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Study of Heterosis for Fruit Yield and its Component Traits in Okra [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT

Experiment carried out to get information on magnitude of heterosis for fruit yield and its related components; adopting Griffing's diallel analysis (Method II, Model I) involving eight parents and their resultant 28 F_1 hybrids (excluding reciprocal cross) along with a commercial hybrid check 'GJOH-4' of okra; tested at College farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari, during *kharif*–2019. The hybrids *viz.*, GAO-5 x NOL-18-14 followed by Arka Abhay x NOL-18-14, NOL-18-12 x NOL-18-14, NOL-18-14 x NOL-18-17, Arka Abhay x GAO-5 and NOL-18-14 x NOL-18-15 exhibited higher standard heterosis in for fruit yield and its yield contributing characters involving elite lines as the parents suggested that there is a good scope of exploiting heterosis commercially and also possibility of isolating desirable segregants.

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] a member of *Mallow or Malvaceae* family is commonly known as *Lady's Finger* in England, *Gumbo* in the USA and *Bhindi* in India. The geographical origin of okra is tropical Africa (de Candolle, 1985). The okra plant is cultivated in tropical, subtropical and warm temperate regions around the world. In India major okra growing state is West Bengal followed by Bihar, Odisha, Gujarat, Maharashtra, Andhra Pradesh and Uttar Pradesh. The cultivated okra has somatic chromosome number 2n = 130 and is considered to be an amphidiploid of *Abelmoschus tuberculatus* (2n = 58) & unknown species with 2n = 72 (Datta and Naug, 1968). Okra fruit is principally consumed fresh or cooked and is a major source of vitamins A, B, C, minerals, Iron and important vegetable source of viscous fibre but it is reportedly low in sodium, saturated fat and cholesterol (Moaward *et al.,* 1984). In India, its medicinal value has also been reported in curing ulcers and relief from hemorrhoids (Adams, 1975). Okra is a self-pollinated crop; however the occurrence of out-crossing to an extent of 4 to 19 per cent (Choudhury and Anthai- Choomsai, 1970) by insects has been reported which renders considerable genetic diversity. The term 'heterosis' was coined by Shull (1914) to replace the phrase '*special stimulus of* *heterozygosis*'. Vijayaraghavan and Warrier (1946) were the first to report hybrid vigour in okra with respect to the number, size and weight of fruit. To overcome the yield barriers in okra, a hybridization-based breeding strategy would be desirable. The magnitude of heterosis provides a basic idea about genetical diversity present in the material. It also helps to choose desirable parents for the development of superior F_1 hybrids for exploiting hybrid vigour and further developing gene pools to be employed in future breeding programme. In okra, commercial exploitation of heterosis is a profitable proposition owing to the phenomenon of protogyny and its floral biology, which enables easy emasculation and pollination besides being able to produce a large number of seeds in single pollination (Reddy, 2010). Among various diallel forms, the half-diallel technique that includes one set of single cross progeny and the parents has certain advantages over others, giving maximum information about the genetic architecture of a trait, parents and allelic frequencies. Half-diallel crossing had been used by several researchers to evaluate parents in all possible combinations excluding reciprocals to estimate heterosis in okra. By keeping above points in mind, the present investigation was framed using half diallel matting design.

Materials and Methods

In the present experiment, eight genotypes (6 advanced breeding lines + 2 released varieties) were sown at Regional Horticulture Research Station, NAU, Navsari and made 28 direct crosses using half diallel mating design in *summer* 2019. The F_1 hybrids were evaluated at College farm, N. M. College of Agriculture, N. A. U., Navsari in *kharif*-2019, with three replications using okra hybrid GJOH-4 as standard check. Each and every genotype was grown in single line using 60 cm x 30 cm spacing. Observations recorded for yield and yield attributes *viz*., days to 50 % flowering, plant height (cm), branches per plant, fruit weight (g), fruit length (g), fruit diameter (cm), fruit per plant, fruit yield per plant, internodal length (cm), number of seeds per fruit, and 100 seed weight (g). The heterosis was estimated in relation to standard check hybrid and calculated as a percentage increase or decrease of F_1 as over standard check using the method of Fonseca and Patterson (1968).

