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Effect of organic and inorganic nutrient management on growth and yield of pearl millet (*Pennisetum glaucum* L.)

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Abstract
A field experiment was conducted during kharif 2023 at the research farm of Guru Kashi University, Talwandi Sabo, Bathinda, Punjab, to study the effect of various organic and inorganic nutrient management strategies on the growth and yield attributes of Pearl Millet (*Pennisetum glaucum* L.) variety PCB 165. The experiment was laid out in a Randomized Block Design (RBD) comprising ten treatments: T_1 - Control (No fertilizer applied), T_2 - RDF 100%, T_3 - RDF 75% + Azotobacter, T_4 - RDF 75% + Azospirillium, T_5 - FYM 10 t ha^{-1}, T_6 - VC 5 t ha^{-1}, T_7 - PM 3 t ha^{-1}, T_8 - RDF 75% + FYM 5 t ha^{-1}, T_9 - RDF 75% + VC 2.5 t ha^{-1}, T_{10} - RDF 75% + PM 1.5 t ha^{-1}, each replicated three times. Significant effects were observed among treatments for growth parameters and yield. The combined application of 75% RDF + PM 1.5 t ha^{-1} (T_{10}) resulted in the highest plant height (272.12 cm), number of leaves per row length (97.59), number of tillers per plant (6.69), dry matter accumulation (108.10 g plant^{-1}), ear head length (29.71 cm), grain yield (32.14 q ha^{-1}), and biological yield (116.18 q ha^{-1}). The study demonstrates that integrating poultry manure with inorganic fertilizers enhances growth and yield significantly compared to the sole application of either nutrient source

Keywords: Pearl millet, organic manure, integrated nutrient management, growth, yield

1. Introduction
Pearl millet (*Pennisetum glaucum* L.), commonly known as Bajra, is an essential staple food crop in semi-arid and arid regions due to its high drought tolerance and adaptability to marginal soils [Anonymous, 2022] [3]. Despite its robustness, maximizing productivity requires optimal nutrient management practices. Traditionally, excessive chemical fertilizer usage has led to nutrient imbalances and declining soil health, pressing the need for integrated nutrient management. Organic manures such as farmyard manure (FYM), vermicompost (VC), and poultry manure (PM), when used in combination with inorganic fertilizers, improve soil physicochemical properties and nutrient availability, thereby sustaining crop yield and soil fertility [Gupta *et al*., 2015] [5]. The present study was designed with the objective to evaluate the effect of organic and inorganic nutrient management strategies on the growth and yield of pearl millet under Bathinda agro-ecological conditions

2. Materials and Methods
Experimental Site
The study was carried out during kharif 2023 at the Agricultural Research Farm, Guru Kashi University, Talwandi Sabo, Bathinda (29°57'38.3"N, 75°07'20.3"E; altitude: 208 m). The site experiences a semi-humid climate with harsh winters and summers and sandy loam soils (sand 78%, silt 11%, clay 11%) with neutral pH (7.4), low organic carbon (0.35%), and available N, P, K at 130, 12, and 215 kg ha^{-1}, respectively.

Experimental Design and Treatments
- **Design:** Randomized Block Design (RBD)
- **Replications:** 3

Treatments

- T_1: Control (No fertilizer applied)
- T_2: RDF 100%
- T_3: RDF 75% + Azotobacter
- T_4: RDF 75% + Azospirillium
- T_5: FYM 10 t ha^{-1}
- T_6: VC 5 t ha^{-1}
- T_7: PM 3 t ha^{-1}
- T_8: RDF 75% + FYM 5 t ha^{-1}
- T_9: RDF 75% + VC 2.5 t ha^{-1}
- T_{10}: RDF 75% + PM 1.5 t ha^{-1}
- Plot size: Gross - 6 m²; Net - 4.59 m²
- Variety: PCB 165
- Row spacing: 45 cm × 15 cm
- Recommended Fertilizer Dose (RDF): 100 kg N, 60 kg P_2O_5, 0 kg K_2O ha^{-1}

Application of Inputs

Organic manures were applied as per treatments and incorporated thoroughly before sowing. Half the nitrogen and full phosphorus were applied as the basal dose using diammonium phosphate; the remaining N was top-dressed using urea. All cultural operations, irrigation, and pest management were as per standard practices [Choudhary, 2005] [4].

Observations recorded

Growth parameters measured included plant height (cm), number of leaves per row length, number of tillers per plant, and dry matter accumulation (g plant^{-1}), recorded at 30, 60, and 90 days after sowing (DAS). Yield parameters included effective tillers per plant, ear head length (cm), grain weight per ear head (g), 1000-grain weight (g), and grain yield (q ha^{-1}). Data analysis followed standard ANOVA procedures appropriate for RBD.

