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Effect of different doses of RDF with Vermicompost on growth and yield of Garden pea (*Pisum sativum* L.)

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Abstract

A field experiment was conducted during the rabi season of 2025–26 at the Agricultural Research Farm, Nehru Mahavidyalaya, Lalitpur, Uttar Pradesh (India), to evaluate the "Effect of different doses of RDF with Vermicompost on growth and yield of Garden pea (Pisum sativum L.)". The experiment was laid out in a Randomized Block Design (RBD) with three replications comprising eight distinct treatment combinations: T_1 (Control), T_2 (Vermicompost), T_3 (50% RDF), T_4 (75% RDF), T_5 (100% RDF), T_6 (50% RDF + Vermicompost), T_7 (75% RDF + Vermicompost), and T_8 (100% RDF + Vermicompost). The results revealed that the integrated application of nutrients significantly influenced both vegetative growth and crop productivity. Among all the treatments, T_8 (100% RDF + Vermicompost) recorded the best performance, establishing that combining full recommended inorganic fertilizers with organic manure optimizes the physiological expression and yield potential of garden pea under the agro-climatic conditions of Bundelkhand.

Keywords: *Garden pea (Pisum sativum L.), Recommended Dose of Fertilizer (RDF), Vermicompost, Integrated Nutrient Management, Growth and Yield, Randomized Block Design (RBD), Rabi Season.*

INTRODUCTION

Garden pea (*Pisum sativum* L.) is a highly nutritious leguminous vegetable crop grown globally during the winter season for its protein-rich green pods and soil-enriching nitrogen-fixing ability. In regions like Lalitpur, Uttar Pradesh, sustaining pulse productivity faces challenges due to declining soil organic matter and unbalanced chemical fertilizer application. While Recommended Doses of Fertilizers (RDF) provide readily available nutrients for rapid crop establishment, exclusive reliance on chemical inputs degrades soil health over time. Conversely, vermicompost serves as an excellent organic source that improves soil structure, enhances microbial activity, and supplies macro- and micronutrients steadily. Integrating inorganic fertilizers with vermicompost offers a viable strategy to fulfill the crop's precise nutrient demand while sustaining the soil ecosystem, thereby maximizing both vegetative development and green pod yield [1-2].

MATERIALS AND METHOD

The field experiment was executed during the *rabi* season of 2025–26 at the Agricultural Research Farm, Nehru Mahavidyalaya, Lalitpur, Uttar Pradesh, India, which features a semi-arid climate and typical Bundelkhand soil characteristics. The trial was structured using a Randomized Block Design (RBD) featuring three replications to test eight treatments: T_1 (Control), T_2 (Vermicompost), T_3 (50% RDF), T_4 (75% RDF), T_5 (100% RDF), T_6 (50% RDF + Vermicompost), T_7 (75% RDF + Vermicompost), and T_8 (100% RDF + Vermicompost). Standard regional agronomical practices, including uniform land preparation, sowing, irrigation schedules, and plant protection measures, were maintained across all plots. Biometric observations were systematically recorded for growth parameters (plant height, number of branches, and nodules per plant) at critical physiological stages, alongside key yield attributes (pod length, number of pods per plant, and final green pod yield), with the collected data subjected to standard statistical analysis of variance[3-4].

Result and Discussion

Growth Parameters

The experimental data indicated that the integrated nutrient management treatments significantly outpaced the sole organic or reduced inorganic applications regarding both growth and yield attributes. The data revealed that maximum plant height at 30, 60 DAS and at harvest were found (31.56, 53.12 and 83.88 cm respectively) with the application of 100% RDF and Vermicompost but significantly at par with T_7- (75% RDF + Vermicompost) but significantly higher than control treatment (table 1). This increase in growth attributes might have been due to more and quick supply of NPK with heavy application of inorganic fertilization which increased photosynthetic activity, cell division, elongation and differentiation etc. resulting in higher growth attributes [5]. Maximum number of leaves plant^{-1} at 30, 60 DAS and at harvest were found (37.06, 56.60 and 59.67 leaves respectively) with the application of 100% RDF and Vermicompost but significantly at par with T_7- (75% RDF + Vermicompost) but significantly higher leaves than control treatment (table 1).

