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Influence of Nitrogen and Zinc Levels on Pearl Millet (*Pennisetum glaucum* L.)

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ABSTRACT: A field experiment was conducted during *kharif* 2020 at Krishi Vigyan Kendra, Kalyandurgam (A.P.). The soil of trial plot was sandy loam in texture, basic in soil reaction (pH 8.29), low in Organic carbon (0.20%), medium available N (170.6 kgha^{-1}), higher available P (31.0 kg ha^{-1}) and medium available K (232.5 kg ha^{-1}). The research is laid out in Randomized Block Design (RBD) which consist of nine treatments replicated thrice. The outcomes showed that higher plant height (164.24 cm), maximum dry weight (27.69 g), higher Crop Growth Rate (4.46 g/m^2/day) were noted significantly higher with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}. The maximum no. of grains per ear head (1724.96), Number of effective tillers (1.61), grain yield (3.77 t ha^{-1}), stover yield (5.96 t ha^{-1}) then harvest index (39.45%) were noted significantly with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}. The maximum net returns (81050.3 INR ha^{-1}) then B:C (1.86) noted with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}.

Keywords: Pearl millet, Nitrogen, Zinc, growth, yield and economics.

INTRODUCTION

Pearl millet is a main cereal crop in India. The crop is grown in very severe, arid, dry climatic areas having temperature of germination pearl millet seed is 23 to 32°C. The optimal rainfall requirement for pearl millet ranges between 500-800 mm, it can well grown on areas that receive less than 500 mm of annual rainfall. Pearl millet is appropriately termed as “nutri cereal” because it is a good source of energy, carbohydrate, protein, fat, ash, dietary fiber, iron and zinc. The grain include 11-19% protein 60-78% carbohydrates and 3.0-4.6% fat and also has good amount of phosphorous and iron. India is largest producer of pearl millet individually in terms of area and production. In India, it is annually grown on 7.5 million ha area producing nearly 9.73 million tones of grains with productivity of 1305 kg/ha during 2016-17 (Directorate of Millet Development, 2018). The tendency in area, production and productivity of pearl millet suggests that area has increased marginally (2%) during first two years and productivity has gone up by 19% (Yadav, 2011).

Nitrogen is the considerable nutrient require by pearl millet and show varying growth and yield response to nitrogen application. The content of nitrogen is healthy plant ranges between 1-5% depending upon the species or variety. It is a vital structural constituent of cell and even cell wall (5% N) Therefore, it increases growth and development of all living tissues and improves the protein content of food grains and quality of fodder. Usually, pearl millet has been known for growing under low nitrogen management. However several studies showed that nitrogen application can increases millet production (Singh *et al.*, 2012). The enhancement of yield attributes with continuous increase of nitrogen levels was also stated by (Ali, 2010). The N deficient plants are generally stunted, develop late and produce less flowers as well as shriveled grains. Judicious and suitable use of fertilizer not only increases yield but also improves quality of forage especially protein contents (Ayub *et al.*, 2009).

Zinc is especially for the regular healthy growth and reproduction of plants (Marschner, 1995). While the supply of available zinc to the plant is inadequate, not only crop yields will be reduced that also the quality of crop products for use as food or feed can be expected to the sub-optimal. Zinc involves in a significant role in various enzymatic and physiological activities in the plant system. Zinc is the main nutrient in connecting part of some enzymes like alcohol dehydrogenase, carbonic anhydrase and superoxide dismutase and is required for the plant enzyme formation, besides, many enzymatic reactions become active in zinc (Pedler *et al.*, 2000). Zinc abundance in the plants retards development and maturation of the panicles of grain crops (Alloway, 2004). Under A.P. conditions of soil was deficient in micro and macro nutrient which reduce yield. For more positive results adding of Nitrogen and Zinc to increase yield. Keeping in view the above facts the present experiment to find out influence of Nitrogen and Zinc levels on pearl millet was conducted.

