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Nutrient content, yield and uptake of nutrient of little millet (*Panicum sumatrence* L.) as influenced by nano fertilizer and nitrogen levels

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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 consisted of twelve treatments. Variety *Phule Ekadashi* was used for experiment. The experiment findings show 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 nutrient content in grain and straw as well as shows highest nutrient uptake of little millet as influenced by nano fertilizer and nitrogen levels treatments. Significantly more nitrogen content in grain (1.45%) and straw (0.36%), more phosphorous content in grain (0.27%) and straw (0.18%) and also more potassium content from both grain (0.38%) and straw (0.71%) were recorded by treatment T_{12}. In case of total nutrient uptake by little millet the treatment T_{12} shows higher uptake for all major macronutrient *viz.*, nitrogen (30.14 kg ha^{-1}), phosphorous (8.35 kg ha^{-1}) and potassium (23.01 kg ha^{-1}). However, lowest research findings regarding nutrient content in grain and straw as well as in case of total nutrient uptake recorded little millet crop observed by treatment T_2 (T_1 without nitrogen application). The treatment T_{12}also performed good in obtaining higher grain yield 1466kgha^{-1} and straw yield 2458kgha^{-1}.

Keywords: Little millet, nutrient content, yield, nutrient uptake, nano fertilizer, nitrogen levels

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) [7].

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) [2]. Even though it is nutritionally rich crop it got neglection because of lack of 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) [4]. 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) [6]. 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) [8]. 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. 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. This 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) [13]. 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. All observations are recorded by following standard methodology of research. Data is statistically analysed as per the method given by Panse and Sukhatme (1967) [10].

Result and Discussion

Nutrient Content: The experimental results indicate that the content of major primary nutrients is influenced by the application of nano fertilizer and different nitrogen levels as pertained in Table 1. Comparatively high nitrogen content in grain (1.45%) and straw (0.36%) was recorded under treatment T_{12} over rest of treatment except T11 & T7 as T12, T11 & T7 are statistically at par. It's because of the availability of nutrient in higher rate which enhances growth of root of plant as well as improves the multiplication of cell which results in maximum absorption of nitrogen hence in grain nitrogen was found in high content. However, the lowest nitrogen content was found in treatment T_2 (Dhansil *et al.*, 2018 and Soutade 2017) [1, 14]. Treatment T_{12} recorded high phosphorous content in both grain and straw which was 0.27% and 0.18% respectively due to higher availability of nutrients which was at par with treatment T_{11} and significantly superior over rest of treatment. Lowest phosphorous content in grain was 0.20% and in straw it was 0.10% recorded by treatment T_2 (Dhansil*et al.*, 2018 and Soutade 2017) [1, 14]. In case of potassium content treatment T_{12} observed maximum values for both grain and straw content which was 0.38% and 0.71% respectively, its due to the higher availability of nutrients which was at par with treatment T_{11} and T_7. Lowest potassium content in grain was 0.29% and in straw it was 0.60% recorded by treatment T_2 (Imam Sarvar MD 2021) [3].

Yield of little millet

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 is pertained in Table 2. 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 1466 $kgha^{-1}$. 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 and other openings which is assimilated by plants and easily distributed through phloem from source to sink and utilized according to need of plant. Nano nitrogen fertilizer increases area for different metabolic processes such as photosynthesis. Its application leads to increase grain yield of little millet. Lowest grain yield was recorded by treatment T_2 with grain yield of 969 kg ha^{-1}(Rajput *et al.*, 2022 and Samanta *et al.*, 2022) [11, 12]. 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) [3]. Numerically, highest harvest index (37%) was noticed under treatment T_{12}. The treatment T_2 resulted in lowest harvest index (34%) of little millet (Rajput *et al.*, 2022 and Samanta *et al.*, 2022) [11, 12].

Nutrient uptake: The total uptake of N, P and K in little millet crop as influenced by the treatment of nano fertilizer and different nitrogen levels is described in details through Table 3. Among different nutrient management treatments, the significantly highest N uptake (30.14 kg ha^{-1}) was observed under treatment T_{12} over rest of treatments it might be due to higher yield and nutrient availability in soil from

respective treatment which accelerates maximum nitrogen accumulation when compare to other treatments. Whereas, comparatively lowest amount of total nitrogen uptake was recorded by treatment T_2 which was (18.45 kg ha^{-1}) (Nigade *et al.*, 2011 and Dhansil *et al.*, 2018) [9, 1]. The highest uptake of phosphorus (8.35 kg ha^{-1}) observed by treatments T_{12}., and the lowest total phosphorus uptake which was (3.99 kg ha^{-1}) observed in treatment T_2 (Soutade 2017) [14]. In case of total potassium uptake treatment T_{12} recorded maximum uptake (23.01 kg ha^{-1}) while, treatment T_2 recorded lowest uptake of potassium which was (14.23 kg ha^{-1}) (Imam Sarvar MD 2021) [3].

Table 1: N, P, and Kcontent (%) in grain and straw of little millet as influenced by nano fertilizer and nitrogen levels.

