"Effect Different Organic Nutrition Sources (Compost, Foliar Nutrients And Biofertilizers) On Growth And Growth Parameters Of Wheat (*Triticum Aestivum* L.)"

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ABSTRACT

The Crop Research Center conducted a field experiment at the School of Agriculture, Uttaranchal University, Dehradun, to assess the impact of various organic nutrition sources (compost, foliar nutrients, and biofertilizers) on the growth and growth parameters of wheat (Triticum aestivum L.) during the Rabi season of 2021. Employing the HD-2967 variety, the experiment followed a randomized block design (RBD) with ten treatments and three replications. The net and gross plot dimensions were 4.5 m × 6.5 m and 5.4 m × 7.0 m, respectively. Treatment combinations included T6: T2 + T3 + T4, T7: T2 + T4 + T5, T8: T3 + T4 + T5, T9: T2 + T3 + T4 + T5, T10: T2 + T3, T1: Control; T2: Compost @ 8.5 t ha-1; T3: Azotobacter and PSB soil application @ 10.0 kg ha-1; T4: Three foliar sprays of liquid organic NPK; T5: One foliar spray of liquid organic potash plus compost at 8.5 t ha-1; T6.

The experiment aimed to assess how organic nutrient sources influenced the quality and growth outcomes of wheat. Results indicated that the treatment T9 (One foliar spray of liquid organic potash + compost + soil application of Azotobacter and PSB + three foliar sprays of liquid organic NPK + compost @ 8.5 t ha-1) significantly impacted growth parameters, yield attributes, quality, and economic profit. Comparable treatments, including compost + soil application of Azotobacter and PSB + three foliar sprays of liquid organic NPK (T6), were also effective in these aspects. Moreover, improvements in soil chemical, biological, and fertility status were observed with T9, involving three liquid organic NPK foliar sprays, one liquid organic potash foliar spray, compost application, and the use of Azotobacter and PSB in the soil, along with compost at 8.5 t ha-1.

Economically, the application of compost plus Azotobacter and PSB to the soil demonstrated increased gross financial returns, net financial returns, and B:C ratio when cultivating organic wheat. Notably, T9, incorporating more compost at 8.5 t ha-1, outperformed other organic nutrient sources, similar to one foliar spray of liquid organic potash and three foliar sprays of liquid organic NPK.

Keywords: PSB, Azotobacter, Nutrients, liquid organic, foliar sprays, Yield

INTRODUCTION

The poaceae family includes annual plants like wheat (*Triticum aestivum* L.). It is most frequently growing staple crop on the planet. The noteworthy and distinctive historical aspect of wheat farming is its importance in humankind's progressive dominance as a colonizer of the earth's surface. It is widely grown in the central and north-western zones. India is among the family lands of this crucial food yield, and north-west India and Afghanistan are likely where it originated. Wheat farming takes up the most acreage worldwide compared to other crops. The key nations that must produce wheat in order for humanity to exist are the India, USA, China, Russia, Germany, Australia, France, Argentina.

Wheat (*Triticum aestivum* L.), durum wheat (*Triticum durum* L.), and emmer wheat are the three primary species of wheat (*Triticum dicoccum*). It is the most adaptable crop species and is grown in a variety of locations around the world. More land than any other crop is used to produce wheat globally. *Triticum aestivum* covers more than 80% of the entire wheat land in India. *Triticum durum* and *Triticum dicoccum* barely cover 10% and 1% of the whole area, respectively.

After rice, wheat is 2nd most significant food crop in India. Crop was responsible for the green revolution and for ensuring India's food security. It produces roughly 25% of India's total production of food grains. India grows wheat from the level ofsea to an altitude of 3568 m in the Himalaya (**Rao *et al.*, 1992**).Wheat is cultivated in India under a variety of agro-climatic settings and is confronted with a range of biotic as well as challenges. The three states of Uttar Pradesh, Punjab, and Haryana are important in terms of agriculture in the north-western plain zone, contributing 68.29% of India's wheat production. Punjab has the greatest production in India(5188 kg ha^{-1}), followed by Haryana, Rajasthan, U.P., Uttarakhand, Bihar, and Madhya Pradesh. Uttar Pradesh has the maximum output (32.59 M tonnes) and area (9.50 M ha) (4925 kg/ha, 3501 kg/ha, 3432 kg/ha, 2910 kg/ha, 2998 kg/ha and 2993 kg/ha separately).

