Electronic Journal of Plant Breeding, 5(4): 824-827 (Sep 2014)
ISSN 0975-928X

Research Note

Magnitude and direction of association for yield and yield attributes in groundnut (*Arachis hypogaea* L.)

R. Prabhu[1]*, N. Manivannan[1], A. Mothilal[2] and S.M. Ibrahim[3]
[1]Department of Oilseeds, Centre for Plant Breeding and Genetics, TNAU, Coimbatore, Tamil Nadu, India.
[2]Regional Research Station, TNAU, Vridhachalam, Tamil Nadu, India.
[3]Agricultural College and Research Institute, TNAU, Madurai, Tamil Nadu, India.
*Email: rajprabhu03@yahoo.com

(Received: 10 Mar 2014; Accepted: 10 Spe 2014)

Abstract
Correlation analysis among kernel yield and its component characters was carried out to identify the selection indices in BC_1F_1 populations of two crosses *viz.,* CO 7 × GPBD 4 and CO 7 × COG 0437. Kernel yield per plant and pod yield per plant expressed significant and positive correlation with plant height, number of primary branches, number of pods per plant, 100-pod weight and shell weight, in both crosses. Hence these characters may be considered as selection indices. These characters may be given due emphasis in breeding for high kernel yield in groundnut. The association of kernel yield per plant with 100-kernel weight, sound mature kernel, late leaf spot score and rust score varies with the crosses. Hence these characters may also be considered as selection indices with caution.

Keywords:
Groundnut, correlation, selection indices, kernel yield.

Groundnut *(Arachis hypogaea* L.) is an important oilseed crop. Cultivated groundnut is a principle source of human nutrition predominantly in tropical and subtropical areas of the world. Groundnuts are an excellent source of plant protein which contains about 45-55% oil, 27-33% protein as well as essential minerals and vitamins. Over 60% of global groundnut production is crushed for extraction of oil for edible and industrial uses, while 40% consumed for food uses and seed purpose. Groundnut oil is an excellent cooking medium because of its high smoking point. Countries like India, China, Myanmar and Vietnam, use groundnut oil for cooking purpose extensively. In any plant breeding programs, understanding the relationships between yield and other characters is of paramount importance for making the best use of these relationships in selection. The efficiency of selection mainly depends on the direction and magnitude of association between yield and its components. Correlation analysis provide an opportunity to study the magnitude and direction of association of yield with its components and also among various components. With this view, the present study was conducted to evaluate BC_1F_1 generation of two groundnut crosses to determine the association between yield and yield component characters.

The 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 backcrossed with recurrent parent CO 7. The BC_1F_1 populations of two crosses were used to investigate the relationship among yield and yield component characters. The crop was raised during Kharif 2013, at the Oilseeds farm, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. Recommended agronomic practices were followed under irrigated condition. Observations were recorded on 46 and 79 single plants 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 carried out utilizing the formula suggested by Al-jibouri *et al.* (1985).

Genetic association plays a significant role to study the interrelationship and relative contribution of different characters towards crop improvement. The results of the correlation coefficient of BC_1F_1 population of CO 7 × GPBD 4 and CO 7 × COG 0437 are presented in Table 1.

Association of kernel yield per plant with other yield components: Among the 12 characters studied, kernel yield per plant expressed significant and positive relationship with plant height, number of primary branches, number of pods per plant, 100-pod weight, shell weight and pod yield per plant in both crosses. In addition to these

characters, kernel yield per plant showed significant and positive association with sound mature kernel, late leaf spot score and rust score in CO 7 × GPBD 4 and 100-kernel weight in CO 7 × COG 0437. Hence these characters may be considered as selection indices for yield improvement. These results are confirmative with findings of John *et al.* (2009), Sharma and Dashora (2009), Zaman *et al.* (2011), Kumar *et al.* (2012), Narasimhulu *et al.* (2012) and Priyadharshini (2012).

Association of pod yield per plant with other yield components: The character pod yield per plant recorded significant and positive correlation with plant height, number of primary branches, number of pods per plant, 100-pod weight and shell weight in both 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 sound mature kernel, late leaf spot score and rust score whereas 100-kernel weight in CO 7 × COG 0437. Similar results were also observed by John *et al*. (2009) and Ladole *et al.* (2009).

Association of plant height with other yield components: Plant height resulted significant and positive association with number of pods per plant, 100-pod weight and shell weight, in both the crosses. In addition to these characters, plant height showed significant and positive association with late leaf spot score in CO 7 × GPBD 4 and number of primary branches in CO 7 × COG 0437. Similar findings were observed by Alam *et al.* (1985), Manoharan *et al.* (1990), Nagabhushanam and Prasad (1992), Pushkaran and Nair (1993), Rosemary Francis and Ramalingam (1997).

Association of number of primary branches with other yield components: The character number of primary branches recorded significant and positive correlation with number of pods per plant, 100-pod weight and shell weight in both the two crosses. In the cross CO 7 × COG 0437, number of primary branches had significant and positive correlation with sound mature kernel. Similar results were reported by Sangha and Sandhu (1970).

