Plant Archives Vol. 20, Supplement 2, 2020 pp. 1612-1614 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

CORRELATION AND PATH ANALYSIS OF YIELD AND YIELD ATTRIBUTING TRAITS OF OKRA (*ABELMOSCHUS ESCULENTUS* L. MOENCH)

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Abstract

Okra is an important vegetable crop of tropics and sub-tropics. Correlation and path coefficient analysis was carried out in ten genotypes for yield and yield attributing traits. Observations were recorded on eleven yield and yield attributing characters. Fruit yield per plant is in positive and significant correlation with fruit weight and number of fruits per plants. Path coefficient analysis revealed that the traits days to first flowering, number of fruits per plants, fruit length, number of ridges per pod, fruit weight have positive direct effect on fruit yield per plant.

***Keywords*:** Okra, correlation, Path coefficient analysis

Introduction

Okra is an important vegetable crop belonging to the family Malvaceae. It is an important vegetable of tropics and sub-tropics. Okra is amphidiploids in nature. It is cultivated for its green fleshy pods. They are found to be an excellent source of iodine, which is effective in controlling goiter. Fruits are rich in iron, calcium, manganese, vitamins A, B, C, K (USDA National Nutrient Database 2015). Okra has pharmacological and medicinal properties against cancer. Seeds of this vegetable are rich in oil (30-40%) and protein (15-20%) (Gemede *et al.,* 2015).Okra is affected by various number pest and diseases. The most important disease which produces a yield loss up to 100% is okra yellow vein mosaic virus disease which is transmitted by white fly (*Bemisia tabaci*).

The major aim of any breeding programme is to produce high yield. To identify an efficient breeding method it is important to have an adequate knowledge between yields and yield attributing traits and their relationship between quantitative characters at genotypic and phenotypic levels. Correlation analysis helps in identifying the character that would result in the improvement of character that is positively correlated (Jagan *et al.,* 2013).

As there are number of factors involved in the correlation studies, their indirect association becomes more complex and confusing but path analysis helps to avoid complication (Thulasiram *et al.,* 2017). Path analysis divides the observed correlation coefficient into direct and indirect effects which would be helpful in understanding the direct and indirect contribution of various characters towards yield.

Materials and Methods

The present investigation was carried out at the pot culture yard, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University. The details of ten genotypes along with their source of collection are presented in the table 1.The genotypes were grown in a completely randomized block design with two replications. Standard agronomic practices were followed. Eleven observations were recorded on five randomly selected plants in each replication for the traits such as plant height, intermodal length, number of internodes, days to first flower, fruit length, fruit girth, number of fruits per plant, number of ridges per pod, fruit weight, coefficient of inflection for yellow vein mosaic disease incidence, yield per plant. The data were statistically analysed to find out genotypic and phenotypic correlation coefficients and path coefficient analysis using the GENRES and TNAUSTST softwares.

Result and Discussion

The correlation between different components of yield is needed for selecting an efficient breeding programme for crop improvement. Correlation coefficient analysis is used to measure the relationship between yield and its components for crop improvement. The data regarding the genotypic and phenotypic correlation are given in the table 2.The traits numbers of fruits per plant and fruit weight were positively significantly correlated with the yield. This result is in accordance with Thulasiram *et al.* (2017), Sujitha *et al.* (2019), Magar and Madrap (2019), Kumar *et al.* (2015), Prasath *et al.* (2015). The traits number of internodes per plant is positive and non-significantly correlated with the yield. Sujatha *et al.* (2015) observed the similar results.

Plant height and internodal length is negatively and non-significantly correlated with yield. The result is in accordance with the findings of Patrot and Ravishankar (2004) for plant height and against the result obtained by Thulasiram *et al.* (2017), Sujatha *et al.* (2015), Magar and Madrap (2019), Bhalekar *et al.* (2005) and Dakahe *et al.* (2007) for plant height.

