

Pusa Lal Bhindi-1: Anthocyanin Rich Okra

Red okra has high nutritional value over green okra, especially in terms of anthocyanin content and antioxidants. It is also rich in dietary fibre, protein and minerals, like iron, calcium and iodine. The high antioxidant property of red okra provides protection against several diseases and improves immunity. Due to all these advantages, it is becoming a highly demanded crop and fetches 3 to 4 times higher prices as compared to green okra pods.

OKRA [*Abelmoschus esculentus* L. (Moench)] or lady's finger is an important vegetable in tropical and subtropical countries and is most popular in India, Nigeria, Pakistan, Cameroon, Iraq and Ghana. Now it is becoming popular and highly demanded in other parts of the world especially in Europe and North America, due to its taste as a fresh vegetable and multipurpose uses as from food (flour-based adhesives), processing (canned, dehydrated and frozen form), medicinal (extender of serum albumin, tablet binder) and industrial (defloculant in paper and fabric production). Okra pods are rich sources of dietary fibres, carbohydrates, proteins, vitamins, phenolic compounds and minerals especially iodine and low. Therefore, it is many times included in weight-reducing diets and considered good for diabetic persons. It also helps in overcoming problems of constipation. Mature fruits and stems containing crude fibre are used in the paper industry and cleaning of jaggery. India is the largest producer of okra with 6.35 million tonnes of production (63% of total world production) from 0.519 million ha area (FAOSTAT 2020). It is also an important vegetable for earning foreign exchange which accounts for 13% of the export of fresh vegetables.

Now-a-days there is great demand for red okra (anthocyanin rich). To meet the demand for red okra, the ICAR- Indian Agricultural Research Institute, New Delhi has released one high-yielding and moderately resistant to diseases (YVMV and ELCV) red okra variety, i.e. Pusa

Lal Bhindi-1.

Pusa Lal Bhindi-1 (DOV-68)

This variety was released by ICAR-Indian Agricultural Research Institute, Pusa, New Delhi in 2022 which was approved by the State Seed-Committee for Agricultural & Horticultural Crops, Govt. of NCT of Delhi on 17 January 2023. Its fruits are reddish purple. It is moderately resistant to Bhendi yellow vein mosaic (YVMV) and Enation leaf curl virus (ELCV) diseases. All plant parts including stem and petioles are reddish purple. It yields 15 t/ha on short internodes. It is rich in anthocyanin (130 µg/g) and antioxidant content (357 µg/g GAE). It is suitable for both summer and *kharif* season.

Plant morphology and characteristics: Plant is straight with 3-4 branches having dark red stem and petioles. Leaves are green with reddish veins and medium lobbing and serration. Flower is yellowish purple and the petals have purple claws at the base on both sides. Fruits are attractive dark reddish purple colour with 5 ridges, smooth surface, medium in length (10-12 cm) and less hairy.

Package of practices of okra variety Pusa Lal Bhindi-1

Climate

It is a warm-season vegetable crop and requires a



Field view of Pusa Lal Bhindi-1



Pusa Lal Bhindi-1 at marketable stage

long warm growing season. The seeds will not germinate below 18°C. It is susceptible to frost and will not thrive well when there is a continuous cold spell.

Soil

It can be grown in all kinds of soils, but sandy loam, friable and rich in organic contents is considered good for its cultivation.

Seed rate

12-15 kg/ha during spring-summer season.
8-10 kg/ha during rainy season.

Sowing

It can be grown throughout the year when frost and severe winters are absent. In plains and frost-free areas, the first sowing is done from second fortnight of February to March and the second during June to July. It is sown on flat beds, but in high rainfall or waterlogged areas, it should be sown on raised beds.

Spacing: Row to row: 45 cm during spring and summer, and 60 cm during *kharif*.

Plant to plant: 15 cm during spring-summer and 20 cm during *kharif*.

Manure and fertilizers

Twenty tonnes of well-rotten Farm Yard Manure, along with N: P: K @100:60:80 kg/ha should be applied. One-third dose of nitrogen and a full amount of phosphorus and potash should be applied at the last field preparation just before sowing. Remaining nitrogen (2/3) should be applied in three equal split doses at 30, 45 and 60 days after sowing.

Irrigation

The crop should be irrigated as per requirement during summer and whenever required in the rainy season. Always light irrigation should be given.

Intercultural operations

Apply pendimethalin solution @ 3 litre/ha in 500 litres of water immediately after sowing, when there is sufficient moisture in the soil. Manual weeding should be done as per need and earthing up in the rows should be done after weeding, especially during the rainy season.

Harvesting

Fruits are continuously harvested 5 to 6 days after the opening of flowers when they are tender. The growth and bearing of the plant are adversely affected if the fruits are not harvested timely.

