

Yield and Yield Attributes of Wheat Crop Response to FYM and Fertilizers Application: A Review

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ABSTRACT

Wheat is one of the world's most commonly consumed cereal grains. It comes from a grass (*Triticum*) that is grown in countless varieties worldwide. Wheat is the dominant component of the Indian food security system as it is consumed as major staple food. Wheat is an exhaustive crop and requires large amount of nutrients, so the use of chemical can't be completely avoided. One of the major constraints in boosting up the wheat production is the deteriorious effect on soil health. Therefore there is a need to improve nutrient supply system in terms of integrated nutrient management involving the use of chemical fertilizers in conjunction with organic manures coupled with input through biological processes. Higher yield at balanced nutrition safe guard soil fertility. Integrated plant nutrient supply system could help in meeting the goals of balanced fertilization. The research findings on various aspects of the integrated nutrient management on wheat are reviewed.

Key words: FYM, Fertilizers, Biofertilizer, Chemical fertilizers, Wheat

INTRODUCTION

An integrated use of manure with chemical fertilizer resulted in build-up of available nutrients in soil much more effectively than that of chemical fertilizer alone as reported by Bhatt, (2018). Hassan et al., (2018) observed that organic source with inorganic sources are more suitable. This integration not only reduced the cost of cultivation but also is an environment friendly approach. Incorporation of organic manures alone or in combination with inorganic fertilizers maintained soil fertility and proper nutrition to crop. Joy et al., (2018) studied that soils which receive plant

nutrients only through chemical fertilizers are showing declining productivity despite being supplied with sufficient nutrients. This can be attributed to the appearance of deficiency in secondary and micronutrients. The physical condition of the soil is deteriorated as a result of long-term use of chemical fertilizers.

Effect of FYM on wheat crop:

Application of FYM @ 10 and 20 tonnes/ha increased the grain yield and the total N P and K uptake in wheat crop (Singh & Agrawal, 2005). Response of FYM measured as kg grain / tn was highest in wheat (Mahapatra et al., 2007).

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It was further noticed that fertilizer needs of the winter wheat could be reduced to the extent of 25 per cent by substituting 25 per cent needs of preceding monsoon crop through FYM at some location (Singh et al., 2009).

Organic carbon content registered an increase varying from 28.6 to 35.7 per cent over control due to continuous application of FYM, rice straw or green Karanj leaf over the year. Addition of organic nutrient source might have created environment conducive for formation of humic acid, stimulated the activity of soil microorganism resulted in an increase in the organic carbon content of the soil (Bajpai et al., 2006).

Effect of chemical fertilizers application on wheat yield :

Application of 100 % NPK significantly improved the grain yield of wheat by 21.5% over application of 75% NPK (Bandyopadhyay et al., 2009). Application of different levels of potassium and zinc significantly increased all the yield attributes and yield of wheat (Khare & Dixit, 2011). Higher seed yield (36.42 q/ha) of wheat was recorded when 120 kg N/ha was applied to preceding rice crop and 120 kg N/ha was applied to succeeding wheat crop. Application of N @120 kg N/ ha helps to increase uptake of N by wheat significantly (Kumar et al., 2011). Application of 100% N, 100% NP and 100% NPK produced 2681, 4431 and 4950 kg/ha grain of wheat (Chauhan et al., 2011).

Application of 180 kg/ha significantly increased the grain and straw yield of wheat by 32.5 and 33.7 % compared with the 60 kg N/ ha 100% NPK in wheat showed beneficial effect on plant height and dry matter accumulation at harvest in wheat (Katiyal et al., 2002). The sulphur content in wheat increased with the increase in the level of applied S but the increase was non-significant (Sharma et al., 2009). Maximum grain yield of wheat was recorded with 150% RDF (2.1 t ha⁻¹) followed by 100% RDF (4.98 t ha⁻¹).

Plant height of wheat increased significantly from 78-81 to 84-85 cm when the rate of P application was increased from 0 to

80 kg P₂O₅ /ha as DAP in all the 3 years of study and incorporation of crop residues increased cost of cultivation by 9.1% over control (Singh et al., 2011).

Effect of combination of FYM, biofertilizer and chemical fertilizers on wheat yield :

Bhatt et al., (2017) studied that a field experiment with wheat at the Crop Research Centre, Pantnagar, under a rice–wheat system was conducted to study the long-term effect of inorganic fertilizer and FYM on physico-chemical properties of soil and yield. The results obtained indicated that the highest grain yield (3524 kg ha⁻¹) was recorded due to application of N +P +K +Zn (F) + FYM while, the lowest grain yield (859 kg ha⁻¹) was recorded under control. The results obtained indicated that the highest straw yield was recorded due to application of N +P +K +Zn (F) + FYM while, the lowest straw yield was recorded under control. The highest biological yield was recorded with N +P +K +Zn (F) + FYM while, the lowest biological yield was observed under control. The fertilizer treatments had significant influence on grain, straw and biological yields.

