

## EFFECT OF FYM AND ZINC ON GROWTH, YIELD ATTRIBUTES AND PRODUCTIVITY PARAMETERS OF WHEAT (*TRITICUM AESTIVUM* L.)

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(Received 17 May, 2022; Accepted 1 July, 2022)

**Key words:** FYM, Harvest Index, Spikelets, Tiller, Wheat and Yield.

**Abstract**–The present field experiment was conducted at pot house of the Department of Soil Science and Agricultural Chemistry of C.S.A.U.A & T Kanpur (campus) under the Central Plain zone of Uttar Pradesh, during Rabi season of 2019-20. The experiment comprised of 9 treatment combinations in randomized block design with three replications consisted of T<sub>1</sub>: Control, T<sub>2</sub>: RDF + FYM (50%), T<sub>3</sub>: RDF + FYM (100%), T<sub>4</sub>: RDF + Zn (50%), T<sub>5</sub>: 2 RDF + Zn (100%), T<sub>6</sub>: RDF + FYM (50%) + Zn (50%), T<sub>7</sub>: RDF + FYM (100%) + Zn (50%), T<sub>8</sub>: RDF + FYM (50%) + Zn (100%), T<sub>9</sub>: RDF + FYM (100%) + Zn (100%). On the basis of the results emanated from the present investigation, it could be concluded that application of RDF + FYM (100%) + Zn (100%) applied in wheat to significantly increases growth parameter, i.e. plant height and yield attributes, i.e. no. of tiller plant<sup>-1</sup>, no. of ear plant<sup>-1</sup>, no. of seeds ear<sup>-1</sup>, weight of ear (g), grain weight ear<sup>-1</sup> (g), 1000 seed weight (g), spike length (cm) and no. of spikelets spike<sup>-1</sup>. Results showed that among the different fertility levels, application of RDF + FYM (100%) + Zn (100%) significantly enhanced productivity parameters, i.e. grain yield, straw yield, biomass yield and harvest index over the control.

### INTRODUCTION

Wheat (*Triticum aestivum*) is the most important staple food grain crop that has been labelled as “king of cereals”. India is the second largest wheat producer country in the world. The approximate chemical composition of the wheat kernel is starch 63-71%; protein 10-12%; water 8-17%; cellulose 2-3%; fat 1.5-2%; sugar 2-3%; and mineral matter 1.5-2%. Gluten of the wheat kernel contains about 17.6% nitrogen (Anonymous, 2021).

The major wheat producing states are Uttar Pradesh, Madhya Pradesh, Punjab, Rajasthan, Haryana and Bihar which occupy 33%, 18%, 12%, 10%, 9% and 8% area of total wheat cultivation in the country, respectively. In India, the highest productivity of wheat is recorded in Punjab.

Zinc plays an important role in carbohydrate

metabolism, detoxification of super oxide radical and imparts resistance to disease in plants. Zinc (Zn) is also involved in key metabolic processes such as respiration, photosynthesis and assimilation of some major nutrients. Zinc plays an important role in enzymes activation as well. The efficiency of such type of elements is improved when it is used in combination with other elements like N and K (Rajput *et al.*, 1995 and Fathi *et al.*, 1990).

Zn deficiency-related health problems in humans, such as impairments in physical development, immune system and brain function. Among the strategies being discussed as major solution to Zn deficiency, plant breeding strategy (e.g., genetic biofortification) appears to be a most sustainable and cost-effective approach useful in improving Zn concentrations in grain.

The role of organic matter is well established in

governing the nutrient fluxes, microbial biomass and improvement in soil physical chemical and biological properties. Maintaining soil health is of utmost important to ensure food and nutritional security of the country. For most efficient use of fertilizers, all nutrients must be used in balance proportion. However, there is a lack of information regarding the performance of FYM and nitrogen in relation to productivity and fertility of soil under wheat cultivation.

FYM is a good source of nutrients and contributed towards build-up of organic matter in soil. Nitrogen is an indispensable element for optimum functioning of crops. The increase in eco-friendly production of wheat can be made possible by widespread adoption of improved technologies of which fertilizer management particularly that of nitrogen through organic manure can play a key role. Hence, the present investigation was carried out to study the growth, yield and nutrient uptake behaviour of wheat to define optimum dose under integrated use of FYM (Das *et al.*, 2008).