Results and Discussion

The present study was intended to estimate the heterosis of hybrids using eight diverse parents in okra. The Analysis of variance for different characters revealed that genotypes were highly significant for all the characters under study. Highly significant differences were observed among parents (except days to 50 % flowering) and hybrids for all the characters. Parents *vs.* hybrids comparison indicated that means of hybrids were significantly different from the means of the parents for days to 50 % flowering, plant height and fruit length. The analysis of mean performance (Table 1) of eight parent and their 28 hybrids for different characters revealed that, none of the parents showed consistent high performance for all the characters. Almost identical result was reported by Patel *et al.,* (2015), Bhatt *et al.*, (2016), Sabesan *et al.*, (2016), Kumar *et al.*, (2017), More *et al.*, (2017), Paul *et al.*, (2017), Kerure and Pitchaimuthu (2018), Chowdhury and Kumar (2019), Suganthi *et al.*, (2019) and Vekariya *et al.*, (2019). Among the parents, Arka Abhay was recorded early flowering and higher branches per plant. NOL-18-14 reported maximum value fruit yield per plant as well as its yield components like plant height, fruit weight, fruit length, fruit diameter, fruit per plant and lower internodal length.

Table.1 Magnitude of standard heterosis for different characters in okra

Sr. No.	Hybrids	Days to 50 % Flowering	Plant height (c m)	Branches per plant	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruits per plant	Fruit yield per plant (g)	Internodal length (cm)	Number of seeds per fruit	100 seed weight (g)
1.	Arka abhay x GAO-5	-6.43	45.76**	37.84**	8.45	7.79	16.90**	7.79	14.55*	-28.44**	37.91**	17.42**
2.	Arka abhay x NOL-18-9	-1.43	26.22**	16.22	3.70	-3.86	6.25	-1.30	-4.94	7.74	2.84	-10.61
3.	Arka abhay x NOL-18-12	-6.43	9.99	13.51	-0.57	5.00	-4.63	-6.93	-12.51	18.92*	8.69	15.91**
4.	Arka abhay x NOL-18-14	-2.86	39.88**	21.62*	16.02**	23.55**	14.58**	19.05**	28.86**	-9.24	25.28**	4.55
5.	Arka abhay x NOL-18-15	2.14	-19.09**	-8.11	-10.81	-2.79	-8.80	-12.55*	-23.67**	23.82**	-2.05	3.03
6.	Arka abhay x NOL-18-16	-7.86*	3.77	-5.41	2.69	5.92	-0.93	-18.61**	-21.76**	14.47	11.37	9.09
7.	Arka abhay x NOL-18-17	-2.86	19.59**	8.11	-5.31	4.78	2.78	1.73	-2.17	20.65*	26.54**	5.30
8.	GAO-5 x NOL-18-9	-0.71	-10.90	-13.51	-3.66	-8.37	1.16	-12.99*	-12.20	47.30**	-0.95	-10.61
9.	GAO-5 x NOL-18-12	-5.71	23.96**	16.22	10.88	21.77**	5.79	4.33	11.07	30.66**	17.38	8.33
1.	GAO-5 x NOL-18-14	-7.14*	36.01**	37.84**	18.36**	15.58*	3.01	13.85**	29.41**	4.90	22.91*	20.45**
11.	GAO-5 x NOL-18-15	-3.57	1.16	5.41	-11.40*	6.87	-7.64	-7.36	-19.46**	17.70	-7.42	15.15**
12.	GAO-5 x NOL-18-16	-4.29	-4.97	0.00	-1.77	13.95*	7.41	-18.61**	-22.27**	34.72**	12.80	17.42**
13.	GAO-5 x NOL-18-17	0.00	-9.44	-10.81	-9.96	-3.96	-2.31	-5.63	-18.16**	46.19**	9.64	-10.61
14	NOL-18-9 x NOL-18-12	1.43	2.96	16.22	2.22	4.72	8.56	6.06	2.02	-0.50	5.37	16.67**
15.	NOL-18-9 x NOL-18-14	0.71	10.80	21.62*	9.51	23.58**	0.46	-7.79	3.12	1.22	21.17*	-5.30
16.	NOL-18-9 x NOL-18-15	0.71	-23.30**	-24.32*	-11.73*	0.06	-4.40	-25.11**	-29.56**	19.53*	-1.90	-3.03
17.	NOL-18-9 x NOL-18-16	-5.00	-4.92	13.51	0.99	15.98*	5.56	6.93	0.84	9.96	18.48*	-3.79
18.	NOL-18-9 x NOL-18-17	0.71	-16.93*	-21.62*	-11.63*	-9.97	-5.09	-20.78**	-31.18**	43.52**	-5.06	-10.61
19.	NOL-18-12 x NOL-18-14	-10.71**	27.77**	24.32*	9.23	26.68**	8.56	16.02**	23.40**	-15.14	38.70**	15.15**
17.	NOL-18-9 x NOL-18-16	-5.00	-4.92	13.51	0.99	15.98*	5.56	6.93	0.84	9.96	18.48*	-3.79

