Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2018; 7(4): 329-332
Received: 15-05-2018
Accepted: 20-06-2018

**Vivek Sharma**
Plant Breeding & Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Chatha, Jammu, Jammu & Kashmir, India

**Ashwani Kumar**
Plant Breeding & Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Chatha, Jammu, Jammu & Kashmir, India

**Dr. Sumita Kumari**
Plant Breeding & Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Chatha, Jammu, Jammu & Kashmir, India

**Correspondence**
**Vivek Sharma**
Plant Breeding & Genetics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Chatha, Jammu, Jammu & Kashmir, India

# Correlation matrix wheat (*Triticum asetivum* L.) grain zinc (Zn) & iron (Fe) and among yield contributing traits quantitative and quality traits

**Vivek Sharma, Ashwani Kumar and Dr. Sumita Kumari**

**Abstract**
Micronutrient deficiency affects two-third of human population in the world. Micronutrient malnutrition is a serious issue now a day's especially in developing countries. One of the several strategies to reduce the micronutrient deficiency by the quality breeding approaches. One of the strategy was to find out genetic variation for yield contributing traits and it was correlated with micronutrients such as zinc (Zn), iron (Fe). In the current research was conducted to find out the correlation between the high yielding contributing traits and micronutrients such as iron and zinc. So we can improve both seed yield with seed micronutrients. Highly significantly correlation was found between the seed yield for plant with days to maturity (r=0.307**, p<0.01) and test weights (r=0.558**, p<0.01). It means the maximum magnitude in yield component traits by days to maturity and test weights and trait more number of grains per spike. Highly significant correlation was found between mean values of iron (Fe) with days to maturity (r=0.357**), test weights (r=0.343**) and seed yield per plant (r=0.279*). We were also find the mean value of zinc (Zn) correlated with the yield per plant (r= -0.216*). So we can improve lines with high yield per plant and high iron and zinc simultaneously and no significant correlation with other yield contributing. It was suggested that high micronutrient concentration not necessary tensed to produce low yield lines. We will also use this relationship for biofortification when dealing with wheat varieties.

**Keywords:** wheat (*Triticum asetivum* L.), iron (Fe), zinc (Zn), correlation, seed yield

## 1. Introduction
Wheat is important crop in the world with global production 754.1 million tonnes, grown over ~128 countries in the world with top five leading producers including India [1]. India is among the most important producer country after china, Involving the production 98.38 million tonnes and average productivity 3.2 tonnes per hectors [2]. In India, wheat is major staple food crop with more than 65% of population consumption. The demand wheat keep growing due to increasing of population sharply [3].
India is among the several countries with high micronutrient deficiency in the world. Nearly one-third of population of developing countries are deficient of iron and zinc, causes serious health issues. Several strategies have been suggested by scientists for reduction in micronutrient malnutrition in human population includes food fortification, dietary supplement, dietary diversification, micronutrient biofortification. Traditional breeding is one of the comprehensive potential strategy, sustainable and less expensive. In which one of the method to improve the micronutrient by exploration of diversity of micronutrient in wheat. After exploration micronutrient association is to be found with yield contributing traits. Correlation is an important phenomenon to find out high seed zinc (Zn), iron (Fe) with high seed yield in wheat.

## 2. Material and Methods
The set of 98 genotypes (94 core set genotypes and four check varieties) Indian bread wheat genotypes collected from the Indian Institute of Wheat & Barely Research (IIWBR), Karnal, Haryana; based on the multivariate analysis for five agro-morphological traits was evaluated at Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, using Augmented Randomized Block Design [4]. All the observations were taken in three replicates and values were then averaged. Correlation quantifies the degree to which two variable are related. Correlation is used when both X and Y variables are measured. The correlation analysis reports correlation coefficient (r). The correlation coefficient (r) ranges from -1 to +1. Correlation was calculated between biochemical traits (iron, zinc content) and quantitative morphological traits of all wheat cultivars using SPSS 16.0. Association between traits was established by the Pearson correlation coefficient.

