



## Effect of different levels of FYM and varieties on yield and yield attributes of Wheat

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### Abstract

A field experiment on “performance of different wheat genotypes and different levels of farm yard manure under late sown conditions” was conducted at Chandigarh University, Gharuan (Mohali) during rabi 2020-21 to investigate the effects of different levels of Farmyard manure on yield of wheat varieties. The soil of experimental field was clayey loam and neutral in reaction. The soil was low in organic carbon and available nitrogen and medium in available potassium and phosphorous. The experiment was laid out in split plot design with five nutrition treatments (FYM to supply 187.5, 125 and 62.5 kg N ha<sup>-1</sup>, recommended dose of chemical fertilizers and unfertilized control) in main plots and 3 varieties (UNNAT PBW 343, HD 3086 AND DBW 222 ) in sub plots. A significant improvement in growth and yield attributing characters were recorded with the application of recommended chemical fertilizers over the rest of the treatments. The highest level of FYM (FYM<sub>187.5</sub>), supposed to supply 1.5 times higher nitrogen over the recommended nitrogen, resulted in lower grain yield (45.5 q ha<sup>-1</sup>) than recommended chemical fertilizers (48.5 q ha<sup>-1</sup>). However, the highest level of FYM was significantly better than the other two levels of FYM and unfertilized control. Among varieties, highest grain yield was recorded with the variety UNNAT PBW 343 followed by the variety HD 3086 and lower grain yield was recorded with the variety DBW 222.

**Keywords:** wheat, varieties, levels of FYM, yield and yield attributes

### Introduction

Wheat (*Triticum aestivum* L.) is one of the main cereal crops in world. It is widely cultivated and produced throughout the world. Of all the grain crops, wheat is the most popular staple food crop for human consumption. Belonging to family poaceae, it is annual crop of self pollination. It is cultivated over an area of about 29.14 (2019-20) million per hectares with an annual production of 2646.7 million tonnes (acc. to FAO) throughout the world. In India area under wheat cultivation is 29.58 (2019-20) million hectares with an annual production and yield of 99.70 million tonnes and 3371 kg/ha respectively (Directorate of Economics and Statistics). Wheat is a major cereal crop of Punjab. It is grown on an area of 35.20 lakh hectares during (2019-20) with production of 182.62 lakh tonnes and average yield of 51.88 quintals per hectare (acc. to PAU, Ludhiana. Among the various factors, which contributes towards productivity, the sowing condition and selection of suitable genotypes is quite important. Each variety has a specific genotypic ability to maintain its performance over a wide range of environmental conditions which is referred to as sensitivity or adaptability of a variety (Longove *et al.*, 2014) <sup>[1]</sup>. The cultivars developed and adapted in a particular agro- ecological zone usually remain sufficiently stable for the expression of morpho-physiological characters but occasionally behave differently when exposed to other zoned with different growing conditions. Changing crop phenology is considered an important bio-indicator of climate change, with the recent warming trend causing an advancement in crop phenology. The effects of climate change on crop phenology have interacted with the effects of changes in crop management, such as changing cultivars (Liu *et al.*, 2009) <sup>[2]</sup>. Developing varieties in demand with the local and zonal requirements

and strategic planning to deploy matching production technology have contributed a lot in this endeavour. To strengthen the role of wheat in food security under changing climatic conditions, it is pertinent to develop wheat varieties and check their adaptation in various agro-climatic conditions. Location alter not only the yielding ability of a genotype but also the yielding potential of sites located in the specific region (Mohan, 2014) <sup>[3]</sup>. In addition to a number of factors influencing yield attributes, the vital factor for harvesting suitable environment into grain yield is the genetic potential of the crops (Nadeem, 2001) <sup>[4]</sup>. Therefore, there is a need to generate valuable information on these aspects.

The green revolution has made our country self-sufficient in food production. As a result of green revolution, the total food production has increased more than three times, while the productivity in the same period has increased more than twice. This successful story has been possible due to use of agricultural inputs such as use of chemical fertilizers, higher use of agrochemicals and improvement in farm mechanization. This production technology has helped the country develop a food surplus as well as contributing to concerns of soil health, environmental pollution, pesticide toxicity, and sustainability of agricultural production. The continuous use of chemical fertilizers and pesticides has resulted in increased nitrate levels in the ground waters and contaminated food products with pesticides. Organic farming is one of the widely used methods, which is thought of as the best alternative to avoid ill effects of chemical farming. Addition of organic matter in the soil is a well-known practice to increase crop yields. Organic matter like farmyard manure (FYM) supplies available nutrients to the plants and also provide favourable soil environment and increase water holding capacity of soil for longer period of time. Farmyard manure is applied to soils mainly as a source