3. Results and Discussion

3.1 Plant Height

Significant differences among treatments were noted for plant height at 60 and 90 DAS. The highest (272.12 cm at 90 DAS) plant height was recorded under T_{10} (RDF 75% + PM 1.5 t ha^{-1}), followed by T_7 (PM 3 t ha^{-1}) and T_6 (VC 5 t ha^{-1}). The lowest (258.00 cm) was under control (T_1). The synergistic effect of combined poultry manure and fertilizers promoted quick cell division, extension, and vegetative growth [Amarghade *et al*., 2021] [2].

3.2 Number of Leaves per Row Length

T_{10} recorded the significantly highest number of leaves per row length (97.59 at 90 DAS), followed by T_9 and T_8. The lowest value (84.74) was observed under the control. Integrated application boosts leaf area development, facilitating better photosynthesis [Sangma *et al*., 2018] [6].

3.3 Number of Tillers per Plant

The number of tillers per plant at 90 DAS was highest (6.69) in T_{10}, followed by T_9 (6.30) and T_8 (6.12). The control had the lowest (5.12). Enhanced microbial activity in organically amended plots encouraged new shoot emergence [Abdullahi *et al*., 2014] [1].

3.4 Dry Matter Accumulation

A significant increase in dry matter was observed with T_{10} (108.10 g plant^{-1} at 90 DAS), followed closely by T_9 and T_8. Control plots had the minimum (84.46 g plant^{-1}). Poultry manure's slow nutrient release provided sustained availability, increasing biomass [Amarghade *et al*., 2021] [2].

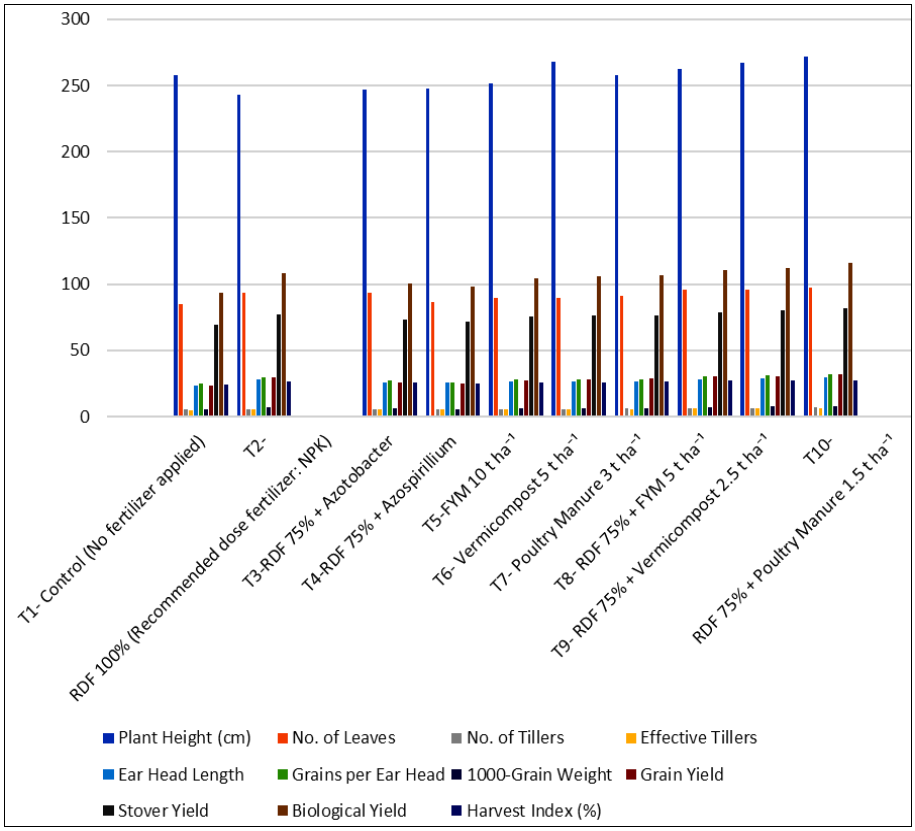
3.5 Yield Components and Yield

- Number of Effective Tillers/Plant: Highest in T_{10} (6.58), lowest in T_1 (4.81).
- Ear Head Length: T_{10} led with 29.71 cm.
- Grain Weight per Ear Head: T_{10} had the maximum (32.36 g).
- Test Weight: Highest in T_{10} (7.90 g), lowest in T_1 (5.77 g).
- Grain Yield: T_{10} produced the highest grain yield (32.14 q ha^{-1}); control (T_1) had the lowest (23.03 q ha^{-1}).
- Biological Yield: Highest in T_{10} (116.18 q ha^{-1}), lowest in T_1 (93.36 q ha^{-1}).

