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Effect of integrated nutrient management on Yield, quality parameters, soil properties and economics of varieties of finger millet under rainfed condition

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Abstract

Field experiments were conducted at the Department of Agronomy, College of Agriculture collaboration with Hill Millet Research Station, NAU, Waghai, during Kharif season of three years of 2013 to 2016 to study the response different varieties of finger millet (Nagli) to integrated nutrient management under rainfed condition. The results revealed that, the grain yield recorded under treatment N2 were 2502, 1870, 2628 and 2378 kg/ha during 2013-14, 2015-16, 2016-17 and in pooled results, respectively. Significantly higher straw yield was recorded under the treatment N2 during all the years of experimentation as well as in pooled analysis but remained at par with treatment N1 and N3 during 2nd and 3rd year of experimentation. Interaction effect of variety and nitrogen levels was found to be non-significant during all four years of experimentation and in pooled analysis. The Economics of the application of 75% recommended dose of fertilizer + vermicompost @ 2 t/ha realized more net income of Rs. 59001/- than rest of nitrogen levels.

Keywords: Fertilizer management; Finger millet; Nutrient uptake; Rainfed

1. Introduction

Finger millet (*Eleusine coracana* Gaertn.) is one of the important small millets grown for food grain and fodder, especially in tribal predominant areas. The crop is hardy and well suited to upland farming ecosystems, because of its early maturity and quick growing nature. In India among millets, ragi stands third only to sorghum and pearl millet. It is commonly known as Nagli in the tribal belt of Gujarat and occupies an area of about 19000 ha with annual production of 16000 tonnes (Annonyms 2011). In Gujarat, it is mainly cultivated as rainfed crop in *kharif* in the less fertile hill soils of Dang, Valsad, Tapi and Dahod District.

Finger millet is known for their unique nutritional properties particularly high calcium, high fibre content, quality protein and mineral composition. Now looking to gaining popularity of this crop and for increase the yield of our improved varieties respond favorably to, nutrient management, therefore a field experiment was planned.

2. Materials and methods

Field experiments were conducted during Kharif season of 2009, 2010 and 2011 under rainfed condition at the Department of Agronomy, College of Agriculture collaboration with Hill Millet Research Station, NAU, Waghai, during *Kharif* season of three years of 2013 to 2016 to study the response different varieties of finger millet (Nagli) to integrated nutrient management under rainfed condition. The soil of the experimental site had a clayey texture, medium medium in organic carbon (0.60%), available nitrogen (272.80 kg/ha) and available phosphorus (29.84 kg/ha), whereas high in available potassium (367.50 kg/ha). This region has a warm, humid monsoon with heavy rainfall, a moderately hot summer and a fairly cool winter. The seeds of cultivar GN-4 & GN-5 were used in the present investigation. The

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experiment was laid out in Factorial Randomized Block Design with four replications with 32 number of plots. With Two varieties of Finger milletes assign with main factor with Four levels of Nitrogen fertilizer (N_1- Recommended dose of fertilizer (40:20:00 NPK kg/ha), N_2- 75 % RDF + Vermicompost @ 2 t/ha, N_3- 75%RDF + Vermicompost @ 1 t/ha.+ Biofertilizer (*Azotobacter* @ 4 kg/ha, N_4- VC 2 t/ha + biofertilizer *Azotobacter*@4 kg/ha) assign as a sub factor was used to set up the experiment. The experiment comprising total eight nutrient management treatments. The fertilizers were applied to finger millet as per treatments. Nitrogen was applied in the form of urea, while phosphorus applied in the form of SSP. Finger millet nursery was raised using 5 kg/ha seed rate and one month old seedlings were transplanted at 22.5 cm × 7.5 cm spacing.

3. Results and discussion

3.1. Grain and straw yield of finger mille

The grain and straw yield (Table 1) of finger millet were significantly differed due to variety and nitrogen levels.

The results revealed that the variety GN-5 (V_2) recorded significantly higher grain yield of finger millet as compared to variety V_1 (GN-4) during all the individual years as well as in pooled analysis except during the year 2015-16. While significantly higher straw yield was recorded with the variety GN-4 over GN-5 during all the individual years and in pooled results as well.

Grain yield of finger millet was affected significantly due to nitrogen levels during all the individual years as well as in pooled analysis except 2nd year of experiment, where the nitrogen effect was non-significant. In all the cases, treatment N_2 (75% RDF + Vermicompost @ 2 t/ha) recorded significantly higher grain yield as compared to rest of the treatments, except 1st and 3rd year of experiment, wherein the treatment N_3 remained at par with treatment N_2. The grain yield recorded under treatment N_2 were 2502, 1870, 2628 and 2378 kg/ha during 2013-14, 2015-16, 2016-17 and in pooled results, respectively.

