Okra manual

info@sawie.net
Tel +9230450115
Website: sawie.net
14/4, 3 Gillani Park, Shadab Colony, Ferozepur Road Lahore, Pakistan

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THANK YOU!

This is to formally thank to all those who are contributing their services, dedication, and assistance to SAWIE, and we are extremely grateful to all of you for this kind gesture. What we're doing couldn't have been possible without your guidance, intelligence, and enlightenment. We're eagerly looking forward to making this relationship stronger and stronger with every passing day, and your presence in this organization means the world to us.

SAWIE wishes you all the possible luck in every aspect of your life.

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Introduction

- Okra (***Abelmoschus esculentus*** L.) also known as ladyfinger belongs to the family Malvaceae
- It is an important summer crop that is used as a vegetable for cooking, frying, or soup purposes
- Important crop of many parts of the world, its origin is tropical Asia and Africa
- Now it is widely grown in many parts of Pakistan
- Pakistan ranked in 5th number in okra cultivation
- It is rich in vitamins (A, B, C), protein, calcium, potassium, iron, iodine, and other mineral materials
- The stem of okra plant rich in crude fiber that is used in the paper industry

Area and production

- In Pakistan 15529 hectare area is under cultivation with the production of okra is 118986 tons
- Major okra growing cities of Pakistan are Multan, D.G Khan, Rahim yar khan, Faisalabad, Rawalpindi, Gujranwala, Vehari, Okara, and Toba Tek Singh
- The average share of provinces in the area and production of okra is given below:

Share of all provinces in area and production of okra

Sr.no	Province	Area (hectare)	Production (tons)
1.	Punjab	5909	67058
2.	Sindh	4915	18995
3.	Kpk	2083	16809
4.	Baluchistan	2622	16124

Area, production, and an average yield of okra in Punjab (2015-20)

Sr.No.	Year	Area		Production	Average yield	
		000 hectare	000 acre	000 tons	Kg per hectare	Mounds per acre
1.	2015-16	5.909	14.434	67.057	11349	123.05
2.	2016-17	5.932	14.634	68.056	11473	124.39
3.	2017-18	5.920	14.630	68.589	11585	125.61
4.	2018-18	5.922	14.658	70.438	11894	128.96
5.	2019-20	5.841	14.434	70.739	12110	131.30

Varieties of okra

- To get good yield of okra following varieties of okra are recommended:
  - Sabz pari
  - Pusa sawani
  - Arka anamika
  - Green wonder
  - Sharmili (evergreen)

Climate and soil

- Okra is summer season, Kharif crop that requires high temperature for good production
- It can tolerate a wide range of soils and rains and grow well in both dry and wet season
- For better production of okra, the soil should be fertile, granular, and well leveled
- It can be cultivated in well-drained sandy loam soils with good drainage facilities
- For the best yield of okra, the pH of the soil should be 6.0 to 6.8
- Summer crop and highly sensitive to frost
- The optimum temperature should be 25-30^{o}C for better production of okra
- Seed optimum germination is increase at 25^{o}Cand germination reduced at a temperature below 17^{o}C

Seed rate and sowing time:

Seed treated with fungicide Topsin M2g/kg before sowing of 24 hours

- For better growth of okra, at least 12-15 kg seeds per acre are required for summer season crop and 8-10 kg seeds per acre are required for rainy season crop
- The first crop is grown from mid-February to march that gives fruit from April to September
- The second crop is grown from mid-June to mid-July that gives fruit in August-November

Preparation of land:

- Incorporate 20 to 25 tons of well-decomposed farmyard manure per hectare one month before okra production
- Two to three times ploughing is done so that the farmyard manure mix very well in soil and then irrigate the field
- Ridges and beds are made on well-prepared soil for the sowing of okra seeds
- Before sowing recommended fertilizers should be applied in ridges and maintain a 75cmdistance between ridges

Method of sowing:

- In prepared soil make ridges at a distance of and half feet and dig 1 inch deep lines from both sides
- Seed can also be sown on both sides of the 60-75 cm wide ridges in addition to strips
- Be careful that seeds should not sow at a depth of more than 2 cm
- In addition after seed sowing, irrigate the field in such a way that only moisture can reach the seeds

Irrigation:

- First irrigation is given just after the seed sowing in such a way that water does not rise above the ridges
- Only moisture reaches the seed so that the soil does not harden and seed germination is not affected
- When the weather gets too hot, water requirement increases, so irrigate the field after 4 to 5 days in summer
- In the winter/ rainy season, irrigate the field after 10 to 12 days or whenever required

Hoeing and thinning:

- For better production of okra, hoeing and thinning of plants at right time is very important
- Pruning should be done when the plants are 3-4 inches high, remove all other plants from each hole except one healthy plant
- Thinning should be done at the 8-10 cm height of plants for better plant growth
- Three to four hoeing practices are required to protect the crop from weeds and to get a better yield

Eradication of weeds:

- Goosefoot/lambs quarter common (bathu), broadleaf dock (jungli palak), jungle halon, and slender amaranth (chulai) weeds cause damage in February-March cultivated okra
- Okra crop cultivated in mid-March and June is mostly affected by slender amaranth (Chulai), false amaranth (Tandla), crowfoot grass (Madhana ghas), yellow nutsedge (Della), and horse pursalane (ITSIT) weeds
- For better growth of the crop, timely control of weeds should adopt
- Different control measures of weeds are given below:

i. Weed control before sowing

- Spray Pendimethalin at the rate of 1200 mL per acre 24 hours after sowing in okra field cultivated in February-march
- Similarly, May-June grown crop can be sprayed with 800 mL of Pendimethalin herbicide just 24 hours after sowing of seeds

- In the okra field, Pendimethalin is more effective as compared to dual gold herbicide

ii. Weed control after sowing

- To control the growth of the weeds in the May-June cultivated crop, after three weeks of cultivation add a shield on the ridges, and then spray can be done with 800 mL of dual gold and 600 mL of gramoxone per acre

Fertilizer recommendations

- Determine the amount of fertilizer based on the laboratory analysis of the soil
- At the time of land preparation, add 1 bag of ammonium sulfate, and 3 bags of superphosphate per acre
- At the flowering stage, apply 1 bag of ammonium sulfate and half a bag of urea per acre
- After 3ed picking of fruit, incorporate the soil with 1 bag of ammonium sulfate and half bag of urea per acre

Fertilizer recommendations for an average fertile soil

Amount of nutrients (kg/acre)			Amount of fertilizers (bags/acre)
Nitrogen N	**Phosphorus P**	**Potash K**	**At sowing time**
26	35	25	1.5 bag of DAP, 1 bag of ammonium nitrate or ammonium sulfate, and 1 bag of SOP

- In addition to the above-mentioned fertilizers, apply 15 20 kg of urea per acre after every fortnight when the crop grows large

Diseases of okra:

Damping off

- The damping-off problem induced by fungi ***Pythium*** **spp.** and ***Rhizoctonia solani*** **L**.
- Attacks young plants before or after crop grow.
- In the first case, the seeds rot, and the growing plants die
- Plant growth stops and suddenly begin to wither
- Dark brown spots appear on the lower parts of the plant stem

- The germs of this disease are present in the soil in case of poor drainage it intensifies

Control

- This disease is spread through seeds.
- Therefore, seeds should be treated with Thiophanate methyl or Carbendazim at the rate of 2 grams per kg of seeds.
- A three-year rotation of suitable crops is essential to control disease
- For cultivation, choose the soil that has the best drainage

Okra leaf curl virus

- This viral disease is spread by whiteflies
- Before the onset of the disease, the leaf veins begin to turn yellow, which gradually turns dark yellow.
- This disease cause upward/downward curling of leaves followed by the thickening of small and main veins of leaves
- Sometimes photosynthetic material in the leaves disappears completely
- The fruit also turns yellow, and its size remains small