MATERIALS AND METHODS

The experiment was conducted during the *kharif* season 2020, at Krishi Vigyan Kendra, Kalyandurgam, Anantapur district (A.P.) which is located at 14° 6' N latitude, 77007' E longitude (Fig. 1&2). Pearl millet ABV-04 was planted at 45×15 cm spacing. The research was laid out in Randomized Block Design consisting of Nine treatments which are T_1 : Nitrogen (N) 45 kg ha^{-1} + Zinc (Zn) 5 kg/ha^{-1}, T_2 : Nitrogen (N) 45 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}, T_3 : Nitrogen (N) 45 kg ha^{-1} + Zinc (N) 20 kg ha^{-1}, T_4 : Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 5 kg ha^{-1} T_5 : Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}, T_6 : Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1}, T_7 : Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 5 kg ha^{-1}, T_8 : Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1} and T_9 : Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1} were replicated thrice. The soil experiment plot was sandy loam in texture, basal in soil reaction (pH 8.29), low in Organic carbon (0.20%), medium available N(170.6 kg ha^{-1}), higher available P (31 kg ha^{-1}) and medium available K (232.5 kg ha^{-1}). Nutrient sources were Urea, SSP, MO to fulfill the requirement of nitrogen, phosphorous and potassium.

The application nitrogen 40 kg ha^{-1} was applied as per the treatment and full amount of phosphorous and potassium applied at basal. Half dose of nitrogen, whole dose of phosphorous, potassium and zinc were applied at the time of sowing. The remaining dose was given at 40 days after sowing. Irrigation is given at require time intervals, the growth parameters *viz*, plant height, crop growth rate, Relative growth rate and dry weight recorded during plant growth. Gap filling was done at 8-10 DAS while thinning was done at 15 DAS to sustain plant population for suitable growth and yield of crop. Harvest was done by all border plants and then net plot area of each treatment was harvested by cutting of plants thoroughly to the ground. The yield parameters viz, no. of effective tillers, ear head length, no. of grains per ear head, test weight, grain yield and stover yield were recorded. The details were statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez and Gomez 1984).

Fig. 1. (a). Layout Preparation before Sowing; (b) Weeding done by wheel hoe, khurpi at 12th, 25th DAS at Krishi Vigyan Kendra (KVK), Kalyandurgam, *Kharif*, 2020.

Fig. 2. (a) Field inspection was done by Bala Chandra.Y. (co-Advisor) at Krishi Vigyan Kendra(KVK), Kalyandurgam, *Kharif*, 2020; (b) Field inspection was done by Bala Chandra. Y (co-Advisor) at Harvesting stage in Krishi Vigyan Kendra(KVK), Kalyandurgam.

RESULTS AND DISCUSSION

A. Influence of Nitrogen and Zinc on plant height of pearl millet

Data in Table 1, tabulated the plant height (cm) of pearl millet and there was increasing in crop age plant height was improved with the advancement of experimentation. The plant height was significantly higher in all different growth intervals with levels of Nitrogen (N) and Zinc (Zn). At harvest, maximum plant height (164.24 cm) was recorded with the application of Nitrogen (N) 85 $kgha^{-1}$ + Zinc (Zn) 10 kg ha^{-1} which was significantly higher. Nitrogen (N) 85 $kgha^{-1}$ + Zinc (Zn) 20 $kgha^{-1}$ recorded (161.57 cm) which is statistically on par with Nitrogen (N) 85 $kgha^{-1}$ + Zinc (Zn) 10 kg ha^{-1}. The probable reason for increasing plant height increase with nitrogen fertilizer due to the fact that nitrogen promotes number of internodes and increase length of the internodes which results in progressive increase in plant height (Gasim, 2001). This might have accelerated the meristematic activity, vegetative growth and photosynthetic activity, consequently resulting in to increase plant height (Azam *et al.,* 2010). Zinc is involved in the biosynthesis of Indole 3-acetic acid, a growth hormone, involved in stem elongation, hence the increase in the plant height (Patel *et al.,* 2007).

B. Influence of Nitrogen and Zinc on Dry weight (g/plant) of pearl millet

Data pertaining to dry weight (g/plant) are given in Table 1 and there was dry matter accumulation had consecutively increased from 20 DAS to at harvest. At harvest, maximum dry matter accumulation (27.69 g/plant) was obtained with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1} which were significantly higher over all other treatments except with application of Nitrogen (N) 85 kg/ha + Zinc (Zn) 20 kg/ha was found at par in case of dry weight (26.57 g/plant) also Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1} was found at par in case of dry weight (25.99 g/plant). It has been recognized that Zn plays vital role in synthesis of various enzymes like carbonic anhydrase, glutamic acid dehydrogenase and some peptidases. It is also considered to be a precursor for auxin synthesis, involved in nitrogen metabolism and several oxidation reduction reactions, stability of RNA and starch formation. Thus, its suitable supply effects in higher dry matter production, ultimately growth and development of plants. Parallel results were found by Meena *et al.,* (2012).

