

Original Research Article

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Influence of Organic Manures on Quality Parameters like Crude Protein Content (%), Statistical Analysis and Economics in Wheat (*Triticum aestivum* L.)

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ABSTRACT

Interest in soil enzyme activity has increased recently since their activities are believed to reflect the potential capacity of soil to perform nutrient transformations. Since, soil microbial and enzyme systems are associated with organic manure management, incorporation of organic manures into soil not only plays an important role in soil chemical and biological activity, but also affects the rate at which nutrients become available to crop plants as well as other forms of life. The Present experiment consisted of nine treatments T₁:RDF, T₂: EC (1/4) basal + PM (3/4) basal, T₃: FYM (1/4) basal + VC (3/4) basal, T₄: FYM (1/4) basal + PM (3/4) basal, T₅: EC (1/4) basal + VC (3/4) basal, T₆: FYM (1/4) basal + PM (3/4) top dressing 30DAS, T₇: EC (1/4) basal + VC (3/4) top dressing @ 30 DAS, T₈: EC (1/4) basal + PM (3/4) top dressing at 30DAS, T₉: Control. The study revealed that, among the treatments T₈: EC (1/4) basal + PM (3/4) top dressing at 30DAS has the highest crude protein content (13.30%), low cost of cultivation (25,570.00Rs/ha), high gross returns per hectare (62,387.00Rs/ha), high net returns per hectare (36817.00Rs/ha) and benefit cost ratio B:C (2.43) compared to control.

Keywords

Organic manures, Vermicompost and farmyard manure, Poultry manure and Enriched compost

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Introduction

Wheat (*Triticum aestivum*) is one of the most widely grown crops in the world, and is the second most important source of staple food in India after rice. In order to increase the wheat yield the farmers are extensively using the chemical fertilizer for higher yield. During

the era of green revolution the farmers stressed more in use hybrid and high yielding varieties. Response of maize-wheat cropping sequence to phosphorus and farm yard manure (Negi *et al.*, 1988). However it increased the crop production and productivity but supplying the nutrient source from inorganic fertilizer for long term without

any addition of organic manures affected the soil health and resulted in the large scale deficiency of micro nutrients in soil which play an important role in enhancing the quality and quantity of the agriculture production.

Further, heavy application of inorganic fertilizer left residues in grain fruits and vegetables and caused human and animal health. The use of inorganic fertilizer alone also reduces the fertilizer use efficiency by crop through creation of problems such as volatilization, leaching and denitrification of nitrogen, to overcome the problem of nutrient deficiency and helping the nature rather than destroying it (Singh *et al.*, 2001).

Organic sources of nutrients are the best option maintain the health of soil, plant and animal and provide the equal opportunity for all living existence to live and use from their beneficial activities, like nitrogen fixation, phosphorus solubilization, recycling of animal waste etc. Hence, the present study was undertaken. To overcome the problem of nutrient deficiency and to increase wheat yield, the farmers are applying chemical fertilizers. However, the chemical fertilizers are expensive and the small farmers cannot afford to use these fertilizers in suitable amount and balanced proportion. Under such condition integrated use of chemical and organic fertilizer/manures can play an important role to sustain soil fertility and crop productivity (Khadtare *et al.*, 2006). Influence of vermicompost on quality parameters and soil fertility status of sweet corn (*Zeamays L. saccharata*). The use of organics largely excludes the use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives, enriches the soil, encourages bio-diversity, reduce the toxic bodies (Auti *et al.*, 1999). Improves water quality, creates a safe environment for people and wild life, produces nutritious food of high quality,

supply micronutrients in soil and maintains soil fertility and crop productivity.

Materials and Methods

Seed source

For the present study, seeds of wheat variety PBW-550 were obtained from Dept. of agriculture Dehradun, Uttarkhand.

