Journal of Experimental Agriculture International

Volume 46, Issue 7, Page 569-573, 2024; Article no.JEAI.117021
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

The Study of Variability Heritability and Genetic Advance in Okra [(*Abelmoschus esculentus* L.) Moench] Crop

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i72610

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/117021

Original Research Article

Received: 08/04/2024
Accepted: 13/06/2024
Published: 24/06/2024

ABSTRACT

The study was conducted during kharif 2019 to Ziad 2020 at the research farm of shri Durga ji post graduate college Chaneshwar Azamgarh U.P. with ten genotypes Azad Bhindi1, Azad Bhindi 2, Azad Bhindi 3, KS 312, VRO5, KS 442, KS 439, BO2, Arka Abhay and Prabhani Kranti along with 11 characters viz days to flowering, height of plant, number of branches per plant /main shoot, number of first fruiting node, height of first fruiting node, number of nodes per plant, length of internodes, length of fruit, width of fruits , number of fruits per plant and fruit yield per plant . All data recorded as per scientific for good genotypes of releasing factors i.e. high yielding and good quality characters. The number of first fruiting node coefficients of variability for all the variables

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Cite as: *Yadav, Kalyan Singh, and Ajeet Pratap Singh. 2024. "The Study of Variability Heritability and Genetic Advance in Okra [(Abelmoschus Esculentus L.) Moench] Crop". Journal of Experimental Agriculture International 46 (7):569-73. https://doi.org/10.9734/jeai/2024/v46i72610.*

traits were higher in F1 generations. The number of initial fruiting nodes and total number of nodes in the F1 generation exhibited coefficients of variability with highest magnitudes in the F1 generation. When compared to parents, F1 generations, and other traits, the number of branches per plant showed the highest coefficient of variabilities in F2. The high heritability estimates in narrow sense were observed for length of fruit in both the generations and height for all the characters except height of plant, width of fruit, number of fruits per plant and fruit yield per plant in F1 generation only. Other characters showed moderate heritability F2 generations and height of plant in both generation, genetic advance in narrow sense higher in F2 then F1 generation for all the characters. The maximum genetic advance was observed for fruit yield per plant in F1 and F2 and moderate genetic advance was observed for height of plant in both F1 and F2 generation.

Keywords: Heritability; okra; vegetable crop; genetic advance.

1. INTROUCTION

"Okra or Bhindi [*Abelmoschus esuculentus* (L.) Moench] is an important vegetable crop of India. It belongs to the family Malvaceae and having chromosome number 2n = 130. It behave as often cross-pollinated crop although it is potential self pollinated crop, 8.75 to 9.61 percent out crossing" (Purewal and Randhawa, 1947) [1,2]. It is thought that the Hindustani center of origin is where okra began. Nonetheless, Ethiopia is regarded as its original home, from where it spread throughout Arabia via the Nile Valley, was brought to Europe by the Moors, and then went on to Louisiana in the earlier 17th century via French colonists (Woodruff, 1927). Given that it encounters many ancestral wild forms in India, the country is also regarded as its birthplace (Yawalkar, 1965). Vegetable availability in India is near about 175 g per day per inhabitant, despite the country's 300 g daily requirement (125 g for leaf vegetables, 100 g for root and tuber vegetables, and 75 g for miscellaneous vegetables) according to ICMR report. With an average productivity of 18.40 tonnes per hectare, India's 6.75 million hectares of vegetable output rank second in the world, behind China's 96.02 million tonnes (NHB study, 2019). The most productive states are Tamilnadu (25.3 t/ha), Kerala (22.6 t/ha), and Uttar Pradesh (18.5 t/ha). India currently contributes 13.60% of the world's total vegetable production. Given the current situation and the nation's growing need for vegetable consumption to meet the needs of the upcoming generation, it is imperative that the productivity per unit area and total amount of vegetables produced in the nation be increased.

2. MATERIALS AND METHODS

The study was conducted during Kharif 2019 to Ziad 2020 at the research farm of shri Durga ji post graduate college Chandeshwar Azamgarh U.P. with ten genotypes Azad Bhindi1, Azad Bhindi 2, Azad Bhindi 3, KS 312, VRO5, KS 442, KS 439, BO2, Arka Abhay and Prabhani Kranti along with 11 characters viz days to flowering, height of plant, number of branches per plant /main shoot,number of first fruiting node height of first fruiting node number of nodes per plant ,length of internodes, length of fruit, width of fruits , number of fruits per plant and fruit yield per plant [3,4]. All data recorded as per scientific. for good genotypes of releasing factors i.e. high yielding and good quality characters.

3. RESULTS AND DISCUSSION

3.1 Variability

The phenotypic coefficient of variability in the current study was more than genotypic coefficient of variability for every traits and the number of first fruiting node coefficients of variability was higher in F1 generations. The number of initial fruiting nodes and total number of nodes in the F1 generation exhibited coefficients of variability with larger magnitudes in the F1 generation. The F2 generation had a higher coefficient of variabilities in number of branch per plant than did the parents, F1 generations, and other traits.