Table 1: Influence of Nitrogen and Zinc levels on growth of pearl millet.

S. No.	Treatments	Plant height				Dry weight			
		40 DAS	60 DAS	80 DAS	At harvest	40 DAS	60 DAS	80 DAS	At harvest
1.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 5 kg/ha	34.62	70.12	144.11	147.12	2.14	8.87	17.93	21.95
2.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 10 kg/ha	36.58	70.98	144.37	147.62	2.17	8.99	18.44	23.24
3.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 20 kg/ha	36.58	71.14	146.96	149.40	2.20	9.37	19.67	22.88
4.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 5 kg/ha	36.91	71.80	147.47	151.63	2.22	9.63	19.82	23.59
5.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 10 kg/ha	36.74	71.82	148.32	151.66	2.26	9.64	20.82	23.61
6.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 20 kg/ha	37.61	75.54	148.94	151.93	2.29	9.50	21.60	25.99
7.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 5 kg/ha	37.89	76.30	149.30	154.11	2.34	9.50	21.44	23.90
8.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 10 kg/ha	41.32	82.84	161.10	164.24	2.53	10.30	25.06	27.69
9.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 20 kg/ha	39.53	77.75	156.71	161.57	2.42	10.24	24.64	26.57
	SEm (±)	1.20	2.40	3.34	1.15	0.06	0.29	1.07	0.86
	CD (5%)	3.58	7.15	9.94	3.44	0.19	0.86	3.20	2.56

C. Influence of Nitrogen and Zinc on CGR and RGR of pearlmillet

Data presented in Table 2 tabulated the Crop growth rate (CGR) was recorded at different growth intervals found to be significant. Relative growth rate (RGR) found to be non-significant. At 80 DAS- at harvest, highest CGR(4.46 g/m^2/day) was recorded with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1} also Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1} was found at par in case of Crop growth rate (4.29 g/m^2/day). The maximum RGR (0.014 g/g/day) was recorded with the application of Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}, Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 5 kg ha^{-1}. Plant adequately supplied with N had a greater number of functional leaves and photosynthesizing area and this consequently contributed to better growth and development of individual plant and show the significant result to the crop growth rate. Similar results were found by Charate *et al.,* (2018). The results of RGR should be found non-significant and the highest RGR (0.014 g/g/day) was found by the application of nitrogen (N) 65 kg ha^{-1} + zinc (Zn) 5 kg ha^{-1} and nitrogen (N) 85 kg ha^{-1} + zinc (Zn) 10 kg ha^{-1}.

D. Influence of Nitrogen and Zinc on yield of pearl millet

The data pertaining to yield and economics in Table 3. The number of effective tillers (1.61), ear head length (22.31 cm), number of grains per ear head (1724.96), grain yield (3.77 t ha^{-1}) , stover yield (5.96 t ha^{-1}) and harvest index (39.45%) was recorded significantly higher with the application Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1}, also Nitrogen (N) 85 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1} was found at par in case of no. of effective tillers (1.56), ear head length (21.89 cm), no. of grains per ear (1686.22), grain yield (3.56 t ha^{-1}), stover yield (5.76 t ha^{-1}) and harvest index (38.76%) and also Nitrogen (N) 85 kg/ha + Zinc (Zn) 5 kg/ha was found at par in case of grain yield (3.43 t ha^{-1}), stover yield (5.70 t ha^{-1}) and harvest index (37.95%) also Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 10 kg ha^{-1} (37.55%), Nitrogen (N) 65 kg ha^{-1} + Zinc (Zn) 20 kg ha^{-1} (37.86) was recorded. the test weight found non-significant. Nitrogen improves the improvement of strong cell walls and consequently, straw which might be resulted into profuse tillering. These results are already in agreement reported by Rajput (2008), (Ayub *et al.,* 2007), Pathan and Bhilare (2009). Application of nitrogen and zinc levels improve grain yield. Higher number of grains per panicle might due to the application of nitrogen increases the fertility of flowers and increase in leaf area and duration and resulted into increase in supplying assimilates for the sink (Mousavi *et al.,* 2012). The increase in yield attributes might due to zinc in biosynthesis indole acetic acid especially due to its role initiation of primordial reproductive parts promoting photosynthesis towards them. (Ganapathy and Savalgi, 2006).

