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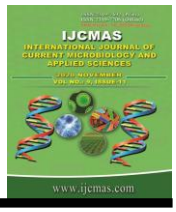

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# Correlation, Regression Coefficient Analysis among Yield and Yield Traits in Wheat (*Triticum aestivum*)

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**A B S T R A C T**

A field experiment was conducted under loamy sand soil during two consecutive *Rabi* seasons of 2016-17 and 2017-18 at Research Farm, Rajasthan Agricultural Research Institute, Sri Karan Narendra Agriculture University, Durgapura, Jobner. The results revealed that Yield components (Plant height, dry matter, number of total and fertile tillers per metre row length, number of grains per spike, Spike length, Spikelets per spike, Number of spikes per metre square, 1000 grain weight and Leaf area index) were studied in two seasons in order to predict their effect and to determine their effects on grain yield in order to define selection criteria for grain yield. Results revealed all studied traits were positively correlated with grain yield, and had a significant regression with grain yield and these traits.

## Introduction

Wheat [*Triticum aestivum* (L.) emend. Fiori & Paol)] is grown all over the world for its wider adaptability and high nutritive value than any other food crop. Currently it is grown on an area of about 224.82 million hectares and production of about 732.98 million tonnes with productivity of 3.26 tonnes per hectare (Anonymous, 2015a). Since 1960, world production of wheat and other grain crops has tripled and is expected to grow further through the middle of the 21st century. It is occupying 17 per cent of crop acreage worldwide, feeding about 40 per cent of the world population and good supplement

for nutritional requirement of human body as it contains 12.60 per cent protein and 78.10 per cent carbohydrate (Kumar *et. al*., 2011). Global demand of wheat is increasing due to the unique viscoelastic and adhesive properties of gluten proteins, which facilitate the production of processed foods, whose consumption is increasing as a result of the worldwide industrialization process and the westernization of the diet. India has the largest area under wheat cultivation (30.4 million hectares), but ranks second in production (99.70 million tonnes) after China with the average productivity of 3279 kg $ha^{-1}$ (ICAR-IIWBR, 2018). In Rajasthan, the crop occupies an area of 3.0 million hectares and production of 11.2 million tonnes with an average productivity of 3674 kg $ha^{-1}$ (Anonymous, 2018).

Yield of crop is a complex function of metabolic and bio-chemical processes taking place in a plant system which may be modified by the environment and the suitable cultural practices adopted in the cultivation of the crop. Generally, economic yield depends on the fruiting organs produced by plant. In wheat, yield depends mostly on yield attributes *viz.*, effective tillers, number of grains $spike^{-1}$, spike length, number of spikelets $spike^{-1}$, number of spikes per unit area and test weight. In present study, effective tillers, number of grains $spike^{-1}$, spike length, number of spikelets $spike^{-1}$, number of spikes per unit area and test weight was taken as components related with the grain yield of wheat. Several researchers have reported their findings regarding the correlation studies. Virk and Anand (1970) showed that in wheat grain yield was positively correlated with 1000 grain weight. Sandhu and Mangat (1985), Eunus *et al.*, (1986), Chowdhry *et al.*, (1991), Belay *et al.*, (1993) and Aycecik and Yildirim (2006) reported positive correlation of grain yield with number of grains per spike, plant height and 1000 grain weight. Gupta *et al.*, (1999) and Chowdhry *et al.*, (2000) also conducted such studies and concluded that yield components like tillers per plant, grains per spike and 1000 grain weight are main contributors to grain yield in wheat.

The present study was conducted to estimate the correlation between studied traits, and to predict their effect on grain yield through regression analysis, and to determine their direct and indirect effects on grain yield in order to define selection criteria for grain yield.

## Materials and Methods

The field experiment was conducted during *Rabi* season 2016 and 2017 at Research farm, Rajasthan Agricultural Research Institute, Sri Karan Narendra Agriculture University, Durgapura, Jobner, Rajasthan (75$^{o}$ 47’ East longitudes, 26$^{o}$ 51’ North latitude and at altitude of 390 m above mean sea level). The soil of experimental field was loamy sand in texture, slightly alkaline in reaction containing 0.25% organic C, with *p*H 8.2, EC 0.15ds $m^{-1}$, available nitrogen 136.5 kg $ha^{-1}$, phosphorous 33.30 kg $ha^{-1}$ and potassium 195.45 kg $ha^{-1}$. The meteorological data was recorded daily from sowing to harvest from meteorological observatory situated near the experimental farm.

