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Effect of different source of fertilizers on yield and economics of wheat

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Abstract
The experiment was conducted at Crop Research Cafeteria, School of Agricultural sciences, G.H. Raisoni University, Chhindwara (M.P.). The experiment was laid out in Randomized Block Design (RBD) with six treatments and three replications. The treatment detail is T_1 Control, T_2 100% RDF, T_3 100% RDF + farm yard manure @1t/ha, T_4 75% RDF + farm yard manure@ 1t/ha, T_5 50% RDF + farm yard manure @1t/ha, T_6 100% RDF + farm yard manure @1t/ha + PSB, T_7 75% RDF + farm yard manure @1t/ha + PSB and T_8 50% RDF + farm yard manure @1t/ha + PSB. Integrated use of chemical compost manure showed a significant impact on the yield and economics of wheat. The results revealed that the application of 100% RDF + farm yard manure @ 1 t/ha + PSB showed a significant positive impact on grain produce (Kg ha-1), straw produce (Kg ha-1) and gross monetary profit, net profit and Benefit cost ratio.

Keywords: Wheat, urea, yield and economics

Introduction
Wheat is an important cereal crop belongs to family “Poaceae” and genus “Triticum”. It is the world's most important cereal crop, accounting for 30% of all cereal food produced globally and is a staple food for nearly 10 billion people in 43 nations. It has been under cultivation in the Indian subcontinent from pre-historic times and is an integral part of country’s economy and food security. Wheat accounts for almost 55% of all carbohydrates and 20% of all dietary calories consumed globally. In India wheat is grown in an area of about 29.58 million hectares with the production of 99.70 million tonnes and the productivity of 33.71 q ha-1 (Anonyms, 2018) [1]. Wheat is grown in India on 31.61 m ha and produces of 109.52 m t with national average productivity of 3.46 t ha^{-1} during 2020-21 (Anonymous, 2021a).In Madhya Pradesh wheat is a major cereal crop of Rabi season. Wheat is one important crop of Chhattisgarh and the cropping system of the state is mainly rain dependent. In Chhattisgarh, wheat occupies an area (3.6 m ha) and average productivity of 1.6 t ha^{l} (Anonymous, 2021) [1].
Organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection.
Biofertilizers are not chemical fertilizers rather these are carrier based preparations containing beneficial microorganisms and when incorporated in soil, enhance specific microbial growth in rhizosphere, play vital role in nutrient mineralization, increase nutrient accumulation ultimately increase crop yield without any deterioration of nature. Biofertilizers reduce chemical fertilizer use thus improve soil fertility and minimize cost of production. The inoculation of seeds with Rhizobium is known to efficiently increase nodulation, nitrogen uptake, growth and yield parameters of wheat.

Material and Methods

The present research entitled "Effect of different source of fertilizers on yield and economics of wheat" was carried out during *Rabi* season of 2022 at the Crop Research Cafeteria, School of Agricultural sciences, G.H. Raisoni University, Chhindwara (M.P.). The details of materials used in the experimentation, and the techniques adopted during the course of investigation are described in this chapter. The details of observation taken in the field as well as in the chemical determination performed in the laboratories are also presented. Location and the climate meteorological data including maximum and minimum temperature, mean relative humidity, rainfall and evaporation during the period of experimentation were recorded at the meteorological observatory, G.H Raisoni University, during the crop growth period from 26th Nov, 2022 to 14th Mar, 2023. The data reveals that season witnessed a rainfall of 59.00 mm during the crop growth period during Rabi 2022. Soil Characteristics of experimental field. The topography of field was uniform and gentle slope with adequate drainage facilities. The soil sample was taken randomly from the experimental field before sowing of the crop at the depth of 15 cm. These samples were mixed together and a composite soil sample was drawn for chemical analysis.

Grain yield (kg ha-1)

The grain yield per net plot was recorded after winnowing the produce and sun drying with the help of double pan balance. Finally, grain yield of each plot was converted into grain yield kg h-1 by multiplying with appropriate conversion factor.

Straw yield (kg ha-1)

The straw yield was recorded by deducting the grain yield (economic yield) of each plot from the biological yield (bundle weight) of the same plot. This was later converted into straw yield kg ha-1 by multiplying with same conversion factor which was used in case of grain yield kg ha-1.

