International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(6): 2025-2029
© 2018 IJCS
Received: 14-09-2018
Accepted: 15-10-2018

Nandini KM
Department of Agronomy, University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka, India

Sridhara S
Department of Agronomy, University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka, India

Kiran Kumar
Department of Agronomy, University of Agricultural Sciences, Dharwad, Karnataka, India

Effect of different levels of nitrogen on yield, yield components and quality parameters of foxtail millet (*Setaria italica* L.) genotypes in southern transition zone of Karnataka

Nandini KM, Sridhara S and Kiran Kumar

Abstract
Foxtail millet (*Setaria italica* L.) is an important crop in arid and semiarid regions of the world because of its drought tolerance. Nitrogen is one of the most limiting nutrients in crop production due to low availability and loss. We hypothesize that there are differences in physiological and yield traits among foxtail millet genotypes in response to N. The objectives of this study were to determine the responses of foxtail millet genotypes to N fertilizer and the relationship between their yield, yield components and quality traits. A field experiment was carried out during *kharif*, 2016 and 2017 on red sandy clay loam soils of Agriculture College, UAHS, Shivamogga. The experiment was laid out in randomized complete block design with factorial concept and replicated thrice. The treatments consisted of three foxtail millet genotypes *viz.*, Local, HMT-1 and SIA 2644 and five nitrogen levels *viz.*, 0%, 50% and 100%, 125% and 150% of RDN ha^{-1}. The foxtail millet genotypes were evaluated for yiels and yield parameters *viz.*, number of productive tillers, panicle length, panicle weight, grain yield and straw yield and quality parameters protein percent, and fibre percent. Nitrogen levels have significant effect on both yield components and quality parameters of foxtail millet genotypes. Among different nitrogen levels application of 125% N ha^{-1} recorded significantly higher yield components *viz.*, number of productive tillers hill^{-1} (13.65) at harvest, panicle length (15.72 cm), panicle weight (7.24 g) and test weight (3.52 g) as well as grain yield (2189 kg ha^{-1}) and straw yield (4643 kg ha^{-1}) with respect to quality parameters, 125% N ha^{-1} recorded significantly higher protein percent (11.55) whereas 100% N ha^{-1} recorded significantly higher fiber percent (6.06) compared to other Nitrogen levels. Among genotypes, SIA 2644 resulted significantly higher yield parameters like number of productive tillers hill^{-1} (10.08) at harvest, panicle length (14.28 cm), panicle weight (6.16 g), and test weight (3.28 g) grain yield (2246 kg ha^{-1}) and straw yield (4823 kg ha^{-1}) followed by HMT-1 and Local. With respect to quality parameters, SIA 2644 recorded significantly higher protein percent (8.72) and fiber percent (5.32) as compared to other genotypes.

Keywords: Foxtail millet, nitrogen, genotypes, yield and quality parameters

1. Introduction

Future trends of food requirement indicate that millet crop production will increase globally because of the increase in number of millet consumers as they are nutritionally miles ahead of rice and wheat. Millets is known to be ‘crops of the future’ as they can be well adapted and cultivated under harsh environment of arid and semi-arid region (RESMISA, 2012). During the present days of climatic change, high energy farming is slowly replaced with low energy traditional farming with climatic resilient crops like small millets for conservation and to aid in making sound and stable management under increasing evidence of less seasonal rainfall, increase in temperature and frequent occurrence of extreme weather events. Under such situations foxtail millet is best suited as it is of short duration, known for its drought tolerance and can withstand severe moisture stress and also suited to wide range of soil conditions with high energy use efficiency. The yield potential of foxtail millet is low in India compared to the potentially achievable yield because of inadequate application of fertilizers, conventional cultivation of low yielding cultivars and lack of good management practices. The Maximum yield potential can be achieved by growing high yielding varieties with improved tolerance to drought, resistance to pests and diseases and response to higher rates of fertilizer applications. Nitrogen is the major nutrient required by the millets which positively increases the growth, yield attributes and finally improve the yield (Prasad *et al.*, 2014) [12].

Correspondence
Nandini KM
Department of Agronomy, University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka, India

Foxtail millet realizes maximum yield potential with improved varieties and optimum nitrogen management. Recent studies also have shown that newly developed varieties of foxtail millet are more responsive to nitrogenous fertilizers (AICSMIP, 2013) [1]. Keeping the importance of foxtail millet under semi arid region and importance of nitrogen fertilizer, an experiment was conducted to assess the growth, yield and quality of foxtail millet genotypes with nitrogen levels.

