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Research Article

NUTRIENT UPTAKE STUDIES IN LITTLE MILLET AS INFLUENCED BY VARIETIES AND LEVELS OF FERTILIZERS

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ABSTRACT

An experiment was conducted during *kharif* 2016 at Post Graduate Research Farm, College of Agriculture, Kolhapur Maharashtra. The objectives of experiment were to find out suitable varieties of little millet, to study the fertilizer requirement of little millet, the interaction effects of fertilizer and variety on little millet and the economics of different treatments in little millet.

INTRODUCTION

Little millet *(Panicumsumatrense L.*) is one of the minor millet, which belongs to family Poaceae. Little millet is another reliable catch crop in view of its earliness and resistance to adverse agro-climatic conditions of high drought as well as water logging. It is grown throughout India and a traditional crop of Karnataka. It is mostly cropped with other millets, pulses and oilseeds. It is generally consumed as rice and any recipe that demands staple rice can be prepared using little millet. It is described as a "quick growing, short duration cereal which withstands both drought and water logging". Doubtless this is a valuable crop in difficult situations. It occurs as wild crop in Northern India and South Eastern Asia. It will yield some grain and useful fodder under very poor conditions. The crop is a balanced and staple food of tribal and economically poor section of the population. It provides low priced proteins, minerals and vitamins in the form of sustainable food. The stover is a good fodder for cattle.

Nitrogen is of vital importance to the physiology of little millet. It plays a critical role in the process of photosynthesis by which plants manufacture their own food from sunlight. Further, nitrogen is essential in little millet for manufacturing of proteins and in virtually every other aspect of its physiology. Plants that are deficient in nitrogen grow poorly and develop yellowing leaves. Nitrogen is major component of amino acids and the building blocks of protein. Major component of chlorophyll. Phosphorus is an essential nutrient for animals and plants. It plays a critical role in cell development and is a key component of molecules that store energy, such as ATP (adenosine triphosphate), DNA and lipids (fats and oils).

Insufficient phosphorus in the soil can result in a decreased crop yield. Phosphorus (P) is vital role in plant growth and is found in every living plant cell. It is involved in several key plant functions, including energy transfer, photosynthesis, transformation of sugars and starches, nutrient movement within the plant and transfer of genetic characteristics from one generation to the next. Traditionally, little millet is grown in low fertile soils without application or limited fertilizer application. However, experimental results indicate that the crop responds favorably low fertilizer application.

MATERIAL AND METHODS

The field experiment was laid out in a factorial randomized block design (FRBD) comprising eight treatment combinations replicated thrice *viz*. V_1-Phule Ekadashi, V_2-OLM 203, and four fertilizer levels F_1-75 per cent RDF, F_2-100per cent RDF, F_3-125per cent RDF,F_4-150 per cent RDF. The gross and net plot sizes were 4.50 x 3.0 m^2 and 3.90 x 2.40 m^2, respectively. Little millet crop was transplanted at row to row and plant to plant spacing with 30 cm × 7.5 cm.

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The Post Graduate Research Farm, College of Agriculture, Kolhapur is geographically situated between $16^0$42' North latitude and $74^0$14' East longitude having elevation of 548 meters above the mean sea level. It comes under the Sub-montane zone of Maharashtra with average annual rainfall 1061 mm being received in 66 rainy days. Out of which 80 per cent rainfall receives from South West monsoon in June to September. Rest of the rainfall is received in the month of October and November from North East monsoon. The soil of experimental plot was sandy clay loam in texture, medium in available nitrogen and phosphorus and high in available potassium. It was slightly alkaline in reaction.

RESULTS AND DISCUSSION

Nutrient concentration

Effect of varieties - The mean nitrogen, phosphorus and potassium content in grain and straw of little millet were not influenced significantly due to different little millet varieties.

Effect of fertilizer levels – The nitrogen, phosphorus and potassium content in grain and straw of little millet did not differ significantly due to different fertilizer levels. These results are similar to those reported by Que *et al.* (1986), Duryodhana *et al.* (2004), Raman and Krishnaprabu (2004) and Deshmukh (2007).

Table 1 Mean nitrogen, phosphorus and potassium content (%) in grain and straw of little millet at harvest as influenced by different treatments

Treatment	Nitrogen content (%)		Phosphorus content (%)		Potassium content (%)	
	Grain	Straw	Grain	Straw	Grain	Straw
Varieties						
V1–Phule Ekadashi	1.34	0.33	0.23	0.11	0.36	0.68
V2 – OLM-203	1.33	0.61	0.22	0.10	0.37	0.69
SE (m) ±	0.02	0.01	0.02	0.01	0.01	0.01
C.D. at 5 %	NS	NS	NS	NS	NS	NS
Fertilizer levels						
F1 – 75 % RDF	1.30	0.60	0.20	0.09	0.35	0.68
F2 – 100 % RDF	1.33	0.61	0.21	0.09	0.36	0.69
F3 – 125 % RDF	1.34	0.63	0.24	0.11	0.37	0.69
F4 – 150 % RDF	1.35	0.64	0.26	0.12	0.37	0.70
SE (m) ±	0.04	0.03	0.03	0.02	0.01	0.01
CD at 5%	NS	NS	NS	NS	NS	NS
Interaction effect (V x F)						
S.E (m) ±	0.07	0.03	0.04	0.03	0.01	0.02
C. D. at 5 %	NS	NS	NS	NS	NS	NS
General mean	1.33	0.62	0.22	0.10	0.36	0.68

Interaction effects

All the interaction effects were found to be non-significant.