Days to first flowering, fruit length, fruit girth and incidence of YVMW is negatively significantly correlated with yield. The results are in accordance with Thulsiram *et al.* (2019) for days to first flowering, Kumar *et al.* (2015) for YVMW incidence and against the results obtained by Jagan *et al.* (2013) Prasath *et al.* (2017) for fruit girth, Yadav *et al.* (2019) for fruit girth, Raval *et al.* (2017) for fruit girth, Vani *et al.* (2012) for fruit girth.

The character internodal length and number of ridges per pod is non-significant and negatively correlated with yield. The obtained results gives the evidence that the selection of genotypes based on fruit weight and number of fruits per plant is highly useful. Selection of genotypes based on plant height, days to first flowering, fruit length and fruit girth will not help in the improvement of yield.

Path coefficient analysis

Correlation studies provide the effect of different characters on yield but not the direct and indirect effects. It can be done by path coefficient analysis. Genotypic correlations are divided into direct and indirect effect towards the yield components. Path coefficient analysis method was developed by Wright (1921).

Path coefficient analysis at genotypic level shows that the traits days to first flowering, number of fruits per plant, fruit length, number of ridges per pod, fruit weight have positive direct effect on yield wheras the traits plant height, fruit girth and incidence of YVMW have negative direct effect on yield. Similar results were obtained by Patro and Ravishankar (2009) where he observed fruit weight has positive direct effect on yield. Thulasiram *et al.* (2017) observed positive direct effect on yield for fruit weight, number of fruits per plant. Positive direct effect for number of fruits per plant, days to first flowering, fruit weight was observed by Magar and Madrap (2009), Prasath *et al*. (2019), Jagan *et al.* (2013), Raval *et al.* (2017) observed positive effect for traits like fruit weight, number of fruits per plant.

The results obtained in the above experiment were against the results obtained by Patro and Ravishankar, (2009), Thulasiram *et al.* (2017), Sujatha *et al.* (2015) for plant height and number of internodes, Jagan *et al*. (2013) for incidence of YVMW and fruit girth, Thulasiram *et al*. (2017) for fruit girth, Raval *et al*. (2017) for fruit length.

High positive direct was found for YVMW incidence via days to first flowering. High negative direct effect was found for number of fruits via days to first flowering. Number of fruits per plant was found to have positive direct effect via plant height, number of internodes, fruit girth, incidence of YVMW and negative indirect effect via intermodal length, days to first flowering, fruit length, number of ridges per pod, fruit weight. The results obtained were against the results obtained by Kumar *et al.* (2015).

Fruit weigh have positive indirect effect on yield. Yellow vein mosaic incidence has positive indirect effect via number of nodes per plant, days to first flowering and number of ridges per pod and negative indirect effect via plant height, fruit length, intermodal length, number of fruits per plant, fruit girth, fruit weight and yield. The results are in accordance with the results obtained by Thulasiram *et al.* (2017).

Conclusion

The results obtained give a clear idea about the selection of a character for yield improvement in Okra. The traits fruit weight and number of fruits per plant have been highly contributed for yield improvement. Hence selection of genotypes for yield improvement based on these characters will be highly effective.

Table 1 : Genotypes and their source of collection

S.No.	Genotype	Source of collection
1	Okra elephant tusk	Dindugal
2	Red okra	Dindugal
3	Tree Okra	Dindugal
4	Okra short	Dindugal
5	Okra purple	Dindugal
6	Okra plain	Dindugal
7	Okra long	Dindugal
8	Okra white	Dindugal
9	Arka Anamika	Coimbatore
10	Avinashi local	Avinashi

Table 2 : Genotypic and phenotypic correlation coefficients (r) between yield and yield contributing characters in okra

