Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8809

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2021) *9*(5), 142-146

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Influence of Integrated Nutrient Management of Wheat (*Triticum aestivum* L.) Under Vindhya Region in Satna Condition

Mohammed Altaf[1]* and D.P. Chaturvedi[2]*

[1]M. Sc. (Ag) Student, Department of Agronomy, AKS University, Sherganj Satna (M.P.)

[2]Teaching Associate, Department of Agronomy, AKS University, Sherganj Satna (M.P.)

*Corresponding Author E-mail: altafraza15597@gmail.com

Received: 9.09.2021 | Revised: 12.10.2021 | Accepted: 24.10.2021

ABSTRACT

A field experiment was conducted at Instructional Farm of Department of Agronomy, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.) to study the effect of integrated nutrient management on yield of wheat during winter seasons of 2020- 21. Ten treatments were evaluated in randomized block design with three replications. Results revealed that the 75% RDF + Vermicompost @ 3 tons/ha significantly influenced the plant height (85.87 cm) and number of tillers per meter row length at 90 DAS (80.87), spike length (11.46 cm), number of grains per spike (35.80) and test weight (39.24 g) of wheat. Application of 75% RDF + Vermicompost @ 3 tons/ha produced highest grain yield (50.99 q/ ha) and straw yield per hectare (66.30 q/ ha) of wheat. The integrated use of organic manure and inorganic fertilizers improved the protein content in grain and maximum value (12.74 %) was recorded with 75% RDF + Vermicompost @ 3 tons/ha. The results indicated that combined use of 75% RDF + Vermicompost @ 3 tons/ha was the most appropriate nutrient management for higher growth, yield and quality parameters of wheat.

Keywords: *Tillers, Grain, Straw, Test weight, Protein content.*

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops of the world. Among the world's most important food grains, wheat ranks next to rice. Wheat straw is a good source of feed for a large population of the cattle in our country. It ranks second in the world among the cereals both in respect of acreage. The total area under wheat cultivation in the world during 2018-19 was 218.2 million hectares with an annual production of 765.5 million tons and average productivity of 3.51 tons/ ha (USDA, 2019). It is an excellent health-building food containing approximately, 78% carbohydrates, 12% protein, 2% fat and minerals each and considerable number of vitamins (Kumar et al., 2011).

Cite this article: Altaf, M., & Chaturvedi, D. P. (2021). Influence of Integrated Nutrient Management of Wheat (*Triticum aestivum* L.) Under Vindhya Region in Satna Condition, *Ind. J. Pure App. Biosci. 9*(5), 142-146. doi: http://dx.doi.org/10.18782/2582-2845.8809

About 80 to 85% of wheat grains are ground into flour (atta) and consumed in the form of chapaties.

The recent research indicated that a judicious combination of organic and inorganic fertilizers with biofertilizers will maintain long term soil fertility better and sustain higher levels of productivity (Pillai et al., 1985). Integrating of chemical and bio- fertilizers with organic manures has been found to be quite promising not only in maintaining higher productivity but also in providing greater stability in crop production. The interactive advantages of combining inorganic and organic sources of nutrients generally proved superior to the use of each component separately. Thus, to maintain the soil health, integrated nutrient management approach involving organic and mineral sources needs to be standardized.

Crop responses to organics and bioinoculants do not bring an immediate change as chemical fertilizers, but lead to increased use efficiency of fertilizers and enhanced physico-chemical properties of soil on long term basis. Therefore, to reduce dependence on chemical fertilizers and maintenance of high production levels are vital issues in modern agriculture which is only possible through integrated nutrient management (INM). Use of organic manures and bioinoculants in INM helps in mitigating the multiple nutrient deficiencies. Addition of organic manures provides favorable environment for plant growth in addition to causing improvement in physical, chemical and biological properties of soil. The INM strategy is focused on preserving the supply of plant nutrition to achieve a certain degree of crop production by cohesively maximizing the benefits of all possible plant nutrition sources, relevant to each crop trend and farming situation (Kaushik et al., 2012). Hence, present investigation was carried out to study the growth, yield and qualitative behavior of wheat to define optimum dose under integrated use of organic manure and fertilizers.

