*Original Research Article*

Response of little millet (*Panicum sumantrense* Roth. EX. Roem and Schultz) to various sources of organic nutrient in Konkan region of Maharashatra

.

ABSTRACT

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| **Aims:** The field experiment was conducted to find out the effect of various sources of organic nutrient on growth and yield of little millet (*Panicum sumantrense* Roth. Ex. Roem and Schultz)  **Study design:** This experiment was laid out in Randomized Block Design comprising eight treatments.  **Place and Duration of Study:** The field trial was carried out at the Instructional Farm, Department of Agronomy, College of Agriculture, Dr. B.S.K.K.V., Dapoli, Ratnagiri, Maharashtra, India during *Kharif* 2024-25.  **Methodology:** The treatments of the experiment were T1: Absolute control, T2: 100% RDN through FYM, T3: 100% RDN through vermicompost, T4: 100% RDN through neem cake, T5: 50% RDN through FYM + 50% RDN through vermicompost, T6: 50% RDN through FYM + 50% RDN through neem cake, T7: 50% RDN through neem cake + 50% RDN through vermicompost, T8: 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake. The seedlings of little millet var. Konkan satwik were transplanted at the spacing of 20 cm × 15 cm. The recommended dose of fertilizer (RDF) used for the crop was 80:40:40 NPK kg ha-1.  **Results:** Among the various sources of organic nutrient, application of 50% RDN through neem cake + 50% RDN through vermicompost (T7) recorded significantly higher growth as well as grain yield (1640 kg ha-1) and straw yield (2609 kg ha-1) of little millet which were statistically at par with 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake (T8) and 50% RDN through FYM + 50% RDN through neem cake (T6)  **Conclusion:** Application of 50% RDN through neem cake + 50% RDN through vermicompost or 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake or 50% RDN through FYM + 50% RDN through neem cake (T6) might improve the yield in little millet. |

*Keywords: Organic sources; FYM; Neem cake; Vermicompost; Little millet; Growth and Yield.*

1. INTRODUCTION

Little millet (*Panicum sumatrense*), a minor millet from the Poaceae family, was formerly known as *P. miliare*. It has two subspecies: the cultivated P. sumatrense subsp**.** sumatrense and its wild ancestor, P. sumatrense subsp. psilopodium. In India, it's known by several names, including Vari in Maharashtra and Samai and Gindi in other regions. This crop is primarily grown in the Indian states of Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu, Odisha, Jharkhand, Chhattisgarh, Madhya Pradesh and Uttarakhand. According to a 2022 report by Patro *et al*., little millet is cultivated on over 291,000 hectares, yielding 102,000 tonnes with a productivity rate of 349 kg ha-1. It's a highly nutritious and versatile food, with a dietary fiber content of 37% to 38% the highest of any cereal. This makes it an excellent ingredient for processed foods, snacks and baby food. A 100-gram serving of little millet is nutritionally superior to both rice and wheat, containing 60-75g of carbohydrates, 7-10g of protein, 4-8g of crude fiber, 12-13mg of calcium and 7-13mg of iron (Himanshu *et a*l., 2018). Its high fiber content helps reduce fat accumulation and it also contains beneficial nutraceuticals like phenols, tannins and phytates. The year 2023 was the International Year of Millets, a global effort to revive these grains. Millets have a long history and are resilient, but their cultivation area has dropped by 60% over the last 70 years due to the dominance of wheat and rice. Despite this, millet productivity has risen by 200%, a complex trend influenced by supply, demand and agricultural policies (Yadav *et al*., 2024). The Konkan region, with its diverse climate and biodiversity, is well-suited for organic farming. Given the growing demand for healthy, safe food, there's heightened interest in organic crops like little millet, which are valued for their health benefits and resilience. Organic farming practices are a natural fit for little millet cultivation in the Konkan region, as they are compatible with its traditional agricultural ecosystems. This research aims to understand how the gap between millet production and consumption affects global food security. It also seeks to explore how new farming methods can position millets as a key part of the solution. Because of growing threats like climate change water scarcity, and biodiversity loss, millets are seen as crucial for sustainable food systems. Unlocking this potential requires more than just changing farming practices; it also needs a strong commitment to research and policies that give millets the same importance as wheat and rice. This study examines the various factors affecting millet cultivation, including the challenges and opportunities to boost their productivity, competitiveness and role in global agriculture.

