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Effect of different manures on yield, attributes of wheat (*Triticum aestivum* L.)

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Abstract
The field experiment entitled "Effect of Different Manures and Fertilizers on Productivity of Wheat (*Triticum aestivum* L.) & Soil Properties." will be carried out at Agricultural Research Farm, College of Agriculture, Indore during *rabi* season of 2022-23.in randomized block design (RBD) with three replications. Along with 8 treatments T_1 100% RDF (120:60:40 Kg/ha of N,P2O5 and K2O respectively), T_2- RDF with10% equivalent N substituted by FYM from basal dose of N, T_3- RDF with 10% equivalent N substituted by Vermicompost from basal dose of N,T_4-RDF with 10% equivalent N substituted by Poultry manure frombasal dose of N, T_5- RDF with 10% equivalent N substituted by Neem cake from basal dose of N, T_6-RDF with 10% equivalent N substituted by Karanj cake from basal dose of N, T_7-RDF with 10% equivalent N substituted by Castor cake from basal dose of N and T_8-Control(90% of recommended Nitrogen with recommended P and K)The significantly highest grain yield (t/ha) (5.01 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N).The significantly lowest grain yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (3.08 t/ha) respectively. Highest biological yield (t/ha) (13.07 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N) (12.60 t/ha) and T_4 (RDF with 10% equivalent N substituted by Poultry manure from basal dose of N) (12.24 t/ha). The significantly lowest biological yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (8.15 t/ha) respectively.

Keywords: Wheat, *Triticum aestivum*, manures, fertilizers, FYM, vermicompost, poultry manure

Introduction
Wheat (*Triticum aestivum* L.) is the most important staple food of about 36% of the world population and improvement in its productivity has played a key role in making the country self-sufficient in food grains (Tiwari *et al*., 2017) [6]. Wheat is an annual grass that belongs to the Poaceae family and is scientifically known as *Triticum spp.* The crop is typically planted in the fall and harvested in the summer, although the exact timing may vary depending on the climate and growing conditions. Wheat is one of the chief sources of diet by providing half of the dietary protein and more than half of the calories to the rising population of India. As a consequence, scientists are always focusing to produce higher yields to feed the nation (Khan *et al*., 2015) [3].

Wheat is cultivated in at least 63 countries of the world. The leading countries in wheat cultivation are China, India, Russia, U.S.A and Canada (IWPS, 2022) [2]. Total world production of wheat was 772 million tons an on area of 218 million hectares with a productivity of 2960 kg ha^{-1} (IWPS, 2022) [2].

Wheat is the most important staple food in the world and is the second important cereal crop after rice in India. It is cultivated in 31.61 million ha area with an annual production of about 109.52 million tonnes and an average productivity of 3464 kg/ha (GOI, 2021).

Madhya Pradesh covers about 6551 thousand ha area and 19607.14 thousand metric tons production with a productivity of 2993 kg/ha (Anonymous, 2021) [1].

The nutrient management of plants is one of the most important factors determining ultimate crop productivity. Long-term studies reveal that crop productivity is declining even after applying recommended dose of NPK fertilizers (Yadav and Kumar, 2009) [4]. The wheat crops exhibit substantial economic response on high fertility levels. The productivity may be further enhanced by increase in nutrient doses of NPK fertilizers (Singh, 2016) [5]. Integrated use of organic and inorganic sources of nutrient may support enhanced yield of wheat (Kumar *et al*., 2013) [4]

Materials and Methods

Field experiment was conducted at Agricultural Research Farm, College of Agriculture, Indore during *rabi* season of 2022-23. Geographical Situation and Normal Climate and Weather Condition of Indore is located in western Madhya Pradesh, India. It has a semi-arid subtropical climate. The city sits at an elevation of 553 meters above sea level. Indore is situated at 22.43° north latitude and 75.66° east longitude. The average yearly rainfall is 950 mm. Most of the rain falls during the monsoon season from mid-June to mid- September. Weather conditions during the crop growth season are detailed information of weekly total rainfall, temperature, relative humidity and wind velocity during crop season (12th December, 2022 to 02nd April, 2023) were recorded properly at the meteorological observatory under Meteorological department, College of Agriculture, Indore The weekly mean maximum and minimum temperature during crop growth varied from 6.29 to 22.75 °C and 21.14 to 36.89 °C, respectively. The maximum temperature was recorded 36.89 °C (Week No. 13) whereas minimum temperature was recorded 6.29°C (Week No 03), respectively.

1. Grain yield (t/ha)

The significantly highest grain yield (t/ha) (5.01 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N) (4.91 t/ha) and T_4 (RDF with 10% equivalent N substituted by Poultry manure from basal dose of N) (4.79 t/ha). The significantly lowest grain yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (3.08 t/ha) respectively.

The treatment of T_1 (100% RDF) recorded the highest grain yield of 5.01 t/ha among all the treatments tested. This superior performance of T_1 can be attributed to the balanced and optimum supply of major nutrients nitrogen, phosphorus and potassium to the wheat crop through the recommended inorganic fertilizer doses alone. The full doses of NPK ensured that there was no deficiency of any essential nutrient throughout the crop growth period. This led to maximized vegetative growth in terms of plant height, number of tillers and developed spikes.

