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Effect of Sowing Methods and Nutrients on Growth and Yield of Wheat (*Triticum aestivum* L.): A Review

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ABSTRACT

Wheat is one of the most important cereal crop and staple foods in the world. Increase in productivity of wheat by sowing methods and balance nutrient management is one of the most crucial factors. The main objective this study is to assessing the role of sowing methods and nutrients in improving different components of wheat yield. Results have show that the sowing methods and nutrient application substantially improved leaf area index (LAI), leaf area duration, CGR (Crop growth rate), RGR (Relative growth rate), NAR (Net assimilation rate), plant height, spike length, spikelets/spike, grains/spike, test weight, tillers m-2, grain yield, chlorophyll content and biological yield as well as harvest index of wheat. The yield and quality of wheat products improved and boosted by the sowing methods and nutrient applications.

Keywords: *Growth, Yield, Nutrients, Sowing.*

INTRODUCTION

Wheat (*Triticum aestivum* L.), a member of the Poaceae family, is one of the second main grain crops in the world. It is the important staple food of the world which meets most of the protein requirement of the people. In 2017/2018, wheat output exceeded 761.7 million tonnes, and in 2019/2020, global demand was projected to reach 762.4 million tonnes (FAO, 2020). Wheat is often commonly used for crumpets, cookies, flake, chapatis, bread, biscuits, noodles, flour, and grain to livestock, sales, roasted grain, and so forth. As the population increases exponentially, the production of wheat needs to be increased in order to fix the gap between growth and consumption. Wheat is subjected to many biotic and abiotic pressures regardless of their poor productivity.

The sowing methods (broadcasting, in rows, and in ridges) indicated that sowing wheat in ridges surpassed the other methods for crop growth rate; chlorophyll content; leaf area index; spike length; number of spikelet& spike-1; number of grain spike-1; 1000 kernel weight (g), biological; grain; and straw; yields as ton ha-1followed by sowing wheat in rows and broadcasting method during both seasons (Radwan et al., 2013).

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Whereas, drill-planting techniques with row spacing was inferior to broadcast method. It may be concluded that, paired rows and drill planting method is suitable for wheat sowing in sandy loam soils (Naresh et al., 2014).

In addition, there is inconsistency and improper use of fertilizers, lack of information on variants, edaphic features, mismanagement of farmers' field operations, and technology (Ali et al., 2018; Kumar et al., 2005; & Meena et al., 2013). A cultivar that performs best in one type of soil can perform poorly in the other type of soil, and vice versa (Adhikari et al., 2019). The organic manure alone cannot satisfy the nutrient demand, the wheat plant generates low yield (Sheoran et al., 2017). A report that the optimal use of mineral fertilizers and organic manures increases plant inputs, crop field, and water use efficiency (Zhang et al., 2016). The main objective of this study was to provide the information on the role of different nutrients on the growth and productivity of wheat. Many factors which cause deficiency problems are intensification in the cropping system, chemical fertilizers (NPK), over liming of acid soils, and the increased demand of high-yielding varieties to feed the global population (Fageria et al., 2007).

