International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 18s, 2025
https://theaspd.com/index.php

Growth, Productivity And Soil Health In Wheat (Triticum Aestivum L.) As Influenced By Organic And Inorganic Fertilizers

Amritpal singh[1], Dr.Baljinder singh[2], Chetna[3], Akashdeep Singh[4]
[1]Department of Agronomy Guru Kashi University ,Talwandi sabo
[2]Associate Professor, Department of Agronomy Guru Kashi University,Talwandi sabobaljindersds@gmail.com
[3]Department of Agronomy Guru Kashi University ,Talwandi sabo, kansalchetna7@gmail.com
[4]Department of Agronomy Guru Kashi University ,Talwandi sabo, akashdeepdhaliwal000001@gmail.com

Abstract
A field experiment entitled "Growth, productivity and soil health in wheat (Triticum aestivum L.) as influenced by organic and inorganic fertilizers" was conducted during rabi season of 2024-25 at Research Farm, Guru Kashi University, Talwandi Sabo, Bathinda (Punjab). The experiment was conducted in Randomized Complete Block Design (RCBD) with one control and 7 treatments with three replications. The treatments consisted of T_1: Control (No fertilizer), T_2: Recommended dose of fertilizer (RDF) {125 N: 62.5 P_2O_5: 30 K_2O kg ha^{-1}}, T_3: 50% RDF + Vermicompost @ 2 t/ha, T_4: 75% RDF + Vermicompost @ 2 t/ha, T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha, T_7: Vermicompost @ 5 t/ha, T_8: Farmyard manure (FYM) @ 10 t/ha. Results showed that recommended dose of fertilizer (RDF) and 75% RDF + Farmyard manure (FYM) @ 5 t/ha (T6) resulted in statistically similar growth parameters viz., plant height, leaf area index, number of tillers and yield attributes viz., number of effective tillers, number of grains/ear and 1000-grain weight in wheat. Treatment recommended dose of fertilizer (T2) recorded significantly higher grain and straw yield of wheat than other fertilizer treatments, however, it was statistically at par with 75% RDF + Farmyard manure @ 5 t/ha. (T6). The increase in grain yield with RDF was 42.9, 18.5, 13.5, 5.6, 3.4, 31.8 and 25.4% than the T1, T3, T4, T5, T6, T7 and T8, respectively. Farmyard manure (FYM) @ 10 t/ha alone and with RDF significantly improved the soil organic carbon, available nitrogen, phosphorous and potassium in soil than control.
Key words: *Grain yield, Organic, inorganic, soil health and wheat.*

INTRODUCTION

Wheat (Triticum aestivum L.) is the world's most important cereal crop used as a food grain. It ranks first in global cereal production and serves as a staple food for nearly one-third of the world's population (Hussain et al., 2002). In India, wheat is the second most important cereal after rice, contributing about 35% to the national food basket. It plays a vital role in ensuring food and nutritional security across the country. Wheat is a staple in the diets of people, particularly in major wheat-growing states, and is consumed in various forms such as chapatis, puris, cookies, dalia, upma, cakes, and biscuits. Nutritionally, wheat grain consists of approximately 13% water, 70% carbohydrates, 13–15% fiber, and 10% protein.

The combined use of organic and inorganic fertilizers represents a holistic production management system that sustains the health of soils, ecosystems, and people, offering long-term benefits to both human communities and the environment (Hans, 2014). This integrated approach promotes and enhances agro-ecosystem health by supporting biodiversity, biological cycles, and soil biological activity (Raahinipriya and Rani, 2018). Farmyard manure (FYM), as a major source of essential nutrients, contributes to the improvement of soil organic matter and the humus content of soil. It also fosters the activity of beneficial microorganisms, thereby enhancing nutrient availability for crops (Raghuwanshi et al., 2016). Vermicompost, produced through microbial composting of organic waste via earthworm activity, is rich in organic matter, organic carbon, macro- and micronutrients (N, P, K), as well as microbial and enzymatic activity (Pandey et al., 2017; Verma et al., 2017). Its application has been shown to improve nutrient availability and positively influence plant growth parameters, including increased plant height, number of tillers per plant, and effective tillers in wheat.Wheat is an exhaustive nutrient feeder and

