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Genetic Variability, Heritability and Genetic Advance studies in Genotypes of Okra [(*Abelmoschus esculentus* (L.) Moench]

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Abstract
Sixty-eight okra accessions were evaluated for genetic variability, heritability, and genetic advance in okra at Horticulture Research Centre, SVP University of Agriculture and Technology, Meerut (U.P.) during the year 2014-15 and 2015-16. Genetic variability analysis on sixty eight genotypes of okra (pooled data analysis) revealed high magnitude of genetic variability for the traist viz., pod yield and plant height under study. High magnitude of genotypic coefficient of variation (>20%) for number of pod yield and plant height indicated high degree of genetic variability offering great scope for selection of these characters. The genotypes under study showed moderate heritability (30-60%) showed the environmental influence. High heritability coupled with high genetic advance for the traits like plant height and pod yield per plant indicated the involvement of additive gene action and more chances of fixing by selection to improve such traits. The genotypes viz., B-02, KS-442 are noticed with great potential and can be utilized for improvement of okra germplasm.

Keywords: okra, *Abelmoschus esculentus*, genetic variability, heritability, genetic advance

Introduction
Okra [Abelmoschus esculentus (L.) Moench] is cultivated in tropical, subtropical, and warm temperate regions around the world. The whole body of the okra is a treasure. The leaves and seeds are considered a valuable traditional medicine (Gul *et al*., 2011) [8]. Okra seeds contain abundant mineral elements, including iron, potassium, calcium, and manganese. Okra fruit contains sufficient amounts of iron, calcium, manganese and magnesium, vitamins A, B, C and K, as well as folates and very high levels of antioxidants such as xanthin and lutein (Kumar *et al*., 2010) [15]. Okra was considered a minor crop until more attention was paid to its recent genetic improvements (Schafleitner *et al*., 2013) [25], especially its rapid growth cycle, easy cultivation, resistance to pests, high yield, and high nutritional value (Calisir *et al*., 2005) [4]. Okra production worldwide is estimated at six million tonnes per year. The total area under cultivation has increased over the years. India is the largest producer of okra in world followed by Nigeria and Sudan (Varmudy, 2011) [31]. The average productivity of okra has remained very low and almost stagnant over the last few decades. A major constraint to okra productivity is the low genetic potential of the current varieties that have poor plant type, late maturity, early senescence, short fruiting period, long crop duration and susceptibility to a range of biotic and abiotic stresses. To meet the demand of ever-growing human population in the country, it is thus imperative to find alternative means for increasing the yield potential of okra in a sustainable manner.

Crop improvement depends on the magnitude of genetic variability present in the base population. The expected improvement in yield components primarily depends on the nature and magnitude of heritable portion of total variation. Selection based on a single character may not always be effective. On the other hand, it is very cumbersome process for a breeder to consider a large number of component characters simultaneously in selection procedure. The presence of genetic variability is of utmost importance for any breeding programme and due to this reason, the plant breeders have emphasized the evaluation of germplasm for the improvement of crop yield as well as for utilization in further breeding programmes. Absolute variability in different characters cannot be the decisive factor in deciding which character is showing the highest degree of variability. Furthermore, relative values of phenotypic and genotypic coefficients of variation give a reliable idea about the magnitude of variability present in a population. In this way, it is indispensable to split the overall variation into genetic and non-genetic components and to standardize this by obtaining the coefficients of phenotypic and genotypic variability. Therefore, this present study was undertaken to discover the potential okra genotypes based on morphological traits.

