Asian Journal of Crop Science

ISSN 1994-7879

science alert
http://www.scialert.net

ANSInet
an open access publisher
http://ansinet.com

Asian Journal of Crop Science 3 (2): 85-91, 2011
ISSN 1994-7879 / DOI: 10.3923/ajcs.2011.85.91

Study of Genotypic and Phenotypic Correlation for Some Agro-Economic Traits in Okra (*Abelmoschus esculents* (L.) Moench)

A.M.A. Rashwan
Department of Horticulture (Vegetable crops), Faculty of Agriculture, South Valley University, Egypt

ABSTRACT

The aim of this study was to study the genotypic and phenotypic correlation in okra (*Abelmoschus esculents*) for eight traits, using 36 genotypes (6 parents, 15F1 and 15F2). The genotypic and phenotypic correlations values for most pairs of characters were more or less similar. Days to flowering showed negative and significant association with plant height, number of branches/plant, number of fruits/plant and total green fruit yield (ton/feddan) for parents, F1 and F2 populations. Positive correlation was observed between plant height and number of branches/plant for all populations. Number of branches/plant was positively correlated with each of number of fruit/plant, fruit diameter and total fruit yield (ton/feddan) for parents, F1 and F2 populations. Selection for this trait is seen as the most effective methods for improving yield. Significant and positive correlated was observed between number of fruit/plant and total green fruit yield (ton/feddan). Thus, the total green fruit yield in okra can be improved by selecting for number of fruits/plants. Fruit length showed positive with fruit weight for parents. Positive and significant correlation was observed between fruit diameter and total green fruit yield (ton/feddan) for all populations. Fruit weight showed negative associations with total green fruit yield (ton/feddan) for all populations. Total green fruit yield (ton/feddan) positively correlated with each of fruit diameter, number of branches/plant and number of fruit/plant for all populations (parents, F1 and F2). Such results suggested that total green fruit yield (ton/feddan) can be improved by increasing fruit diameter, number of branches/plant and number of fruit/plant through selection program.

Key words: F1, F2 population, genotypes, fruits/plant, branches/plant, days to flowering

INTRODUCTION

Okra (*Abelmoschus esculentus* (L.) Moench) is one of the important vegetable crops in Egypt. It had been used for its young green fruits in fresh, frozen, canned and dry states; also, okra fruit has high nutritional value. It contains, carbohydrates, fates, fibers, oil, mineral and vitamins viz; B1, A and C (Ebraheem, 2004). Estimation of genotypic and phenotypic correlations among characters is useful in planning and evaluating breeding programs. Knowledge of correlation between different traits is necessary in plant breeding. If two traits are positively correlated, then one trait can be improved indirectly by improving the other trait. Also, correlation coefficient are useful in indirect selection of a secondary trait is to be used for improving the primary trait of interest. Several authoresses have studied genotypic and phenotypic correlation in okra. Hussein (1994), Jawili and Rasco (1990), Morakinyo Makinde (1991), Akinyele and Osekita (2006), Krushna *et al.* (2007), Alam and Hossain (2008) and Mishra *et al.* (1990) reported that yield/plant showed a highly significant positive correlation with pods yield/plant and pod weight.

Mandal and Dana (1994) showed that fruit yield of okra was significantly and positively associated with number of fruit/plant and fruit length; but it was negatively associated with days to 50% flowering. Ahmed (2001) reported that days to flowering were significant and negative correlated with total yield/plant and weight of pods for parents, F1 and F2 populations. Abbas (2006) found that days to flowering was significant and negative correlated with plant height, pod length, number of fruits/plant, weight of fruits and total fruit yield (ton/feddan); but positive with number of branches and pod weight. Magar and Madrap (2009) stated that total fruit/plant was significantly and positively correlated with number of fruits/plant and fruit weight .Knowledge of correlation and causation among the yield and yield components is of paramount importance in any crop improvement programme through plant breeding.

The objective of this work was to study the genotypic and phenotypic correlation in okra (parents, F1 and F2 populations).

MATERIALS AND METHODS

Thirty six genotypes (6 parents, 15 F1 and 15 F2) in okra were evaluated in April 20, 2009 summer season at the Experimental Farm of South Valley University, Qena, Governorate, Egypt. Six genotypes of okra, were used as parents (inbreed line) seeds (s1) in this study. The general chracteristics of six parents study are given in Table 1.