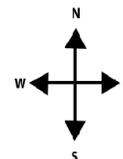
Description of variety

The wheat variety PBW 550 is a yellow rust resistant version of PBW 550. Its average plant height is 86 cm and matures in about 145 days. Its average grain yield is 23.0 quintals per acre. It is resistant to yellow and brown rusts and susceptible to loose smut.

Design and layout

The experiment will be laid out in a Randomized block design (RBD) with three replications (Fig. 1). The experimental details and lay out plan are given below:

Crop : Wheat (*Triticum aestivum L.*)
Variety : PBW-550
Spacing : 22.5 cm × 10 cm
Design : Randomized block design (RBD)
Replications : 03
Total treatments : 09
Gross plot : 2.5m × 1.5m
Irrigation channel : 0.5m



Treatment details

T₁ - RDF
T₂ - EC (1/4) basal + PM (3/4) basal
T₃ - FYM (1/4) basal + VC (3/4) basal
T₄ - FYM (1/4) basal + PM (3/4) basal
T₅ - EC (1/4) basal + VC (3/4) basal
T₆ - FYM (1/4) basal + PM (3/4) top dressing
30DAS
T₇ - EC (1/4) basal + VC (3/4) top dressing @

30 DAS

T₈ -EC (1/4) basal + PM (3/4) top dressing at 30DAS

T₉ - Control

Note 1: All organics are made equivalent to recommended dose of nitrogen (RDN)

Note 2: FYM: Farm yard manure, VC: Vermicompost, PM: Poultry manure, EC: Enriched compost

Note 3: RDF (recommended dose of fertilizers 100:75:50 kg NPK ha⁻¹).

Sowing of seed

The seeds of wheat were sown in the field on 16th November 2018.

The seeds were sown directly into the plots made on main field. Sowing was done in row spaced 22.5 cm later seeds were covered manually. Soon after sowing the plots were irrigated and then regular irrigations were applied at an interval of 10 days.

Harvesting and threshing

Crop was harvested on 10th April 2018 after attaining physiological maturity. The harvested crop was dried in the sun and weighed before threshing. Each plot was threshed separately as per treatment and the weight of grains per plot was recorded in kg.

Quality parameters

Crude protein content (%)

The individual treatment wise grain samples were subjected to nitrogen content analysis by modified Micro kjeldhal method (Piper, 1966). Then the protein content analysis by modified treatment was calculated by multiplying the nitrogen content (%) in the grain by the factor 5.7 (Tai and Young, 1974). It was expressed in per cent.

Statistical analysis

Fisher's method of analysis of variance as given by Gomez and Gomez (1984) was applied for analysis and interpretation of data. The level of significance used in F test was at $p = 0.05$. critical difference (CD) was worked out whenever 'F' test was significant.

Correlation studies were made between yield and yield attributing characters, growth parameters, quality parameters, uptake of nutrients as per procedure outlined by Gomez and Gomez (1984).

Economics

Based on the current price of input used and produce obtained during 2018, the net profit per hectare ad benefit cost (B:C) ratio was worked out by using the following formula.

Net profit (Rs ha⁻¹) = Gross income (RS ha⁻¹) - cost of cultivation (Rs ha⁻¹)

Benefit cost ratio =

$$\frac{\text{Gross income (Rs ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs ha}^{-1}\text{)}}$$

Results and Discussion

The results of experiment conducted to study the effect of organic manures on growth, yield and grain quality of wheat (*Triticum aestivum* L.) during Rabi season 2018-2019 are presented in this paper.

Quality parameter

Crude protein content (%) (Table 1 and Fig. 2)

T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS significantly showed higher protein

(13.30%) content than all other treatments and was followed by T₆- FYM (1/4) basal + PM (3/4) top dressing @ 30 DAS (12.91%) which

was on par with T₂- EC (1/4) basal + PM (3/4) basal(12.70%). The lowest (11.70%) was recorded in T₉ - Control.