Material and Methods

The present research was conducted at Horticultural Research Centre, SVPUA&T, Meerut during, 2014-15 and 2015-16 respectively. The details of sixty genotypes included in the present study along with their source of the collection are presented in table 1. The genotypes which were chosen for the present study were grown in a randomized block design with three replications. Standard cultural and agronomic practices were followed to maintain healthy crop growth. Ten observations were recorded on five randomly selected plants in each replication for the morphological traits viz., Days to 50% flowering, Plant height (cm), Number of fruits per plant, Fruit Length (cm), Fruit width (cm), Number of branches per plant, Number of fruiting nodes per plant, Number of first fruiting node, Tapering length of fruit (cm) and Pod yield per plant (g). The data were statistically analyzed the analysis of variance as per the standard statistical procedure (Panse and Sukhatme, 1985) [19]. Phenotypic and genotypic components of variance were estimated as per the formulae suggested by (Lush, 1940) [16]. The broad sense heritability was estimated by following the procedure suggested by Weber and Moorthy. Estimates of phenotypic and genotypic coefficients of variation were calculated as per the standard formulae (Burton and Devane, 1953) [3]. Genetic advance for each character was predicted by the formula given by (Johnson *et al*., 1955) [10].

Table 1: List of germplasm and their source of collection

S.N.	Name of genotype	Sources	S.N.	Name of genotype	Sources
1	IC-28872	IIVR, Varanasi	35	108-10-12I	-
2	IC-306053	-	36	238	-
3	1773	-	37	217-10-1	-
4	648-4-1	-	38	446	-
5	67-10-3	-	39	1668	-
6	5135	-	40	SK4/8R/RS-8S	-
7	21-10-1	-	41	770	-
8	282-10-1	-	42	118	-
9	317-10-1	-	43	177	-
10	IC-11527	-	44	SC-108	-
11	138-10-1	-	45	332-10-1	-
12	1999	-	46	Parbhani Kranti	-
13	135-10-1	-	47	F B-10	-
14	155-1-1,2,3	-	48	VRO-5	-
15	68-10-12	-	49	C1801	-
16	629-7-12-3	-	50	BO-2	-
17	SKX/QR/RS,10-7	-	51	VRO-3	-
18	231-10-1	-	52	KS-310	-
19	223	-	53	KS-442	-
20	1875	-	54	C-11-HR-4	-
21	212-10-1	-	55	KS-305 (AB-3)	-
22	2A	-	56	KS-446	-
23	263	-	57	C8901	-
24	SKA/TR/RS-113	-	58	KS-311	-
25	454-10-1	-	59	KS-404	-
26	37	-	60	Kashi Mohini	IIHR, Bangalore
27	IC-169302	-	61	Kashi Lalima	-
28	EC-169367	-	62	Kashi Vibhuti	-
29	307-10-1	-	63	Kashi Pragati	-
30	151-101,2,3	-	64	Varsha Upkar	-
31	137-10-12	-	65	Utkal Gourav(2014)	-
32	409	-	66	Co-2 (2014)	-
33	167	-	67	Pusa Sawni	-
34	326	-	68	Arka Anamika	-

Results and Discussion

Analysis of variance (pooled data) revealed that the genotypes under study were highly significant for all characters studied indicating the presence of sufficient amount of genetic variability among the germplasm (Table 2). Generally, the significant differences revealed among the morphological traits may be diverse source of materials and also the result of environmental influence affecting okra genotypes This corroborates findings of Ariyo (1993) [2] and Adeniji (2003) [1] who mentioned the role of environmental factors as well as differences in the genetic makeup of different varieties in yield determination of okra.

