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**Triveni U**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

**Nagarjuna D**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

**Rani YS**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

**Anuradha N**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

**Patro TSSK**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

**Corresponding Author:****Triveni U**

All India Coordinated Small Millets Improvement Project, Acharya N.G. Ranga Agricultural University, Agricultural Research Station, Vizianagaram, Andhra Pradesh, India

## Performance of improved short duration finger millet genotypes in red sandy loamy soils of North Coastal Zone of Andhra Pradesh at graded doses of NPK fertilizers

Triveni U, Nagarjuna D, Rani YS, Anuradha N and Patro TSSK

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### Abstract

A field experiment was conducted at Agricultural Research Station, Vizianagaram during *kharif*, 2017 to know the fertilizer responsiveness of improved short duration finger millet genotypes. Experiment was conducted in split plot design with NPK fertilizer levels were assigned to main plots and improved finger millet genotypes were assigned to subplots. Results revealed that among the NPK fertilizer levels, performance of growth as well as yield attributes of finger millet at 100% RDF was on par with 125% RDF, however it was significantly superior over 75% RDF. Similarly yield and economics in 100% RDF was on par with 125% RDF. Among the finger millet genotypes, highest growth, yield attributes, yield and economics were recorded in VL 386 when compared to other genotypes.

**Keywords:** Finger millet, short duration, NPK fertilizer levels

### Introduction

Finger millet is the most prominent crop among the small millets and is having huge acreage (5.46 lakh ha) and production (4.39 lakh tons) in India (Ministry of Agriculture & Farmers welfare, Govt. of India, 2017-18). It can be grown in all kinds of soils and in all elevations. It is the most drought tolerant and low nutrient requiring crop. It is highly nutritious and cheap alternative to eliminate micronutrient malnutrition in developing countries like India. Though it has large acreage, overall production and productivity per unit area are very less in India. This is mainly due to the use of traditional low productive varieties and improper nutrient management practices. In addition, most of the traditional finger millet varieties are long duration and fit for mono cropping. In order to meet the growing food demands of burgeoning population, intensive cropping is necessary and short duration finger millet varieties can very well be fit in the multiple cropping sequences. Many short duration finger millet varieties have been developed at different AICRP on Small millets centers across India. However, limited research has been done on the response of these short duration finger millet varieties to different NPK fertilizer levels. Application of optimum dose of fertilizers is necessary in order to eliminate the fertilizer wastage and also its adverse effect on the environment and national economy. Hence this study was proposed to know the responsiveness of short duration finger millet varieties to different NPK fertilizer levels.

### Materials and Methods

A field experiment was conducted at Agricultural Research Station, Vizianagaram, Andhra Pradesh during *kharif*, 2017. The soil of the experimental field was red sandy loam in texture and neutral in reaction. The soil was low in available nitrogen (186.6 kg/ha), High in available phosphorus (74.8 kg/ha) and medium in available potassium (262.5 kg/ha). The experiment was laid out in split plot design with three replications. The treatments consisted of three fertilizer levels, viz. F<sub>1</sub>:75% RDF; F<sub>2</sub>:100% RDF; F<sub>3</sub>:150% RDF in main plots and four finger millet genotypes, viz. V<sub>1</sub>:VL-386; V<sub>2</sub>:VL-352; V<sub>3</sub>:GPU-45; V<sub>4</sub>:VR-708 in sub plots. Finger millet nursery was sown on 17.06.2017 by using seed rate of 7.5 kg per hectare. Transplanting was done with 25 days old seedlings with row to row spacing of 30cm.

Recommended dose of NPK fertilizers 50-40-25 kg were applied in the form of urea, single super phosphate and murate of potash. Full dose of P and half dose of N, K were applied at the time of transplanting in respective treatments. Remaining half dose of nitrogen was applied at tillering stage and remaining half dose of potassium was applied at panicle initiation stage. All observations were recorded by the standard procedures and statistical analysis was done using ANOVA.

## Results and Discussion

### Effect of graded doses of NPK fertilizers

Different NPK fertilizer levels significantly influenced growth and yield attributes of finger millet genotypes. Days to 50% flowering was slightly increased with increase in NPK fertilizer dose from 75% RDF to 125% RDF. However, no significant difference in days to 50% flowering was noticed between 100% RDF and 125% RDF. Similar findings were reported by Triveni *et al.* (2018). 125% RDF recorded an increase of 10.1% in plant height, 34.5% in productive tillers per plant, 18.4% in fingers per ear, 9.1% in earhead length respectively over 75% RDF; however it was on par with 100% RDF. These results are in agreement with the findings of Nigade and More (2013) [5]. Prakasha *et al.* (2018) [6] also reported significant increase in growth and yield attributes with increase in NPK dose from 50% RDF to 100% RDF. Earhead weight per plant in 125% RDF was significantly higher, which recorded 14.6% increase over 100% RDF and 42.5% increase over 75% RDF. Test weight in 125% RDF was on par with 100% RDF, however, it was significantly higher than 75% RDF.

Drymatter production, grain yield and straw yield were significantly influenced by the fertilizer doses. Drymatter production in 125% RDF was significantly higher over lower NPK levels, which has shown 7.5%, 16.2% increase over 100% RDF and 75% RDF respectively. Similarly in 125% RDF, grain yield was increased by 14.7% compared to 75% RDF, however it was on par with 100% RDF. These results are in agreement with the findings of Divyashree *et al.* (2018) [2] who reported higher grain and straw yields with increased doses of NPK fertilizers in little millet. Straw yield in 125% RDF was significantly higher than lower levels of NPK fertilizers, which was 17.2%, 10.3% higher over 75% RDF and 100% RDF respectively. Chandrakala *et al.*, 2017 reported similar results with 125% recommended dose of phosphorus in finger millet. Considering the economics, gross income, net income and benefit cost ratio of 125% RDF was on par with 100% RDF. Similar findings were reported by Sundaresh and Basavaraja (2017) [7] in finger millet and

Jogaroo *et al.* (2019) [3] in rice fallow finger millet.