MATERIALS AND METHODS

The experiment was carried out at Instructional Farm, Faculty of Agriculture, AKS University, Satna (M.P.) during rabi season 2020- 21. The experiment was conducted in randomize complete block design with three replications. The treatments were; T1= Control, T2= 100 % RDF, T3= 75 % RDF, T4= 50 % RDF, T5= 50% RDF + 25% RDN + Azotobacter, T6= 37 % RDF + 37% RDN + Azotobacter, T7= 75 % RDF + 25% RDN, T8= 50 % RDF + 50% RDN, T9= 75% RDF + Vermicompost @ 3 tons/ha and T10= 50% RDF + FYM @ 6 tons/ha. The wheat variety Pusa Tejas- 8769 was sown on November 1st, 2020 using 100 kg seeds per ha. The gross and net plot size was 5.0 m x 3.5 m and 4.0 m x 3.0 m, respectively. The N, P2O5 and K2O were applied through urea, single super phosphate and muriate of potash, respectively. Full recommended dose of phosphorus and potassium at the rate of 60 kg P2O5 /ha and 40 kg K2O /ha and half dose of nitrogen @ 120 kg/ha, respectively was uniformly applied to each plot (except control plots) as basal dose before sowing. Remaining half dose of N was top dressed in two equal splits at 25 and 45 days after sowing. Quantity of vermicompost (as per treatment) was mixed in respective plots as per treatments. Wheat seeds were inoculated with Azotobacter cultures as per treatments by using 10 packets (200 g each packet) for 100 kg seed of wheat needed for sowing one-hectare area. The other crop management practices were followed as per standard recommendation. The crop was harvested at the physiological maturity. All the other agronomic practices were applied uniformly to all the treatments.

RESULTS AND DISCUSSION

Data regarding plant height and number of tillers per plant are reported in Table- 1. Statistical analysis of the data revealed that maximum plant height (85.87 cm) and number of tillers per meter row length at 90 DAS (80.87) at maximum crop growth stage of 90 DAS were observed under the integrated use of chemical fertilizers and organic manure with 75% RDF + Vermicompost @ 3 tons/ha while, lowest values were observed under the control.

The increase in growth attributes with the application of 75 % RDF + Vermicompost @ 3 t/ha might be due to improved photosynthetically active leaf area for longer period during vegetative and reproductive phases, led to more absorption and utilization of radiant energy which ultimately resulted in higher dry matter accumulation and significant increase in plant growth. It is an established fact that organic manure improves the physical, chemical and biological properties of soil and supplies almost all the essential plant nutrients for growth and development of plants along with growth hormones and beneficial microbes which might have developed more favorable environment of nutrients in soil for longer period resulted in increased plant height, new shoots and increased dry matter accumulation. It is fact that organic matter acts as a chelate for nutrients and soluble chelates probably increase their availability and uptake to plants and mobility in soils. The results of the present investigation are in conformity with those of Mali et al. (2016) and Neelam and Satpal (2018).

The increase in growth attributes might be due to increase in availability of major nutrients of nitrogen and phosphorus due to direct addition in the form of fertilizer. Nitrogen is one of the major essential plant nutrients required for growth and the increased availability of nitrogen due to direct addition of nitrogen in the form of inorganic fertilizer on otherwise poor soil might have increased number of cells and cell size leading to better growth of crop. Similarly, increased supply of available phosphorus in soil has long been considered as an essential constituent of all living organisms and plays an important role in the conservation and transfer of energy in the metabolic reactions of living cells including biological energy transformations. Thus, application of recommended dose of fertilizers at optimum level increased the plant growth. Similar finding has also been reported by Berkesia et al. (2018) and Kumar et al. (2021).