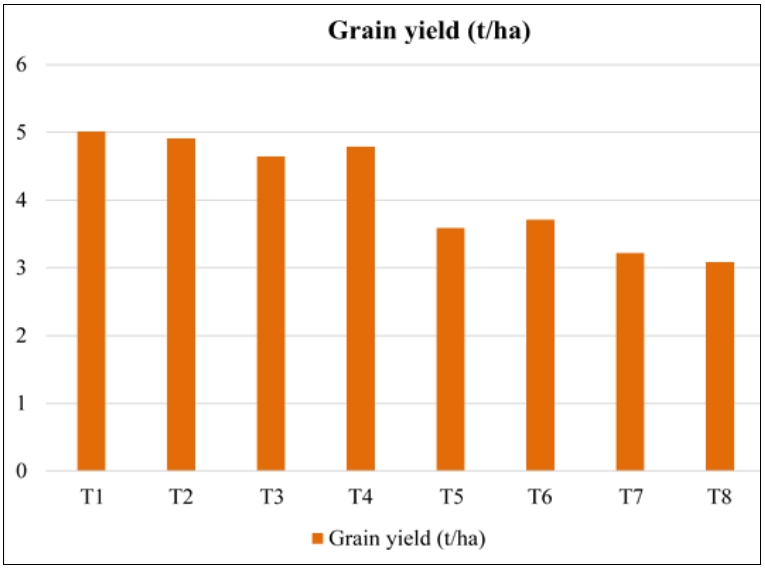

Fig 1: Effect of different manures and fertilizers on grain yield (t/ha)

Table 1: Effect of different manures and fertilizers on grain yield (t/ha)

Tr. No.	Treatment details	Grain yield (t/ha)
T_1	100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively	5.01
T_2	RDF with 10% equivalent N substituted by FYM from basal dose of N	4.91
T_3	RDF with 10% equivalent N substituted by Vermicompost from basal dose of N	4.64
T_4	RDF with 10% equivalent N substituted by Poultry manure from basal dose of N	4.79
T_5	RDF with 10% equivalent N substituted by Neem cake from basal dose of N	3.59
T_6	RDF with 10% equivalent N substituted by Karanj cake from basal dose of N	3.71
T_7	RDF with 10% equivalent N substituted by Castor cake from basal dose of N	3.22
T_8	Control (90% of recommended Nitrogen with recommended P and K)	3.08
	Sem ±	0.39
	CD (0.05) =	1.19

2. Biological yield (t/ha)

The significantly highest biological yield (t/ha) (13.07 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N) (12.60 t/ha) and T_4 (RDF with 10% equivalent N substituted

by Poultry manure from basal dose of N) (12.24 t/ha). The significantly lowest biological yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (8.15 t/ha) respectively.

The highest biological yield (t/ha) was recorded in the T_1 treatment (100% RDF) because it provided optimal and balanced nutrition to the wheat crop by applying the recommended doses of nitrogen, phosphorus, and potassium fertilizers fully through chemical fertilizers. This ensured adequate and timely availability of all the required nutrients to the crop, allowing it to achieve its full yield potential. Treatments involving substitution with organic manures or deficient N application resulted in lower yields due to sub-optimal nutrition availability.

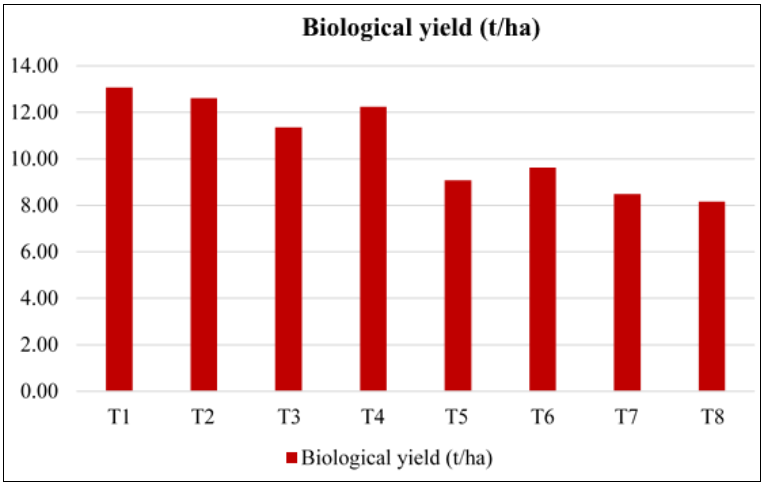

Fig 2: Effect of different manures and fertilizers on biological yield (t/ha)

Table 2: Effect of different manures and fertilizers on biological yield (t/ha)

Tr. No.	Treatment details	Biological yield (t/ha)
T_1	100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively	13.07
T_2	RDF with 10% equivalent N substituted by FYM from basal dose of N	12.60
T_3	RDF with 10% equivalent N substituted by Vermicompost from basal dose of N	11.35
T_4	RDF with 10% equivalent N substituted by Poultry manure from basal dose of N	12.24
T_5	RDF with 10% equivalent N substituted by Neem cake from basal dose of N	9.08
T_6	RDF with 10% equivalent N substituted by Karanj cake from basal dose of N	9.62
T_7	RDF with 10% equivalent N substituted by Castor cake from basal dose of N	8.48
T_8	Control (90% of recommended Nitrogen with recommended P and K)	8.15
	Sem ±	0.87
	CD (0.05) =	2.65

Conclusion

The significantly highest grain yield (t/ha) (5.01 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N) (4.91 t/ha) and T_4 (RDF with 10% equivalent N substituted by Poultry manure from basal dose of N) (4.79 t/ha). The significantly lowest grain yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (3.08 t/ha) respectively. highest biological yield (t/ha) (13.07 t/ha) was recorded with treatment T_1 (100% RDF (120:60:40 Kg/ha of N, P2O5 and K2O respectively)) which was at par with T_2 (RDF with 10% equivalent N substituted by FYM from basal dose of N) (12.60 t/ha) and T_4 (RDF with 10% equivalent N substituted by Poultry manure from basal dose of N) (12.24 t/ha). The significantly lowest biological yield (t/ha) was recorded in treatment T_8 (Control (90% of recommended Nitrogen with recommended P and K)) (8.15 t/ha) respectively

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