The Pearson's correlation coefficient (r) was analysed to evaluate the relationships among different variables the 94 germplasm accessions along with four checks, the genotypes were sown with a row to row distance of 20 cm and 0.5 m distance in between blocks and each genotype was sown in 3 lines of 2 m length in *Rabi* 2013-14. Check varieties were repeated in each block. Recommended cultural practices were followed to grow a healthy crop and for proper expression of genotypes. Three random but robust plants from inner rows were tagged from each plot for data collection. A total of eight quantitative traits were taken at appropriate crop growth stage, in to the consideration.

## 3. Results & Discussion

### A. Plant height (cm)

There was highly significant correlation (r=0.283**, p<0.01) between plant height and days to 50 % flowering plant. Days to 50% flowering increase with plant height. No significant correlations occurred between plant height and days to maturity, no. of spikelet per spike, no of seed per spike, 100-seed weight and grain yield per plant. Similar Plant height showed no significant correlation with no of seed per spike, 100-seed weight and grain yield/plant [5].

### B. Days to maturity

There was highly significant correlation between days to maturity with no. of spikelet per spike (r=0.295**, p<0.01), Spike length (cm) (r=0.467**, p<0.01), no of seed per spike (r=0.466**, p<0.01), grain yield per plant (r=0.307**, p<0.01). There was no significant correlation (p>0.05) between days to maturity with plant height, days to 50% flowering and test seed weight (gm).

### C. No. of spikelet/spike

There was highly significant correlation (p<0.01) between no. of spikelet/spike and days to maturities (r=0.295**, p<0.01), Spike length (cm) (r= 0.469**), No. of grain per spikelet (r= 0.288**), Yield per plant (gm) (r= 0.236*).

### D. Spike length (cm)

There was highly significant correlation (p>0.01) Spike length (cm) and days to maturity (r=0.467**, p<0.01), no. of spikelet/spike (r=0.469**, p<0.01), No. of grains per spike (r=0.288**, p<0.01) and seed yield plant-1 (r=0.244**, p<0.01). There was no significant correlation with plant height (cm), days to 50 % flowering, test weight (gm). Similarly, spike length showed no significant (P>0.05) correlation plant height, 100-seed weight and seed yield plant$^{-1}$.at the phenotypic level [5].

### E. Seed yield per plant (gm)

Seed yield per plant (gm) was highly significantly positively correlated with days to maturity (r=0.307**, p<0.01) and Test weights (r=0.558**, p<0.01). Seed yield per plant (gm) was significantly correlated with number of seeds per spike, spike length (cm), no of grain per spike. Seed yield per plant (gm) were increasing with long maturity duration, higher test weight (gm). The above findings conform to earlier reports [6, 7, 8].

**Table 1:** Correlation coefficient (r) matrix of among yield contributing traits

| | Correlation coefficient | | | | | | |
|---|---|---|---|---|---|---|---|
| **Characters** | **Days to 50% flowering** | **Days to maturity** | **No. of spikelets per spike** | **Spike length (cm)** | **No. of grains per spike** | **Test weight (gm)** | **Avg. yield per plant (gm)** |
| Plant height (cm) | 0.283** | -0.028 | 0.120 | 0.105 | 0.026 | -0.037 | -0.017 |
| Days to 50 % flowering | | -0.071 | 0.077 | 0.153 | 0.149 | 0.045 | 0.053 |
| Days to maturity | | | 0.295** | 0.467** | 0.466** | 0.173 | 0.307** |
| No. of spikelets per spike | | | | 0.469** | 0.288** | 0.072 | 0.236* |
| Spike length (cm) | | | | | 0.324** | 0.190 | 0.244* |
| No. of grains per spike | | | | | | 0.044 | 0.257* |
| Test weight (gm) | | | | | | | 0.558** |

*, **: Significant at 5 and 1 percent levels respectively

Test weight & days to maturity were mostly contributing traits to improve seed yield. In this material seed yield were increase by the selection for high test weights and long duration of crops. There were also significant role to increase seed yield with more no of spikelet per spike, more spike length and more no of grains per spike (Figure 1).

