

## Effect of Time of Pollination on Fruit Set, Seed Yield and Seed Quality of Okra Hybrid (*Abelmoschus esculentus* (L.) Moench)

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### ABSTRACT

A research experiment was conducted during kharif 2019 to study the effect of time of pollination on fruit set, seed yield and seed quality parameters. Among three different pollination times viz., pollination between 8.00 to 10.00 am (T1), 11.00 am to 1.00 pm (T2) and 2.00 to 4.00 pm (T3), pollination done between 8:00 am to 10:00 am recorded significantly maximum number of crossed fruits retained per plant (4.17), fruit set percentage (42.11 %), fruit weight per fruit (27.97 g), fruit length (18.16 cm), fruit girth (5.09 cm), hybrid seed weight per fruit (3.70 g), number of seeds per fruit (40.22), seed yield per plant (24.89 g) and 100 seed weight (5.96 g) and also seed quality parameters recorded maximum seed germination percentage (80.40 %), seedling shoot length (14.47 cm), seedling root length (8.22 cm), seedling dry weight (27.23 mg), seedling vigour index I (length) (1837.26) and seedling vigour index II (mass) (2205.89).

**Keywords:** Pollination time, Okra, Seed quality, Seed yield, Vigour, Hybrid

### INTRODUCTION

Okra (*Abelmoschus esculentus* (L.)  $2n=8x=72$  or 144) also known as “Lady’s finger”. This vegetable is called ‘Bhendi’ in India. The crop is dicotyledonous, belonging to the order malvales, family malvaceae and genus *Abelmoschus* (syn. *Hibiscus*) (Schippers, 2000). It is being an often-cross-pollinated crop, outcrossing to an extent of 20 per cent by insects is reported (Patil, 1995), which renders a considerable amount of variability. The time of pollination and stigma receptivity plays a crucial role in hybrid seed production of okra. But success rate of pollination varies from 30 to 50 per

cent in okra hybrid seed production since transfer of male pollens to the female flowers during crossing period is most important aspect in large scale production.

The best hybrid seed can be produced from the female parent when there is a perfect coincidence between stigma receptivity and pollen viability. The viable pollens deposited early on stigma may lead to poor seed setting due to non-receptive stigma and similar is the case if pollens are deposited very late on stigma, there is a chance of drying up of stigma and loss of pollen viability.

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In addition to this, the amount of F<sub>1</sub> hybrid seed is also decided by the quantity of the male pollens depositing on the receptive stigma of the female parent. In okra, F<sub>1</sub> hybrid seed yield is influenced by several factors like stigma receptivity, time of emasculation, and pollination time besides use of improved seed production practices.

Therefore, present study was carried out to study the effect of time of pollination on fruit set, seed yield and seed quality in okra hybrid.

## MATERIALS AND METHODS

The investigation was carried out during *kharif* 2019 at sagdividi farm, Department of Seed Science and Technology, College of Agriculture, Junagadh Agricultural University, Junagadh. The male and female seeds were obtained from Vegetable Research Station, Junagadh, Gujarat. The experiment consists of JOL-2K-19 as male parent and genotype JF-55 as female parent for okra hybrid seed production. The field experiment was laid out in randomized block design (factorial concept) in black soil and completely randomized design (factorial) for laboratory experiments in three replications. In present study, there were three treatments consisting of different pollination time *viz.*, – Pollination between 8:00am to 10:00am, 11:00am to 1:00pm and 2:00pm to 4:00pm.

The distance maintained between male and female block is 5m. The spacing followed for sowing male and female seeds in main field is of 60 X 30 cm. With the help of forceps, needle, scalpel, etc. floral buds were emasculated which are ready to open in next day morning. Emasculation was carried out daily in the evening hours. The fresh pollens collected from male parental flowers were transferred to female parent. The female parent after pollination was covered with butter paper bag to avoid contamination with other pollen. Coloured threads were tied for identification purpose. Five plants from each replication and in each treatment were randomly selected and tagged. At the end of the experiment, observations were recorded

on growth parameters, yield parameters and seed quality parameters from tagged plants. The standard seed germination was conducted as per the ISTA procedure (Anon., 1999). Seedling vigour index I (Length) was calculated by multiplying germination percentage with seedling length [root length + shoot length (cm)]. and Seedling vigour index II (mass) was calculated by multiplying germination percentage with seedling dry weight (mg) as per Abdul Baki and Anderson (1973).

