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Effect of organic manures on growth and yield of Wheat (*Triticum aestivum* L.)

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Abstract

A field experiment was conducted during *Rabi* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagra, Uttar Pradesh, India. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.36%), available N (171.48 kg/ha), available P (15.2 kg/ha) and available K (232.5 kg/ha). The experiment was laid out in Randomized Block Design with nine treatments (T1-T9). The results showed that Neem cake -1t/ha + FYM-7.5t/ha was recorded significantly higher Plant height (94.11 cm), No. of tillers/hill (10.35), Plant dry weight (17.83 g/plant), Crop growth rate (7.05 g/m²/day), Effective tillers (10.15), spike length (11.21 cm), Test weight (35.16 g), Grain yield (4.21 t/ha), Straw yield (7.69 t/ha) and harvest index (35.47%).

Background: Wheat (*Triticum aestivum* L.) is one of the leading cereals in the world. It is the second most staple food in India. Wheat grown in the Indo-gangetic plains with the use of high concentrate chemical fertilizers in the last several years causing wide spread of nutrient deficiency in the soil. In order to increase wheat production and productivity and to maintain soil health the use of ancient method of cultivation by using organic manures.

Objective: To study the effect of different organic manures on growth and yield of Wheat.

Keywords: Neem cake, FYM, organic manures, growth, yield

Introduction

Wheat (*Triticum aestivum* L.) is one of the leading cereals in the world. It belongs to the family Poaceae and it is the world's most widely cultivated cereal crop which ranks first followed by rice. Wheat accounts for 26% of world cereal production and 44% of total cereal consumption. Rapid economic and income growth, urbanization, and globalization are leading to dramatic dietary shifts, especially in Asia as consumers are increasing their consumption of wheat products. Wheat production needs to increase to meet the combined growing population and expanding demand by the middle of this century (Bhattacharya, 2007)

Measured either by cultivated area (211.06 million ha) or by the production (566.8 million t) achieved. Known as "king of cereals". It is grown throughout the temperate, tropical and sub-tropical region in the world. It constitutes the staple food in at least 43 countries. Wheat attained its premier position by virtue of its unique protein gluten, which is responsible for bread making properties of wheat flour. It is highly nutritious cereal foodstuff and its amino acid yield per acre far exceeds that of animal products.

The application of FYM in the soil helps in increasing the fertility of the soil as physical condition including its water holding capacity. Organic manures, which were perhaps the main sources of plant nutrients in traditional agriculture, receive less emphasis with the advent of high analysis chemical fertilizers. The decision on the optimum use of fertilizer required knowledge of crop response to applied fertilizer, inherent nutrients by soil and its short or long-term fate effects (Dobermann *et al.*, 2003) [2].

Neem (*Azadirachta indica*) is a very useful tree and has immense importance in our daily life as well as in agriculture. Neem seed cake which is a residue obtained after oil extraction from the seed of neem tree acts as a biofertilizer when applied in the field. Neem seed cake has quite distinct chemical properties having organic carbon, N and P contents in high amount and also provides other nutrients such as K, Ca, Mg and other micronutrients which indicate its potential for nutrient supply for crop growth. The organic matter in Neem seed cake (646.64 kg-1), suggested the ability of Neem seed cake to improve the physical, chemical and biological properties in the soil (Garba and Oyindola, 2014) [3].