These results confirm that integrating organic (poultry manure) and inorganic sources improves yield attributes through enhanced plant growth, nutrient uptake, and soil health [Verma *et al*., 2018] [8].

Table 2: Effect of Treatments on Key Growth and Yield Attributes

Treatment	Plant Height (cm) 90 DAS	No. of Leaves (90 DAS)	No. of Tillers (90 DAS)	Effective Tillers (per plant)	Ear Head Length (cm)	Grains per Ear Head (g)	1000-Grain Weight (g)	Grain Yield (q ha^{-1})	Stover Yield (q (q ha^{-1})	Biological Yield (q ha^{-1})	Harvest Index (%)
T_1- Control (No fertilizer applied)	258	84.74	5.12	4.81	23.15	25.27	5.77	23.03	69.33	93.36	24.22
T_2-RDF 100% (Recommended dose fertilizer: NPK)	243.33	93.18	5.12	5.73	27.92	29.7	6.77	29.37	77.08	107.95	26.7
T_3-RDF 75% + Azotobacter	247	93.18	5.67	5.25	25.76	27.37	6.01	25.67	73.24	100.41	25.67
T_4-RDF 75% + Azospirillium	248.12	86.16	5.1	5.19	25.62	25.67	5.81	25.03	71.47	98	25.16
T_5-FYM 10 t ha^{-1}	251.28	89.39	5.14	5.35	26.63	27.88	6.52	27.58	75.55	104.63	25.9
T_6- Vermicompost 5 t ha^{-1}	268.21	89.85	5.43	5.47	26.74	27.93	6.6	27.83	76.53	105.79	25.83
T_7- Poultry Manure 3 t ha^{-1}	257.89	91.13	6.16	5.57	26.78	28.4	6.63	28.75	76.53	106.78	26.44
T_8- RDF 75% + FYM 5 t ha^{-1}	262.33	95.5	6.12	5.98	28.38	30.08	6.92	30.12	78.64	110.91	27.14
T_9- RDF 75% + Vermicompost 2.5 t ha^{-1}	267.33	96.17	6.3	6.34	28.53	31.08	7.46	30.27	80.01	112.12	27.19
T_{10}-RDF 75% + Poultry Manure 1.5 t ha^{-1}	272.12	97.59	6.69	6.58	29.71	32.36	7.9	32.14	81.56	116.18	27.64



The Graph presents a comprehensive comparison of ten different nutrient management treatments on the growth and yield attributes of pearl millet at 90 days after sowing (DAS), indicating the effect of organic, inorganic, and integrated nutrient sources.

4. Conclusion

The experiment established that integrated nutrient management, particularly RDF 75% + poultry manure 1.5 t ha^{-1} (T_{10}), significantly enhanced the growth and yield of pearl millet compared to the sole use of either inorganic or organic nutrient sources. This strategy offers a sustainable approach for higher productivity alongside improved soil health in pearl millet cultivation.

References

1. Abdullahi *et al*. Effect of biofertilizer and organic manure on growth and nutrients content of pearl millet. J Agri Biol Sci. 2014;9(10):351-355.
2. Amarghade N, Singh R. Impact of nutrient management on yield and economics of pearl millet (*Pennisetum glaucum* L.). Biol Forum - An Int J. 2021;13(13a):649-652.
3. Anonymous. Millets—The Future Super Food of India. Directorate of Statistics and Economics. 2022;3:15-16.
4. Choudhary RS. Studies on integrated nutrient management in pearl millet based cropping systems. Division of Agronomy, IARI, New Delhi. 2005.
5. Gupta SK, *et al*. Seed set variability under high temperatures during flowering period in pearl millet (*Pennisetum glaucum* L.). Field Crops Res. 2015;171:41-53.
6. Sangma SS, *et al*. Response of Capsicum to different levels of spacing and training systems under foothills of Arunachal Pradesh. Int J Agric Environ Biotechnol. 2018;11(2):327-332.
7. Sheoran OP. Statistical Package for Agricultural Scientists (OPSTAT). CCS HAU; 2023.
8. Verma SK, *et al*. Performance of pearl millet under agri-horti system as influenced by sowing methods and integrated nutrient management. J Appl Nat Sci. 2018;10(1):482-486.