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# CORRELATION COEFFICIENT ANALYSIS FOR YIELD AND YIELD ATTRIBUTES IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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## Abstract

Genetic association plays a significant role to study the interrelationship and relative contribution of different characters towards crop improvement. Correlation analysis between yield and other yield components were carried out to identify the selection indices in $BC_2F_1$ generation of two crosses *viz*., CO 7 × GPBD 4 and CO 7 × COG 0437. From the upshot of correlation coefficient analysis, selection could be exercised on number of pods per plant, 100-pod weight, 100-kernel weight and shell weight for improving the pod yield and kernel yield per plant in groundnut. Hence, these characters may be considered as the important yield attributing characters and due emphasis should be placed while breeding for high pod and kernel yield per plant in groundnut. Selection based on these characters will help in improving the yield in groundnut. The association among plant height and sound mature kernel per cent with yield and other yield related traits varies with the population. Hence, these characters may also be considered as selection indices with caution. Since, no relationship was found between disease scores and yield attributes in both the backcross populations, selection needs to be made for both yield and disease scores.

***Key words :*** Groundnut, correlation, selection indices, pod yield per plant, kernel yield per plant.

## Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop grown worldwide, distributed across the vast area in tropical, sub-tropical and temperate zones. It is a major source of vegetable oil and protein, both for human and animal. Although, groundnut is an important multipurpose crop for resource poor farmers in the semi-arid tropics, due to environmental stresses and disease pressure, productivity often alleviates. Several biotic and abiotic stresses contribute majorly to the variation in groundnut productivity. Among them, foliar fungal diseases *viz*., late leaf spot (*Phaeoisariopsis personata*) and rust (*Puccinia arachidis*) are the prime constraints, which cause huge economical losses. Yield being complex in inheritance and subjected to environmental fluctuations, the expected outcome based on *per se* performance of yield hinders direct selection as high genotype and environment interaction will restrict improvement. Selection based on highly heritable yield attributes is most potent and reliable approach as compared to direct selection on yield itself. The focus of correlation studies is primarily to know the suitability of various traits for indirect selection. Correlation coefficient assists to differentiate requisite associations from those of the non vital ones. Understanding the nature and extent of association of yield with different yield components and correlation among them is an essential pre-requisite for the formulation of breeding procedure for effectual yield improvement. Hence, an attempt was made in the present study to understand the direction and extent of association among kernel yield per plant and pod yield per plant with other component traits in two $BC_2F_1$ populations of groundnut.

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## Materials and Methods

The current experimental material comprised of two crosses *viz*., CO 7 × GPBD 4 and CO 7 × COG 0437. The parent CO 7 is susceptible to late leaf spot and rust diseases. To incorporate resistance to these diseases, resistant donors *viz*., GPBD 4 and COG 0437 were used in crossing programme and the recurrent parent CO 7 were again backcrossed with $F_1$'s and $BC_1F_1$'s. The $BC_2F_1$ populations of two crosses were used to investigate the relationship among yield and yield component characters. The crop was raised during *Rabi*

2013-14, at the Oilseeds Farm, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu), India. Recommended agronomic practices were followed under irrigated condition. Observations were recorded in each cross for 12 characters *viz*., plant height (cm), number of primary branches, number of pods per plant, 100-pod weight (g), 100-kernel weight (g), shell weight (g), shelling percentage, sound mature kernel (SMK) (%), late leaf spot (LLS) score, rust score, pod yield per plant (g) and kernel yield per plant (g). Simple correlation coefficient analysis for yield and yield components were computed utilizing the formula proposed by Al-Jibouri *et al*. (1985).

## Results and Discussion

The efficiency of selection mainly depends on the direction and magnitude of association between yield and its components. Knowledge on the strength and type of association is an important pre-requisite for the formulation of breeding procedure. Hence, correlation studies provide an opportunity to study the magnitude and direction of association of yield with its components and also among various components. Correlation coefficient analysis among yield and yield attributes in CO 7 × GPBD 4 and CO 7 × COG 0437 of groundnut are presented in table 1. The correlation coefficient between kernel yield per plant and foliar disease scores *viz.,* late leaf spot and rust are furnished in Figs. 1 and 2, respectively.

