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## Studies on stigma receptivity for hybrid seed production in okra (*Abelmoschus esculentus* (L.) Moench)

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**Abstract**

A field experiment was conducted during *kharif* 2019 to study the effect of stigma receptivity of seed parent for hybrid seed production in okra using JOL-2K-19 as male parent and JF-55 as female parent. The pollination on same day of emasculation recorded significantly the maximum number of crossed fruits retained per plant (5.48), fruit set percentage (54.78%), fruit weight per fruit (32.06 g), fruit length (19.01 cm), fruit girth (5.22 cm), hybrid seed weight per fruit (4.05 g), number of seeds per fruit (47.22), seed yield per plant (30.52 g) and 100 seed weight (6.21 g) and also seed quality parameters recorded maximum seed germination percentage (86.02%), seedling shoot length (15.11 cm), seedling root length (8.81 cm), seedling dry weight (29.08 mg), seedling vigour index I (length) (2059.24) and seedling vigour index II (mass) (2500.75) as compared to pollination one day and two days after emasculation.

**Keywords:** Stigma receptivity, pollination, emasculation, okra, quality, seed yield

**Introduction**

Okra (*Abelmoschus esculentus* L.) is a vegetable crop, which is grown for its young tender vegetable. Its chromosome number is  $2n=8x=72$  or 144 and is polyploidy in nature belongs to the family Malvaceae. In India, area occupies about 5,13,000 ha with production upto 61,76,000 MT and productivity 12,000 kg ha<sup>-1</sup> during 2018-2019 (Anon., 2019) [5]. While in Gujarat, the area, production and productivity of bhendi is around 75,270 ha, 9,21,720 MT and 12,250 kg ha<sup>-1</sup> respectively during 2017-2018 (Anon., 2018) [4]. It is a potential export earner accounting for 60 per cent of exported fresh vegetable (Sharma and Arora, 1993) [9]. Okra has nutritional values and health benefits. It has high fibre content and it is a good source of folic acid. Fiber can be extracted from the stem of this plant. It is an excellent source of vitamin 'A', 'B', 'K' and 'C'. Hybrid seed production is becoming most essential in agriculture industries for gaining higher profits. Further, the hybrids developed by the public sector have little prospects unless immediate efforts are made to produce large quantities of seeds of such hybrids. Therefore, best hybrid seed production technology should be developed in order to realize the best potential hybrids. So, one of the important factors that influence hybrid seed production is stigma receptivity of seed parent. In okra, hybrid seed yield is influenced by several seed production factors like stigma receptivity, day of emasculation, and time of pollination apart from improved agronomic practices. Therefore, present investigation was carried out to study the effect of stigma receptivity on hybrid seed yield and seed quality in bhendi.

**Materials and Methods**

The parent materials JF-55 (female parent) and JOL-2K-19 (male parent) were obtained from Vegetable research station, Junagadh, Gujarat. The field experiment was carried out at sagdividi farm, Department of Seed Science and Technology, college of agriculture, Junagadh Agricultural university, Junagadh during *kharif* 2019. Junagadh is situated at 21.5°N latitude and 70.5°E longitude with an elevation of 60 meters above mean sea level. The field experiment was laid out in factorial randomized block design in black soil and factorial completely randomized design for laboratory experiments. In stigma receptivity study, there were three treatments consisting of different days for pollination of emasculated flower buds viz. pollination on the same day of emasculation (no stigma starvation), pollination one day after emasculation, pollination two days after emasculation.

The seeds of male and female parent were sown in main field with spacing of 60 X 30 cm and the distance maintained between male and female block is 5m.

The emasculation and pollination were carried out according to the treatments. The floral buds which are likely to open on next day morning hours were only emasculated by using the forceps, needle, scalpel, etc. Emasculation was carried out daily from 2:00 to 5:00 pm (evening hours). The fully opened flowers were plucked from the male parental block and the pollen were transferred to female parent. Different coloured threads were tied for easy identification purpose. Five competitive plants from each treatment and in each replication were randomly selected and tagged for recording observations on growth parameters, yield parameters and seed quality parameters. The seed germination was tested as per the ISTA procedure (Anon., 1999) [3]. Seedling vigour index I (Length) and Seedling vigour index II (mass) was calculated as per Abdul Baki and Anderson (1973) [11].

## Results and Discussion

**Fruit set, seed yield and its attributes:** The statistical differences on fruit character and seed yield components were significant due to stigma receptivity (Table 1 and 2). The present study revealed that stigma becomes fully receptive on the same day of emasculation. The stigma receptivity declined up to two day after emasculation beyond which stigma was found to be either less receptive or non-receptive in most of the observations. On an average, the highest number of crossed fruits retained per plant, fruit set percentage (%), fruit weight per plant (g), fruit length (cm), fruit girth (cm), hybrid seed weight per fruit (g), number of seeds per fruit, seed yield per plant (g) and 100 seed weight (g) were observed (Table 1 and 2) when pollination was done on same day of emasculation (5.48, 54.78%, 32.06 g, 19.01 cm, 5.22 cm, 4.05 g, 47.22, 30.52 g and 6.21 g respectively).