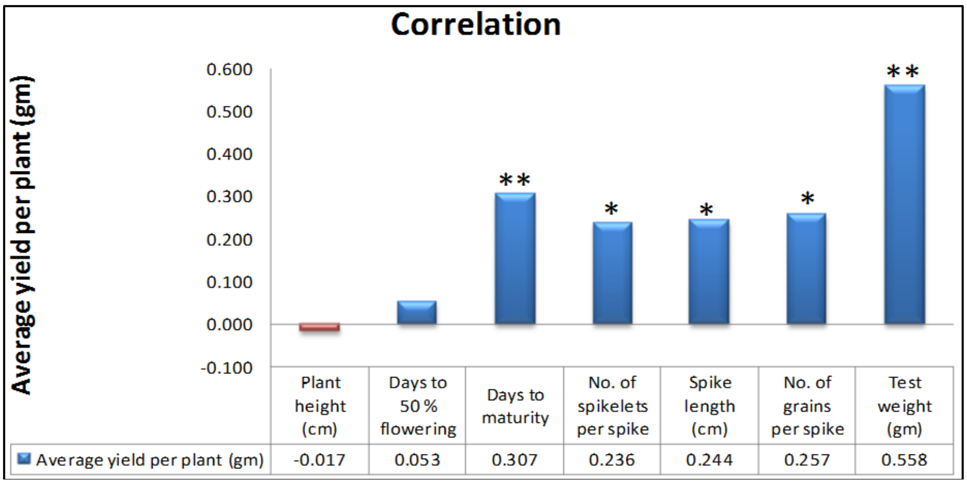


**Fig 1:** Effect of Iron (Fe) & Zinc (Zn) on yield contributing traits

**F. Correlation between Zn (Zinc), Iron (Fe) and yield contributing traits**

Negative, no significant correlations occurred between plant height and Zn, Fe. No effect on Zn, Fe with decreasing plant height. This means dwarfing gene no significant effects mean values Zn, Fe (mg/100g). Similar results were finding strong negative significant correlations occurred between Fe and plant height [9].

There were high significant correlation mean values Fe (mg/100g) and days to maturity (r=0.357**), test weights (r=0.343**). While no correlation mean values Zn (mg/100g) with days to maturity (r=-0.166), test weights (r=-0.175). Similar finding no correlation between days to maturity and grain Zn, Fe concentration (r = 0.01) suggests high Zn and Fe lines can be developed in varying maturity background [10].

**Table 2:** Correlation coefficient (r) matrix of grain mean values Zn, Fe concentrations (mg/100g) and other yield contributing traits.

| | Correlation coefficient (r) | |
|---|---|---|
| **Characters** | **Mean values Zn (mg/ 100g)** | **Mean values Fe (mg/100g)** |
| Plant height (cm) | 0 | -0.081 |
| Days to 50% flowering | 0.074 | 0.018 |
| Days to maturity | -0.166 | 0.357** |
| No. of spikelet/spike | -0.037 | 0.092 |
| Spike length (cm) | -0.077 | 0.221* |
| No. of grains per spike | -0.061 | 0.173 |
| Test weight (gm) | -0.175 | 0.343** |
| Yield per plant (gm) | -0.216* | 0.279* |

*, **: Significant at 5 and 1 percent levels respectively

There was much higher association of test weight and Fe (*r* = 0.343**; *P* < 0.01) than Zn concentrations (*r* = -0.175) indicates there are lines with higher Fe concentrations also had higher grain weight and suggesting that higher grain Zn concentrations are not necessarily related to small grain size [11].The lack of correlation between test weight (gm) and Zn suggests the concentration effect is not an issue [10]. The concentration of Fe was positively correlated with grain weight or the 1000-kernel weight in some studies [12], indicating that grain weight and Fe concentration can be improved simultaneously by traditional breeding strategies.

