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Influence of nitrogen levels on productivity and profitability of finger millet genotypes

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ABSTRACT

The experiment was conducted at Birsa Agricultural University Farm Ranchi, during kharif (rainy) season of 2009. The experiment was conducted in Randomized Block Design with three replications and twenty treatment combinations consisting of four nitrogen levels (0, 20, 40 and 60 kg N/ha) and five medium duration finger millet genotypes (TNAU-1022, OEB-219, KMR-204, RAU-8 and BM-2). Finger millet genotypes respond positively to nitrogen levels and application of 40 kg N/ha manifested significantly higher grain yield (20.71q/ha) and straw yield (54.12q/ha) of finger millet also improved significantly only upto 40 kg N/ha resulting is significantly higher net return (Rs.7235/ha) and Benefit: cost ratio (1.24). Among genotypes, BM-2 was found superior to rest of the genotypes except RAU-8 which was comparable to BM-2. Genotype BM-2 has outstanding performance in respect grain yield (19.54 q/ha) and straw yield (52.44 q/ha). The economics of result also revealed that BM-2 genotypes gave significantly higher net return (Rs.6816/ha) and benefit: cost ratio (1.20) than other genotypes except RAU-8.
Key words : *Nitrogen levels, Varieties, Economics and finger millet.*

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INTRODUCTION

Finger millet is extensively cultivated in India. They are important in the areas of their production as dryland crops, as well as for hill agriculture. The small millet grains have longer storage life and hence can be termed as "Famine reserves". The resilience exhibited by the crop may prove good for their adjustment to different ecological situations and may make them potential crops for contingency planting. Easy cultivation, low input requirements, free from major pests/diseases, rejuvenating capacity after alleviation of stress conditions have made these crops indispensible component of dryland farming, tribal and hill agriculture. Small millets are predominantly grown on lands where no other crop can give a reasonable quantity of grain and valuable straw. They require small quantity of water, mature early and well suited for cultivation in scarce conditions. It is mainly grown on red and laterite soils. Its inherent capacity to recover after the withdrawal of temporary abiotic stress, finger millet is considered as an excellent dryland crop. The important small millet growing states in the country are Karnataka, Tamil Nadu, Orissa, Madhya Pradesh, Chhattisgarh, Jharkhand, Andhra Pradesh, Uttrakhand, Maharashtra and Gujarat. The annual planting area under small millets is around 2.5 million hectares of which finger millet alone accounts for about 60% area and 75% production. In spite of reduction in acreage and production in the country has not come down proportionately due to significant increase in productivity of finger millet from 731 kg/ha in 1960-61 to 1552 kg/ha in 2008-09. In Jharkhand, it is grown in an area of 0.8 million ha producing 0.9 tonnes per ha of grain (2006-07). Nearly forty per cent of cultivated land comes under category of upland and they are pre-dominantly, rainfed and monocropped with upland rice, finger millet, black gram, maize and other small millet crops. Among grain crops, finger millet ranks fourth in productivity after wheat, rice and maize. Finger millet poses considerable production potential in less fertile, intense probably heat and chronically moisture deficit area. This might be due to deeper root system, better extraction of soil moisture, efficient photo-synthetic mechanism and rapid transfer of nutrient from source to sink. The irrigated area is about 9.4% and after realizing the complete irrigation potential, irrigated area may not increase beyond 25%. The state with poputation of 21.84 million requires 46 lakh tones food grains against the production of 22 lakh tones. Hence to meet the deficit, production has to be doubled. In northern hills, grains are eaten mostly in form of chapatti. In South India, grains are used in many preparations like cake, pudding and sweets etc. It is also useful to pregnant women because it contains rich amount of calcium, iron and phosphorus. Finger millet contains 9.2 per cent protein, 76.32 per cent carbohydrates, 6.24 per cent minerals and 3.6 per cent fiber. No finer cereal is as rich as finger millet in its nutritive qualities. It is good for person suffering from diabeties. These millet are with high fiber content, protein quality and mineral composition contribute significantly to their nutritional security of some of the most disadvantaged groups of people. They are rich source of phytochemicals and micro nutrients also so are aptly termed as 'nutri cereals'. Epidemiologically, millets are beneficial for management of diabetes mellitus, cardiovascular disease and gastrointestinal tract related disorders. Thus, millets are strategic in terms of their food, nutritional and livelihood security and their role in local agro-ecosystems. Cultivation of right type of genotype is a first step to increase the low production of finger millet in this region, where 75 per cent of farmers still use traditional low yielding local varieties. The high yielding new genotypes are more responsive to heavy fertilizer application. After harvest of short duration finger millet genotypes, second crop of rabi can be grown on residual soil moisture. However, the basic information available is inadequate on medium duration new genotypes of finger millet at different nitrogen levels particularly for Jharkhand in rainfed condition. Keeping this in mind that finger millet growers of this region are those belonging to "below poverty line" (BPL) and as such the strategy shall be to improve the economic condition of neglected and economically backward farming community of plateau region by introduction of suitable medium duration finger millet genotypes and nitrogen fertilization.

