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Research Article

CORRELATION COEFFICIENT ANALYSIS IN OKRA [*Abelmoschus esculentus* (L.) Moench]

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Abstract: The experiment was conducted with 120 treatments (28 F_{1s}, 28F_{2s}, 28B_{1s} and 28B_{2s} populations) developed through diallel technique excluding reciprocals along with 8 parents *viz*., AB-2, AB-1, KS-312, BO-2, P-7, VRO-3, VRO-5 and PK in a randomized block design with three replications at the Research Farm of the Department of Vegetable Science, C.S. Azad University of Agriculture and Technology, Kalyanpur, Kanpur during *Kharif* 2006. The observations was recorded on 20 randomly selected plants for 10 quantitative traits namely, days to flowering, height of plant (cm), number of branches per plant, number of first fruiting node, number of nodes per plant, length of fruit (cm), width of fruit (cm), number of fruits per plant and yield per plant (g). The phenotypic and genotypic correlation coefficients were workout to measure the association among the quantitative traits. Correlation coefficient for fruit yield per plant had positive and significant association with number of nodes per plant, length of fruit and number of fruits per plant at both genotypic and phenotypic level in all the generations.

Keywords: Okra, Genotypic correlation coefficient, Phenotypic correlation coefficient

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Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is an important vegetable crop of Malvaceae family with having chromosome number 2n = 130 and grown in *Kharif* and Zaid season. Green edible fruits are consumed for vegetable purpose. Okra said to be very useful in curing diabetes, chronic dysentery and genitor urinary disorder. Ripe seeds roasted grinned and used as substitute of coffee in turkey [1]. The estimates of heritable variation give an insight on the possible improvement for the characters under study. The correlation reflects special importance as if tells us about the genetic association manures do not employ any cause and effects inter-relationship. The present investigation was undertaken to study the correlation coefficient analysis in 8 parents along with 28F_{1s}, 28F_{2s}, 28B_{1s} and 28B_{2s} of the crop keeping the view of selection superior genotypes in order to make substantial improvement of the crop [2]. The information on inter relationship may be useful in prediction of correlated response to direct selection indices and detection some characters, which may have no value in themselves but may be useful as indicator of other important characters [3] there, knowledge of correlation coefficients between yield and its components may be a valuable indication regarding the components.

Materials and Methods

A set of 8 varieties/strains of okra namely, AB-2, AB-1, KS-312, BO-2, P-7, VRO-3, VRO-5 and PK were crossed in diallel technique excluding reciprocals. All the 28 F_{1s}, 28F_{2s}, 28 B_{1s} and 28 B_{2s} along with 8 parents were sown in a randomized block design (RBD) with three replications at the Department of Vegetable Science of C.S. Azad University of Agriculture and Technology Kalyanpur, Kanpur, 208024, during *Kharif* 2006. Parents were sown in single row with 10 plants and F_{1s}, F_{2s}, B_{1s} and B_{2s} grown in double with ten plants in each row. The plant to plant and row to row spacing were maintained at 45 cm apart.

The competitive plants of parents of F_{1s}, F_{2s}, B_{1s} and B_{2s} were randomly selected and observations were recorded for days to flowering, height of plant (cm), number of branches per plant, number of first fruiting node, number of nodes per plant, length of internode (cm), length of fruit (cm), width of fruit (cm), number of fruits per plant and yield per plant (g).

Results and Discussion

The phenotypic and genotypic correlation coefficient among the characters studies were marked out in parents [Table-1], F_{1s} [Table-2], F_{2s} [Table-3], B_{1s} [Table-4] and B_{2s} [Table-5] in general, the magnitude of correlation coefficient for genotypic was higher than their phenotypic correlation coefficients. The genotypic correlation coefficients were observed higher comparatively in F_{1s}, F_{2s}, B_{1s} and B_{2s} than the parents. Among the parents yield per plant showed positive and significant correlation with height of plant, number of nodes per plant, length of fruit and number of fruits per plant at both genotypic and phenotypic level [4]. Its association with number of branches per plant and width of fruit were negative and significant. Among characters themselves days to flowering had positively significant correlation with number of branches per plant, number of first fruiting node and width of fruit both at genotypic and phenotypic levels, respectively. Height of plant showed positive and significant association with number of nodes per plant, length of fruit and number of fruits per plant both at genotypic and phenotypic levels. The association of number of branches per plant was positive and significant with number of first fruiting node and width of fruit. It association with number of nodes per plant and number of fruits per plant were negative both at genotypic and phenotypic levels but up to non significant numerically number of first fruiting node had positive and significant correlation with width of fruit at genotypic level only. Other characters except number of fruits per plant also showed positive inter relationship with it but statistically non significant.