Material Methods

A field experiment was carried out during *kharif,* 2016 and 2017 at Agricultural College UAHS, Shivamogga. The soil of the experimental site belongs to taxonomic class of *Typic Haplustalf* with red sandy loam texture. The soils of experiment were acidic in reaction (6.20), low in available nitrogen (198.83 kg N_2O ha^{-1}), high with respect to phosphorus (64.00 kg P_2O_5 ha^{-1}) and potassium (239.00 kg K_2O ha^{-1}) status. The experiment was laid out in randomised complete block design with factorial concept with fifteen treatment combinations and replicated thrice. The treatments comprised of genotypes *viz.,* Local, HMT-1 and SIA 2644 and five nitrogen levels *viz.,* 0%, 50%, 100%, 125% and 150% of RDN ha^{-1}. The experimental field was prepared by working once with a tractor drawn cultivator followed by harrowing with bullock drawn blade harrow. The field was finally levelled with wooden plank and the plots were laid out according to the layout plan. The crop was sown in lines 30 cm apart by adopting all the standard package of practices except the imposed treatments. A basal dose of P_2O_5 was applied uniformly in all the treatments. The scheduled nitrogen was applied to the respected plots as per the treatments. All the agronomic practices were carried out uniformly to raise the crop. For taking data on growth, yield and yield components on foxtail millet five plants were selected randomly in each plot. Yield obtained from each plot was converted to kg/ ha. The data obtained on yield during the study was statistically analyzed by following the analysis of variance for Randomized Block Design with factorial concept as suggested by Gomez and Gomez (1984). The mean values of interaction effects were separately subjected to Duncan's Multiple Range Test (DMRT) using the corresponding error mean sum of squares and degrees of freedom values under D–SAAT program.

Quality parameters

Crude protein content of grain (%)

Nitrogen content in the grain was determined by Kjeldal Method as described by Jackson (1973) and expressed in percentage. The crude protein content was worked out by multiplying the nitrogen percentage with factor 6.25 (Doubetz and Wells, 1968).

Crude protein (%) = N content in grain (%) × 6.25.

Crude fibre content of grain (%)

Crude fibre content was estimated by the acid-alkali digestion method. The residue obtained after digestion was dried in a crucible and its weight was recorded (We). The dried residue was then ashed in a muffle furnace at 600 °C for 3 to 4 hours and its weight (Wa) was recorded. The difference between these two weights (We - Wa) was taken as the weight of the crude fibre (Mahadevan 1965).

$$\text{Crude fibre (\%)} = \frac{W_e - W_a}{\text{Weight of sample}} \text{x100}$$

Results and Discussion

Effect of nitrogen levels, genotypes and their interactions on yield and yield parameters of foxtail millet

The pooled data of the experiment was resulted that, among the five nitrogen levels evaluated for their performance, grain yield and straw yield per hectare was significantly highest at higher level of nitrogen application, *i.e.,* 125% N (2189 kg ha^{-1} and 4643 kg ha^{-1}, respectively). This was found to be on par with the treatment which received 100% N (2178 kg ha^{-1} and 4563 kg ha^{-1}, respectively) as compared to 150% (2005 kg ha^{-1} and 4382 kg ha^{-1}, respectively) and lowest yield was observed with 0% N (1455 kg ha^{-1} and 3286 kg ha^{-1}, respectively) (Table 1). In the present investigation profound influence of nitrogen fertilization on yield seems to be on account of their potential role in modifying soil and plant environment conducive for better components of the both morphological and biochemical of the plant growth that increase efficiency of physiological process of plant system and ultimately led to realization of higher productivity of individual plant the results also be evidenced in the studies of Basavaraj Naik (1993) [2] in foxtail millet. The increased percentage of nitrogen has contributed to the nutrient requirement of crop which favored increased grain yield. Bhomte *et al.* (2016) reported that application of 50 kg N ha^{-1} recorded maximum yield (2675 kg ha^{-1}) over control in little millet. Among genotypes, SIA 2644 gave significantly higher grain yield and straw yield (2246 and 4823 kg ha^{-1}, respectively) than HMT-1 (2061 kg ha^{-1} and 4468 kg ha^{-1}, respectively) and Local (1582 kg ha^{-1} and 3446 kg ha^{-1}, respectively) (Table 1). This higher straw yield of SIA 2644 may be attributed to higher dry matter accumulation in vegetative parts. Lower straw yield of local genotype (3446 kg ha^{-1}) may be due to reduced size of photosynthesizing surface which might have caused reduction in growth. These consequently reduced the total straw yield production. These results are in confirmatory with the work of Saini and Thakur (1997) in little millet. The grain yield of foxtail millet due to interaction effects of nitrogen and genotype levels were found significant and significantly higher grain and straw yield (2527 and 5267 kg ha^{-1}, respectively) was recorded with the interaction of 125 percent N ha^{-1}+ SIA 2644 which was on par with 100 percent N ha^{-1}+ SIA 2644 (2493 and 5246 kg ha^{-1}, respectively) as compared to 50 kg N ha^{-1} + SIA 2644 (Table 1).

