

Original Research Article

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Effect of Crossing Ratio on Seed Yield and Quality of F₁ Hybrid Okra [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT

Keywords

Crossing ratio, Okra, Germination, Vigour index, Arka Anamika.

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An investigation on hybrid seed production was undertaken in *Karif* season 2014-15 to study the effect of crossing ratio of male to female flower (IC-550848 × Arka Anamika) on seed yield and quality of F₁ hybrid okra. Among the crossing ratios, maximum fruit set percentage (42.75), 100 seed weight (6.60 g), number of seeds per fruit (60.00), seed yield per plant (27.61 g), germination (91.85 %) and vigour index (3249) were noticed in crossing ratio of 1:4 (male : female) compared to 1:2, 1:6, 1:8 and 1:10.

Introduction

Okra [*Abelmoschus esculentus* (L.) Moench] is a fast growing annual which has captured a prominent position among the vegetables and is commonly known as bhendi or lady's finger in India. India is the largest producer of okra in the world with an annual production of 63.46 million tonnes from an area of 0.532 million hectares with a productivity of 11.9 tonnes per hectare (Anon., 2014).

In okra, F₁ hybrid seed set, seed yield and quality are influenced by several factors like flower characteristics, time of pollination, crossing ratio of female to male, fruit load per plant and growth regulators spray besides use of improved seed production techniques. The amount of F₁ hybrid seed and its quality has decided by the quantity of the male pollens depositing on the receptive stigma of the

female parent. In case, if more pollen is deposit on the stigma, there may be more chances of poor seed setting and poor seed quality due to competition between germinating pollens. Similar is the case with deposition of inadequate viable pollens. The quantity of pollens depositing on stigma can be manipulated by adjusting the crossing ratio of female to male flower. With these the objective to study the ideal crossing ratio of male to female flower ratio on fruit set, seed yield and quality was under taken.

Materials and Methods

The investigation was carried out to standardize the hybrid seed production techniques in okra. The seed crop was raised at field of Biotechnology and Crop

Improvement, Kittur Rani Chennamma College of Horticulture, Arabhavi during *Kharif* 2014-15 by adopting the package of practices of University of Horticultural Sciences, Bagalkot (Anon., 2013). The experiment consist of five crossing ratio *viz.*, 1:2, 1:4, 1:6, 1:8 and 1:10 of male (IC-550848) to female (Arka Anamika). The flower buds of female parent prior to the day of opening were emasculated and bagged in the evening and pollination was done on next day morning with the flowers of male parent according to the crossing ratio. observation were recorded for number of flowers crossed per plant, number of fruits retained per plant, fruit set percentage, seed weight per fruit, number of seeds per fruit, seed yield per plant, germination per cent, seedling shoot length, seedling root length, seedling dry weight and vigour index.

The seed obtained from each treatment combination were evaluated for seed quality parameters in the laboratory of the Department of Biotechnology and Crop improvement, Kittur Rani Channamma College of Horticulture, Arabhavi. Laboratory test was conducted as per ISTA rules (Anon., 1999) by adopting rolled towel method. The vigour index values were calculated as per the method prescribed by Abdul-Baki and Anderson (1973) and expressed in whole number.

Vigour index = Germination (%) x seedling length (cm).

Results and Discussion

In this experiment, crossing ratio of male to female flower was found to be significant for number of crossed fruits retained, fruit set percent, number of seeds per fruit and seed yield per plant (Table 1 and 2). The highest number of crossed fruits retained per plant (6.98), fruit set (42.75%), number of seeds per

fruit (60.0), 100 seed weight (6.60) and total seed yield per plant (27.61 g) were observed in the crossing ratio of 1:2 (male : female), which was on par with the crossing ratio 1:4. The lowest number of crossed fruits retained per plant (4.83), fruit set (32.03%), number of seeds per fruit (53.66), 100 seed weight (6.16) and total seed yield per plant (15.96 g) were observed in the crossing ratio of 1:10 (male : female).

The significant increase in seed yield per plant in 1:2 and 1:4 crossing ratio may be attributed to its higher fruit set percentage, number of seeds per fruit, seed weight per fruit and 100 seed weight. It might be further resulted due to availability of sufficient viable pollen mass in 1:2 and 1:4 crossing ratio compared to other crossing ratios.

With deposition of inadequate viable pollens found in 1:6, 1:8 and 1:10 ratio and hence it might have resulted in lower fruit set percentage, fruit weight and seed yield and quality components.

