www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 252-255

www.thepharmajournal.com
Received: 10-12-2021
Accepted: 19-01-2022

Biram Singh Gurjar
Research Scholar, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

LR Yadav
Professor, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

Bhavna Singh Rathore
Research Scholar, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

Priyanka Yadav
Research Scholar, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

Kuldeep Singh
Research Scholar, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

Rakesh Kumar
Ph.D., Research Scholar, ICAR-NDRI, Karnal, Haryana, India

Corresponding Author:
Kuldeep Singh
Research Scholar, Department of Agronomy, SKNAU, Jobner, Jaipur, Rajasthan, India

Effect of foliar nutrition on growth and yield of hybrid pearl millet (*Pennisetum glaucum* (L). R.Br.)

Biram Singh Gurjar, LR Yadav, Bhavna Singh Rathore, Priyanka Yadav, Kuldeep Singh and Rakesh Kumar

Abstract
A field experiment was conducted at Agronomy farm, of S.K.N. College of Agriculture, Jobner (Rajasthan) during *kharif* 2020 on loamy sand soil, which consisted ten treatments of foliar nutrition (control, RDF, RDF + water spray, RDF+ urea 2% spray at FI, RDF+ DAP 2% spray at FI, RDF+ MOP 2% spray at FI, 19:19:19 (NPK) 2% spray at FI, RDF + B chelate 0.5% spray at FI, RDF + Zn chelate 0.5% spray at FI, RDF + Fe chelate 0.5% spray at FI and RDF+ urea 2% spray at FI) and were tested in randomized block design with three replications. Results indicated that application of RDF+ DAP 2% spray at FI, RDF + MOP 2% spray at FI, RDF+ urea 2% spray at FI, RDF + Fe chelate 0.5% spray at FI, RDF + Zn chelate 0.5% spray at FI and RDF + B chelate 0.5% spray at FI remaining at par with each other significantly increased plant height, dry matter accumulation, total number of tillers, ear length, grains per ear, test weight, grain, stover and biological yield and protein content over control.

Keywords: Nutrition, hybrid, pearl, *Pennisetum glaucum* L.

Introduction
Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is one of the most important staple food crop of majority of poor and small land holders in Asia and Africa. It is also consumed as feed and fodder for livestock. India accounts for half of global millet production in the country. It is the sixth most important cereal crop in the world next to wheat, rice, maize, barley and sorghum. In India, pearl millet is the fourth most widely cultivated food crop after rice, wheat and maize. Pearl millet has a special health beneficial property for people suffering from life style diseases like diabetes, obesity etc. Nutrition value of pearl millet is better than wheat, rice, maize and sorghum. It is good source of energy, carbohydrate, fat (5-7%), ash, dietary fibre (1.2 g/100 g), protein (9-13%), antioxidant such as coumaric acids with better digestibility. Pearl millet has higher contents of nutrients such as iron, zinc, calcium, magnesium, copper, manganese, phosphorus, folic acid and riboflavin.

Foliar nutrition is a method of feeding plants by applying liquid fertilizers directly to their leaves. Plants are able to absorb essential elements through their bark. Foliar uptake is a means of rapid nutrient supply, especially when soil nutrient availability or root activity is reduced. Quick recovery from N deficiency in dry farming areas where soil nutrient is a constraint. Nitrogen is deficient in most of the Indian soils particularly the light textured ones which is one of the basic plant nutrient. N is involved in the formation of proteins, nucleic acids, growth hormones and vitamins and is an integral part of chlorophyll. An adequate supply of nitrogen is associated with vigorous vegetative growth and dark green colour. Phosphorus is known to stimulate extensive root system, thereby, enabling the plant to extract moisture and mineral nutrients optimally. Phosphorus plays a vital role in increasing crop yield because it improves crop quality. It also plays a key role in formation of energy rich phosphate bonds like adenosine triphosphate (ATP), phospholipids and major part of nucleus of the cells where, it is involved in organization of cell and transfer hereditary characteristics. Iron is an essential micronutrient for all living organisms and itplays critical role in metabolic processes such as DNA synthesis, respiration photosynthesis. In plants, iron is involved in the synthesis of chlorophyll and it is essential for the maintenance of chloroplast structure and function. Zinc is one of the eight essential micronutrients. It is needed by plants in small amounts, but yet crucial to plant development. In plant, Zinc is a key constituent of many enzymes and proteins. It plays an important role in a wide range of processes, such as growth hormone production and internode elongation. In India, Zn is one of the multi-nutrient deficiencies causing poor

crop yields. Zinc deficiency in Indian soils is expected to increase from 42% in 1970 to 63% by 2025 due tocontinuous depletion of soil fertility (Singh 2011) [18]. Boron is becoming a deficienct of the micronutrient boron plants. It is the most widespread micronutrient deficiency around the world and causes large losses in crop production and crop quality (Shorrocks 1997) [16]. Boron deficiency affects vegetative and reproductive growth of plants, resulting in inhibition of cell expansion, death of the meristem, and reduced fertility (Marschner, 1995) [7]. Plants contain boron both in a water-soluble and insoluble form.

