The Pharma Innovation Journal 2023; 12(7): 1086-1088

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 1086-1088

www.thepharmajournal.com
Received: 03-05-2023
Accepted: 07-06-2023

Chavan SR
PG Student, Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India

JB Patil
Assistant Professor of Agronomy, RCSM College of Agriculture, Kolhapur, Maharashtra, India

RH Shinde
Associate Professor of Agronomy, RCSM College of Agriculture, Kolhapur, Maharashtra, India

VB Gedam
Agronomist, Regional Sugarcane and Jaggery Research Station, Kolhapur, Maharashtra, India

Patil MJ
College Librarian, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Corresponding Author:
JB Patil
Assistant Professor of Agronomy, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Impact of nano fertilizer and nitrogen levels on yield attributing characters, yield and quality of little millet (*Panicum sumatrence* L.)

Chavan SR, JB Patil, RH Shinde, VB Gedam and Patil MJ

Abstract
Experiment was carried out at the farm of Zonal Agriculture Research Station, Shendapark, Kolhapur (M.S.), India during *kharif*, 2021. The experiment was laid out in randomized block design with three replication and consist of twelve treatments. The treatments consist of different levels of RDN along with seed treatment and foliar sprays of nano nitrogen fertilizer. Variety Phule Ekadashi was used for experiment. The experiment findings shows that among all the treatments, treatment T_{12} (75 RDN+ Seed treatment with 1% nano fertilizer+ Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering) recorded highest yield attributing characters *viz.*, panicle length (27.33 cm), panicle weight (3.80 g), number of grains panicle^{-1} (3.0 g), test weight (2.61 g), and yield at harvest both grain yield (1466 kg ha^{-1}) and straw yield (2458 kg ha^{-1}) over rest of the treatments and was followed by treatment T_{11} (75% RDN + Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering). Also, T_{12} recorded maximum harvest index (37%). However, lowest research findings as regards to yield attributing characters as well as for the yield of little millet observed under treatment T_2 (T_1 without nitrogen application).The treatmentT_{12} recorded higher percentage of protein content in seeds (9.06%). While, lower percentage of protein content from seed was recorded by the treatment T_2 (8.02%).

Keywords: Little millet, nano fertilizer, nitrogen levels, yield attributes and yield

Introduction
One of the earliest foods consumed by humans is millets, which may have been the first cereal grain used in residential settings. Small- seeded millets are resilient, rain-fed crops that thrive well in dry region and also grow well in low soil fertility and moisture. Millets are incredibly nutrient rich, non-glutenous and acid-free meals. They are regarded as the least allergic and most easily digestible grains available in the market. Millets are referred as "nutria-cereals" due to their higher nutritional content. They are also known as "famine reserves" due to their prolonged storability under circumstances (Michaelraj and Shanmugam, 2013) [6].

By taking into consideration importance of millets Government of India had proposed to united nations for declaring 2023 as International Year of Millets. The proposal of India was supported by 72 countries and declared 2023 as International Year of Millets (IYOM) on 5th March, 2021. Now, Government of India is celebrating 2023 as a IYOM with purpose of making peoples' movement towards Indian millets, recipes and value-added products which are helpful to accept at global level.

Little millet (*Panicum sumetranse* L.) is one of the minor millets, which belongs to family *Poaceae.* It is important catch crop as it withstands both drought and water logging conditions. It contains 67.0 g of carbohydrates,7.7 g of proteins, 4.7 g of fats, 12.2 g of dietary fibers, 1.5 g of mineral matter, 17.0 g of calcium, 220.0 mg of phosphorous and 6.0 mg of iron (Divyashree *et al*., 2018) [1]. Even though it is nutritionally rich crop it got neglection because of lackof adoption of improved package of practices. And it is one of the reasons of less production and productivity of little millet.

