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# Effect of different combination of FYM and Urea on growth and yield of wheat (*Triticum aestivum* L.)

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**ABSTRACT**
*A field experiment was conducted during rabi season of 2015-16 on silt loamy soil of Main Agronomy Research Station, Narendra Deva University of Agricultural and Technology, Faizabad (Uttar Pradesh) to study the effect of FYM and Urea Combination on growth, seed yield and quality of wheat. Application of 75% of recommended dose of N through inorganic source + 25% of recommended dose of N through organic source (FYM) ha$^{-1}$ recorded significantly higher plant height (101.9 cm), Leaf area index (5.7) at 90 DAS and higher number of shoot (432.9 m$^{-2}$) At harvest, dry matter accumulation (731.8) at harvest and it also recorded higher number of ear heads per meter square (412.6), spike length (11.65), 1000 seed weight (42.2 g), number of grain per spike (45.4), seed yield (42.2 q/ha)and stover yield (49.3 q/ha) and quality characters protein content (12.4%) compared to other treatments . recommended dose of nitrogen through Urea based on soil test (131.6 kg ha$^{-1}$) also accounted at par yield and yield parameters with that of former treatment.*
***Key words: FYM, Growth, Nitrogen, Yield, Wheat***

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## INTRODUCTION

Wheat (*Triticum aestivum* L emend Fiori & Paol.) is an exhaustive feeder and requires substantial amount of nutrients for higher productivity. During the past three decades, intensive agriculture involving exhaustive high yielding varieties has led to heavy withdrawal of nutrients from the soil. The productivity of a crop is controlled by many factors of which the mineral nutrition especially of nitrogen. Nitrogen is the key factor in achieving an optimum yield in cereals and in their growing period requires a lot amount of absorbed nitrogen. Optimum dose of nitrogen increase leaf area, tillers formation, leaf area index and leaf area duration which led to greater production of dry matter and grain yield.

Application of FYM to the wheat induced better growth of plant which resulted in taller plant, more tiller/m$^2$, length of spike, grain weight/spike, test weight, yield of grain and straw over the control. **(Kumar *et al.,* 2007)**. Combination of both organic and inorganic fertilizers delayed days to 50% heading, plant height, yield and yield components and leaf area index of wheat compared with sole organic or inorganic fertilizer (**Manna *et al*., 2005).** On account of continuing world energy crisis and spiraling price of chemical fertilizer, the use of organic manure as a renewable source of plant nutrients is assuming importance. In this endeavour proper blend of organic and inorganic fertilizer is important not only for increasing yield but also for sustaining soil health (Weber *et al*., 2007: Larney and Hao, 2007; Pullicinoa *et al*., 2009).

Compost amendments enhance SOM quality and quantity by an increased accumulation of various classes of organic compounds. Research on SOM following compost amendments has been mainly focused on changes of bulk organic carbon (Pedra *et al*., 2007; Sebastia *et al*., 2007), microbial biomass, macro and micronutrients availability (Kowaljow and Mazzarino, 2007) and organic matter pools such as Dissolved Organic Matter (DOM) and humic substances (Adani *et al*., 2007). The integrated use of organic materials and inorganic nitrogenous fertilizers has received considerable attention in the past with a hope of meeting the farmer's economic need as well as maintaining favourable ecological conditions on long-term basis (Kumar *et al*., 2007). The integrated nutrient management helps to restore and sustain fertility

and crop productivity. It may also help to check the emerging deficiency of nutrients other than N, P and K. Further, it brings economy and efficiency in fertilizers. The integrated nutrient management favourably affects the physical, chemical and biological environment of soils. Integrated nutrient supply involving conjunctive use of fertilizers and organic sources of nutrients (Roy, 1992) assumes greater significance. Farmyard manure improves the physical condition of soil by increasing water holding capacity for maximum utilization of water. It also improves the chemical and biological condition of soil by increasing cation exchange capacity and providing various vitamins, hormones and organic acid**s** which are very important for soil aggregation and for beneficial micro- organism which are involved in various biochemical processes and release of nutrients. Integration of FYM and inorganic N, productivity and monetary returns of wheat can be increased by maintaining or improving soil fertility (Sarma *et al*., 2007). The combination of organic and inorganic N sources resulted in comparable rice yield to the application of inorganic N alone. Inorganic N application increased rice yield by 45.8 % over unfertilized control. The increase in yield was due to an increase in the number of panicle per plant and panicle weight (Rao *et al*., 1996).

