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Scientific Okra Cultivation

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It is an important vegetable crop grown in summer and rainy seasons throughout India. The medicinal properties of okra are associated with genitor-urinary disorders, spermatorrhoea and chronic dysentery. Scientific okra cultivation is very important to get higher and quality production. In Indian conditions, an yield of 60-70 q/ha in summer and 100-120 q/ha in rainy season can be obtained with scientific cultivation of okra.

Introduction

Okra (*Abelmoschus esculentus*) is an annual vegetable crop grown in tropical and subtropical regions. Tender, green fruits are cooked in curry and soup. The root and stem are used for clearing cane juice in preparation of 'gur'. High iodine content of fruits helps control goitre. The fruits also help in cases of renal colic, leucorrhoea and general weakness. It has yet multiple uses. The dry seed contains 13–22% good edible oil and 20–24% protein. The oil is used in soap, cosmetic industry and as vanaspati while protein is used for fortified feed preparations. The crushed seed is fed to cattle for more milk production and the fibre is utilized in jute, textile and paper industry. India has an area of 231 thousand hectare with production of 6350 thousand metric tones of okra with an average productivity of 27.5 m tonnes per hectare (NHB, 2013-14). Uttar Pradesh, Bihar and Orissa are major okra-growing states in India.

Climate

Okra requires a long, warm and humid growing period. It can be successfully grown in hot humid areas. It is sensitive to frost and extremely low temperatures. For normal growth and development a temperature between 24°C and 28°C is preferred. The plants at higher temperatures grow faster and the higher position is reached earlier. For faster plant growth still higher temperature helps though it delays the fruiting. But at higher temperatures beyond 40°–42°C, flowers may desiccate and drop, causing yield losses.

For seed germination optimum soil moisture and a temperature between 25°C and 35°C is needed with fastest germination observed at 35°C. Beyond this range the germination will be delayed and weak seeds may not even germinate.

Soil

It is grown on sandy to clay soils but due to its well-developed tap root system, relatively light, well-drained, rich soils are ideal. As such, loose, friable, well manured loam soils are desirable. A pH of 6.0–6.8 is ideally-suited. All soils need to be pulverized, moistened and enriched with organic matter before sowing.

Varieties

Important commercially cultivated varieties in different parts of the country are: Arka Anamika Co 1, MDU 1, Azad Kranti, Gujarat Bhindi 1, Parbhani Kranti, Perkins Long Green, Punjab 8, Pusa A 4, Pusa Makhmali, Pusa Sawani, Red Bhindi and TN Hybrid 8

Arka Abhay: Resistant to yellow-vein mosaic virus, its plants and fruits resemble to those of Arka Anamika in appearance.

Harbhajan Bhindi: Its plants are very tall, thick and prolific-bearing with large, moderately lobed leaves having rough surface and prominent veins. The fruits are very long, tapered, bright green, spineless and mostly 8-ridged.

Hisar Unnat: It is resistant to yellow-vein mosaic virus. It is suitable for growing during summer as well as rainy season.

Punjab 7: The plants are tall in *kharif* and medium-tall in spring-summer. Fruits are medium-long, green, 5-ridged, slightly furrowed with less pointed beak. Fruits are borne on 5th–6th node, 50 days after sowing. It yields 100q/ha in *kharif* and 50q/ha in spring-summer.

Punjab Padmini: First picking is available in 53–54 days. It possesses field resistance to yellow-vein mosaic virus and tolerance to jassids and cotton boll-worm. It is suitable for *kharif* and summer seasons of north and winter season of southern India. On an average, the yield is 100–125q/ha green fruits or 12.5q/ha dries seed.

Varsha Uphar: It has high degree of resistance to yellow-vein mosaic virus and field tolerance to leaf hoppers. It can be grown in spring-summer as well. It takes 46–47 days to first picking. Fruit bearing starts from the 4th node. Due to fast growth of fruits, harvesting on alternative days is recommended

Cultivation Practices

Sowing: Okra gives little success on transplanting and thus seed is sown directly in the soil by seed drill, hand dibbling or behind the plough. Broadcasting is not recommended as it increases seed rate as well as causes great inconvenience in cultural operations and harvesting. Sowing on ridges ensures proper germination, reduces water requirement during spring-summer and helps in drainage during rainy season.

