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The Reproductive Biology of Okra

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Introduction

Okra, *Abelmoschus esculentus* L. (Moench), is a vegetable crop produced in tropical and subtropical regions of the world. Both huge commercial farms and gardens can grow this crop well. Green, non-fibrous fruits or pods with round seeds are the reason okra is grown. The immature fruits are collected and consumed as vegetables. Okra stems and roots are used to clarify sugarcane juice, which is utilized to make brown sugar or gur (Chauhan, 1972). In certain nations, its ripe seeds are roasted, pulverized, and used as a replacement for coffee. In order to make paper, mature fruits and stems that contain crude fiber are utilized. An alternate source of edible oil is extracts from okra seeds. Unsaturated fats like oleic acid and linoleic acid are abundant in the greenish-yellow edible oil, which also has a good flavor and aroma. The seed has a 40% oil content, which is fairly significant. Okra is a valuable source of vitamins, calcium, potassium, and other minerals that are frequently missing in the diets of underdeveloped nations.

Reproductive Biology

Growth and Development

growth and development Okra takes 90 to 100 days to mature from sowing to harvest. Typically, it is an annual plant. Its stem is strong, upright, branching irregularly, and ranges in height from 0.5 to 4.0 meters. The bloom is axillary and solitary, although the leaves are alternating and often five lobed. Okra plants grow in an Indeterminate growth habit. Although flowering is constant, it is very reliant on biotic and abiotic stress. Typically, the plant produces its first blossom one to two months after being sown. After flowering, the fruit, which is a capsule, grows quickly.

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The fourth to sixth day after pollination is when fruit length, height, and diameter expand the most. Fruit is often picked for food at this time. Okra pods are picked when they are young, have a high mucilage content, but before they become very fibrous. According to Nath (1976), fiber synthesis typically begins in fruit on the sixth day after fruit formation and suddenly increases on the ninth day. Depending on the type, the season, the soil's quality and moisture, and other factors, okra plants can continue to bloom and bear fruit indefinitely. In fact, consistent harvesting encourages ongoing fruiting to the point that it could be necessary to pick daily in regions with very rapid development.

Floral Biology

The okra flower has five white to yellow petals with a crimson or purple patch at the base of each one. It has a diameter of 4 to 8 cm, and it withers in a day. The floral structure combines self-compatibility with hermaphroditism.

Flower buds emerge in the axil of each leaf, usually above the sixth to eighth leaf, depending on the cultivar. The crown of the stem holds 3-4 undeveloped flowers at this time, but later on during the plant's profuse flowering period, there may be as many as 10 immature blooms on a single crown. The lowermost flower buds blossom into flowers as the stalk lengthens. There

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may be a delay of two, three, or more days between the formation of each bloom, but never more than one blossom appears on a single stalk.

A flower bud initiates and develops into full bloom in around 22–26 days. A staminal column that may contain more than 100 anthers surrounds the style. By extending the staminal column or as a result of insect feeding, the pollen may come into touch with the stigmas (Thakur and Arora, 1986). Okra flowers reproduce on their own as a result. One pollen grain may produce several tubes because it has a vast number of pores, each of which is a possible source for a tube (Purewal and Randhawa, 1947).