1. Role of methods of sowing in wheat

Sowing methods and seed rate were evaluated in a four replicated RCBD method. Results revealed that all growth and yield parameters were significantly affected by the sowing methods and seed rates. The interaction of sowing methods and seed rates significantly effected on spikes per plant and grains per spike, while other characters showed non significant interactions. Wheat sown by drilling method at the seed rate of 150 kg/ha significantly increased the plant vigor and yield. This increase in yield was associated with the progressive increase in all growth components. (Umed et al., 2009). To compare the conventional planting methods (22.5 cm) and broadcasting method of wheat sowing with drill planting method [15.0, 17.5, 20.0 cm and paired row (15:25 cm)] for grain yield and its parameters. The results over the years of the study revealed that, the germination were statistically at par in drill sowing at 17.5 cm apart rows and broadcasting. Better plant height was noted in drill planting with 17.5, 20 cm rows and 15:25 cm paired rows. However, number of spikelets spike-1 and number of grains spike-1 were statistically similar in drilling at 17.5, 20, and 15:25 cm paired apart rows. Similarly, 1000 grain weight was recorded in drill sowing at 20 cm and 15:25 cm paired rows. The maximum grain yield was obtained through 15:25 cm paired rows drill planting method and it was statistically at par with drill planting method where row spacing was 20 cm. Whereas, drill-planting techniques with row spacing 15 cm was inferior to broadcast method. It may be concluded that, 15:25 cm paired rows and 20 cm drill planting method is suitable for wheat sowing in sandy loam soils of irrigated areas of western Uttar Pradesh. (Naresh et al., 2014). The obtained results showed that wheat yield and its components were significantly affected all main factors (number of irrigations, planting methods and nitrogen levels) in both seasons. The highest values of yield and its components were obtained by applying the treatment of three irrigations after Mohayah irrigation as compared with other irrigation treatments (one or two irrigations) in both seasons. The highest value of all studied characters were resulted from planting wheat by using broadcasting and bed methods as compared with drilling method in both seasons. (Attia et al., 2013). The broadcast along with row spacings 10, 20 and 30 cm while five wheat cultivars i.e., Bhakar 2002, Seher 2006, Shafaq 2006, Faisalabad 2008 and Lasani 2008 were allocated in sub plots. The row spacing exhibited substantial effects on growth, yield and yield related attributes of wheat cultivars under study. The significant increase in LAI, LAD, CGR, number of fertile tillers per m2, spikelets per spike and number of grains per spike led to the highest grain yield in the cultivar Lasani 2008

at 20 cm row spacing. Nevertheless, the largest plant height and 1000-grain weight was obtained in Bhakar 2002 under 30 cm row spacing but it could not reimburse the severe decline in fertile tillers per m2 resulting in reduced grain yield. The minimum grain yield was recorded for broadcast method in all cultivars, as unevenly distributed plants were unable to utilize land, light and other inputs efficiently. Thus, it may be concluded that wheat could be sown at 20 cm row spacing irrespective of cultivar to exploit its maximum growth and yield potential (Nazim et al., 2014). Sowing methods shows significant differences in yield and yield components. Drilling on terraces sowing method gave the highest mean value of grain and biological yields as compared with broad casting method, which is the common sowing method for wheat. (Said & Ameen, 2016).

2. Role of nutrients in wheat

Nitrogen (N) The plant height and the number of tillers are enhanced. The synthesis of enzymes, nucleic acids (DNA, RNA), proteins, hormones, vitamins, alkaloids, and so on has a significant role to play. Phosphorus (P) Energy and protein metabolism transport has a critical part to play. Sugar Phosphates, phospholipids, co-enzymes, Nucleotides, and nucleic acids are essential to this field, Potassium (K) It tends to make ionic control and osmotic easier and necessitates a co-factor or activator of over 40 enzymes. This offers disease tolerance and drought protection (Agrinfobank, 2019).

The nitrogen source does not significantly impact the row length of tillers but increased tiller length and plant height (Sharma et al., 2016). The wheat grains were significantly increased when nitrogen was incorporated to over 40 kg ha-1 to 80 kg ha-1. The usage of wheat has been declining by weight from 0 to 80 kg N ha-1 of 1000 grams of wheat (Sharma et al., 2016). Nitrogen needs for cereals vary from different growth phases (Akhter et al., 2016; Biljana & Aca, 2009; & Tranaviciene et al., 2008). The content of chlorophyll dictates the amount of nitrogen the plants require. The amount of chlorophyll was significantly linked to the concentration of nitrogen in the wheat plant and the leaves (Akhter et al., 2016; & Schlichting et al., 2015). The amount of phosphorus from wheat is not impaired by the fertilizers containing phosphates. The plants will persist in adverse environmental effects with Phosphorous (Jamal & Fawad, 2019). Phosphorus is an essential part of numerous physiological functions such as energy accumulation and transmission, photosynthesis, respiration, cell differentiation, and cell expansion, which implies energy-rich phosphate compound synthesis as ATP, ADP. Phosphoproteins, nucleic acids, nucleotides, phospholipids, are also essential components (Anwar, 2016). The agricultural dimensions such as plant height, grain number per spike, grain weight, and test weight dramatically improved with treatments of 180 kg of N ha-1 and 90 kg of P2O5 (Ibtida, 2010).

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