There was significant yield per plant (gm) with mean values Fe (mg/100g) (r=0.279*) and negative significant correlation (p>0.05) with mean values Zn (mg/100g) (r=-0.216). Similar finding There was no negative linkage of Fe with grain yield [10, 13, 14]. On contrary, some reports showed slightly negative association between Zn and grain yield in wheat [15, 16, 17, 18]. A significant positive association was observed between grain yield and Fe yield (R2 = 0.44; P < 0.01), indicating some of the highest yielding entries also had high Fe concentrations [10]. These results suggest that it is highly possible to develop high yielding, Zn and Fe-enriched wheat varieties [10]. Negative correlations between the concentrations of Zn in grain and grain yield were reported in many studies [19, 20, 21].

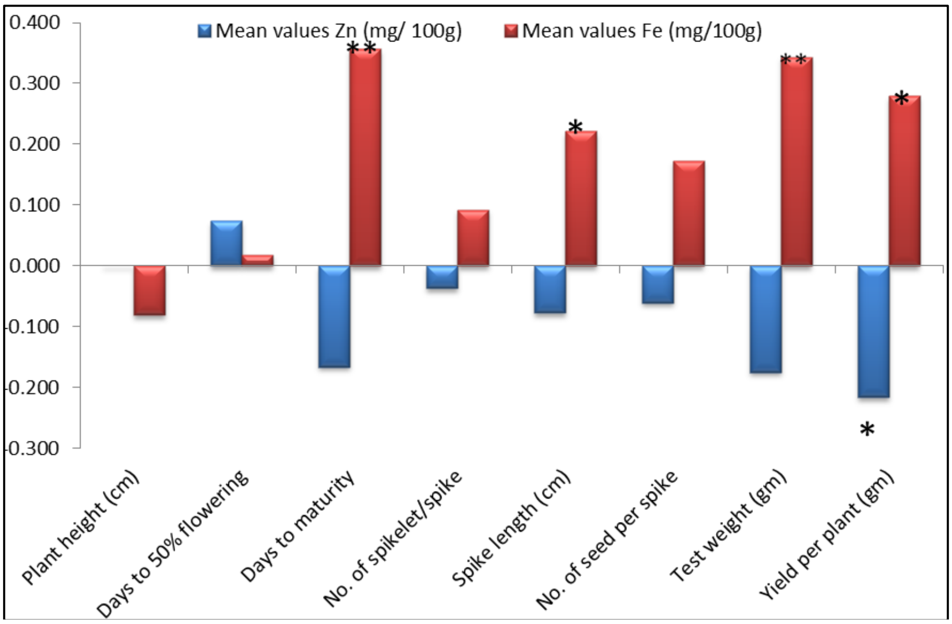


**Fig 2:** Effect of Iron (Fe) & Zinc (Zn) on yield contributing Phenotyping traits.

There were no significant correlation found among micronutrient concentration (Fe, Zn) and measured yield component traits such as no of spikelet per spike, no of grains per spike and days to 50 % flowering. There were similar results found i.e. no significant correlation for spike length, no of grains per spike and plant height [23]. Non- significant correlation among yield component traits of wheat and grains micronutrient concentration exhibited that varieties with high micronutrient concentrations not necessarily tend to produce lower yield. So, this non-relationship is useful for the biofortification of high yielding wheat varieties [23].