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Sr. No.	Hybrids	Days to 50 % Flowering	Plant height (cm)	Branches per plant	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)	Fruits per plant	Fruit yield per plant (g)	Internodal length (cm)	Number of seeds per fruit	100 seed weight (g)
18.	NOL-18-9 x NOL-18-17	0.71	-16.93*	-21.62*	-11.63*	-9.97	-5.09	-20.78**	-31.18**	43.52**	-5.06	-10.61
19.	NOL-18-12 x NOL-18-14	-10.71**	27.77**	24.32*	9.23	26.68**	8.56	16.02**	23.40**	-15.14	38.70**	15.15**
20.	NOL-18-12 x NOL-18-15	-5.00	8.04	13.51	2.10	22.88**	0.00	6.49	5.33	6.46	29.86**	18.18**
21.	NOL-18-12 x NOL-18-16	2.14	-25.11**	-18.92	-11.61*	0.43	-1.62	-5.63	-21.07**	-5.84	2.37	-15.91**
22.	NOL-18-12 x NOL-18-17	0.00	14.36*	16.22	8.80	33.67**	-3.01	-9.52	-0.40	-1.50	-9.32	-5.30
23.	NOL-18-14 x NOL-18-15	-4.29	19.59**	32.43**	8.40	25.15**	5.09	7.36	14.29*	-12.35	27.65**	16.67**
24.	NOL-18-14 x NOL-18-16	-5.00	-14.01	-13.51	-7.41	27.32**	6.71	-4.76	-11.76	4.84	12.95	6.82
25.	NOL-18-14 x NOL-18-17	4.29	17.53*	16.22	9.06	34.44**	-5.56	11.26*	16.93*	-4.12	5.37	15.15**
26.	NOL-18-15 x NOL-18-16	-6.43	5.83	-13.51	-2.81	16.84*	7.87	1.30	-6.13	-12.35	33.18**	-13.64
27.	NOL-18-15 x NOL-18-17	0.71	10.60	5.41	9.44	25.70**	1.85	-6.49	-3.79	4.12	-2.53	0.00
28.	NOL-18-16 x NOL-18-17	-0.71	-8.19	-18.92	-2.78	-4.08	-10.19	-15.58**	-17.05*	14.75	-8.06	-2.27
	S. Ed. (±)	1.51	4.58	0.23	0.78	0.74	0.08	0.77	15.16	0.54	3.73	0.25
	C.D. @ 5%	3.10	9.39	0.48	1.60	1.51	0.16	1.59	31.10	1.10	7.66	0.50
	C.D. @ 1%	4.0	12.12	0.62	2.06	1.96	0.20	2.05	40.13	1.42	9.88	0.65
	Range	-10.71 to 4.29	-25.11 to 45.76	-24.32 to 37.84	-11.73 to 18.36	-9.97 to 34.44	-10.19 to 16.90	-25.11 to 19.05	-31.18 to 29.41	-28.44 to 47.30	-9.32 to 38.70	-15.91 to 20.45

* - Significant at 5 % and **- Significant at 1%

Among the hybrids, GAO-5 x NOL-18-14 reported higher fruit yield per plant followed by followed by Arka Abhay x NOL-18-14, NOL-18-12 x NOL-18-14, NOL-18-14 X NOL-18-17, Arka Abhay x GAO-5 and NOL-18-14 x NOL-18-15. Hybrid Arka Abhay x NOL-18-14 was reported maximum fruits per plant while hybrid NOL-18-12 x NOL-18-14 was showed early flowering. The hybrids *viz.*, Arka Abhay x GAO-5 and GAO-5 x NOL-18-14 exhibited maximum numbers of branches per plant and fruit weight while Arka Abhay x GAO-5 exhibited maximum fruit diameter and plant height with minimum internodal length. The hybrid NOL-18-14 x NOL-18-17 was exhibited maximum fruit length. In general, the overall information obtained from *per se* performance of hybrids revealed that the hybrids involving Arka Abhay and NOL-18-14 as one of the parents recorded higher fruit yield with other yield component characters.