Material and Method

This experiment was conducted at Agronomy Farm, S.K.N. College of Agriculture, Jobner (Rajasthan) on field No. 10 during *kharif,* 2020. The Jobner is situated 45 km west of Jaipur at 26°05′ N-latitude and 75°28′ E-longitude and at an altitude of 427 metres above mean sea level. The region falls under Agroclimatic zone IIIa (Semi-Arid Eastern Plains Zone) of Rajasthan. The field experiment comprised of 10 treatments involving control, RDF, RDF+ Water spray, RDF + Urea 2% spray at FI, RDF+ DAP 2% spray at FI, RDF+MOP 2% spray at FI, 19:19:19 (N:P:K) 2% spray at FI, RDF+ Boron chelate 0.5% spray at FI, RDF + zinc chelate 0.5% spray at FI, RDF+ Iron chelate 0.5% spray at FI. The experiment was laid out in Randomized Block Design with four replications. In treatment RDF through fertilizer, half dose of nitrogen and full dose of phosphatic fertilizers was drilled as per plan through urea and DAP at the time of sowing and remaining half dose of urea was applied as top dressing in split. The recommended dose of fertilizer is 65:40:0. The foliar spray was done at flowering initiation as par treatments. Seeds of the hybrid bajra variety, RHB-173 were sown on 11th July, 2020 in rows spaced at 45 cm apart at the depth of 4-5 cm with the help of 'kera' method using a seed rate of 4 kg/ha.

Result and Discussion

Growth attributes

Data presented in table 1 revealed that application of foliar nutrition significantly enhanced the growth attributes of hybrid pearl millet over control. Application of RDF + DAP 2% spray at FI recorded the maximum plant height at 25, 50 DAS and at harvest. Application of RDF + DAP 2% spray, remained at par with RDF + MOP2% spray, RDF+ urea 2% spray, RDF + Fe chelate 0.5% spray, RDF+ Zn chelate 0.5% spray and RDF + B chelate 0.5% spray at 25, 50 DAS and at harvest stage application of RDF + DAP 2% spray recorded an increase of 29.24, 38.26 and 23.57 per cent, respectively, over control. These results are in conformity with Pandey and Gupta (2012) [9] and Patil *et al.* (2013) [11] in pearl millet.

Application of RDF+ DAP 2% spray, RDF + MOP 2% spray, RDF+ urea 2% spray, RDF + Fe chelate 0.5% spray, RDF + Zn chelate 0.5% spray and RDF + B chelate 0.5% spray at being at par with each other produced significantly higher dry matter production at all stages and indicated a significant increase of 37.92, 33.04, 29.43, 22.36, 29.43 and 16.67 per cent at 25 DAS, 29.14, 27.13, 25.53, 23.79 and 21.78 per cent at 50 DAS and 28.00, 27.10, 23.78, 21.23 and 20.42 per cent at harvest stage, respectively, over control. The results of the present study also corroborate the findings of Narayan and Joshi (2000) [8] and Chaudhari *et al.* (2002) [2] in pearl millet and Reddy *et al.* (2018) [13] in finger millet and Kumar *et al.* (2020) [5] in pearl millet.

The perusal of the data (Table 2) revealed that different foliar nutrient significantly increased the total number of tillers per plant in hybrid pearl millet. Treatment RDF+ DAP 2% spray at FI recorded significantly higher number of total tillers at 60 DAS and at harvest than control, RDF, RDF + water spray, 19:19:19 (NPK) 2% spray and RDF + B chelate 0.5% spray and remained at par with RDF + MOP 2% spray at, RDF + Fe chelate 0.5% spray and RDF + Zn chelate 0.5% spray.

Yield attributes and yield

A reference to the data presented in (Table 2) revealed that numbers of tillers per metre row length, ear length, grains per ear and test weight were significantly increased by treatments of foliar nutrition. Application of RDF+ DAP 2% spray at FI produced the highest number of tillers, ear length (30.12 cm), grains per ear (1369) and test weight (7.82 g) was found at par with RDF + MOP 2% spray at FI, RDF+ urea 2% spray at FI, RDF + Fe chelate 0.5% spray at FI, RDF + Zn chelate 0.5% spray at FI and RDF + B chelate 0.5% spray at FI over control.

