Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(5): 269-271
Received: 04-07-2019
Accepted: 06-08-2019

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Influence of integrated nitrogen management on growth and yield attributes of foxtail millet genotypes

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Abstract
A field experiment was conducted during the kharif season of 2018 on Foxtail millet of varieties SIA 3156 and SIA 326 (PRASAD) at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P). The experiment was laid out in Randomized Block Design with 6 treatments combinations, consisting of two varieties of Foxtail millet (SIA 3156, SIA 326) and nitrogen management viz., Farmer's practice (NPK= 40:20:0), 100% RDF (NPK= 50:30:20)), 75% RD N + 25% N through PM, 75% RD N + 25% N through PM + Azospirillum SI, 50% RD N + 50% N through PM and 50% RD N + 50% N through PM + Azospirillum SI. The Experiment revealed that in variety SIA 3156, integration of inorganic fertilizer of 75% RD N through Urea + 25% N through PM resulted in statistically significant plant height (93.07 cm) and obtaining highest plant dry weight (6.09 g). In this treatment, all the growth parameter viz. Number of Tiller per running row meter, LAI and Yield parameter viz. number of effective tiller per running roe meter, length of panicle and test weight (1000 seeds0 were at par with the highest observation recorded. In variety SIA 326, the experiment reveals that 75% RD N through Urea+ 25% N through Poultry Manure+ Azospirillum SI was found out to be the best treatment which result in statistically significant plant height (99.80 cm), highest plant dry weight (7.35 g) and highest test weight (3.29 g) other growth and yield parameters were found to be at par with the highest observation recorded.

Keywords: Foxtail millet, integrated nitrogen management, growth and yield attributes

Introduction
Foxtail millet (*Setaria italica* L. Beauv) is important minor millet belonging to the family Poaceae. In India, the cultivation of foxtail millet is confined to Andhra Pradesh, Karnataka, and Tamil Nadu. It's grain used for human consumption and a feed for poultry and cage birds. It is used in several food preparations like chapati, fermented bread, biscuits, malts, etc. the stalks are used as fodder and for thatching. It is rich in micronutrients and good for diabetic patients. It protects against cancer and related heart diseases (Anon., 1993). It is tolerant to drought, and it can escape some drought because of early maturity. Due to its quick growth, it can be grown as a short-term catch crop. It is adapted to a wide range of elevation, soils, and temperatures

Material and Methods
The experiment was carried out during *Kharif* season 2018 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Prayagraj (U.P.), which is located at $25^{0}40'94"$ N latitude and $81^{0}85'35"$ E longitude of 98 meter above the sea level (MSL). This area is situated on the right side of the river Yamuna by the side of Allahabad Rewa Road about 5 km away from Allahabad city. The soil of experimental field was sandy loam, pH of soil was 7.3 with 0.690% organic C, having available N, P, K, 278.75, 18.2 and 250.5 kg h^{-1} respectively. The experiment involving two varieties of Foxtail millet SIA 3156 and SIA 326 (*Prasad)* which was brought from IIMR, Andhra Pradesh was laid out in randomized block design with six treatments replicated thrice, comprising Farmer's practice (NPK= 40:20:0), 100% RDF (NPK= 50:30:20)), 75% RD N + 25% N through PM, 75% RD N + 25% N through PM + Azospirillum SI, 50% RD N + 50% N through PM and 50% RD N + 50% N through PM + Azospirillum SI.

Results and Discussions

Effect on Growth parameters of Foxtail millet

In variety SIA 3156, statistically significant plant height (93.07 cm) was observed in treatment A_{13} (75% RD N + 25% N through PM). However treatment A_{14} (75% RD N + 25% N through PM + *Azospirillum* SI) and A_{12} (RDF (NPK= 50:30:20) were statistically at par with treatment A_{13} (75% RD N + 25% N through PM). Highest number of tiller per running row meter (26.33) was recorded in treatment A_{12} (RDF (NPK= 50:30:20) which is due to nitrogen which enhance the tiller population, as it increases the cytokinin content within tiller nodes and further enhances the germination of the tiller primordium. With regard to LAI, there were no significant between the treatments, however treatment A_{13} (75% RD N + 25% N through PM) was recorded with highest leaf area index (3.34). It was also recorded that statistically significant plant dry weight (6.09 g) was observed in treatment A_{13} (75% RD N + 25% N through PM). However, treatment A_{12} (RDF (NPK= 50:30:20), treatment A_{16} (50% RD N + 50% N through PM + *Azospirillum* SI) and treatment A_{11} [Farmer's practice (NPK= 40:20:0)] were statistically at par with treatment A_{13} (75% RD N + 25% N through PM). Integration of inorganics and organics might have exerted a pronounced effect on growth attributes *viz*., plant height, leaf area index and dry matter production.