MATERIALS AND METHODS

The experiment was conducted during kharif (rainy) season of 2009 at Birsa Agricultural University Farm Ranchi, on a representative upland sandy loam soil in texture and acidic in reaction pH (5.30) with poor fertility organic carbon (0.30%), available nitrogen (182.2kg/ha) phosphorus(8.96 kg/ha) and potassium (92.70 kg/ha) representing major soil group of Jharkhand. The total annual rainfall of about 1350 mm, 85 percent is of which received between mid June to mid September. The experiment was laid out in randomized block design comprising twenty treatment combination replicated thrice. Under this investigation, four levels of nitrogen (0, 20, 40 and 60kg N/ha) with five medium duration finger millet new genotype (V_1-TNAU-1022, V_2-OEB-219, V_3-KMR-204, V_4-RAU-8 andV_5-BM-2). The details of the treatment combination are enlisted below: T_1 - V_1N_0 T_2 - V_1N_{20}, T_3 - V_1N_{40}, T_4 - V_1N_{60}, T_5 - V_2N_0, T_6 - V_2N_{20}, T_7 - V_2N_{40}, T_8 - V_2N_{60}, T_9 – V_3N_0, T_{10} – V_3N_{20}, T_{11} – V_3N_{40}, T_{12} – V_3N_{60}, T_{13} – V_4N_0, T_{14} - V4 N_{20}, T_{15} – V_4N_{40}, T_{16} – V_4N_{60}, T_{17} – V_5N_0, T_{18} - V_5N_{20}, T_{19} – V_5N_{40} and T_{20} –V_5N_{60} . The experimental plot was ploughed with tractor drawn disc plough followed by harrowing and planking. Finger millet was sown at 30 cm row spacing with seed rate of 10 kg/ha in the first week of July (4^{th}). The soil was treated with BHC 10% dust at the rate of 25 kg/ha to guard against termite. In finger millet, full dose of 40 kg P_2O_5 and 25 kg K_2O/ha along with half dose of nitrogen as per treatment was applied at the time of sowing. Remaining half dose of nitrogen was applied after weeding (30 days after sowing) as per treatment. One interculturing operation at 15 days and one hand weeding at 30 days after sowing was done.

RESULTS AND DISCUSSION

Yield: Nitrogen application plays an important role in production potential of the crop. Nitrogen application significantly increased grain and straw yield upto 40 kg N/ha. Better vegetative growth along with higher yield traits under high nitrogen level was mainly due to higher absorption of nutrients which increased photosynthates accumulation and high biomass production. Adequate nitrogen supply in balanced quantity enables the plants to assimilate sufficient photosynthate, leading to increased dry matter accumulation. Maximum mean grain yield (21.68 q/ha) and straw yield (52.44 q/ha) were produced at 60 kg N/ha which was significantly superior to all other treatments. The grain and straw yield increased corresponding with increasing levels of nitrogen from 20-60 kg N/ha. However, the difference in yield at nitrogen levels of 60 kg and 40 kg /ha was very less (4.7 %) might be due to 40 kg N is sufficient to meet the nutritional requirement of medium duration genotypes (Table 1). There was 77.5 and 85.5 percent increase in yield at 40 and 60 kg N/ha, respectively, over control. This is in conformity with the findings of Sharma *et al.,* [8], Singh *et al.,* [9], Saini *et al.,* [7] and Roy *et al.,* [6]. Medium duration finger millet genotype BM-2 produced higher grain and straw yield of 19.54 and 52.44 q/ha, respectively, The lowest mean grain yield was produced by OEB-219 probably due to their earliness in maturity. This is in the conformity with the finding of Pradhan and Ghosh [4] who reported that A-404 (115-120 days) has potentiality of producing higher yield, where as IE-723 (85-90 days) recorded lowest yield might be due to its early maturity. Sharma *et al.,* [8] also found higher yield with PR-202(115-120 days) followed by HR-404 (110 days) and PES-400(105 days), respectively. Pilane *et al.,* [3] and Dubey and Shrivas [1] also supported the findings.