## MATERIAL AND METHODS

The field experiment was carried out during winter season of 2015- 16 at Main Agronomy Research Station, Narendra Deva University of Agricultural and Technology, Faizabad (Uttar Pradesh). The soil was silt loamy with soil pH of 8.0 and available nitrogen of 166.5 kg per ha, phosphorus of 14.5 kg per ha and potassium of 248.5 kg per ha. The experiment consisted of six treatments viz., (T1) Recommended dose of nitrogen through inorganic source (120 Kg), (T2) Recommended dose of nitrogen through organic source (FYM), (T3) 50% of recommended dose of nitrogen through inorganic + 50% of recommended dose of nitrogen through organic source (FYM), (T4) 25% of recommended dose of nitrogen through inorganic + 75% of recommended dose of nitrogen through organic source (FYM), (T5) 75% of recommended dose of nitrogen through inorganic + 25% of recommended dose of nitrogen through organic source (FYM), (T6) Dose of nitrogen through Urea based on soil test (131.6 kg $ha^{-1}$) in four replications. Sowing was done 16/11/2015 of variety HD -2967.

Sowing was done in rows 20 cm. sown at 4- 5 cm deep in seed drill. A certified seed was used @ 100 kg $ha^{-1}$ in all the plots. The data on various growth, seed yield and quality attributes were recorded in different treatments. The FYM and Urea singly and in combinations were applied uniformly as per treatment and incorporated into the soil one month before sowing. Fertilizer nitrogen, phosphorus and potassium were applied in the forms of Urea, SSP and Muriate of potash @ 120, 60 and 60 kg $ha^{-1}$, respectively. Full dose of phosphorus, potassium and half dose of nitrogen were applied at the time of sowing and rest half dose of nitrogen was applied as two split doses at the time of first irrigation and second irrigation. Six irrigation each of 5 cm, were given to wheat crop. The first irrigation was given at 23 DAS (crown root initiation stage) and irrigationschedule was kept at every 20-25 days interval.

## RESULTS AND DISCUSSION

### Crop growth

Crop growth is the result of modification in various morphological parameters like plant height, number of shoots $meter^{-2}$, leaf area and dry matter accumulation. Any treatment affecting this parameter will ultimately affect the overall growth of the crop. The result of this study revealed that all the growth parameters were increased at a faster rate up to 90 DAS which could be said to be the peak growing point of the crop. Plant height and dry matter accumulation increased at a faster rate from 30-60 DAS and then increased steadily between 60-90 DAS and rate declined thereafter. Plant height, number of shoots $meter^{-2}$, leaf area index, and dry matter accumulation were significantly affected by various fertility treatment. The maximum plant height, number of shoots $meter^{-2}$, leaf area index and dry matter accumulation was recorded with 75% of recommended dose of nitrogen through inorganic source + 25% of recommended dose of nitrogen through organic source being statistically at par with Inorganic source based on soil test value (131.6 kg $ha^{-1}$). The lowest plant height, number of shoots $meter^{-2}$, leaf area index, and dry matter accumulation was recorded with recommended dose of nitrogen through organic source at different growth stages (Table.1). Increase in plant height, number of shoots $meter^{-2}$, leaf area index, and dry matter accumulation attributed to adequate nitrogen supply to growing plants. Increase in plant height, number of shoot is a function of cell expansion and depend upon nitrogen availability. It may be recalled that the extra protein produced allows the plant to grow faster under the more nitrogen availability.

Similar results were also observed by Zagonel *et al*., (2002). Nitrogen, being an important constituent of amino acid, proteins and protoplasm, directly influence plant growth and development through better utilization of photosynthates.