### Correlation between kernel yield per plant and other yield attributes

Among the 12 characters studied, kernel yield per plant expressed significant and positive relationship with number of pods per plant, 100-pod weight, 100-kernel weight, shell weight and pod yield per plant in both the crosses under study. In addition to these characters, kernel yield per plant also showed significant and positive association with plant height and sound mature kernel per cent in CO 7 × GPBD 4. Hence, these characters may be considered as selection indices for kernel yield improvement. These results are confirmative with findings of Kumar *et al*. (2014) for number of pods per plant, Mothilal (2003) for 100-pod weight, Shoba *et al*. (2012) for 100-kernel weight (Anitha, 2013) for shell weight (Prabhu *et al*., 2014) for pod yield per plant (Kwaga, 2014) for plant height (Nandini and Savithramma, 2012) for sound mature kernel per cent.

### Correlation between pod yield per plant and other yield attributes

The character pod yield per plant recorded significant and positive correlation with number of pods per plant, 100-pod weight, 100-kernel weight and shell weight in both the crosses *viz*., CO 7 × GPBD 4 and CO 7 × COG 0437. In the cross CO 7 × GPBD 4, pod yield per plant showed significant and positive correlation with plant height and sound mature kernel per cent. Hence, these characters may be considered as selection indices for pod yield improvement. Similar results were reported by Rao *et al*. (2014) for number of pods per plant (Priyadharshini, 2012) for 100-kernel weight (Anitha, 2013) for shell weight (Kumar *et al*., 2012) for plant height (Mothilal, 2003) for 100-pod weight and sound mature kernel per cent.

### Correlation between plant height and other yield attributes

Plant height registered significant and positive association with number of primary branches, number of pods per plant, 100-pod weight and shell weight in the cross CO 7 × GPBD 4, while the same recorded significant and negative association with number of primary branches in the cross CO 7 × COG 0437. Similar studies for the trait plant height were reported earlier by Babariya and Dobariya (2012) and Dandu *et al*. (2012).

### Correlation between number of primary branches and other yield attributes

In cross CO 7 × COG 0437, the character number of primary branches recorded significant and positive association with 100-pod weight, 100-kernel weight, shell weight and rust score. Similar results were reported for number of primary branches by John *et al*. (2009), Priyadharsini (2012) and Korat *et al.* (2010).

### Correlation between number of pods per plant and other yield attributes

Number of pods per plant showed positive and significant association with 100-pod weight, 100-kernel weight, shell weight in both the crosses *viz*., CO 7 × GPBD 4 and CO 7 × COG 0437. Similarly, the character number of pods per plant had significant and positive association with sound mature kernel per cent in the cross CO 7 × GPBD 4. These findings were also reported by Anitha (2013) for 100-pod weight, 100-kernel weight, shell weight and shelling percentage.

### Correlation between 100-pod weight and other yield attributes

Both the crosses expressed significant and positive association with 100-kernel weight and shell weight for the trait 100-pod weight. In addition to these characters, 100-pod weight showed significant and positive association with sound mature kernel per cent in CO 7 ×