Table 1. Grain and straw yield (q/ha) of finger millet, as influenced by nitrogen levels and genotypes.

Genotypes	Grain yield (q/ha)					Straw yield (q/ha)				
	Nitrogen levels(kg/ha)					Nitrogen levels(kg/ha)				
	N_0	N_{20}	N_{40}	N_{60}	Mean	N_0	N_{20}	N_{40}	N_{60}	Mean
TNAU-1022	12.06	17.45	20.04	20.92	17.62	39.62	48.72	55.56	56.70	50.15
OEB-219	10.42	15.39	19.56	20.11	16.37	40.93	46.12	49.90	51.40	47.09
KMR-204	12.85	15.76	19.40	20.93	17.24	37.54	44.83	54.41	61.50	49.57
RAU-8	11.71	17.27	21.79	23.35	18.53	44.53	49.72	54.50	55.40	51.04
BM-2	11.29	21.01	22.75	23.10	19.54	41.33	52.92	56.25	59.25	52.44
Mean	11.67	17.38	20.71	21.68	-	40.79	48.46	54.12	56.85	-
	Nitrogen(N)		Genotypes(G)			Nitrogen(N)		Genotypes(G)		
SEm±	0.46		0.51			1.23		1.38		
CD(P=0.05)	1.32		1.47			3.56		3.98		
CV (%)	7.92					7.62				

Economics evaluation: Perusal of the data indicated that economics of finger millet production was significantly influenced by nitrogen levels and genotypes. Data pertaining to cost of cultivation (Rs./ha) and gross return (Rs./ha) have been presented in Table-2. Data recorded on net return (Rs./ha) and Benefit: cost ratio have been presented in Table 2. The interaction between nitrogen levels and genotypes couldn't affect net return and benefit: cost ratio significantly. It is apparent from the data (Table 3.) that net return varied significantly due to nitrogen levels. Economics of production depends on several factors like input cost and labour requirement. While assessing the relative efficiency of differ levels of nitrogen and genotypes, economics in terms of net returns (Rs/ha) and benefit: cost ratio has to be considered. Maximum mean net return (Rs 7358/ha) was obtained at 60 kg N/ha which was statistically alike to 40 kg N/ha (Rs 7235/ha). However, maximum benefit: cost ratio (1.24) was obtained at 40 kg N/ha. In this condition, 40 kg N/ha may be considered as a economically viable fertilizer dose for getting higher net return and benefit cost ratio (Table 3.). Thus the increase in net return and benefit: cost ratio was obtained only upto 40 kg N/ha. Kaushik and Gautam [2] found 40 kg N/ha is the optimum levels of nitrogen. Rao *et al.,* [5] and Singh and Arya [10] also reported 40-45 kg N/ha as optimum N levels for production of millet under rainfed condition. On the other hand, data recorded on net return and benefit: cost ratio revealed that among genotypes, BM-2 produced maximum net return (Rs 6816/ha) and benefit: cost ratio (1.20) which was followed by RAU-8, but BM-2 was found superior to rest of the genotypes. It is due to the fact that BM-2 out yielded rest of the genotypes. The interaction effect between the nitrogen levels and genotypes were statistically not significant which revealed that potential of crop management practices in enhancing the productivity and genotypes used, was independent.

Table 2. Cost of cultivation and gross return (Rs./ha) of finger millet, as influenced by nitrogen levels and genotypes.

