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Effect of varieties and nutrient levels on growth and yield of rice fallow finger millet

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ABSTRACT

A field experiment was carried out on clay loam soils during *rabi*, 2024-2025 at Agricultural College Farm, Bapatla to assess the Response of finger millet (*Eleusine coracana* L.) varieties to nutrient levels in rice-fallows. The experiment was laid out in randomised block design with factorial concept with 4 varieties *viz.,* Vakula, Tirumala, Indravathi and Gosthani as factor I and nutrient levels – 75%, 100% and 125% RDF as factor II, replicated thrice. The results of the investigation revealed that among the varieties, Indravathi recorded highest drymatter accumulation at harvest (9986 kg ha^{-1}), number of productive tillers m^{-2} (129), number of fingers $earhead^{-1}$ (7.9), grain yield (3148 kg ha^{-1}) and straw yield (5622 kg ha^{-1}). Highest plant height at harvest (87.6 cm), drymatter accumulation at harvest (9692 kg ha^{-1}), number of productive tillers m^{-2}(128), number of fingers $earhead^{-1}$(7.5), grain yield (3042 kg ha^{-1}) and straw yield (5450 kg ha^{-1}) was recorded with application of 125 % RDF (75-50-37.5 N, P_2O_5, K_2O kg ha^{-1}) over 100% (60-40-30 N, P_2O_5, K_2O kg ha^{-1}) and 75% RDF(45-30-22.5 N, P_2O_5, K_2O kg ha^{-1}).

Keywords: *Finger millet, Nutrient levels, Rice fallows and Varieties*

Finger millet (*Eleusine coracana* L.), commonly known as ragi, stands out among millets for its exceptional nutritional content *viz.,* high in protein, dietary fiber, calcium, iron, and antioxidants and its adaptability as a short-duration, drought-tolerant C_4 crop with high water-use efficiency. In India, finger millet is cultivated in about 1.07 million hectares, producing 1.7 million tonnes, primarily in southern and central states, including Andhra Pradesh, where it is grown mainly in Visakhapatnam, Chittoor, Anantapur, and Vizianagaram districts.

Rice fallows, spanning approximately 14 million hectares in South Asia, particularly in India, need to be utilized by introducing short-duration crops like finger millet. Rice-fallows offer opportunities to enhance system productivity, improve farmer incomes, and maintain soil health through sustainable intensification. Finger millet's drought tolerance, flexible sowing window and low input needs makes it well-suited for rice fallow situations.

Crop yield is influenced by varietal potential, environmental conditions, and management practices, including nutrient management. Since residual soil nutrients often remain after rice, optimizing fertilizer application for finger millet in rice fallows and particularly nitrogen, phosphorus and potassium is essential to maximize yield while sustaining soil health. In this context, present investigation was carried out to study the "Effect of varieties and nutrient levels on growth and yield of rice fallow finger millet".

MATERIAL AND METHODS

A field experiment was conducted at Agricultura College Farm, Bapatla, Andhra Pradesh during *rabi*, 2024-25. The soil of the experimental field was clay loam in texture, neutral in reaction with pH 7.5, electrical conductivity 0.51 dS m^{-1}, non-saline, low in organic carbon, low in available nitrogen (224.2 kg ha^{-1}), medium in available phosphorus (35.1 kg ha^{-1}) and high in available potassium (288.7 kg ha^{-1}). Average mean maximum temperature was 33.2 ^{0}C and minimum temperature was 22.7 ^{0}C during the crop growth period. The total amount of rainfall received was 18.7 mm with one rainy day. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with 12 treatments replicated three times. Factor I represents varieties *i.e.*, V_1: Vakula, V_2: Tirumala, V_3: Indravathi and V_4: Gosthani. Factor II represents nutrient levels *i.e.,* F_1: 125% RDF, F_2: 100% RDF and F_3: 75% RDF. Nutrient

NPK were applied in the form of urea, Single Super Phosphate (SSP) and Muriate of Potash (MOP), respectively. Nitrogen was applied in two equal splits *viz.;* basal and 30 DAS and entire dose of phosphorus and potassium was applied as basal. Sowing of seed was done with a spacing of 30 cm x 10 cm on 6th January. Irrigation was given at weekly intervals based on soil moisture condition. The recommended plant protection measures were followed whenever necessary. Five plants from each plot were selected randomly to record the biometric observations like plant height, drymatter accumulation (kg ha^{-1}), days to 50 % flowering and maturity and yield attributes. Crop was harvested at maturity on 21st April and threshed separately; grain yield and straw yield were recorded separately for each plot. All the data was analyzed statistically following the standard procedures as described by Gomez and Gomez(1984).

RESULTS AND DISCUSSION

Growth parameters: Growth parameters (Table.1) were significantly affected by different treatments**.** Among the varieties tested highest plant height (94.0 cm) was recorded with Tirumala while the lowest (77.1 cm) was recorded with Vakula. Application of 125% RDF resulted in higher plant height (87.6 cm) in rice fallows. Similar results were reported by Radha *et al*. (2020). Indravathi variety recorded higher drymatter accumulation (9986 kg ha^{-1}) which was on par with Gosthani (9631 kg ha^{-1}) and the lowest (8090 kg ha^{-1}) was recorded with Vakula. Among the nutrient levels tested, higher drymatter accumulation (9692 kg ha^{-1}) was recorded with the application of 125% RDF whereas lowest accumulation of drymatter (8301 kg ha^{-1}) was recorded with 75% RDF. These findings are similar with Triveni *et al*. (2018). It might be due to the genetic potential of the variety and higher nutrient availability. Tirumala took more number of days (56 and 107) to 50 % flowering and maturity whereas Vakula took less number of days (53 and 100) to flowering and maturity. Among the nutrient levels tested, application of 125% RDF delayed days to 50 % flowering and maturity (57 and 106). These results are similar to Pavani *et al*. (2022).