Table-1 *Phenotypic and genotypic correlation coefficients in parents among ten characters under study in okra*

Characters	Days to flowering	Height of plant	Number of branches per plant	Number of first fruiting node	Number of nodes per plant	Length of internode	Length of fruit	Width of fruit	Number of fruits per plant	Yield per plant
Days to flowering	p	0.411	0.618*	0.754**	0.145	0.397	0.294	0.585*	-0.285	-0.3
	g	0.48	0.662**	0.991**	0.33	0.408	0.297	0.757**	-0.429	-0.311
Height of plant		p	0.024	0.398	0.683**	0.395	0.756**	0.174	0.364	0.511
		g	0.04	0.47	0.845**	0.507	0.844	0.363	0.743**	0.657**
Number of branches per plant			p	0.586*	-0.106	0.396	0.051	0.654**	-0.257**	-0.368
			g	0.857**	-0.13	0.498	0.082	0.832**	-0.472	-0.525*
Number of first fruiting node				p	0.057	0.245	0.209	0.508	-0.192	-0.18
				g	0.337	0.425	0.229	0.790**	-0.316	-0.208
Number of nodes per plant					p	0.504	0.672**	0.132	0.392	0.481
					g	0.934**	0.819**	0.591*	0.685**	0.725**
Length of internode						p	0.666**	0.3	0.326	0.283
						g	0.796**	0.840**	0.457	0.377
Length of fruit							p	0.175	0.542*	0.483
							g	0.401	0.781**	0.760**
Width of fruit								p	-0.287	-0.246
								g	-0.384	-0.598*
Number of fruits per plant									p	0.734*
									g	0.911**
Yield per plant										1

**Significant at 5 percent level, p = Phenotypic; **Significant at 1 percent level, g = Genotypic*

Table-2 *Phenotypic and genotypic correlation coefficients in F_{1s} among ten characters under study in okra*

Characters	Days to flowering	Height of plant	Number of branches per plant	Number of first fruiting node	Number of nodes per plant	Length of internode	Length of fruit	Width of fruit	Number of fruits per plant	Yield per plant
Days to flowering	p	0.628**	0.641**	0.497**	-0.012	0.407**	0.305**	0.500**	-0.17	-0.186
	g	0.682**	0.757**	0.624**	0.008	0.474**	0.374**	0.621**	-0.219	-0.234
Height of plant		p	0.424**	0.187	0.427**	0.541**	0.489**	0.591**	0.166	0.13
		g	0.486**	0.205	0.588**	0.663**	0.607**	0.686**	0.238	0.144
Number of branches per plant			p	0.311**	-0.079	0.314**	0.250*	0.458**	-0.143	-0.229
			g	0.434**	-0.141	0.390**	0.434**	0.583**	-0.213	-0.290*
Number of first fruiting node				p	-0.02	0.108	0.093	0.084	-0.221	-0.157
				g	-0.033	0.168	0.104	0.177	-0.353**	-0.264*
Number of nodes per plant					p	0.149	0.365**	0.211	0.397**	0.356**
					g	0.264**	0.581**	0.280*	0.661**	0.489**
Length of internode						p	0.472**	0.461**	0.099	0.06
						g	0.642**	0.693**	0.12	0.073
Length of fruit							p	0.341**	0.274*	0.293*
							g	0.471**	0.422**	0.407**
Width of fruit								p	0.05	0.059
								g	0.051	0.067
Number of fruits per plant									p	0.626**
									g	0.988**
Yield per plant										1

**Significant at 5 percent level, p = Phenotypic; **Significant at 1 percent level, g = Genotypic*

Table-3 *Phenotypic and genotypic correlation coefficients in F_{2s} among ten characters under study in okra*