The experimental site characterized by aridity of the atmosphere and extremity of temperature both in summer (45.5ºC) and winter (4ºC). Under semi-arid climatic conditions, the area receives 500-700 mm per annum rainfall which is mostly occurring during July to September. Rainfall received during the wheat growing season (Nov. to April) was 22.9 mm. The mean monthly maximum and minimum temperatures during the wheat growing season (Nov. to April) varied from 21.55 to 38.32 and 6.05 to

23.25$^{o}$C, respectively. The cumulative bright sunshine hours during the growing season varied between 6.70 to 10.05 hrs. The experiment was laid out in Split plot design with three replications. Thirty six treatment combinations were investigated. Treatments comprises four irrigation levels: $I_1$ (0.6 ETc), $I_2$ (0.8 ETc), $I_3$ (1.0 ETc) and $I_4$ (1.2 ETc), three cultivars: $C_1$ (Raj-4120), $C_2$ (Raj-4079) and $C_3$ (Raj-4238) and three dates of sowing: $D_1$ (15$^{th}$ Nov.), $D_2$ (30$^{th}$ Nov.) and $D_3$ (15$^{th}$ Dec.).To describe the relationship between grain yield and the yield attributes, correlation and regression studies were undertaken (Panse and Sukhatne, 1985).

## Results and Discussion

Results of correlation study revealed a strong positive and highly significant correlation between grain yield and Plant height at harvest (r= 0.964**) and Dry matter at harvest (g plant$^{-1}$) at harvest (r = 0.932**), and Total tillers (r = 0.949**), and Spike length (cm) (r = 0.963**) and Spikelets per spike (0.969**) and Number of spikes per metre square (0.917**) and Effective tillers per metre row length (0.940**) and Number of grains per spike (0.960**) and 1000 grain weight (g) (0.971**) and Leaf area index (0.928**) (Table 1).

**Table.1** Correlation coefficients (r) and regression equations for the relationship between grain yield (Y) (kg ha$^{-1}$) and growth and yield attributes of crop (X)

| S.No. | Treatments | 2016-17 | | 2017-18 | | Pooled | |
|---|---|---|---|---|---|---|---|
| | | Correlation coefficient (r) | Regression equation Y = a + $b_y$ x. X | Correlation coefficient (r) | Regression equation Y = a + $b_y$ x. X | Correlation coefficient (r) | Regression equation Y = a + $b_y$ x. X |
| **1.** | Plant height at harvest (cm) | 0.966** | Y = -6638.67+126.36 $X_3$ | 0.962** | Y = -5676.14+114.74 $X_3$ | 0.964** | **Y = -6143.59+120.36 $X_3$** |
| **2.** | Dry matter at harvest (g plant$^{-1}$) | 0.926** | Y = 353.45+355.74 $X_4$ | 0.936** | Y = 514.90+337.08 $X_4$ | 0.932** | **Y = 429.19+346.69 $X_4$** |
| **3.** | Total tillers | 0.943** | Y = --4963.36+68.32 $X_5$ | 0.953** | Y = -5360.90+70.68 $X_5$ | 0.949** | **Y = -5166.27+69.53 $X_5$** |
| **4.** | Spike length (cm) | 0.960** | Y = -1011.86+370.52 $X_6$ | 0.965** | Y = 1056.06+362.70 $X_6$ | 0.963** | **Y = 1031.73+361.79 $X_6$** |
| **5.** | Spikelets per spike | 0.967** | Y = 661.32+265.43 $X_7$ | 0.970** | Y = 682.92+261.86 $X_7$ | 0.969** | **Y = 670.25+263.75 $X_7$** |
| **6.** | Number of spikes per metre square | 0.925** | Y = -7693.88+37.09 $X_8$ | 0.967** | Y = -7676.61+36.49 $X_8$ | 0.917** | **Y = -7199.98+36.83 $X_8$** |
| **7.** | Effective tillers per metre row length | 0.936** | Y = 218.44+41.54 $X_9$ | 0.944** | Y = -283.40+45.76 $X_9$ | 0.940** | **Y = -24.71+43.61 $X_9$** |
| **8.** | Number of grains per spike | 0.954** | Y = 657.102+100.03 $X_{10}$ | 0.964** | Y = 513.53+102.42 $X_{10}$ | 0.960** | **Y = 579.99+101.38 $X_{10}$** |
| **9.** | 1000 grain weight (g) | 0.963** | Y = -11326.5+408.60 $X_{11}$ | 0.972** | Y = -11214.5+406.76 $X_{11}$ | 0.971** | **Y = -11369.7+410.24 $X_{11}$** |
| **10** | **Leaf area index** | **0.900**** | **Y = -2846.03+1711.95 $X_{12}$** | **0.950**** | **Y = -5464.16+2260.91 $X_{12}$** | **0.928**** | **Y = -4083.18+1974.52$X_{12}$** |

This indicates that growth and yield attributes are directly correlated with the grain yield. Our data are in accordance with earlier results between grain yield and grain number per spike (Rajpoot *et al.,* 2013; Khan and Dar, 2010 and Khokhar *et al.,* 2010).Other studies (Heidari *et al.,* 2005 and Moucheshi *et al.,* 2013) also conducted similar results between grain yield and grain weight per spike. There are reports about the correlation between thousand grain weight and grain yield per plant (Mondal and Khajuria, 2001). Our results also agree with previous findings (Saleh, 2011; Dogan, 2009). The regression coefficients (b) and regression equations were also worked out to quantify the amount of change in grain yield for a unit change in growth and yield attributes of crop and nutrient uptake. The present study results are in agreement with previous studies (Ashraf *et al.,* 2014; Olgun *et al.,* 2011; Efyoni *et al.,* 2005).

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