Significantly higher straw yield was recorded under the treatment N_2 during all the years of experimentation as well as in pooled analysis but remained at par with treatment N_1 and N_3 during 2nd and 3rd year of experimentation. Bhoite and Nimbalkar (1995) reported that, the variety PR 202 recorded highest grain and straw yield with the application of higher doses of nitrogen.

Interaction effect of variety and nitrogen levels was found to be non-significant during all four years of experimentation and in pooled analysis.

3.2. Quality parameters

The results of nutrient content in grain and straw of finger millet is given in table. The results revealed that only the nitrogen content in grain was affected significantly due to effect of variety. Variety V_1 recorded significantly higher nitrogen content in comparison to V_2. With respect to nitrogen levels, only the K content in grain was influenced significantly. Here, treatment N_3 registered significantly higher K content in grain as compared to rest of the nitrogen levels.

Nutrient uptake by different component *i.e.*, grain and straw as well as total uptake of all the nutrients were significantly influenced due to variety except total uptake of potash. In all the cases variety V_2 found better than V_1. Nitrogen levels influenced significantly the uptake of N, P and K by grain and straw as well as total uptake. In all the cases, treatment N_2 out yielded rest of the nitrogen levels by recording significantly higher values of N, P and K uptake.

3.3. Soil parameters

The results presented in table revealed that organic carbon, available nitrogen, available phosphorus and available potassium content in soil after harvest of crop were found to be non-significant due to varieties during all the four years as well as in pooled results.

From the results presented in table revealed that organic carbon, available nitrogen, available phosphorus and available potassium content in soil were found to be non-significant due to nitrogen levels during all the years of experimentation as well as in pooled results also except organic carbon content during the year 2016-17 where in the effect of nitrogen was significant and treatment N_4 registered significantly higher organic carbon content as compared to N_1 but it remained at par with rest of the treatments and available potassium content during the year 2015-16 wherein treatment

N_1 out yielded rest of the nitrogen levels by recording significantly higher content of K. The results are in conformity with the findings of Roy *et al.* (2001) and Basavrajjappa *et al.* (2002).

Table 1 Grain and fodder yield (kg/ha) of finger millet as affected by different treatments

Treatments	Grain yield (kg/ha)					Straw yield (kg/ha)				
	2013-14	2014-15	2015-16	2016-17	Pooled	2013-14	2014-15	2015-16	2016-17	Pooled
Variety										
V_1	2167	2177	1643	2067	2011	7408	6303	6064	7767	6886
V_2	2430	2463	1704	2354	2238	6000	5532	5457	7087	6019
S.Em±	57	67	50	80	32	200	187	180	175	94
CD at 5%	166	198	NS	234	91	589	549	529	515	266
Nitrogen levels										
N_1	2239	2276	1618	2056	2047	6444	5817	5827	7073	6290
N_2	2502	2512	1870	2628	2378	7641	6522	6409	8322	7223
N_3	2329	2305	1750	2232	2154	6597	6040	6075	7313	6506
N_4	2125	2186	1457	1927	1924	6135	5289	4731	7000	5789
S.Em±	80	95	71	112	46	283	264	254	248	130
CD at 5%	235	NS	210	331	129	833	776	748	728	366
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	9.8	11.6	12.1	14.4	12.1	11.9	12.61	12.5	9.4	11.5

Table 2 Nitrogen, phosphorus and potash content of finger millet as affected by different treatments (Four year pooled)

Treatments	Content in grain (%)			Content in straw (%)		
	N	P	K	N	P	K
Variety						
V_1	0.74	0.178	0.683	0.588	0.073	1.48
V_2	0.72	0.183	0.677	0.587	0.072	1.43
S.Em±	0.005	0.002	0.007	0.005	0.002	0.036
CD at 5%	0.014	NS	NS	NS	NS	NS
Nitrogen levels						
N_1	0.72	0.181	0.667	0.584	0.074	1.43
N_2	0.74	0.183	0.674	0.589	0.073	1.53
N_3	0.72	0.181	0.702	0.584	0.072	1.43
N_4	0.72	0.178	0.677	0.595	0.072	1.41
S.Em±	0.007	0.0031	0.009	0.007	0.002	0.051
CD at 5%	NS	NS	0.025	NS	NS	NS
Interaction	NS	NS	NS	NS	NS	NS
CV %	5.53	10.06	7.42	7.26	14.98	15.85

Table 3 Nitrogen, phosphorus, potash and total uptake of finger millet as affected by different treatments (Four-year pooled data)