## MATERIALS AND METHODS

In the present investigation the experiment was conducted at Pot house of the Department of Soil Science and Agricultural Chemistry of C.S.A.U.A. & T. Kanpur (campus) under the Central Plain zone, during Rabi season of 2019-20. It is situated at an elevation of 124 meters above the sea level in the alluvial belt of Gangetic plains of central Uttar Pradesh. The annual precipitation is about 800 mm. The maximum temperature of the location reaches

up to 38 °C and seldom falls as low as 12 °C. The relative humidity ranged between 33 to 96 percent. The experimental field is sandy clay loam in texture, pH (7.7), EC (0.36 dS m<sup>-1</sup>), low in organic carbon (0.42%), available N (184.4 kg ha<sup>-1</sup>), medium in available P (16.3 kg ha<sup>-1</sup>) and available K (174.7 kg ha<sup>-1</sup>). The experiment consisted of 3 replications and laid out in randomized block design assigning 7 treatments combinations in each replication *viz.* T<sub>1</sub>: Control, T<sub>2</sub>: RDF + FYM (50%), T<sub>3</sub>: RDF + FYM (100%), T<sub>4</sub>: RDF + Zn (50%), T<sub>5</sub>: 2 RDF + Zn (100%), T<sub>6</sub>: RDF + FYM (50%) + Zn (50%), T<sub>7</sub>: RDF + FYM (100%) + Zn (50%), T<sub>8</sub>: RDF + FYM (50%) + Zn (100%), T<sub>9</sub>: RDF + FYM (100%) + Zn (100%). Each treatment was randomly allocated with in them. The crop was fertilized with a recommended dose of @ 120-60-40 kg nitrogen, phosphorus and potassium/ha, respectively and applied to all plots excluding control. The wheat (var. PBW-502) was transplanted in third week of November. Half of nitrogen and full dose of phosphorus and potash were applied as basal at the time of sowing by placement method. The remaining half of the nitrogen was applied at the time of first irrigation. The quantity of FYM @ 10 ton per hectare required for substituting a specified amount of nitrogen as per treatment was calculated and incorporated into soil 15 days before sowing of the crop.

The harvest index was worked out with the help of following formula:

$$\text{Harvest Index (\%)} = \frac{[\text{Seed Yield (q ha}^{-1}\text{)]}}{[\text{Biological Yield (q ha}^{-1}\text{)]}} \times 100$$

## RESULTS AND DISCUSSION

### Plant Height

The data revealed that maximum plant height at 30, 60, 90 DAS and harvest stage was found with the application of T<sub>9</sub> [RDF + FYM (100%) + Zn (100%)] which was statistically at par with T<sub>8</sub> [RDF + FYM (50%) + Zn (100%)] and significantly higher than T<sub>1</sub> [Control] treatment. The results of the present investigation are also in agreement with the findings of Malav *et al.*, (2019).

### Yield Attributing Characters

Among the yield attributing characters *viz.*; number of tiller plant<sup>-1</sup>, number of ear plant<sup>-1</sup>, number of seeds ear<sup>-1</sup>, weight of ear (g), grain Weight ear<sup>-1</sup> (g), 1000 seed weight (g), spike length (cm) and number of spikelets spike<sup>-1</sup> of wheat were studied.

**Table 1.** Effect of different treatment combination on plant height (cm).

Treatment	Plant Height (cm)			
	30 DAS	60 DAS	90 DAS	At Harvest
T <sub>1</sub>	22.3	64.9	95.0	97.4
T <sub>2</sub>	24.1	66.7	98.6	99.5
T <sub>3</sub>	26.0	71.3	109.4	110.0
T <sub>4</sub>	27.0	74.6	112.9	113.6
T <sub>5</sub>	28.2	75.7	115.8	116.6
T <sub>6</sub>	28.6	76.8	116.7	117.5
T <sub>7</sub>	29.5	77.2	117.4	118.0
T <sub>8</sub>	30.8	78.8	118.7	119.2
T <sub>9</sub>	32.1	80.2	120.1	121.7
F- test	S	S	S	S
S. Em+	0.43	0.86	0.63	0.61
C.D.(P=0.05)	0.95	1.89	1.39	1.33