Association of number of pods per plant with other yield components: Number of pods per plant showed positive and significant association with 100-pod weight and shell weight in both the crosses. In addition to that, number of pods per plant had positive and significant association with 100-kernel weight in the cross CO 7 × COG 0437. These findings were also reported by Khanpara *et al*. (2010) and Priyadharshini (2012).

Association of 100-pod weight with other yield components: Hundred pod weight expressed significant and positive association with shell weight in both the crosses. In addition to these characters, 100-pod weight showed significant and positive association with sound mature kernel, late leaf spot score and rust score in CO 7 × GPBD 4 and 100-kernel weight in CO 7 × COG 0437. Similar results were reported by Manoharan *et al.* (1990) and Vasanthi *et al.* (1998) except for the trait shell weight. Kotzamanidis *et al*. (2006) observed that 100-pod weight was significantly and positively associated with 100-kernel weight.

Association of 100-kernel weight with other yield components: The character hundred kernel weight exhibited significant and positive correlation with shelling percentage in cross CO 7 × GPBD 4 and shell weight in cross CO 7 × COG 0437. Similar findings were reported by Manoharan *et al*. (1990), Odedara (2005), Sharma and Dashora (2009) and Pradhan and Patra (2011). Mohinder Singh *et al.* (2000), Venkataramana *et al*. (2000), Shoba (2010) and Priyadharshini (2012) observed that 100-kernel weight was significantly and positively associated with shelling percentage alone.

Association of shell weight and shelling percentage with other yield components: Shell weight recorded significant and positive association with sound mature kernel, late leaf spot score and rust score in cross CO 7 × GPBD 4. Whereas, shelling percentage showed significant and positive correlation with sound mature kernel, late leaf spot score and rust score in cross CO 7 × COG 0437. Similar findings were reported by Kotzamanidis *et al.* (2006), Shoba (2010), Narasimhulu *et al.* (2012) and Priyadharshini (2012).

Association of sound mature kernel and late leaf spot score with other yield components: The character sound mature kernel exhibited significant and positive association with rust score in cross CO 7 × COG 0437. Late leaf spot score expressed significant and positive relationship with rust score in both crosses *viz.*, CO 7 × GPBD 4 and CO 7 × COG 0437. No similar findings were reported earlier.

It is therefore, logical to conclude that for improving the kernel yield per plant in groundnut, selection has to be exercised on plant height, number of primary branches, number of pods per plant, 100-pod weight, shell weight and pod yield per plant. Hence these characters may be considered as the important yield attributing characters and due emphasis should be placed while breeding for high kernel yield in groundnut. The association of kernel yield per plant with 100-kernel weight, sound mature kernel, late leaf spot

score and rust score varies with the crosses. Hence these characters may also be considered as selection indices with caution.

References

Alam, M.S., Rahman, A.R.M.S. and Khair, A.B.M.A. 1985. Genetic variability and character association in groundnut. *Bangladesh J. Agric.*, **10**: 9-16.

Al-jibouri, H.A., Miller, P.A. and Robinson, H.P. l985. Genotypic and environmental variances and covariances in upland cotton cross of interspecific origin. *Agron. J.*, **50**: 633-36.

John, K., Vasanthi, R.P. and Venkateswarlu, O. 2009. Studies on variability and character association in Spanish bunch groundnut (*Arachis hypogaeae* L.). *Legume Res.*, **32**(1): 65-69.

Khanpara, M.D., Shinde, P.P., Jivani, L.L., Vachhani, J.H. and Kachhadia, V.H. 2010. Character association and path coefficient analysis in groundnut (*Arachis hypogaea* L.). *Plant Arch.*, **10**(2): 695-698.

Kotzamanidis, S.T., Stavropoulos, N. and Lpsilandis, C.G. 2006. Correlation studies of 21 traits in F_2 generation of groundnut (*Arachis hypogaea* L.). *Pakistan J. Biol. Sci.*, **9**(5): 929-934.

Kumar, D.R., Sekhar, M.R., Reddy, K.R. and Ismail, S. 2012. Character association and path analysis in groundnut (*Arachis hypogaea* L.). *Int. J. Appl. Biol. Pharm. Technol.*, **3**(1): 385-389.

Ladole, M.Y., Wakode, M.M. and Deshmuk, S.N. 2009. Genetic variability and character association studies for yield and yield contributing characters in groundnut. *J. Oilseeds Res.*, **26**(Special Issue): 123-125.

Manoharan, V., Vindhiyavarman, P. and Ramalaingam, R.S. 1990. Character association in groundnut (*Arachis hypogaea* L.) hybrids. *Madras Agric. J.*, **77**(9-12): 512-514.

Mohinder Singh, Raheja, R.K., Ahuja, K.L. and Sharma, S.R. 2000. Correlation between pod yield and quality characters in groundnut (*Arachis hypogaea* L.) types. In: Proceedings of the National Seminar on Oilseeds and Oils – Research and Development Needs in the Millennium, DOR, Hyderabad. pp. 331-332.

Nagabhushanam, G.V.S. and Prasad, M.V.R. 1992. Selection criteria for groundnut. *Oleagineux*, **47**: 23-28.