The variation in yield could be attributed to the variations in the yield attributing parameters. The main yield attributing parameters in foxtail millet are number of productive tillers, panicle weight, panicle length and test weight. Application of 125% N ha^{-1} recorded significantly higher yield components *viz.,* number of productive tillers hill^{-1} (13.65) (Table 1), panicle length (15.72 cm), panicle weight (7.24 g) and test weight (3.52 g) at harvest as compared to 150% N ha^{-1} (15.65 cm, 6.70 g and 3.35 g, respectively) followed by 100 percent N ha^{-1} (Table 2). Among genotypes, SIA 2644 resulted significantly higher yield parameters like number of productive tillers hill^{-1} (10.08) (Table 2), panicle length (14.28 cm), panicle weight (6.16 g), and test weight (3.28 g) at harvest followed by HMT-1 and local (Table 2). The increase in yield attributes may be due to genetic and environmental factors. These results are in conformity with earlier works of Pareek and Shaktawat (1988) in pearl millet, Munirathnam *et* *al.* (2006) in foxtail millet. In combined effect of 125% N ha^{-1}+ SIA 2644 recorded significantly higher number of productive tillers hill^{-1} (14.27) and panicle weight (7.90 g), panicle length (16.37cm) and test weight (3.39 g) which was found to be on par with 125% N ha^{-1}+ HMT-1 and 100% N ha^{-1}+ SIA 2644 as compared to 0% N ha^{-1}+ Local (Table 2). The difference in the performance of yield attributes with different levels of nitrogen could be due to variation in translocation of photosynthates from vegetative to reproductive parts. This result supports the findings of Basavaraj Naik (1993) [2]. Maximum production of productive tillers was might be due to of higher dry matter production and the efficient translocation to the reproductive parts under comfortable nitrogen nutrition might be responsible for the beneficial effect on elevating the stature of all the yield attributes. Similar results have been reported by Bhanuprasad Reddy (2014) [3] in pearl millet.

Table 1: Grain yield (kg ha^{-1}) and straw yield (kg ha^{-1}) of foxtail millet as influenced by nitrogen levels and genotypes

