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Mukesh Kumar
Ph.D. Research Scholar, Department of Seed Science and Technology, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia, West Bengal, India

Dr. Prabir Chakraborti
Associate Professor, Department of Seed Science and Technology, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur Nadia, West Bengal, India

Corresponding Author:
Mukesh Kumar
Ph.D. Research Scholar, Department of Seed Science and Technology, Bidhan Chandra Krishi Vishwavidyalaya, Mohanpur, Nadia, West Bengal, India

Genotypic variability in yield attributing seed traits in okra [*Abelmoschus esculentus* (L) Moench]

Mukesh Kumar and Dr. Prabir Chakraborti

Abstract
An investigation was carried out at Research Farm (C-Block) of Bidhan Chandra Krishi Vishwavidyalaya, Kalyani during Post-Kharif, 2022 with the objective to study phenotypic variations in seed yield attributing characters. The eight genotypes of okra collected from various sources were grown in randomized block design (RBD) with three replication and observations were recorded on days to first flowering, days to 50 percent flowering, plant height, capsule length, capsule diameter, seeds per capsule, capsules per plant and seed yield. Analyzed data revealed that there were significant differences in seed yield related parameters among the genotypes. Correlation studies showed that seed yield per plant had significant positive association with capsule length and seeds per capsule. These two attributes have a strong influence on seed yield. Further, path coefficient analysis revealed that seed per capsule had the highest direct effect on seed yield representing highest heritability (H^2%) and genetic advance (GA%). Hence, number of seed per capsule is the foremost determiners for qualitative and quantitative improvement of the okra genotypes.

Keywords: Correlation, heritability, path analysis, okra, seed yield

Introduction
Okra [*Abelmoschus esculentus* (L) Moench] is an important vegetable crop that is predominantly farmed in tropical and subtropical regions, belongs to family *Malvaceae*. It is a warm-season vegetable that yields long, slender, edible pods that are frequently referred to as "ladies' fingers." With a production of 60.9 lakh metric tonnes from an area of 5.09 lakh hectares, it is the fifth most prevalent vegetable in the country, right behind tomatoes [8]. Low productivity of okra is linked to a poor seed replacement ratio that initiate the scarcity of high-quality seed, its supply, and the prevalence of insect pests. Utilizing high-quality seeds is need for effective vegetable production as well as seed production. The genotypic variation in major traits including the quantity of pods, pod length, weight, and number of seeds per pod determines the quantity green pod and seed yields of the cultivar. Additionally, the diverse okra genotypes differentiate in their physiological characteristics under various environmental factors, which ultimately affect the yield components [6]. Genetic diversity is crucial for parent selection to recover transgressive segregants [5]. The genetic diversity and heritability have been studied on different crops for various breeding programme. Heritability can be estimated with various techniques to provide information on the proportion of phenotypic variance that is attributable to genetic factors considering different traits; however, heritability estimates in alone are insufficient indicator for the potential genetic advancement, even when the best selection are used for breeding programme [15]. The combined estimation with genetic progress or selection differential, the value will be more authentic [4]. Generally, the observations on a crop for its advancement through selection and genetic improvement, the crucial factors are connected to yield and yield-related traits which will demonstrate the relationship between the phenotypic traits with the ultimate economic yield [11]. But, the goal of the current study utilizing the performance of eight okra cultivars, the identifiable characters were observed to identify the seed yield characteristics of okra which have high heritability and strong genetic advance.

Materials and Methods
Experimental material comprised eight cultivars of okra. All cultivar was evaluated in a randomized block design (RBD) with three replications in C-Block Research Farm, Bidhan Chandra Krishi Vishwavidyalaya (BCKV), Kalyani during Post-Kharif 2022. Cultural and agronomic practices were followed as per the standard recommendations and need based plant

protection measures were taken up to maintain healthy crop stand. Observations were recorded on ten plants in each replication considering each genotype for days to first flowering, days to 50 percent flowering, plant height, capsule length, capsule diameter, number of seed per capsule, number of capsules per plant and seed yield. Coefficients of correlation between two characters were determined as suggested by Dhankar *et al*. (2002) [3]. Path coefficient analysis was carried out as suggested by Wright (1921) [16] and illustrated by Lenka and Mishra (1973) [7].