Harvest index (%)

It refers to the ratio of economic yield (grain yield) in the biological yields (grain + straw yields) and it is expressed under a particular treatment in percentage. It was worked out for each plot by using the following formula (Donald, 1962) [7].

$$\text{Harvest index (\%)} = \frac{\text{Economic yield (kg ha}^{-1})}{\text{Biological yield (kg ha}^{-1})} \times 100$$

Net return and B-C ratio. Gross return was calculated by multiplying the total grain and straw yield with prevalent market prices of the items and then presented on per hectare basis as per treatments. Net return was computed by deducting the total cost of cultivation from the gross return as per treatments. Net return (ha-1) = Gross return (ha-1)- Cost of cultivation (ha-1).

$$\text{B-C ratio} = \frac{\text{Net return (ha)}}{\text{Total cost (ha)}}$$

Result and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

Grain yield (q/ha)

Data presenting to seed yield (kg ha-1), straw yield (kg ha-1) and harvest index (%) is presented in Table 1. The function of various growth and yield parameters like crop dry matter accumulation, number of grains plant-1 and test weigh. Among all the treatments, the maximum grain yield (4463 kg ha-1), straw yield was maximum (6099 kg ha-1) and harvest index (43.48%) in T_6 where 100% RDF + farm yard manure @ 1t/ha + PSB which significantly superior than other treatments and minimum grain yield (2122 kg ha-1) was recorded under T_1.

The application of 100%RDF+ farm yard manure @ 1t/ha + PSB (T_6) resulted in significantly maximum grainand strawyield over rest of other treatments. These results are concomitant with the findings of Akther *et al.,* (2018), Astaneh *et al.,* (2018) [8] and Gomaa *et al.,* (2018) [9].

Table 1: Effect of integrated nutrient management on grain, straw yield ha-1, harvest index of wheat

T. No.	Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	HI (%)
T_1	Control	2,122	3,735	36.23
T_2	100% RDF	3,766	5,776	39.49
T_3	100% RDF + farm yard manure @ 1t/ha	4,172	5,841	41.67
T_4	75% RDF + farm yard manure @ 1t/ha	3,986	6,099	39.53
T_5	50%RDF + farm yard manure @ 1t/ha	3,757	5,635	40.00
T_6	100%RDF+ farm yard manure @ 1t/ha +PSB	4,463	5,802	43.48
T_7	75%RDF + farm yard manure @ 1t/ha +PSB	4,073	5,973	40.56
T_8	50%RDF+ farm yard manure @ 1t/ha +PSB	3,884	5,890	39.74
	SEm±	34	89	0.27
	CD (P=0.05)	105	273	0.84

Effect on economics

The net monetary returns under each treatment was determined by subtracting the cost of cultivation from gross monetary returns (GMR) of the particular treatment. The treatment wise values, thus obtained, are presented in the Table 2. It is obvious from the data that NMR was minimum (19944 Rs/ha) under T_1 (Control). However, it was increased with the application of different nutrients. The NMR was maximum (63202 Rs/ha) under 100%RDF+ farm yard manure @ 1t/ha + PSB (T_6).

Benefit-cost ratio

It refers to net monetary gain under a particular treatment with each rupee of investment. The benefit-cost ratio as affected by the different treatments is depicted in Table 2. It is evident from the data that B:C ratio was lowest (1.76) under application of Control (T_1) and maximum (2.87) under application of 100% RDF+ farm yard manure @ 1t/ha + PSB (T_6). The results are well supported by the findings of Kannoj *et al.,* (2022) [3] and Bagri *et al.* (2022) [2].

Table 2: Effect of integrated nutrient management on economic analysis of wheat

T. No.	Treatments	Cost of cultivation	Gross monetary returns	Net monetary returns	B:C
		..……Rs/ha……..			
T_1	Control	26210	46154	19944	1.76
T_2	100% RDF	31268	81911	50642	2.62
T_3	100% RDF + farm yard manure @ 1t/ha	33268	90741	57473	2.73
T_4	75% RDF + farm yard manure @ 1t/ha	32004	86696	54692	2.71
T_5	50%RDF + farm yard manure @ 1t/ha	30739	81715	50976	2.66
T_6	100%RDF+ farm yard manure @ 1t/ha +PSB	33868	97070	63202	2.87
T_7	75%RDF + farm yard manure @ 1t/ha +PSB	32604	88588	55984	2.72
T_8	50%RDF+ farm yard manure @ 1t/ha +PSB	31339	84477	53138	2.70

Conclusion

Based on the results of one year experimentation, it was concluded that maximum higher yield and benefit: cost ratio from wheat crop with the application of 100% RDF+ farm yard manure @ 1t/ha +PSB, respectively in Chhindwara region of Madhya Pradesh.

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