Research Article

Growth and Yield response of Wheat (*Triticum aestivum* L.) to Compost and Farm Yard Manure applications

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Abstract | Wheat (*Triticum aestivum* L.), a staple food crop belonging to the family poaceae, plays a vital role among cereals. For human beings and animals, it is a major source of proteins and carbohydrates. Plant nutrients availability is the major contributing factor towards the productivity of any soil. Chemical fertilizers are ready-made sources of nutrients for crops. They are less bulky and can be handled and transported easily. However, chemical fertilizers are costly and also deteriorate quality of soil and food. Organic matters especially, composts and farmyard manure (FYM) not only improve soil health, but also provide plant nutrients for sustainable crop yield. In order to reduce the gap, a pot experiment was performed to appraise the effect of compost and FYM on growth and yield attributes of wheat under the agro-climatic conditions of District Buner during winter. The trial consisted of two factors: compost and FYM applied @ 0, 5, 10, 15 and 0, 10, 20 tons ha^{-1} respectively. Before the start of experiment, a media for each pot was prepared by mixing 12 Kg sieved soil and the required quantity of compost and FYM according to each treatments combination. Afterward the pots were filled with the already prepared media. Basal doses of N, P and K were applied as urea, single super phosphate (SSP) and sulphate of potash (SOP @ 120, 90 and 60 kg ha^{-1} to each pot. Wheat cultivar (Pirsabak-2015) was sown in these pots @ 30 seeds per pot and then thinned to nine. Pots were arranged by using CR Design with three replications. Plant height, tillers pot^{-1}, spike length, grains spike^{-1}, biological yield, grain yield and thousand-grain weight showed positive responses towards mix application of compost and FYM @ 15 and 10 tons-ha^{-1} as compared to control treatments. Therefore, combined application of compost and FYM @ 15 and 10 tons ha^{-1} respectively, is recommended to get a higher yield of wheat.

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Introduction

Wheat (*Triticum aestivum* L.) a staple food crop belonging to the family poaceae plays a vital role among cereals. For human beings and animals, it is a major source of protein and carbohydrates. On about 8825-thousand-hectare area, it is grown in Pakistan and its total and average production is 24.34 million tons and 2827 kg ha^{-1} (Pakistan Bureau of Statistics, 2019). Crop yield of wheat is decreased due to water shortage, Imbalanced fertilizers and high costs of inputs. Plant nutrients are the major determinants of the productivity of any soil. Chemical fertilizers are a ready-made source of nutrients for crops. They are less bulky and easy in transport and handle. However, due to their high cost, growers could not afford and due to their mismanagement yield decreased day by day (Hussain *et al.*, 1987). Organic matter in the form of farmyard manure, poultry manure, sewage sludges etc., has been used for a long time. Organic matters not only improve soil health, but also provide plant nutrients for sustainable crop yield (Lal, 2005; Kolay, 2000).

To dispose of organic wastes, an effective and environment-friendly technique is composting (Millner *et al.*, 1998). In composting, organic wastes are altered into stable substances (i.e. humus) biologically. These can be stored and can be applied easily (Gallardo-Larva and Nogales, 1987). This method is economical and friendly to the environment. It is the source of energy and provides nutrients for sustainable farming. Due to the deterioration in soil quality and the high cost of fertilizers in Pakistan, composting is very crucial in Pakistan (Lasaridi and Stetiford, 1999). The present research study was conducted to assess the effect of different levels of FYM and compost on the growth and yield attributes of wheat under the ecological conditions of district Buner. The objectives of the current study are to assess the response of growth and yield attributes of wheat towards different levels of compost and FYM.

Objectives

- To assess the response of growth and yield attributes of wheat towards different levels of compost and FYM.
- To find out the best levels of compost and FYM.
- To encourage organic farming.

