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Influence of nitrogen and phosphorus on growth and yield of finger millet (*Eleusine coracana* L.)

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Abstract
The Field experiment was conducted on finger millet during the *kharif* season of 2020.To study the influence of nitrogen and phosphorus on growth and yield of finger millet. at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P). The treatments consist of three Levels of Nitrogenviz.40 kg/ha, 60 kg/ha and 100 kg/ha and three phosphorus levels *viz.* 10 kg/ha, 20 kg/ha and 30 kg/ha. The experiment was laid out in randomized block design with three replications. The results showed that maximum plant height (69.73 cm), dry matter (17.36 g/plant), number of tillers per plant (7.36) and Test weight (4.46 g), Grain yield (3.53 t/ha), Stover yield (4.33 t/ha) and harvest index (44.91) of finger millet at harvest, respectively; and economics *viz.* gross return (105000 INR/ha) net return (71293 INR/ha) and B:C ratio (2.12) were recorded with application of treatment Nitrogen 100 kg/ha + Phosphorus 30 kg/ha (T9) and found significantly superior than rest of the combination of nitrogen and phosphorus levels.

Keywords: Plant height, yield, Nitrogen and phosphorus.

Introduction
Finger millet (*Eleusine coracana* L.) is a cereal grass grown mostly for its grain. Finger millet is a robust, tufted, tillering annual grass, up to 170 cm high (FAO. 2012; De Wet, 2006; Quattrocchi. 2006). The inflorescence is a panicle with 4-19 finger like spikes that resembles a first when mature, hence the name of finger millet (de Wet, 2006; Quattrocchi. 2006). The spikes bear up to 70 alternate spikelets, carrying 4 to 7 small seeds (Dida *et al.* 2006). The seed pericarp is independent from the kernel and can be easily removed from the seed coat (FAO. 2012). Finger millet is a staple food in many African and South Asian countries. It is also considered a helpful famine crop as it is easily stored for years (FAO. 2012).

Nitrogen, phosphorous and potassium are the essential elements required for plant growth in relatively large amounts (Dhhwayo and Whhgwin, 1984) [5]. Nitrogen fertilizeris one of the most yield limiting nutrients for crop production and it is applied in large quantity for most annual crops (Huber and Thompson, 2007) [9]. It plays an important role in building units of proteins in the plant system. Thus, Nnutrition not only influences productivity but also quality. In finger millet, nitrogen application has been found to increase the growth, dry matter production and yield under dry/rainfed conditions (Hari Prasanna, 2016) [8]. The studieson N fertilization indicate that higher grain yield was obtained with application of N ranging from 0 to 90 kg/ha (Bekele *et al*., 2016, Nigade *et al.*, 2011) [3, 14]. Beside N, phosphorous also plays a vital role in increasing the yield. It is an important nutrient in energy transfer for the living cells by means of high-energy phosphate bonds of ATP. Phosphorous deficit is the most important restrictive factor in plant growth because it promotes root development that in turn enhances uptake ofother essential elements (CGIAR, 2005) [4]. It was reported that application of P2O5 at 60 kg (Sandya Rani *et al*., 2017), 45kg (Arulmozhiselvan *et al*., 2013) [1] resulted in higher grain yield as compared to lower levels of P application. Finger millet is an exhaustive crop, especially for nitrogen. Nigen is essential constituents of chlorophyll. It is important factor for boosting up the yield of cereals and is very important for vegetative growth as well as higher yield (Shrivastava and Sinha, 1972), Cereal crops have been reported to deplete the soil fertility to a relatively greater extent. On the other hand, a restorative crop of legumes enriches it to a considerable extent. The beneficial effects of growing legumes in intercropping system have been amply demonstrated through various experiment in our country Judicious use of the nitrogen is essential to ensure stable production from any intercropping system.

As the nutrient needs of intercropping system may be differ from monoculture of their component crops, it in therefore, important to standardize the most profitable level of nitrogen and phosphorus.

So there is need to know the effect of nitrogen and phosphorus on growth parameter and yield parameter to standardize the production of finger millet. In the light of the field experiment was carried out to find out the influence of nitrogen and phosphorus on growth and yield of finger millet.