Table 1: Effect of Integrated Nitrogen Management on Growth parameter of Foxtail millet

Treatments	Varieties							
	SIA 3156				SIA 326			
	Mean plant height (cm)	Number of tillers/ running row meter	LAI	Plant dry weight (g)	Mean plant height (cm)	Number of tillers/ running row meter	LAI	Plant dry weight (g)
Farmer's practice (NPK= 40:20:0)	80.76	23.33	2.89	5.09	89.47	24.33	3.65	7.20
RDF (NPK= 50:30:20)	91.03	26.33	3.02	5.71	84.99	24.67	3.56	6.18
75% RD N + 25% N through PM	93.07	24.00	3.34	6.09	89.68	27.33	3.03	5.07
75% RD N + 25% N through PM + Azospirillum SI	91.83	24.33	2.44	4.16	99.80	27.00	4.06	7.35
50% RD N + 50% N through PM	86.35	22.00	2.35	3.97	90.09	28.00	3.55	6.17
50% RD N + 50% N through PM + Azospirillum SI	82.82	23.67	2.90	5.40	85.04	26.00	3.48	5.56
S.E.(m)±	2.19	0.73	0.08	0.44	2.86	0.68	0.40	0.37
CD (P = 0.05)	6.90	2.29	-	1.40	9.01	2.14	-	1..17

In variety SIA 326 (*Prasad),* statistically significant plant height (99.80 cm) were observed with treatment A_{24} (75% RD N + 25% N through PM + *Azospirillum* SI). However, A_{23} (75% RD N + 25% N through PM) was statistically at par with treatment A_{24} (75% RD N + 25% N through PM + *Azospirillum* SI). It was also observed with maximum number of tillers per running row meter (28.00) was recorded in treatment A_{25} (50% RD N + 50% N through PM). With regard to LAI, there was no significant between the treatments. However, treatment A_{24} (50% RD N + 50% N through PM + *Azospirillum* SI) was recorded with highest LAI (4.06). It was also recorded that statistically significant plant dry weight (7.35 g) was observed in treatment A_{24} (50% RD N + 50% N through PM + *Azospirillum* SI). *Azospirillum* increased the plant height, leaf area index and dry matter production. This could be due to fixing atmospheric nitrogen by *Azospirillum* and the effect of growth promoting substances and polysaccharides from *Azospirillum*. These results are in accordance with the findings of Shanmugam and Veeraputhran (2000) [10].

Table 2: Effect of Integrated Nitrogen Management on yield attribute of Foxtail millet

Treatments	Varieties							
	SIA 3156				SIA 326			
	No of effective tillers/ running row meter	Length of Panicle (cm)	No. of Grains per panicle	Test Weight (g)	No of effective tillers/ running row meter	Length of Panicle (cm)	No. of Grains per panicle	Test Weight (g)
Farmer's practice (NPK= 40:20:0)	20.67	18.63	1433.00	3.21	22.67	18.60	1184.33	2.96
RDF (NPK= 50:30:20)	22.33	20.82	1400.33	3.66	24.33	18.64	1384.67	3.08
75% RD N + 25% N through PM	23.00	20.82	1532.67	3.45	26.67	19.21	1480.00	3.19
75% RD N + 25% N through PM + Azospirillum SI	24.33	20.46	1509.33	3.37	26.33	17.99	1684.33	3.29
50% RD N + 50% N through PM	22.00	19.73	1317.67	3.40	25.67	18.68	1332.33	3.17
50% RD N + 50% N through PM + Azospirillum SI	22.67	20.41	1522.67	3.52	25.00	18.83	1470.00	3.08
S.E.(m)±	0.62	0.87	124.81	0.08	0.78	0.54	S	0.11
CD (P = 0.05)	1.97	-	-	2.73	2.46	-	91.38	-

Effect on Yield attributes of Foxtail millet: The data on yield attributing characters as influenced by Integrated Nitrogen Management on two varieties of Foxtail millet are presented in Table 2. In variety *SIA* 3156, the treatment A_{14} (75% RDN through urea + 25% N through Poultry Manure + *Azospirillum* SI) recorded higher number of effective tillers per running row meter (24.33). It was also found that there was no significant between treatments with regards to length of panicle and number of grains per panicle. However, treatment A_{13} (50% RD N + 50% N through PM) was

recorded with highest length of Panicle (20.82 cm) and numbers of grains per panicle (1532.09). With regard to Test weight, statistically significant test weight (3.66 g) was recorded with treatment A_{12} [RDF (NPK= 50:30:20)].

In variety SIA 326, treatment A_{23} (75% RDN through urea + 25% N through Poultry Manure) recorded higher number of effective tillers per running row meter (26.67). Maximum production of productive tillers was might be due to of higher dry 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. It was also found that there was no significant between treatments with regards to length of panicle and test weight (1000 seeds). However, treatment A_{23} (75% RDN through urea + 25% N through Poultry Manure) was recorded with highest length of panicle (19.21 cm) and treatment A_{24} (50% RD N + 50% N through PM + *Azospirillum* SI) with highest test weight (3.29 g). Treatment A_{24} (50% RD N + 50% N through PM + *Azospirillum* SI) was recorded the statistically significant number of grains panicle^{-1} (1684.33). When the fertilizers are combined with organic sources, resulted in sustained and prolonged mineralization process which promotes the yield attributes *viz*., number of effective tiller per running row meter, number of grains per panicle and thousand grain weights. These results are in concomitance with the reports of Shivakumar and Ahlawat (2008) [12]

Conclusion

In variety SIA 3156, on the basis of the above finding it can be concluded for obtaining higher growth parameters and yield parameter, treatment A_{13} (75% RD N + 25% N through Poultry Manure) was found to be the best treatment from all other treatments. And in variety SIA 326, it can be concluded for obtaining higher growth parameters and yield parameter, treatment A_{24} (75% RD N + 25% N through Poultry Manure+ *Azospirillum* SI) was found to be the best treatment from all other treatments.

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