to plant nutrient. Animal manure supplies all the macronutrients as well as micronutrients necessary for plant growth, hence it acts as diverse fertilizer. An integrated use of manure with chemical fertilizer results in build up of available nutrients in soils much more effectively than that of chemical fertilizer alone. (Bhatt, 2017) <sup>[6]</sup>. According to (Joy *et al.*, 2018) <sup>[7]</sup> soils which receive plant nutrients only through chemical fertilizers shows declining productivity despite being supplied with sufficient nutrients. Application of FYM also enhances the effectiveness of commercial fertilizers through favourable soil microbial activity and augmentation of organic soil collides (humus) that possess large nutrient retaining surface area. FYM is the major source of nutrient supply and it is considered as the desirable soil amendment and reports of its effects on soil properties are numerous.

### Material and Methods

The investigation was conducted at the experimental farm of Chandigarh University, Gharuan Mohali which is located at 30.7691 °N latitude and 76.5759 °E longitude at an altitude of 296.86 meters above the mean sea level. The climate is sub tropical type characterized by very hot summers and severe winters. The average annual precipitation over past twenty five years is 792 mm and more than 80 per cent of precipitation is received during south west monsoon. During crop growth period (5<sup>th</sup> Dec- 28<sup>th</sup> April) wettest month was January. The mean maximum and minimum temperature for entire crop growth period of wheat crop was 38.83° C and 3.59 °C, respectively. The mean monthly meteorological data collected for the cropping season during experimental period recorded at the meteorological observatory at division of agronomy, Chandigarh University, gharuan (Mohali). The experiment was laid out in split plot design with five nutrition treatments (FYM to supply 187.5, 125 and 62.5 kg N ha<sup>-1</sup>, recommended dose of chemical fertilizers and unfertilized control) in main plots and 3 varieties (HD 3086, UNNAT PBW 343 and DBW 222 ) in sub plots. The soil of the field experiment was sandy loam in texture. The design of experiment was Randomized block design (RBD) with three replications. Certified seed of wheat varieties HD 3086, UNNAT PBW 343 and DBW 222 were used in the experiment. Average plant height of variety HD 3086 is 95 cm. It is resistant to yellow rust and brown rust. It takes near about 150 days to mature. Average plant height of variety UNNAT PBW 343 is 100 cm. It is a gene introgressed rust resistant version of mega variety PBW 343. It takes near about 155 to mature. Average plant height of variety DBW 222 is 103 cm. It has a potential yield of q ha<sup>-1</sup>. It matures in 143 days. All necessary management practices were carried out as per standard recommendation for wheat crop. All vegetative and reproductive parameters were recorded. Plant height (cm), total dry matter accumulation, number of tillers m<sup>-2</sup>, leaf area index were measured. Data on different yield parameters such as ear length, were measured with measuring scale and counted total grains ear<sup>-1</sup> and finally grain yield (q ha<sup>-1</sup>), straw yield (q ha<sup>-1</sup>) and biological yield (q ha<sup>-1</sup>) were weighed with electric balance. The crop was harvested manually at full maturity. The harvested crop of the plot was banded separately, tagged properly and then threshed. The weight of grains and straw weight were recorded after sun drying with electric balance. The data was analysed statistically using the analysis of variance (ANOVA) technique with the

help of MSTAT-C (Gomez and Gomez, 1984) and microsoft excel programme, and mean difference were adjusted by Duncan's Multiple Range Test (DMRT).

## Results and Discussions

### Yield Attributes

Number of effective tillers m<sup>-2</sup> and number of grains ear<sup>-1</sup> were influenced by different levels of FYM and different varieties (Table 1). The highest number of effective tillers m<sup>-2</sup> (424.7) was recorded with the recommended doses of fertilizers (RDF) which was significantly higher than all other treatments. The reason behind this may be the supply of proper amount of nutrients through recommended doses of chemical fertilizers. These results are supported by Dhar *et al.*, (2010) <sup>[5]</sup>. The higher level of FYM gave significantly higher effective tillers m<sup>-2</sup> than the lower levels of FYM and unfertilized control. The results are supported by the findings of Jan and Noor (2007). Lowest number of effective tillers m<sup>-2</sup> was recorded with unfertilized control. It might be due to lack of nutrients in treatment unfertilized control. Among varieties, variety UNNAT PBW 343 gave highest number of effective tillers m<sup>-2</sup> (330.2) than other two varieties. It may be due to its genetic factors and it may be suited well to the environmental conditions of the location where experiment was performed. Variety HD 3086 gave 277.6 effective tillers m<sup>-2</sup> which was statistically at par with variety DBW 222 (274.3). Lowest number of ear<sup>-1</sup> was recorded with the variety DBW 222 (10.2). The number of grains ear<sup>-1</sup> varied significantly with different nutrition levels. The maximum number of grains ear<sup>-1</sup> was recorded with the inorganic chemical fertilizers (46.5) which was significantly higher than the medium (40.8) and lower level (40.3) of FYM and unfertilized control (39.4) Similar results shown by Dai *et al.*, (2010) <sup>[9]</sup> and Ram (2010) <sup>[10]</sup> who compared the chemical fertilizers with unfertilized control. Number of grains ear<sup>-1</sup> for FYM<sub>187.5</sub> was significantly at par with medium (FYM<sub>125</sub>) and lower (FYM<sub>62.5</sub>) levels of FYM. Variety PBW UNNAT 343 gave highest number of grains ear<sup>-1</sup> (14.0) which was statistically at par with variety HD 3086 (13.0). Lowest number of grains ear<sup>-1</sup> was reported with the variety DBW 222 (10.0).