In 2007 summer season, the six parental genotypes of okra were planted at the Experimental Farm of South Valley University with two sowing dates (March 10 and 25 in the summer season). Each genotype was represented by single row and was repeated three twice, the long row was 3 m 60 cm apart and plants spaced 20 cm from each other. The six parental genotypes were crossed in a half diallel using hand emasculation and pollination to obtain of 15 F1 hybrids seeds.

In 2008 summer season, the seeds of F1 hybrids were planted in 10 March to produce of the F2 seeds. In 2009 summer season, the genotypes of 6 parents, F1 and 15F2 (populations) were planted in 20 April at the Experimental Farm of South Valley University to study the genotypic and phenotypic correlation in eight traits of okra. Experimental design used in this study was a randomized complete block design with three replications. Each of the parents and their F1s' hybrids was represented by three rows, while each cross of F2 population was represented by five rows per block.

The long row three meters, spaced 60 cm apart and plants spaced 20 cm within each row. The normal agriculture practices of irrigation, fertilization, weed and pest control were practiced as recommended for okra production. Harvesting of green fruits took place during the period May 10th July 20th every 2 days intervals. Data were taken on 5 to 10 pants and on 10 fruits every tow days (one feddan = 4200 m).

Table 1: The general characteristics of the six parents study

Genotypes	Color of fruits	Leaf shape	Flowering	Plant height
(P_1) Balady	Dark green	Lobed	Early	Long
(P_2) Escandrany (Escand)	Green	Lobed	Medium	Medium
(P_3) Clemson spineless (Clm.S.)	Green	Very lobed	Medium	Short
(P_4) Emerald	Dark green	Palmately	Medium	Short
(P_5) White velvet(White. V.)	Light green	Lobed	Medium	Medium
(P_6)Pusa Sewani (Pusa.S.)	Green	Lobed	Early	Long

Source: Prof. Dr. A.M. Damarany, Horti. Dep., Fac. of Agric., Sohag University

Measurements: The following characters were studied, total green fruit yield (ton/fedden), Days to flowering, 3-plant height in cm, Number of green fruits per plant, Number of branches/plant 6-Fruit length (cm), Fruit diameter (cm) and Weight of green fruit (g).

Statistical procedures: The mean values of all entry were used for statistical analysis according to Gomez and Gomez (1984), user, Microsoft office Excel. The phenotypic and genotypic correlations were estimated using the formula according to Miller *et al.* (1958).

RESULTS AND DISCUSSION

Table 2-4 showed that the genotypic and phenotypic coefficient values for most pairs of characters were more or less similar.

Parent population: It was found that total green fruit yield (ton/feddan) is positively correlated with each of number fruits/plant, fruit diameter and number of branches/plant but negatively correlated with days to flowering and fruit weight/plant in the parents population in Table 2. Such results suggested that these traits would be the most useful as selection criteria in breeding for yield improvement. These results are in support of the results of Mansour (2000), who stated that total edible pod yield/plant was correlated with number of branches/plant, pod diameter and pod weight.

Another study, Dhall *et al.* (2000) observed that total yield/plant positively and significant correlated with number of fruits/plant. Also, Ramya and Senthilkumar (2009) found that pod yield/plant was significant and positive correlated with number of pods/plant. Days to flowering showed negative and significant association with plant height, number of branches/plant, number of fruits/plant and total green fruit yield (ton/feddan); while it was positive and significant correlated with weight of fruit for parents population (Table 2).

Table 2: Estimates of genotypic (top values) and phenotypic (bottom values) correlation coefficient between Paris of traits in parents populations

Traits		Days of 50 % flowering (1)	Plant height (2)	No. of branches /plant (3)	No. of green fruit/plant (4)	Fruit length (cm) (5)	Fruit diameter (cm) (6)	Weight of fruit (g) (7)	Total green fruit yield (ton/fed.) (8)
(1)	rg		-0.525*	-0.947**	-0.502**	0.441	-0.561*	0.594*	-0.948**
	rp		-0.511*	-0.886**	-0.488**	0.433	-0.528*	0.578	-0.921**
(2)	rg			0.526*	0.271	-0.539*	0.252	-0.022	0.383
	rp			0.479*	0.266	-0.538*	0.247	-0.019	0.367
(3)	rg				0.512*	-0.318	0.586*	-0.650*	0.976**
	rp				0.470*	-0.297	0.519*	-0.608*	0.927**
(4)	rg					0.314	-0.229	-0.064	0.801**
	rp					0.312	-0.212	-0.066	0.767**
(5)	rg						-0.820**	0.542*	-0.125
	rp						-0.810**	0.540*	-0.119
(6)	rg							-0.906**	0.491**
	rp							-0.896**	0.474**
(7)	rg								-0.593*
	rp								-0.565*
(8)	rg								
	rp								