Results and Discussion

The mean performance of the eight-okra cultivars utilizing nine seed yield related traits indicates that there were significant differences among the cultivars for most of the measured characters presented in Table-1. Days to first flowering was ranged between 42.67 to 49.67 days. The cultivar Hisar Unnat was reached earliest days to 50 percent flowering on 46.67 days after sowing, where as it was 53 days in case of Arka Anamika. There were also significant variations in plant height where the extreme was detected in Gujrat Okra-5 (120.00 cm) and minimum in Varsha Uphar (96.07 cm). The mean Plant height was recorded 108.60 cm. For capsule length at maturity, Hisar Unnat recorded the shortest mean values of 17.17 cm, while Arka Anamika recorded the highest value of 20.31 cm. The Kasi Kranti recorded highest capsule diameter (20.45 mm) followed by Arka Anamika (19.57 mm), Varsha Uphar (19.38mm) and the lowest was in Prabhani Kranti (18.34 mm).The mean capsule diameter was recorded 19.13 mm. Capsule per plant was highest in Prabhani Kranti with mean value of 8.37, while the least value was 7.07 for Pusa Bhindi-5.The 100 Seed weight was ranged from 5.91 g (Kasi Pragati) to 7.62 g (Arka Anamika).Seeds per capsule varied significantly amongst genotypes and was recorded highest value in Arka Anamika (43.80) followed by Hisar Unnat (43.50), Prabhani Kranti (40.67), Varsha Uphar (40.46), Kasi Kranti (38.80), Kasi Pragati (35.93) andleast value was recorded for Gujrat Okra-5 (31.20).

Expectedly, phenotypic variances were higher than the genotypic variances for all characters studied in current (Table 2). The highest phenotypic and genotypic variances for all considerable characters were recorded 83.42 and 80.58 respectively in plant height at maturity. High phenotypic and genotypic variances 22.51 and 18.90 respectively were also observed in seed per capsule. The PCV ranged between 4.18% and 12.20% for Capsule diameter and seed per capsule respectively. Similarly, the GCV was also recorded minimum (3.17%) for capsule diameter and maximum (11.18%) for seed per capsule.

Moreover, there was high degree of broad sense heritability for all the parameters were recorded except capsules per plant. Similarly, genetic advance over average mean had a range between 1.74% and 21.10% for capsule per plant and seed per capsule respectively.

A collective consideration of genotypic coefficient of variation, broad-sense heritability and genetic advance revealed that seed per capsule showed the topmost after considering these, whereas plant height also indicated superior mutual effect having high genetic variability, high heritability with moderate genetic advance indicating the values 8.26, 96.60, 16.73% respectively.

Correlation data showed that seed yield per plant had significant positive association with capsule length and seeds per capsule, whereas it exhibited significant negative association with days to first flowering. The 100 seed weight, capsule diameter and capsules per plant displayed non-significant positive correlation where, as plant height and days to 50 percent flowering showed non-significant negative correlation. This suggests that the capsule length and seed per capsule have a strong influence on seed yield. The similar result also obtained from previous observations by Singh and Sharma (2001) [13] Akinyele and Osekita (2006) [1] and Debbarma and Chakraborti, (2020) [2].

The results of path coefficient analysis presented genotypic behaviour in Table 4. The estimates of residual effect reflected the adequacy and appropriateness of the characters chosen for path analysis. In present study, the residual value was 0.01 indicating that characters studied contributed 99.0% towards seed yield in okra and only 1.0% variation in seed yield remained unaccounted. The low residual effect revealed that the traits selected for path coefficient analysis were adequate and appropriate (Nawaz *et al*., 2019). Path coefficient analysis revealed that seed per capsule had the highest direct effect on seed yield indicating highest heritability and genetic advance. Hence, seed per capsule was the main determiners for qualitative and quantitative improvement of the okra genotypes. These results were in harmony with those previous study obtained by Rambabu *et al*. (2019) [10] and Ranga *et al.* (2021) [12].

Table 1: Mean of seed yield related phenotypic characters in okra genotype grown during Post-Kharif