Table.1 Grain protein content as influenced by organic manures

Treatments	Protein content
T ₁ - RDF	12.383
T ₂ - EC (1/4) basal + PM (3/4) basal	12.707
T ₃ - FYM (1/4) basal + VC (3/4) basal	11.817
T ₄ - FYM (1/4) basal + PM (3/4) basal	12.193
T ₅ - EC (1/4) basal + VC (3/4) basal	12.040
T ₆ - FYM (1/4) basal + PM (3/4)top dressing @ 30 DAS	12.910
T ₇ - EC (1/4) basal + VC (3/4) top dressing @ 30 DAS	12.117
T ₈ - EC (1/4) basal + PM (3/4) top dressing @ 30 DAS	13.300
T ₉ – Control	11.700
CD(p=0.05)	0.116
C.V.	0.542
S.Em±	0.400

Table.2 Cost of cultivation, gross returns, net returns and benefit cost ratio (B:C) as influenced by organic manures

Treatments	Cost of cultivation (Rs.ha ⁻¹)	Gross returns (Rs.ha ⁻¹)	Net returns (Rs.ha ⁻¹)	B:C
T ₁ - RDF	24,306.67	51,321.33	20014.66	2.11
T ₂ - EC (1/4) basal + PM (3/4) basal	25,570.00	57,496.67	31926.67	2.24
T ₃ - FYM (1/4) basal + VC (3/4) basal	36,500.33	50000.00	13499.00	1.36
T ₄ - FYM (1/4) basal + PM (3/4) basal	32,233.33	52,236.33	20003.33	1.62
T ₅ - EC (1/4) basal + VC (3/4) basal	32,233.33	50,075.67	17842.34	1.55
T ₆ - FYM (1/4) basal + PM (3/4)top dressing @ 30 DAS	24,306.67	58376.67	34070.00	2.40
T ₇ - EC (1/4) basal + VC (3/4) top dressing @ 30 DAS	36,500.00	52,000.33	14821.33	1.42
T ₈ - EC (1/4) basal + PM (3/4) top dressing @ 30 DAS	25,570.00	62,387.00	36817.00	2.43
T ₉ – Control	13,700.00	32,735.33	19035.00	2.38
CD(p=0.05)	--	144.97	144.97	--
C.V.	--	0.18	0.18	---
S.Em±	---	67.80	67.80	---