requires a substantial supply of nutrients to achieve high productivity. In organic farming, limited nutrient availability during the conversion period is a major factor contributing to lower yields. Research indicates that using a combination of multiple organic nutrient sources is more effective than relying on a single source. Under current agricultural conditions, the balanced application of diverse organic formulations—such as solid and liquid organic manures and NPK liquid consortia—alongside sound agronomic practices, offers a sustainable strategy for enhancing wheat yields while maintaining soil fertility. Therefore, the present study aims to assess the response of combining inorganic fertilizers with organic manures in improving wheat productivity and soil health in Punjab.

MATERIAL AND METHODS

The present investigation entitled **"**Growth, productivity and soil health in wheat (Triticum aestivum L.) as influenced by organic and inorganic fertilizers**"** was carried out at Research Farm of Guru Kashi University, Talwandi Sabo (Bathinda) during rabi season of 2024-25. Talwandi sabo (Bathinda) is situated at 29°33' N latitude and 74°38' E longitude at a height of 208 metres above the mean sea level. The experimental site belongs to semi-arid climate, where both summers and winters are acute. A maximum temperature of about 45°C is common during summer, while freezing temperature accompanied by frost happening may be there in the months of December and January. The soil of the experimental field was loamy sand in texture which has pH 7.37 with normal electrical conductivity (0.26 dSm^{-1}). The soil was medium in organic carbon content (0.24%). The available nitrogen (120.1 kg ha^{-1}) was low, whereas the available phosphorus (18.0 kg ha^{-1}) and available potassium (229.3 kg ha^{-1}) were both medium. The experiment includes eight treatments viz., T_1: Control (No fertilizer), T_2: Recommended dose of fertilizer (RDF) {125 N: 62.5 P_2O_5: 30 K_2O kg ha^{-1}}, T_3: 50% RDF + Vermicompost @ 2 t/ha, T_4: 75% RDF + Vermicompost @ 2 t/ha, T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha, T_7: Vermicompost @ 5 t/ha, T_8: Farmyard manure (FYM) @ 10 t/ha, replicated thrice. The wheat variety 'PBW 826' was sown at 8 cm depth with a seed drill at row spacing of 22.5 cm on November 29, 2024. Seed rates of 100 kg ha^{-1} for wheat was used. Organic and inorganic fertilizers were applied, as per treatment. N, P, K nutrients were applied through urea (46% N), DAP (18% N, 46% P2O5) and MOP (60% K2O) fertilizers. One hand hoeing was given with the help of wheel hoe at 30 DAS. Weeds in the rows of wheat crop were removed with the help of khurpa after the hand hoeing. Wheat was sprayed with Tilt 25 EC (Propiconazole) @ 500 ml ha^{-1} to control yellow rust and Rogor 30 EC (dimethoate) @ 375 ml ha^{-1} for control of aphid at ear head stage of wheat. The harvesting of wheat was done manually from the net plot area. The harvested crop was tied in well labeled bundles and kept for sun drying. Then the threshing was carried out. The weather data during crop season has been presented in Fig 1. The total rainfall received during the crop season was 45.8 mm. The maximum mean weekly rainfall of 18.2 mm was observed during 7th standard meteorological week. A maximum of 62.7 mm and minimum of 5.2 mm evaporation was recorded during 14th and 49th standard meteorological week, respectively. Weekly sunshine hours ranged from 2.4 to 8.1 hours during 1st and 11th standard meteorological week, respectively.

