THINK INDIA JOURNAL ISSN: 0971-1260

Vol-22-NO-30 Special Issue- December-2019

Response of Combined Application of Inorganic and Organic Fertilizers on The Growth and Yield Attributes of Wheat

Sakshi, *Hina Upadhyay and ǂKawaljeet Kaur

Department of agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

Department of Soil Science and Agriculture Chemistry, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

*Corresponding author: Email id: hina.18745@lpu.co.in

ǂ Present address: School of Agriculture, CT Group of Institution Shahpur campus, Jalandhar, Punjab, India

ABSTRACT

The research study entitled "Response of combined application of inorganic and organic fertilizers on the growth and yield attributes of wheat" (*Triticum aestivum* L.) was conducted at the experimental farm of School of Agriculture, Lovely Professional University. The research experiment was designed in Randomized Complete Block Design with 8 treatments and 3 replications. Throughout present studies analysis of soil was done and observations on biochemical parameters were also taken into consideration. Morphological parameters *viz.*, height of the plant (cm), tillers number per plant, spike length, yield in terms of grain and straw and test weight. Incorporation of 100% RDF leads to highest plant height followed by T_6 = 50% Vermicompost + 50 % FYM taken at different time intervals, *viz.*, sowing after 30 days, 60, 90 and 120 DAS. Tillers per plant were highest in T_4 = 50% FYM + 50% RDF, while spike length was highest in plots where T_1 = 100% RDF was given. It was resulted that grain yield as well as straw yield was highest in T_4 = 50% FYM + 50% RDF. The highest weeds population was recorded in T_0 = Control followed by T_3 = 100% FYM. The combination of 50% FYM+50% RDF proved to be best in all aspects like number of tillers, test weight, grain and straw yield including harvest Index.

Key words: Nutrient management, Organic fertilizer, Wheat, Weed flora

ISSN: 0971-1260

Vol-22-NO-30 Special Issue- December-2019

INTRODUCTION

Wheat is main cereal crop of India and ranks 2nd followed by China in world. The wheat belongs to family Gramineae. Wheat is most significant cereal crop as well as staple food for almost 35 % population of the world, being next to rice. It provides 55% carbohydrates and 20% calories are consumed by people (Breiman and Graur, 1995). Apart from carbohydrates and calories it also provides proteins, moisture, fat and minerals. Wheat is cultivated in various parts of the world and under varied climatic conditions considering the genetic and breeding purposes. It is used worldwide for making chapattis, dalia (crushed wheat), flour, pasta, etc. The baking quality is affected by gluten content present. The residues can be used for mulching, straw, padding, etc. The production of wheat varies with respect to the area, country, region, state but the worldwide production of wheat is 757.92 MT and is grown over 215 m ha area (Agropedia, 2017-18). In India wheat is grown over 305.97 lakh ha^{-1} area with production and productivity of 98.38 million tones and 3216 kg ha^{-1}, respectively (Indian Department of Agriculture 2016-17). Wheat crop is mainly grown in northern hemisphere occupying the Uttar Pradesh with highest production (25.22 MT) and Punjab with highest productivity (15.7MT).

The productivity can be enhanced by using different sources of fertilizers. The wheat is main crop of *Rabi* season in India. The cultivation of the wheat is not only favored by tropical and sub-tropical regions but also in temperate zone. For successful cultivation of wheat cool and moist weather type of climate is required while for proper maturity some sunny, warm conditions are needed. The average temperature required for germination of seed ranges from, 20-25^{0}C. The excessive high and low temperature during heading and flowering stages is hazardous for the wheat crop. Sudden changes in climate like high humidity, rainfalls and prevailing of cloudy weather, are harmful for wheat growth and causes many diseases. The range of temperature for ripening must not be more than 14-15^{0}C.

Weed management is main problem in inorganic agriculture the excessive use of herbicides and chemicals affect the crop and soil. Apart from managing the weeds by applying herbicides in the fields green manures can be used that will preserve the soil and kills the weeds. The allelopathic effects of some weeds and crops can suppress the weed crop, weed on weed or crop on weed methods can be used to emit the weeds from the field of wheat crop. Integrated weed management (INM) is finest method to cope out with the problem of the weeds. The weeds responses in different ways to the organic and inorganic application of the fertilizers, the manures is organic sources which will maintain the soil health and high temperatures created by the organic fertilizers will destroy the weed seeds (Baitilwake *et al.,* 2011; The main weeds of wheat crop are *Chenopodium album, Phalris minor, Malva neglecta, Anagallis arvensis,* etc.