Materials and Methods

The current study was carried out in the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during the *kharif* season of 2020 (U.P.). The experimental field is located approximately 7 kilometers from Prayagraj city, near the River of Yamuna, on the left side of the Prayagraj-Rewa Road. Prayagraj has a subtropical and semi-arid climatic condition, with hot summers and pleasant winters. The area's average temperature is 26°C to 38°C, with temperatures seldom dropping below 3°C or 4°C. The relative humidity levels range from 45% to 92%. In this location, is requires about 1120mm annual rainfall during crop period for optimum production. The soil chemistry analysis revealed a sandy loam texture with a pH of 6.9, low amounts of organic carbon (0.112 percent) and available Nitrogen (278.93 kg/ha), potassium (206.4 kg/ha), and a low quantity of accessible phosphorus (10.8 kg/ha). The soil was electrically conductive and had a electrical conductivity of 0.296dS/m. For each of the nine treatment combinations, three replications were employed. The therapy details and treatment combinations are shown in Tables 1, respectively. Finger millet variety GPU 28 was physically seeded on June 23rd, 2020. Nitrogen and Phosphorus levels were maintained according to the treatment combinations. Plant height (cm) at harvest, dry weight at harvest, Number of tillers per plant, and yield were all successfully measured.

Statistical analysis

The experimental data analysed statistically by applying the technique of analysis of variance (ANOVA) prescribed for the design to test the significance of overall difference among treatments by the F test and conclusion were drawn at 5% probability level. Economics of treatments was also worked out (Gomez and Gomez, 1984) [6].

Table 1: Treatment Combinations

Treatments No.	Treatments combinations
T_1	Nitrogen 40 kg/ha + Phosphorus 10 kg/ha
T_2	Nitrogen 40 kg/ha + Phosphorus 20 kg/ha
T_3	Nitrogen 40 kg/ha + Phosphorus 30 kg/ha
T_4	Nitrogen 60 kg/ha + Phosphorus 10 kg/ha
T_5	Nitrogen 60 kg/ha + Phosphorus 20 kg/ha
T_6	Nitrogen 60 kg/ha + Phosphorus 30 kg/ha
T_7	Nitrogen 100 kg/ha + Phosphorus 10 kg/ha
T_8	Nitrogen 100 kg/ha + Phosphorus 20 kg/ha
T_9	Nitrogen 100 kg/ha + Phosphorus 30 kg/ha

Results and Discussion

Growth parameters

Data pertaining to growth parameters which are plant height (cm), dry weight (g/plant) and Number of tillers per plant were recorded and tabulated in Table 2. The significantly maximum plant height was recorded with application of Nitrogen 100 kg/ha + Phosphorus 30 kg/ha which was significantly superior over all the treatments except it was found statically at par with treatment of Nitrogen 40 kg/ha + Phosphorus 20 kg/ha, (62.53 cm), Nitrogen 40 kg/ha + Phosphorus 30 kg/ha (63.20 cm), Nitrogen 60 kg/ha + Phosphorus 20 kg/ha (65.34 cm), Nitrogen 60 kg/ha + Phosphorus 30 kg/ha (65.40 cm) and Nitrogen 100 kg/ha + Phosphorus 20 kg/ha (68.00 cm). While in case of data related to plant dry weight treatment with Nitrogen100 kg/ha + Phosphorus 30 kg/ha (T_9) was recorded maximum dry weight (17.36 g) which significantly superior the treatments and treatment with Nitrogen100 kg/ha + Phosphorus 20 kg/ha (T_8), statically at par with Nitrogen 100 kg/ha + Phosphorus 30 kg/ha (T_9). The dry matter at harvest increased with increase in P_2O_5 levels from 0 to 20 and 40 kg/ha. It has been reported that with increase in nitrogen application, the availability of nutrients will be higher in soil and there by uptake of nutrients and it is higher at higher levels N (Gupta *et al*., 2012) [7] and (Krishna *et al*. 2019) [10].