Five plants per plot were selected randomly to measure the height from ground level to the tip of longest leaf at 30 days after sowing (DAS), up to the base of top most fully opened leaf at 60 DAS, up to the base of flag leaf at 90 DAS and up to the base of the ear at harvest. Total number of tillers per m row length was recorded at 60 and 90 DAS and at harvest from two sites in each plot. Periodic leaf area was recorded at 60 and 90 DAS by using leaf area meter. For this purpose, all the leaves were taken from a half metre row length at two random places in each plot. The leaves were divided into three categories i.e. small, medium and large. From these leaves, two representative leaves for each category were chosen and preserved in paper folds. Then all the leaves were counted category wise. Average leaf area for leaf in each category was determined using leaf area meter. Effective tillers per metre row length from two spots in each plot were counted and converted into m^2 at harvest. One thousand grains from produce of each plot were taken and their weight was recorded. The thousand grain weight was expressed in grams. For biological yield, the total produce was weighed in bundles after harvesting and threshed thereafter. The weight of grains was recorded. The straw weight was obtained after deducting the weight of grains from

total bundle weight. Grain and straw yield were computed and expressed as quintal ha^{-1}. HI was calculated by dividing economic (grain) yield by the total biological (grain + straw) yield and expressed as percentage.

$$HI\ (\%) = \frac{\text{Economic yield}}{\text{Biological yield (Grain + Straw)}} \times 100$$

Analysis of variance was performed using Proc GLM procedure of SAS version 9.4 (SAS. 2017) and significant mean differences were tested using Fisher's protected least significant difference (LSD) test at $\alpha = 0.05$.

RESULTS AND DISCUSSION

Effect on growth

Analysed data revealed that the plant height of wheat was significantly influenced by different fertilizer management practices (Table 1). However, at 30 DAS, the plant height was not significantly influenced by different organic and inorganic fertilizers. At 60, 90 DAS and at maturity, maximum plant height of wheat was recorded under T_2: Recommended dose of fertilizer (RDF) treatment and it was statistically at par with the plant heights of wheat recorded under the treatments T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha, T_7: Vermicompost @ 5 t/ha and T_8: Farmyard manure (FYM) @ 10 t/ha at 90 DAS and with T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha and T_8: Farmyard manure (FYM) @ 10 t/ha at harvest and was significantly superior to rest of the treatments at all stages. Data revealed that the number of tillers of wheat was significantly influenced by different fertilizer management practices (Table 2). At 60 and 90 DAS and at harvest, T_2: Recommended dose of fertilizer (RDF) treatment recorded the highest number of tillers per m row length of wheat which was significantly higher than other treatments of fertilizer application and but it was statistically at par with the T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha and T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha treatments.

T_2: Recommended dose of fertilizer (RDF) treatment exhibited the higher values of leaf area index in wheat which was significantly higher than other treatments and but it was statistically at par with T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha and T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha treatments (Table 3). The significant increase in LAI with application of chemical and FYM fertilizers than unfertilized control might be due to supply of available nutrients to the plants with decomposition and mineralization of the manure.

Effect on yield and yield attributes

The highest number of effective tillers per m row length, number of grains per ear and 1000-grain weight of wheat were recorded in T_2: Recommended dose of fertilizer (RDF) treatment which was significantly higher than other treatments and but it was statistically at par with T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha and T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha treatments (Table 4). The highest number of effective tillers per m row length was recorded with the application of chemical fertilizers (RDF) and it was statistically at par with FYM treatments. This might be due to the proper supply of readily available nutrients in required amount with the chemical fertilizers.

Treatment T_2: Recommended dose of fertilizer (RDF) recorded the highest grain yield of wheat which was significantly higher than other fertilizer treatments and it was statistically at par with T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha (Table 4). The increase in grain yield with recommended fertilizers was 42.9, 18.5, 13.5, 5.6, 3.4, 31.8 and 25.4% than the T_1, T_3, T_4, T_5, T_6, T_7 and T_8, respectively. The grain yield was positively correlated with the numbers of effective tillers per m row length and number of grains per spike. The T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha gave significantly lower grain yield (47.5 q ha^{-1}) than the chemical fertilizers (RDF) however it gave significantly higher grain yield than the T_3: 50% RDF + Vermicompost @ 2 t/ha, T_4: 75% RDF + Vermicompost @ 2 t/ha, T_7: Vermicompost @ 5 t/ha, T_8: Farmyard manure (FYM) @ 10 t/ha and the control. The similar results have been reported by Kharub and Chander (2010) who compared the chemical fertilizers with FYM supplying nitrogen equivalent to the chemical fertilizers. All chemical and organic fertilizer treatments were significantly better than the unfertilized control. Sole vermicompost and in combination i.e. T_3: 50% RDF +