The mean range could give a rough estimate of the variability among the genotypes. The characters with high variability have more room for improvement (Table 3). All the 18 characters under study showed high variability from the mean values. However, the characters marketable pod yield per plant, plant height, number of fruits per plant and number of first fruiting nodes having wide range of variation in mean values indicated the presence of high variability for these characters and thus more scope for the selection of desirable genotypes. Based on mean performance the accession no. 648-4-1 showed early for days to 50% flowering (40 days). Plant height showed high significant variance compared to the other traits. Accession No. C1081 obtained maximum height of 112 cm while the genotype Arka Anamika obtained maximum height of 78 cm. Number of fruits per plant were obtained from accession no. 37 and least number of fruits per plant where obtained from accession no. 5135. Similarly, the genotype with maximum fruit length and fruit width was obtained from accession B-02 (14cm) while Parbhani Kranthi showed minimum among the genotypes (12.8 cm) for fruit length and 155-1-1-2-3 showed minimum for fruit width. Likewise, the maximum no of branches per plant and number of first fruiting node/ plan were obtained from KS-442 and genotypes SK4/8R/RS-8S showed minimum no of branches per plant and accession no 409 showed minimum number of first fruiting node/ plan respectively. Likewise, the maximum number of nodes per plant were obtained from 137-10-12 and genotypes SK4/8R/RS-8S minimum no of nodes per plant. Furthermore, Maximum pod yield was obtained from accession B-02 (231g) and minimum was from accession no. 446 (148g). These findings are in consonance with the findings of earlier workers (Dhankar and Dhankar, 2002; Singh *et al.*, 2006; Mohapatra *et al*., 2007; Prakash *et al*. 2011; Reddy *et al*., 2012; Vani *et al*. 2012; Khajuria *et al*. 2015; Jadhav *et al*. 2016; Shivaramegowda *et al*. 2016; Kerure *et al*. 2017) [7, 27, 18, 21, 23, 30, 13, 9, 26, 12] in okra.

For all the characters under study, phenotypic variances were higher than the corresponding genotypic variances showing the environmental factors influence the expression (Table 4). The phenotypic variance was highest for number of branches per plant followed by number of first fruiting nodes per plant. Similarly, the genotypic variance was also highest for tapering length of fruit followed by pod yield per plant. Whereas the phenotypic and genotypic coefficient of variance was maximum for pod yield per plant followed by plant height and phenotypic and genotypic coefficient of variance was minimum obtained from width of the fruit followed by length of the fruit. High magnitude of PCV and GCV for above characters suggested greater phenotypic and genotypic variability among the populations and indicated that these characters can be improved through phenotypic selection. The similar high PCV and GCV values were observed by (Kumar and Kumar, 2014; Patel *et al*. 2014; Saryam *et al*. 2015 Jadhav *et al*. 2016) [14, 20, 24, 9] for number of branches/plant at final harvest; (Kandasamy *et al*., 2015; Sundaram, 2015; Jadhav *et al*., 2016; Shivaramegowda *et al*., 2016; Kerure *et al*., 2017) [11, 29, 9, 13, 26, 12]; for fruit yield/plant; (Chaukhande *et al*,. 2011; Prakash *et al*. 2011; Vani *et al*., 2012; Sundaram and Rajkumar, 2015) [5, 21, 30, 28]; for internodal length; (Kandasamy *et al*., 2015; Khajuria *et al*,. 2015; Sundaram, 2015, Kerure *et al*., 2017) [11, 13, 29, 12] for number of fruits/plant and (Kandasamy, 2015; Khajuria *et al*., 2015; Jadhav *et al.* 2016 and Shivaramegowda *et al*., 2016) [11, 13, 9, 26] for plant height at final harvest.

Heritability measures how important genetics is to a trait. A high heritability, close to 1, indicates that genetics explain a lot of the variation in a trait between different germplasm; a low heritability, near zero, indicates that most of the variation is not genetic. In addition broad-sense heritability, defined as H2 = VG/VP, captures the proportion of phenotypic variation due to genetic values that may include effects due to dominance and epistasis. On the other hand, narrow-sense heritability, h2 = VA/VP, captures only that proportion of genetic variation that is due to additive genetic values (VA). The estimates of heritability showed moderate magnitude for plant height, number of fruits per plant, width of fruit, number of branches per plant, number of first fruiting nodes per plant, tapering length of fruit and pod yield per plant (Table 4). This denotes the effect of environmental influence. Heritability depends on the range of typical environments in the population that is studied. If the environment of the population is fairly uniform, then heritability may be high, but if the range of environmental differences is very large, then heritability may be low.