*, **Significant at 0.05 and 0.01 levels of probability, respectively: rg: Genotypic correlation, rp: Phenotypic correlation

Positive and significant correlated observed between plant height and number of branches/plant while it was negative and significant association with fruit length for parents. Number of branches/plant was positively correlated with each of number of fruits/plant, fruit diameter and total green fruit yield (ton/feedan) while it was negatively correlated with fruit weight for parents (Table 2). Kiran and Ravisankar (2004) they found that positive and significant correlated between number of branches/plant and total green fruit yield (ton/feddan). Significant and positive correlated was observed between number of fruits/plant and total green fruit yield (ton/feddan) for parents. From Table 2 fruit length showed positive and significant correlation with fruit weight/plant in parents. These results are in agreement with obtained by Mehta *et al.* (2006) and Nasit *et al.* (2010), they found that fruit yield was significant and positively correlated with fruit length. Negative and significant observed between fruit length and fruit diameter for parents. Positive and significant correlated was observed between fruit diameter and total green fruit yield (ton/feddan) in parents (Table 2). Negative and significant correlated observed between weight of fruit and total green fruit yield (ton/feddan) for parents.

F1 populations: Table 3 showed that total green fruit yield (ton/feddan) positively correlated with each of number branches/plant, number of green fruits/plant and fruit diameter for F1 population. Mohamed (2000) found that total edible pod yield/plant was significant and positive correlated with number of branches/plant for F1 generation in okra. Another study, Mansour (2000) stated that total edible pod yield was correlated with pod diameter for F1 generation in okra. For F1 population, days to flowering negative and significant correlated with number of branches/plant, number of fruits/plant and total green fruit yield (ton/feddan); while it was positive and significant correlated with weight of fruit Table 3. Negative and significant correlated observed between plant height and fruit length. Number of branches/plant was positively correlated with each of number fruits/plant, fruit diameter and total green fruit yield (ton/feddan); while it was negatively correlated with fruit

Table 3: Estimates of genotypic (top values) and phenotypic (bottom values) correlation coefficient between Paris of traits in F1 populations

Traits		Days of 50 % flowering (1)	Plant height (2)	No. of branches /plant (3)	No. of green fruit/plant (4)	Fruit length (cm) (5)	Fruit diameter (cm) (6)	Weight of fruit (g) (7)	Total green fruit yield (ton/fed.) (8)
(1)	rg		-0.319	-0.845**	-0.875**	0.224	-0.305	0.487**	-0.828**
	rp		-0.300	-0.782**	-0.831**	0.210	-0.268	0.483**	-0.818**
(2)	rg			0.323	0.188	-0.690**	0.061	0.082	0.163
	rp			0.318	0.188	-0.687**	0.056	0.081	0.163
(3)	rg				0.880**	-0.439**	0.628**	-0.787**	0.972**
	rp				0.847**	-0.420**	0.568**	0.757**	0.962**
(4)	rg					0.304	0.288	-0.565**	0.870**
	rp					0.303	0.266	-0.561**	0.867**
(5)	rg						-0.512**	0.256	-0.294
	rp						-0.474**	0.256	-0.293
(6)	rg							-0.848**	0.612**
	rp							-0.797**	0.602**
(7)	rg								-0.830**
	rp								-0.828**
(8)	rg								
	rp								

*, **Significant at 0.05 and 0.01 levels of probability, respectively: rg: Genotypic correlation, rp: Phenotypic correlation

weight and fruit length (Table 3). Significant and positive correlated was observed between number of fruits/plant and total green fruit yield (ton/feddan) for F1 population. Selection for this trait is seen as the most effective methods for improving yield. Similar results were obtained by Ahmed (2001), he found that positive and significant correlation between number of fruits/plant and total green fruit yield (ton/feddan) for F1 population. Weight of fruit negatively correlated with each of number branches/plant, number of green fruits/plant and fruit diameter (Table 3). Fruit diameter showed negative and significant correlated with fruit weight for F1 population. In contrast, Abbas (2001) found that significant and positive correlated between fruit diameter and fruit weight for F1 population. The positive or negative correlation values among characters can be used as an indicator for direct or indirect selection methods to improve characters in vegetable crops.