Vermicompost @ 2 t/ha and T_4: 75% RDF + Vermicompost @ 2 t/ha were not able to give the grain yield equivalent to the recommended chemical fertilizers. The increase in FYM levels resulted in increase in grain yield of wheat. The lowest grain yield of 28.7 q ha^{-1} under unfertilized control indicated the inherent potential of soil. The increase in grain yield was due to the cumulative effect of subsequent increase in all the yield attributing characters. The recommended chemical fertilizers and increasing FYM levels increased the number of effective tillers per m row length and number of grains per ear. The higher availability of nitrogen to the plants increased the grain yield significantly. The recommended chemical fertilizers supplied readily available nitrogen to the crops throughout the growing period whereas nutrient release from FYM is a slow process. So the availability of nitrogen might be less with the FYM application. The 50% RDF + Farmyard manure (FYM) @ 5 t/ha was unable to meet the required amount of N to wheat and resulted in significantly lower grain yields than that with RDF.

T_2: Recommended dose of fertilizer (RDF) treatment exhibited the highest straw yield of wheat which was significantly higher than other fertilizer treatments but it was statistically at par with T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha and T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha (Table 4). Control crop produced significantly lower straw yield (39.5 q ha^{-1}) than the all of the FYM, vermicompost treatments and recommended chemical fertilizers. Organic and inorganic fertilizers treatments had significant effect on harvest index of wheat (Table 4). T_1: Control, T_2: Recommended dose of fertilizer (RDF), T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha and T_7: Vermicompost @ 5 t/ha treatments results in statistically similar harvest indices of wheat. The lowest values of harvest index were observed in T_3: 50% RDF + Vermicompost @ 2 t/ha. The results corroborated the findings of Dhar et al (2010).

Effect on soil health

The soil pH and electrical conductivity did not differ significantly due to different fertilizer treatments, however, organic carbon was significantly influenced by fertilizer treatments (Table 5). T_8: Farmyard manure (FYM) @ 10 t/ha gave significantly higher organic carbon than the other treatments, however, it was statistically at par with T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha and T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha. The similar results were also found by Kaltia (2003). It might be due to the application of high amount of FYM to the surface soil. All fertilizer containing treatments gave higher organic carbon than unfertilized control. The available nitrogen was significantly higher with the T_8: Farmyard manure (FYM) @ 10 t/ha than RDF (Chemical fertilizers) and control crop, however, T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha and T_8: Farmyard manure (FYM) @ 10 t/ha treatments were statistically at par with each other for available nitrogen. This might be due to the application of FYM which caused slow release of available nitrogen, whereas the inorganic nitrogen in chemical fertilizers might have lost by leaching and volatilization. The plant uptake of nitrogen was also significantly higher with chemical fertilizers. The results are supported by the findings of Shivakumar and Ahlawat (2008). Application of FYM caused significant increase in available nitrogen status of the soil than unfertilized control. Treatments T_4: 75% RDF + Vermicompost @ 2 t/ha, T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha and T_8: Farmyard manure (FYM) @ 10 t/ha resulted in statistically at par available phosphorus with each other. The higher phosphorus under FYM treatments might be due to the application time of fertilizer and FYM to the soil. The chemical fertilizers and FYM were applied to the soil in November and soil samples were taken at harvest i.e. in April for analysis. In the month of November the cool climate might have resulted in the lower availability of the phosphorus, whereas it might have increased in the month of April due to high temperature. The T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha) had significantly higher available potassium (238.2 kg ha^{-1}) than the chemical fertilizers and unfertilized control. The similar results were reported by Liu et al (2010). Shivakumar and Ahlawat (2008) also reported a significant increase in available potassium with the application of FYM than unfertilized control. T_4: 75% RDF + Vermicompost @ 2 t/ha, T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha, T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha and T_8: Farmyard manure (FYM) @ 10 t/ha resulted in statistically at par available potassium with each other. The more residual potassium in case of FYM and higher potassium uptake in case of chemical fertilizer might be the reason behind lower available potassium under chemical fertilizers.