Integrated use of 75% NPK and FYM @ 5 t/ha or poultry manure @ 1.5 t/ha or phosphocompost @5 t/ha to rainy season crops and 75% NPK to wheat significantly improved the yield of wheat over application of 100% NPK in both the season (Bandyopadhyay et al., 2009). Application of FYM @ 10 t/ ha and poultry manure @ 2.5 t /ha along with 50% NPK resulted in 13.5 and 22.9% high yield, respectively over 50% NPK alone (Behera et al., 2007)

Amanullah Jan et al., (2011) studied that present experiment was designed to ascertain the combined effect of organic and inorganic fertilizer management on rainfed wheat. Four levels of farm yard manure, FYM, (0, 10, 20, and 30 Mg FYM ha⁻¹) and nitrogen (0, 30, 60, 90, and 120 kg N ha⁻¹) were used. The present study suggested that application of 30 Mg FYM ha⁻¹ + 90 kg N ha⁻¹ are promising levels for higher production of wheat under moisture stress conditions.

Increase grain & straw yield due to integrated use of FYM, sulphur and boron with 75% NPK may be due to synergistic effect of all inputs when combined together with 75% NPK (Reena et al., 2017). The maximum grain yield of wheat 34.70 q/ha was recorded in treatment obtaining nitrogen from FYM and urea in 75:25 ratio succeeded by 33.92 q/ha in treatment obtaining nitrogen from two sources in 50:50 ratio. A significant lowest grain yield was recorded in treatment receiving nitrogen solely from FYM than other fertilizers treatments (Hassan et al., 2018).

Effect of combination of organic and inorganic sources on yield attributes :

Tejalben et al., (2017) observed that a significant effects observed by INM in tillers and test weight of wheat. Among the different treatments, (75% RDF + 10 t FYM ha⁻¹) registered maximum value for plant height (78.00 cm), number of effective tillers (82.77) and test weight (33.30 g 1000 seeds⁻¹) which was significantly more than RDF. The increase in the yield attributing characters by INM treatments might be due to addition of nitrogen as well as other nutrients and growth promoting substances through organic manure (FYM 10t ha⁻¹)

The per cent increase in number of spikes per metre row length, length of spike and number of grains per spike were 34.35%, 28% and 31% respectively over the RDF 120:60:00 NPK kg/ha (Desai et al., 2015). Application of 150:75:75 of NPK + FYM 5 t/ha + 24 kg Zn SO₄ /ha resulted significantly higher plant, height tiller/ m, effective tiller/ m, length of ears, grain per year and test weight as compared to rest of the treatments.

In the current study an experiment was carried out through the integrated use of organic manure (FYM) and inorganic fertilizers (Urea). The maximum plant height of 84.75 cm was recorded in the treatment obtaining nitrogen from FYM and urea in the ratio of 75:25 followed by 50:50 and 100:00 ratio. The control treatment receiving no FYM and urea has minimum plant height of 73.6 cm as reported by Hassan et al., (2018).

The maximum plant height and number of tillers per plant was observed with (N-120, P-60, K-40, FYM-10, Zn-25 kg /ha) which was 86.43 cm and 7.33 respectively at 90 DAS (Sangma et al., 2017)

Amanullah Jan et al. (2011) reported that Plant height, productive tillers m⁻², grains spike⁻¹, grain yield, straw yield, and harvest index were significantly higher in plots which received 30 Mg FYM ha⁻¹. In the case of nitrogen (N) no distinctive differences between the effect of 90 and 120 kg ha⁻¹ was observed for most of the parameters. Nitrogen application at 90 kg ha⁻¹ had significantly higher; plant height, grains spike⁻¹, grain yield, straw yield, and harvest index as compared with the lower levels, i.e., 0, 30, and 60 kg N ha⁻¹ but were at par with 120 N kg ha⁻¹. Significantly higher numbers of productive tillers m⁻², grains spike⁻¹, grain yield, straw yield and harvest index were recorded with application of 30 Mg FYM ha⁻¹ + 90 kg N ha⁻¹.

Effect of combination of organic and inorganic sources on N, P, K uptake and other attributes:

Phullan et al., (2017) observed that the experiment was laid out in a split plot design with manures as main split and mineral fertilizer rates as sub-split. The manures significantly influenced shoot dry weight, N, P and K uptake and soil properties. The rates of mineral fertilizers significantly enhanced the shoot dry weight and N, P and K uptake. The combined use of manures and mineral fertilizers had a significant effect on shoot P uptake. Shoot dry weight was significantly influenced with the incorporation of organic manures and rates of mineral fertilizers. In case of organic manures, maximum shoot dry weight of 0.263 g plant⁻¹ (8% over mineral fertilizer) was noted in plots fertilized with farmyard manure

At maturity, wheat grain had highest Zn concentration under 100% NPK + Zn treatments (Peeyush et al., 2009). The highest OC content (9.4 g/ kg) was recorded in the treatment of 100% NPK + FYM 15 t/ ha after the wheat crop (Chauhan et al., 2011).

CONCLUSION AND RECOMMENDATIONS

Results suggested that the integrated use of fertilizers and FYM performed better than the use of fertilizer or FYM alone in terms of improving crop and yields of wheat. The combination of fertilizer and FYM produced excellent results and is therefore recommended for optimum wheat production.

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