MATERIALS AND METHODS

A field trial titled "Production potential of wheat as influenced by compost, foliar nutrients, and bio fertilizers" was showed during the 2021 rabi season. The specifics tools and methods used throughout the study are covered in this section.

Uttaranchal University is located at a distance of about 3.1 km after the IMA, Dehradun. The field study was carried out in the rabi season of 2021-2022 at the trail farm,Crop Research Centre, Uttaranchal University, School of Agriculture. The organization is located at India, Arcadia Grant, Chandanwari, Premnagar, Dehradun City, Dehradun — 248001. The geographic situation of the farm lies at longitude — **78°12′23.72″E (78.206595)**, latitude — **30°43′11.75″N (30.719932)**.

With 10 treatment combinations and three replications of each, this experiment used a "Randomize Block Design." A random replication of each treatment was done to reduce the outside impact, the field boundary and plot border were left unpainted. Following are the treatment details:

T1 Control
T2 Compost @ 8.5 t ha-1
T3 Soil application of Azotobacter and PSB @ 10.0 kg ha1
T4 Liquid Organic NPK three foliar sprays
T5 Liquid organic potash one foliar spray + Compost @ 8.5 t ha-1
T6 T2 + T3 + T4
T7 T2 + T4 + T5
T8 T3 + T4 + T5
T9 T2 + T3 + T4 + T5
T10 T2 + T3

RESULTS AND DISCUSSION

Numerous observations were made throughout the course of the study project, "Production potential of wheat as influenced by compost, foliar nutrients, and bio fertilizers." Data were gathered, properly analysed, and are now given here under the appropriate headings. Additionally, outcomes briefly covered in this section.

Growth studies

Plant height (cm)

Table 4.2 represent data on plant height (cm), which was periodically recorded. As thecrop grew older, the height of the plants increased. The pace at which plant height increasedwas modest the first 20-40 days and quick in the following 40 to 80 DAS, before slowing down as the plant approached the harvest stage. Between 20 DAS and harvest, the mean plant height varies between 8.14 cm and 92.32 cm.

Number of tillers $plant^{-1}$

Information regarding the amount of tillers/plant during harvest and at 40, 60, and 80 DAS. Table 4.3 contains information on the impact of various organic effect of micronutrients on the number of tillers. Average total tillers was 2.24 at 20 DAS and 2.49 atharvest, depending on the growth stage.

Number of functional leaves $plant^{-1}$

From 20 to 60 DAS, $plant^{-1}$'s functional leaf count grew; however, after 80 DAS, the number of leaves decreased as the crop approached the maturity stage, which led to the senescent loss of older leaves. At 60 DAS, the highest rate of leaf formation was noted. At different growth phases, the average number of leaves varies from 3.55 at 20 DAS to 6.95 at harvest.

Leaf area $plant^{-1}$

A 20-day interval was used to collect data on $plant^{-1}$'s mean leaf area up to 80 DAS. Table 4.5 displays the leaf area per plant as impacted various conducts. 20 DAS and harvest,mean leaf area was 0.55 dm^2 and 0.92 dm^2, respectively.

Additionally, out of all the treatments, the application of compost combined with three foliar applications of liquid organic NPK and one foliar application of liquid organic potash, along with soil applications of Azotobacter and PSB, produced the largest leaf area (T9). The treatments T2, T6, T7, T8, and T10 performed better at 40 DAS than the control (T1).

Dry matter accumulation plant^{-1}

At 20, 40, 60, 80 DAS, at produce, data on per plant dry matter levels were acquired. The impacts of various organic fertilizer sources on the dry matter accumulation plant, respectively. 20 D.A.S. and harvest, 0.21 g and 11.21 g, respectively, of the mean dry matteraccumulation plant^{-1} were noted. The effect of biological nutrient organization strategies wheat's dehydrated material accumulation was substantial with (T9) among all treatments, but it was comparable to T6 and T10 at 40 DAS.