Fig.1 Plan layout of the experimental site

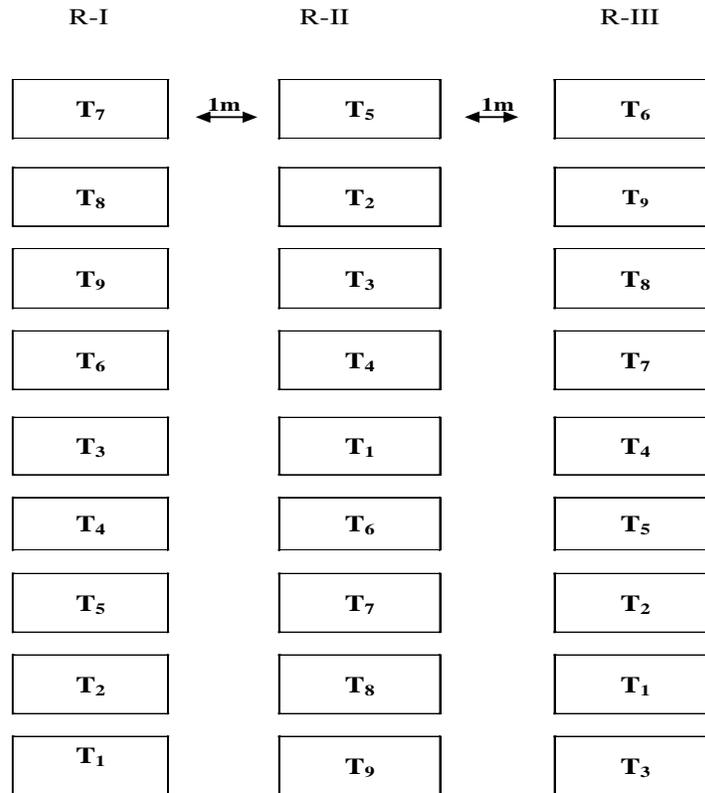


Fig.2 Grain protein content as influenced by organic manures

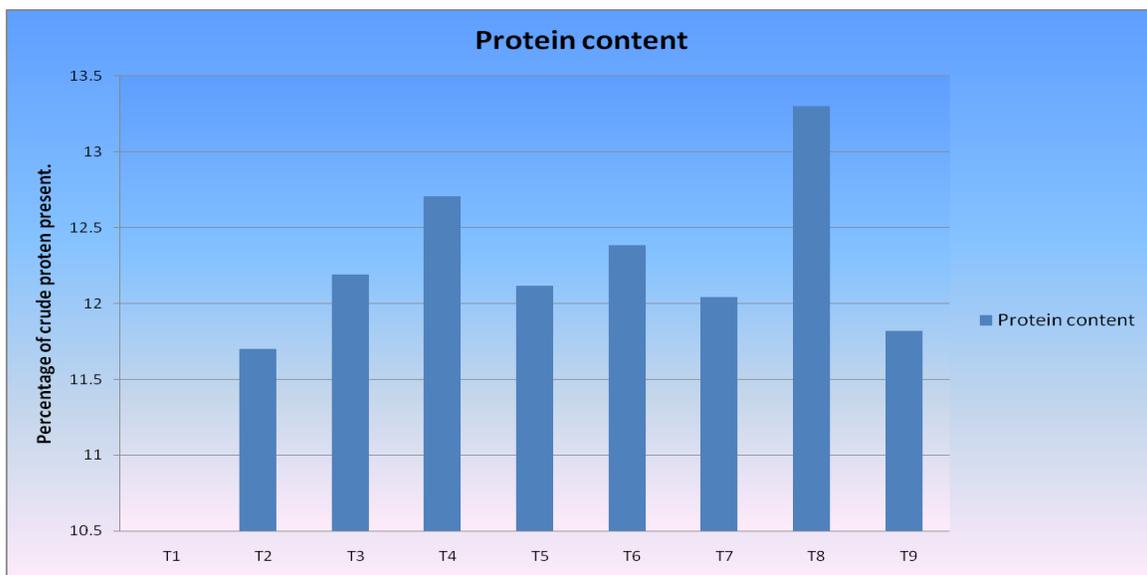
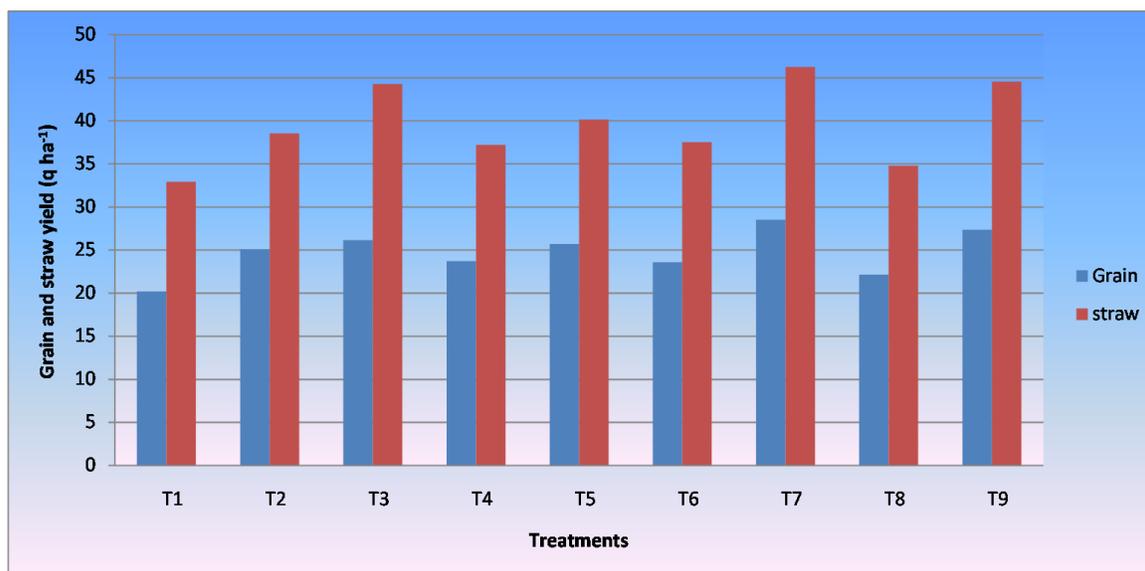