Data regarding length of spike, number of grains per spike, test weight, grain & stover yield of wheat and protein content are reported in Table- 1 and maximum values were observed when crop fertilized with chemical fertilizers and organic manure. Statistical analysis of the data revealed that highest spike length (11.46 cm), number of grains per spike (35.80), test weight (39.24 g), grain yield (50.99 q/ ha), straw yield per hectare (66.30 q/ ha) and protein content (12.74 %) recorded under the integrated use of chemical fertilizers and organic manure with 75% RDF + Vermicompost @ 3 tons/ha.

The increase in yield attributes with the application of vermicompost in increasing rate might be due to higher availability of balanced plant nutrients throughout the crop period specially at critical stages of plant favourable C:N ratio (Marimuthu et al., 2002), better utilization of nitrogen for reproductive growth rather than for vegetative growth, functional role of nitrogen in the plant body i.e. in multiplication, cell elongation and tissue differentiation.

The increase in the yield attributes with the application of 75 % RDF + Vermicompost @ 3 t/ha ascribed to improved physical, chemical and biological properties of soil, direct addition of plant nutrients (macro and micro) and growth regulators and also due to increased

microbial population of soil, which accelerated the process of humification, removal of obnoxious smell and detoxification of soil pollutants.

The increase in grain and straw yields with this integrated nutrient management treatment might be due to better nutritional environment in low status of nitrogen and phosphorus soil as evidenced by their uptake in the plant and due to the increased supply of N, P and K and their higher uptake by plants might have stimulated the rate of various physiological processes in plant and led to increased growth and yield parameters, resulted in increased grain and straw yield of the crop. Combined application of bio-organics and fertilizer levels showed significant positive interaction on number of effective tillers of wheat. The combined application of vermicompost with fertilizer in optimum level obtained maximum number of effective tillers. The enhanced early vegetative growth of plant, dry matter accumulation and vigorous root system resulted in more spike which consequently increased the number of spikes bearing tillers significantly. Stimulated vegetative growth of wheat on account of adequate and prolonged supply of essential nutrients in integrated nutrient management treatments receiving vermicompost in addition to increasing levels of RDF manifested itself in increased yield attributes and yield. These findings are in accordance with the results of Dinka et al. (2018), Dahiya et al. (2019), Kumar et al. (2019), Parashar et al. (2020a) and Yadav et al. (2020).

Significant increase in protein content with fertilizer levels due to inorganic and organic nutrient sources, might be due to increased nitrogen content in grain which might have resulted due to increased availability of nitrogen to plants and increased activity of nitrate reductase enzyme. Higher nitrogen in grain is directly responsible for higher protein content, because it is a primary component of amino acids which constitute the basis of protein. These results are in conformity with the findings of Yadav et al. (2020).

Table 1: Influence of integrated nutrient management on growth, yield and quality of wheat

Treatment	Plant height (cm)	Number of tillers	Spike length (cm)	Number of grains per spike	Test weight (cm)	Grain yield (q/ha)	Stover yield (q/ha)	Protein content (%)
T_1	73.02	50.27	6.10	28.40	32.31	18.01	39.74	9.60
T_2	85.04	73.47	10.09	33.87	37.18	50.76	66.16	12.54
T_3	80.35	62.60	7.88	31.27	34.40	21.76	53.55	11.42
T_4	76.47	53.67	6.48	28.87	32.70	18.30	48.66	10.12
T_5	79.50	60.53	7.33	30.33	34.07	20.98	52.40	11.22
T_6	78.61	60.13	7.02	29.73	33.39	20.03	52.06	11.04
T_7	82.94	67.40	8.50	32.27	36.14	49.27	64.19	12.33
T_8	81.28	66.33	8.19	31.73	34.76	24.56	53.68	11.98
T_9	85.87	80.87	11.46	35.80	39.24	50.99	66.30	12.74
T_{10}	82.12	66.73	8.88	31.87	35.46	25.62	53.90	12.10
S. Em±	0.82	1.11	0.20	0.89	1.55	4.51	2.42	0.82
C.D.(P=0.05)	2.39	3.24	0.57	28.40	32.31	18.01	39.74	9.60

Acknowledgment

Authors are thank to Dr. T. Singh Prof and head Agronomy for very kindly providing all the experimental facilities and suggestions for successful conduct of the experiment.