Similarly, the earlier results were confirmed by Khadi *et al.*, (1995), Doddagoudar (2005) in cotton and Patil (2005) in brinjal.

Marked differences due to crossing ratios were noticed for seed germination, shoot length, root length, seedling dry weight and seedling vigour index (Table 3). However, germination (91.85%), root length (12.55 cm), shoot length (22.82 cm), seedling dry weight (65 mg) and seedling vigour index (3249) were more in the 1:2 crossing ratio, which was on par with 1:4 followed by 1:6 ratio (Table 3). All these quality parameters were less (81.30%, 20.30 cm, 10.97 cm, 58.9 mg and 2543) in the 1:10 ratio (C5). The increase in seed quality parameters in the 1:2 and 1:4 crossing ratio may be due to the higher fruit set and seed number coupled with seed weight per fruit.

Table.1 Effect of crossing ratio on number of crossed fruits retained per plant and fruit set per cent in okra F₁ hybrid

| Crossing ratio(C) | No. of flowers pollinated per plant | No. of crossed fruits retained per plant | Fruit set (%) |
|---------------------------|-------------------------------------|--|---------------|
| C ₁ -1:2 (M:F) | 16 | 6.98 | 42.75 |
| C ₂ -1:2 (M:F) | 16 | 6.90 | 42.63 |
| C ₃ -1:2 (M:F) | 16 | 5.83 | 36.90 |
| C ₄ -1:2 (M:F) | 16 | 5.35 | 33.30 |
| C ₅ -1:2 (M:F) | 16 | 4.83 | 32.03 |
| S. Em± | -- | 0.090 | 0.120 |
| CD @ 5% | -- | 0.290 | 0.380 |

M- Male, F-Female

Table.2 Effect of crossing ratio on number of seeds per fruit, 100 seed weight and total seed weight of crossed fruit per plant in okra hybrid

| Crossing ratio(C) | Number of seeds per fruit | 100 seed weight (g) | Total seed weight of crossed fruit per plant (g) |
|---------------------------|---------------------------|---------------------|--|
| C ₁ -1:2 (M:F) | 60.00 | 6.60 | 27.61 |
| C ₂ -1:2 (M:F) | 59.35 | 6.57 | 26.91 |
| C ₃ -1:2 (M:F) | 56.52 | 6.40 | 21.07 |
| C ₄ -1:2 (M:F) | 55.20 | 6.30 | 18.60 |
| C ₅ -1:2 (M:F) | 53.66 | 6.16 | 15.97 |
| S. Em± | 0.150 | 0.040 | 00.370 |
| CD @ 5% | 0.480 | 0.130 | 1.150 |

M- Male, F-Female

Table.3 Effect of crossing ratio on germination percentage, seedling shoot length, seedling root length, seedling dry weight and seedling vigour in okra hybrid

| Crossing ratio (C) | Germination (%) | Seedling shoot length (cm) | Seedling root length (cm) | Seedling dry weight (mg) | Vigour index |
|---------------------------|-----------------|----------------------------|---------------------------|--------------------------|---------------|
| C ₁ -1:2 (M:F) | 91.85 | 22.82 | 12.55 | 65.0 | 3249 |
| C ₂ -1:2 (M:F) | 91.42 | 22.77 | 12.32 | 64.8 | 3209 |
| C ₃ -1:2 (M:F) | 88.50 | 21.55 | 11.95 | 61.9 | 2965 |
| C ₄ -1:2 (M:F) | 84.32 | 20.84 | 11.67 | 60.9 | 2742 |
| C ₅ -1:2 (M:F) | 81.30 | 20.30 | 10.97 | 58.9 | 2543 |
| S. Em± | 0.210 | 0.150 | 0.160 | 0.249 | 19.300 |
| CD @ 5% | 0.632 | 0.460 | 0.500 | 0.769 | 59.700 |

M- Male, F-Female

Chattopadhyaya (2000) also reported similar findings in brinjal, Yogeeshha *et al.*, (1999) in tomato, Doddagoudar (2005) in cotton, and Patil (2005) in brinjal.

From the above discussion, it can be concluded that for pollination of male flowers with female flower at the crossing ratio 1: 2 or 1:4 was found to be more ideal by registering superior seed quality parameters along with seed yield as compared to 1:6, 1:8 and 1:10 crossing ratios in okra hybrid seed production.

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