Because this combination pairs the quick-release, high-concentration essential nutrients (N, P, K) from chemical fertilizers with the steady release of macro/micronutrients, beneficial microbes, and plant growth regulators present in organic vermicompost. This synergistic action markedly enhances soil structure, root proliferation, and overall vegetative growth, prompting rapid cell division and greater leaf production [6].

Yield Parameters

Maximum pod length (10.84 cm), number of pods plant^{-1} (24.58 pods), weight of a single pod (7.89 g), number of grains pod^{-1} (8.67 grains) and pod yield (174.67 q ha^{-1}) were found with the application of 100% RDF and Vermicompost but significantly at par with T_7- (75% RDF + Vermicompost) but significantly higher leaves than control treatment (table 2). Because the combination of readily available inorganic fertilizers (RDF) provides immediate early-stage nutrients, while vermicompost improves soil structure and steadily releases macro- and micronutrients to sustain reproductive development.

This synergetic Integrated Nutrient Management (INM) approach significantly enhances metabolic processes, chlorophyll synthesis, and effective photosubstrate translocation, which directly boosts the plant's structural yield attributes [7-8].

Conclusion

Based on the field trial, it is concluded that the integrated use of chemical fertilizers and organic manure is highly effective for maximizing garden pea productivity. Treatment T_8, combining 100% RDF with Vermicompost, emerged as the most superior treatment, yielding the best results for all vegetative growth and green pod yield attributes. Therefore, application of 100% RDF along with Vermicompost can be recommended to the farmers of the Lalitpur region to achieve optimal growth, higher yields, and better soil health preservation for *rabi* garden pea cultivation.

Table 1: Effect of different doses of RDF with Vrmicompost on plant height andnumber of leaves plant^{-1} of Garden pea

Treatments	Plant height (cm)			No. of leaves plant^{-1}		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T_1 - Control	25.38	39.9	60.37	23.68	45.6	48.2
T_2- Vermicompost	27.56	43.88	63.97	26.88	49.79	52.38
T_3 - 50% RDF	28.56	45.93	68.44	28.69	51.46	55.12
T_4 - 75% RDF	29.56	47.18	70.16	29.79	52.6	55.32
T_5- 100% RDF	30.56	50.89	76.8	34.36	53.99	56.87
T_6 - 50% RDF + Vermicompost	30.56	49.89	72.91	31.8	53.99	56.4
T_7 - 75% RDF + Vermicompost	30.94	51.84	82.82	35.65	55.24	57.66
T_8 - 100% RDF + Vermicompost	31.56	53.12	83.88	37.06	56.6	59.67
S. EM(±)	**1.2**	**0.57**	**0.55**	**0.9**	**0.70**	**0.85**
CD 5%	**Non Sig**	**1.73**	**1.66**	**2.7**	**2.12**	**2.55**

Table 2: Effect of different doses of RDF with Vrmicompost on yield attributes characters of Garden pea

Treatment	Pod length	No. of Pod plant^{-1}	Pod weight (g)	No. of grain Pod $^{-1}$	Pod yield (q ha^{-1})
T_1 - Control	6.90	16.2	5.14	6.87	92.45
T_2- Vermicompost	8.59	18.29	5.87	7.73	122.44
T_3 - 50% RDF	8.94	19.2	6.23	7.67	112.44
T_4 - 75% RDF	9.23	20.58	6.92	7.87	122.89
T_5- 100% RDF	9.76	21.8	7.18	8.00	143.44
T_6 - 50% RDF + Vermicompost	10.17	23.6	7.58	8.12	156.78
T_7 - 75% RDF + Vermicompost	10.81	24.2	7.68	8.33	162.67
T_8 - 100% RDF + Vermicompost	10.84	24.58	7.89	8.67	174.67
SE(m) ±	**0.24**	**0.34**	**0.13**	**0.09**	**1.80**
CD at 5%	**0.72**	**1.04**	**0.39**	0.28	**5.44**

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