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Genetic Variability Studies in Segre gating Population (F2) of a Cross, Phule Utkarshi × Arka Anamika for Yield and its Attributing Traits in Okra [*Abelmoschus esculentus* (L.) Moench]

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A B S T R A C T

The present investigation was aimed to assess the extent of genetic variability in 250 F_2 population of cross, Phule Utkarshi × Arka Anamika for fruit yield and its component traits along with parents as checks which was carried out at the ZAHRS Navile, Shivamogga during *kharif*-2018. The analysis of variance revealed the existence of significant amount of variability for all the traits studied in the segregating population. High PCV and GCV were observed for number of branches per plant, number of fruits per plant, fruit weight, number of seeds per fruits, number of picking and yield per plant. High heritability coupled with high genetic advance as percent mean was observed for traits like plant height at maturity, number of fruits per plant, fruit weight, fruit width, fruit length, number of seeds per fruit, number of picking and yield per plant which indicates that preponderance of additive genes.

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is an economically important fast growing annual vegetable crop belongs to Malvaceae family, it is widely cultivated throughout tropical to the subtropical region of the world including countries like India, Turkey, Iran, Western Africa, Ethiopia and Southern United States. Okra is widely grown during summer and rainy seasons for its tender green fruits. It is one of the widely consumed vegetable crops in India. It is also known by many local names in different parts of the world. It is called Lady's finger in England, Gumbo in the U.S.A. and Bhendi in India. Fresh and tender fruits contain 88 per cent moisture and a large number of chemical components including vitamin A (88 IU), vitamin B (63 IU) and vitamin (C 13 mg/100 gm) (Aykroyd, 1941). Immature100 g of okra fruits contain 3.1 K calorie energy, 1.80 g protein, 90.00 mg calcium and 1.0 mg iron (Gopalan *et al.*, 2007). Its mucilage has medicinal applications

as well when used as a plasma replacement or in detoxification by binding to cholesterol and bile acid carrying toxins (Gemede *et al.*, 2015). Seeds of okra contain oil content (17.30 %) it is a nutritious ingredient of cattle feed (Martin and Ruberte, 1979) and contain 20 to 23 per cent crude protein (Berry *et al.*, 1988). It has ayurvedic medicinal properties. Its leaves are used for preparing a medicament to reduce inflammation. It is an excellent source of iodine for control of goiter (Chadha, 2001). The stem and roots of okra are used as cane juice clarifier from which brown sugar or jaggery (gur) is prepared (Chauhan, 1972) and is also used in the paper industry.

Increase in demand and the area under cultivation necessitates development of improved varieties in this crop. Improvement of the crop for yield and yield attributing characters depends upon variability present in crop and breeding method used. Genetic variability is prerequisite for any successful breeding programme. The variability that is present naturally in population was considered enough for crop improvement. Lack of useful variability necessitates the creation of variability through different means like hybridization or hybridization followed by selection in segregating population is very useful. The present investigation was aimed to assess the genetic variability in segregating population for yield improvement in okra.

Materials and Methods

The experimental materials consist of 250 F_2 plants which were developed from the cross, Phule Utkarshi × Arka Anamika and parents of the cross were used as checks, which was carried out at D-9 block, College of Agriculture ZAHRS, University of Agricultural and Horticultural Sciences, Shivamogga. All the 250 F_2 plants along with checks were sown in augmented design with a spacing of 60 × 30 cm in a 3-meter row. A total of 25 rows accommodated all the 250 plants. After every five rows, commercially cultivated verities Phule Utkarshi and Arka Anamika were sown as checks. The observations were recorded on all the individually tagged 250 plants on thirteen characters (Table.1). The data recorded from the experiment was subjected to various statistical analysis to estimate phenotypic and genotypic coefficients of variation, heritability in broad sense, genetic advance as per cent of mean as per Burton and De vane (1953).

Results and Discussion

The analysis of variance showed that each plant differed significantly among themselves for all the thirteen traits in the material studied. The mean, range, genotypic (GCV) and phenotypic (PCV) coefficients of variation, heritability and genetic advance as per cent of mean for all the traits are presented in Table 1. Highest range observed for plant height at maturity (50.00 to 137.00 cm), number of internodes (6.00 to 23.00), number of fruits per plant (1.00 to 11.00), fruit weight (4.50 to 41.66 g), fruit width (10.12 to 45.60 cm), number of seeds per fruit (18.00 to 95.00), and yield per plant (24.00 to 260.00 g) suggesting that these characters can be improved by individual plant selection. The magnitude of PCV was higher than that of GCV for all the traits indicating that all the thirteen traits were influenced by the environment. The GCV and PCV were high for number of branches per plant (38.00 %, 45.81 %), number of fruits per plant (35.15 %, 44.90 %), fruit weight (33.32 %, 34.53 %), number of seeds per fruits (20.16 %, 29.98 %), number of picking (29.76 %, 41.97 %) and yield per plant (39.62 %, 40.14 %) ; moderate for plant height at maturity (12.19 %, 18.94 %), number of internodes (13.22 %, 22.19 %) fruit width (16.84 %, 19.09 %) and fruit length (17.60 %, 16.65 %) and low for days to first flowering (2.02 %, 3.06 %), number of ridges per fruit (7.90 %, 10.69 %) and test weight (8.46 %, 16.59 %).

