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Stability Assesment in Okra - *Abelmoschus esculentus* - L. Moench

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ABSTRACT

The phenotypic stability of 53 genotypes of okra (30 varieties and 23 hybrids) grown over three environments was studied for growth and yield characters. Variance due to genotypes and environments was highly significant for these characters. The large variation in regression values indicated large differences in genotype response to different environments. G x E interaction was significant for plant height, intermodal length, number of fruits per plant, total yield per plant and yield per plot. The genotype Arka Abhay was found promising and stable for plant height, internodal length. The hybrids KAOH09 and KAOH08 were found highest yielder and also stable for total yield per plant. The F1 hybrids had greater stability for yield across the environments compared to open pollinated varieties. Stability of the crosses was attributed to the stability of parents. Stability for yield is attributed to stability for component traits.

KEYWORDS Okra, Stability, GxE interaction.

Introduction

Okra (syn.bhindi, lady's finger and gumbo) is an important vegetable crop grown in tropics and sub-tropics for its tender green fruits. It has high nutritive value and export potential. Great fluctuations in the yield are observed due to the non-adaptability of varieties to variable agro-climatic conditions. A breeding programme aimed at developing phenotypically stable varieties needs information on the extent of g x e interaction for growth, yield and its component characters. Genotype × environment (GE) interaction is useful for explaining adaptation patterns, as only this interaction can be exploited by selecting for specific adaptation or by growing specifically adapted genotypes. Little information was available on stability of promising genotypes in okra. Hence the present study was undertaken.

Materials and Methods

The present investigation comprised of totally 53 genotypes of okra collected from different sources and F_1 hybrids developed at Kittur Rani Channamma College of Horticulture, Arabhavi. The experiment was carried out in randomised block design with three replications during kharif and rabi 2004-2005 over three environments, viz., E_1 (kharif 2004-2005 with full dose of recommended fertilisers, i.e., 125:75:62.5 kg NPK/ha), E_2 (kharif 2004-2005 with half dose of recommended fertilisers, i.e., 62.5:37.5:31.25 kg NPK/ha) and E_3 (rabi 2004-2005 with full dose of recommended fertilisers, i.e., 25:75:62.5 kg NPK/ha). The data were analysed for stability parameters using the model proposed by Eberhart and Russel [3].

Results and Discussion

Pooled analysis over the environments indicated highly significant differences due to genotypes and environments. G x E interaction was highly significant for plant height, intermodal length,number of fruits per plant, early yield per plant, total yield per plant and yield per plot. For other traits, viz., per cent fruit set, fruit length, fruit diameter and average fruit weight interaction was not significant. Variance due to G x E (linear) was significant for all these traits except for plant height, indicating significant differences among the genotypes for their regression on environmental indices. Pooled deviation (non-linear component) variances were significant for intermodal length, number of fruits per plant, early yield per plant, total yield per plant, suggesting importance of both linear and non-linear components.

For plant height the genotype KAOH12, KAO05, Arka Abhay, KAOH11 and KAO31 were found stable for this character with high mean values and regression coefficients were around unity with non-significant deviations from regression (Table-1). Other genotypes KAO29, KAO79 and KAO37 had regression coefficients below unity and can perform marginally well in unfavourable environments, whereas other genotype KAOH-14 had higher mean value and regression coefficient above unity with non-significant deviation from regression, indicating slightly better performance in favourable environments.Such varied responsiveness of genotypes to changing environments for plant height was also reported by Raiet al. (2000) in brinjal, Mulge and Aravindakumar (2003) in tomato.

For internodal length, the genotypes KAO68, KAOH16, Arka Abhay, KAOH12 and KAOH14 had high mean values and regression coefficients around unity with non-significant deviations from regression and hence, regarded as predictable and stable genotypes for this trait.Varied response of genotypes to environmental changes for internodal length has also been reported by Babuet al. (1983) in okra with different set of genotypes.

For number of fruits per plant, the genotypes AROH10, KAOH08, KAO67, Arka Anamika and Parbhani Kranti were found stable and average responsive with regression coefficients approaching unity and non-significant deviations from regression (Table 1). The other genotypes S-152, KAOH09, KAOH12 and MHB-10 with high mean values were found to be unstable because of significant regression coefficients above unity and were suited to favourable environments.

The genotypes KAOH09, KAOH08, KAO67, Arka Anamika, Parbhani Kranti, KAOH06 andArka Abhay had higher mean values, non-significant regression coefficients approaching unity with predictable performance for total yield per plant (Table 1). Hence, all these genotypes were considered as stable across the environments. The genotypes KAOH12 and-KAOH16 had high mean values for total yield per plant, but found unstable with their significant regression coefficients above unity and are suited to favourable environments.