Treatments	Uptake by grain (kg/ha)			Uptake by straw (kg/ha)			Total uptake (kg/ha)		
	N	P	K	N	P	K	N	P	K
Variety									
V_1	14.85	3.61	13.79	40.38	4.98	102.0	55.23	8.59	116
V_2	16.06	4.11	15.15	35.12	4.34	86.0	51.18	8.44	107
S.Em±	0.27	0.09	0.27	0.60	0.11	3.07	0.66	0.14	3.03
CD at 5%	0.76	0.25	0.76	1.69	0.31	8.63	1.85	NS	8.54
Nitrogen levels									
N_1	14.76	3.73	13.67	36.63	4.59	90.1	51.39	8.32	104
N_2	17.63	4.36	16.07	42.35	5.25	111.0	59.98	9.60	128
N_3	15.57	3.91	15.12	37.82	4.64	92.8	53.39	8.55	108
N_4	13.85	3.43	13.00	34.20	4.16	81.8	48.06	7.59	94.8
S.Em±	0.37	0.12	0.37	0.83	0.15	4.34	0.093	0.19	4.28
CD at 5%	1.05	0.33	1.05	2.35	0.43	12.20	2.61	0.54	12.05
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	13.97	17.80	14.93	12.63	18.64	20.77	9.92	12.90	17.06

Table 4 Organic carbon (%), available nitrogen, available phosphorus and available potassium content in soil as affected by different treatments

Treatments	Organic carbon content (%)				Available N content (kg/ha)				Available P_2O_5 content (kg/ha)				Available K_2O content (kg/ha)			
	2013-14	2014-15	2015-16	2016-17	2013-14	2014-15	2015-16	2016-17	2013-14	2014-15	2015-16	2016-17	2013-14	2014-15	2015-16	2016-17
Initial	1.08	1.06	1.06	1.05	492	489	484	482	97.2	96.4	96.8	95.6	524	522	521	521
Variety																
V_1	1.05	1.04	1.00	1.03	470	473	475	471	91.4	89.8	93.4	94.4	507	507	505	504
V_2	1.01	1.04	0.98	1.04	473	471	474	475	91.7	92.6	92.2	92.9	504	505	509	508
S.Em±	0.022	0.020	0.015	0.019	4.30	14	3.03	2.79	2.7	2.02	2.08	2.00	5.4	7.4	3.3	6.1
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Nitrogen levels																
N_1	1.01	0.97	0.95	0.96	471	472	468	467	93.3	93.4	94.4	96.0	516	520	519	525
N_2	1.01	1.06	1.02	1.05	472	471	476	474	91.6	92.5	94.9	93.5	504	502	499	499
N_3	1.05	1.04	1.01	1.05	474	471	475	469	91.3	87.2	91.7	92.7	501	502	504	501
N_4	1.06	1.08	1.00	1.07	470	473	478	481	90.2	91.6	90.1	92.5	499	502	505	501
S.Em±	0.031	0.027	0.021	0.027	6.08	19	4.29	3.95	3.8	2.87	2.94	2.82	7.6	10.4	4.7	8.6
CD at 5%	NS	NS	NS	0.080	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	13.7	NS
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	8.49	7.43	5.95	7.43	5.65	11.56	4.56	4.36	11.72	8.89	8.97	8.52	4.25	5.83	4.62	4.81

Table 5 Economics of finger millet as affected by different treatments

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Cost of cultivation (Rs./ha)	Gross income (Rs./ha)	Net income (Rs./ha)
Variety					
V_1	2011	6890	41956	91070	49115
V_2	2238	6010	41956	96357	54401
Nitrogen levels					
N_1	2047	6290	35535	90531	54996
N_2	2373	7209	45696	104696	59001
N_3	2154	6516	41176	94936	53760
N_4	1924	5785	45417	84692	39275

Price of Nagli: Grain: Rs. 35/- per kg Straw: Rs. 3/- per kg

4. Conclusion

From these studies it was concluded that for finger millet variety GN-5 during *kharif* season showed good response with the fertilized crop with 75% RDF (40:20:00 NPK kg/ha) + vermicompost @ 2 t/ha for getting higher yield and net income under rainfed condition

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Basavarajapp, R., Prabhakar, A.S. and Halikatti, S.I. (2002). Effect of tillage, organics, nitrogen and their interactions on yield attributes and yield of foxtail millet (Sataria italica) under shallow alfisol during rainy season. Indian J. Agron., 47 (3): 390-397.

[2] Bhoite, S.V. and Nimbalkar. V.S. (1995). Response of finger millet cultivation to nitrogen and phosphorus under rainfed condition. J. Maharashtra Agric. Univ., 20 (2): 189-190.

[3] Nigade, R.D., Jadhav, B.S. and Bhosale, A.S. (2011). Response of finger millet long duration variety to different levels of nitrogen under rainfed conditions. Internat. J. Agric. Sci., 7(1) : 152-155.