The estimates of heterosis were worked out with respect to standard heterosis, useful to the developed new hybrids which were good performed from older one. Therefore, standard heterosis was worked out by comparing F_1 with standard check hybrid 'GJOH-4' statistically. For 11 different traits, the estimation for heterosis of 28 hybrids over standard check (GJOH-4) is detailed in Table 1. In the present investigation, standard heterosis ranged from -31.18 per cent (NOL-18-9 x NOL-18-17) to 29.41 per cent (GAO-5 x NOL-18-14) for fruit yield per plant in okra. Almost identical result was reported Patel and Patel (2016), Devi *et al.*, (2017), Gavint *et al.*, (2018), Makdoomi *et al.*, (2018), Kerure and Pitchaimuthu (2018), Suganthi *et al.*, (2019), and Vekariya *et al.*, (2019). The hybrids show standard heterosis for fruit yield per plant may probably due to dominance nature of genes and due to high heterosis value was in positive direction for yield attributes like, fruit weight, fruit diameter, fruit length and fruits per plant were found significant standard heterosis in desirable direction. Almost identical result has been reported Bhatt *et al.*, (2016), Paul *et al.*, (2017), Kerure and Pitchaimuthu (2018), Suganthi *et al.*, (2019) and Vekariya *et al.*, (2019). Earliness, one of the most desirable characters for okra is indicated by days required for 50 per cent flowering. Out of six best hybrids; GAO-5 x NOL-18-14 and NOL-18-12 x NOL-18-14 were reported negative and significant standard heterosis which was in desirable direction. similar result were reported by, Satish *et al.*, (2017), Gavint *et al.*, (2018), Kulkarni *et al.*, (2018), Yadav *et al.*, (2018), Kumar and Kumar (2019), Suganthi *et al.*, (2019). Fruit yield can be increase by increased by increasing by fruit length, fruit diameter and fruit weight (Reddy *et al.*, 2013). The crosses exhibited a wide range of standard heterosis ranged from -9.97 per cent (NOL-18-9 x NOL-18-17) to 34.44 per cent (NOL-18-14 x NOL-18-17) for fruit length. Out of best six hybrids, five hybrids exhibited positive and significant heterosis for fruit length. Similar result was reported by Bhatt *et al.*, (2016), More *et al.*, (2017), Gavint *et al.*, (2018), Kulkarni *et al.*, (2018), Vekariya *et al.*, (2019) for fruit length. For fruit weight, two best hybrids *viz.*, Arka Abhay x NOL-18-14 (16.02) and GAO-5 x NOL-18-14 (18.36) were reported positive and significant standard heterosis. This finding was in agreement with Patel *et al.*, (2015) Patel and Patel (2016), Sabesan *et al.*, (2016), Devi *et al.*, (2017), More *et al.*, (2017), Paul *et al.*, (2017), Kerure and Pitchaimuthu (2018), Makdoomi *et al.*, (2018), Suganthi *et al.*, (2019) and Vekariya *et al.*, (2019). For fruit diameter, two best hybrids *viz.*, Arka Abhay x GAO-5 and Arka Abhay x NOL-18-14, were exhibited positive and significant standard heterosis for this trait. Similar result was reported by Patel and Patel (2016), Devi *et al.*, (2017), More *et al.*, (2017), Kerure and Pitchaimuthu (2018) and Vekariya *et al.*, (2019). Plant height is one of the important yields attributing character in okra. The fruit formation in okra takes place at the nodes, short internode length accompanied by additional plant height enhance the number of fruit bearing nodes thereby increasing fruit yield per plant. Plant height along with shorter internodal length and more branches per plant determine the geometry of okra plant. All six best hybrids exhibited positive and significant standard heterosis for plant height. This indicated that plant height may be considered as a major yield contributing traits in okra. Positive and significant standard heterosis was reported by Patel *et al.,* (2015), Bhatt *et al.,* (2016), Sabesan *et al.,* (2016), Devi *et al.,* (2017), Kumar *et al.,* (2017), Hadiya *et al.,* (2018), Devi *et al.,* (2019) and Vekariya *et al.,* (2019).

The crosses exhibited a wide range of standard heterosis from -24.32 per cent (NOL-18-9 x NOL-18-15) to 37.84 per cent (Arka Abhay x GAO-5) for branches per plant. Out of six best hybrids, significant and positive standard heterosis were recorded by five hybrids *viz.,* Arka Abhay x NOL-18-14, GAO-5 x NOL-18-14, Arka Abhay x GAO-5, NOL-18-12 x NOL-18-14 and NOL-18-14 x NOL-18-15 for this trait. This finding was in agreement with Tiwari *et al.,* (2015), Paul *et al.,* (2017), Hadiya *et al.,* (2018), Kerure and Pitchaimuthu (2018), Sapavadiya *et al.,* (2019), Suganthi *et al.,* (2019) for this trait.