CONCLUSION

It may be concluded that the application of the recommended dose of fertilizer (RDF) and 75% RDF combined with farmyard manure (FYM) at 5 t/ha (T_6) produced statistically similar growth parameters in wheat. However, the RDF treatment (T_2) recorded significantly higher grain and straw yields compared to other fertilizer treatments, and was statistically at par with T_6. The grain yield increase under RDF was 42.9%, 18.5%, 13.5%, 5.6%, 3.4%, 31.8%, and 25.4% higher than treatments T_1, T_3, T_4, T_5, T_6, T_7, and T_8, respectively. Furthermore, the application of FYM at 10 t/ha, either alone or in combination with RDF, significantly enhanced soil organic carbon as well as available nitrogen, phosphorus, and potassium levels compared to the control.

REFERENCES

1. Dhar S, Kumar A and Rai R K (2010) Productivity of wheat (Triticum aestivum) as influenced by different sources and levels of nutrients in wheat-mungbean (Vigna radiata)-maize (Zea mays) cropping system. Proc XIX National Symposium on Resource Management Approaches towards Livelihood Security. Pp. 28. Bengaluru, Karnataka, India. December 2-4.
2. Hans, V.B. (2014) Climate change and Indian agriculture. EPRA International Journal of Climate and Economic Resource Review **2**: 62–67.
3. Hussain M I, Shah S H, Hussain S and Iqbal K (2002) Growth, yield and quality response of three wheat (Triticum aestivum L .) varieties to different levels of N, P and K. Int J Agric Biol **4**: 362-64.
4. Kaltia U (2003) Integrated nutrient management in durum wheat. Ph. D. dissertation. Department of Agronomy, CCSHAU, Hisar, India.
5. Kharub A S and Chander S (2010) Integrated plant nutrient supply in rice (Oryza sativa)-wheat (Triticum aestivum) system. Indian J Agric Sci **80**: 282-86.
6. Liu E, Yan C, Mei X, He W, Bing S H, Ding L, Liu Q, Liu S and Fan T (2010) Long-term effect of chemical fertilizer, straw and manure on soil chemical and biological properties in northwest China. Geoderma **158**: 173-80.
7. Pandey, A., Li, F., Askegaard M. and Olesen, J.E. (2017) Biological nitrogen fixation in three long-term organic and conventional arable crop rotation experiments in Denmark. European Journal of Agronomy **90**: 87–95.
8. Raahinipriya, P. and Rani, R.J. (2018) Consumers' purchasing behaviour towards organic products in Karur district, Tamil Nadu. International Journal of Farm Sciences **8**(3): 96–98.
9. Raghuwanshi, P., Khaddar, V.K. and Bhanger, K.S. (2016) Changes in status of organic carbon, available nitrogen and bacterial population in soils with organic manures. Annals of Plant and Soil Research **18**(4): 366–369.
10. SAS. (2017). Version 9.4. Inc Cary (NC, USA.): SAS Institute.
11. Shivakumar B G and Ahlawat I P S (2008) Integrated nutrient management in soybean (Glycine max) wheat (Triticum aestivum) cropping system. Indian J Agron **53**: 273-278.
12. Verma, H.P., Sharma, O.P., Kumar, R., Yadav, S.S., Shivran, A.C. and Balwan, (2017) Yield attributes and yield of wheat (Triticum aestivum L.) as influenced by irrigation scheduling and organic manures. Chemical Science Review and Letters **6** (23): 1,664–1,669.