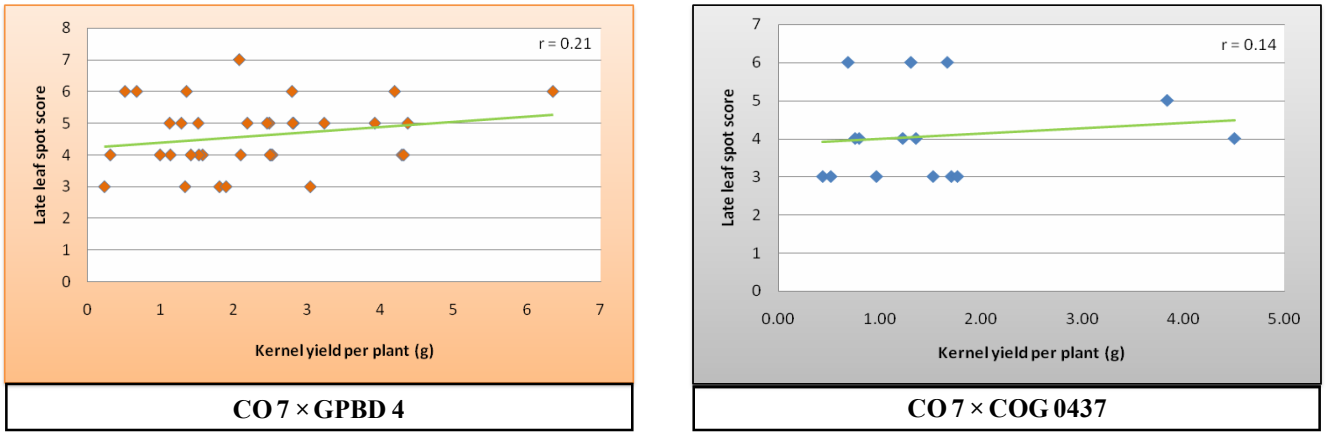


**Fig. 1 :** Correlation coefficient between kernel yield per plant and late leaf spot score in groundnut.

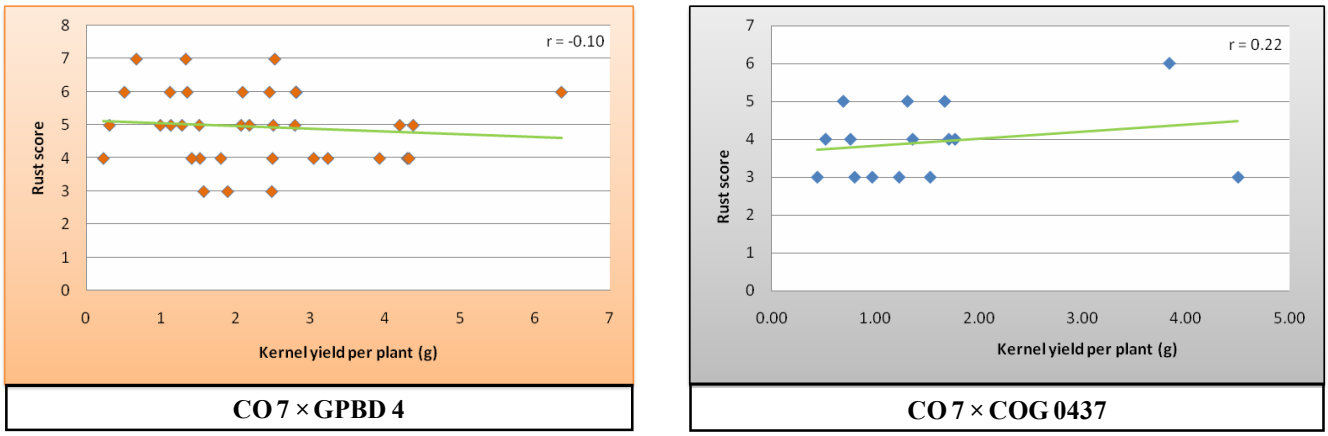


**Fig. 2 :** Correlation coefficient between kernel yield per plant and rust score in groundnut.

GPBD 4. Similar results were reported by Priyadharsini (2012), Pavithradevi (2013) and Anitha (2013).

**Correlation between 100-kernel weight and other yield attributes**

The character 100-kernel weight exhibited significant and positive correlation with shell weight in both the crosses, while the cross CO 7 × GPBD 4 registered the same with shelling percentage and sound mature kernel per cent. Dandu *et al.* (2012), Priyadharsini (2012), Pavithradevi (2013) and Anitha (2013) also observed similar association for the trait 100-kernel weight.

**Correlation between shell weight, shelling percentage and other yield attributes**

Shell weight recorded significant and positive association with sound mature kernel per cent in the cross CO 7 × GPBD 4. Shelling percentage recorded significant and positive correlation with sound mature kernel per cent in CO 7 × GPBD 4, while significant and negative association was found with rust score in the cross CO 7 × GPBD 4. Anitha (2013) noticed significant and positive association between shell weight and shelling percentage whereas, Babariya and Dobariya (2012) possessed significant and positive association between shelling percentage and sound mature kernel per cent.

**Correlation between sound mature kernel, disease scores and other yield attributes**

The character late leaf spot score expressed significant and positive relationship with rust score in both the crosses *viz*., CO 7 × GPBD 4 and CO 7 × COG 0437. These results are in accordance with the findings of Prabhu *et al.* (2014).