Table 2: Influence of Nitrogen and Zinc levels on CGR and RGR of pearl millet.

S. No.	Treatments	No. of effective tillers/plant	No. of grains/ear head	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index (%)	Net returns (INR/ha)	B:C ratio
1.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 5 kg/ha	1.42	1486.99	8.38	2.99	5.34	35.01	66991.9	1.60
2.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 10 kg/ha	1.44	1550.63	7.99	3.17	5.18	35.31	59950.6	1.39
3.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 20 kg/ha	1.46	1548.70	8.33	3.26	5.47	36.36	62971.5	1.38
4.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 5 kg/ha	1.48	1606.66	8.23	2.96	5.56	37.03	58439.9	1.39
5.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 10 kg/ha	1.47	1568.61	8.52	3.23	5.49	37.55	65232.8	1.51
6.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 20 kg/ha	1.48	1611.45	8.19	3.35	5.46	37.86	68751.0	1.50
7.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 5 kg/ha	1.49	1612.22	8.12	3.43	5.70	37.95	74426.6	1.76
8.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 10 kg/ha	1.61	1724.96	8.53	3.77	5.96	39.45	81050.3	1.86
9.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 20 kg/ha	1.56	1686.22	8.36	3.56	5.76	38.76	65358.3	1.42
	SEm (±)	0.03	35.07	0.17	0.12	0.13	0.77		
	CD (5%)	0.09	104.21	-	0.38	0.41	2.31		

Table 3: Influence of Nitrogen and Zinc levels on yield attributes, yield and economics of Pearl millet.

S. No.	Treatments	Crop Growth Rate ($g/m^2/day$)				Relative Growth Rate (g/g/day)			
		20-40 DAS	40-60 DAS	60-80 DAS	80-At harvest	20-40 DAS	40-60 DAS	60-80 DAS	80-At harvest
1.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 5 kg/ha	0.80	4.48	7.94	1.66	0.036	0.084	0.030	0.006
2.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 10 kg/ha	0.81	4.94	8.32	1.98	0.036	0.080	0.030	0.006
3.	Nitrogen (N) 45 kg/ha + Zinc (Zn) 20 kg/ha	0.70	4.95	6.29	2.10	0.039	0.078	0.029	0.005
4.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 5 kg/ha	0.88	5.32	6.95	2.27	0.035	0.076	0.031	0.014
5.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 10 kg/ha	0.74	5.39	7.50	2.34	0.030	0.084	0.030	0.010
6.	Nitrogen (N) 65 kg/ha + Zinc (Zn) 20 kg/ha	0.87	5.42	8.68	3.27	0.035	0.084	0.031	0.011
7.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 5 kg/ha	0.78	5.71	10.59	3.94	0.039	0.089	0.032	0.004
8.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 10 kg/ha	0.94	5.93	10.85	4.46	0.040	0.084	0.033	0.014
9.	Nitrogen (N) 85 kg/ha + Zinc (Zn) 20 kg/ha	0.88	5.81	8.60	4.29	0.046	0.089	0.033	0.007
	SEm (±)	0.10	0.24	0.90	0.19	0.01	0.01	0.01	0.01
	CD (5%)	-	0.73	2.71	0.58	-	-	-	-

E. Influence of Nitrogen and Zinc on economics of pearl millet

Data Table 3 revealed that net returns (81050.3) along with B:C ratio value of (1.86) was recorded with the application of Nitrogen (N) 85 kg/ha + Zinc (Zn) 10 kg/ha. This might due to increase in grain yield and stover yield.

CONCLUSION

On the basis of study, suggests that the application of Nitrogen (N) 85 kg/ha + Zinc (Zn) 10 kg/ha resulted highest grain yield of (3.77 t ha^{-1}), net return (81050.3 INR/ha) as well as B:C ratio of (1.86).