### Grain yield, straw yield and harvest index

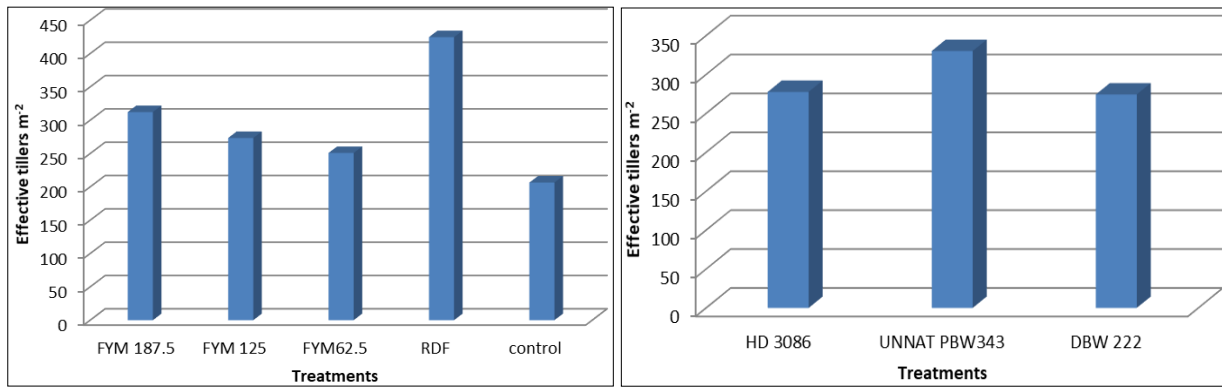
The grain yield and straw yield with different nutrition sources varied from a minimum (34.5 q ha<sup>-1</sup>, 49.5 q ha<sup>-1</sup>) in unfertilized control to maximum (48.5 q ha<sup>-1</sup>, 64.5 q ha<sup>-1</sup>) in recommended dose of chemical fertilizers. The results were similar to the findings of Dai *et al.*, (2010) <sup>[9]</sup>. Kharub and Chander (2010) <sup>[11]</sup> reported that 100 percent recommended dose in the form of inorganic fertilizer was significantly superior in grain and straw yield in wheat than 100 per cent organic supply through FYM and grain and straw yield increase under inorganic fertilization was 2.1 and 3.79 t ha<sup>-1</sup>, respectively than the 100 per cent organic sources. Medium level of FYM (FYM<sub>125</sub>) gave significantly lower grain and straw than higher level of FYM (FYM<sub>187.5</sub>) and recommended dose of chemical fertilizers, however it gave higher grain yield and straw yield than lower level of FYM (FYM<sub>62.5</sub>) and unfertilized control. The similar results have been reported by Channabasanagowda *et al.*, (2008) <sup>[12]</sup> and Shah *et al.*, (2009) <sup>[13]</sup>. Among varieties highest grain yield and straw yield was observed with the variety UNNAT PBW 343 (46.6 q ha<sup>-1</sup>, 61.4 q ha<sup>-1</sup>) followed by the variety HD 3086 (41.5 q ha<sup>-1</sup>, 55.0 q ha<sup>-1</sup>). Lowest grain yield and

straw yield was observed with the variety DBW 222 (39.4 q ha<sup>-1</sup>, 53.6 q ha<sup>-1</sup>). It may be due to the reason that variety DBW 222 didn't suited well to the environment where research was performed. Harvest index was higher (42.92%) with recommended dose of chemical fertilizers. And lowest