Table 1: Wheat plant height as affected by different treatments

Treatments		Plant height (cm)				
		20 DAS	40 DAS	60 DAS	80 DAS	At harvest
T1	Control	7.62	25.56	45.56	74.86	77.31
T2	Compost @ 8.5 t ha^{-1}	8.9	30.64	55.26	90.56	92.55
T3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	8.02	28.29	48.72	82.32	85.45
T4	Liquid Organic NPK 3 foliar sprays	8.06	28.62	50.66	85.82	87.86
T5	Liquid Organic Potashone foliar spray + Compost @ 8.5 t ha^{-1}	7.92	27.79	46.32	76.89	80.60
T6	T2 + T3 + T4	8.42	31.52	63.12	101.86	104.86
T7	T2 + T4 + T5	8.22	30.95	58.12	93.69	95.94
T8	T3 + T4 + T5	8.07	30.52	52.69	87.13	89.16
T9	T2 + T3 + T4 + T5	8.49	31.84	63.58	105.9	108.89
T10	T2 + T3	8.39	31.29	62.40	97.00	100.51
SE (m) ±		**0.16**	**1.20**	**2.37**	**3.95**	**4.06**
CD at5%		**0.51**	**3.59**	**7.06**	**11.76**	**12.08**
CV (%)		**3.69**	**7.05**	**8.54**	**8.65**	**8.62**
GM		**8.13**	**29.71**	**54.64**	**89.52**	**92.31**

Table 2: The effect of different treatments on the number of tillers plant-1

Treatments		Tillers plant^{-1}			
		40 DAS	60 DAS	80 DAS	At HARVEST
T1	Control	1.49	3.30	4.46	2.12
T2	Compost @ 8.5 t ha^{-1}	2.32	3.76	2.72	2.49
T3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	1.62	3.66	2.50	2.19
T4	Liquid Organic NPK 3 foliar sprays	1.89	3.67	2.55	2.36
T5	Liquid Organic Potash one foliar spray + Compost @ 8.5 t ha^{-1}	1.99	3.59	2.49	2.19
T6	T2 + T3 + T4	2.82	3.09	3.32	2.76
T7	T2 + T4 + T5	2.29	3.76	2.81	2.52
T8	T3 + T4 + T5	1.99	3.64	2.66	2.42
T9	T2 + T3 + T4 + T5	3.09	4.07	3.76	3.06
T10	T2 + T3	2.79	3.99	3.22	2.72
SE (m) ±		**0.13**	**0.13**	**0.10**	**0.11**
CD at 5%		**0.41**	**0.34**	**0.34**	**0.35**
CV (%)		**10.89**	**6.71**	**0.19**	**8.47**

GM	**2.23**	**3.74**	**2.85**	**2.48**

Table 3: Number of functioning leaves as affected by different treatments per Plants

Treatments		Functional leaves plant^{-1}				
		20 DAS	40 DAS	60 DAS	80 DAS	At HARVEST
T1	Control	3.18	6.42	10.95	7.92	3.96
T2	Compost @ 8.5 t ha^{-1}	3.58	9.32	13.49	10.47	6.86
T3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	3.33	8.37	12.38	9.35	5.91
T4	Liquid Organic NPK 3 foliar sprays	3.40	8.65	12.91	9.88	6.20
T5	Liquid Organic Potash one foliar spray + Compost @ 8.5 t ha^{-1}	3.24	7.86	11.00	7.98	5.40
T6	T2 + T3 + T4	3.96	11.37	14.17	11.15	8.91
T7	T2 + T4 + T5	3.60	9.75	13.74	10.72	7.29
T8	T3 + T4 + T5	3.33	9.39	13.34	10.33	6.93
T9	T2 + T3 + T4 + T5	4.01	12.63	15.09	12.06	10.17
T10	T2 + T3	3.66	10.18	13.76	10.74	7.72
SE (m) ±		**0.18**	**0.45**	**0.65**	**0.67**	**0.45**
CD at 5%		**NS**	**0.45**	**1.96**	**2.04**	**1.38**
CV (%)		**9.33**	**8.60**	**8.78**	**11.86**	**11.64**
GM		**3.54**	**9.40**	**13.08**	**10.06**	**6.94**