Fig.3 Grain yield, straw yield, harvest index and 1000 grain weight (g) as influenced by organic manures



Economics

Cost of cultivation (Rs ha⁻¹)

The data pertaining significant changes in cost of cultivation (Rs ha⁻¹) in treatments are presented in Table 2 and Fig. 3.

Maximum cost of cultivation (Rs 36500) was recorded in T₃- FYM (1/4) basal + VC (3/4) basal and T₅- EC (1/4) basal + VC (3/4) basal (Rs 32233) while the minimum cost of cultivation was recorded in T₉- Control (Rs 13700).

Gross returns (Rs ha⁻¹)

The data pertaining significant changes in gross returns (Rs ha⁻¹) in treatments are presented in Table 2 and Fig. 3.

Maximum gross returns (Rs 62387) was recorded in T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS followed by T₆- FYM (1/4) basal + PM (3/4) top dressing @ 30 DAS (Rs 58376) further T₂- EC (1/4) basal + PM (3/4) basal (Rs 57496) and the minimum

gross return was recorded in T₉- Control (Rs 32735).

Net returns (Rs. ha⁻¹)

The data pertaining significant changes in Net returns (Rs. ha⁻¹) in treatments are presented in Table 2 and Fig. 3.

Maximum net returns (Rs 36817) was recorded in T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS, followed by T₆- FYM (1/4) basal + PM (3/4) top dressing @ 30 DAS (Rs 34070) while the minimum net return was recorded in T₃- FYM (1/4) basal + VC (3/4) basal (Rs 13499).

Benefit cost ratio (B:C) (Table No.2)

The data pertaining significant changes in Benefit cost ratio (B:C) in treatments are presented in Table 2 and Fig. 3. The highest B:C (2.43) was recorded in T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS, followed by T₆- FYM (1/4) basal + PM (3/4) top dressing @ 30 DAS (2.40) and it was on par with T₂- EC (1/4) basal + PM (3/4) basal

(2.24). The lowest benefit cost ratio (1.13) was recorded in T₃- FYM (1/4) basal + VC (3/4) basal (1.36).

It is concluded that, T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS significantly showed higher protein (13.30%) content than all other treatments and the lowest (11.70%) was recorded in T₉- Control. The statistical analysis showed that gross and net returns of wheat were significantly higher in case of T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS (Rs 62387 and 36817 ha⁻¹) While the minimum gross and net returns was recorded in T₉- Control (Rs 32735 and 19035 respectively ha⁻¹). Significantly higher B:C was recorded with T₈- EC (1/4) basal + PM (3/4) top dressing @ 30 DAS (2.43) and the minimum B:C (1.36) was recorded in T₃ - FYM (1/4) basal+ VC (3/4) basal.

Almost all the growth and yield attributing characters were particularly correlated with the grain yield. To achieve maximum yield of wheat during *Rabi* season under irrigation, an organic nutrient management system involving combinations FYM, Enriched compost and Poultry manure helps in maximizing the grain and straw yield of wheat as well as with higher returns.

Under organic production system, integrated organic nutrient management practices involving application of EC (1/4) basal + PM (3/4) top dressing @ 30 DAS resulted in higher net returns over other organic manure combinations. For sustaining the crop

productivity, application of EC (1/4) basal + PM (3/4) top dressing @ 30 DAS is recommended.

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