REFERENCES

Dinka, T. B., Goshu, T. A., & Haile, E. H. (2018). Effect of Integrated Nutrient Management on Growth and Yield of Food Barley (Hordeum vulgare) Variety. *Adv. Crop Sci. Tech. 6* (3), 1- 8.

Kumar, P., Yadav, R. K., Gollen, B., Kumar, S., Verma, R. K., & Yadav, S. (2011). Nutritional contents and medical properties of wheat. *A review Life Sciences and Medicinal Research, 47* (2), 145-149.

Kaushik, M. K., Bishnoi, N. R., & Sumeriya, H. K. (2012). Productivity and economics of

wheat as influenced by inorganic and organic sources of nutrients. *Annals of plant and soil research, 14* (1), 61-64.

Mali, H., Choudhary, J., Shukla, K. B., & Chopra, R. (2016). Effect of Varieties and Different Precision Nutrient Management Practices on Performance of Barley. *International Journal of Agriculture Sciences, 8* (53), 2616- 2620.

Neelam, B., Singh, B., Kainwal, M. K., & Satpal (2018). Potential Productivity and Economics of Feed Barley as Influenced by Different Nitrogen Levels and Plant Growth Regulators. *International Journal of Agriculture Sciences, 10* (10), 6150-6152.

Neelam, Singh, B., & Satpal (2018). Response of barley genotypes to different nitrogen levels under irrigated timely sown conditions. *Forage Res. 44* (1), 63- 65.

Parashar, A., Kumar, S., Gupta, S., Dogra, P., & Tyagi, B. S. (2020a). Response of malt barley (Hordeum vulgare L.) varieties to nitrogen and sulphur application under Agro-climatic zone IIIa (semiarid eastern plain zone) of Rajasthan. *Journal of Cereal Research, 12* (1), 55- 60.

Pillai, K. G., Devi, S. L., & Setty, T. K. P. (1985). Research achievements of All India Coordinated Agronomic Res. Project. *Fertilizers News, 30*, 26-34.

Seema, D., Singh, J., Singh B., & Khedwal, R. S. (2019). Yield and quality of malt barley (Hordeum distichum L.) as influenced by seed rate, row spacing and nitrogen levels. *Applied Biological Research, 21* (1), 35-40.

Santosh, K., Vivek, Rana, N. S., Kumar, R., Naresh, R. K., & Dhyani, B. P. (2019). Effect of Weed and Nutrient Management on the Growth and Yield of Barley (Hordeum vulgare L.) and Associated Weeds. *Int. J. Curr. Microbiol. App. Sci. 8* (2), 993-1001.

Santosh, K., Vivek, Naresh, R. K., Dhyani, B. P., Sharath Chandra, M., Kumar, R., & Sandeep, G. (2021). Nutrients removal by crop and weeds under different weed and nutrient management practices in barley (Hordeum vulgare L.) and its associated weeds. *The Pharma Innovation Journal, 10* (3), 599-605.

Shipra, Y., Kumar, R., Chauhan, S. S., Kumar, M., & Kumar, S. (2020). Influence of different nitrogen levels on growth, productivity, profitability, nutrient content and protein yield of barley cultivars in Sodic soil of Uttar Pradesh. *International Journal of Chemical Studies, 8* (2), 1205- 1215.

United States Department of Agriculture (USDA) (2019). Foreign agricultural service/office of global analysis international production assessment division (IPAD), Ag Box 1051, Room 4630 South Building, Washington D C. 20250-1051, https://ipad.fas.usda.gov.