Characters	Days to flowering	Height of plant	Number of branches per plant	Number of first fruiting node	Number of nodes per plant	Length of internode	Length of fruit	Width of fruit	Number of fruits per plant	Yield per plant
Days to flowering	p	0.492**	0.209	0.324**	0.277*	0.473**	0.471**	0.248	0.305*	0.262*
	g	0.513**	0.246	0.356**	0.336**	0.505**	0.565**	0.587**	0.317*	0.304*
Height of plant		p	0.261*	0.247	0.483**	0.655**	0.162	0.202	0.225	0.143
		g	0.340*	0.256*	0.528**	0.671**	0.192	0.404**	0.245	0.166
Number of branches per plant			p	0.207	0.225	0.278*	0.047	0.14	-0.033	-0.003
			g	0.390**	0.292*	0.345**	0.088	0.885**	-0.043	-0.056
Number of first fruiting node				p	0.134	0.218	0.089	0.135	0.165	0.215
				g	0.165	0.231	0.137	0.269*	0.231	0.278*
Number of nodes per plant					p	0.415**	0.287*	0.149	0.165	0.071
					g	0.452**	0.308*	0.376**	0.19	0.079
Length of internode						p	0.233	0.24	0.256*	0.173
						g	0.265*	0.537**	0.268*	0.176
Length of fruit							p	0.153	0.524**	0.550**
							g	0.400**	0.587**	0.650**
Width of fruit								P	0.167	0.147
								G	0.480**	0.537**
Number of fruits per plant									p	0.853**
									g	0.974**
Yield per plant										1

**Significant at 5 percent level, p = Phenotypic; **Significant at 1 percent level, g = Genotypic*

Table-4 *Phenotypic and genotypic correlation coefficients in B_{1s} among ten characters under study in okra*

Characters	Days to flowering	Height of plant	Number of branches per plant	Number of first fruiting node	Number of nodes per plant	Length of internode	Length of fruit	Width of fruit	Number of fruits per plant	Yield per plant
Days to flowering	p	0.595**	0.472**	0.662**	-0.027	0.281*	0.279*	0.483*	-0.2	-0.272*
	g	0.635**	0.536**	0.855**	-0.052	0.297*	0.366**	0.529**	-0.286*	-0.285*
Height of plant		p	0.261*	0.347**	0.447**	0.581**	0.496**	0.616**	0.194	0.055
		g	0.322*	0.392**	0.522**	0.607**	0.623**	0.673**	0.247	0.043
Number of branches per plant			p	0.496**	-0.203	0.167	0.02	0.492**	0.265*	-0.285*
			g	0.659**	-0.246	0.237	0.092	0.688**	0.456**	-0.394**
Number of first fruiting node				p	-0.18	0.097	0.049	0.315**	-0.325**	0.297*
				g	-0.143	0.117	0.196	0.444**	-0.441**	0.468**
Number of nodes per plant					p	0.509**	0.497**	0.2	0.464**	0.430**
					g	0.553**	0.802**	0.201	0.650**	0.540**
Length of internode						p	0.554**	0.522**	0.263*	0.167
						g	0.746**	0.561**	0.356**	0.179
Length of fruit							p	0.365**	0.378**	0.279*
							g	0.512**	0.475**	0.410**
Width of fruit								p	0.101	0.054
								g	0.096	0.065
Number of fruits per plant									p	0.662**
									g	0.934**
Yield per plant										1

**Significant at 5 percent level, p = Phenotypic; **Significant at 1 percent level, g = Genotypic*

Table-5 *Phenotypic and genotypic correlation coefficients in B_{2s} among ten characters under study in okra*

Characters	Days to flowering	Height of plant	Number of branches per plant	Number of first fruiting node	Number of nodes per plant	Length of internode	Length of fruit	Width of fruit	Number of fruits per plant	Yield per plant
Days to flowering	p	0.741**	0.546**	0.737**	0.372**	0.706**	0.554**	0.510**	0.084	-0.001
	g	0.767**	0.630**	0.815**	0.475**	0.741**	0.673**	0.621**	0.086	-0.02
Height of plant		p	0.412**	0.554**	0.683**	0.662**	0.682**	0.264*	0.335**	0.182
		g	0.459**	0.592**	0.768**	0.694**	0.779**	0.297*	0.362**	0.208
Number of branches per plant			p	0.435**	0.071	0.505**	0.398**	0.519**	0.024	-0.054
			g	0.576**	0.111	0.551**	0.502**	0.605**	0.048	-0.07
Number of first fruiting node				p	0.299**	0.532**	0.352**	0.22	0.031	-0.053
				g	0.308*	0.609**	0.424**	0.318*	0.025	-0.059
Number of nodes per plant					p	0.425**	0.509**	0.011	0.391**	0.195
					g	0.546**	0.594**	0.04	0.502**	0.346*
Length of internode						p	0.650**	0.495**	0.280*	0.238
						g	0.802**	0.564**	0.320*	0.249
Length of fruit							p	0.353**	0.351**	0.192
							g	0.475**	0.433**	0.326*
Width of fruit								p	0.034	-0.01
								g	0.081	-0.119
Number of fruits per plant									p	0.777**
									g	0.970**
Yield per plant										1