Sowing time: June-end is sowing time for *kharif* crop and February-end to early-March for spring-summer crop in north India. In southern India, it could be grown year round. Winter crop with November-sowing is also taken. In north Indian hills, it is sown during April–June while in eastern and western India, summer crop sowing is done during January–February. In West Bengal, sowing continues from February to June.

Spacing: A planting distance of 60cm × 30cm, is recommended for branching and robust types, while 45cm × 30cm is for non-branching types. During spring-summer season with less plant

growth these spacing are kept at 45cm × 30cm or even less. For harvesting smaller fruits for fresh fruit export a group of 2–3 rows at 20cm distance keeping 60cm between these groups of rows could be planted allowing 20–30cm between plants within the rows.

Seed rate and its treatments: This eases harvesting and checks branching. The seed rate of 18–22kg/ha for spring-summer and 8–10kg for rainy *(kharif)* season crop is optimum. Higher seed rate could be used if the crop is to start early in spring summer as it augments germination loss due to low temperature.

Soaking seeds in 0.2%. Bavistin solution overnight helps activate germination and protects seedlings from wilt. Soil treatment with Furadon @ 2kg ai/ha (20–22kg product) helps protect plants from root-knot nematodes and other pests during initial 4–5 weeks. Sufficient soil moisture and temperature around 30°C help in quick and uniform germination. Sowing in moist soil is preferred over irrigation after sowing.

Manuring and fertilization: The farmyard manure should be mixed in soil at the time of land preparation along with whole quantity of P and K. Half of N should be added to the soil before sowing, while one-fourth before flowering as side-dressing and one-fourth in 3 consecutive foliar sprays (1% urea) at 10 days interval during fruiting. Okra responds to 150kg N/ha depending on genotype and soil fertility. Similarly soils deficient in P and K improve fruiting and fruit quality when these are applied to the soil externally. Moreover fruiting and fruit appearance are also improved. With the advent of high-yielding varieties and hybrids, their nutritional requirement has gone higher.

Interculture operations: Thin out the closely germinated plants at one true leaf stage. Proper weed management in okra could save up to 90% crop losses due to weeds. A total of 3–4 weedings starting from 20 days after sowing are required till the crop covers the soil surface. Use of weedicides reduces the number of weedings to zero during summer and 1 during *kharif* (rainy) season. Fluchloralin (Basalin 48ec) @ 1.2kg/ha as Pendimethalin (Stomp 30ec) @ 0.75kg/ha as post sowing and pre-emergence soil surface spray gives initial control of dicot weeds, though one weeding may be needed in *kharif* crop.

Crop rotations: Okra could be taken in different cropping systems. In sequential cropping, potato–carrot–okra; okra–potato–tomato; cauliflower–tomato–okra; groundnut– greens–wheat–okra; okra–palak–potato–muskmelon and okra–radish–cauliflower– squash–cowpea give crop security and higher income/unit area. Okra + radish and okra + Frenchbean give higher returns than solo crop. They respond to higher doses of NPK indicating better utilization of fertilizers under intercropping. Okra could give 300–500% crop land-use efficiency as an intercrop in cassava and cucurbits. Growing okra–cowpea–maize, maize–okra–radish and okra–okra–radish reduces bacterial wilt in tomato and brinjal taken as succeeding crop.

Irrigation: First irrigation should be given when first true leaf initiates in spring-summer and when it expands in *kharif* (rainy) season. Subsequent irrigations at 4–5 days interval are given to summer crop. If temperature goes around 40°C, frequent light irrigations are recommended to help proper fruiting. Drip irrigation saves around 85% water requirement though it is not yet commercial in okra. Furrow system is better than flood system. Moisture stress during flowering

and fruit/seed setting causes around 70% crop losses. The nutrient uptake from soil is also at peak during fruit set and development stages. A water stress in the field during this period not only causes yield reductions but also affects the nutritional status of the fruits.

Disease Management

Enation leaf-curl (Transmitted by whitefly): Initial symptoms of the disease are small, pin-head enations followed by warty and rough texture of the leaves. Later on the leaves begin to curl in an adaxial direction. Mild and bold enation are prominant on the under surface of the leaves. Twisting of the main stem and lateral branches along with enations are common. The disease may cause yield loss up to 30–40%.