Nutrient management is an approach for maintaining and enhancing soil fertility and improving productivity of the crop. Among all primary macronutrients, nitrogen is most important nutrient required by the plant. In all vegetative growth stages of plant nitrogen plays an important role as it is major constitute of chlorophyll which imparts green color to the plant and helps for the production of proteins (Iqbal, 2019) [3]. Nitrogen use efficiency (NUE) by crops is very low when comparison is done with the quantity of nitrogen applied to soil. Whatever amount of nitrogen as a conventional fertilizer applied out of this only 30-50 percent

get utilized by plant, while remaining nitrogen lost by leaching and volatilization. Now it's time to solve this problem by adopting nanotechnology (Maria *et al.*, 2010) [4]. The phrase 'Nanotechnology' comes from the Greek word 'nanos', which means dwarf having size of particles about 1-100 nm. Nanotechnology will be the blessing for contemporary agricultural farming as it enhances the efficiency of nutrient uptake by using nano-fertilizers (Manikandan *et al.*, 2018) [5].

Before being approved as a nano fertilizer, a substance or set of particles must pass tests to determine their size, stability, form and characterisation **(**Misra *et al.*, 2014) [7]. Several studies shows that nano fertilizers profoundly increase the crop yield over control which are without application of nano fertilizer, when applied as foliar spray. This because of nano fertilizer gets direct entry into leaves of plant through stomata and other openings. As they are utilized according to need of plant that encourages the growth of plant and increases the rate of metabolic processes like, photosynthesis which leads to higher accumulation of photosynthates and its translocation towards the economic parts of the plant. It indicates, foliar application of nano particles increases crop yield significantly. Nano fertilizer provide more surface area and more availability of nutrients to the crop (Singh *et al.*, 2017) [11]. Hence, through this trial major emphasis was given on nutrient management particularly nitrogen by making eminent use of nano fertilizers over conventional fertilizers.

Materials and Methods

Experiment was carried out at the farm of Zonal Agriculture Research Station, Shendapark, Kolhapur (M.S.), India during *kharif*, 2021. The variety Phule Ekadashi was used for research trial. The gross plot size was 3.80 m × 3.60 m and net plot size was 3.20 m × 2.70 m. The experiment was consisting of three replications with twelve treatments that were laid out in Randomized Block Design (RBD). The treatment details are as follows, T_1:RDF (60:30:30 NPK kg ha^{-1}), T_2: T_1 without nitrogen application, T_3: 50% RDN + Seed treatment with 1% nano fertilizer, T_4: 50% RDN + Foliar spray of nano fertilizer @ 0.4% at active tillering stage, T_5: 50% RDN + Foliar spray of nano fertilizer @ 0.4% at 7-10 days before flowering, T_6: 50% RDN +Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering, T_7: T_3+ Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering, T_8: 75% RDN + Seed treatment with 1% nano fertilizer, T_9: 75% RDN + Foliar spray of nano fertilizer @ 0.4% at active tillering stage, T_{10}: 75% RDN + Foliar spray of nano fertilizer @ 0.4% at 7-10 days before flowering, T_{11}: 75% RDN + Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering, T_{12}: T_8 + Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering. The recommended dose of fertilizer 60:30:30 kg N; P: K ha^{-1} for little millet. The source used to supply are urea, single super phosphate and muriate of potash and they are applied as per the treatment. Nitrogen was applied in two split doses at active tillering stage and at panicle initiation stage. Total phosphorous and potash were applied at the time of sowing. IIFCO nano urea is used for seed treatment and foliar spraying in little millet and applied as per treatment. All observations are recorded by following standard methodology of research. Data is statistically analysed as per the method given by Panse and Sukhatme (1967) [8].