Materials and Methods

Trail entitled "Growth and yield attributes of wheat as affected by different levels of compost and FYM" was conducted at Agriculture Research Station Buner in November, 2020. Treatments were applied as below. Before, the start of the experiment each pot was filled with 12 kg of sieved soil. Compost and farmyard manure (FYM) were mixed with soils before filling the pots according to their combination. N, P and K fertilizers were applied as urea, single super phosphate (SSP) and sulphate of potash (SOP) as a basal dose @ 120, 90 and 60 kg ha^{-1}. The pots were arranged according to a completely randomized design with three replications. Seeds (30 No) of wheat (Pirsabak, 2015) were sown in each pot and latterly thinned (9 No). The pots were irrigated after a few days. Over-irrigation was avoided, and subsequent irrigation was adjusted according to crop's needs. At maturity, wheat plants were harvested and data were recorded. The data was analyzed statistically (Steel and Torrie, 1980). Using the least significant difference (LSD), treatment means were compared. Data was recorded on:

Plant height (cm)

It was determined by taking five plants randomly from each pot with meter rod and then their average height was determined.

Tillers pot^{-1}

Tillers pot^{-1} was determined by counting all the tillers of the plants in each pot and then their total number was noted.

Spike length (cm)

Spike length was determined by taking five spikes randomly in each pot with ruler and then their average was determined.

Grains $spike^{-1}$

Grain/spike was determined by taking three spikes randomly in each pot, threshed manually, counted and then their average was noted.

Biological yield (g pot^{-1})

It was determined while harvesting each pot plants then sun-dried and weighed.

Grain yield (g/pot)

Grain yield was determined by threshing spikes of each pot manually and then weighted.

1000 grains weight

Thousand-grain weights were determined in each pot by sensitive electronic balance, while taking a random sample of thousand grains.

Results and Discussion

The result showed significant variations for plant height, when different treatments were applied. Plant height ranged from 54.46 to 75.75 cm. Plants having minimum height were noted in T_1 (control), while plants having maximum height were noted in (T_{11}), followed by T_{12} and T_{10} (Table 2). This is obvious from the results that the mingle application of compost and FYM @ 15 and 10 tons ha^{-1} had a significant effect on plant heights as compared to control and other treatments. Our findings are in line with Selvakumari *et al*. (2000), Dixit and Gupta (2000) and Khoshgoftarmanesh and Kalbasi (2002). Results regarding wheat tillers/pot showed significant variations towards application of different treatments. Tillers varied from 23 to 31.33 pot^{-1}. The least tillers were noted in T_1 (control), while maximum tillers were recorded in (T_{11}) followed by T_{12} and T_{10} (Table 2). The above results clarify that combined application of compost and FYM @ 15 and 10 tons ha^{-1} had a significant effect on several numbers of tillers pots^{-1} as compared to control and other treatments. Our findings are similar to of Selvakumari *et al*. (2000), Dixit and Gupta (2000) and Khoshgoftarmanesh and Kalbasi (2002). Results for spike length also showed significant variations of wheat, when different treatments were applied. Spike length varied from 7 to 9.18 cm. Minimum spike length was recorded in control (T_1), while maximum spike length was recorded in (T_{11}) followed by T9, T_{10} and T_{11} (Table 2).

Table 1: *Treatments combinations of compost and FYM.*

Treatments	Compost (t ha^{-1})	FYM (t ha^{-1})
T_1 (control)	0	0
T_2	0	10
T_3	0	20
T_4	5	0
T_5	5	10
T_6	5	20
T_7	10	0
T_8	10	10
T_9	10	20
T_{10}	15	0
T_{11}	15	10
T_{12}	15	20

Results indicate that compost and FYM applied mix @ 15 and 10 ton ha^{-1} had significant effect on spike length as compared to control and other treatments. Our findings match with our findings are similar with Selvakumari *et al*. (2000), Dixit and Gupta (2000) and Khoshgoftarmanesh and Kalbasi (2002). Grain spike^{-1} indicated significant variations by the application of different treatments. Grain spike^{-1} of wheat varied from 27.67 to 64.33 g. minimum grain spike^{-1} were noted in control (T_1), while maximum grain spike^{-1} was noted in (T_{11}) followed by T_8 and T_{10} (Table 2). Results clarify that combined application of compost and