The heritability estimate provide the information on the magnitude of inheritance of quantitative characters but does not indicate the magnitude of genetic gain obtained by selection of best individual from the best population. So, heritability along with genetic advance is more useful than the heritability alone. In present study, high genetic advance coupled with high heritability was observed for pod yield and plant height. It indicated that additive gene action was more important for these characters which was in accordance to the findings of (Mazid *et al*., 2013; Patel *et al*., 2014; Deo, 2014; Saryam *et al*., 2015; Sundaram, 2015; Khajuria *et al*., 2015; Rao *et al*., 2015; Shivaramegowda *et al*. 2016; Jadhav *et al*., 2016; and Kerure *et al*. (2017) [17, 20, 6, 24, 29, 13, 22, 26, 9, 12]. Therefore, improvement in these traits would be more effectively be done through selection in the present material.

Table 2: Mean performance of 68 genotypes of okra for different quantities character

	Germplasm	Days to 50% Flowering	Plant Height (cm)	Fruits/ Plant	Fruit Length (cm)	Fruit Width (cm)	Branches / Plan	Nodes/Plant	First Fruiting Node/Plant	Tappring Length of Fruit	Yiekd /Plant (g)
1	IC-28872	42.8000	89.4767	9.4667	14.0667	1.8013	2.1667	6.5333	2.2413	192.6500	192.6500
2	IC-306053	42.5333	87.6167	9.5667	14.2367	1.7033	2.0000	7.3667	2.0487	196.5667	196.5667
3	1773	41.8667	85.6767	10.3333	14.2733	1.8193	1.9333	7.5333	2.0887	185.1333	185.1333
4	648-4-1	40.5000	84.4000	40.4000	13.8200	1.7793	2.0333	7.0333	2.0430	167.7333	167.7333
5	67-10-3	41.9333	81.0200	9.6667	13.8433	1.8920	2.2000	6.3333	2.0030	202.6333	202.6333
6	5135	42.4667	816167	8.9333	13.4633	1.8433	2.0333	6.9000	2.2820	179.4333	179.4333
7	10/21/2001	44.0500	84.6400	9.8333	13.9533	1.7863	2.0333	5.9000	2.3463	166.9333	166.9333
8	282-10-1	41.7667	81.7100	9.7000	14.1100	1.7937	2.1667	7.2667	2.0693	165.6333	165.6333
9	317-10-1	42.300	84.4667	9.8000	13.7033	1.7640	2.1000	6.8000	1.9960	165.7666	165.7666
10	IC-11527	44.9667	81.1400	10.4000	14.3600	1.7560	1.9667	6.0333	1.7533	184.5667	184.5667
11	138-10-1	42.7667	83.3467	10.3333	13.8233	1.7530	1.9000	13.1000	7.6000	1.7547	189.6667
12	1999	44.6667	84.4600	10.1000	13.4667	1.7323	2.2000	12.033	6.4667	1.7360	196.6000
13	135-10-1	43.7000	84.5367	10.5667	13.8233	1.7160	1.8667	12.7333	7.4333	1.7117	202..4000
14	155-1-1 2 3	43.6667	88.2133	11.2000	13.7367	1.6950	2.0667	13.1333	7.2333	1.8763	176.6667
15	68-10-12	41.8667	91.7767	10.3667	13.4167	1.8410	1.9667	13.3333	6.2000	1.8703	170.6667
16	629-7-12-3	41.9000	92.6867	10.2667	13.8267	1.8667	1.9667	13.4000	6.7000	1.8270	186.4667
17	SKX/QR/RS 10-7	42.6667	93.7233	10.9667	13.4867	1.9247	1.9333	13.7000	6.6667	1.8013	170.8667
18	231-10-1	42.6000	91.2067	10.8667	13.8733	1.8303	1.7667	12.8333	7.5333	1.8460	183.9667
19	223	45.4000	91.9833	10.4667	13.2500	1.8313	2.1667	11.7000	6.9667	1.9723	177.3000
20	1875	42.2333	92.1500	11.0333	13.6033	1.8883	2.0667	12.5000	6.4667	2.2317	180.1667
21	212-10-1	42.5333	93.0100	10.5000	13.7933	1.8677	1.9000	13.1000	7.6333	2.3963	194.8000
22	2A	43.4667	92.4033	12.1833	14.0467	1.9677	2.0667	13.4000	6.2833	2.3533	185.9500
23	263	43.3333	91.4400	12.1667	13.1633	1.9487	2.3333	12.3000	6.9000	2.1427	196.4667
24	SKA/TR/RS-113	43.6000	92.1400	11.6667	13.8900	1.8717	2.0667	13.3333	6.7667	2.0083	187.5667
25	454-10-1	42.6667	91.4067	12.2333	13.8700	1.8057	2.3000	13.0000	7.6333	1.7190	199.5667
26	37	43.6000	89.1500	12.9000	13.5133	1.9157	2.0667	12.9000	8.4000	1.8110	202.4333