F2 population: In Table 4, days to flowering showed negative and significant association with plant height, number of branches/plant, number of green fruits/plant and total green fruit yield (ton/feddan) while it was positive and significant correlated with weight of fruit for F2 population. Adeniji and Aremu (2007), found that significant and negatively correlated between days to flowering and number of pods/plant in F2 generations. Positive and significant correlated was recorded between number of fruits/plant and total green fruit yield (ton/feddan). Present findings corroborated Mohamed (2000). Negative and significant correlated was observed between fruit length and fruit diameter for F2 population (Table 4). Positive correlated was recorded between fruit diameter and total green fruit yield (ton/feddan).Total green fruit yield (ton/feddan) positively correlated with each of number branches/plant, number of green fruits/plant and fruit diameter but negatively correlated with dayes to flowering and weight of fruit for F2 population in (Table 4). Significant and positive correlated observed between plant height and number of branches/plant while it was negative and significant association with fruit length for F2 population.

Table 4: Estimates of genotypic (top values) and phenotypic (bottom values) correlation coefficient between Paris of traits in F2 populations

Traits		Days of 50 % flowering (1)	Plant height (2)	No. of branches /plant (3)	No. of green fruit/plant (4)	Fruit length (cm) (5)	Fruit diameter (cm) (6)	Weight of fruit (g) (7)	Total green fruit yield(ton/fed.)(8)
(1)	rg		-0.388*	-0.752**	-0.845**	0.273	-0.261	0.431**	-0.807**
	rp		-0.365*	-0.660**	-0.785**	0.250	-0.211	0.399**	-0.785**
(2)	rg			0.396*	0.260	-0.782**	0.073	-0.067	0.233
	rp			0.373*	0.259	-0.770**	0.068	-0.069	0.231
(3)	rg				0.908**	-0.560**	0.357*	-0.708**	0.863**
	rp				0.686**	-0.538**	0.377*	-0.675**	0.849**
(4)	rg					0.379*	0.179	-0.551**	0.841**
	rp					0.374*	0.156	-0.541**	0.833**
(5)	rg						-0.363*	0.195	-0.258
	rp						-0.336*	0.189	-0.258
(6)	rg							-0.708**	0.426**
	rp							-0.619**	0.418**
(7)	rg								-0.765**
	rp								-0.761**
(8)	rg								
	rp								

*, **Significant at 0.05 and 0.01 levels of probability: rg: Genotypic correlation, rp: Phenotypic correlation

Such results emphasize the point that selection for short plant or low number of branches/plant must be avoided when selection is aimed at increasing yield. Ali (1995) found that positive and significant correlation between plant height and number of branches/plant for F2 population. For F2 population, number of branches/plant was positively correlated with each of number of fruits/plant, fruit diameter and total green fruit yield (ton/feddan) Table 4. Abbas (2006) found that number of branches/plant significant and positive correlation with each of total green fruit yield (ton/feddan) and number of fruits/plant for F2 population (Table 4).

CONCLUSION

Genotypic and phenotypic coefficient values for most pairs of characters were more or less similar. Positive and significant association between of total green fruit yield (ton/feddan) and each of fruit diameter, number of branches/plant and number of fruit/plant for all population (parents, F1 and F2), suggested that total green fruit yield (ton/feedan) can be improved by increasing fruit diameter, number of branches/plant and number of fruits/plant traits through selection program.

REFERENCES

Abbas, H.S., 2001. A study of genetic variation in some characters of okra (*Abelmoschus esculentus* (L.) Moench). M. Sc. Thesis, Assuit University, Egypt.

Abbas, H.S., 2006. Genetic improvement of okra (*Abelmoschus esculentus* (L.) Moench). Ph.D. Thesis, Assuit University, Egypt.

Adeniji, O.T. and C.O. Aremu, 2007. Interrelationships among characters and path analysis for pod yield components in West African okra (*Abelmoschus caillei* (A. chev) stevels). J. Agron., 6: 162-166.