MATERIALS AND METHODOLOGY

Present study at research farms by application of different combination of fertilizers (organic and inorganic) having 8 treatments and 3 replications with wheat variety HD 3086 (Pusa Gautami) has been recommended for commercial cultivation in irrigated areas of North Western Plains Zone (NWPZ). Different treatments were designed as follows viz., T_1 (100% RDF), T_2 (100% Vermicompost), T_3 (whole F.Y.M), T_4 (50% F.Y.M + 50% RDF), T_5 (50% recommended dose of fertilizer + 50% Vermicompost fertilizer), T_6 (50% Vermicompost + 50% F.Y.M), T_7 (50% RDF + 25 % + F. Y. M 25% Vermicompost). Observations were documented for different parameters of growth and yield viz. height of the plant, number of tillers/plants, number of grains in single spike, Test weight, Straw yield (q ha-1), grain yield (q ha-1) and harvest Index (%)

RESULTS AND DISCUSSION

Height of the plant

Plant height was noted at unlike days after sowing i.e. 30 DAS, 60 DAS, 90 DAS and 120 DAS. Plant height was recorded in the range of 13.59 to 18.35cm respectively at 30 DAS.

Plant height was observed maximum (18.35 cm) in case of T1 (100%RDF) trailed by treatment T6 (50% Vermicompost+ 50% FYM) while it was at its lowest (13.59 cm) in control treatment(T0). After sowing of 60 days height of the plant was noted in the range of 32.27 to 40.33 cm. maximum plant height (40.33) was noted in treatment T1 (100% RDF) trailed by T7 (50% RDF+25 %Vermicompost+25% FYM) while the lowest value (32.26 cm) was recorded in T_0 (Control). After 90 days of sowing, plant height was recorded in the range of 82.06 to 94.90 cm. The maximum plant height (94.40 cm) was recorded in treatment T1 (100% recommended dose of fertilizer i.e. RDF) trailed by treatment T7 in which 50%RDF and 25% Vermicompost+25% FYM are applied while minimum value of plant height (82.07 cm) was noted in control treatment. After sowing of 120 days, plant height was documented ranging from 86.60 to 97.13cm. Highest value of plant height (97.13 cm) was recorded in T1 treatment with 100% recommended dose of fertilizer and it was followed by T2 treatment where 100% Vermicompost+25% FYM, was applied while the lowest value (86.60cm) was recorded in T_0 (Control). From the above result it shows that plant height was found to be maximum in T_1 (100% Recommended doses of fertilizer) as compare to 50% (Recommended doses of fertilizer other treatments). The maximum height in treatment T_1 (100% RDF) due to the nitrogen which plays an important role in plant growth system and also an integral part of protein, which are responsible for the development of chlorophyll and ultimately nitrogen supply to plant. So, it specifies that alone use of inorganic fertilizer gave the better response on height of the plant. Analogous reports were submitted by Verma *et al*., (2018).

Table 1. Impact of inorganic and organic fertilizer on height of the plant after sowing after days of 30, 60, 90 and 120

Treatments	30 days after sowing	60 days after sowing	90 days after sowing	120 days after sowing
T0	13.59e±0.16	32.26c±0.53	82.06d±2.41	86.60bc±0.49

T1	18.35a±0.13	40.33a±0.71	94.90a±0.813	97.13a±0.79
T2	14.10de±0.24	34.83bc ±0.13	93.33a±1.17	95.30c±0.13
T3	15.63c±0.19	35.15abc±1.09	84.36cd±0.11	95.00a± 1.00
T4	15.46c±0.14	37.83ab±1.15	87.56bc±0.27	91.33abc±1.39
T5	14.66d±0.15	36.93abc±1.44	87.93bc±0.42	91.13abc±0.51
T6	17.03b±0.09	34.96abc±1.28	92.06ab±0.90	93.60ab±0.02
T7	14.20de±0.04	38.06ab±1.97	93.73a±2.12	95.13a±0.14

Tillers per plant

Tillers per plant were observed at 90 DAS (Table 2). Minimum and maximum tiller number was verified in the range of (7.53 to 8.87) respectively at 90 DAS. The maximum number of tillers were found in T_4 (50%RDF+50% FYM) followed by T_7 (50% RDF+25% Vermicompost +25% FYM). Tillers number was at its lowest in control treatment (T0). It has been established that application of combination of fertilizers exhibited maximum number of tillers over other treatments. Similar results have been described by Abdus Subhan *et al* (2017).