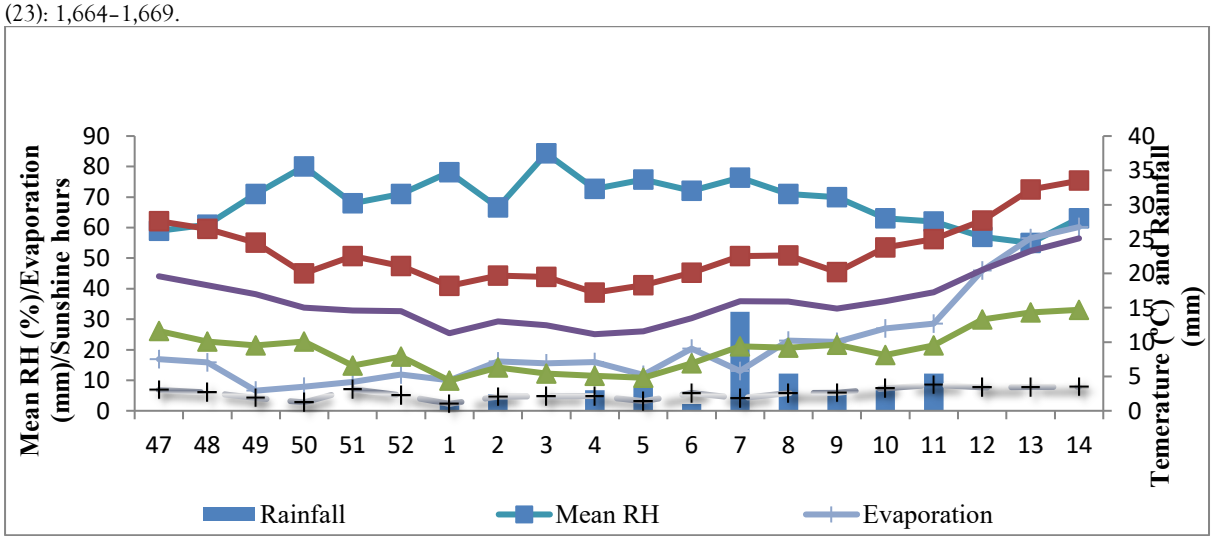

Fig. 1: Weekly meteorological data during crop season 2024-25 (Rabi)

Table 1: Effect of organic and inorganic fertilizers on periodic plant height of wheat

Treatment	Plant height (cm)			
	30 DAS	60 DAS	90 DAS	At harvest
T_1: Control (No fertilizer)	10.1	26.2	55.5	88.7
T_2: Recommended dose of fertilizer (RDF)	12.8	35.2	68.4	102.1
T_3: 50% RDF + Vermicompost @ 2 t/ha	12.1	33.1	65.1	95.6
T_4: 75% RDF + Vermicompost @ 2 t/ha	12.5	34.2	66.0	96.9
T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha	12.0	33.5	67.2	99.5
T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha	12.1	34.0	67.8	99.8
T_7: Vermicompost @ 5 t/ha	12.3	32.7	67.1	97.4
T_8: Farmyard manure (FYM) @ 10 t/ha	12.1	33.1	68.2	98.8
SEm ±	0.1	0.3	0.5	1.4
CV (%)	5.5	11.2	9.8	9.3
CD (P=0.05)	NS	0.9	1.6	4.2

Table 2: Effect of organic and inorganic fertilizers on periodic number of tillers per m row length of wheat

Treatment	Number of tillers per m row length		
	60 DAS	90 DAS	At harvest
T_1: Control (No fertilizer)	120.2	110.5	108.1
T_2: Recommended dose of fertilizer (RDF)	142.8	138.2	137.3
T_3: 50% RDF + Vermicompost @ 2 t/ha	128.4	120.1	117.8
T_4: 75% RDF + Vermicompost @ 2 t/ha	131.5	129.1	125.4
T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha	139.5	136.8	134.9
T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha	140.7	137.3	135.8
T_7: Vermicompost @ 5 t/ha	126.3	122.8	117.3
T_8: Farmyard manure (FYM) @ 10 t/ha	129.8	127.7	126.0
SEm ±	1.3	1.8	2.1
CV (%)	6.7	12.3	13.1
CD (P=0.05)	4.1	5.4	6.5