Table 2: Effect of different levels of nitrogen and phosphorus on growth parameters of finger millet

	Treatments combinations	Growth Parameters		
		Plant height (cm)	Number of tillers per plant	Dry weight of plant (g/plant)
1.	Nitrogen 40 kg/ha + Phosphorus 10 kg/ha	54.53	5.53	11.63
2.	Nitrogen 40 kg/ha + Phosphorus 20 kg/ha	62.53	5.80	13.30
3.	Nitrogen 40 kg/ha + Phosphorus 30 kg/ha	63.20	5.80	13.63
4.	Nitrogen 60 kg/ha + Phosphorus 10 kg/ha	54.66	5.60	14.06
5.	Nitrogen 60 kg/ha + Phosphorus 20 kg/ha	65.34	6.13	14.96
6.	Nitrogen 60 kg/ha + Phosphorus 30 kg/ha	65.40	6.40	15.73
7.	Nitrogen 100 kg/ha + Phosphorus 10 kg/ha	56.13	5.80	12.83
8.	Nitrogen 100 kg/ha + Phosphorus 20 kg/ha	68.00	6.98	16.86
9.	Nitrogen 100 kg/ha + Phosphorus 30 kg/ha	69.73	7.26	17.36
F Fest		S	S	S
S.Ed. (+)		2.73	0.10	0.34
CD (p=0.5)		8.20	0.32	1.03

Yield parameters

Data pertaining to growth parameters which are test weight (g), grain yield (t/ha), stover yield (t/ha) and harvest index (%) were recorded and tabulated in Table 3. Treatment with application of Nitrogen 100 kg/ha + Phosphorus 30 kg/ha was recorded maximum test weight (4.46 g) which was significantly superior over all other treatments. However with the treatment of application of Nitrogen 100 kg/ha +

Phosphorus 20 kg/ha (4.38 g) which was statistically on par with treatment with Nitrogen 100 kg/ha + Phosphorus 30 kg/ha.

Treatment with application of Nitrogen 100 kg/ha + Phosphorus 30 kg/ha was recorded maximum Grain yield (3.53 t/ha) which was significantly superior over all other treatments. However treatment of application of T_8 Nitrogen 100 kg/ha + Phosphorus 20 kg/ha (3.13 t/ha), T_6 Nitrogen 60 kg/ha + Phosphorus 30 kg/ha (3.11 t/ha) and T_5 Nitrogen 60 kg/ha + Phosphorus 20 kg/ha (2.96 t/ha) which was statistically at par with the treatment of T_9 Nitrogen 100 kg/ha + Phosphorus 30 kg/ha. Treatment with application of T_9 Nitrogen 100 kg/ha + Phosphorus 30 kg/ha was recorded maximum Stover yield (4.33 t/ha) which was non-significant. Treatment with application of T_9 Nitrogen 100 kg/ha + Phosphorus 30 kg/ha which was recorded maximum Harvest index (44.91%) which was non-significant. Optimal availability of P resulted in an increase of nutrient use efficiency by the provision of adequate energy and an early proliferation of growth attributes which increased the grain yield potential. These finding was collaborated by Latake *et al.* (2009) [11] whose results obtained proved the efficacy of nitrogen fixing and phosphate solubilizing microorganisms to enhance growth and yield of finger millet crop when inoculated to the seed and have possibility of substituting a part of demand of chemical fertilizers of the crop. Muraleedharan *et al.* (2010) [12] has reported that Nitrogen promote growth by increasing the found of primary nutrients. Bhagchand and Gautam (2000) also reported that the use of nitrogen and phosphorus that promoted growth and development and ultimately resulting in higher yields. So these can substitute a part of chemical fertilizers and farmers can get better returns.

Table 3: Effect of different levels of nitrogen and Phosphorus on yield of finger millet

S.N	Treatments	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
1.	Nitrogen 40 kg/ha + Phosphorus 10 kg/ha	3.44	1.79	3.91	31.40
2.	Nitrogen 40 kg/ha + Phosphorus 20 kg/ha	4.03	2.49	3.94	38.72
3.	Nitrogen 40 kg/ha + Phosphorus 30 kg/ha	4.07	2.70	4.05	40.29
4.	Nitrogen 60 kg/ha + Phosphorus 10 kg/ha	3.70	2.14	3.97	35.02
5.	Nitrogen 60 kg/ha + Phosphorus 20 kg/ha	4.08	2.96	4.01	42.46
6.	Nitrogen 60 kg/ha + Phosphorus 30 kg/ha	4.15	3.11	4.17	42.71
7.	Nitrogen 100 kg/ha + Phosphorus 10 kg/ha	3.88	2.14	4.12	34.02
8.	Nitrogen 100 kg/ha + Phosphorus 20 kg/ha	4.38	3.13	4.22	42.58
9.	Nitrogen 100 kg/ha + Phosphorus 30 kg/ha	4.46	3.53	4.33	44.91
F-Test		NS	S	NS	NS
S.Em (±)		0.04	0.19	0.29	2.52
CD (5%)		-	0.59	-	-

