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Effect of Organic Nutrients and Neem Cake on Growth and Yield of Wheat (*Triticum aestivum* L.)

K. Jagadeeshwar Reddy, Umesha C.

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ABSTRACT

At the Department of Agronomy, SHUATS, Prayagraj (UP), Crop Research Farm, a field experiment was carried out in *rabi* 2022.The soil in the experimental plot had a sandy loam texture, a pH of 7.1 that was almost neutral, a low level of organic carbon (0.36), and poor availability of the nutrients n, p, and k (171.48 kg/ha, 15.2 kg/ha, and 232.5 kg/ha, respectively). Nine treatments were included in the study, each of which was reproduced three times over the course of a one-year investigation.The treatments which are T_1: FYM – 10t/ha + Neem Cake -300kg/ha, T_2: FYM – 10t/ha + Neem Cake -400kg/ha, T_3: FYM – 10t/ha + Neem Cake -500kg/ha, T_4: Vermicompost -1t/ha + Neem Cake -300kg/ha, T_5: Vermicompost -1t/ha + Neem Cake -400kg/ha, T_6: Vermicompost -1t/ha + Neem Cake -500kg/ha, T_7: Poultry manure -0.5t/ha + Neem Cake -300kg/ha, T_8: Poultry manure -0.5t/ha + Neem Cake -400kg/ha, T_9: Poultry manure -0.5t/ha + Neem Cake -500kg/ha and T_{10}: Control (150:60:40 NPK kg/ha) used. The findings revealed : Plant height (101.32 cm) was considerably greater when poultry manure (4 t/ha) and neem cake (500 kg/ha) were combined. No. of tillers/hill (13.45), Plant dry weight (29.24 g/plant), Maximum effective tillers (11.86), Grains/spike (54.17), Test weight (43.41 g), Grain yield (55.78 q/ha) and Straw yield (116.41 q/ha).

Keywords Neem cake, FYM, Vermicompost, Poultry manure, Wheat.

INTRODUCTION

One of the most popular cereals in the world is wheat (*Triticum aestivum* L.). It is the most frequently farmed cereal crop in the world and comes in first place behind rice in the family Poaceae. 26% of all cereals produced worldwide and 44% of all cereals consumed are made of wheat. Significant dietary changes are being brought on by urbanization, rapid economic and income growth, and globalization, particularly in Asia where people are consuming more wheat-based goods. By the middle of this century, wheat output must increase to keep up with the increased demand and the population growth.

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 subtropical region in the world. It constitutes the staple food in at least 43 countries. Wheat attained its premier

K. Jagadeeshwar Reddy[1*], Umesha C.[2]

[2]Assistant Professor
[1,2]Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh 211007, India

Email: jagadeeshkjr.1999@gmail.com
*Corresponding author

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 addition of FYM to the soil improves both its physical properties, such as its ability to hold water, and its fertility. With the introduction of high analysis chemical fertilizers, focus on organic manures, which may have been the primary supply of plant nutrients in traditional agriculture, has decreased. Knowledge of the crop response to applied fertilizer, the intrinsic nutrients in the soil, and its short- or long-term fate impacts were necessary to make the best fertilizer usage decisions (Dobermann *et al*. 2003).

According to (Devi and Prakash 2015), vermicompost is the end result of decomposition process, which uses earthworms to transform organic waste into high-quality compost that mostly contains worm cast and degraded organic materials. Vermicomposting assists in transforming home trash, animal manure, and agricultural waste into very nutrient-dense fertilizers for plants and soil. Vermicomposting helps to convert the organic wastes (agrowastes, animal manure and domestic refuse) into highly nutrient fertilizers for plant and soil. Vermicompost contains 3% N, 1% P, 1.5% K. It helps in preventing environment pollution and protect soil health, improves soil structure and water holding capacity. It stimulates activity of micro-organisms that make plant to get macro and micro nutrients through biological process, increase nutrient solubility, alter soil salinity, sodicity and pH.

Neem (*Azadiracta indica*) is a very useful tree on has emcee importance in our daily life as well as in agriculture. Neem seed cake which is a residue optioned after oil extraction from the seed of neem tree act as a biofertilizer when applied in the field. With high levels of organic carbon, N, and P as well as other nutrients like K, Ca, and Mg and other micronutrients, neem seed cake has rather unique chemical features that suggest its potential for nutrient supply for crop growth. Neem seed cake may be able to enhance the physical, chemical, and biological characteristics of the soil due to its high organic content (646.64 kg^{-1}), according to Garba and Oyinlola (2014).