Result and Discussion

Yield attributes of little millet: It was observed that yield attributing characters like panicle length, panicle weight, grain yield $panicle^{-1}$, test weight were significantly influenced by the application of nano fertilizer and different nitrogen level treatments which shown in Table 1. The highest panicle length recorded by treatment T_{12} (27.33 cm) which was at par with treatment T_{11}, T_7, T_6, & T_9 and significantly superior over T_4, T_{10}, T_5, T_1, T_8, T_3 and T_2. However, lowest panicle length was observed in treatment T_2 (18.67 cm) (Soutade 2017) [12]. TreatmentT_{12}observed higher panicle weight (3.80 g). This is due to higher accumulation of carbohydrates which increases green leaf retention which in correspondence increases nitrogen use efficiency which lead to develop quality grains of little millet. Through this increasing efficiency of photosynthesis maximum sourceis converted into sink which ultimately increases yield attributing components. Lowest panicle weight was recorded by treatment T_2 (2.50 g). (Rajput *et al.*, 2022 and Samanta *et al.*, 2022) [9, 10]. High grain yield $panicle^{-1}$ (3.0 g)was profoundly observed in treatment T_{12} which was at par with treatment T_{11} and T_7 significantly higher over treatments T_6, T_9, T_4, T_{10}, T_5, T_1, T_8, T_3 and T_2. In treatment T_2 low weight of grain yield $panicle^{-1}$ (2.11g) was recorded. (Soutade 2017) [12]. Results regarding test weight was recorded as non-significant, still treatment T_{12} recorded maximum test weight (2.61g) and treatment T_2 recorded lower test weight (2.23g) of little millet. (Samanta *et al.*, 2022) [10].

Yield of little millet

Table 2 is showing the results of experiment regarding the grain yield, straw yield and harvest index of little millet crop as influenced by the effect of nano fertilizer and nitrogen levels. Treatment T_{12} recorded the highest values for grain yield kg ha^{-1}. This treatment numerically at par with treatments T_{11}, T_7, T_6 and T_9, however treatment T_{12} significantly found superior over rest treatments T_4, T_{10}, T_5, T_1, T_8, T_3 and T_2 with highest grain yield of 1466kgha^{-1}. The reason behind it is the foliar application of nano nitrogen on leaves. As nano urea is in liquid form it easily gets entry into leaves infrastructure through stomata which is assimilated by plants and easily distributed through phloem from source to sink and utilized according to need of plant. Indicating that nano nitrogen fertilizer increases area for different metabolic processes such as photosynthesis. This leads to increase grain yield of little millet. Lowest grain yield was recorded by treatment T_2 with grain yield of 969kg ha^{-1}(Rajput *et al.*, 2022 and Samanta *et al.*, 2022) [9, 10]. The maximum straw yield was noted under treatment T_{12} (2458 kg ha^{-1}) which was significantly at par with treatment T_{11}, T_7, T_6, T_9, T_4 and T_{10}. However, treatment T_{12} significantly superior over rest of the treatments T_5, T_1, T_8, T_3 and T_2. Lowest straw yield was noted in treatment T_2 (1892kg ha^{-1}) (Imam Sarvar MD 2021). Numerically, highest harvest index (37%) was noticed under treatment T_{12}. The treatment T_2 resulted in lower harvest index (34%) of little millet(Rajput *et al.*, 2022 and Samanta *et al.*, 2022) [9, 10].

Quality of little millet

Maximum protein content (9.06%) was found in treatment T_{12} over rest of treatments except treatment T_{11}. This might be

due more availability of nutrients to the crop which help to increase the quality parameters of the plant (protein). Also, accumulation of nitrogen in sink rather than vegetative plant part increased the nitrogen thereby increased the protein content in seed than straw. While, the lowest protein content in grain (8.02%) was observed in treatment T_2.

Table 1: Effect of nano fertilizer (N) and nitrogen levels on yield attributing characters of little millet

Treatments	Panicle length (cm)	Panicle weight (g)	Grain yield panicle^{-1} (g)	Test weight (g)
T_1	22.00	3.20	2.48	2.40
T_2	18.67	2.50	2.11	2.23
T_3	21.00	3.13	2.47	2.27
T_4	23.80	3.27	2.57	2.44
T_5	23.60	3.20	2.54	2.40
T_6	25.00	3.33	2.59	2.44
T_7	26.00	3.47	2.72	2.47
T_8	21.33	3.13	2.48	2.33
T_9	24.60	3.33	2.59	2.44
T_{10}	23.67	3.23	2.57	2.43
T_{11}	26.33	3.63	2.74	2.57
T_{12}	27.33	3.80	3.00	2.61
S. Em±	1.19	0.12	0.10	0.08
C. D. at 5%	3.50	0.37	0.30	NS
CV%	8.75	6.68	6.82	6.09

Table 2: Effect of nano fertilizer (N) and nitrogen levels on grain yield, straw yield, harvest index and quality of little millet.