Treatments	Grain yield (kg ha^{-1})			Straw yield (kg ha^{-1})		
	2016	2017	Pooled	2016	2017	Pooled
Nitrogen levels						
N_1: 0%	1435	1476	1455	3242	3330	3286
N_2: 50%	1960	2016	1988	4296	4412	4354
N_3: 100%	2149	2207	2178	4503	4623	4563
N_4: 125%	2158	2219	2189	4581	4705	4643
N_5: 150%	1993	2017	2005	4356	4408	4382
F test	*	*	*	*	*	*
S.Em±	11.53	22.84	15.17	27.18	43.21	29.50
C.D. (p=0.05)	33.41	66.16	43.96	78.73	125.16	85.45
Genotypes						
G_1: Local	1561	1602	1582	3404	3488	3446
G_2: HMT-1	2032	2089	2061	4408	4527	4468
G_3: SIA 2644	2223	2269	2246	4775	4872	4823
F test	*	*	*	*	*	*
S.Em±	8.93	17.69	11.75	21.05	33.47	22.85
C.D.(p=0.05)	25.88	51.25	34.05	60.99	96.95	66.19
N×G						
N_1G_1	1149^{k}	1182^{j}	1166^{j}	2621^{j}	2693^{i}	2657^{i}
N_1G_2	1516^{i}	1559^{h}	1538^{h}	3430^{h}	3523^{g}	3476^{g}
N_1G_3	1639^{h}	1686^{g}	1662^{g}	3674^{g}	3774^{f}	3724^{f}
N_2G_1	1767^{g}	1817^{f}	1792^{f}	3926^{f}	4033^{e}	3979^{e}
N_2G_2	2014^{f}	2072^{e}	2043^{e}	4419^{e}	4540^{d}	4479^{d}
N_2G_3	2098^{e}	2158^{e}	2128^{d}	4541^{de}	4664^{cd}	4602^{cd}
N_3G_1	1731^{g}	1780^{fg}	1756^{f}	3712^{g}	3812^{f}	3762^{f}
N_3G_2	2284^{c}	2350^{bc}	2317^{c}	4856^{b}	4988^{b}	4922^{b}
N_3G_3	2458^{ab}	2528^{a}	2493^{ab}	5176^{a}	5316^{a}	5246^{a}
N_4G_1	1738^{g}	1787^{fg}	1762^{f}	3644^{g}	3743^{f}	3694^{f}
N_4G_2	2202^{d}	2290^{cd}	2246^{c}	4636^{cd}	4822^{bc}	4729^{c}
N_4G_3	2508^{a}	2545^{a}	2527^{a}	5230^{a}	5304^{a}	5267^{a}
N_5G_1	1422^{j}	1443^{i}	1433^{i}	3115^{i}	3160^{h}	3138^{h}
N_5G_2	2145^{de}	2176^{de}	2160^{d}	4697^{c}	4765^{b-d}	4731^{c}
N_5G_3	2410^{b}	2431^{ab}	2421^{b}	5255^{a}	5300^{a}	5277^{a}
S.Em±	19.98	39.56	26.28	47.07	74.83	51.09

Table 2: Yield components of foxtail millet as influenced by nitrogen levels and genotypes

Treatments	Productive tillers hill^{-1}			Panicle length (cm)			Panicle weight (g)			Test weight (g)		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
Nitrogen levels												
N_1: 0%	5.24	5.45	5.34	11.05	11.47	11.26	4.15	4.36	4.25	2.83	2.89	2.86
N_2: 50%	6.93	7.20	7.07	12.58	13.06	12.82	4.95	5.20	5.07	3.12	3.18	3.15
N_3: 100%	11.71	12.17	11.94	13.63	14.15	13.89	5.72	6.00	5.86	3.24	3.30	3.27
N_4: 125%	13.38	13.92	13.65	15.36	15.94	15.72	7.07	7.42	7.24	3.32	3.39	3.52
N_5: 150%	9.89	10.29	10.09	15.43	16.01	15.65	6.53	6.86	6.70	3.49	3.56	3.35
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em±	0.18	0.25	0.20	0.17	0.17	0.17	0.05	0.06	0.05	0.02	0.02	0.02
C.D. (p=0.05)	0.51	0.74	0.57	0.48	0.50	0.49	0.15	0.16	0.16	0.06	0.06	0.06
Genotypes												
G_1: Local	8.95	9.31	9.13	13.11	13.74	13.43	5.41	5.68	5.55	3.15	3.21	3.18
G_2: HMT-1	9.45	9.83	9.64	13.67	14.12	13.90	5.63	5.91	5.77	3.20	3.27	3.23
G_3: SIA 2644	9.88	10.28	10.08	14.05	14.51	14.28	6.01	6.31	6.16	3.25	3.32	3.28
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em±	0.14	0.20	0.15	0.13	0.13	0.13	0.04	0.04	0.04	0.02	0.02	0.02
C.D.(p=0.05)	0.39	0.57	0.44	0.37	0.39	0.38	0.12	0.12	0.12	0.05	0.05	0.05
N×G												

