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Variability studies for fruit yield and its components okra (*Abelmoschus esculentus* (L.) Moench)

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Abstract

The present investigation was conducted to assess genetic variability. Character association and path analysis with respect to fruit yield and its components in 40 genotypes of okra (*Abelmoschus esculentus* (L.) Moench) along with one check in a Randomized Block Design with two replications at the Experimental Farm, during Kharif-2022. The characters studied were days to 50 percent flowering, plant height, internodal length, number of nodes per plant, number of branches per plant, fruit length, fruit diameter, number of fruits per plant, fruit weight, days to first picking, YVMV incidence and fruit yield per plant. The observations were recorded on five selected plants for above mentioned characters.

Analysis of variance indicated significant differences for all the traits under study, indicating the presence of wide genetic variability in the experimental material studied. The magnitude of GCV and PCV was recorded to be high for days to 50 percent, plant height, internodal length, number of nodes per plant, fruit length, fruit diameter and fruit weight, number of fruits per plant, days to first picking and fruit yield per plant.

The higher values of PCV than GCV for a character, suggesting the environmental influence on the characters.

The close correspondence between GCV and PCV for most of the traits indicated lesser environmental influence on the expression of these traits. While the higher magnitude of difference between PCV and GCV indicates more environmental effect on the traits.

The least value of PCV was observed for days to 50 percent flowering, days to first picking. While moderate for plant height, internodal length, number of nodes per plant, fruit length, fruit diameter and fruit weight, number of fruits per plant and fruit yield per plant showing the additive type of gene action so these traits are suitable for selection.

Keywords: Variability, PCV, GCV, okra and fruit

Introduction

Okra (*Abelmoschus esculentus* (L.) Moench) is an annual, herbaceous plant and belongs to the family malvaceae, having a chromosome number $2n=130$ and is considered to be an amphidiploid. Okra is also known as "Queen of vegetable". It is cultivated in states of Gujarat, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Uttar Pradesh Orissa, and Haryana. Okra plant is a robust, erect and annual herb of 0.5 to 2 meter tall; stem green or tinged red; leaves simple and alternate; flower solitary and auxiliary, calyx completely fused; petals five, separate and yellow with crimson spot-on claw; staminal column united to base of petals, with monadelphous staminal tube; ovary superior; stigma small, 5-8 fids, fruit pyramidal capsule; seeds dark green to dark brown rounded and about 5 mm in diameter.

It is a nutritious vegetable containing 86.1 percent water, 2.2 percent protein, 0.2 percent fat, 9.7 percent carbohydrate, 1.0 percent fiber and 0.8 percent ash. Okra is also canned or dehydrated. Okra is rich in vitamins, calcium, potassium and other mineral matters. Considering the importance of okra as a vegetable, there is a prime need for its improvement. Despite of huge demand for the crop, more attention has been given for its genetic improvement to enhance the productivity level. In India, there is always great desire for a high yielding variety with other quality parameter. This is possible by using suitable breeding method for recognition of the genotypes and quantitative assessment of population for the yield and its contributing traits. Any breeding programme regulated by amount of genetic variability present in the population (Singh *et al.*, 2020) [1]. The extent of variability decides improvement of any character. The significant amount of variability provides important information regarding selection of diverse parents to be used in hybridization programme.

Material and Methods

Table 1: List of genotypes

Sr. No.	Genotypes	Sr. No.	Genotypes
1.	PBNLF-102	21.	PBNLF-123
2.	PBNLF-103	22.	PBNLF-124
3.	PBNLF-104	23.	PBNLF-125
4.	PBNLF-105	24.	PBNLF-126
5.	PBNLF-107	25.	PBNLF-127
6.	PBNLF-108	26.	PBNLF-128
7.	PBNLF-109	27.	PBNLF-129
8.	PBNLF-110	28.	PBNLF-130
9.	PBNLF-111	29.	PBNLF-131
10.	PBNLF-112	30.	PBNLF-132
11.	PBNLF-113	31.	PBNLF-133
12.	PBNLF-114	32.	PBNLF-134
13.	PBNLF-115	33.	PBNLF-135
14.	PBNLF-116	34.	PBNLF-136
15.	PBNLF-117	35.	PBNLF-137
16.	PBNLF-118	36.	PBNLF-138
17.	PBNLF-119	37.	PBNLF-139
18.	PBNLF-120	38.	PBNLF-140
19.	PBNLF-121	39.	PBNLF-141
20.	PBNLF-122	40.	Parbhani Kranti (c)