Control

- Cultivate resistant varieties of okra
- Whiteflies should be treated from the beginning
- The first few severally affected plants and weeds should be destroyed

Root knot nematode

- It is caused by ***Meloidogyne incognita*** L.
- Early onset of the disease causes the plant to shrink

- Plant leaves turn yellow completely
- To diagnose this disease, uproot the affected plant and detect the presence of nodes on the roots
- These nodes or galls can be found on any underground part of the plant

Control

- Cultivate resistant varieties of okra
- Oilseed crops should be included in the crop rotation program
- To eradicate nematodes, apply Carbofuran granular poison at the rate of 6 kg per acre
- Apply organic compost and well decomposed dung in the affected fields significantly reduce the nematode quantity

Fusarium wilt:

- It is caused by an underground fungus ***Fusarium oxysporum*** L.
- Water and mineral transportation in the plant is stops and its roots are rot
- The leaves on the stem of the plants dry out and the plant dies in one to two days
- It can attack the crop at any growth stage
- It also causes stunted growth and plant turning yellow

Control:

- Always use healthy, disease-free seeds
- Treat the seeds with recommended fungicides before cultivation
- Always cultivate the vegetables into a disease-free land
- Do not irrigate the healthy plant field from the water of the infected field
- Soak the okra nursery into the solution of recommended fungicide before transplantation
- Drench with Carbendazim at the rate of 10 grams per 10 liters of water around the root zone

Yellow vein mosaic disease:

- This disease is spread permanently by whitefly.
- The veins of the leaves begin to turn yellow and gradually turn dark green
- The veins and vein lets become thick and form yellowish nets on all the leaves
- Sometimes leaves are completely depleted of green material, and diseased plants could be seen from far
- The fruit also turns yellow and its size dropped

Control:

- Destroy the weeds far from okra plants
- Cultivates one of the most resistant varieties of okra
- Destroy some of the infected plants at the beginning of the disease
- To control sap-sucking insects use of insecticides is Recommended
- Use a less amount of fertilizers at an appropriate time interval to enhance the plant resistance against diseases

Okra leaf spot:

- Leaf spot in okra is caused by ***Cercospora malayensis*** **L.** and ***Cercospora abelmoschi*** **L.**
- It is a fungal disease that causes leaf defoliation
- Small moist spots start to appear on leaves which later turn yellow
- In the case of severe attacks, these spots turn to blackish brown color
- In the case of extreme heat, these spots mixed
- The plant cannot fulfill its nutritional values in a good way

Control:

- To control leaf spots, give enough space between plants while sowing
- Treat the seeds with thiram fungicide before use
- Take spray of mancozeb at the rate of 4 grams per liter or captan at the rate of 2 grams per liters of water in the okra field

Powdery mildew of okra:

- It is caused by a fungus ***Erysiphe cichoracearum*** **L.**
- White minute patches appear on the surface of older leaves that later spread to younger leaves
- In case of a severe attack, greyish powdery growth of the fungus appear on the leaves that leads to necrosis
- Diseased parts of the plant turn brown and affected leaves start drying and defoliated

Control:

- To control the spread of disease, prune the overcrowded leaves of the plant so the proper sunlight reaches the plants
- Use disease-free and resistant varieties of okra
- Intercultural practices should be followed for the control of host plants (weeds)
- Spray the field with penconazol at the rate of 10 ml per 10 liters of water for 4 times with an interval of 10 day

Pests of maize:

- Insects attack okra plant causes a significant reduction in the yield of okra
- Some of the insect pests are given below:
  - Aphid
  - Termite
  - Mealy bug
  - Jassid
  - Red mite
  - Okra fruit and shoot borer
  - Leaf miner
  - Cutworm
  - Painted bug
  - Whitefly
  - American worm

Aphid:

Damage symptoms:

- The causal organism is *Myzus persicae* L. and *Macrosiphum euphorbiae* L.
- Adult and nymph of aphid suck the sap from the lower surface of the leaves and damage it
- They excrete a sweet substance from their body that causes black fungus on the leaves and the photosynthetic activity of the leaves is severely affected
- Their attack is intense from mid-February to March
- The growth of small plants stops and they do not produce much
- High humidity and low temperature are helpful in the growth of aphid

Control:

- Always use resistant varieties of okra
- Increase the numbers of ladybird beetle in the okra field to control the aphid
- The high-pressure spray of water is done with the help of a power sprayer
- Insecticidal soaps and oil such as neem oil are the best methods to control aphid

Jassid:

Damage symptoms:

- The causal organism is *Amrasca devastans* L.
- Both adults and nymphs suck the sap from the lower surface of the leaves
- The edges of the leaves become dark yellow and later reddish
- Leaves dry out and form a cup-like shape at the top or downward

- In a severe attack, leaves begin to fall and the crop appears to be burnt

Control:

- Keep the field free from weeds
- Cultivate the resistant varieties of okra
- In case of severe attack recommended insecticides are used

Whitefly:

Damage symptoms:

- The causal organism is *Bemisia tabaci* L.
- It is a vector that transmits viral diseases i.e., leaf curl virus, yellow vein mosaic virus
- Its moth is very small, yellowish body, and covered with white powder that's why it looks white
- Adult and nymph both suck the cell sap and weakens the plants
- Whitefly also release sweet sticky material that causes black fungus to appear on infected parts
- More susceptible to the conditions such as dry climate and high temperature
- Found in large quantities on vegetables in June and August

Control:

- Keep the field free from weeds
- Always sow the treated seeds at the recommended distance
- Spray the recommended insecticides in case of a severe attack of whitefly

Red mites:

Damage symptoms:

- It is caused by *Tetranychus telarius* L.
- They are very small in size, so they can be seen on the leaves only with the help of magnifying glass
- Female red mite is reddish or greenish-yellow in color
- At the beginning of the attack on the leaves, the spots of light greenish to whitish-yellow color appears on leaves and fall off
- In case of a severe attack, the whole leaf is covered with white silky nets
- Due to sucking the sap, the leaves turn upward from the edges and their color change from green to yellow and later turn brown

Control:

- It attacks in hot and dry weather if proper irrigation is provided then its attack reduce
- Always use resistant varieties of okra
- Always sow the treated seeds at the recommended distance
- In case of severe attack recommended insecticides are used

Okra fruit and shoot borer:

Damage symptoms:

- It is caused by *Earias vitella* L. and *Earias insulana* L.
- Larvae bore into the terminal shoots in the vegetative stage
- It also attacks flower buds, flowers, and young fruit during the flowering stage of okra
- Infected flowers and shoot wither, droop and dry up

Control:

- Collect and destroy infected shoots, flowers, and fruits
- Set up the light traps to destroy larvae
- Do not cultivate okra in the cotton field
- Use 20 to 30 trichogramma cards per acre and change them after discussing with agricultural experts

Mealybug:

Damage symptoms:

- Causal organism is *Pseudococcu slongispinus* L.
- Female Mealybug has no feathers and its color is light reddish a larval stage
- At the young stage, a thick layer of white powder solidifies on it and become very hard
- This insect attacks in the form of colonies and suck the sap from soft branches of vegetables
- It causes the plant leaves to turn yellow, wilt, and drop

Control:

- Removed the affected plants from the field
- Ensure the destruction of weeds
- In case of severe attack recommended insecticides are used

Harvesting of okra:

- The fruit is ready to harvest after 50 to 55 days of sowing
- Small and tender fruit should be harvested every alternate day
- Fruit picking is done when the size of the fruit reaches 3 inches
- Fruit should be harvested in the early morning and evening
- Delay in harvesting may make the fruit hard and fibrous, it loses its tenderness and taste

Yield of maize

- Okra green fruit yield varies from 15-20 tons per hectare during summer
- In the rainy season, it gives a 10-12 tons per hectare yield

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