2. material and methods

The field experiment was carried out at the Instructional Farm, Department of Agronomy, College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra, India during *Kharif 2024-25*. Geographically, the site of experiment is situated at 17.45° North latitude and 73.10° East longitude having elevation of 250 m above the mean sea level. The topography of the experimental plot was uniform and suitable for cultivation of little millet. The experimental plot was sandy clay loam in texture, low in available nitrogen (220.05 kg ha-1) and phosphorus (10.5 kg ha-1), medium in available potassium (205.95 kg ha-1), high in organic carbon (9.00 g kg ha-1) and acidic in reaction (pH 5.74).The experiment was laid out in Randomized Block Design comprising eight treatments T1: Absolute control, T2: 100% RDN through FYM, T3: 100% RDN through vermicompost, T4: 100% RDN through neem cake, T5: 50% RDN through FYM + 50% RDN through vermicompost, T6: 50% RDN through FYM + 50% RDN through neem cake, T7: 50% RDN through neem cake + 50% RDN through vermicompost, T8: 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake. The little millet variety Konkan satwik was used for the experimentation. Seed rate adopted was 4 kg ha-1. The seedlings are transplanted at a spacing of 20 cm × 15 cm. The recommended dose of fertilizer (RDF) for little millet is 80 kg N, 40 kg P2O5 and 40 kg K2O ha-1. The treatment was applied before the transplanting.The periodical observations on growth were recorded at 20, 40, 60, 80 DAT and at harvest. The grain and straw yield were recorded from the net plot and converted into the hectare basis. Experimental data were analyzed statistically by applying techniques of analysis of variance as applicable in randomized block design. The significance of the treatment difference was tested by table value of f at 0.05 level of probability and critical difference was calculated where ever the effects were significant for comparison and statistical interpretation of significance between treatments mean (Panse and Sukhatme, 1967).

3. results and discussion

Data presented in Table 1 and Table 2 clearly indicated that the growth parameters of little millet crop was noticeably influenced due to the application of different treatments. Based on the data, plant height showed no significant difference among treatments at 20 and 40 DAT. At 60 DAT, the treatment with 50% RDN through neem cake + 50% RDN through vermicompost (T7) resulted in the tallest plants. This was significantly better than all other treatments, though it was statistically at par with the treatment using 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake (T8). The next most effective treatments were 50% RDN through FYM + 50% RDN through neem cake (T6) and 50% RDN through FYM + 50% RDN through vermicompost (T5). Both of these were statistically similar to treatment T4. The remaining treatments (T3, T2 and T1) showed a descending order of significance, with T1 producing the shortest plants. At 80 DAT and at harvest, treatment T7 was again significantly superior to all others. However, it was statistically at par with treatments T8 and T6. Following these, treatment T5 was the next best and it was statistically similar to treatment T4. Among the remaining treatments, T3 was statistically at par with T2 and T1 resulted in the lowest plant height. There were no significant differences in the number of functional leaves per hill among the treatments at 20 and 40 DAT. At 60 DAT, the T7 treatment (50% RDN through neem cake + 50% RDN through vermicompost) produced the most functional leaves per hill. This was significantly higher than all other treatments, except for T8 (25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake) which was statistically similar. The next-best treatment was T6 (50% RDN through FYM + 50% RDN through neem cake), which was statistically at par with T5, T4 and T3. The remaining treatments T2 and T1 showed a descending level of significance with T1 having the fewest functional leaves. At 80 DAT and at harvest, T7 recorded significantly more functional leaves than the other treatments. It was, however, statistically similar to T8 and T6.Following these, T5 was the next most effective treatment, showing no significant difference when compared to T4 and T3. The remaining treatments T2 and T1 had a descending order of significance with T1 again resulting in the lowest number of functional leaves per hill.