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REFERENCES

Ali, E.A. (2010). Grain yield and nitrogen use efficiency of pearl millet as effected by plant density, nitrogen rate and splitting nitrogen in sandy soil. *American-Eurasian Journal of Agricultural and Environmental Science;* **7**(3): 327-335.

Ayub, M., Nadeem, M.A., Tahir, M., Ibrahim, M., Aslam, M.N. (2009). Effect of Nitrogen Application and Harvesting Intervals on Forage Yield and Quality of Pearl millet. *Pakistan Journal of Life Social Sciences*, **7**(2): 185-189.

Ayub, M., Nadeem, M.A., Tanveer, A., Tahir, M. and Khan, R.M.A. (2007). Interactive effect of different nitrogen levels and seeding rates on fodder yield and quality of pearl millet. *Pakistan Journal of Agricultural Science*, **44**(4): 592-596.

Azam, Mansoor, Waraich, E.A., Asim Peraiz and Nawaz, Fahim (2010). Response of a newly developed fodder sorghum (*Sorghum bicolor* L.) Monech variety (F-9917) to NPK application, *Pakistan j. Life & Soc. Sci.*; **8** (2): 117-120.

Alloway, B.J. (2004). Zinc in soils and crop nutrition. International Zinc Association Communications. *Brussels: IZA Publications*.

Charate, S., Thimmegowda, M.N., Rao, G.E., Ramachandrappa, B.K., & Sathish, A. (2018). Effect of nitrogen and potassium levels on growth and yield of little millet (*Panicum sumatrense*) under dryland alfisols of southern Karnataka. *Int. J. Pure App. Biosci*., **6**(6), 918-923.

Gomez, K.A. and Gomez, K. (1984). Statistical procedure for agricultural research. Jhon-Wiley and Sons inc., New York, P. 680.

Gasim, S.H. (2001). Effect of nitrogen, phosphorus and seed rate on growth, yield and quality of forage maize *(Zea maize* L.). M. sc. Thesis, Faculty of Agricultural University of Khartoum.

Mousavi, S. G. R., Seghatoleslami, M. J., & Arefi, R. (2012). Effect of N fertilization and plant density on yield and yield components of grain sorghum under climatic conditions of Sistan, Iran. *Plant Ecophysiology*, **4**, 141-149.

Ganapathy, B. A., & Savalgi, V. P. (2006). Effect of micronutrients on the performance of *Azospirillum brasilense* on the nutrient uptake, growth and yield in maize crop. *Karnataka Journal of Agricultural Sciences*, **19**(1), 66.

Meena, S.N., Jain, K.K., Dasharath Prasad and Asha Ram. (2012). Effect of nitrogen on growth, yield and quality of fodder pearl millet (*Pennisetum glaucum* L.) cultivars under irrigated condition of North-Western Rajasthan. *Annals of Agricultural Research*, **3**(33): 183-188.

Marschner, H., (1995). Mineral Nutrion of Higher Plants (Academics Press, London), 2ndEd.

Pathan, A.H. and Bhilare, R.L., (2009). Growth parameters and seed yield of forage pearl millet varieties as influences by nitrogen levels. *Journal of Maharastra Agricultural University*. **34**(1): 101-102.

Pedler, J.F., Parker, D.R., and Crowley, D.E., (2000). Zinc deficiency- included phytosiderophore released by the Triticaceae is not consistently expressed in solution culture. *Planta*, **211**: 120-126.

Patel, A.S., Sadhu, A.C., Patel, M.R. and Patel, P.C. (2007). Influence of nitrogen and zinc on maize (*Zea maize* L.). *Forage Research*, **34**(4): 209-212.

Rajput, S.C., (2008). Effect of integrated nutrient management of productivity and monetary returns of pearl millet (*Pennisetum glaucum* L.). *Research on crops*, **9**(2): 248-250.

Singh, B., Rana, D.S., Joshi, U.N. and Dhaka, A.K. (2012). Fodder yield and quality of pearl millet genotypes as influenced by nitrogen levels. *Forage Research*, **38**(1): 62-63.

Yadav, O.P. (2011). Project Coordinator's Review (2010-11) on Pearl millet Research. (http://www.aicpmip.res.in/pcr2011.pdf).

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