A perusal of data (Table 3) revealed that application of foliar nutrition significantly increased the grain (2398 kg/ha), straw and biological yield of hybrid pearl millet over control. Treatment RDF+ DAP 2% spray remained at par with RDF + MOP2% spray at FI, RDF+ urea 2% spray at FI, RDF + Fe chelate 0.5% spray at FI RDF + Zn chelate 0.5% spray at FI RDF + B chelate 0.5% spray at FI. Singh and Ram (2005) [7] and Esfahani *et al.*, (2014) [3] have also reported similar increase in yield of wheat and rice due to Fe, Zn application under different agro-climatic conditions.

Foliar application of micronutrients is important when the roots could not be able to provide the necessary nutrients and hence the application on the foliage helped in the rapid absorption of the required nutrients by the crop for higher production. Recommended dose of fertilizer of plants appears to be synergistic with zinc, which may leads to increase in many physiological and molecular activities which in turn improve yield attributing characters (Cakmak *et al.* 2010) [1] and Kumar *et al.* (2014) [6] in pearl millet.

Table 1: Effect of foliar nutrition on plant height and dry matter of pearl millet

Treatments	Plant height (cm)			Dry matter accumulation (g/plant)		
	25 DAS	50 DAS	At harvest	25 DAS	50 DAS	At harvest
T1	58.4	101.5	161.1	94.6	135.6	233.1
T2	66.9	121.5	182.6	110.5	163.3	278.3
T3	67.1	123.6	184.7	111	165	280.2
T4	72.7	135.5	192.5	125.9	172.4	296.3
T5	75.4	140.3	199.1	132.6	181.3	305
T6	74.5	136.6	197.2	130.5	175.1	298.4
T7	66.5	120.4	180.6	108.6	154.9	265.8

T8	68.6	125.3	185.6	110.4	165.2	280.8
T9	70.1	128.5	188.6	115.8	167.9	282.6
T10	71.6	130.7	191.6	122.5	170.2	288.6
S.Em+	2.78	5.59	5.06	4.8	5.66	8.19
CD (P=0.05)	8.03	16.15	14.2	13.9	16.2	24.3

T1: control, T2: RDF, T3: RDF+ Water spray, T4: RDF+Urea 2% spray at FI, T5: RDF+ DAP 2% spray at FI, T6: RDF+MOP 2% spray at FI, T7: 19:19:19 (N:P:K) 2% spray at FI, T8: RDF+ Boron chelate 0.5% spray at FI, T9: RDF + zinc chelate0.5% spray at FI, T10: RDF+ Iron chelate 0.5% spray at FI

Table 2: Effect of foliar nutrition on no. of total tillers per plant, ear length, grains per ear and test weight

Treatments	No. of total tillers per plant		Ear length (cm)	Grains per ear	Test weight (g)
	60 DAS	At harvest			
T1	19.50	19.30	23.80	1055.00	6.11
T2	24.50	23.30	27.60	1210.00	6.96
T3	23.70	23.60	28.20	1213.00	6.98
T4	25.70	25.50	29.70	1345.00	7.32
T5	27.00	26.80	30.20	1369.00	7.82
T6	26.10	26.00	30.10	1362.00	7.80
T7	23.00	22.80	26.90	1208.00	6.95
T8	23.80	23.60	27.80	1265.00	7.30
T9	24.60	24.40	28.90	1300.00	7.36
T10	25.30	25.00	29.60	1332.00	7.44
S.Em+	1.09	1.09	1.08	52.60	0.29
CD (P=0.05)	3.20	3.10	3.10	152.00	0.83

Table 3: Effect of foliar nutrition on grain, stover, biological yield and harvest index of pearl millet

Treatments	Grain yield (kg/ha)	Stover yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)
T1	1540.00	4248.00	5788.00	26.61
T2	2094.00	5615.00	7689.00	26.97
T3	2111.00	5711.00	7842.00	27.00
T4	2342.00	6329.00	8671.00	27.01
T5	2398.00	6491.00	8889.00	26.98
T6	2387.00	6459.00	8846.00	26.98
T7	1938.00	5225.00	7163.00	27.06
T8	2137.00	5765.00	7902.00	27.05
T9	2150.00	5801.00	7951.00	27.04
T10	2156.00	5822.00	7978.00	27.02
S.Em+	102.00	269.00	330.00	1.20
CD (P=0.05)	294.00	776.00	988.00	NS

Conclusion

According to the results of one year experimentation, it is concluded that application RDF+ DAP 2% spray (2398 kg/ha), RDF + MOP 2% spray (2387 kg/ha) and RDF + urea 2% spray (2342 kg/ha) were equally effective in increasing grain and stover yield of hybrid pearl millet.