Genotype	Days to First Flowering	Days to 50 percent Flowering	Plant Height (cm)	Capsule Length (cm)	Capsule Diameter (mm)	100 Seed Weight (g)	Seed per Capsule	Capsule per Plant	Seed Yield (kg/ha)
Hisar Unnat	42.67	46.67	99.27	17.17	19.05	6.98	43.50	7.80	1312.57
Varsha Uphar	43.67	48.67	96.07	18.81	19.38	6.41	40.47	8.00	1151.40
Arka Anamika	46.33	53.00	107.87	20.31	19.57	7.62	43.80	7.53	1396.20
Pusa Bhindi-5	47.00	52.00	113.13	17.55	18.60	7.58	34.20	7.07	1012.80
Kasi Kranti	45.00	51.00	101.00	17.71	20.45	6.82	38.80	7.73	1134.37
Kasi Pragati	47.33	50.00	118.20	18.27	19.05	5.91	37.50	8.27	1009.60
Prabhani Kranti	44.33	50.33	113.00	19.21	18.34	6.88	40.67	8.37	1299.97
Gujrat Okra-5	49.67	52.33	120.27	17.91	18.58	7.24	31.20	8.17	1025.63
Mean	45.75	50.50	108.60	18.36	19.13	6.93	38.77	7.80	1167.82
C.D.	2.35	1.97	2.19	0.02	0.32	0.03	2.57	0.74	114.83
SE(m)	0.77	0.64	0.72	0.01	0.11	0.01	0.84	0.24	37.50
SE(d)	1.09	0.91	1.01	0.01	0.15	0.02	1.19	0.34	53.03
C.V.	2.91	2.21	1.14	0.06	0.95	0.28	3.75	5.35	5.56

Table 2: General mean, estimate of phenotypic and genotypic variance, phenotypic and genotypic coefficient of variability, broad sense

heritability and genetic advance expressed for eight okra genotypes during kharif

Characters	Grand Mean	EV	GV	PV	GCV	PCV	Broad sense Heritability (H^2%)	Genetic advance (GA)	Genetic Advance as percentage of mean
Days to First Flowering	45.75	2.571	4.310	6.881	4.538	5.734	62.60	3.384	7.40
Days to 50% Flowering	50.50	1.316	3.911	5.226	3.916	4.527	74.80	3.524	6.98
Plant Height	108.60	2.841	80.578	83.419	8.266	8.410	96.60	18.174	16.73
Capsule length	18.36	0.001	1.062	1.063	5.611	5.611	100.00	2.123	11.56
Capsule Diameter	19.13	0.270	0.369	0.639	3.177	4.181	57.70	0.951	4.97
100 Seed Weight	6.95	0.064	0.278	0.341	7.574	8.401	81.30	0.978	14.07
Seed per Capsule	38.89	3.612	18.898	22.511	11.178	12.199	84.00	8.205	21.10
Capsule per Plant	7.85	0.399	0.044	0.444	2.678	8.476	10.00	0.137	1.74
Seed Yield per plant	23.63	0.421	2.163	2.584	12.593	13.766	83.70	2.771	23.73

Table 3: Pearson Correlation Matrix of seed yield related phenotypic characters in okra genotype grown during Post-Kharif

	Days to First Flowering	Days to 50% Flowering	Plant Height	Capsule Length	Capsule Diameter	100 Seed Weight	Seed per Capsule	Capsule per Plant	Seed Yield
Days to First Flowering	1	0.527^{**}	0.723^{**}	0.012^{NS}	-0.154^{NS}	0.112^{NS}	-0.699^{**}	0.173^{NS}	-0.569^{**}
Days to 50% Flowering	0.527^{**}	1	0.504^{*}	0.344^{NS}	-0.016^{NS}	0.477^{*}	-0.370^{NS}	-0.127^{NS}	-0.084^{NS}
Plant Height	0.723^{**}	0.504^{*}	1	0.055^{NS}	-0.523^{**}	0.041^{NS}	-0.616^{**}	0.131^{NS}	-0.400^{NS}
Capsule length	0.012^{NS}	0.344^{NS}	0.055^{NS}	1	0.039^{NS}	0.122^{NS}	0.345^{NS}	0.087^{NS}	0.515^{**}
Capsule Diameter	-0.154^{NS}	-0.016^{NS}	-0.523^{**}	0.039^{NS}	1	-0.066^{NS}	0.306^{NS}	-0.201^{NS}	0.106^{NS}
100 Seed Weight	0.112^{NS}	0.477^{*}	0.041^{NS}	0.122^{NS}	-0.066^{NS}	1	-0.011^{NS}	-0.474^{*}	0.262^{NS}
Seed per Capsule	-0.699^{**}	-0.370^{NS}	-0.616^{**}	0.345^{NS}	0.306^{NS}	-0.011^{NS}	1	-0.129^{NS}	0.746^{**}
Capsule per Plant	0.173^{NS}	-0.127^{NS}	0.131^{NS}	0.087^{NS}	-0.201^{NS}	-0.474^{*}	-0.129^{NS}	1	-0.035^{NS}
Seed Yield	-0.569^{**}	-0.084^{NS}	-0.400^{NS}	0.515^{**}	0.106^{NS}	0.262^{NS}	0.746^{**}	-0.035^{NS}	1

Table 4: Direct (diagonal) and indirect genotypic path co efficient values of different characters on seed yield in okra during Kharif