N_1G_1	4.78	4.97	4.88	10.64^{h}	11.04^{h}	10.84^{g}	3.84^{i}	4.03^{i}	3.94^{i}	2.75^{j}	2.81^{j}	2.78^{j}
N_1G_2	5.35	5.57	5.46	10.97^{gh}	11.39^{gh}	11.18^{fg}	4.18^{hi}	4.39^{hi}	4.29^{hi}	2.81^{j}	2.87^{j}	2.84^{j}
N_1G_3	5.57	5.80	5.68	11.53^{gh}	11.97^{gh}	11.75^{fg}	4.43^{g-i}	4.65^{g-i}	4.54^{g-i}	2.93^{i}	2.99^{i}	2.96^{i}
N_2G_1	6.44	6.70	6.57	11.81^{g}	12.26^{g}	12.04^{f}	4.70^{gh}	4.94^{gh}	4.82^{gh}	3.08^{h}	3.14^{h}	3.11^{h}
N_2G_2	6.96	7.24	7.10	12.74^{f}	13.22^{f}	12.98^{e}	4.81^{fg}	5.05^{fg}	4.93^{fg}	3.12^{gh}	3.18^{gh}	3.15^{gh}
N_2G_3	7.38	7.68	7.53	13.20^{ef}	13.70^{ef}	13.45^{de}	5.33^{ef}	5.60^{ef}	5.47^{ef}	3.16^{f-h}	3.22^{f-h}	3.19^{f-h}
N_3G_1	11.37	11.83	11.60	13.50^{ef}	14.02^{ef}	13.76^{de}	5.49^{de}	5.77^{de}	5.63^{de}	3.20^{e-g}	3.26^{e-g}	3.23^{e-g}
N_3G_2	11.57	12.03	11.80	13.65^{de}	14.17^{de}	13.91^{cd}	5.70^{de}	5.98^{de}	5.84^{de}	3.27^{d-f}	3.34^{d-f}	3.30^{d-f}
N_3G_3	12.18	12.67	12.42	13.73^{de}	14.25^{de}	13.99^{cd}	5.97^{cd}	6.26^{cd}	6.12^{cd}	3.25^{d-f}	3.32^{d-f}	3.28^{d-f}
N_4G_1	12.78	13.29	13.04	14.48^{cd}	15.03^{cd}	14.75^{bc}	6.60^{b}	6.93^{b}	6.76^{b}	3.29^{de}	3.36^{de}	3.32^{de}
N_4G_2	13.38	13.92	13.65	15.53^{ab}	16.12^{ab}	15.83^{a}	6.89^{b}	7.24^{b}	7.07^{b}	3.31^{c-e}	3.38^{c-e}	3.34^{c-e}
N_4G_3	13.99	14.55	14.27	16.06^{a}	16.68^{a}	16.37^{a}	7.71^{a}	8.09^{a}	7.90^{a}	3.36^{cd}	3.43^{cd}	3.39^{cd}
N_5G_1	9.39	9.76	9.58	15.12^{bc}	15.71^{bc}	15.58^{ab}	6.42^{bc}	6.74^{bc}	6.58^{bc}	3.42^{bc}	3.49^{bc}	3.45^{bc}
N_5G_2	9.99	10.39	10.19	15.45^{ab}	15.97^{ab}	15.74^{a}	6.56^{b}	6.89^{b}	6.72^{b}	3.50^{ab}	3.57^{ab}	3.59^{a}
N_5G_3	10.29	10.71	10.50	15.71^{ab}	16.35^{ab}	15.84^{a}	6.62^{b}	6.95^{b}	6.79^{b}	3.55^{a}	3.62^{a}	3.54^{ab}
S.Em±	0.30	0.44	0.34	0.29	0.30	0.29	0.09	0.10	0.09	0.04	0.04	0.04

Effect of nitrogen levels, genotypes and their interactions on quality parameters of foxtail millet

Quality of grain is an important as the grain yield itself in assessing the performance in relation to its functional usage and quality. Significantly higher protein content (11.55%) were obtained when fertilizer was applied at the rate of 150 percent N ha^{-1} and least content was obtained with 0 percent N ha^{-1} (4.04%). Significantly fiber content (6.06%) was noticed in 100% N ha^{-1} and least was found in 150 percent N ha^{-1} (4.11%) (Table 3) as compared to other treatments. Among genotypes, SIA 2644 resulted significantly higher quality parameters *viz.*, protein and fiber content (8.72 and 5.32%, respectively) followed by HMT-1 (8.38 and 5.19%, respectively) than local (Table 3). Significant increase in seed quality parameters with respect to genotype was mainly due to increase in seed size and better filling of individual seeds this might be due to higher yield and yield attributing parameters. The higher yield attributing parameters were achieved due to better uptake of nutrients and better translocation of photosynthates from source to sink lead to higher protein content in seeds and also higher accumulation of carbohydrates. Similar results in close conformity with the findings of Sharer *et al*. (1995) [16] and Chauhan *et al*. (2015) [6].