Characters.		PH	NOI	IL	DFF	NOF	FL	FG	NOR	FW	CI	YPP
PH	G	1.000	0.764**	0.096	0.738**	-0.550*	0.514*	0.457*	0.544*	0.550*	0.296	-0.100
	P	1.000	0.645**	0.095	0.594**	-0.531*	0.377	0.197	0.219	0.505*	0.291	-0.100
NOI	G		1.000	-0.563**	0.228	-0.453*	0.495*	0.267	0.786**	0.859**	-0.168	0.164
	P		1.000	-0.605**	0.342	-0.368	0.045	0.196	0.087	0.646**	-0.126	0.137
IL	G			1.000	0.433	0.010	0.171	0.656**	0.242	-0.295	0.402	-0.194
	P			1.000	0.066	0.048	0.262	-0.015	0.091	-0.277	0.321	-0.154
DFF	G				1.000	-0.872**	0.744**	0.688**	0.766**	-0.040	0.829**	-0.743**
	P				1.000	-0.773**	0.315	0.256	0.254	0.048	0.713**	-0.629**
NOF	G					1.000	-0.603	-0.925**	-0.817**	-0.036	-0.817**	0.805**
	P					1.000	-0.492	-0.337	-0.321	-0.096	-0.790**	0.790*
FL	G						1.000	0.119	0.813**	0.187	0.618**	-0.499*
	P						1.000	0.580**	0.660**	0.190	0.426	-0.331
FG	G							1.000	0.127	0.307	0.708**	-0.589**
	P							1.000	0.795**	0.149	0.271	-0.232
NOR	G								1.000	0.537*	0.599**	-0.385
	P								1.000	0.287	0.237	-0.145
FW	G									1.000	-0.367	0.558*
	P									1.000	-0.353	-0.512*
CI	G										1.000	-0.920**
	P										1.000	-0.915**
YPP	G											1.000
	P											1.000

PH-Plant height(cm), NOI-Number of Internodes, IL-Internode length (cm), DFF-Days to first flowering, NOF-Number of Fruits per plant, FL-Fruit length (cm), FG-Fruit Girth (cm), NOR-Number of Ridges per pod, FW-Average fruit weight (g), CI-Coefficient of infection, YPP-Total yield per plant (g)

*and** indicates significance at 5% and 1% respectively

Table 3 : Path coefficients (Direct and indirect effect) at genotypic level in okra

Characters	PH	NOI	IL	DFF	NOF	FL	FG	NOR	FW	CI	Correlation coefficient
PH	**-1.581**	-0.341	-0.067	2.172	-0.943	0.084	-0.154	0.063	0.858	-0.190	-0.100
NOI	-1.208	**-0.446**	0.393	0.672	-0.777	0.081	-0.090	0.090	1.341	0.108	0.164
IL	-0.152	0.251	**-0.699**	1.273	0.018	0.028	-0.221	0.028	-0.460	-0.258	-1.94
DFF	-1.167	-0.102	-0.302	**2.942**	-1.494	0.121	-0.232	0.088	-0.063	-0.533	-0.743**
NOF	0.870	0.202	-0.007	-2.564	**1.714**	-0.098	0.313	-0.094	-0.056	0.525	0.805**
FL	-0.812	-0.221	-0.119	2.187	-1.033	**0.163**	-0.716	0.208	0.291	-0.397	-0.499*
FG	-0.723	-0.119	-0.458	2.023	-1.586	0.345	**-0.338**	0.244	0.479	-0.455	-0.589**
NOR	-0.861	-0.351	-0.169	2.252	-1.401	0.295	-0.718	**0.115**	0.837	-0.385	-0.385
FW	-0.869	-0.383	0.206	-0.119	-0.061	0.030	-0.104	0.062	**1.560**	0.236	0.558*
CI	-0.468	0.075	-0.281	2.438	-1.399	0.100	-0.239	0.069	-0.573	**-0.642**	-0.920**

PH-Plant height(cm), NOI-Number of Internodes, IL-Internode length (cm), DFF-Days to first flowering, NOF-Number of Fruits per plant, FL-Fruit length (cm), FG-Fruit Girth (cm), NOR-Number of Ridges per pod, FW-Average fruit weight (g), CI-Coefficient of infection
* and** indicates significance at 5% and 1% respectively

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