Materials and Methods

The present examination was carried out during *Rabi* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, India, which is located at 25.28°N latitude, 81.54°E longitude and 98 m altitude above the mean sea level. The experiment laid out in Randomized Block Design which consisting of nine treatments with T₁: Neem cake -0.5t/ha + FYM-2.5t/ha, T₂: Neem cake -0.75t/ha + FYM-2.5t/ha, T₃: Neem cake- 1t/ha + FYM-2.5t/ha, T₄: Neem cake -0.5t/ha + FYM-5t/ha, T₅: Neem cake- 0.75t/ha + FYM-5t/ha, T₆: Neem cake -1t/ha + FYM-5t/ha, T₇: Neem cake -0.5t/ha + FYM-7.5t/ha, T₈: Neem cake -0.75t/ha + FYM-7.5t/ha, T₉: Neem cake -1t/ha + FYM-7.5t/ha are used. The experimental site was uniform in topography and sandy loam in texture, nearly neutral in soil reaction (P^H 7.1), low in Organic carbon (0.38%), medium available N (225 kg ha⁻¹), higher available P (19.50 kg ha⁻¹) and medium available K (213.7 kg ha⁻¹). In the period from germination to harvest several plant growth parameters were recorded at frequent intervals along with it after harvest several yield parameters were recorded those parameters are growth parameters, plant height, no. of tillers/hill and plant dry weight are recorded. The yield parameters like no. of Effective tillers, spike length (cm), Test weight (g), Grain yield, straw yield and harvest index were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Bhattacharya, 2007).

Results and Discussion

Growth attributes

Plant height

Significantly higher plant height (94.11 cm) was recorded with the treatment Neem cake -1t/ha + FYM-7.5t/ha. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (93.36 cm) was found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha. As a slow releasing nitrogen fertilizer Neem cake provided sufficient amount of nitrogen throughout its life cycle helped for plant growth. It is obvious that FYM proved more useful in case of plant growth of wheat crop, it may be due to slow mineralization and availability of nutrients along with moisture holding capacity of soil by FYM (Channabasanagowda *et al.*, 2008)^[4].

Number of Tillers/hill

Significantly higher tillers/hill (10.35) was recorded with the treatment Neem cake -1t/ha + FYM-7.5t/ha. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (10.15) was found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha. The plants attained more vigour with phosphorus, due to adequate supply and availability of nitrogen, phosphorus, potassium and spacing in a balanced combination, resulting in enhanced growth of plant increased number of tillers as reported by (Gupta A *et al.*, 1996)^[5].

Plant dry weight (g/plant)

Significantly maximum dry weight (17.83 g/plant) was recorded with the treatment with Neem cake -1t/ha + FYM-7.5t/ha over the other treatments. However, treatment with Neem cake -0.75t/ha + FYM-7.5t/ha (17.64 g/plant) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments.

FYM application helps to increase total biomass production in dry weight of plant, they stimulate vegetative growth of crop,

help to increase maximum plant dry weight (Agrawal *et al.*, 2010)^[6]. Organic manures make easily available of nutrients to crop without any losses (leaching, runoff), nutrient uptake will increase, ultimately dry matter accumulation significantly increases (Gurwinder Singh *et al.*, 2018)^[7]

Yield attributes and Yield

Number of effective tillers

Significantly Maximum Number of Effective tillers (10.15) was recorded with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (9.94) which were found to be statistically at par with Neem cake -1 t/ha + FYM-7.5t/ha as compared to other treatments.

Applied organic manures created favorable soil environment, which leads to increase water holding capacity of soil for long time. Ultimately number of effective tillers/hills increased (Bhattacharya *et al.*, 2011).

Spike length (cm)

Significantly Maximum Spike length (11.21 cm) was recorded with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (11.09 cm) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments. (Sandeep *et al.*, 2018)^[10].

Test weight (g)

Significantly Maximum Test weight (35.16 g) was recorded with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (34.36 g) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments.

Improvement of test weight might be due to proper utilization organic manures, enhance sustainable production of crop. Same data found in two consecutive year research work (Channabasanagowda *et al.*, 2008)^[4].

Grain yield (t/ha)

Significantly Maximum Grain yield (4.21 t/ha) was recorded with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (4.13 t/ha) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments.

Increase in yield of wheat was due to steady decomposition of FYM and release of nutrients through out the crop growth period coupled with better assimilation of nutrients (Kumar *et al.*, 2015, Singh *et al.*, 2016)^[9, 15].

Straw yield (t/ha)

Significantly Maximum Straw yield (7.69 t/ha) was recorded with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (7.52 t/ha) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments.