Correlation coefficients worked out among different growth and yield parameters in okra over all the three environments are presented in Table-2.Present investigation brought out the fact that yield stability of a given genotypes was attributed to its stability for at least few of growth and yield attributing traits. It was also evident from the correlation studies, where total yield per plant was strongly associated with plant height (r_p=0.826), average fruit weight (r_p=0.784), internodal length (r_p=0.722), number of primary branches (0.698), number of leaves per plant (r_p=0.686), per cent fruit set (r_p=0.552), number of fruits per plant (r_p=0.643), average fruit weight (r_p=0.784), early yield per plant (r_p=0.679) and yield per plant (r_p=0.989).

Table 2. Correlation coefficients of total yield per plant with component characters

	Yield per plant (g)
Plant height	0.826**
Number of primary branches	0.698**
Number of leaves per plant	0.686**
Number of fruits per plant	0.643**
Average fruit weight (g)	0.784**
Internodal length (cm)	0.722**
Fruit diameter (cm)	-0.261**
Per cent fruit set	0.522**
Early yield per plant (g)	0.679**
Total yield per plant (g)	0.989**

*** and ** indicate significant at P=0.05 and P=0.01, respectively.**

Table 1. Stability parameters for intermodal legth, plant height and yield and its component traits in okra

Entry	Internodal length			Plant height (cm)			Number of fruits per plant			Yield per plant (g)		
	Mean	bi	S^2_{di}	Mean	(bi)	(S^2_{di})	Mean	Bi	S^2_{di}	Mean	bi	S^2_{di}
ArkaAnamika	6.79	1.36	-0.10	66.22	1.42	3.09	20.44	1.31	2.43	271.62	1.30	114.22
ArkaAbhay	5.38	1.32	-0.08	64.00	1.84	194.54**	19.97	0.95	0.60	258.77	0.86	106.64
ParbhaniKranti	6.12	1.07	0.78**	62.60	1.73	118.40**	20.06	1.00	0.99	270.45	1.15	95.43
KAO29	6.52	2.27*	1.31**	63.22	0.32	5.57	18.77	1.38	0.19	206.77	1.02	100.58
KAO30	4.79	0.40	0.06	85.61	0.29*	21.67	16.14	0.92	0.97	209.92	0.82	104.61
KAO31	6.88	1.24	2.89**	60.50	1.32	1.84	16.47	0.78	0.65	248.43	1.30	98.57
KAO37	5.69	1.61	0.35**	62.22	0.43	2.87	18.22	1.18	3.73*	282.05	1.14	29.35
KAO58	6.64	0.44	-0.04	105.61	0.83	112.21*	16.55	0.56*	1.00	259.07	1.16	256.53
KAO62	6.99	0.37	-0.08	127.72	1.00	216.72**	18.94	1.13	0.87	298.15	1.29	93.25
KAO67	5.77	0.62	0.14	105.06	0.79	0.22	20.50	0.92	0.71	328.41	1.33	52.91
KAOH06	6.72	1.90	3.07**	122.78	1.26	11.77	19.39	1.03	0.29	291.88	1.62**	47.26
KAOH08	7.27	1.04	4.34**	124.06	1.35	19.66	21.22	1.25	1.03	227.67	1.10	83.84
KAOH09	7.35	0.88	1.76**	139.11	1.75**	689.28**	24.06	1.46*	0.08	253.47	1.68**	18.97
KAOH12	6.78	1.45	0.07	125.61	1.87**	6.11	21.66	1.56**	0.97	339.08	1.92**	917.31**
KAOH13	5.89	0.66	1.02**	113.28	1.18	154.39**	18.61	1.10	0.71	306.00	1.38*	419.46**
KAOH14	6.58	1.41	0.07	63.67	1.64	1.21	18.39	0.93	6.20**	290.92	1.64**	530.22**
KAOH16	7.05	1.13	0.08	106.72	0.76	7.07	19.94	1.88**	0.35	271.62	1.30	114.22
S152	8.07	0.43	0.71**	152.11	1.41	16.99	26.05	2.06**	0.98	258.77	0.86	106.64
AROH10	6.63	0.90	1.15**	127.83	1.48	13.89	22.55	1.30	0.58	270.45	1.15	95.43
MHB10	7.13	2.30*	3.80**	125.50	1.64*	45.29	21.17	1.63**	0.08	206.77	1.02	100.58
Population mean	5.912			102.157			17.50		2.43			
S.E.(Mean)							0.932					
S.E of bi	0.635	0.554		7.32	0.296		Mean	0.212				

bi*, ** : Regression coefficient is significantly different from unity at P=0.05 and P=0.01, respectively.

$S^2_{d_i}$ ***, **: Deviation from regression are significantly differed from zero at P=0.05 and P=0.01, respectively.**

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