MATERIALS AND METHODS

The current investigation was conducted in *rabi* 2022 at the Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, which is situated 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 ten treatments with T_1: FYM – 10t/ha + Neem Cake -300kg/ha, T_2: FYM – 10t/ha + Neem Cake -400kg/ha, T_3: FYM – 10t/ha + Neem Cake -500kg/ha, T_4: Vermicompost -1t/ha + Neem Cake -300kg/ha, T_5: Vermicompost -1t/ha + Neem Cake -400kg/ha, T_6: Vermicompost -1t/ha + Neem Cake -500kg/ha, T_7: Poultry manure -0.5t/ha + Neem Cake -300kg/ha, T_8: Poultry manure -0.5t/ha + Neem Cake -400kg/ha, T_9: Poultry manure -0.5t/ha + Neem Cake -500kg/ha and T_{10}: Control (150:60:40 NPK kg/ha), are used. The experimental location had a homogeneous topography, sandy loam soil, a virtually neutral soil response (PH 7.1), low 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, and plant dry weight are recorded. The yield parameters like Tillers/Plant, Grains/Spike, Test weight, seed yield, stover yield and harvest index were recorded.

RESULTS AND DISCUSSION

Growth attributes

Plant height

Observation of plant height were presented in (Table 1). Significantly higher plant height (101.32 cm) was recorded with the treatment Poultry manure -4 t/ha + Neem Cake -500kg/ha. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (99.59 cm) was found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha.

It is clear that FYM was more beneficial for the development of wheat plants; this may be be-

Table 1. Effect of organic nutrients and neem cake on growth attributes of wheat.

Treatments	Plant height (cm)	Tillers/hill	Dry weight (g/ plant)
1. FYM – 10t/ha + Neem Cake -300kg/ha	90.76	7.29	24.22
2. FYM – 10t/ha + Neem Cake -400kg/ha	91.30	8.13	25.01
3. FYM – 10t/ha + Neem Cake -500kg/ha	92.76	8.28	25.34
4. Vermicompost -4.5 t/ha + Neem Cake -300kg/ha	94.14	8.44	26.20
5. Vermicompost -4.5 t/ha + Neem Cake -400kg/ha	94.39	8.97	26.58
6. Vermicompost -4.5 t/ha + Neem Cake -500kg/ha	95.60	9.23	27.86
7. Poultry manure -4 t/ha + Neem Cake -300kg/ha	97.15	9.32	27.57
8. Poultry manure -4 t/ha + Neem Cake -400kg/ha	99.59	9.55	28.41
9. Poultry manure -4 t/ha + Neem Cake -500kg/ha	101.32	10.06	29.24
10. Control	90.80	7.22	22.30
F- test	S	S	S
SEM (±)	0.59	0.19	0.30
CD (p = 0.05)	1.76	0.56	0.88

cause FYM promotes slow mineralization, nutrient availability, and soil moisture retention (Bonde *et al*. 2009).

Tillers/Hill

Observation of Tillers/hill were presented in (Table 1). Significantly higher Tillers/hill (10.06) along with the treatment was recorded. Poultry manure -4 t/ha + Neem Cake -500kg/ha. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (9.5) was determined to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha.

Plant dry weight (g/plant)

Observation of plant dry weight were presented in (Table 1). Significantly maximum dry weight (29.24 g/plant) was recorded with the treatment with Poultry manure -4 t/ha + Neem Cake -500kg/ha over the other treatments. However, treatment with Poultry manure -4 t/ha + Neem Cake -400kg/ha (28.41 g/plant) which were found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha in contrast to other treatments.

By stimulating crop vegetative development and increasing maximum plant dry weight, FYM treatment aids in increasing total biomass output in dry weight of plants (Agarwal *et al*. 2010).

Yield attributes and yield

Number of effective tillers

Observation of No. effective tillers were presented in (Table 2). Significantly maximum number of effective tillers (11.86) was recorded along with the treatment of application of Poultry manure -4 t/ha + Neem Cake -500kg/ha over all the treatments. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (11.19) which were found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha as compared to alternative methods of treatment.

The soil environment was improved through the application of organic manures, increasing the soil's long-term capacity to store water. In the end, there were more effective tillers and hills (Sandeep and Thomas 2018).