**Significant at 5 percent level, p = Phenotypic; **Significant at 1 percent level, g = Genotypic*

Number of nodes per plant showed positive and significant correlation with length of fruit at both the genotypic and phenotypic levels and with length of internode to expressed positive and significant association with length of fruit at both the levels and width of fruit only genotypic level. Length of fruit showed positive and significant association with number of fruits per plant at both genotypic and phenotypic level. Number of fruits per plant showed positive and significant correlation only with yield per plant both at genotypic and phenotypic levels [5]. Among F_1 genotypic yield per plant had positively significant relationship with number of nodes per plant, length of fruit and number of fruits per plant at both genotypic and phenotypic levels and negatively significant with number of branches per plant and number of first fruiting node only at genotypic level [6]. Among characters themselves, days to flowering was positive and highly significant with height of plant, number of branches per plant, number of first fruiting node, length of internode, length of fruit and width of fruit both at genotypic and phenotypic levels. Height of plant showed positive and significant association with number of branches per plant, number of nodes per plant, length of internode, length of fruit and with of fruit both at genotypic and phenotypic levels. Number of branches per plant had positive and significant correlation with number of first fruiting node, length of internode, length of fruit and width of fruit at both genotypic and phenotypic levels and its association with number of nodes per plant and number of fruits per plant were negative both at genotypic and phenotypic levels. Number of first fruiting node was negative and significant association only with number of fruits per plant only at genotypic level. Number of nodes per plant showed positive and significant association with length of fruit and number of fruits per plant both at genotypic and phenotypic levels and length of internode and width of fruit only at genotypic level. Length of internode had positive and significant correlation with length of fruit and width of fruit both at genotypic and phenotypic levels. Length of fruit showed positive and significant association with width of fruit and number of fruits per plant both at genotypic and phenotypic levels. Width of fruit had positive and non-significant association with number of fruits per plant and yield per plant both at genotypic and phenotypic levels. Number of fruits per plant showed positive and significant correlation with yield per plant both at genotypic and phenotypic levels [7]. Among F_2 population, which revealed that yield per plant had positive and significant association with days to flowering, length of fruit and number of fruits per plant both at genotypic and phenotypic levels and number of first fruiting node only at genotypic level. Among characters themselves, days to flowering was positive and significant with height of plant, number of first fruiting node, number of nodes per plant, length of internode, length of fruit and number of fruits per plant both at genotypic and phenotypic level and width of fruit only at genotypic level.

Height of plant showed positive and significant association with number of branches per plant, number of nodes per plant, and length of internode both at genotypic and phenotypic levels and number of first fruiting node and width of fruit only at genotypic level. Number of branches per plant was positive and significant association with length of internode both at genotypic and phenotypic levels and number of first fruiting node, number of nodes per plant and width of fruit only at genotypic level. Number of first fruiting node, number of nodes per plant and width of fruit only at genotypic level. Number of first fruiting node showed positive and significant association with width of fruit only at genotypic level. Number of nodes per plant had positive and significant correlation with length of internode and length of fruit both at genotypic and phenotypic levels. Length of internode showed positive and significant association with number of fruits per plant at both genotypic and phenotypic levels and length of fruit and width of fruit only at genotypic level. Length of fruit showed positive and significant association with number of fruits per plant at both genotypic and phenotypic levels and width of fruit only at genotypic level. Width of fruit had positive and significant correlation with number of fruits per plant only at genotypic level. Number of fruits per plant showed positive and significant association with yield per plant at both genotypic and phenotypic levels [8]. Among B_1 generation yield per plant showed positive and significant correlation with no. of nodes per plant, length of fruit and no. of fruits per plant and negative and significant with days to flowering, no, of branches per plant and no, of first fruiting node at both genotypic and phenotypic levels. Other characters showed non- significant positive and negative correlation. Among B_1 generation yield per plant showed positive and significant correlation with no. of fruits per plant at both genotypic and phenotypic levels and no. of nodes per plant and length of fruit only at genotypic level. Other characters showed non-significant positive and negative correlation.

Conclusion

The correlation coefficient among the parents, F_{1s}, F_{2s}, B_{1s} and B_{2s} were showed positive and significant yield per plant with the number of nodes per plant, length of fruits and number of fruits per plant and it was negatively significant with days to flowering and number of branches per plant and number of first fruiting node among the B1s generations.

Application of research: Study of high yielding and disease resistant varieties of okra.

Research Category: Genotype and phenotype level; yield.

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Study area / Sample Collection: Department of Vegetable Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur.

Cultivar / Variety / Breed name: AB-1, AB-2, KS-312, BO-2, P-7, VRO-3 VRO-5 and PK.

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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