Conclusion

Findings of present study well demonstrated the positive effects of Nitrogen levels particularly Phosphorus levels treatment on various growth and yield parameters of finger millets plant. The application Nitrogen 100 kg/ha + Phosphorus 30 kg/ha (T_9) obtaining higher yield attributes and yield of finger millets useful for eastern Uttar Pradesh condition.

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References

1. Arulmozhiselvan KM. Elayarajan and Sathya, S. Effect of long term fertilization and manuring on soil fertility, yield and uptake by finger millet on inceptisol. Madras Agriculture Journal. 2013;100(4-6):490-494.
2. Baghchand, Gautam RC. Effect of organic manure, bio-fertilizer and inorganic fertilizer on growth, yield and quality of rainfed pearl millet. Annals of Agriculture Research. 2000;21:459-464.
3. Bekele Anbessa, Getahun Dereje, Dereje Alemu. Determination of optimum rates of nitrogen and phosphorus fertilization for finger millet (*Eleusine coracana* L.) production at Assosa Zone, in Benishangul-Gumuz region of Ethiopia. Advances in Sciences and Humanitie. 2016, 2472-0941.
4. CGIAR Annual progress report. CGIAR Research program on dryland cereals. Performance monitoring report for calendar year, 2005. Available online: http://www.cgiar.org/resources/crp-documents/.
5. Dhhwayo HH, Whhgwiri EE. Effect of nitrogen and phosphorus on finger millet. Zimbabwe Agronomy. Journal. 1984;81:115-118.
6. Gomez KA, Gomez AA. Statistical Procedures for Agricultural Research, Edn 2, 1984, 591. Johns & Sons, New York.
7. Gupta N, Gupta AK, Gaur VS, Kumar A. Relationship of nitrogen use efficiency with the activities of enzymes involved in nitrogen uptake and assimilation of finger millet genotypes grown under different nitrogen inputs. Scientific world journal. 2012, 1-10.
8. Hari prasanna K. Nutritional importance and cultivation aspects, Indian institute of Millets Research, Rajendranagar, Hyderabad 500030, Telangana, India. Indian Farming. 2016;65(12):25-29.
9. Huber DM, Thompson MI. Nitrogen and plant disease. In: Datnoff, W.H., Elmer and Huber, D. M. (eds.). Mineral nutrition and plant disease St. Paul, MN: The American Phyto pathological Society. 2007, 31-44.
10. Krishna, K. V., Deepthi, C. H., Reddy, M. D., Raju, P. S. and Pal, A. Effect of Nitrogen and Phosphorus Levels on Growth and Yield of Finger Millet (*Eleusine coracana* L.) During summer. Indian Journal of Agricultural

Research, 2019, 1-5.
11. Latake SB, Shinde DB, Bhosale DM. Effect of inoculation of beneficial microorganisms on growth and yield of pearlmillet. Indian Journal of Agriculture Research. 2009;43:61-64.
12. Muraleedharan H, Seshadri S, Perumal K. Bio-fertilizer (Phosphobacteria), Shri AMM Murugappa Chettiar Research Centre, Tar Amani, Chennai, 2010.
13. Nelson LM. Plant growth promoting rhizobacteria (PGPR): Prospects for new inoculants, Crop Management, 2004, 301-305.
14. Nigade RD, Jadhav BS, Bhosale AS. Response of long duration finger millet (*Eleusine coracana* L.) variety to different levels of nitrogen under rainfed condition. Intern. J agric. Sci. 2011;7(1):152-155.
15. Sandhya Rani Y, Triveni U, Patro TSSK, Anuradha N. Effect of nutrient management on yield and quality of finger millet (*Eleusine coracana* (L.) Gaertn). Andhra Pradesh. International Journal of Chemical Studies. 2017;5(6):1211-1216.