Average yield

120 q/ha during spring-summer season.
150 q/ha during *kharif* season.

Plant protection

Insect-pests

Jassid or leaf hopper: The insects are greenish-yellow in colour and the adults and nymphs suck the sap from the lower surface of leaves, causing curling of leaves and burning effects on the edges. The insects lay small whitish round eggs on the lower surface of leaves.

Control: Alternate spraying of systemic insecticide, viz. acetamiprid@ 0.3-0.5 ml/litre solution and spiromesifen@0.5 ml/litre of water at 10 days intervals.

Table 1. Mean value of Pusa Lal Bhindi-1 in station trial (average of 3 years)

Variety	Yield (q/ha)	Days to 50 % flowering	Node no of first fruit	% incidence of ELCV			
				(90DAS)	30 DAS	60 DAS	90 DAS
Pusa Lal Bhindi-1	150	42	5	5	0	0	12

Variety	Node to first flowering	Fruit length (cm)	Fruit dia. (cm)	Average fruit weight (g)	Plant height (cm)	Crop duration (days)
Pusa Lal Bhindi-1	5	10.5	1.6	11.5	120	120

Table 2. Nutritional analysis of okra genotypes

Genotype	Pod colour	Moisture (%)	Protein (%)	Sugar (%)	Starch (%)	Crude fat (%)	Dietary Fiber (%)	Phenols (mg/g)	FRAP mg/g GAE	Anthocyanin (µg/g)
DOV-20	Green	88.4	2.42	2.52	1.08	0.17	4.15	0.89	0.292	-
DOV-245	Light red	87.0	2.56	3.09	0.94	0.25	4.20	0.83	0.224	43
DOV-17	Red	88.0	2.82	2.13	1.62	0.14	3.98	0.69	0.217	51
Pusa Sawani	Light green	86.0	2.74	2.84	2.75	0.26	3.75	1.23	0.285	-
Pusa Lal Bhindi-1	Purple red	89.3	2.16	2.17	2.07	0.29	3.63	1.20	0.357	130
Kashi Lalima	Red	86.9	2.64	2.17	3.57	0.11	3.74	0.983	0.356	67
CD (5%) CV (%)	-	-	0.14 3.0	0.34 7.5	0.51 14.0	0.06 14.2	0.25 3.2	0.16 9.8	0.06 14.5	-

Shoot and fruit borer

The larvae bore into the tender shoots and fruits, causing stunted growth of plants and fruits are rendered unfit for consumption.

Control: Spray neem seed kernel extract (5%) or spraying of malathion @ 2 ml/litre or spinosad @1 ml/3 litres of water at 10-day intervals. Pheromone trap @20 traps/ha should be installed to trap the male insects.

Whitefly

The adults and nymphs suck the sap from the lower surface of leaves and damage the crop by transmitting Bhendi yellow vein mosaic virus disease.

Control: Sowing of 3 rows of maize/bajara on all borders of the field around 45 days in advance. Yellow sticky traps should be installed in the field @20 traps /ha. Alternate spraying of systemic insecticides, like acetamiprid@0.03-0.05 % solution followed by spiromesifen@0.5ml/litre of water at 10 days intervals.

Red spider mites

The insects are very tiny and light reddish-yellow in colour and make net on the lower surface of the leaves. Adults suck the sap from the lower surface of leaves, causing yellowing of leaves and burning effects on the leaves by causing necrotic effects.

Control: Spray miticides, namely propargate or spiromesifen at 2 ml/litre of water at 10 days intervals.

Bhendi Yellow vein mosaic virus

It is a vein-clearing virus disease. In severe cases, the leaves as well as the fruits become yellow and fruiting is badly affected. It is transmitted by whitefly.

Control: Control measures similar to that used for whitefly.

Enation leaf curl virus

In case of enation leaf curl virus, curling of new leaves, shortening and thickening of leaves, twisting of petiole and stem bending are the major symptoms. The enation of veins which causes the breakdown of photosynthates is the major symptom which results in no flowering and fruiting. It also causes abaxial surface of leaves, thickened and leathery leaves and veins, small and deformed fruits and stunted plants.

Control: Control measures similar to that used for whitefly.

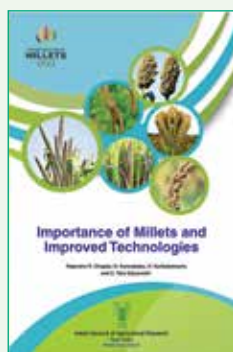
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TECHNICAL ASPECTS

Pages: v + 183; Price: ₹ 700, US\$ 90; Postage: ₹ 50
ISBN No.: 978-81-7164-272-4

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