According to the data, the number of tillers per hill showed no significant difference among treatments at 20 and 40 DAT. At 60 DAT, the T7 treatment (50% RDN through neem cake + 50% RDN through vermicompost) produced the most tillers per hill, making it significantly superior to all other treatments. It was, however, statistically at par with treatment T8 (25% RDN through vermicompost + 25% RDN through FYM + 50% RDN from neem cake).The next most effective treatment was T6 (50% RDN through FYM + 50% RDN through neem cake), which was statistically similar to treatments T5, T4 and T3. Following these, T2 was the next best and it was found to be statistically at par with T1. T1 produced the lowest number of tillers per hill. At 80 DAT and at harvest, treatment T7 continued to be significantly superior to all other treatments. It was statistically at par with treatments T8 and T6. The next highest number of tillers was observed in treatment T5, which was statistically at par with T4 and T3.After that, treatment T2 was found to be statistically at par with T1. Consistently, the lowest mean number of tillers per hill was seen in treatment T1. There was no significant difference in dry matter accumulation per hill among treatments at 20 and 40 DAT. At 60 DAT, the T7 treatment (50% RDN through neem cake + 50% RDN through vermicompost) led to the highest dry matter accumulation. This was significantly greater than all other treatments, although it was statistically at par with treatment T8 (25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake).The next-best treatment was T6 (50% RDN through FYM + 50% RDN through neem cake) which was statistically similar to treatments T5, T4 and T3. The remaining treatments (T2 and T1) showed a descending trend in significance, with T1 having the lowest dry matter accumulation. At 80 DAT and at harvest, T7 continued to be significantly superior to the other treatments, though it was statistically at par with T8 and T6. Following these, T5 was the next most effective treatment, which was statistically at par with both T4 and T3. The other treatments (T2 and T1) showed a descending level of significance and T1 consistently resulted in the lowest dry matter accumulation per hill. Applying vermicompost and neem cake together boosts plant growth. This is because they improve water retention and turgor pressure, encourage stomatal opening and photosynthesis and provide faster nitrogen release for metabolic activities. These effects accelerate cell division and elongation, leading to increased vegetative growth, longer internodes and ultimately greater plant height and dry matter production. Additionally, these amendments supply nutrients in a balanced and mineralized form. Similar result also obtained by kumawat *et a*l. (2022) in wheat crop, Abhinav *et al*. (2025) in strawberry, Parmar *et al*. (2019) in tomato and charan kumar (2009) in stevia. In the present study the lowest growth and development values were recorded in unfertilized control.

In terms of grain yield (Kg ha-1), the T7 treatment (50% RDN through neem cake + 50% RDN through vermicompost) was the most effective, producing a significantly higher yield than all other treatments. However, it was statistically on par with T8 and T6.Following these, the T5 treatment produced the next highest yield, which was statistically similar to T4 and T3. The remaining treatments T2 and T1, showed a descending level of significance, with T1 consistently resulting in the lowest grain yield during the study. Based on the data for straw yield (kg ha-1), the T7 treatment (50% RDN through neem cake + 50% RDN through vermicompost) was found to be the most effective. It was significantly better than most treatments, although it was statistically at par with T8 and T6. Next, the T5 treatment produced a higher yield, which was statistically similar to T4. This was followed by T3, which was statistically at par with T2. The lowest straw yield was observed in the T1 treatment. Combining vermicompost and neem cake boosts crop yield by improving soil fertility and nutrient availability. Neem cake provides essential nutrients and repels pests, while vermicompost increases organic matter and beneficial microbes. This synergy promotes better root development, nutrient uptake, and overall plant growth, leading to higher yields. Similarly, the improved yield and yield-related traits observed in little millet crops likely stem from the slow, sustained release of nutrients throughout their growth, which supports greater photosynthate formation and efficient translocation from source to sink.. This outcome was further corroborated by Rohith *et al*. (2021) in chili, Arya and Rana (2021) in bell pepper, Patel *et al*. (2020) in sugarcane, Singh *et al*. (2023) in pea. Veeral and Krishnamoorthy (2023) and Darekar and Paslwar (2022) in turmeric.

4. Conclusion

Thus, it can be concluded that application of 50% RDN through neem cake + 50% RDN through vermicompost or 25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake or 50% RDN through FYM + 50% RDN through neem cake (T6) improve the growth and yield of little millet.

disclaimer (artificial Inteligence)

Author(s) have declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text to image generators have been used during writing and editing of this manuscript.