The experimental material was evaluated at Experimental Farm, in Randomized Block Design with two replications under rainfed condition. The sowing was carried out at the spacing of 60 cm and 30 cm between the rows and plants, respectively. The method of sowing followed was dibbling. One plant per hill was maintained by thinning 15 days after sowing. Plot size for each genotype was 1.20 x 6.0 m². The recommended fertilizer dose of 50:50:50 kg N:P:K /ha was applied. All other cultural practices and plant protection measures were undertaken to maintain healthy crop.

Observations Recorded

The observations on twelve yield and yield contributing characters were recorded on five randomly selected competitive plants from each genotype from every replication. Average value of each character was determined from these

observational plants. Observations were recorded on following biometrical traits.

Days to 50 percent flowering (%), Plant height (cm), Internodal length (cm), Number of nodes per plant, Number of branches per plant, Fruit length (cm), Fruit diameter (cm), Number of fruits per plant (No's), Fruit weight (gm), Days to first picking, Fruit yield per plant and YVMV incidence

Statistical analysis

The replication means based on selected plants for all yield and yield contributing characters were for analysis. The analysis was based on the model suggested by Panse and Sukhatme (1985) [5].

Results and Discussion

The genetic components *viz.* genotypic variance, phenotypic variance, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), worked out by using appropriate statistical formula for all the twelve morphological characters in 40 okra genotypes including check. The results are presented in Table

The values of genotypic and phenotypic variance found for days to 50 percent flowering character were having 0.93 and 2.44 respectively. The GCV and PCV had values of 2.38 and 3.86 respectively. Plant height showed genotypic and phenotypic variance components of 110.70 and 155.56, respectively. The GCV and PCV both values of 10.29 and 12.22 percent respectively. The broad sense heritability estimates of 71.16 percent was observed along with an expected genetic advance of 18.28 percent and genetic advance expressed as a percentage of mean was 17.89 percent. The value of genotypic variance found for internodal length was 0.52 and phenotypic variance value observed was 1.08. The genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for this trait were 9.59 and 13.78 percent, respectively. For the trait number of nodes per plant the values of genotypic and phenotypic variance were noticed as 1.09 and 1.97, respectively. The estimated genotypic and phenotypic coefficient of variation for this trait were 10.63 and 14.33 percent, respectively.

Table 2: Parameters of genetic variability for different characters in okra

Sr. No.	Characters	Range	General Mean	Genotypic Variance	Phenotypic Variance	GCV (%)	PCV (%)
1	Days to 50% flowering	38.50-44.50	40.40	0.93	2.44	2.39	3.86
2	Plant height (cm)	77.20-121.80	102.20	110.70	155.56	10.30	12.20
3	Internodal length (cm)	6.10-9.60	7.54	0.52	1.08	9.59	13.79
4	Number of nodes per plant	6.40-11.90	9.82	1.09	1.97	10.63	14.31
5	Number of branches per plant	0.60-1.60	1.16	0.07	0.08	22.53	24.95
6	Fruit length (cm)	14.77-8.77	11.41	0.93	1.87	8.45	11.98
7	Fruit diameter (cm)	1.35-2.15	1.62	0.01	0.02	7.35	9.17
8	Fruit weight (gm)	8.58-12.75	11.24	0.76	1.40	7.74	10.52
9	Number of fruits per plant	16.70-22.30	19.19	1.14	2.46	5.57	8.17
10	Days to first picking	44.50-50.00	46.39	1.31	1.88	2.47	2.96
11	YVMV incidence	5.00-25.00	12.63	46.84	48.64	54.21	55.24
12	Fruit yield per plant	165.70-261.20	216.45	387.50	805.67	9.10	13.11