Acknowledgements

The technical and financial support facilitated by Sri Karan Narendra Agriculture University, Jobner for conducted research are duly acknowledged.

References

1. Cakmak I, Pfeiffer WH, McClafferty B. Bio fortification of durum wheat with zinc and iron. Cereal Chem. 2010;87:10-20.
2. Chaudhari AC, Meena NL, Jat RL. Effect of nitrogen and moisture conservation practices on growth and yield of rainfed pearl millet. Annals Agriculture Research 2002;23(2):223-225.
3. Eshfahanin AA, Pirdashi H, Yousuf N. Effect of Fe, Zn and Si application on quantitative parameter of rice. International Journal of Farming and Allied Sciences. 2014;3:529-533.
4. Joshi Maitrik P, Pankhaniya RM, Nazir Khan Mohammadi. Response of pearl millet (*Pennisetum glaucum* L.) to levels and scheduling of nitrogen under south Gujarat condition. International Journal of Chemical Studies. 2018:6(1):32-35.
5. Kumar LS, Sankaran VM, Hemalatha M, Suresh S. Effect of different level of fertilizers and foliar nutrition on yield attributes and yield of Pearl millet under rainfed condition. International Journal of Chemical Studies. 2020;8(6):979-982.
6. Kumar P, Kumar R, Singh SK, Kumar A. Effect of fertility on growth, yield and yield attributes of pearl millet (*Penisetum glaucum* L.) under rainfed condition. Agriways. 2014;2(2):89-93.
7. Marschner H. Mineral Nutrition of Higher Plants (2nd ed.) San Diego: Academic Press: 1995, 379-396.
8. Narayan P, Joshi NL. Nutrient management of pearlmilletin arid region of Rajasthan. Fertilizer News. 2000;75:35-43.
9. Pandey N, Gupta B. The impact of foliar boron sprays on reproductive biology and seed quality of black gram. Plant Nutrition and Stress Physiology Laboratory, Department of Botany. University of Lucknow. 2012.
10. Patel NI, Patel BR, Patel CK, Foram Patel B. Effect of foliar spray of nutrients at different growth stages on pearl millet under Dryland condition. *International*

Journal of Chemical Studies. 2019;7(5):5-9.
11. Patil AS, Patel HK, Chauhan NP. Yield, quality and monetary returns of summer pearl millet (*pennisetum glaucum*) as influenced by integrated nitrogen management and sowing methods. Crop Research 2013;47(1-3):24-28.
12. Rani Y, Sandhya U, Triveni, Patro Tssk, Anuradha N. Effect of nutrient management on yield and quality of finger millet (*Eleusine coracana* (L.) Gaertn). International Journal of Chemical Studies 2017;5(6):1211-1216.
13. Reddy BH, Bulbule AV, Gajbhiye PN, Patil DS. Effect of Foliar Application of Plant Nutrients on Growth and Yield of Finger Millet. International Journal of Current Microbiology and Applied Sciences 2018;7(3):2203-2209.
14. Rundla Surgyan, Bairwa RC. Response of Foliar Supplementation of N, P and K Fertilizers on Yield and Economics of Pearl Millet. International Journal of Current Microbiolog. 2018.
15. Shankar MA, Thimmegowda MN, Bhavitha NC, Manjunatha BN. Comparative efficiency of soil and foliar application of boron on growth and yield of finger millet (*Eleusine coracana* L.). Mysore Journal of Agriculture Sciences 2017;51(2):430-435.
16. Shorrocks VM. The occurrence and correction of boron deficiency. Plant and Soil. 1997;193(1):121-148.
17. Singh V, Ram N. effect of 25 years of continuous fertilizer use on response to applied nutrients and uptake of micronutrients by rice-wheat-cowpea system. Cereal Research Communications. 2005;33:589-594.
18. Singh MV. Scenario of zinc deficiency in Indian soils and its influence on zinc enrichment in crops for improving human and animal health. (In): 3rdInternational Zinc Symposium: Improving Crop Production and Human Health, Hyderabad, India. 2011.
19. Yadav LR, Choudhary GL. Effect of fertility levels and foliar nutrition on profitability, nutrient content and uptake of cowpea [*Vigna unguiculata* (L.) Walp]. Legume Research. 2012;35(3):258-260.