Nutrient uptake, yield and economics

Effect of varieties: The mean total uptake of nitrogen, phosphorus and potassium by little millet were influenced significantly due different varieties. The highest nitrogen, phosphorus and potassium uptake was observed in Phule Ekadashi which was significantly superior over OLM-203.

The grain and straw yield of little was influenced significantly due to different little millet varieties. The Phule Ekadashi variety of little millet was recorded significantly higher grain and straw yield over OLM-203. The difference in grain and straw yield in little millet varieties might be due to inherent genetical potential of little millet varieties. Similar result were observed in Anonymous (2015).

The net monetary returns had significantly influenced by the different little millet varieties. The Phule Ekadashi variety of little millet recorded significantly higher net monetary returns (Rs. 24695 ha^{-1}) over OLM 203 (Rs.9695 ha^{-1}). The Phule Ekadashi variety of little millet recorded higher B: C ratio (1.84) over OLM 203 (1.33).

Effect of fertilizer levels: The mean total uptake of nitrogen by little millet was influenced significantly due to different fertilizer levels. The significantly higher nitrogen uptake of little millet was recorded as 150 per cent RDF which was at par with 125 per cent RDF and significantly superior over rest of the treatments. These findings corroborate the reports of Chakraborty *et al.* (2002), Kumar *et al.* (2003). The mean total uptake of phosphorus by little millet was influenced significantly due to different fertilizer levels.

The significantly higher phosphorus uptake of little millet was recorded as 150 % RDF which was at par with 125 % RDF and significantly superior over rest of the treatments. This findings are in corroborative with the findings of Chakraborty *et al.* (2002) and Kumar *et al.* (2003).

The mean total uptake of potassium by little millet was influenced significantly due to different fertilizer levels. The significantly higher potassium uptake of little millet was recorded as 150 per cent RDF which was at par with 125 per cent RDF and significantly superior over rest of the treatments.

Table 2 Effect of varieties and fertilizer levels on nutrient uptake, yield and economics of little millet

Treatment	Total N uptake (kg ha^{-1})	Total P uptake (kg ha^{-1})	Total K uptake (kg ha^{-1})	Grain yield qha^{-1}	Straw yield qha^{-1}	Net returns (Rs ha^{-1})	B:C ratio
Varieties							
V1–Phule Ekadashi	28.23	4.87	15.86	13.45	16.21	24695	1.84
V2 – OLM 203	20.72	3.41	12.43	9.70	12.83	9695	1.33
SE (m) ±	0.45	0.18	0.28	0.40	0.52	1600	-
C.D. at 5 %	1.36	0.53	0.84	1.21	1.56	4810	-
Fertilizer levels							
F1 – 75 % RDF	19.31	2.94	11.42	9.32	12.01	8643	1.30
F2 – 100 % RDF	23.23	3.57	13.68	11.0	14.10	15051	1.51
F3 – 125 % RDF	26.87	4.76	15.61	12.60	15.87	21139	1.72
F4 – 150 % RDF	28.39	5.41	16.22	13.40	16.10	24027	1.81
SE (m) ±	0.55	0.22	0.37	0.32	0.21	1280	-
CD at 5%	1.64	0.62	1.11	0.97	0.64	3840	-
Interaction effect (V x F)							
S.E (m) ±	1.56	0.30	0.47	0.33	0.27	1320	-
C. D. at 5 %	NS	NS	NS	NS	NS	NS	-
General mean	24.48	4.14	14.15	11.58	14.52	17215	

The grain yield of little was influenced significantly due to different fertilizer levels. The application of 150 percent RDF recorded significantly higher grain yield which was at par with 125 percent RDF and significantly superior over rest of the treatments. This might be due to high chlorophyll synthesis and dehydrogenase activity, also it affects source to sink relationship which reflects in higher yields. Similar result were observed in Bhomte (2013) and Anonymous (2015).

The straw yield of little was influenced significantly due to different fertilizer levels. The application of 150 percent RDF recorded significantly higher straw yield which was on par with 125 percent RDF and significantly superior over rest of the treatments. This might be due to better root activity, good source to sink relationship and high physiological activities which synthesized cytokinise. Similar result were reported by Kumar *et al.* (2003), Deshmukh (2007) and Pradhan *et al*. (2011).

Application of 150 per cent RDF gave significantly higher net monetary returns (Rs. 24027 ha^{-1}), which was at par with 125 per cent RDF (Rs. 21139 ha^{-1}) and significantly superior over rest of the treatments *viz*. 75 and 100 per cent RDF. Similar results were also reported by Ramamoorthy and Lourduraj (2002) and Bhomte *et al*., (2013). Application of 150 per cent RDF recorded higher B: C ratio (1.81) followed by 125, 100 and 75 per cent RDF. Similar results were also reported by Ramamoorthy and Lourduraj (2002) and Sunitha *et al.,* (2004) and Bhomte *et al*., (2013).

Interaction effects

All the interaction effects were found to be non-significant.

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