Control: The disease spread can be reduced by foliar sprayings of Dimethoate (0.05%) at 10-day interval. The infected plants should be rouged out as soon as they are noticed

Yellow-vein mosaic (Transmitted by whitefly): The characteristic symptom of this disease is homogenous interwoven network of yellow veins, enclosing islands of green tissues within. It causes yield losses up to 80–90%

Control: Four to five foliar sprayings of Dimethoate (0.05%) or Oxydemeton methyl (0.02%) at 10-day interval, followed by 1 or 2 sprays of mineral oil (2%). Apply Carbofuran @ 1kg/ha at the time of sowing. Rouge diseased plants. Use resistant varieties Arka Anamika and Arka Abhay.

Pest Management

Shoot and Fruit Borer (*Earias vittela* and *E. insulana*): The incidence of fruit borers usually occurs during humid conditions after the rainfall. The adult female lays eggs individually on leaves, floral buds and on tender fruits. Small brown caterpillars bore into the top shoot and feeds inside the shoot before fruit formation. Later on they bore into the fruits and feed within. Affected fruits become unfit for consumption.

Control: The infested fruits and shoots should be removed regularly and buried deep in the soil. Spraying with Quinalphos 25 EC (2 ml/litre of water) or Carbaryl (4 g/litre of water) effectively controls the pest. Before spraying all the affected plant parts should be removed.

Leaf Hopper (*Amrasca biguttula biguttula*): This pest attacks the crop at its early stage of growth. Small, greenish leaf hoppers; nymphs and adults are found on the underside of the leaves. The adults and the nymphs suck the cell sap from the leaves. As a result the leaves curl upwards along the margins and have a burnt look which extend over the entire leaf area. The affected plants show a stunted growth.

Control: Soil application of Carbofuran 3 G (1 kg a.i./ha) at the time of sowing effectively controls the pest. Spraying the crop with Monocrotophos (0.05%) at fortnightly intervals starting with the appearance of the pest provides a good control.

Mites (*Tetranychus spp.*): The infestation of mites is mostly observed during the warm and dry periods of the season. Nymphs and adults suck cell sap and whitish grey patches appear on leaves. Affected leaves become mottled, turn brown and fall.

Control: Spraying with Wettable Sulphur 80 WP (2 g/ litre of water) or Dicofol 18.5 EC (2.5 ml/litre of water) effectively control the mites.

White Fly (*Bemisia tabaci*): The milky white minute flies; nymphs and adults suck the cell sap from the leaves. The affected leaves curl and dry. The affected plants show a stunted growth. White flies are also responsible for transmitting yellow vein mosaic virus.

Control: Soil application of Carbofuran (1 kg a.i./ha) at the time of sowing and 4-5 foliar sprays of Dimethoate (0.05%) or Metasystox (0.02%) or Nuvacron (0.05%) at an interval of 10 days effectively controls the whitefly population.

Root-Knot Nematode (*Meloidogyne incognita*): The root-knot nematode enters the roots causing characteristic root knots or galls. The aerial symptoms consist mainly of stunted plant growth and yellowing of leaves. Nematode attack in the seedling stage leads to pre- and post-emergence damage resulting in reduced crop stand.

Control: Cultural control methods such as rotation with non-host crops such as cereals, fallowing and deep ploughing 2-3 times in summer months is recommended. Application of Nemagon (30 litres/ha) with irrigation before sowing is recommended to protect the seedling in its early stage of plant grow.

Harvesting

Early harvesting gives lower yields of tender fruits with shorter shelf-life. In general, harvesting on every alternate day is advisable. A cheap hand glove or cloth bag should be used to protect fingers. Harvesting in the morning is convenient. For distant markets, harvesting late during evening and transporting during night is also advise

Yield

Yield of okra depending on the varieties, climatic condition and season of okra cultivation. In summer season crop gives 60-70 q/ha and rainy season crop 100-120 q/ha.

Marketing

The fruits are graded. For processing industry and fresh fruit export 6–8cm long fruits are sorted out. Longer fruits are used for fresh market. For local market, fruits are cooled (preferably) and filled in jute bags or baskets. For export, suitable size perforated paper cartons are taken and pre-cooled fruits are packed and transported in refrigerated vans. Export market requires tender, dark green, straight, short (6–8cm) fruits.

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