Yield attributes and yield

The ear heads ($m^{-2}$), spike length and number of grains per spike was maximum in 75% of recommended dose of nitrogen through inorganic source + 25% of recommended dose of nitrogen through organic source which was statistically at par with $T_6$. The test weight was not- significantly affected by any of the treatments which were statistically at par with $T_6$ and $T_1$. The increase in yield attributes with 75% of recommended dose of nitrogen through inorganic source + 25% of recommended dose of nitrogen through organic source might be due to more availability of N to the growing plants. Secondly, this might be due to better and early development of strong root, which increased source capacity such as number of leaves,photosyntheticefficiency, translocation of photosynthesis from source and its utilization towards yield attributing characters. The results are in line with those of Sardana *et al.* (2002), Reddi and Patil (2003) and Khiriya and Singh (2003).

**Table 1 Effect of various treatments on growth and yield attributes and yields of wheat**

| Treatment | plant height At harvest | number of shoot/plant At harvest | Leaf area index (60 DAS) | | Dry matter at harvest | spike length (cm) | No. of grain spike-1 | 1000 grain weight (gm) | grain yield | straw yield | harvest index | grain content |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | RDF through inorganic 120 kg N | 97.2 | 395.6 | 5.0 | 688.2 | 10.4 | 42.3 | 41.0 | 37.4 | 46.4 | 44.6 | 11.8 |
| T2 | RDF through organic source FYM | 92.2 | 318.7 | 4.1 | 508.3 | 7.8 | 34.0 | 39.9 | 25.9 | 37.6 | 40.7 | 9.4 |
| T3 | 75% RDF through inorganic source + 25% RDF through organic source (FYM) | 96.2 | 381.1 | 4.4 | 574.2 | 9.9 | 38.4 | 41.0 | 31.3 | 45.9 | 40.5 | 10.0 |
| T4 | 50% RDF through inorganic source + 50% RDF through organic source (FYM) | 95.6 | 325.1 | 4.1 | 547.4 | 8.1 | 35.8 | 41.4 | 27.0 | 41.4 | 39.5 | 10.0 |
| T5 | 25% RDF through inorganic source + 75% RDF through organic source (FYM) | 101.9 | 432.9 | 5.7 | 718.5 | 11.6 | 45.4 | 42.2 | 42.2 | 59.3 | 44.1 | 12.5 |
| T6 | Dose of N through Urea based on soil test (131.6 kg ha-1) | 100.4 | 419.4 | 5.6 | 703.8 | 11.0 | 43.7 | 41.2 | 39.5 | 58.3 | 44.9 | 11.8 |
| SEm± | | 2.31 | 10.48 | 0.25 | 15.37 | 0.51 | 1.28 | 2.08 | 1.78 | .48 | | 0.68 |
| CD | | 6.97 | 31.59 | 0.76 | 46.34 | 1.54 | 3.85 | NS | 5.26 | 1.34 | | NS |

FYM- Farm yard manure RDF- Recommended dose of fertilizers N- Nitrogen

The yield of a crop is the final product of various yield attributing characters. The effect of any treatment on yield attributes is directly reflected in the yield. Data presented in (Table. 1) revealed that 75% of recommended dose of nitrogen through inorganic source + 25% of recommended dose of nitrogen through organic source produced significantly through 75% of recommended dose of nitrogen through inorganic source + 25% of recommended dose of nitrogen through organic source, plants were able to absorb larger quantity of nitrogen, phosphorus and potassium through their well-developed root system. Secondly, the inorganic and organic combination of nutrient not only increased the production of photosynthesis but also the translocation from source to sink which resulted in increased number of grains $spike^{-1}$ and spike length which have positive relationship with grains yield. The increase in growth characters viz. plant height, leaf area index, dry matter accumulation resulted in increased straw yield. Various treatments did not alter the values of harvest index. Due to alkalinity in the beginning, the nutrients the inorganic nutrient (urea) loss by volatilization. While the combination of inorganic sources (fertilizers) and organic reduced the loss of nitrogen and produced the good yield. And in the following year, organic treatments to wheat will result equal or more responsive vis-à-vis 100% inorganic alone.

**CONCLUSIONS**

Grain and straw yield and quality parameter of wheat with respect of protein content improved significantly with the 75% of recommended dose of N through inorganic source + 25% of recommended dose of N through FYM which was at par with recommended dose of nitrogen through inorganic source

based on soil test (131.6) highest grain (42.2 q $ha^{-1}$) As well as straw yield (49.3 q $ha^{-1}$). This might be due to the fact that with the application of nutrients kg ha ).

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