Table.1 Genetic variability for yield and yield attributing traits of F_2 segregating population in okra

Sl. No.	Characters	Range		Mean± SEm of F_2	Coefficient of variation		h^2 (bs)(%)	GAM (%)
		Min.	Max.		PCV (%)	GCV (%)		
1	Days to first flowering	33.00	47.00	44.95±0.08	3.06	2.02	45.32	2.86
2	Plant height at maturity (cm)	50.00	137.00	73.42±0.87	18.94	12.19	75.30	29.39
3	Number of branches per plant	1.00	4.00	1.37±0.03	45.81	38.10	36.74	34.72
4	Number of internodes	6.00	23.00	10.42±0.15	22.19	13.22	51.81	24.46
5	Number of fruits per plant	1.00	11.00	4.50±0.12	44.90	35.15	75.55	69.88
6	Fruit weight (g)	4.50	41.66	18.16±0.39	34.53	33.32	75.88	53.98
7	Fruit width (cm)	10.12	45.60	15.36±0.18	19.09	16.84	92.07	36.21
8	Fruit length (cm)	7.00	16.88	11.90±0.12	16.65	17.60	83.56	28.67
9	Number of ridges per fruit	5.00	9.00	5.17±0.03	10.69	7.90	51.02	11.23
10	Number of seeds per fruit	18.00	95.00	47.27±0.89	29.98	20.16	88.10	54.42
11	Number of picking	1.00	9.00	4.06±0.10	41.97	29.76	75.98	65.69
12	Test weight (g)	6.00	10.00	7.89±0.08	16.59	8.46	41.72	14.26
13	Yield per plant (g)	24.00	260.00	124.01±3.14	40.14	39.62	97.42	80.57

Where,
SEm= Standard error of mean PCV= Phenotypic coefficient of variation h^2(bs) =Heritability broad sense
GCV=Genotypic coefficient of variation GAM=Genetic advance as per cent mean

The low values indicate narrow range of variation for these characters and provides very least scope for improvement through selection. Similar observations were also made by Gangashetty *et al.,* (2010), Adeoluwa and Kehinde (2011), Kumar *et al.,* (2012) and Syfullah *et al.,* (2018).

The estimates of heritability in broad sense were high for characters studied *viz.,* plant height at maturity (45.32 %), number of fruits per plant (75.55 %), fruit weight (75.88 %), fruit width (92.07 %), fruit length (83.56 %), number of seeds per fruits (88.10 %), number of picking (75.98 %) and yield per plant (97.42 %) and moderate for days to first flowering (45.32 %), number of branches per plant (36.74 %), number of internodes (51.81 %), number of ridges per fruit (51.02 %) and test weight (41.72 %). The high to moderate estimates of heritability for all these traits suggested that selection based on phenotypic performance would be more effective. Prakash and Pitchaimuthu. (2010) and Ahamed *et al.,* (2015) also observed high heritability for fruit yield and its components.

The information on heritability alone may be misleading but when used in combination with genetic advance, the utility of heritability estimate and efficiency increases. In the present study, high genetic advance coupled with high to moderate heritability was observed for all the studied characters except days to first flowering (2.86 %), number of ridges per fruit (11.23 %) and test weight (14.26 %). It indicates that higher response for selection of high yielding genotypes as these traits are governed by additive gene actions and selection might be effective. These findings are in agreement with the earlier results of Nwangburuka *et al.,* (2014) and Syfullah *et al.,* (2018).

Heritability coupled with genetic advance as per cent mean were more useful than heritability alone in predicting the resultant effect for selecting the best individual. High heritability coupled with high genetic advance as per cent mean for traits like plant height at maturity, number of branches per plant, number of internodes, number of fruits per plant, fruit weight, fruit width, fruit length, number of seeds per fruits, number of picking and yield per plant (Table.1) noticed might be assigned to additive gene effects governing their inheritance and phenotypic selection for their improvement could be achieved by simple breeding methods. Thus, the fruit yield in okra can be improved by selecting plant height at maturity, number of branches per plant, number of internodes, number of fruits per plant, fruit weight and fruit width simultaneously in the present study.

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