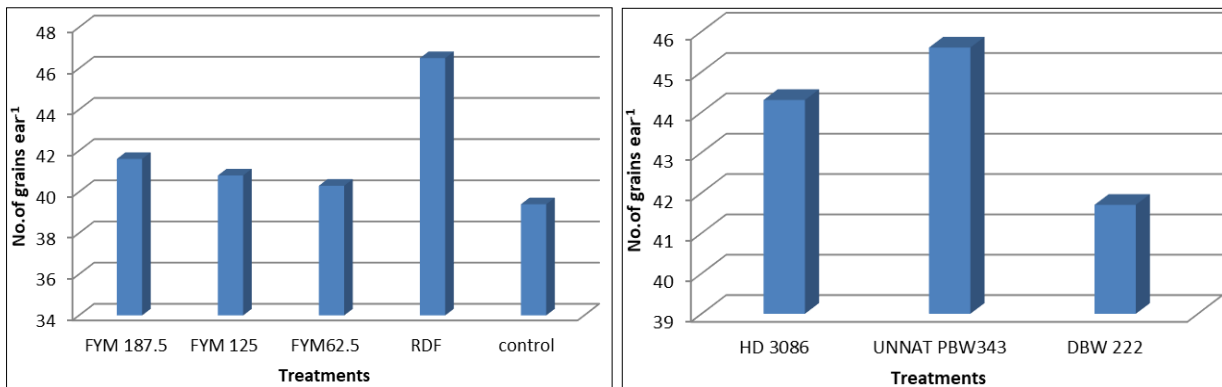
value of harvest index was recorded with treatment unfertilized control (41.07 %). Among varieties highest harvest index was recorded with the variety UNNAT PBW 343 (43.14%) lowest with variety DBW 222 (42.36%).

**Table 1:** Yield attributes of Wheat as affected by nutrition and varieties

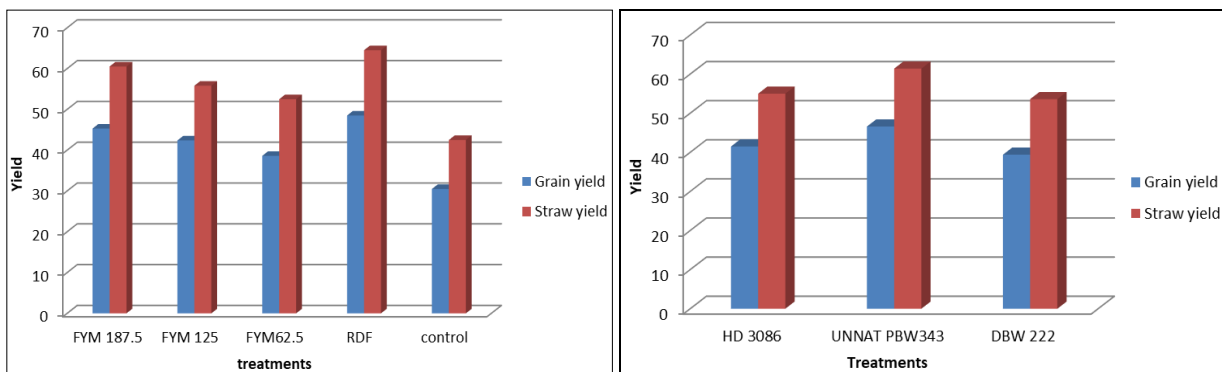
Treatment	Effective Tillers m <sup>-2</sup>	No. of grains ear <sup>-1</sup>	Grain yield (q ha <sup>-1</sup> )	Straw Yield (q ha <sup>-1</sup> )	Harvest index
Nutrition					
FYM <sub>187.5</sub>	312.3	41.6	45.3	60.5	42.81
FYM <sub>125</sub>	273.4	40.8	42.4	55.8	43.17
FYM <sub>62.5</sub>	250.9	40.3	38.6	52.5	42.37
RDF	424.7	46.5	48.5	64.5	42.92
Unfertilized Control	206.5	39.4	34.5	49.5	41.07
CD (p=0.05)	13.21	3.21	1.54	2.34	
Varieties					
HD 3086	277.6	44.3	41.5	55.0	43.00
UNNAT PBW 343	330.2	45.6	46.6	61.4	43.14
DBW 222	274.3	41.7	39.4	53.6	42.36
CD (p=0.05)	16.45	4.28	1.34	1.65	



**Fig 1:** Number of effective tillers m<sup>-2</sup> as affected by nutrition and varieties



**Fig 2:** Number of grains ear<sup>-1</sup> as affected by nutrients and varieties



**Fig 3:** Grain and straw yield (q ha<sup>-1</sup>) of Wheat as affected by nutrients and varieties

## Conclusion

From the present study it may be concluded that treatment recommended dose of chemical fertilizers (RDF) and variety UNNAT PBW 343 could be considered to increase the yield of Wheat.

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