Effect of FYM is due to its contribution in supplying additional plant nutrients, improvement of soil physical, chemical and biological process in soil. Metabolites root activities increased resulting absorption of moisture and other

nutrients enhanced resulting into higher production. Kumar *et al.*, (2010)^[14] and Chauhan *et al.*, (2010)^[16]

Harvest Index (%)

Significantly Maximum Harvest index (35.47%) was recorded

with the treatment of application of Neem cake -1t/ha + FYM-7.5t/ha over all the treatments. However, the treatments Neem cake -0.75t/ha + FYM-7.5t/ha (35.36%) which were found to be statistically at par with Neem cake -1t/ha + FYM-7.5t/ha as compared to other treatments.

Table 1: Effect of Organic manures on Growth attributes of Wheat

Treatments	Plant height (cm)	Tillers/hill	Dry weight (g/plant)
1) Neem cake -0.5t/ha + FYM-2.5t/ha.	87.63	8.76	15.74
2) Neem cake -0.75t/ha + FYM-2.5t/ha.	87.99	8.94	15.89
3) Neem cake- 1 t/ha + FYM-2.5t/ha.	90.28	9.64	16.64
4) Neem cake -0.5t/ha + FYM-5t/ha.	88.78	9.15	16.12
5) Neem cake- 0.75t/ha + FYM-5t/ha.	91.13	9.77	16.88
6) Neem cake -1 t/ha + FYM-5t/ha.	92.16	9.90	17.22
7) Neem cake -0.5t/ha + FYM-7.5t/ha.	89.76	9.44	16.37
8) Neem cake -0.75t/ha + FYM-7.5t/ha.	93.36	10.15	17.64
9) Neem cake -1 t/ha + FYM-7.5t/ha.	94.11	10.35	17.83
F- test	S	S	S
S. EM (\pm)	0.30	0.07	0.07
C. D. (P = 0.05)	0.89	0.20	0.21

Table 2: Effect of Organic manures on Yield attributes and Yield of Wheat

Treatments	Effective tillers	Spike length (cm)	Test Weight (g)	Grain yield (t/ha)	Straw yield (t/ha)	Harvest Index (%)
1) Neem cake -0.5t/ha + FYM-2.5t/ha.	8.12	9.85	28.92	2.65	6.54	28.79
2) Neem cake -0.75t/ha + FYM-2.5t/ha.	8.36	10.02	29.62	2.86	6.65	30.05
3) Neem cake- 1 t/ha + FYM-2.5t/ha.	9.13	10.63	31.73	3.45	7.11	32.65
4) Neem cake -0.5t/ha + FYM-5t/ha.	8.65	10.24	30.04	3.01	6.75	30.84
5) Neem cake- 0.75t/ha + FYM-5t/ha.	9.42	10.74	32.37	3.67	7.19	33.80
6) Neem cake -1 t/ha + FYM-5t/ha.	9.69	10.93	33.83	3.87	7.36	34.43
7) Neem cake -0.5t/ha + FYM-7.5t/ha.	8.87	10.45	30.77	3.19	6.93	31.55
8) Neem cake -0.75t/ha + FYM-7.5t/ha.	9.94	11.09	34.36	4.13	7.52	35.36
9) Neem cake -1 t/ha + FYM-7.5t/ha.	10.15	11.21	35.16	4.21	7.69	35.47
F test	S	S	S	S	S	S
S. EM (\pm)	0.09	0.05	0.27	0.04	0.06	0.32
CD (P = 0.05)	0.26	0.14	0.81	0.13	0.19	0.95

Conclusion

The combination of Neem cake 1t/ha + FYM 7.5t/ha proved to be advantageous to farmers, resulting in higher grain yield 4.2t/ha, higher straw yield 7.69 t/ha, higher gross return Rs 105250.00/ha, net returns Rs 74555.00/ha and benefit cost ratio 2.42 was obtained respectively.

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