27	IC-16902	44.500	85.1033	12.0333	12.9167	1.9630	2.2000	13.4000	7.7667	1.7403	196.2333
28	EC-169367	44.1667	89.0267	12.2333	13.1300	1.9720	2.2000	13.1333	7.3667	1.7727	205.0333
29	307-10-1	42.1000	85.3633	11.7333	13.8200	1.8560	1.8000	13.0333	7.4667	1.8833	191.7333
30	151-101-2-3	42.6333	95.6567	10.6833	14.1800	1.7817	2.1333	12.4000	6.9667	2.0313	164.7333
31	137-10-12	43.6667	98.4333	11.0667	14.0967	1.8073	2.0667	14.6000	7.3000	1.9110	177.0667
32	409	45.0333	94.9667	10.8667	13.9200	1.7877	2.1667	12.8667	5.6000	1.9000	186.8000
33	167	46.7333	97.9167	10.7667	14.4000	1.7470	2.3333	11.6333	6.9333	1.6467	171.6667
34	326	46.23333	93.9800	10.4667	14.2600	1.7953	2.0000	12.8333	7.0000	1.7377	176.1333
35	108-10-21	45.3333	93.3733	10.4333	13.9333	1.8650	2.0333	13.4000	6.5333	2.1543	184.7000
36	238	45.4333	87.9200	10.3000	13.8467	1.8470	2.1000	12.8667	6.5667	2.2873	153.6667
37	217-10-1	44.3000	88.5533	9.9333	14.0633	1.9113	1.9333	13.4333	6.7000	2.3030	150.8000
38	446	43.4000	97.1967	10.9333	13.9533	1.8253	1.9333	13.7667	7.3000	2.0460	148.0333
39	1668	47.0333	92.7967	10.5333	13.9633	1.7837	2.0333	12.6667	6.1667	1.8750	155.5000
40	SK4/8R/RS-8S	43.6333	94.0833	10.9667	14.0833	1.8290	1.7000	12.3667	6.3333	1.9533	167.3667
41	770	44.3333	96.0033	11.0000	13.6333	1.8750	2.1667	12.3000	6.4333	2.0755	150.7667
42	118	45.3333	95.6267	11.5333	13.2467	1.8363	2.0667	13.5667	7.9333	2.1017	161.6000
43	177	45.9667	105.9767	11.8667	13.8267	1.8243	2.0000	13.8000	7.8333	2.2507	164.7667
44	SC-108	45.6667	101.8000	12.1000	13.3567	1.8560	2.0667	13.1000	8.8333	2.4347	176.400
45	332-10-1	43.3333	104.1767	11.6000	13.2700	1.8893	2.3000	13.2333	8.4667	1.6503	212.0333
46	Parbhani	43.2667	104.9367	10.7000	12.8900	1.8807	2.4667	12.9333	7.6333	1.8953	187.4333
47	Kranti	44.6000	102.9100	11.5667	14.2533	1.8717	2.5333	12.8667	7.5667	2.0987	216.0000
48	F B-10	44.5000	107.7334	12.5000	13.9433	1.9217	2.5667	12.2667	7.8667	2.1660	202.4167
49	VR0 -5	43.4000	112.6933	11.9000	14.7133	1.9180	2.5667	13.6667	7.8333	2.0747	221.7000
50	C1801 B0-2	42.2667	111.0733	11.5667	14.8333	1.9933	2.5333	12.9667	8.0000	2.2253	231.8333
51	VRO-03	42.4333	107.2300	11.3333	14.1533	1.9770	2.2000	13.6333	8.0667	2.2200	214.5333
52	KS-310	42.1667	101.0567	11.3667	13.4533	1.8770	2.8000	12.6000	8.4333	2.2917	203.2000