Table 4: Leaf area per plant as impacted by different treatments

Treatments		Leaf area (dm^2)			
		20 DAS	40 DAS	60 DAS	80 DAS
T1	Control	0.50	0.91	1.12	0.70
T2	Compost @ 8.5 t ha^{-1}	0.55	1.28	1.93	0.90
T3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	0.53	1.07	1.79	0.80
T4	Liquid Organic NPK 3 foliar sprays	0.52	1.09	1.91	0.81
T5	Liquid Organic Potash one foliar spray + Compost @ 8.5 t ha^{-1}	0.50	0.09	1.76	0.80
T6	T2 + T3 + T4	0.57	1.55	2.29	1.03
T7	T2 + T4 + T5	0.55	1.30	1.94	0.91
T8	T3 + T4 + T5	0.55	1.18	1.92	0.90
T9	T2 + T3 + T4 + T5	0.58	1.85	2.36	1.25
T10	T2 + T3	0.55	1.41	2.09	1.00
SE (m) ±		**0.01**	**0.06**	**0.07**	**0.02**
CD at 5%		**0.05**	**0.21**	**0.23**	**0.10**
CV (%)		**6.50**	**10.01**	**9.42**	**7.22**
GM		**0.54**	**1.26**	**1.91**	**0.91**

Table 6: Dry matter accumulation plant^{-1} as influenced by various treatments

Treatments		Dry matter accumulation plant^{-1} (g)				
		20 DAS	40 DAS	60 DAS	80 DAS	At HARVEST
T1	Control	0.18	1.42	4.81	6.72	8.05
T2	Compost @ 8.5 t ha^{-1}	0.20	2.51	5.23	8.80	11.53
T3	Soil application of Azotobacter and PSB @ 10.0 kg ha^{-1}	0.19	2.39	5.12	7.81	9.91
T4	Liquid Organic NPK 3 foliar sprays	0.19	2.45	5.14	8.11	10.54
T5	Liquid Organic Potash one foliarspray + Compost @ 8.5 t ha^{-1}	0.19	1.75	5.02	7.47	9.42
T6	T2 + T3 + T4	0.21	2.90	5.75	9.85	13.08
T7	T2 + T4 + T5	0.20	2.72	5.42	8.96	12.08
T8	T3 + T4 + T5	0.20	2.51	5.19	8.51	11.11
T9	T2 + T3 + T4 + T5	0.21	3.28	6.42	10.17	13.73
T10	T2 + T3	0.20	2.74	5.32	9.48	12.54
SE (m) ±		**0.01**	**0.17**	**0.23**	**0.43**	**0.48**
CD at 5%		**0.01**	**0.54**	**0.71**	**1.31**	**1.46**
CV (%)		**6.07**	**7.92**	**8.80**	**8.96**	**7.64**
GM		**0.20**	**0.47**	**3.34**	**8.61**	**11.20**

CONCLUSION:

Subsequent conclusions are formed since the findings the current inquir

- Application of Compost + Azotobacter and PSB Soil Application + The growth parameter and growth with the quality parameters were meaning fully greater after (T9).
- Applying dung, applying Azotobacter and PSB to the soil, applying 3 applications of fluid biological NPK to the leaves and 1 dose of fluid biological potash to the leaves(T9) considerably enhanced the soil's chemical and biological qualities and increasedfertility and productivity.

Typically, the interventions involve employing exclusively organic components. This encompasses the utilization of compost, the administration of organic soil fertilizer comprising Azotobacter and PSB, in addition to a liquid organic potash foliar spray (T9), as well as three liquid organic NPK foliar sprays. Another approach involves three liquid organic NPK applications combined with T9, one liquid organic potash foliar spray (T9), three liquid organic compost fertilizer applications, and T9, along with one liquid organic soil fertilizer application. These findings are derived from an analysis conducted over a span of one year; however, it is imperative to conduct more comprehensive testing for the formulation of reliable recommendations.

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