Joshi *et al.,* (1958) have stressed the importance of shorter internodes for increased yield in okra. Negative heterosis was desirable for internodal length to accommodate a greater number of nodes and ultimately provided higher fruit yield. Out of best six heterotic hybrids, Arka Abhay x GAO-5 exhibited negative and significant heterosis for this trait which indicated that this trait may not be more important for present study. This finding was in agreement with Patel and Patel (2016), Satish *et al.,* (2017), Kulkarni *et al.,* (2018), Makdoomi *et al.,* (2018), Sapavadiya *et al.,* (2019) and Vekariya *et al.,* (2019) for this trait.

Seed related traits *viz;* number of seeds per fruit and 100 seed weight are important quality parameters as far as okra breeding is concerned. Out of best six heterotic hybrids; none of the hybrid exhibited negative and significant heterosis for these traits. Similar result was reported by Patel *et al.,* (2015), Kumar *et al.,* (2017), Patel and Patel (2016) and Makdoomi *et al.,* (2018). Number of seeds per fruit and 100 seed weight were not much contributed to the increasing yield in this study and for consuming as a vegetable; less seed was preferred by consumers.

References

Adams, C.F. (1975). Nutritive value of American foods in common units. U.S. Department of Agriculture. *Agric. Handbook*, 425: 29.

Bhatt, J. P., Patel, N. A., Acharya, R. R. and Kathiria, K. B. (2016). Heterosis for fruit yield and its components in okra [*Abelmoschus esculentus* (L.) Moench]. *Indian J. Agric. Sci.*, 8(18): 1332-1335.

Choudhury, B. and Anthai-Choonsai, M.L. (1970). Natural cross pollination in some vegetable crops. *Indian J. Agric. Sci.*, 40: 805-812.

Chowdhury, S. and Kumar, S. (2019). Exploitation of heterosis for yield and yield attributes in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Chem. Stud.*, 7(4): 853-857.

de Candolle, A.P. (1885). *Origin of Cultivated Plants*. Appleton, New York.

Datta, P.C. and Naug, A. (1968). A few strains of *Abelmoschus esculentus* (L.) Moench, their karyology in relation to phylogeny and organ development.

Beitr. Biol. Pflanzen., 45: 113-126.

Devi, N. N., Kayande, N. V., Gawande, P. P. and Nichal, S. S. (2017). Evaluation for heterosis in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Pure Appl. Biosci.*, 5(6): 590-593.

Devi, A. P., Bhattacharjee, T., Banerjee, S., Maurya, P. K., Chatterjee, S. and Chattopadhyay, A. (2019). Heterotic expression of okra hybrids for tolerance to enation leaf curl virus. *Int. J. Veg. Sci*., 26(2): 163-189.

Datta, P.C. and Naug, A. (1968). A few strains of *Abelmoschus esculentus* (L.) Moench, their karyology in relation to phylogeny and organ development. *Beitr. Biol. Pflanzen*., 45: 113-126.

Dutta, S. and Chattopadhyay, A. (2018). First evidence on heterotic affinity and combining ability of cultivated okra [*Abelmoschus esculentus* (L.) Moench] Inbred lines for tolerance to enation leaf curl virus disease. *Agric. Res. & Tech.*, 18(5): 3795-3802.

Fonseca, S. and Patterson, F. (1968). Hybrid vigour in a seven parent diallel cross in common winter wheat (*Triticum aestivum* L.). *Crop Sci.*, 8: 85-88.

Joshi, B., Singh, H. B. and Gupta, P. S. (1958). Studies in hybrid vigour-3 bhendi. *Ind. J. Genet.*, 18(1):5-.68.

Gavint, K. N., Vadodariya, K. V. and Bilwal, B. B. (2018). To study the nature and magnitude of heterosis for fruit yield and yield attributes in okra [*Abelmoschus esculentus* (L.) Moench]. *J. Pharma. Phyto.*, 7(1): 2583-2587.

Hadiya, D. N., Mali, S. C., Baraiya, V. K. and Patel, A. I. (2018). Studies on assessment of heterosis for fruit yield and attributing characters in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Chem. Stud*., 6 (5): 1919-1923.

Kerure, P. and Pitchaimuthu, M. (2018). Heterosis Studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr. Microbiol. Appl. Sci.*,7(9): 1851-1862.