**Table 1:** Effect of stigma receptivity on number of crossed fruits retained per plant, fruit set (%) fruit weight per fruit (g), fruit length (cm) and fruit girth (cm) in okra hybrid

Treatments	No of crossed fruits retained/plant	Fruit set (%)	Fruit weight/plant (g)	Fruit length (cm)	Fruit girth (cm)
D1	5.48	54.78 (47.79) *	32.06	19.01	5.22
D2	3.62	37.35 (37.67)	25.32	17.53	5.03
D3	1.95	20.66 (27.03)	22.38	16.41	4.74
Mean	3.68	37.59	26.58	17.65	4.99
S.Em±	0.09	0.44	0.36	0.06	0.02
C.D. at 5%	0.29	1.32	1.09	0.19	0.08

\* Figures in parenthesis indicate arc sine transformed values

D<sub>1</sub> - Pollination on same day of emasculation

D<sub>2</sub> - Pollination on one day after emasculation

D<sub>3</sub> - Pollination on two days after emasculation

This suggest that the peak stigma receptivity was reached on the same day of emasculation at Junagadh condition, Gujarat and on the other hand pollination two days after emasculation resulted in reduced fruit set. It was observed that when emasculated flower bud was left open for longer period the stigma receptivity decreased. This revealed that the stigma will be receptive for one day after flower opening and there after it declines and become non-receptive after two days of

flower opened. This may be due to the drying of stigmatic surface that led to the reduction in fruit set percentage. These findings are in agreement with the reports of Singh *et al.* (2010) [10] and Abhishek *et al.* (2013) [2] in okra, Priya *et al.* (2009) [7] in Chili, Deshi & Biradarpatil (2016) [6] in brinjal, Santosh and Malabasari (2014) in Bitter gourd and Sujatha *et al.* (2015) [11] in tomato.

**Table 2:** Effect of stigma receptivity on hybrid seed weight per fruit (g), number of seeds per fruit, seed yield per plant (g) and 100 seed weight (g) in okra hybrid

Treatments	Hybrid seed weight per fruit (g)	Number of seeds per fruit	Seed yield per plant (g)	100 seed weight (g)
D1	4.05	47.22	30.52	6.21
D2	3.69	35.44	22.07	5.72
D3	2.96	23.88	16.05	5.18
Mean	3.56	35.51	22.88	5.70
S.Em±	0.05	0.56	0.30	0.03
C.D. at 5%	0.15	1.69	0.90	0.11

D<sub>1</sub> - Pollination on same day of emasculation

D<sub>2</sub> - Pollination on one day after emasculation

D<sub>3</sub> - Pollination on two days after emasculation

### Seed quality parameters

Seed produced from pollination on the same day of emasculation recorded significantly maximum seed germination (86.02%), seedling shoot length (15.11 cm), seedling root length (8.81 cm), seedling dry weight (29.08 mg) (Table 3) over pollination one day and two days after emasculation. This resulted due to higher seed weight (6.21 g) and also bolder seeds harvested from this treatment. Pollination on the same day of emasculation recorded higher

seedling vigour index I (length) (2059.24) and seedling vigour index II (Mass) (2500.75). The increase in seedling vigour index I (length) and II (mass) is due to higher per cent of germination, root length and shoot length. (Table 3). These findings are in agreement with Priya *et al.* (2009) [7] in chilli, Singh *et al.* (2010) [10] and Abhishek *et al.* (2013) [2] in okra, Sujatha *et al.* (2015) [11] in tomato and Deshi and Biradarpatil (2016) [6] in Brinjal.

**Table 3:** Effect of stigma receptivity on seed germination percentage, seedling shoot length (cm), seedling root length (cm), seedling dry weight (mg), seedling vigour index I (length) and seedling vigour index II (mass) in okra hybrid

Treatments	Seed germination (%)	Seedling shoot length (cm)	Seedling root length (cm)	Seedling dry weight (mg)	Seedling vigour index I (length)	Seedling vigour index II (Mass)
D1	86.02 (68.20) *	15.11	8.81	29.08	2059.24	2500.75
D2	77.45 (61.71)	14.17	7.98	26.05	1718.17	2021.61
D3	66.98 (54.98)	12.82	6.87	23.54	1323.35	1579.29
Mean	76.81	14.03	7.88	26.22	1700.25	2033.88
S.Em±	0.17	0.15	0.06	0.12	12.97	10.11
C.D. at 5%	0.50	0.45	0.19	0.37	38.55	30.04

\* Figures in parenthesis indicate arc sine transformed values

D<sub>1</sub> - Pollination on same day of emasculation

D<sub>2</sub> - Pollination on one day after emasculation

D<sub>3</sub> - Pollination on two days after emasculation

## Conclusion

Looking to above discussion, it can be concluded that the pollination on same day of emasculation recorded higher fruit set, number of seeds per fruit, seed yield and higher seed quality parameters such as seed germination percentage, seedling shoot length, seedling root length, seedling dry weight, seedling vigour index I (length) and seedling vigour index II (mass) in the present practice of the pollination on same day of emasculation. The pollination done after one day after emasculation and pollination two days after emasculation should be avoided.

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