Characters	Days to First Flowering	Days to 50% Flowering	Plant Height	Capsule Length	Capsule Diameter	100 Seed Weight	Seed per Capsule	Capsule per Plant
Days to First Flowering	0.23810	-0.02009	0.14746	0.00125	0.10776	0.02051	-1.19902	0.09118
Days to 50% Flowering	0.22095	-0.02164	0.09852	0.03437	0.00345	0.04733	-0.76281	0.14448
Plant Height	0.21904	-0.01330	0.16029	0.00361	0.20254	0.00203	-0.96396	-0.08589
Capsule length	0.00374	-0.00933	0.00725	0.07972	-0.01493	0.01322	0.55690	-0.06759
Capsule Diameter	-0.08345	0.00024	-0.10558	0.00387	-0.30749	-0.01398	0.59881	0.06763
100 Seed Weight	0.05615	-0.01178	0.00374	0.01212	0.04942	0.08696	-0.12322	0.24781
Seed per Capsule	-0.20831	0.01205	-0.11274	0.03239	0.13435	-0.00782	1.37052	-0.05294
Capsule per Plant	-0.10251	0.01477	0.06501	0.02544	0.09819	-0.10176	0.34259	-0.21172

Residual value: 0.01

Conclusion

The mean performance data revealed that highest phenotypic variance was observed in plant height followed by seed per capsule and least in capsule per plant. Based on shared consideration of genotypic coefficient of variation, broad-sense heritability and genetic advance revealed that seed per capsule had highest value followed by plant height. In path coefficient analysis, it was evident that the seed per capsule had significant role with positive or negative association of various characters considering seed yield per plant. Hence, the advancement in seed per capsule would simultaneously quantitative progress the seed yield per plant in okra.

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References

1. Akinyele BO, Osekita OS. Correlation and path coefficient analyses of seed yield attributes in okra (*Abelmoschus esculentus* L. Moench). African Journal of Biotechnology. 2006;5(14):1330-1336.
2. Debbarma M, Chakraborti P. Variability in seed parameters and germination allied enzyme of lentil genotype. International Journal of Current Microbiology and Applied Sciences. 2020;9(5):1185-1191.
3. Dhankhar BS, Dhankhar SK. Genetic variability, correlation and path analysis in okra [*Abelmoschus esculentus* (L.) Moench.]. Vegetable Science. 2002;29(1):63-65.
4. Ibrahim MM, Hussein RM. Variability, heritability and genetic advance in some genotypes of roselle (*Hibiscus sabdariffa* L.). World Journal of Agricultural Sciences. 2006;2(3):340-345.
5. Kiran Patro TS, Ravisankar C. Genetic variability and multivariate analysis in okra [*Abelmoschus esculentus* (L.) Moench]. Tropical Agricultural Research. 2004;16:99-113.
6. Koundinya, AVV, Dhankhar SK. Correlation and Path analysis of seed yield components in okra. Annals of Horticulture. 2013;6(1):145-148.
7. Lenka D, Mishra B. Path coefficient analysis of yield in rice varieties. Indian Journal of Agricultural Sciences. 1973;43:376-379.
8. MoA & FW. Horticultural Statistics at a glance Published by Government of India. 2018. p. 149.
9. Nawaz B, Sattar S, Malik TA. Genetic analysis of yield components and fiber quality parameters in upland cotton. International Multidisciplinary Research Journal.

2019;9:13-19.
10. Rambabu B, Waskar DP, Khandare VS. Genetic Variability, Heritability and Genetic Advance in Okra. International Journal of Pure and Applied Bioscience. 2019;7(1):374–382.
11. Randhawa JS, Sharma BR. Correlation heritability and genetic advance studies in okra. Agric Univ J Res. 1972;25:35-39.
12. Ranga AD, Kumar S, Darvhankar MS. Variability among different yield and yield contributing traits of Okra (*Abelmoschus esculentus* L. Moench) genotypes. Electronic Journal of Plant Breeding. 2021;12(1):74–81.
13. Singh A, Sharma HL. Correlation coefficient analysis of seed yield attributes in okra *[Abelmoschus esculentus* (L.) Moench]. Plant Archives. 2012;12(1):67-68.
14. Singh B, Pal AK, Singh S. Genetic variability and correlation analysis in okra [*Abelmoschus esculentus* (L.) Moench.]. Indian Journal of Horticulture. 2006;63(3):281-285.
15. Wray N, Visscher P. Estimating trait heritability. Nature Education. 2008;1(1):1-16.
16. Wright S. Correlation and causation. Journal of Agricultural Research. 1921;20:557-585.