**Table 2.** Effect of different treatment combination on yield attributing characters.

Treatment	No. of tiller plant <sup>-1</sup>	No. of ear plant <sup>-1</sup>	No. of seeds ear <sup>-1</sup>	Weight of ear (g)	Grain Weight ear <sup>-1</sup> (g)	1000 seed weight (g)	Spike Length (cm)	No. of Spikelets spike <sup>-1</sup>
T <sub>1</sub>	4.80	4.16	17.69	2.17	1.93	36.69	9.33	18.50
T <sub>2</sub>	6.56	4.35	19.08	2.38	2.07	37.56	9.84	18.79
T <sub>3</sub>	7.32	5.80	20.76	2.73	2.46	38.29	10.92	19.94
T <sub>4</sub>	7.69	5.90	21.36	2.89	2.65	38.39	11.15	20.36
T <sub>5</sub>	7.80	5.98	22.57	2.95	2.76	38.51	11.42	21.38
T <sub>6</sub>	7.82	6.01	23.13	2.98	2.80	38.58	11.57	21.95
T <sub>7</sub>	7.86	6.04	23.66	3.05	2.83	38.67	12.13	22.15
T <sub>8</sub>	7.90	6.10	24.10	3.14	2.98	38.98	13.07	22.74
T <sub>9</sub>	7.98	6.18	24.22	3.22	3.04	39.10	13.22	22.93
F- test	S	S	S	S	S	S	S	S
S. Em+	0.04	0.03	0.28	0.05	0.01	3.01	0.06	0.05
C.D.(P=0.05)	0.09	0.07	0.63	0.12	0.03	6.57	0.13	0.11

Maximum number of tiller plant<sup>-1</sup>, number of ear plant<sup>-1</sup>, number of seeds ear<sup>-1</sup>, weight of ear (g), grain Weight ear<sup>-1</sup> (g), 1000 seed weight (g), spike Length (cm) and number of spikelets spike<sup>-1</sup> of wheat was recorded from T<sub>9</sub> [RDF + FYM (100%) + Zn (100%)] which were statistically at par with T<sub>8</sub> [RDF + FYM (50%) + Zn (100%)] and significantly higher than T<sub>1</sub> [Control] treatment. Similar findings were reported by Zia *et al.*, (2007).

### Productivity Parameters

The data revealed that maximum grain yield (q ha<sup>-1</sup>), straw yield (q ha<sup>-1</sup>), biomass yield (q ha<sup>-1</sup>) and harvest index (%) of wheat was recorded from T<sub>9</sub> [RDF + FYM (100%) + Zn (100%)] which were statistically at par with T<sub>8</sub> [RDF + FYM (50%) + Zn (100%)] but significantly superior over other treatments. However, the minimum grain yield (q

ha<sup>-1</sup>), straw yield (q ha<sup>-1</sup>), biomass yield (q ha<sup>-1</sup>) and harvest index (%) of wheat recorded with T<sub>0</sub> [Control]. The result gave clear data that use of FYM in combination with inorganic fertilizers RDF (120:60:40 NPK) and zinc produce the highest yield. These results are accordance with the finding of (Sharma *et al.*, 2013).

### CONCLUSION

Based on the finding of the present study, it can be inferred that application of T<sub>9</sub> [RDF + FYM (100%) + Zn (100%)] resulted maximum growth and yield attributes which results more yield of wheat crop during rabi season in central zone of Uttar Pradesh. It is strongly recommended that farmer of the central U.P adopt the dose of T<sub>9</sub> [RDF + FYM (100%) + Zn (100%)] doses for better crop yield.

### REFERENCES

**Table 3.** Effect of different treatment combination on productivity parameters.

Treatment	Grain Yield (q ha <sup>-1</sup> )	Straw Yield (q ha <sup>-1</sup> )	Biomass Yield (q ha <sup>-1</sup> )	Harvest Index (%)
T <sub>1</sub>	32.55	42.98	75.53	43.09
T <sub>2</sub>	38.94	43.78	82.72	47.07
T <sub>3</sub>	48.55	51.54	100.29	48.66
T <sub>4</sub>	49.95	55.31	105.26	47.45
T <sub>5</sub>	50.95	58.48	109.43	46.55
T <sub>6</sub>	51.28	59.07	110.35	46.96
T <sub>7</sub>	54.76	60.43	113.15	48.43
T <sub>8</sub>	56.20	61.12	115.17	48.61
T <sub>9</sub>	58.10	62.23	116.24	49.04
F- test	S	S	S	S
S. Em+	0.35	0.43	0.32	0.39
C.D. (P= 0.05)	0.76	0.94	0.70	0.87

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