Kulkarni, V. M.; Patel, B. R. and Parihar, A. (2018). Heterosis studies in okra [*Abelmoschus esculentus* (L.) Moench] for green fruit yield and quality parameters over the environments. *Front. Crop Improv*., 6 (2): 81-85.

Kumar, S., Singh, A. K., Yadav, H. and Verma, A. (2017). Heterosis study in okra [*Abelmoschus esculentus* (L.) Moench] genotypes for pod yield attributes. *J. Appl. Natural Sci.*, 9(2): 774-779.

Makdoomi, M. I., Wani, K. P., Dar, Z. A., Hussain, K., Nabi, A., Mushtaq, F. and Mufti, S., (2018). Heterosis studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr. Microbiol. App. Sc*., 7(02): 3297-3304.

More, S. J., Chaudhari, K. N., Vaidya, G. B. and Chawla, S. L. (2017). Estimation of hybrid vigour for fruit yield and quality traits of okra [*Abelmoschus esculentus* (L.) Moench] through Line x Tester analysis carried over environments. *Int. J. Curr. Microbiol. Appl. Sci.*, 6(7): 4101-4111.

Moaward, F.G., Abdelwhab, B.M., Abdelnahun, F.M. and Shehaya, F.W. (1984). *Annuals Agri. Sci.*, 21: 603-613.

Patel, B. G. and Patel, A. I. (2016). Heterosis Studies in Okra [*Abelmoschus esculentus* (L.) Moench]. *Ann. Agric. Environ. Sci*., 1(1): 15–20.

Patel, H. B., Bhanderi, D. R., Patel, A. I., Tank, R. V. and Kumar, A. (2015). Magnitude of heterosis for pod yield and its contributing characters in okra [*Abelmoschus esculentus* (L.) Moench]. *Bioscan*, 10 (2): 939-942.

Paul,T., Desai,R.T. and Choudhary,R. (2017). Genetical studies on assessment of heterosis for fruit yield and attributing characters in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr.*

Microbiol. Appl. Sci., 6(6): 153-159.

Reddy, M. T. (2010). Genetic diversity, heterosis, combining ability and stability in okra [*Abelmoschus esculentus* (L.) Moench]. *Ph. D. Thesis*, submitted to Acharya N. G. Ranga Agricultural University, Rajendranagar, Hyderabad. pp. 1-313.

Satish, K., Bhatt, K., Suresh, K., Prajapati, D. B. and Agalodiya, V. (2017). Heterosis study in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr. Microbial. Appl. Sci.*, 7(24): 85-89.

Shull. G. H. (1914). What is heterosis? *Genet.*, 33: 439-446.

Suganthi, S., Sathiskumar, P., Kamaraj, A. and Shanmugapriya, R. (2019). Exploitation of heterosis through diallel analysis in bhendi [*Abelmoschus esculentus* (L.) Moench]. *J. Pharm. Phyto.*, 2*:* 598-601.

Sabesan, T., Saravanan, K. and Satheeshkumar, P. (2016). Studies on heterosis, inbreeding depression and residual heterosis for fruit yield and its components in okra [*Abelmoschus esculentus* (L.) Moench]. *Pl. Archives*, 16(2): 669-674.

Sapavadiya, S. B., Kachhadia, V. H., Savaliya, J. J., Sapovadiya, M. H. and Singh, S. V. (2019). Heterosis studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Pharma Innov. J.*, 8(6): 408-411.

Tiwari, J. N., Kumar, S., Ahlawat, T. R., Kumar, A. and Patel, Nistha (2015). Heterosis for yield and its components in okra [*Abelmoschus esculentus* (L.) Moench]. *Asian J. Hort*., 10(2): 201-206.

Yadav, Y., Maurya, P. K., Bhattacharjee, T., Banerjee, S., Jamir, I., Mandal, A. K., Dutta, S. and Chattopadhyay, A. (2018). First evidence on heterotic affinity and combining ability of cultivated okra [*Abelmoschus esculentus* (L.) Moench] Inbred lines for tolerance to enation leaf curl virus disease. *Agric. Res. & Tech.*, 18(5): 3795-3802.

Vijayaraghavan, C., and Wariar, U.A. (1946). Evaluation of high yielding bhendi (*Hibiscus esculentus*). Proc. 33rd *Indian Science Congress*, 33:165.

Vekariya, R. D., Patel, A. I., Modha, K. G. and Mali, S. C. (2019). Study of heterosis over environments for fruit yield and its related traits in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Chem. Stud.*, 7(5): 484-490.

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