Genotypes	Cost of cultivation(Rs./ha)						Gross return(Rs./ha)				
	Nitrogen levels(kg/ha)						Nitrogen levels(kg/ha)				
	N_0	N_{20}	N_{40}	N_{60}	Mean		N_0	N_{20}	N_{40}	N_{60}	Mean
TNAU-1022	4825	5325	5825	6325	5575		8014	11160	12799	13293	11316
OEB-219	4825	5325	5825	6325	5575		7257	10000	12273	12624	10538
KMR-204	4825	5325	5825	6325	5575		8303	10120	12422	13542	11097
RAU-8	4825	5325	5825	6325	5575		8084	11122	13619	14445	11817
BM-2	4825	5325	5825	6325	5575		7711	13153	14188	14512	12391
Mean	4825	5325	5825	6325	-		7874	11111	13060	13683	-
							Nitrogen (N)			Genotypes (G)	
					SEm±		232			260	
					CD (P=0.05)		671			750	
					CV(%)		6.29				

Table 3. Net return (Rs./ha) and benefit: cost ratio of finger millet, as influenced by nitrogen levels and genotypes

Genotypes	Net return (Rs./ha)					Benefit: cost ratio				
	Nitrogen levels (kg/ha)					Nitrogen levels (kg/ha)				
	N_0	N_{20}	N_{40}	N_{60}	Mean	N_0	N_{20}	N_{40}	N_{60}	Mean
TNAU-1022	3189	5835	6974	6968	5741	0.66	1.10	1.20	1.10	1.01
OEB-219	2432	4675	6445	6299	4963	0.50	0.88	1.11	1.00	0.87
KMR-204	3478	4795	6597	7217	5522	0.72	0.90	1.13	1.14	0.97
RAU-8	3259	5797	7794	8120	6242	0.68	1.09	1.34	1.28	1.10
BM-2	2886	7828	8363	8187	6816	0.60	1.47	1.44	1.29	1.20
Mean	3049	5786	7235	7358		0.63	1.09	1.24	1.16	
	Nitrogen (N)		**Genotypes (G)**			**Nitrogen (N)**			**Genotypes(G)**	
SEm±	232		260			1.23			1.38	
CD(P=0.05)	671		750			3.56			3.98	
CV(%)	12.29					7.62				

REFERENCES

1. Dubey, O.P. and Shrivas, D.N. (1999). Response of finger millet (Eleusine coracana) genotypes to nitrogen. *Indian J. Agron.* 44(3): 564-566.
2. Kaushik, S.K. and Gautam, R.C. (1981). Response of kodo millet (*Paspalum scrobiculatum*) varieties to nitrogen and phosphorus under rainfed condition. *Indian J. Agron*. 26(2):168-170.
3. Pilane, M.S., Salve, R.B., Pawan, V.S. and Bhoi, P.G. (1997). Response of finger millet cultivars to nitrogen and phosphorus. *Indian J. Agron*. 42(4): 637-640.
4. Pradhan, A.C. and Ghosh, D.C. (1986). Growth and yield variation of figer millet varieties due to nitrogen fertilization. *Indian J. Agron*. 31(1):63-68.
5. Rao, K.L., Rao, C.P. and Rao, K.V. (1989). Response of finger millet cultivar to nitrogen under rainfed condition. *Indian J. Agron*. 34(3):302-306.
6. Roy, D.K., Maitra, S., Saren, B.K., Chakraborty, A. and Chakraborty, P.K. (1996). Response of finger millet varieties to levels of nitrogen under rainfed red laterite zone. *Environ. and Ecol.* 14(2): 367-370.
7. Saini, J.P., Negi, S.C. and Singh, C.M. (1996). Response of finger millet genotype to N application under cold desert conditions. *Indian J. Agron*. 41(1): 61-64.
8. Sharma, R.B., Jain, V.K. and Verma, S.K. (1988). Influences of different levels of N on yield and protein of different varieties of finger millet grown under rainfed conditions. *Agric Sci. Digest.* 8(3): 161-164.
9. Singh, R.V. and Arya, M.P.S. (1994). Response of finger millet (Eleusine coracana) varieties to nitrogen under rainfed condition. *Indian J .Agron*. 39(1): 125-128.
10. Singh, R.V., Arya, M.P.S. and Dwivedi, G.K. (1995). Effect of nitrogen on the yield of different varieties of finger millet under rainfed conditions; *Bhartiya Kri Anusa.Patrika.* 10(4): 197-203.

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