Narasimhulu, R., Kenchanagoudar, P.V. and Gowda, M.V.C. 2012. Study of genetic variability and correlations in selected groundnut genotypes. *Int. J. Appl. Biol. Pharm. Technol.*, **3**(1): 355-358.

Odedara, R.K. 2005. M.Sc. (Ag.) Thesis, submitted to the Junagadh Agricultural University, Junagadh.

Pradhan, K. and Patra. R.K. 2011. Variability and correlation studies on groundnut (*Arachis hypogaeae* L.) germplasm. *Legume Res.*, **34**(1): 26-30.

Priyadharshini, M. 2012. Molecular marker analysis for yield and yield component characters under non stress and drought stress conditions in groundnut (*Arachis hypogaea* L.). Unpublished Ph.D. (Ag.) Thesis, submitted to Tamil Nadu Agricultural University, Coimbatore.

Pushkaran, K. and Nair, V.G. 1993. Correlation studies in groundnut. *J. Trop. Agric.*, **9**: 66-69.

Rosemary Francis and Ramalingam, S.R. 1997. Character association and path analysis in F_2 population of groundnut. *J. Oilseeds Res.*, **14**: 11-14.

Sangha, A.S. and Sandhu, R.S. 1970. Genetic variability and correlation studies in groundnut (*Arachis hypogaea* L). *J. Res.*, **7**: 143-145.

Sharma, H. and Dashora, A. 2009. Character association and path analysis in groundnut (*Arachis hypogaea* L). *J. Oilseeds Res.*, **26**: 614-616.

Shoba, D. 2010. Identification of molecular markers associated with rust (*Puccinia arachidis*) and late leaf spot (*Phaeoisariopsis personata*) in groundnut (*Arachis hypogaea* L.) Ph.D. (Ag.) Thesis, submitted to Tamil Nadu Agricultural University, Coimbatore.

Vasanthi, R.P., Naidu, P.H. and Rao, A.S. 1998. Inter-relation among yield, yield attributes and late leaf spot severity in groundnut. *J. Oilseeds Res.*, **15**(2): 383-385.

Venkataramana, P., Shankaranarayana, V., Sheriff, R.A. and Kulkarni, R.S. 2000. Contribution of different characters towards pod yield in groundnut (*Arachis hypogaea* L.) under different environments. In: Proceedings of the National Seminar on Oilseeds and Oils – Research and Development Needs in the Millennium, DOR, Hyderabad. pp. 96.

Zaman, M.A., Khatun, M.T., Ullah, M.Z., Moniruzzamn, M. and Alam, K.H. 2011. Genetic variability and path analysis of groundnut (*Arachis hypogaea* L.). *The Agriculturists*, **9**(1&2): 29-36.

Table 1. Simple correlation coefficients between yield and yield component characters for the BC_1F_1 of crosses CO 7 × GPBD 4 (C1) and CO 7 × COG 0437 (C2)

Character	Cross	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	SMK (%)	LLS score	Rust score	Pod yield per plant (g)
Number of primary branches	C1	0.04										
	C2	0.36**										
Number of pods per plant	C1	0.63**	0.31*									
	C2	0.69**	0.45**									
100-pod weight (g)	C1	0.46**	0.42**	0.70**								
	C2	0.61**	0.44**	0.74**								
100-kernel weight (g)	C1	-0.10	0.06	0.03	-0.17							
	C2	0.14	0.03	0.22*	0.39**							
Shell weight (g)	C1	0.62**	0.31*	0.76**	0.85**	-0.44						
	C2	0.74**	0.47**	0.87**	0.82**	0.22*						
Shelling percentage	C1	-0.19	-0.04	-0.08	-0.33	0.98**	-0.58					
	C2	-0.11	-0.06	-0.01	-0.01	0.20	-0.26					
SMK (%)	C1	0.08	0.25	0.23	0.39**	-0.24	0.34*	-0.28				
	C2	0.22	0.26*	0.10	0.22	0.05	0.06	0.51**				
LLS score	C1	0.31*	0.03	0.29	0.37*	-0.12	0.36*	-0.18	0.26			
	C2	-0.12	0.12	0.02	0.14	0.13	-0.04	0.31**	0.21			
Rust score	C1	0.09	0.04	0.25	0.48**	-0.19	0.41**	-0.26	-0.01	0.38*		
	C2	-0.18	-0.05	-0.12	0.03	0.14	-0.18	0.32**	0.25*	0.72**		
Pod yield per plant (g)	C1	0.67**	0.40**	0.89**	0.86**	-0.04	0.90**	-0.19	0.34*	0.37*	0.35*	
	C2	0.72**	0.43**	0.91**	0.86**	0.31**	0.96**	-0.01	0.12	0.06	-0.09	
Kernel yield per plant (g)	C1	0.64**	0.41**	0.89**	0.80**	0.18	0.77**	0.03	0.32*	0.34*	0.30*	0.97**
	C2	0.68**	0.39**	0.90**	0.84**	0.34**	0.90**	0.13	0.15	0.11	-0.04	0.99**

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