Grains/Spike

Observation of No. grains/spike were presented in (Table 2). Significantly maximum number of grains/ spike (54.17) was recorded alongside the treatment of application of Poultry manure -4 t/ha + Neem Cake -500kg/ha over all the treatments. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (53.43) and Poultry manure -4 t/ha + Neem Cake -300kg/ha (51.64) which were found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha as compared to other treatments.

Test weight (g)

Observation of test weight were presented in (Table

Table 2. Effect of organic nutrients and neem cake on yield attributes and yield of wheat.

Treatments	No. of effective tillers/hill	No. of grains/ spike	Test weight (g)	Grain yield (q/ha)	Stover yield (q/ha)	Harvest index (%)
1. FYM – 10t/ha + Neem Cake -300kg/ha	7.83	43.52	36.24	38.00	76.15	33.29
2. FYM – 10t/ha + Neem Cake -400kg/ha	8.93	45.41	37.44	41.64	80.51	34.09
3. FYM – 10t/ha + Neem Cake -500kg/ha	9.50	45.36	37.35	43.41	86.12	33.53
4. Vermicompost -4.5 t/ha + Neem Cake 300kg/ha	9.34	46.05	38.00	39.01	92.48	30.46
5. Vermicompost -4.5 t/ha + Neem Cake -400kg/ha	10.12	47.01	39.01	44.08	96.95	31.25
6. Vermicompost -4.5 t/ha + Neem Cake -500kg/ha	10.49	49.11	41.01	47.01	103.07	31.20
7. Poultry manure -4 t/ha + Neem Cake -300kg/ha	10.63	51.64	41.64	48.97	109.10	31.01
8. Poultry manure -4 t/ha + Neem Cake -400kg/ha	11.19	53.43	42.19	53.75	110.54	32.73
9. Poultry manure -4 t/ha + Neem Cake -500kg/ha	11.86	54.17	43.41	55.78	116.41	32.40
10. Control	7.85	44.85	38.19	42.19	79.23	34.77
F test	S	S	S	S	S	S
SEM (±)	0.25	1.42	0.50	0.74	2.45	0.59
CD (p = 0.05)	0.75	4.21	1.50	2.19	7.28	1.74

2). Significantly maximum test weight (43.91 g) was recorded with the treatment of application of Poultry manure -4 t/ha + Neem Cake -500kg/ha over all the treatments. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (42.19) which were found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha as compared to other treatments.

The effective use of organic manures and enhanced sustainable crop production may be responsible for the improvement in test weight. In two years of investigation, the same facts were discovered (Channabasanagowda *et al*. 2008).

Grain yield (q/ha)

Observation of grain yield were presented in (Table 2). Significantly maximum number of grain yield (55.78 q/ha) was recorded alongside the treatment of application of Poultry manure -4 t/ha + Neem Cake -500kg/ha over all the treatments. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (53.75 q/ha) which were found to be statistically at par with Poultry manure -4 t/ha + Neem Cake -500kg/ha in contrast to alternative 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).

Straw yield (q/ha)

Observation of straw yield were presented in (Table 2). Significantly maximum number of straw yield (116.41 q/ha) was captured along with the treatment of application of Poultry manure -4 t/ha + Neem Cake -500kg/ha over all the treatments. However, the treatments Poultry manure -4 t/ha + Neem Cake -400kg/ha (110.54 q/ha) which were found to be statistically at

par with Poultry manure -4 t/ha + Neem Cake -500kg/ha as compared to alternative methods of treatment.

The impact of FYM is a result of its role in giving more plant nutrients as well as improvements to the physical, chemical, and biological processes in the soil. Metabolites root activities increased resulting absorption of moisture and other nutrients enhanced resulting into higher production (Kumar *et al.* 2010 and Chauhan *et al*. 2010).

Harvest index (%)

Observation of harvest index were presented in (Table 2). Significantly maximum harvest index (34.77 %) was recorded with the treatment of application of Control over all the treatments. However, the treatments FYM – 10t/ha + Neem Cake -400kg/ha (34.09 %), FYM – 10t/ha + Neem Cake -500kg/ha (33.53) and FYM – 10t/ha + Neem Cake -300kg/ha (33.29) which were found to be statistically at par with Neem cake -1 t/ha + FYM-7.5t/ha as compared to other treatments.

CONCLUSION

It is concluded that application of treatment Poultry manure -4 t/ha + Neem Cake -500kg/ha was seen to be much higher Seed yield (55.78 q/ha), as compared to other treatments. Since, the findings based on the research done in one season.

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