Treatments	Grain yield (Kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest Index (%)	Protein content in seed (%)
T_1	1178	2192	35	8.15
T_2	969	1892	34	8.02
T_3	1169	2178	35	8.08
T_4	1262	2243	36	8.38
T_5	1227	2214	36	8.25
T_6	1299	2250	36	8.44
T_7	1333	2267	37	8.48
T_8	1177	2197	35	8.08
T_9	1292	2247	37	8.38
T_{10}	1248	2228	36	8.25
T_{11}	1337	2274	37	8.73
T_{12}	1466	2458	37	9.06
S. Em±	63.55	81.69	1.42	0.18
C. D. at 5%	186.41	239.61	NS	0.55
CV%	8.82	6.37	6.87	3.86

Conclusion

Based on the experiment, it can be concluded that treatment T_{12} (75 RDN+ Seed treatment with 1% nano fertilizer+ Foliar spray of nano fertilizer @ 0.4% at active tillering stage and at 7-10 days before flowering) is best treatment in increasing the yield attributing characters, and helpful in obtaining higher grain and straw yield of little millet. Also, treatment T_{12} performs well in obtaining quality protein. Hence, for the sub-montane zone of Kolhapur treatment $T_{12}$is best performing one for the crop little millet.

References

1. Divyashree U, Kumar MD, Sridhara S, Naik TB. Effect of different levels of fertilizers on growth and yield of little millet. International Journal of Farm Sciences. 2018;8(2):104-108.
2. Imam SMD. Standardization of nano nitrogen fertilizer for boosting the productivity of sweet corn. Submitted thesis to Agronomy Section of RCSM, College of Agriculture, Kolhapur; c2021.
3. Iqbal. Nano-fertilizer for sustainable crop production under changing climate: A global perspective. Clarivate Analytics; c2019. DOI: http://dx.doi.org/10.5772/interchopen.89089.
4. Maria CD, Carlos M, Morris S, Ryan W, Yaisr S. Nanotechnology in fertilizers; c2010.
5. Manikandan T, Suresh K, Amit K, Poonam T, Shailesndra K. Agro-nanotechnology: A future technology for sustainable agriculture. International Journal of Current Microbiology Applied Sciences. 2018;7:196-200.
6. Michealraj PSJ, Shanmugam A. A study on millets-based cultivation and consumption in India. International Journal of Marketing, Financial Services and Management Research; c2013, 2(4).
7. Misra SK, Nuseibeh S, Dybowska A, Berhanu D, Tetley TD, Valsami JE. Comparative study using spheres, rods and spindle shaped nanoplatelets on dispersion stability, dissolution and toxicity of CuO nanomaterials. Nanotoxicology. 2014;8:422-432.
8. Panse SG, PV Sukhatme. Statistical method for agricultural research workers. ICAR, New Delhi; c1967, 361.
9. Rajput JS, Thakur AK, Nag NK, Chandrakar T, Singh DP. Effects of nano fertilizer in relation to growth, yield and economics of little millet under rainfed conditions. The Pharma Innovation Journal. 2022;11(7):153-156.
10. Samanta S, Maitra S, Shankar T, Gaikwad D, Sagar L, Panda M, *et al*. Comparative performance of foliar application of urea and nano urea on finger millet. Crop Res. 2022;57(3):166-170.
11. Singh MD, Gautam C, Patidar OM, Meena HM, Prakasha G, Vishwajith. Nano fertilizers is a new way to increase nutrients use efficiency in crop production. International Journal of Agricultural Sciences. 2017;9(7):3831-3833.
12. Soutade VJ. Response of little millet varieties to different levels of fertilizers under rainfed condition. Theis submitted to Agronomy Section of RCSM, College of Agriculture, Kolhapur; c2017.