## Conclusion

From the upshot of correlation coefficient analysis, it may be concluded that for improving the pod yield and kernel yield per plant in groundnut, selection has to be exercised on number of pods per plant, 100-pod weight, 100-kernel weight and shell weight. Hence, these characters may be considered as the important yield attributing characters and due emphasis should be placed while breeding for high pod and kernel yield per plant in groundnut. Selection based on these characters will help in improving the yield in groundnut. The association

**Table 1:** Correlation coefficient between yield and yield attributes in CO 7 × GPBD 4 (C1) and CO 7 × COG 0437 (C2) of groundnut.

| Character | Cross | Plant height (cm) | No. of primary branches | No. of pods per plant | 100-pod weight (g) | 100-kernel weight (g) | Shell weight (g) | Shelling (%) | SMK (%) | LLS score | Rust score | Pod yield per plant (g) | Kernel yield /plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plant height (cm) | **C1** | 1.00 | | | | | | | | | | | |
| | **C2** | 1.00 | | | | | | | | | | | |
| Number of primary branches | **C1** | 0.35* | 1.00 | | | | | | | | | | |
| | **C2** | -0.48* | 1.00 | | | | | | | | | | |
| Number of pods per plant | **C1** | 0.50** | 0.11 | 1.00 | | | | | | | | | |
| | **C2** | 0.05 | 0.33 | 1.00 | | | | | | | | | |
| 100-pod weight (g) | **C1** | 0.44** | -0.05 | 0.79** | 1.00 | | | | | | | | |
| | **C2** | -0.05 | 0.44* | 0.95** | 1.00 | | | | | | | | |
| 100-kernel weight (g) | **C1** | 0.23 | 0.05 | 0.44** | 0.64** | 1.00 | | | | | | | |
| | **C2** | -0.15 | 0.48* | 0.48* | 0.71** | 1.00 | | | | | | | |
| Shell weight (g) | **C1** | 0.52** | 0.03 | 0.77** | 0.96** | 0.56** | 1.00 | | | | | | |
| | **C2** | 0.01 | 0.44* | 0.95** | 0.99** | 0.67** | 1.00 | | | | | | |
| Shelling percentage | **C1** | -0.27 | -0.21 | 0.20 | 0.12 | 0.41** | -0.11 | 1.00 | | | | | |
| | **C2** | -0.32 | -0.03 | 0.12 | 0.24 | 0.39 | 0.09 | 1.00 | | | | | |
| SMK (%) | **C1** | 0.17 | 0.09 | 0.40** | 0.43** | 0.57** | 0.36* | 0.37* | 1.00 | | | | |
| | **C2** | -0.15 | 0.17 | 0.04 | 0.12 | 0.32 | 0.07 | 0.37 | 1.00 | | | | |
| LLS score | **C1** | 0.07 | -0.13 | 0.04 | 0.20 | 0.18 | 0.18 | 0.01 | 0.06 | 1.00 | | | |
| | **C2** | -0.14 | 0.38 | 0.11 | 0.16 | 0.14 | 0.16 | -0.03 | 0.33 | 1.00 | | | |
| Rust score | **C1** | -0.08 | -0.24 | -0.12 | -0.08 | -0.18 | -0.03 | -0.29* | -0.04 | 0.36* | 1.00 | | |
| | **C2** | -0.36 | 0.47* | 0.12 | 0.26 | 0.28 | 0.26 | 0.05 | 0.31 | 0.71** | 1.00 | | |
| Pod yield per plant (g) | **C1** | 0.45** | -0.03 | 0.81** | 0.99** | 0.63** | 0.97** | 0.11 | 0.40** | 0.21 | -0.08 | 1.00 | |
| | **C2** | -0.04 | 0.42 | 0.95** | 1.00** | 0.69** | 0.99** | 0.24 | 0.12 | 0.15 | 0.24 | 1.00 | |
| Kernel yield per plant (g) | **C1** | 0.40** | -0.07 | 0.80** | 0.98** | 0.65** | 0.92** | 0.23 | 0.41** | 0.21 | -0.10 | 0.99** | 1.00 |
| | **C2** | -0.07 | 0.41 | 0.95** | 0.99** | 0.69** | 0.97** | 0.32 | 0.15 | 0.14 | 0.22 | 0.99** | 1.00 |

*,** Significant at 5 % and 1 % level of probability, respectively.

among plant height and sound mature kernel per cent with yield and other yield related traits varies with the population. Hence, these characters may also be considered as selection indices with caution. Since, no relationship was found between disease scores and yield attributes in both the backcross populations, selection needs to be made for both yield and disease scores.

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