Table 2: *Growth and yield attributes of wheat as affected by compost and FYM.*

Treatments	Pl.H (cm)	Till (pot^{-1})	Sp.L (cm)	G/Spike	B.Y (g pot^{-1})	G.Y (g pot^{-1})	TGW (g)
T_1 (control)	54.46cd	23 ef	7.0de	27.67g	50.23e	25f	29c
T_2 (FYM @ 10T ha^{-1})	62.11bcd	25.33def	8.4bc	42	57.50cde	27.33f	35.33d
T_3 (FYM @20T ha^{-1})	62.7bcd	22.67f	8.54abc	42f	55.57cde	32.16e	34.67d
T_4 (Compost@ 5T ha^{-1})	63.96bcd	25 def	8.14cd	47e	60.42cde	32.5 e	36.33cd
T_5 (Compost@5 FYM@10T ha^{-1})	56.87d	25 def	7.46e	51.3cd	69.7bcde	35.25de	38 bcd
T_6 (Compost@5&FYM@20 T ha^{-1})	66.22abc	25.67cde	7.42e	48de	78.04bcd	36.67cd	40.33b
T_7 (Compost@10T ha^{-1})	67.5ab	23ef	8.34bc	53bc	66.52cde	39 c	40bc
T_8 (Compost@10&FYM@10T ha^{-1})	64.79bcd	26c	7.92cde	57b	69.7bcde	39.167c	40.33b
T_9 (Compost@10&FYM@20 T ha^{-1})	65.11bcd	28.33bc	8.84ab	53 bc	70.8bcde	42.67 b	39.33bc
T_{10} (Compost@15T ha^{-1})	67.72ab	29.33ab	8.5bc	54.3bc	79.80bc	42.67 b	40.33bc
T_{11}(Compost@15&FYM@10T ha^{-1})	75.75a	31.33a	9.18a	64.33a	114.75a	48.33 a	44.67a
T_{12}(Compost@15&FYM@20T ha^{-1})	67.72ab	29.33ab	8.23bc	52cd	93.14ab	44.16 b	41ab
LSD	8.511	2.878	0.643	4.1086	24.489	3.1094	3.8816

Means followed by similar letters are not significantly different at P ≤ 0.05%.

FYM @ 15 and 10 tons ha^{-1} had a significant effect on grain $spike^{-1}$ as compared to control and other treatments. These results are supported by Khan and Hussain (2001). Similarly results showed significant differences in biological yield.

It varied from 50.23 to 114.75 g. minimum biological yield pot^{-1} was recorded in control (T_1), while maximum biological yield pot^{-1} was noted in (T_{11}) followed by T_{12} and T_{10} (Table 2). The above results indicate that applying compost and FYM mingle @ 15 and 10 tons ha^{-1} had a significant effect on biological yield as compared to control and other treatments. Our results are somewhat similar with Sarwar *et al.* (2008). Similarly results regarding grain yield and thousand-grain weight showed significant variations among the treatments. Grain yield varied from 25 to 48.33 g. similarly thousand grain yield varied from 29 to 44.67 g. minimum grain yield pot^{-1} were recorded in control (T_1), while maximum grain yield pot^{-1} were recorded in (T_{11}) followed by T_{12} and T_{10} (Table 2). The above results are in line with Pooran *et al.* (2002) and Bajpai *et al.* (2002).

Conclusion

It is concluded from the above results and discussion that all the growth and yield attributes of wheat showed positive responses towards mingle application of compost and farmyard manure. To get better yield of wheat compost and FYM should be applied mingle @ 15 and 10 tons ha^{-1}.

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Novelty Statement

The use of organic fertilizers i.e Compost and FYM increased yield of wheat and also improved quality of soil.

Author's Contribution

L. Zada: Designed and wrote paper.
M. Sajjad: Analysed the data and facilitate.
A. Khan: Helped in writing the paper.
S. N. Khan: Helped in designing of the trial.
A. Ayub: Helped in collection of data.

Generative AI and AI-assisted technology statement
The authors declare that no Genrative AI was used in the creation of this manuscript.

Conflict of interest
The authors have declared no conflict of interest.

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