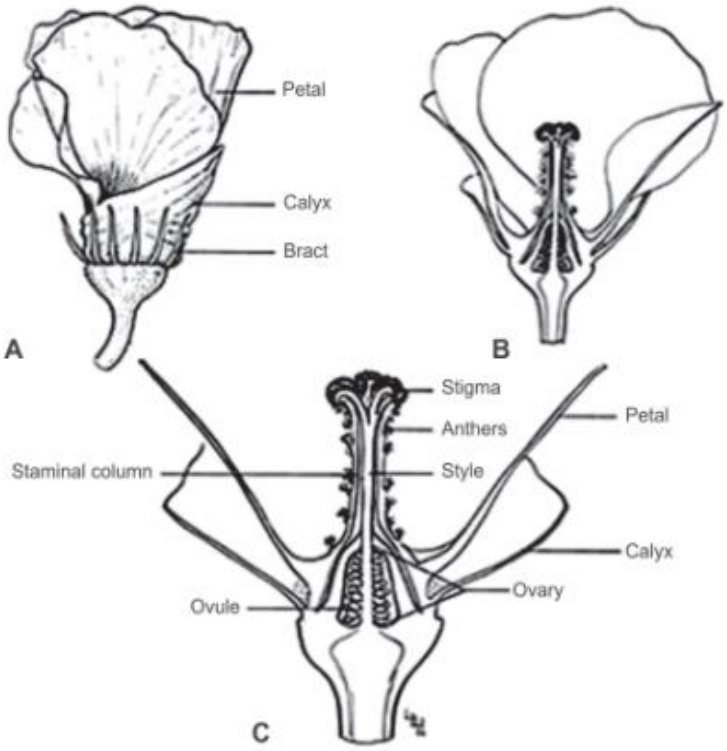

Figure 4: Okra flower. A Side view; B longitudinal section; C longitudinal section of staminal column

Pollination and Fertilization

Genotype and environmental variables including temperature and humidity have an impact on floral bud initiation, blossoming, anthesis, and stigma receptivity. According to research done on six different okra types, flower buds begin to form between 22 and 26 days after seeding, and the first bloom opens between 41 and 48 days later. Flowering continues after it has begun for 40 to 60 days. Anthesis was seen between 6 and 10 in the morning. Anthesis is a time when self-pollination may take place because anthers dehisce before to flower opening. Anthers

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undergo transverse dehiscence, which is complete in 5–10 minutes (Purewal and Randhawa, 1947).

The possibility of a self-pollinated crop has been demonstrated experimentally by the lack of a significant difference in fruit set under open-pollinated, self-pollinated (by bagging alone), and self-pollinated (by hand pollination of bagged flowers) conditions (Purewal and Randhawa, 1947). This crop has not been documented to exhibit the inbreeding depression that is prominent in cross-pollinated crops Okra doesn't require insects for pollination or fertilization, although bees find the blossoms particularly alluring, and the plants are cross-pollinated. There have been reports of cross pollination to the range of 4–19% (Purewal and Randhawa, 1947) the highest documented cross pollination was 42.2%

1. Selection of Bud For Emasculation

2. Removal of Petals & Anthers in selected Bud

3. Pollination of emasculated bud

4. Pollinated bud of okra

5. Bagging of pollinated bud help of butter paper bag

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Seed Dispersal

Spread of Seeds Okra is a member of the plant family known as explosive spreaders, or plants whose mature fruits burst and send seeds flying many feet from the mother plant. Okra seeds can scatter up to 2-3 meters when they break.

Methods of Reproductive Isolation

A self-pollinating crop like okra needs a lot of space between the different types in order to keep its integrity. The fact that a plant can self-pollinate has occasionally been used as evidence that it is not required to isolate self-pollinators. Contrarily, the quantity of cross-pollination that can naturally occur typically has nothing to do with the capacity for self-pollination (McCormack, 2004). As was already indicated, research on the degree of natural cross-pollination in okra has revealed that there is a sizable quantity of cross-pollination. According to Indian minimum seed certification criteria for okra, an isolation distance of 400 meters is needed for the generation of foundation seeds of varieties or hybrids (Tunwar and Singh, 1988). As a result, India has established the criteria of 400 meters as the isolation distance for conducting controlled field trials of genetically modified okra varieties/hybrids.

Conclusion

In conclusion, the study of reproductive biology in okra (Abelmoschus esculentus) sheds light on the intricate processes that govern its reproduction, from flower development and pollination to fertilization and seed formation. Okra exhibits fascinating mechanisms to ensure successful reproduction, such as its self-pollination capabilities and the role of various pollinators in enhancing fruit yield. Understanding the reproductive biology of okra is crucial not only for optimizing crop production but also for conserving genetic diversity and enhancing its resilience in the face of environmental challenges.

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