Length of spike (cm)

Impact of inorganic and organic fertilizers on spike length has been listed in table no. 2. Minimum and maximum spike length was noted in the range of (7.63 to 9.35) at 120 DAS. The highest value (9.35 cm) of spike length was recorded in case of T_1 treatment with 100% RDF trailed by treatment T_4 (50% F. Y. M +50 % R D F) i.e. 9.19 cm. Above all, minimum length of spike was established in T_0 (control treatment). At the same time, the highest value of spike length noted in T_1 (100% RDF). It has been observed that application of the 100% recommended dose concerning fertilizer lead to the better result comparatively. Alike reports are proved by Verma *et al*. (2018).

Grains number spike ^{1}

The effect of inorganic and organic fertilizer on grains number spike-^{1} is shown in Table 2. The lowest and highest grains number spike-^{1} ranged of (42.63 to 62.27).The highest value (62.27) grains number per spikes was recorded in T_1 treatment(100% RDF) trailed by T_7 (50% RDF+ 25% Vermicompost + 25% F Y M) i.e. 57.27 while the lowest value (42.63%) was recorded in T_0 (Control). Grain number in single spike was found maximum in T_1 (100% RDF).

The increase in the number of grains per spike might be due to the adequate and prolonged supply of essential nutrient. Analogous reports have been described by Verma *et al.* 2018.

Test weight.

The effect of inorganic and organic fertilizer on thousand grain weight (Table 2). Minimum and maximum 1000 grain weight was noted in the ranged of (40.73 to 48.33). The highest value (48.33 cm) was recorded in T_4 (50% FYM+ 50% RDF) trailed by T_7 treatment (50% RDF+ 25% Vermicompost + 25% F.Y.M) i.e. 48.30 cm while the lowest value (40.73) was recorded in T_0 (Control). This may be due to the use of combination of (organic and inorganic sources) which leads to increased availability of the nutrients. Comparable results are submitted by Sadur Rehman *et al* (2008). The increase in 1000 grain weight with by using inorganic and organic fertilizer was also reported by other worker Azam *et al*.(2010).

Table 2. Impact of inorganic and organic sources (fertilizers) of nutrients on tillers number plant^{-1}

Treatments	Tillers number plant^{-1}	Length of spike (cm)	Grains number spike^{-1}	Test weight
T0	7.53cd±0.16	7.62c±0.07	42.63b±3.30	40.73c±0.23
T1	8.47e±0.18	9.35a±0.08	62.207a± 1.52	48.26a±0.32
T2	8.37bc±0.22	8.49b±0.11	57.00a±2.40	41.50c±0.17
T3	8.40ab±0.22	8.36b±0.14	57.10a±1.11	45.06b±1.71
T4	8.87de±0.02	9.18a±0.12	60.27a±0.26	48.33a±0.79
T5	8.20a±0.14	7.86c±0.03	44.33b±2.04	41.36c±0.55
T6	8.30c±0.23	8.32b±0.07	46.76b±1.82	42.33 bc±0.56
T7	8.50e±0.64	8.56b±0.02	57.27a±2.49	48.30a±0.54

Grain Yield (q ha^{-1})

The impact of inorganic and organic fertilizer on total grain yield has been displayed in Table 3. Minimum and maximum grain yield was noted in the range of (40.42 q ha-1 to 53.03). The highest value (53.03 q ha-1) was recorded in T_4 (50% FYM+ 50% RDF) followed by T_1

(100% RDF) i.e. 50.58 ton^{-1} while the lowest value (40.42 ton^{-1}) was recorded in T_0 (Control). The grain yield q ha^{-1} higher in T^4 (50% FYM+ 50% RDF) then the control treatment. This may be due the contribution of farmyard manure and vermicompost that help to promote the micronutrient availability in the soil medium and result in increased uptake of the soil anions cations, nitrates and phosphates. Moreover, they are set free in the soil in slow manner so that they may be available for crop during entire growth period. Similar findings reported by H.P. Verma (2017). Highest grain yield was documented in case of T_4 where 50% RDF+ 50 % F.Y.M was applied it indicates that the combination of inorganic and organic fertilizer could be a better way of nutrient availability to the wheat crop rather than the alone use of fertilizers (organic or inorganic natured). Analogous outcomes were proved by Kunj Bihari *et al.*(2018) and Chaturvedi *et al*.(2006).

Straw yield

Maximum and minimum straw yield was documented in the range of (63.90 q ha^{-1} to 66.57 q ha^{-1}).The highest value (66.57 q ha^{-1}) was recorded in T_4 (50% FYM+ 50% RDF) followed by T_1 (100% RDF) i.e 4.17 q ha^{-1} while the lowest value (63.93 q ha^{-1}) was recorded in control treatment i.e.T_0. The highest straw yield was obtained in treatment T_4 (50 % RDF+ 50 % FYM).It may happen be due to the combined use of fertilizers (inorganic and organic) led to increase in crop growth parameter and resulted in higher nitrogen uptake and higher straw yield obtained.