Soil properties like pH, electric conductivity and organic carbon were not significantly influenced by different NPK fertilizer levels, however soil available nitrogen and phosphorous were significantly influenced but soil available potassium was not effected by graded levels of NPK fertilizers. Soil available nitrogen in 125% RDF was significantly higher than 75% RDF, however it was on par with 100% RDF. Soil available phosphorous in 125% RDF was significantly higher, which is 5.9%, 3.6% higher than 75% RDF and 100% RDF respectively. These results corroborates with the findings of Nigade and More (2013) [5] in finger millet.

### Performance of finger millet genotypes

Among different genotypes, days to 50% flowering was significantly lower for VL-352, whereas significantly higher for GPU-45. Plant height was maximum for VR 708 among different genotypes, however it was on par with GPU 45. Both VL 352 and VL 386 genotypes recorded shorter plant height. Reduction in lodging percentage with shorter plant height in pearl millet was reported by Lakew and Berhanu (2019) [4]. Productive tillers per plant in VL 386 was significantly higher, however it was comparable with VL 352. Fingers per ear were maximum in VL 386 and VL 352, while it was minimum in GPU 45. Earhead length of VL 352 was maximum among all; however it was on par with VL 386. Earhead weight per plant in VL 386 was significantly higher among different genotypes, and was shown an increase of 40.4%, 26.6%, 7.7% over GPU 45, VR 708 and VL 352 respectively. Test weight of VR 708 was significantly higher compared to other genotypes. However, next highest test weight was recorded in VL 386.

Among different genotypes, drymatter production in VR 708 was higher and it was on par with GPU 45. However, grain yield in VL 386 was significantly higher and it was 15.4%, 14.2% and 7.3% higher compared to GPU 45, VR 708 and VL 352 respectively. However, straw yield in VL 386 was lowest among all the genotypes. Higher yield attributes and shorter plant height in VL 386 might have contributed to the higher grain yield and lower straw yield. Gross returns, net returns and benefit cost ratio were significantly higher for VL 386 compared to other genotypes due to higher grain yield. Though its fodder yield was lowest among all the genotypes, its economics were higher as fodder has no monetary value. Soil available phosphorous and potassium were significantly influenced by different genotypes. Maximum phosphorous and potassium availability was recorded in GPU 45, however it was on par with VR 708.

**Table 1:** Effect of different levels of NPK fertilizers on growth and yield attributes of pre release Finger millet varieties

Treatments	Days to 50% flowering	Plant height (cm)	Productive tillers/plant	Fingers/ear	Ear head length	Ear weight(g)/hill	Test weight (g)
<b>Main plots: Fertilizer levels (F)</b>							
F1: 75% RDF	52.7	102.3	2.9	7.6	7.7	12.7	3.01
F2: 100% RDF	53.5	108.8	3.3	8.8	8.2	15.8	3.26
F3: 125% RDF	54.1	112.6	3.9	9.0	8.4	18.1	3.48
S.Em±	0.21	1.75	0.17	0.25	0.11	0.25	0.08
CD (p=0.05)	0.83	6.89	0.68	0.98	0.44	1.00	0.32
<b>Subplots: Pre release varieties (V)</b>							
V1: VL-386	56.1	105.4	3.7	9.1	8.7	18.1	3.36
V2: VL-352	45.4	102.5	3.4	9.1	8.8	16.8	3.13
V3: GPU- 45	60.7	109.5	3.1	7.5	7.5	12.9	2.94
V4: VR-708	51.4	114.1	3.3	8.1	7.5	14.3	3.57
S.Em±	0.35	2.71	0.13	0.23	0.23	0.42	0.07
CD (p=0.05)	1.04	8.05	0.38	0.69	0.68	1.26	0.19
Interaction	NS	NS	NS	NS	NS	NS	NS

**Table 2:** Effect of different levels of NPK fertilizers on grain yield, straw yield and economics of pre release Finger millet varieties

Treatments	Dry matter production (kg/ha)	Grain yield (kg/ha)	Straw yield (kg/ha)	Gross income (Rs./ha)	Net income (Rs/ha)	B:C ratio
<b>Main plots: Fertilizer levels (F)</b>						
F1: 75% RDF	7966.1	1978.4	5834.5	55395	32667	1.44
F2: 100% RDF	8615.9	2203.1	6195.4	61686	38189	1.63
F3: 125% RDF	9260.1	2269.1	6836.5	63536	39269	1.62
S.Em±	104.85	31.78	114.01	889.9	889.9	0.04
CD (p=0.05)	411.67	124.79	447.65	3494.1	3494.1	0.15
<b>Subplots: Pre release varieties(V)</b>						
V1:VL-386	8169.9	2340.3	5737.4	65529	42032	1.79
V2:VL-352	8160.8	2182.0	5866.9	61151	37653	1.60
V3: GPU- 45	8898.7	2027.6	6637.8	56772	33275	1.41

### Conclusion

Among the NPK fertilizer levels, 100% recommended dose of NPK fertilizers is found as economically optimum dose and among the finger millet genotypes, VL 386 was found superior as it out yielded the other genotypes. Further it is shorter in height and less prone to lodging and also shorter in duration make it highly suitable for intensive cropping systems.

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