**Table 1. Plant height and No. of functional leaves of little millet as influenced periodically due to different treatments**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Plant height** | | | | | **No. of functional leaves** | | | | |
| 20 DAT | 40 DAT | 60 DAT | 80 DAT | At harvest | 20 DAT | 40 DAT | 60 DAT | 80 DAT | At harvest |
| T1:Absolute control | 1.83 | 7.63 | 13.17 | 18.73 | 19.73 | 10.40 | 15.93 | 20.53 | 8.90 | 7.71 |
| T2:100% RDN through FYM | 1.93 | 9.72 | 19.01 | 30.77 | 31.80 | 11.00 | 18.51 | 22.80 | 10.49 | 9.62 |
| T3:100% RDN through vermicompost | 2.35 | 13.53 | 21.67 | 31.27 | 32.27 | 11.38 | 18.87 | 23.56 | 11.15 | 10.77 |
| T4:100% RDN through neem cake | 2.33 | 15.17 | 22.67 | 34.17 | 34.63 | 11.40 | 19.53 | 23.89 | 11.84 | 11.18 |
| T5:50% RDN through FYM + 50% RDN through vermicompost | 2.33 | 17.20 | 23.33 | 34.43 | 34.80 | 11.50 | 19.80 | 24.13 | 12.47 | 11.42 |
| T6:50% RDN through FYM + 50% RDN through neem cake | 2.37 | 19.70 | 26.33 | 36.40 | 37.40 | 11.56 | 19.91 | 24.40 | 12.67 | 11.64 |
| T7:50% RDN through neem cake + 50% RDN through vermicompost | 2.90 | 23.07 | 37.33 | 44.03 | 44.37 | 12.71 | 22.76 | 29.78 | 14.13 | 12.97 |
| T8:25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake | 25.79 | 67.97 | 134.97 | 148.83 | 149.27 | 12.16 | 21.29 | 28.82 | 12.78 | 12.18 |
| S.Em.± | 1.95 | 1.68 | 0.51 | 0.95 | 0.91 | 0.51 | 1.26 | 0.45 | 0.48 | 0.44 |
| C.D. at 5% | N.S. | N.S. | 1.54 | 2.87 | 2.77 | N.S. | N.S. | 1.37 | 1.47 | 1.34 |

**Table 2. No. of tillers and Dry matter accumulation hill-1 of little millet as influenced periodically due to different treatments**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **No. of tillers** | | | | | **Dry matter accumulation hill-1** | | | | |
| 20 DAT | 40 DAT | 60 DAT | 80 DAT | At harvest | 20 DAT | 40 DAT | 60 DAT | 80 DAT | At harvest |
| T1:Absolute control | 1.15 | 2.50 | 3.33 | 3.34 | 3.34 | 1.83 | 7.63 | 13.17 | 18.73 | 19.73 |
| T2:100% RDN through FYM | 1.64 | 3.06 | 3.56 | 3.58 | 3.58 | 1.93 | 9.72 | 19.01 | 30.77 | 31.80 |
| T3:100% RDN through vermicompost | 1.69 | 3.08 | 3.65 | 3.69 | 3.69 | 2.35 | 13.53 | 21.67 | 31.27 | 32.27 |
| T4:100% RDN through neem cake | 1.80 | 3.14 | 3.75 | 3.77 | 3.77 | 2.33 | 15.17 | 22.67 | 34.17 | 34.63 |
| T5:50% RDN through FYM + 50% RDN through vermicompost | 1.82 | 3.21 | 3.78 | 3.81 | 3.81 | 2.33 | 17.20 | 23.33 | 34.43 | 34.80 |
| T6:50% RDN through FYM + 50% RDN through neem cake | 1.84 | 3.28 | 4.09 | 4.30 | 4.30 | 2.37 | 19.70 | 26.33 | 36.40 | 37.40 |
| T7:50% RDN through neem cake + 50% RDN through vermicompost | 1.93 | 3.90 | 4.75 | 4.80 | 4.80 | 2.90 | 23.07 | 37.33 | 44.03 | 44.37 |
| T8:25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake | 1.91 | 3.30 | 4.30 | 4.48 | 4.48 | 2.43 | 20.93 | 33.00 | 38.90 | 39.50 |
| S.Em.± | 0.20 | 0.23 | 0.15 | 0.16 | 0.16 | 0.30 | 4.95 | 1.80 | 2.19 | 2.87 |
| C.D. at 5% | N.S. | N.S. | 0.46 | 0.48 | 0.48 | N.S. | N.S. | 5.46 | 6.65 | 8.71 |

**Table 3. Yieldof little millet as influenced periodically due to different treatments**

|  |  |  |
| --- | --- | --- |
| **Treatments** | Grain yield  (kg ha-1) | Straw yield  (kg ha-1) |
| T1:Absolute control | 867 | 1420 |
| T2:100% RDN through FYM | 1318 | 2209 |
| T3:100% RDN through vermicompost | 1438 | 2305 |
| T4:100% RDN through neem cake | 1465 | 2368 |
| T5:50% RDN through FYM + 50% RDN through vermicompost | 1524 | 2450 |
| T6:50% RDN through FYM + 50% RDN through neem cake | 1583 | 2571 |
| T7:50% RDN through neem cake + 50% RDN through vermicompost | 1640 | 2609 |
| T8:25% RDN through vermicompost + 25% RDN through FYM + 50% RDN through neem cake | 1605 | 2585 |
| S.Em.± | 36.23 | 42.34 |
| C.D. at 5% | 109.89 | 128.42 |

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