## 4. References

1. Food and Agriculture Organization. Statistics Division (FAOSTAT). FAO, 2018.

2. Wheat and Barley news letter. Project Director‟s Report. G.P. Singh, ICAR- Indian Institute of Wheat & Barely Research, Karnal, India, 2017, 0972-6071.
3. Khatkar BS, Chaudhary N, Dangi P. Production and Consumption of Grains: India. In: Wrigley, C., Corke, H., and Seetharaman, K., Faubion, J., (eds.) Encyclopedia of Food Grains, 2nd Edition, Oxford: Academic Press, 2016, 367-373.
4. Federer WT. Augmented designs. Hawaiian Planters Record. 1956; 55:191-208.
5. Mudasir HK, Nayeem Dar Abdul. Correlation and path coefficient analysis of some quantitative traits in wheat. Journal of African Crop Science. 2010; 18(I):9-14.
6. Kashif M, Khaliq I. Heritability, Correlation and Path analysis Coefficient for some Metric Traits in Wheat. International Journal of Agriculture and Biology. 2004; 6(1):138-142.
7. Aycicek M, Yildirim T. Path coefficient analysis of yield and yield components in bread wheat (*Triticum aestivum* L.) genotypes. Pakistan Journal of Botany. 2006; 38:417-424.
8. Akram Z, Ajmal SU, Munir M. Estimation of correlation coefficient among some yield parameters of wheat under rainfed conditions. Pak. J Bot. 2008; 40:1777-1781.
9. Velu G, Ortiz-Monasterio I., Cakmak I, Hao Y, Singh RP. Biofortification strategies to increase grain zinc and iron concentrations in wheat. Journal of Cereal Science. 2014; 59:365-372.
10. Velu G, Singh RP, Huerta-Espino J, Pena-Bautista RJ, Arun B, Mahendru-Singh A *et al*. Performance of biofortified spring wheat genotypes in target environments for grain zinc and iron concentrations. Field Crops Research. 2012; 137:261-267.
11. Velu G, Ortiz-Monasterio I, Singh RP, Payne T. Variation for grain micronutrients concentration in wheat core-collection accessions of diverse origin. Asian Journal of Crop Science. 2011; 3:43-48.
12. Liu ZH, Wang HY, Wang XE, Zhang GP, Chen PD, Liu DJ. Genotypic and spike positional difference in grain phytase activity, phytate, inorganic phosphorus, iron, and zinc contents in wheat (*Triticum aestivum* L.). Journal of Cereal Science. 2006; 44:212-219.
13. Graham RD, Senadhira D, Beebe S, Iglesias C, Monasterio I. Breeding micronutrient for density in edible portions of staple food crops: conventional approaches. Field Crops Research. 1999; 60:57-80.
14. Graham RD, Welch RM, Saunders DA, Ortiz-Monasterio I, Bouis HE, Bonierbale M *et al*. Nutritious subsistence food systems. Advances in Agronomy. 2007; 92:1-74.
15. Morgounov A, Gomez-Becerra HF, Abugalieva A, Dzhunusova M, Yessimbekova M, Muminjanov H *et al*. Iron and zinc grain diversity in common wheat grown in central Asia. Euphytica. 2007; 155:193-203.
16. Peleg Z, Cakmak I, Ozturk L, Yazici A, Jun Y, Budak H *et al*. Quantitative trait loci conferring grain mineral nutrient concentrations in durum wheat x wild emmer wheat RIL population. Theoretical and Applied Genetics. 2009; 119:353-369.
17. Zhao FJ, Su YH, Dunham SJ. Variation in mineral micronutrient concentrations in grain of wheat lines of diverse origin. Journal of Cereal Science. 2009; 49:290-295.
18. Gomez-Becerra HF, Yazici A, Ozturk L, Budak H, Peleg Z, Morgounov A *et al*. Genetic variation and environmental stability of grain mineral nutrient concentrations in Triticum dicoccoides under five environments. Euphytica. 2010; 171:39-52.
19. Oury FX, Leenhardt F, Remesy C, Chanliaud E, Duperrier B, Balfouriera F *et al*. Genetic variability and stability of grain magnesium, zinc and iron concentration in bread wheat. European Journal of Agronomy. 2006; 25:177-185.
20. Ficco DBM, Riefolo C, Nicastro G, De Simone V, Di Gesu AM, Beleggia R *et al*. Phytate and mineral elements concentration in a collection of Italian durum wheat cultivars. Field Crops Research. 2009; 111:235-242.
21. Zhao FJ, Su YH, Dunham SJ, Rakszegi M, Bedo Z, McGrath SP *et al*. Variation in mineral micronutrient concentrations in grain of wheat lines of diverse origins. Journal of Cereal Science. 2009; 14(1):368.
22. Badakhshan H, Moradi N, Mohammadzadeh H, Zakeri MR, Mirzaghaderi G. Genetic Variability Analysis of Grains Fe, Zn and Beta-carotene Concentration of Prevalent Wheat Varieties in Iran. International Journal of Agriculture and Crop Sciences. 2013; 6(2):57-62.