Table 3: Quality parameters of foxtail millet as influenced by nitrogen levels and genotypes

Treatments	**Fibre percent**			**Protein percent**		
	2016	**2017**	**Pooled**	**2016**	**2017**	**Pooled**
Nitrogen levels						
N_1: 0%	5.21	5.47	5.34	3.94	4.14	4.04
N_2: 50%	5.54	5.82	5.68	7.55	7.93	7.74
N_3: 100%	5.91	6.21	6.06	8.56	8.99	8.78
N_4: 125%	4.51	4.74	4.63	9.76	10.25	10.01
N_5: 150%	4.01	4.21	4.11	11.27	11.83	11.55
F test	*	*	*	*	*	*
SEm±	0.09	0.12	0.09	0.14	0.14	0.14
CD (p=0.05)	0.25	0.34	0.27	0.39	0.40	0.39
Genotypes						
G_1: Local	4.87	5.11	4.99	7.96	8.36	8.16
G_2: HMT-1	5.06	5.32	5.19	8.18	8.59	8.38
G_3: SIA-2644	5.18	5.45	5.32	8.51	8.94	8.72
F test	*	*	*	*	*	*
SEm±	0.07	0.09	0.07	0.10	0.11	0.11
CD(p=0.05)	0.19	0.26	0.21	0.30	0.31	0.30
N×G						
N_1G_1	4.99^{fg}	5.24^{fg}	5.12^{fg}	3.64^{i}	3.82^{i}	3.73^{i}
N_1G_2	5.26^{ef}	5.53^{ef}	5.40^{ef}	3.94^{i}	4.14^{i}	4.04^{i}
N_1G_3	5.38^{de}	5.65^{de}	5.52^{de}	4.24^{i}	4.46^{i}	4.35^{i}
N_2G_1	5.44^{c-e}	5.72^{c-e}	5.58^{c-e}	7.79^{gh}	8.18^{gh}	7.98^{gh}
N_2G_2	5.53^{c-e}	5.81^{c-e}	5.67^{c-e}	7.21^{h}	7.57^{h}	7.39^{h}
N_2G_3	5.65^{b-d}	5.94^{b-d}	5.80^{b-d}	7.66^{gh}	8.04^{gh}	7.85^{gh}
N_3G_1	5.78^{a-c}	6.07^{a-c}	5.93^{a-c}	8.11^{fg}	8.52^{fg}	8.31^{fg}
N_3G_2	5.90^{ab}	6.20^{ab}	6.05^{ab}	8.56^{ef}	8.99^{ef}	8.78^{ef}
N_3G_3	6.05^{a}	6.36^{a}	6.21^{a}	9.01^{de}	9.46^{de}	9.24^{de}
N_4G_1	4.21^{i}	4.42^{i}	4.32^{i}	9.46^{cd}	9.94^{cd}	9.70^{cd}
N_4G_2	4.60^{h}	4.83^{h}	4.72^{h}	9.91^{c}	10.41^{c}	10.16^{c}
N_4G_3	4.73^{gh}	4.97^{gh}	4.85^{gh}	9.91^{c}	10.41^{c}	10.16^{c}
N_5G_1	3.92^{i}	4.12^{i}	4.02^{i}	10.82^{b}	11.36^{b}	11.09^{b}
N_5G_2	4.01^{i}	4.21^{i}	4.11^{i}	11.27^{ab}	11.83^{ab}	11.55^{ab}
N_5G_3	4.10^{i}	4.31^{i}	4.21^{i}	11.72^{a}	12.30^{a}	12.01^{a}
SEm±	0.15	0.20	0.16	0.23	0.24	0.24

Significant difference was noticed among interaction effects with respect to quality parameters. Combined effect of 150 percent N ha^{-1}+ SIA 2644 (12.01%) resulted higher protein content which was found to be on par with 150% N ha^{-1} + HMT-1 (11.55%), 150 percent N ha^{-1} + local, as compared to 0 percent N ha^{-1} + local. Interaction effect of 100 percent N ha^{-1} + SIA 2644 (6.21%) resulted higher fibre content which was found to be on par with 100 percent N ha^{-1} + HMT-1 (6.05%), 100 percent N ha^{-1}+ local, as compared to 150 percent N ha^{-1} + local (Table 3). This was mainly attributed to availability and uptake of nitrogen and there by corresponding increase in protein content. Apart from this nitrogen plays an important role in plant metabolism as a constituent of amino acids (DNA and RNA), it transfers genetic transformation and regulates cellular metabolism of amino acids and protein that form structural units and biological catalyst of phosphorylated compounds which involved in energy transformation. It is a major structural constituent of cell wall thus increasing the quality by improving the protein content. The findings are in confirmative with the results of Desale *et al.* (1999) [7], Ramesh Babu *et al*. (1994) [13], Tiwana *et al*. (2005) [17].The crude fibre content decreased significantly with increasing nitrogen levels was mainly due to rapid synthesis of carbohydrates which are converted into proteins and protoplasm and only smaller portion is available for cell wall material and thus decreases pectin, cellulose and hemi cellulose contents which are major constituents of crude fibre. These results are in conformity with the findings of Bhilare *et al.* (2010) [4], Karwasra *et al*. (2006) [9].