## RESULTS AND DISCUSSION

### Fruit set, seed yield and its attributes

In this experiment pollination time was found to be significant for number of crossed fruits retained per plant, fruit set (%), fruit weight per fruit (g), fruit length (cm), fruit girth (cm), hybrid seed weight per fruit (g), number of seeds per fruit, seed yield per plant and 100-seed weight (g). On an average, the highest number of crossed fruits retained per plant (4.17), fruit set (42.11 %), fruit weight per fruit (27.97 g), fruit length (18.16 cm), fruit girth (5.09 cm), hybrid seed weight per fruit (3.70 g), number of seeds per fruit (40.22), seed yield per plant (24.89 g) and 100 seed weight (5.96 g) were observed in the pollination between 8 am to 10 am. The significant increase in seed yield per plant noticed in the 8 am to 10 am pollination time may be due to its higher fruit set percentage, fruit weight and number of seeds per fruit as evident from this study. These results might also be related to prevalence of active stigma receptivity and peak pollen viability during 8 am to 10 am period in view of congenial environmental conditions.

On the other hand, number of crossed fruits retained per plant, fruit set percentage, fruit weight per fruit (g), fruit length (cm), fruit girth (cm), hybrid seed weight per fruit (g), number of seeds per fruit, seed yield per plant and 100-seed weight (g) were lowest in 2:00 pm to 4:00 pm pollination time (3.24, 33.50%, 25.58 g, 17.12 cm, 4.90 cm, 3.44 g, 31.77, 20.72 g and 5.54 g respectively) and it might be ascribed to substantial decline in

pollen viability and drying of stigmatic surface due to high temperature and dry air prevailed in the afternoon hours. These results are well documented in the findings of Basavaraj (2006), Singh et al. (2010) and Abhishek et al. (2013) in okra, Priya et al. (2009) in chilli, Patil et al. (2008), Korat et al. (2018) and Veerasha et al. (2018) in Brinjal. Sundriyal et al. (2005) and Sandra et al. (2012) in bitter gourd, Sanjeev et al. (2008) and Sharma et al. (2017) in tomato.

#### SEED QUALITY PARAMETERS:

Seed quality parameters viz., seed germination (80.40%), seedling shoot length (14.47 cm), seedling root length (8.22 cm), seedling dry weight (27.23 mg), seedling vigour index-I (length) (1837.26) and seedling vigour index-II (mass) (2205.89) were significantly higher in pollination was done between 8:00 am to

10:00 am. The increase in seed quality parameters noticed in 8:00 am to 10:00 am pollination time may be due to optimum number of seeds per fruit as evident in this study and these might have produced more number of heavier and bolder seeds contributing to better seed quality.

On the other hand, seed quality traits were lower in the treatment of 2:00 pm to 4:00 pm pollination time which can be attributed to immature and thinner seeds obtained from fruits of delayed pollination. These results are similar with the findings of Priya et al. (2009) in chilli, Basavaraj (2006), Singh et al. (2010) and Abhishek et al. (2013) in okra, Sandra et al. (2012) in bitter gourd, Sanjeev et al. (2008) and Sharma et al. (2017) in tomato, Patil et al. (2008) and Veerasha et al. (2018) in brinjal.

**Table 1: Effect of time of pollination 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)
T <sub>1</sub>	4.17	42.11 (40.20) *	27.97	18.16	5.09
T <sub>2</sub>	3.64	37.18 (37.25)	26.21	17.66	5.00
T <sub>3</sub>	3.24	33.50 (35.04)	25.58	17.12	4.90
Mean	3.68	37.59	26.58	17.64	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

T<sub>1</sub> – Pollination between 8:00am to 10:00am

T<sub>2</sub> - Pollination between 11:00am to 1:00pm

T<sub>3</sub> - Pollination between 2:00pm to 4:00pm

**Table 2: Effect of time of pollination 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)
T <sub>1</sub>	3.70	40.22	24.89	5.96
T <sub>2</sub>	3.56	34.55	23.04	5.62
T <sub>3</sub>	3.44	31.77	20.72	5.54
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

T<sub>1</sub> – Pollination between 8:00am to 10:00am

T<sub>2</sub> - Pollination between 11:00am to 1:00pm

T<sub>3</sub> - Pollination between 2:00pm to 4:00pm

**Table 3: Effect of time of pollination on seed germination (%), 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)
T <sub>1</sub>	80.40 (64.22) *	14.47	8.22	27.23	1837.26	2205.89
T <sub>2</sub>	76.88 (61.58)	14.18	7.87	26.43	1707.41	2048.03
T <sub>3</sub>	73.17 (59.10)	13.44	7.57	25.01	1556.10	1847.72
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

T<sub>1</sub> – Pollination between 8:00am to 10:00am

T<sub>2</sub> - Pollination between 11:00am to 1:00pm

T<sub>3</sub> - Pollination between 2:00pm to 4:00pm

## CONCLUSION

Looking into above discussion, it is concluded that pollination time of 8:00 am to 10:00 am was found to be optimum for hybrid seed production of okra as it has recorded better fruit set, fruit weight per plant, fruit length, fruit girth, hybrid seed weight per fruit, seed number, seed yield per plant, 100 seed weight, seed germination, shoot length, root length, seedling dry weight and vigour index, compared to 11:00 am to 1:00 pm and 2:00 pm to 4:00 pm pollination period.

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