Ahmed, N.A.A., 2001. Genetic improvement of yield and some quality characteristic in Balady cultivar of okra (*Abelmoschus esculentus* (L.) Moench). Ph.D. Thesis, Assuit University, Egypt.

Akinyele, B.O. and O.S. Osekita, 2006. Correlation and path coefficient analysis of seed yield attributes in okra (*Abelmoschus esculentus* (L.) Moench). African J. Biotechnol., 5: 1330-1336.

Alam, A.K.M.A and M.M. Hossain, 2008. Variability of different growth contributing parameters of some okra (*Abelmoschus esclentus* L.) Accessions and their interrelation effects on yield. J. Agric. Rural Dev., 6: 25-35.

Ali, M.M., 1995. Genetic studies in okra (*Abelmoschus esculentus* (L.) Moench). M.Sc. Thesis, Assuit University, Egypt.

Dhall, R.K., S.K. Arora and M. Rani, 2000. Correlation and path analysis in advanced generations of okra (*Abelmoschus esculentus* (L.) Moench.). Indian J. Horticulture, 57: 342-346.

Ebraheem, M.A., 2004. Vegetable Plants. Arabic House Publications, Alexandria, Egypt, pp: 307.

Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedures for Agricultural Research. 2nd Edn., John Wiley and Sons, New York. ISBN: 0-471-87931-2, pp:680.

Hussein, H.A., 1994. Variation, heritability and response to selection in okra. Assuit J. Agric. Sci., 25: 193-202.

Jawili, M.E.E. and Jr. E.T. Rasco, 1990. Combining ability, heterosis and correlation among plant and yield characters in okra (*Abelmoschus esculentus* (L.) Moench). Philippine Agric., 73: 75-88.

Kiran, T.K. and C. Ravisankar, 2004. Genetic variability and Multivaiate Analysis in okra (*Abelmoschus esculentus* (L.) Moench). Trop. Agric. Res., 16: 99-113.

Krushna, D., E.P. Harshal and P.D. Sudha, 2007. Genetic variability and correlation studies in okra (*Abelmoschus esculentus* (L.) Moench.). Asian. J. Horticult., 2: 201-203.

Magar, R.G. and I.A. Madrap, 2009. Genetic variability correlations and path coefficient analysis in okra (*Abelmoschus esculentus* (L.) Moench). Int. J. Plant Sci., 4: 498-501.

Mandal, M. and I. Dana, 1994. Correlation and path coefficient analysis on okra. Environ. Ecol., 12: 156-158.

Mansour, S.M., 2000. Genetic variability and inheritance estimates of some characters in okra (*Abelmoschus esculentus* (L.) Moench.). Ph.D. Thesis, Faculty Agriculture Saba Basha, Alexandra University, Egypt.

Mehta, D.R., L.K. Dhaduk and K.D. Patel, 2006. Genetic variability, correlation and path analysis studies in okra *Abelmoschus esculentus* L. Moench. Agric. Sci. Digest, Vol. 26 No. 1.

Miller, P.A., J.C. Williams, H.F. Robinson and R.F. Comstock, 1958. Estimates of genotypic and environmental variances in upland cotton and their implication in selection. Agron. J., 50: 126-131.

Mishra, R.S., U.K. Rath and G.S. Sahu, 1990. Association of biometric characters in okra. Orissa J. Agric. Res., 3: 6-8.

Mohamed, S.A., 2000. Studies of some espects on okra breeding (*Abelmoschus esculentus* L. Moench). Ph.D. Thesis, Faculty Agriculture Saba Basha, Alexandria University, Egypt.

Morakinyo, J.A. and S.C. Makinde, 1991. Variability and heritability in local cultivars of okra (*Abelmoscus esculentus* (L.). Moench). Nig. J. Bot., 4: 33-40.

Nasit, M.B., L.K. Dhaduk, J.H. Vachhani and J.J. Savaliya, 2010. Correlation and path analysis studies in okra (*Abelmoschus esculentus* (L.) Moench). Asian J. Horticulture, 4: 394-397.

Ramya, K. and N. Senthilkumar, 2009. Genetic divergence, correlation and path Analysis in okra (*Abelmoschus esculentus* (L.) Moench). Madras Agric. J., 96: 296-299.