53	KS-442	43.4333	102.4184	12.2333	13.7900	1.9363	3.0333	12.4000	9.2333	2.3417	179.6333
55	C-11-HR-4	44.6667	98.4634	12.2667	13.7500	1.8657	2.3333	12.1000	7.8000	2.2893	180.1667
55	KS-305 (AB-3)	43.8333	101.8800	12.2000	13.7233	1.8180	2.4000	12.4333	7.5333	2.1143	173.7833
56	KS-446	43.5667	99.3867	10.9333	13.8933	1.8493	2.1000	12.3667	8.1667	2.1783	148.1333
57	C8901	44.0333	94.3267	11.1000	13.6933	1.9293	2.1000	13.4667	8.2333	2.2757	155.3667
58	KS-311	41.8667	91.3467	11.5333	14.4867	1.9150	2.0667	13.6000	8.4333	2.1613	159.7333
59	KS-404	42.3000	93.7167	10.1000	13.8567	1.9820	2.0000	14.1333	7.4167	2.0807	184.2667
60	Kashi Mohini	43.2000	92.1433	10.7000	13.6400	1.9803	2.1333	13.7667	8.5000	1.8567	171.8000
61	Kashi Lalima	41.7333	89.6800	10.6667	13.9167	1.9097	2.1333	13.5333	7.8000	1.8697	174.1667
62	Kashi Vibhuti	43.2666	91.423	11.099	14.463	1.9276	2.0666	14.033	8.0333	1.7186	163.9333
63	Kashi Pragati	43.4000	91.0367	10.6333	14.3333	1.9507	1.9333	13.6000	8.3667	1.6543	188.9000
64	Varsha Upkar	43.6667	86.6400	10.6000	13.9600	1.8800	2.1333	13.4333	6.8333	1.8703	189.8333
65	Utkal Gourav (2014)	41.7333	79.6667	10.3667	13.6367	1.7973	2.0000	14.0000	6.0000	1.7487	186.9667
66	Co-2 (2014)	42.5000	84.5367	9.8667	13.4000	1.7407	2.0000	14.1333	7.1333	1.8937	209.0667
67	Pusa Sawni	44.1000	88.0553	10.9000	14.0200	1.8740	2.0333	13.0667	7.8000	1.7700	203.4667
68	Arka Anamika	42.5333	78.4900	12.0333	14.2033	1.8575	2.1333	13.7000	8.6500	1.7613	216.6000
	Mean	43.4875	92.4146	10.9431	13.8429	1.8544	2.1304	13.0902	7.3149	2.0035	183.3319
	C.V.	4.2741	8.4461	10.1688	4.5193	4.5626	13.1118	6.8463	11.5075	9.3915	8.63331
	Fratio	3.1097	5.8992	3.6027	2.3248	4.5053	3.9755	2.8915	5.3050	7.9094	8.6474
	F Prob.	0.0000	0.0000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	S.E.	0.7588	3.1866	0.4543	0.2554	0.0345	01.1140	0.3659	0.3437	0.0768	6.4615
	C.D. 5%	2.1109	8.8645	1.2638	0.7105	0.0961	0.3172	1.0178	0.9560	0.2137	17.9748
	C.D. 1%	2.7800	11.6744	1.6644	0.8357	0.1265	0.4178	1.3404	1.2590	0.2814	23.6726
	Range Lowest	40.5000	78.4900	8.9333	12.8900	1.6950	1.7000	11.6333	5.6000	1.6467	148.0333
	Range Highest	47.0333	112.6933	12.9000	14.8333	1.9933	3.0333	14.6000	9.2333	2.4347	231.8333