Yield attributes: In rice fallow finger millet, among the varieties tested, highest number of productive tillers m^{-2} (129) was recorded in Indravathi

Table 1. Plant height, drymatter accumulation (kg ha^{-1}), days to 50% flowering and maturity as influenced by varieties and nutrient levels in rice fallow finger millet.

Treatments	Plant height(cm)	Drymatter accumulation (kg ha^{-1})	Days to 50% flowering	Days to maturity
Varieties				
V_1: Vakula	77.10	8090.00	53.00	100
V_2: Tirumala	94.00	8302.00	56.00	107
V_3: Indravathi	84.90	9986.00	54.00	106
V_4: Gosthani	82.20	9631.00	55.00	105
SEm±	0.55	252.34	0.67	0.54
CD (P = 0.05)	1.66	757.02	NS	NS
Nutrient levels				
F_1 - 75% RDF	81.90	8301.00	52.00	104
F_2 - 100% RDF	84.10	9014.00	55.00	105
F_3 – 125% RDF	87.60	9692.00	57.00	106
SEm±	0.48	215.20	0.54	0.57
CD (P = 0.05)	1.44	645.61	NS	NS
Interaction				
SEm±	1.21	447.06	0.97	0.78
CD (P = 0.05)	NS	NS	NS	NS
CV (%)	7.80	8.60	7.20	8.10

which was on par with Gosthani (123) and the lowest (100) was observed in Vakula. Among the nutrient levels investigated, application of 125% RDF resulted in higher number of productive tillers m^{-2}(128). The lowest number of productive tillers m^{-2} (103) were noticed with 75% RDF (Table.2). These results are in confirmation with Panda *et al*. (2021). Among the finger millet varieties evaluated, the greatest number of fingers $earhead^{-1}$ (7.9) were recorded by Indravathi, which was comparable to Gosthani (7.3). The lowest number of fingers $earhead^{-1}$ (5.4) was observed with Vakula. The treatment supplied with 125% RDF had the higher number of fingers $earhead^{-1}$ (7.5), whereas the treatment received 75% RDF had the fewest (5.8). Similar results were reported by Aparna *et al*. (2019). Among the varieties and nutrient levels tested, there was no significant difference on test weight of finger millet. However, the results revealed that there was a slight increase in test weight with the increase in the nutrient levels. The test weight was higher (3.0 g) in 125% RDF and lower (2.8 g) in 75% RDF numerically. The better performance of the varieties might be due to there natural genetic strength, complemented by the abundant nutrient availability throughout the crop growth period due to increased nutrient levels.

Table 2: Number of productive tillers m^{-2}, number of fingers $earhead^{-1}$, test weight (g) grain and straw yield (kg ha^{-1}) as influenced by varieties and nutrient levels in rice fallow finger millet.

Treatments	Number of productive tillers m^{-2}	Number of fingers $earhead^{-1}$	Test weight (g)	Grain yield (kg ha-1)	Straw yield (kg ha-1)
Varieties					
V_1: Vakula	100	5.4	2.8	2576	4487
V_2: Tirumala	108	5.8	2.8	2612	4520
V_3: Indravathi	129	7.9	3.0	3148	5622
V_4: Gosthani	123	7.3	2.9	3005	5370
SEm±	4.55	0.27	0.06	76.09	152.76
CD (P = 0.05)	13.66	0.81	NS	228.28	458.3
Nutrient levels					
F_1 - 75% RDF	103	5.8	2.8	2624	4549
F_2 - 100% RDF	115	6.6	2.9	2839	4999
F_3 – 125% RDF	128	7.5	3	3042	5450
SEm±	3.88	0.23	0.05	64.89	130.28
CD (P = 0.05)	11.65	0.69	NS	194.69	390.85
Interaction					
SEm±	8.07	0.48	0.1	134.81	270.65
CD (P = 0.05)	NS	NS	NS	NS	NS
CV (%)	12.1	12.5	6.1	8.2	9.4

Yield: Among the varieties tested, higher grain and straw yield (3148 and 5622 kg ha^{-1}) were recorded with Indravathi which was comparable with Gosthani (3005 and 5370 kg ha^{-1}) and the lowest was noticed in Vakula. The varieties outstanding performance might be due to their favourable physiological characteristics and innate genetic potential (Table.2). The highest grain and straw yield (3042 and 5450 kg ha^{-1}) were recorded with 125% RDF over 100% RDF and 75% RDF. The increased yield with increased fertilizer application might be due to better nutrient availability throughout the crop's growth. These results are in accordance with Sanjana *et al*. (2020) and Chandraprabha *et al*. (2024).

CONCLUSION

Based on the findings, it is concluded that, Indravathi or Gosthani finger millet variety can be taken up in rice fallows with 125% RDF (75-50-37.5 N, P_2O_5, K_2O kg ha^{-1}) application for getting higher yields in Krishna zone of Andhra Pradesh and no interaction was observed.

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