.31	25.66	31.97
V_4:PR202	25.09	15.73	40.82	7.53	4.33	11.86	6.04	25.45	31.49
S.Em. ±	1.06	0.90	1.67	0.37	0.23	0.59	0.58	1.64	2.02
C.D.@ 5%	3.09	2.63	4.89	1.07	0.66	1.72	1.68	4.77	5.91
F x V									
S.Em ±	2.12	1.80	3.35	0.73	0.45	1.18	1.15	3.27	4.05
C.D.@ 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Economics of finger millet varieties as influenced by different levels of fertilizers

Treatments	Cost of cultivation (Rs./ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	B:C Ratio
Fertility levels (F)				
F_0-Absloute control	38049	28809	-9240	0.75
F_1-75 % RDF	43132	53872	10740	1.25
F_2-100% RDF	44827	64377	19439	1.44
F_3- 125% RDF	48216	69115	23860	1.43
C.D.@ 5%	NA	NA	NA	NA
Varieties (V)				
V_1:PR-1731	43130	60509	17380	1.37
V_2:GPU 67	43130	58481	15352	1.33
V_3:VL376	43130	50037	6907	1.14
V_4:PR202	43130	48290	5161	1.10
C.D.@ 5%	NA	NA	NA	NA
F x V				
C.D.@ 5%	NA	NA	NA	NA

Note: NA: Not Analysed

Conclusion

From this experiment, it can be concluded that among different pre-released finger millet variety tested PR-1731 has recorded the higher grain and straw yield and obtained good returns. Further the crop has responded well to application of 125 percent recommended dose of fertilizers.

References

1. Babalad HB. Integrated nutrient management in soybean based cropping systems. Ph.D. thesis, U.A.S. Dharwad, Karnataka; c1999.
2. Chavan IB, Jagtap DN, Mahadkar UV. Economics of Finger Millet (*Eleusine coracana* L. Gaertn.) Influenced Due to Different Establishment Techniques, Levels and Time of Application of Nitrogen. International Journal of Tropical Agriculture. 2017;35(4):839-848.
3. Dhhwayo HH, Whhgwiri EE. Effect of nitrogen and phosphorus on finger millet. Zimbabwe Agk. J. 1984;81:115-118.
4. Duryodhana DK, Krishnegowda TG, Kadalli EG, Ashok G. Uptake pattern of major nutrients at different growth stages by dry land finger millet (*Eleusine coracana* (L.) Gaertn.) from different sources and levels of nutrients. Mysore J Agric. Sci. 2004;38(4):487-495.
5. Gupta N, Gupta AK, Gaur VS, Kumar A. Relationship of nitrogen use efficiency with the activities of enzymes involved in nitrogen uptake and assimilation of finger millet genotypes grown under different nitrogen inputs. Scientific World Journal. c2012, p. 1-10.
6. Gomez KA, Gomez AA. Statistical procedures for agricultural research (2 ed.). John wiley and sons, New York. c1984, p. 680.
7. Jogarao P, Triveni U, TSSK Patro, Anuradha N. Effect of different levels of fertilizers on growth and yield of finger millet under zero tillage conditions in rice fallows. International Journal of Chemical Studies. 2019;7(5):146-148.
8. Kumar V, Kumar T, Singh G, Singh RA. Effect of integrated nutrient management on yield of rice and its residual effect on wheat in rice wheat system under low land. Annals of Plant and Soil Research. 2017;19(4):360-365.
9. Nigade RD, More SM. Performance of finger millet varieties to different levels of fertilizer on yield and soil properties in sub-montane zone of Maharashtra. International Journal of Agricultural Sciences. 2013;9(1):256-259.
10. Shubhashree KS, Raveendra HR, Deepak CA, Sahana SR. Assessment of pre-released finger millet genotypes to varied levels of fertilizer application, The Pharma Innovation Journal. 2022;11(10):1876-1878.
11. Singh JP, Kaur J, Mehla DS, Narwal RP. Long term effects of nutrient management on soil health and crop productivity under rice-wheat cropping system. Indian Journal of Fertilizer. 2012;8(8):28-48.