References

1. AICSMIP (All India Co-ordinated Small Millets Improvement Project). Annual Report (2012-2013), project co-ordinating unit on small millets, ICAR, GKVK, Bangalore. AG, 2013, 36-37.
2. Basavaraj Naik. Effect of fertility management on growth and yield of foxtail millet under rainfed condition. M. Sc.(Agri.) Thesis, Uni. Agric. Sci., Bengaluru, 1993.
3. Bhanu Prasad Reddy, Naga Madhuri. Effect of nitrogen and potassium on yield and quality of pearl millet, M.Sc. (Agri.) Thesis, Acharya N.G. Ranga Agricultural University, Hyderabad, 2014.
4. Bhilare RL, Pathan SH, Damame SV. Response of forage pearl millet varieties to different nitrogen levels under rainfed condition. J Maharashtra agric. Univ. 2010; 35(2):304-306.
5. Bhomte MV, Apotikar VA, Pachpole DS. Effect of different fertilizer levels on growth and yield of little millet (*Panicum sumantrense* L.) genotypes. Contemporary, Res. India. 2016; 6(3):2231-2137.
6. Chauhan M, Gudadhe NN, Dinesh Kumar AK, Kumawat Kumar R. Transplanting dates and nitrogen levels influences on growth, yield attributes and yield of summer pearl millet. Int. J life. Sci. 2015; 10(3):1295-1298.
7. Desale JS, Babar RM, Pathan SH, Bhilare RL. Effect of bio-fertilizers with various nitrogen levels on green forage yield of sorghum. Forage Res. 1999; 24(4):195-198.
8. Gomez KA, Gomez AA. Statistical procedures for agricultural research with emphasis on rice. John wiley and Sors, New York, 1984, 680
9. Karwasra RS, Yadav AS, Guptha SN. Effect of integrated nutrient management on herbage yield and quality of barley (*Hordeum vulgare* L.). Forage Res. 2006; 32(2):130-131.
10. Munirathnam P, Sambasiva A, Sawadhkar SM. Evaluation of foxtail millet varieties under low fertility conditions. Agric. Sci. Digest. 2006; 26(3):197-199.
11. Pareek M, Shaktawat MS. Effect of *Azospirillum* nitrogen and phosphorus on pearlmillet. Indian J Agron. 1988; 33(3):322-324.
12. Prasad SK, Samota A, Singh MK, Verma SK. Cultivars and nitrogen levels influence on yield attributes, yield and protein content of pearl millet under semi-arid condition of vindhyan region. The Ecoscan. 2014; VI:47-50.
13. Ramesh Babu, Subhash Gumaste, Patil TC, Prabhakar AS. Effect of stage of cutting, nitrogen and phosphorous levels on forage pearl millet. Forage res. 1994; 20(4):225-231.
14. Resmisa [Revalorising Small Millets in Rainfed Regions of South Asia]. Supporting Millets in India. Policy Review and Suggestions for Action, 2012, 6.
15. Saini JP, Thakur SR. Effect of variety and nitrogen on growth and yield of little millet under dry temperate condition. Indian J Agric. Sci. 1997; 67(7):311-313.
16. Sharer MS, Ayub M, Hussain M. Fodder yield and quality of pearl millet (*Pennisetum glaucum* L.) as influenced by different nitrogen rates. Pakistan J Sci. & Ind. Res. 1995; 31(2):118-119.
17. Tiwana US, Puri KP, Sukhpreet Singh. Fodder yield and quality of multicut pearl millet (*Pennisetum glaucum* L.) as influenced by nitrogen and phosphorus under Punjab conditions. Forage Res. 2005; 28(4):190-193.