The genotypic and phenotypic variance for number of branches per plant were 0.07 and 0.08 respectively. The respective values for genotypic coefficient of variation and phenotypic coefficient of variation were 22.53 and 24.99. Fruit length observed values of genotypic and phenotypic variance were 0.93 and 1.87, respectively. The GCV and PCV for this trait were 8.44 and 11.98, respectively. The genotypic

variance for fruit diameter character was found as 0.01 and phenotypic variance was observed as 0.02. The values for genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were 7.34 and 9.16 respectively. The GCV and PCV values obtained for fruit weight were 7.74 and 10.52 percent respectively. The genotypic variance and phenotypic variance for this character

were found 1.1 and 2.46 respectively. The GCV values of 5.56 percent and 8.17 percent expressed for number of fruits per plant. For the trait days to first picking the values of genotypic variance and phenotypic variance were found 1.31 and 1.88 respectively. The respective values of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for this trait were 2.46 and 2.95 percent. The genotypic and phenotypic variance noticed for YVMV incidence was 46.84 and 54.21, respectively. The respective GCV and PCV values of 54.21 and 55.24 percent were obtained for YVMV incidence. The respective values of genotypic variance and phenotypic variance were observed 387.50 and 805.67 for fruit yield per plant. The genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for this trait were 9.09 and 13.11 percent, respectively.

The genetic components of variability revealed that, a wide range of variability was observed for majority of the characters studied. The values of phenotypic variance (v_p) were found more than the genotypic variance (v_g) for all the studied characters (Table 3). Comparatively high values of genotypic and phenotypic variance were observed for the characters plant height, number of nodes per plant, number of

fruits per plant, days to first picking, YVMV incidence and fruit yield per plant. The lower values of genotypic and phenotypic variance were observed for days to 50 percent flowering, internodal length, fruit length, fruit diameter and fruit weight. The least value of PCV was observed for days to 50 percent flowering, days to first picking. while moderate for plant height, internodal length, number of nodes per plant, fruit length, fruit diameter and fruit weight, number of fruits per plant and fruit yield per plant. And highest PCV is observed for number of branches per plant and YVMV incidence. The present experiment revealed that the least value of PCV was observed for days to 50 percent flowering, days to first picking showing the additive type of gene action so these traits are suitable for selection.

Best Performing Genotypes

The genotypes PBNLF-111, PBNLF-119, PBNLF-120, PBNLF-116, PBNLF-118 and PBNLF-135 were identified as the best performer among all the studied genotypes for fruit yield per plant and its contributing characters and these best performing genotypes may be tried for genetic improvement of the different traits.

Table 3: List of best performing genotypes for each character under study

Sr. No.	Character	Genotypes
1	Days to 50% Flowering	PBNLF-113, PBNLF-114, PBNLF-116, PBNLF-133, PBNLF-104
2	Plant Height	PBNLF-122, PBNLF-115, PBNLF-141, PBNLF-136, PBNLF-118
3	Internodal length	PBNLF-109, PBNLF-111, PBNLF-126, PBNLF-108, PBNLF-115
4	Number of nodes per plant	PBNLF-119, PBNLF-105, PBNLF-128, PBNLF-118, PBNLF-102
5	Number of branches per plant	PBNLF-137, PBNLF-120, PBNLF-124, PBNLF-128, PBNLF-130
6	Fruit length	PBNLF-120, PBNLF-119, PBNLF-121, PBNLF-111, PBNLF-139
7	Fruit diameter	PBNLF-111, PBNLF-126, PBNLF-11, PBNLF-116, PBNLF-124
8	Fruit weight	PBNLF-139, PBNLF-122, PBNLF-138, PBNLF-121, PBNLF-117
9	Number of fruits per plant	PBNLF-120, PBNLF-118, PBNLF-119, PBNLF-116, PBNLF-135
10	Days to first picking	PBNLF-112, PBNLF-113, PBNLF-136, PBNLF-103, PBNLF-109
11	YVMV incidence	PBNLF-105, PBNLF-112, PBNLF-116, PBNLF-118, PBNLF-127
12	Fruit yield per plant	PBNLF-119, PBNLF-120, PBNLF-116, PBNLF-118, PBNLF-135

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