Table 3: Effect of organic and inorganic fertilizers on leaf area index in wheat

Treatment	Leaf area index	
	60 DAS	90 DAS
T_1: Control (No fertilizer)	1.80	3.35
T_2: Recommended dose of fertilizer (RDF)	3.82	5.33
T_3: 50% RDF + Vermicompost @ 2 t/ha	2.63	4.45
T_4: 75% RDF + Vermicompost @ 2 t/ha	2.95	4.60
T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha	3.47	5.20
T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha	3.56	5.28
T_7: Vermicompost @ 5 t/ha	2.40	4.40
T_8: Farmyard manure (FYM) @ 10 t/ha	3.02	4.75
SEm ±	0.20	0.16
CV (%)	5.50	5.20
CD (P=0.05)	0.60	0.48

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 18s, 2025
https://theaspd.com/index.php

Table 4: Effect of Effect of organic and inorganic fertilizers on number of effective tillers per m row length in wheat

Treatment	Number of effective tillers per m row length	Number of grains per ear	1000-grain weight (g)	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (HI)
T_1: Control (No fertilizer)	98	35.5	38.1	28.7	39.5	42.1
T_2: Recommended dose of fertilizer (RDF)	134	49.2	41.4	50.3	68.2	42.4
T_3: 50% RDF + Vermicompost @ 2 t/ha	110	40.4	35.5	41.0	62.1	39.8
T_4: 75% RDF + Vermicompost @ 2 t/ha	116	42.2	36.2	43.5	62.5	41.0
T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha	129	46.1	42.2	47.5	65.2	42.1
T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha	131	46.9	43.9	48.6	65.7	42.5
T_7: Vermicompost @ 5 t/ha	112	42.8	40.2	34.3	46.8	42.3
T_8: Farmyard manure (FYM) @ 10 t/ha	120	44.5	40.7	37.5	55.8	40.2
SEm ±	2	8.8	1.0	0.8	1.5	0.3
CV (%)	7.5	0.8	5.5	10.1	12.3	5.5
CD (P=0.05)	8	2.5	3.1	2.5	4.5	1.1

Table 5: Effect of organic and inorganic fertilizers on soil pH, electrical conductivity and organic carbon in soil

Treatment	Soil pH	Electrical conductivity (dS m^{-1})	Organic carbon (%)	Available nitrogen (kg ha^{-1})	Available phosphorus (kg ha^{-1})	Available potassium (kg ha^{-1})

T_1: Control (No fertilizer)	7.32	0.25	0.24	108.4	14.8	226.5
T_2: Recommended dose of fertilizer (RDF)	7.34	0.24	0.25	117.1	31.7	228.9
T_3: 50% RDF + Vermicompost @ 2 t/ha	7.33	0.26	0.25	118.5	30.2	232.1
T_4: 75% RDF + Vermicompost @ 2 t/ha	7.34	0.25	0.26	118.9	32.1	234.5
T_5: 50% RDF + Farmyard manure (FYM) @ 5 t/ha	7.35	0.24	0.28	125.9	35.5	237.8
T_6: 75% RDF + Farmyard manure (FYM) @ 5 t/ha	7.33	0.25	0.29	127.2	36.2	238.2
T_7: Vermicompost @ 5 t/ha	7.35	0.26	0.26	119.8	29.8	230.5
T_8: Farmyard manure (FYM) @ 10 t/ha	7.34	0.25	0.30	130.5	34.7	237.8
SEm ±	0.03	0.02	0.01	1.5	1.7	1.3
CV (%)	5.3	5.1	6.2	5.2	5.2	7.6
CD (P=0.05)	NS	NS	0.03	4.5	5.1	4.1