Table 3: Analysis of variance for the characters under study in Okra

Sources of variation	d.f.	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Replication	2	0.60	0.53	0.19	0.06	0.37	0.81	2.55	3.12	0.63	0.96
Treatments	67	3.10	5.8	3.60	2.32	4.50	3.97	2.89	5.30	7.90	8.64
Error	335	3.45	60.92	1.23	0.39	0.007	0.078	0.80	0.70	0.035	250.50

**Significant at 1% level; *Significant at 5% level;d.f = degree of freedom; X1-Days to flowering; X2-plant height (cm); X3-Number of fruits per plant; X4-Length of fruit (cm); X5-Width of fruit (cm); X6-Number of branches per plant; X7-Number of nodes per plant; X8-Number of first fruiting nodes per plant; X9-Tapering length of fruit(cm); X10- Pod Yield per plant (g)

Table 4: Estimate of heritability, genetic advance in per cent over mean for different characters under study in Okra

Characters	Variance			Co-efficient of variation			h^2 (Broad Sense)	Genetic Advancement 5%	Genetic Advancement 1%	Gen. Adv as% of Mean 5%	Gen. Adv as% of Mean 1%
	ECV σ2e	GCV σ2g	PCV σ2p	Var Environmental	Var Genotypical	Var Phenotypical					
X1	4.27	2.53	4.97	3.45	1.21	4.67	0.26	1.16	1.48	2.66	3.41
X2	8.45	7.63	11.38	60.92	49.75	110.67	0.45	9.74	12.48	10.54	13.51
X3	10.17	6.70	12.18	1.24	0.54	1.78	0.30	0.83	1.06	7.59	9.73
X4	4.52	2.12	4.99	0.39	0.09	0.48	0.18	0.26	0.33	1.86	2.38
X5	4.56	3.49	5.74	0.01	0.00	0.01	0.37	0.08	0.10	4.36	5.59
X6	13.11	9.23	16.04	0.08	0.04	0.12	0.33	0.23	0.30	10.95	14.04
X7	6.85	3.84	7.85	0.80	0.25	1.06	0.24	0.51	0.65	3.88	4.97

X8	11.51	9.75	15.08	0.71	0.51	1.22	0.42	0.95	1.22	12.98	16.63
X9	9.39	10.08	13.78	0.04	0.04	0.08	0.54	0.30	0.39	15.19	19.46
X10	8.63	9.75	13.02	250.50	319.28	569.79	0.56	27.55	35.31	15.03	19.26

X1-Days to flowering; X2-plant height(cm); X3-Number of fruits per plant; X4-Length of fruit (cm); X5-Width of fruit (cm); X6-Number of branches per plant; X7-Number of nodes per plant; X8-Number of first fruiting nodes per plant; X9-Tapering length of fruit(cm); X10-Pod Yield per plant (g).

Conclusion
Based upon the present investigation, it is suggested that the genetic variability reported for different characters in relation to pod yield will be worthwhile for future genetic improvement of okra and the characters showing high heritability with high genetic advance viz., plant height, pod yield should be utilized in direct selection. The genotypes B-02, KS-442, performed best under western Uttar Pradesh conditions and can be further utilized for breeding programs.

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