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Okra Landrace of Sikkim: A Genetic Treasure for Climate Resilient Breeding Programme

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Vegetable crops are very sensitive to climatic vagaries and sudden rise in temperature as well as irregular precipitation at any phase of crop growth can affect the normal growth, flowering, pollination, fruit development and subsequently decrease the crop yield. Under changing climatic situations crop failures, shortage of yields, reduction in quality and increase in pest and disease problems are common and they render the vegetable cultivation unprofitable. Also the commercial varieties and hybrids of vegetable crops will perform poorly in an unpredictable manner due to aberration of climate. In these scenarios, landraces or local lines play crucial role as they posseses high genetic diversity and inherent adaptability to biotic and abiotic stresses such as drought, waterlogging, pest and diseases, etc. Okra (*Abelmoschus esculenta* L Moench) belongs to family Malvaceae, is a warm season, annual vegetable crop. It is commonly known as Lady's finger or *Bhindi*. In India, maximum variability has been found in Eastern region and North Eastern region. These plants showed varying degree of biotic and abiotic resistance. Nutritionally, okra is a rich source of dietary fiber, essential vitamins, and several bioactive compounds. It is naturally low in fat and calories, while providing moderate amounts of protein and carbohydrates, making it suitable for balanced diets. Okra is also an excellent source of calcium, phosphorus, vitamin C, folate, and provitamin A compounds such as β-carotene. Due to its nutritional profile, okra has gained attention in health and nutrition research, especially within the context of plant-based interventions for chronic disease prevention.

What are the characteristics of Okra landrace of Sikkim?

Landraces have evolved naturally under specific environmental conditions. These local landraces are hardy and adaptable which can tolerate varying biotic and abiotic stresses as compared to commercial hybrids. Qualitative and quantitative characterization was studied in the okra landrace of Sikkim which has been presented in Table 1. The seeds of this line have been deposited in NBPGR and accession no have been received as IC651260.

Table 1. Qualitative and quantitative characterization of local okra line (IC651260)

Characters	Description
Stem color	Dark Red
Node number at which first flower opens	6.10
Stem diameter at 10cm above ground level (cm)	3.68
Leaf sinus depth (cm)	19.2
Leaf length (cm)	16.76
Leaf width (cm)	31.74
Serration of margin	Serrate
Color between leaf veins	Red purple

Vein color	Red purple
Petiole length (cm)	19.2
Piko color	Green
Petal color	Yellow
Color of petal base	Red purple (inside only)
Flower length (cm)	8.3
Flower diameter (cm)	8.1
Male sterility	Absent
Fruit color	Green with purple red
Fruit length (cm)	16.73
Fruit diameter (cm)	3.94
Fruit ridges	Present
No of fruit ridges	9
Fruit pubescence	Medium
Fruit constriction at basal part	Absent
Fruit shape of apex	Narrow
No of locules	8.1
No of productive branches	29.3
Plant height at final harvest (cm)	189.4
Average fruit weight (g)	38.5
No of fruits/plant	23.5
Total yield/plant (g)	1216

A detailed morphological characterization of this local okra line revealed several distinct and valuable traits that highlight its potential for climate-resilient farming and breeding programmes. The plants exhibited a tall and vigorous growth habit, reaching an average height of about 189 cm at final harvest. The stem was dark red in color with a good thickness (3.68 cm), indicating robustness and structural strength and may be linked with stress tolerance. The first flowering was observed at around the 6th node, suggesting relatively early flowering, which can help the plant escape late-season stresses. The leaves were large and well-developed, with an average length of 16.76 cm and width of 31.74 cm. The presence of deep leaf sinuses (19.2 cm) and serrated margins enhances light interception and gas exchange. A unique feature of this line is the red-purple pigmentation in veins and between leaf veins, which may be associated with stress tolerance. Flower characteristics were also prominent. The flowers were large (about 8 cm in length and diameter) with yellow petals and a distinct red-purple base, making them visually striking. The absence of male sterility ensures normal reproductive ability and seed production.

Fruits are green with a purple-red tinge, long (16.73 cm), and moderately thick (3.94 cm diameter), with nine distinct ridges and medium pubescence. The fruits have a narrow apex and no basal constriction, features often preferred in the market. Each fruit contained about 8 locules, indicating good seed development. In terms of productivity, the plant showed excellent performance with an average of 29 productive branches and around 23–24 fruits per plant. The average fruit weight was 38.5 g, contributing to a total yield of approximately 1.2 kg per plant, which is quite promising for a local line.


Flower of okra



Whole plant


Fruit of Okra


Cross section of fruit

Need for Conservation

Despite their importance, many local okra lines are disappearing. The shift toward cultivation of commercial hybrids and changing farming practices is leading to genetic erosion. Loss of traditional varieties results in loss of valuable traits that may be needed in the future. Therefore it is very much needed to encourage farmers to continue cultivating local varieties and preserve their seeds and promote awareness about its importance.

Conclusion

Local okra lines are more than just traditional crops, they are a valuable genetic treasure for the future of agriculture which holds great promise for use in breeding programmes aimed at developing high-yielding, climate-resilient okra varieties suited to future agricultural challenges.

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