Harvest Index

The impact of fertilizer (inorganic and organic) on Harvest Index is presented in Table 3. The highest and lowest Harvest Index has been observed in the range of (39.02% to 44.33%). Maximum value (44.33%) was documented in T_4 (100% FYM+ 50% RDF as compare to T_0 (Control). Highest harvest index was observed in treatment T_4 (50 % RDF+ 50% FYM) where the combine use of organic and inorganic fertilizer was given. Similar results are reported by Subhan *et al;* 2017.

Table 3: Impact of inorganic and organic sources of nutrients on yield of grains

Treatments	Grain yield	Straw yield	Harvest index
T0	40.42f±0.43	63.90c±0.11	39.02e±0.23
T1	50.58b±0.68	65.12 ab±0.16	43.71 ab±0.39
T2	45.49e±0.37	64.44b±0.22	41.38d±0.12
T3	47.25cde±0.46	65.10ab±0.09	42.05cd±0.20
T4	53.03a±0.62	66.57a±0.11	44.33a±0.32
T5	49.10bc± 0.42	64.67b±0.21	43.20b±0.27
T6	46.36de± 0.42	64.26ab±0.11	41.90d±0.26
T7	48.46bcd± 0.73	63.93ab±0.14	43.08bc±0.31

CONCLUSION:

The present study revealed that comparison of inorganic and organic sources of nutrients on weed flora and wheat yield. Different observations were recorded *viz.*, plant height (cm), tillers per plant, spike length, grain yield (q ha^{-1}), straw yield (q ha-^{1}), and test weight (g). Incorporation of 100% RDF leads to highest plant height followed by T_6 = 50% Vermicompost + 50 % FYM taken at different time interval *viz.*, 30 DAS, 60 DAS, 90 DAS and 120 DAS. Tillers number $plant^{-1}$ were highest in T_4 = 50% FYM + 50% RDF, while spike length was highest in plots where T_1 = 100% RDF was given. It was resulted that grain yield as well as straw yield was highest in T_4 = 50% FYM + 50% RDF. The highest weeds population was recorded in T_0 = Control followed by T_3 = 100% FYM. The combination of 50% FYM+50% RDF proved to be best in all aspects like number of tillers, test weight and grain and straw yield including harvest Index.

REFRENCES

1. Agegnehu, G., Vanbeek, C., & Bird, M. I. (2014). Influence of integrated soil fertility management in wheat and tef productivity and soil chemical properties in the highland tropical environment. *Journal of soil science and plant nutrition*, *14*(3), 532-545.

2. Baitilwake, M. A., De Bolle, S., Salomez, J., Mrema, J. P., & De Neve, S. (2011). Effects of manure nitrogen on vegetables' yield and nitrogen efficiency in Tanzania. *International Journal of Plant Production*, *5*(4), 417-429.

3. Breiman, A., & Graur, D. (1995). Wheat evolution. *Israel Journal of Plant Sciences*, *43*(2), 85-98.

4. Chaturvedi I. Effects of different nitrogen levels on growth, yield and nutrient uptake of wheat (Triticum aestivum L.). (2006). International Journal of Agricultural Sciences. 2(2):372-374.

5. H.P. Verma, O.P. Sharma, Rajesh Kumar, S.S. Yadav, A.C. Shivran and Balwan (2017). Yield attributes and yield of wheat (triticum aestivum l.) as influenced by irrigation scheduling and organic manures *Chemical Science Review and Letters* 6(23), 1664-1669.

6. Ibrahim, M., Hassan, A., Iqbal, M., & Valeem, E. E. (2008). Response of wheat growth and yield to various levels of compost and organic manure. *Pak. J. Bot*, *40*(5), 2135-2141.

7. Meena, K. B., Alam, M. S., Singh, H., Bhat, M. A., Singh, A. K., Mishra, A. K., & Thomas, T. (2018). Influence of farmyard manure and fertilizers on soil properties and yield and nutrient uptake of wheat. *IJCS*, *6*(3), 386-390.

8. Subhan, A., Khan, Q. U., Mansoor, M., & Khan, M. J. (2017). Effect of organic and inorganic fertilizer on the water use efficiency and yield attributes of wheat under heavy textured soil. *Sarhad Journal of Agriculture*, *33*(4), 582-590.

9. Shah, S. A., Shah, S. M., Wisal, M., Shafi, M., Haq, N., Samreen, S., & Amir, M. (2010). Effect of integrated use of organic and inorganic nitrogen sources on wheat yield. *Sarhad Journal of Agriculture*, *26*(4), 559-563.