The difference between phenotypic and genotypic coefficients of variability for all the traits were minute signal that all traits were minute influenced through environmental factors. Heritable variation can not be estimated with the help of genetic coefficient of variation alone Singh et al. (1974) had also observed similar variations.

Table 1. Estimates of variability, heritability and genetic advance for the different characters under study in okra [*Abelmoschus esculentus* (L.) Moench]

Characters	Phenotypic coefficient of variability in per cent			Genotypic coefficient of variability in per cent			Heritability (narrow sense)		Genetic advance in percent of mean (narrow sense)	
	Parent	F1	F2	Parent	F1	F2	F1	F2	F1	F2
Days to flowering	8.56	8.69	9.21	8.29	8.48	8.92	38.02	28.88	7.25	7.58
Height of plant	8.48	10.29	12.33	8.26	9.98	12.10	22.15	14.52	21.15	26.69
Number of branches per plant	22.42	23.33	32.97	21.14	22.12	32.22	32.61	13.60	1.32	2.09
Number of first fruiting node	20.02	14.22	20.00	19.79	19.95	19.65	51.43	29.41	1.93	2.93
Height of first fruiting node	14.67	12.54	13.19	14.22	12.10	12.60	50.83	29.60	4.76	4.83
Number of nodes per plant	12.71	11.64	15.11	12.27	10.66	14.92	37.28	19.29	4.12	6.30
Length of internode	18.02	18.74	19.56	17.52	18.26	19.14	31.70	25.57	3.88	4.35
Length of fruit	16.52	12.93	13.12	15.47	11.97	13.11	42.04	40.04	2.82	3.05
Width of fruit	17.33	20.58	21.32	15.86	18.94	21.31	22.11	16.98	0.75	0.89
Number of fruits per plant	15.74	17.30	18.42	15.00	16.61	18.41	25.88	19.65	5.40	6.10
Fruit yield per plant	11.59	16.93	16.22	11.03	16.17	16.21	13.43	13.94	61.83	62.22

3.2 Heritability

Heritability is the heritable portion of variability, while genetic advancement predicts the amount of gain expected at a given intensity of selection. Information on these factors is therefore crucial when choosing the breeding process to be used [5]. Given that the response to selection for quantitative features is closely correlated with its heredity and genetic advancement, heritability aids in the evaluation of genetic and environmental effects on phenotypic variation as well as selection [6,7].

Robinson (1949, 1966) classified the heritability estimate as low (below 10%), medium or moderate (10 to 30%), and high (over 30%). Many researchers (Mather, 1949; Warner, 1952; Crumpacker and Allard, 1962; Mather and Jinks, 1971) have devised a number of techniques for estimating heredity in a limited sense.

According to present study heritability was high for length of fruit in both F_1 and F_2 generation, high for days to flowering, number of branches per plant, number of first fruiting node, height of first fruiting node, number of nodes per plant, length of internode and length of fruit in F_1 generation, moderate for height of plant, width of fruit, number of fruits per plant and fruit yield per plant in both F_1 and F_2 generation and moderate for all the character except length of fruit in F_2 population. Heritability estimates alone could not be given the real picture of improvement which could be realized during selection. It is only reliable when accomplishment of genetic advance under selection.

3.3 Genetic Advance

According to the current study, the F2 generation has made more genetic progress in a limited sense than the F1 generation for every character. The F1 and F2 generations demonstrated the highest genetic advancement for fruit output per plant, as indicated by Table, although they demonstrated a modest genetic advance for plant height. The height of each plant and the amount of fruit produced by each plant in F1 and F2 were the only traits with low genetic advance, suggesting that these traits would not be selected for. The following studies on okra have also reported comparable findings: Singh and Katiyar (2004), Comstock and Robinson (1952), Yadav et al. (2002), Mahajan and Sharma (1979), and Rao et al. [8]. Singh & Associates (1974), Rao and Satyavarthi, (1977). These findings were in agreement with those of Chacko et al*.* (1999), Yadav et al*.* (2002), Singh et al*.* (2004), Mishra et al*.* (2004), Bharagava et al*.* (2006), Yadav et al*.* (2007), Kumar et al*.* (2007), High heritability estimates in narrow sense were observed for length of fruit in both the generations and height for all the characters except height of plant, width of fruit, number of fruits per plant and fruit yield per plant in F_1 generation only. Other characters showed moderate heritability F_2 generations and height of plant in both generation.

4. CONCLUSION

With the exception of plant height, fruit breadth, number of fruits per plant, and fruit yield per plant in the F1 generation only, the high heritability estimates in the narrow sense were noted for fruit length in both generations and height for all other variables. Other characteristics included plant height in both generations and considerable heritability in the F2 generation; all of these traits demonstrated a greater degree of genetic advancement in the F2 generation than in the F1 generation. The F1 and F2 generations showed the greatest genetic advancement in fruit output per plant, whereas both generations showed a moderate genetic advance in plant height.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
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