Treatments	Nitrogen (%)		Phosphorus (%)		Potassium (%)	
	Grain	Straw	Grain	Straw	Grain	Straw
T_1	1.30	0.31	0.21	0.13	0.32	0.63
T_2	1.28	0.32	0.20	0.10	0.29	0.60
T_3	1.29	0.33	0.20	0.11	0.30	0.61
T_4	1.34	0.31	0.23	0.14	0.34	0.67
T_5	1.32	0.32	0.22	0.13	0.32	0.65
T_6	1.35	0.32	0.25	0.16	0.36	0.68
T_7	1.36	0.34	0.26	0.16	0.36	0.69
T_8	1.29	0.31	0.21	0.12	0.31	0.62
T_9	1.34	0.32	0.24	0.15	0.35	0.68
T_{10}	1.32	0.34	0.23	0.14	0.33	0.65
T_{11}	1.40	0.35	0.27	0.17	0.37	0.70
T_{12}	1.45	0.36	0.27	0.18	0.38	0.71
S. Em±	0.029	0.009	0.004	0.003	0.005	0.005
C. D. at 5%	0.09	0.03	0.01	0.01	0.02	0.02

Table 2: Grain yield, straw yield and harvest index of little millet as influenced by nano fertilizer and nitrogen levels.

Treatments	Grain yield (Kg ha^{-1})	Straw yield (Kg ha^{-1})	Harvest Index (%)
T_1	1178	2192	35
T_2	969	1892	34
T_3	1169	2178	35
T_4	1262	2243	36
T_5	1227	2214	36
T_6	1299	2250	36
T_7	1333	2267	37
T_8	1177	2197	35
T_9	1292	2247	37
T_{10}	1248	2228	36
T_{11}	1337	2274	37
T_{12}	1466	2458	37
S. Em±	63.55	81.69	1.42
C. D. at 5%	186.41	239.61	NS

Table 3: Nutrient uptake (kg ha^{-1}) of little millet as influenced by nano fertilizer treatments and nitrogen levels.

Treatments	Nutrient uptake (kg ha^{-1})								
	Nitrogen			Phosphorous			Potassium		
	Grain	Straw	Total	Grain	Straw	Total	Grain	Straw	Total
T_1	15.34	6.87	22.21	2.47	2.92	5.39	3.77	13.81	17.58
T_2	12.45	5.99	18.45	2.03	1.96	3.99	2.82	11.42	14.23
T_3	15.08	7.20	22.28	2.34	2.39	4.73	3.55	13.36	16.91
T_4	16.91	6.95	23.86	2.91	3.06	5.97	4.33	14.95	19.29
T_5	16.21	7.01	23.23	2.74	2.95	5.69	3.93	14.32	18.25
T_6	17.50	7.12	24.62	3.24	3.52	6.77	4.64	15.30	19.94
T_7	18.10	7.69	25.79	3.42	3.56	6.98	4.75	15.57	20.32
T_8	15.23	6.82	22.05	2.47	2.56	5.04	3.65	13.62	17.27
T_9	17.32	7.27	24.59	3.06	3.37	6.43	4.48	15.28	19.76
T_{10}	16.48	7.65	24.13	2.83	3.04	5.88	4.08	14.48	18.56
T_{11}	18.64	8.04	26.68	3.61	3.87	7.48	4.95	15.92	20.88
T_{12}	21.27	8.86	30.14	4.01	4.33	8.35	5.57	17.44	23.01
S. Em±	0.82	0.36	0.96	0.15	0.13	0.20	0.22	0.53	0.59
C. D. at 5%	2.42	1.07	2.84	0.45	0.40	0.61	0.67	1.57	1.76

Conclusion

Based on results obtained it can be concluded that, for *kharif* little millet, 75% RDN along with seed treatment and two nano fertilizer (N) foliar sprays (one at active tillering stage and another at 7-10 days before flowering) i.e., Treatment T_{12} boosted nutrient content and encourages to fetch high total uptake of nutrients by little millet. In order to increase the production of little millet cropin the sub-montane zone of

Kolhapur, treatment $T_{12}$is best suited treatment among all treatments.

References

1. Dhansil A, Zalawadia NM, Prajapat BS, Yadav K. Effect of nano phosphatic fertilizer on nutrient content and uptake by pearl millet. International Journal of Current Microbiology and Applied Sciences. 2018;7(12):2327-2337.
2. 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.
3. 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.
4. 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.
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. Maria CD, Carlos M, Morris S, Ryan W, Yaisr S. Nanotechnology in fertilizers. Nature Nanotechnology, Macmillan Publishers Limited; c2010, 5.
7. 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).
8. 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.
9. Nigade RD, Jadhav BS, Bhosale AS. Response of long duration finger millet variety to different levels of nitrogen under rainfed condition. International Journal ofAgricultural Sciences. 2011;7(1):152-155.
10. Panse SG, Sukhatme PV. Statistical method for agricultural research workers. ICAR, New Delhi; c1967, 361.
11. 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.
12. 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.
13. 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.
14. 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.