



SHORT COMMUNICATION

Kashi Tripti: A newly developed high-yielding mid-season edible-podded variety of vegetable pea

Jyoti Devi*, Rakesh K. Dubey and S. K. Sanwal

ICAR-Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh, India.

*Corresponding author; Email: jyoti.devi@icar.gov.in

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Introduction

The COVID-19 epidemic has highlighted the crucial need to live a healthy lifestyle, particularly in metropolitan areas. As a result, there has been an increase in demand for functional foods that are high in important nutrients and support excellent health. Pea (*Pisum sativum* L.) is one of the oldest multipurpose legumes grown for human food, animal fodder, and ornamental and aids in ecosystem balance due to their innate nitrogen fixation potential (Devi *et al.*, 2019; Devi *et al.*, 2023). They are grown over an area of 7.04 and 2.59 million hectares for dry and green seeds, respectively (FAOSTAT, 2021). Peas have a beautiful balance of micro and macro nutrition profiles along with high dietary fiber, antioxidants and numerous important biomolecules, thus extremely useful in curing diabetes, cardio problems, certain cancers and many degenerative diseases (Kalloo *et al.*, 2002; Kumari & Deka, 2021; Sharma *et al.*, 2023). Peas are mainly consumed either as pulse (dry seed) or as vegetables (green seeds), which mainly differ by their starch-sugar ratio. Irrespective of consumption patterns and varietal types, its shelling percentage is the key economic trait kept in focus by the breeders that has been found to vary from 45 to 60% in most of the pea genotypes. Thus, only 55 to 60% being the fresh seeds are used as vegetables, while around 40 to 45% goes as waste in the form of pod walls. This conceives the idea of an edible-podded pea, where the whole pod can be eaten and such cultivars become popular among the urban consumers. Edible podded peas also known as snap peas or snow peas are rich sources of protein, vitamins (vitamins C, B7, K, A and vitamin B5) dietary fibre, and antioxidant compounds and also serve as best source of chlorophyll when eaten as raw. As results, edible-podded peas have gained considerable attention in recent years due to their nutritional value and health benefits. Their versatility and culinary use in a variety of dishes, including salads, soups and stir-fries make them an important ingredient in the culinary world. As far as producer and consumer preferences are concerned, there has been an increased

Table 1: Important Horticultural traits of edible podded pea variety Kashi Tripti

S. No.	Traits	Average performance
1	Days to first flowering (No)	50-56
2	Days to first picking (No)	80-85
3	Plant height (cm)	80-90
4	Pod length (cm)	8.2-8.6
5	Pod width (cm)	1.75-1.9
6	Pod per plant ((No)	12-15
7	Average pod weight (g)	7.1-8.0
8	Yield per hectare (q)	95-100
9	100 dry seed-weight (g)	27.9
10	100 green seed-weight (g)	45-50
11	Days to seed maturity	135-140
12	No of picking	2-3
13	Reaction to powdery mildew	Resistant (2.0)

PM: reaction to powdery mildew (represented by 0-9 scale; 0-4 considered as resistant; 0-9 considered as susceptible).

demand for a specific type of edible-podded pea variety that is high-yielding, parchment-free, and has a crisp, lustrous green appearance. India has a limited number of cultivated varieties of edible podded peas, with many of them being imported from other countries. Exotic varieties like Sugar Baby and Oregon Sugar are among the popular one, while some of the other popular varieties developed in India are Swarna Tripti, Mithi Phali, Arka Apoorva and Arka Sampurna. To add this, ICAR-Indian Institute of Vegetable Research, Varanasi has developed a new variety of edible-podded pea 'Kashi Tripti' (IC632629) that offers several advantages including high pod yield and resistance to powdery mildew disease.

The variety Kashi Tripti (IC632629) was developed by crossing the parents 'Maci Grow × JP-19' followed by pedigree selection at ICAR-Indian Institute of Vegetable Research, Varanasi. Single Plant Selection (SPS) approach was adopted F₂ onward with special emphasis on the traits viz., crisp long, broad green pods that are free from parchment layer having slow seed development inside, high pod weight and number etc. After F₆ onward the advanced breeding line was tested in different station trials at ICAR-IIVR, Varanasi as well various other location of the state. The selection of plants was also done for powdery mildew resistance in the later generations. The DUS characters of the variety were recorded according to the descriptor described by PPV & FRA (2007) and DNA fingerprinting of the variety was done through ISSR primers.

Kashi Tripti is a mid-season cultivar of edible podded pea takes about 50 to 56 days with first picking ready at 80-85 days after seed sowing (Table 1, Figure 1). Plants are of medium height (80-90 cm) with one to two primary branches and produces pods that measure 8.2 to 8.6 cm in

Table 2: Quality attributes of variety Kashi Tripti

Parameters	Values
Protein content (%)	21.93
TSS of whole pod (° B)	11
TSS of fresh green seed (° B)	13.9
Ascorbic acid content (mg/ 100 g)	33.4
Total phenolics content (mg GAE/100 g fw)	31
Total flavonoids content (mg CE/100 g fw)	16.37
Antioxidant activities (µmol TE/g fw , CUPRAC)	3.79

**Figure 1:** Plant, pod and seed characters of the variety Kashi Tripti

length and 1.8-1.9 cm in width. The plant bears about 12 to 15 pod per plant with an average weight of 7.1 to 8.0 g and an average pod yield of 95 to 100 quintal/ha that could be harvested in 2 to 3 pickings. Seeds are light green in color with 100 dry seed-weight of 27.98 g while green seed-weight of 45 to 50 g per 100 seeds. It takes approximately 135 to 140 days for the plant to reach seed maturity. Powdery mildew is major biotic stress throughout the pea-growing regions of India and genetic resistance has been considered most effective strategy of its management (Devi *et al.*, 2022). Kashi Tripti has also been screened for powdery mildew reactions during its yield trials. The plants were found to be resistant to powdery mildew with average disease scale rating between 1.7-2.0.

Variety Kashi Tripti is a good source of protein and antioxidants that may have potential health benefits. Some of the important quality parameters of Kashi Tripti are provided in Table 2. The protein content in dried seeds of Kashi Tripti is 21.93% while the total soluble solids (TSS) of the whole pod and fresh green seed are 11° and 13.9°B, respectively. It contains 33.4 mg of ascorbic acid per 100 g and 16.37 mg of total flavonoids (CE/100 g fw), respectively. The total phenolic content of Kashi Tripti has measured 31mg (GAE/100 g fw) while the antioxidant activity of 3.79 µmol TE/g fw, was measured by the CUPRAC method (Table 2). The DNA fingerprinting and DUS characters of variety are given in Figure 2 and Table 3, respectively. The variety has been recommended for commercial cultivation in Uttar Pradesh by SVRC.

Table 3: DUS characterization of 'Kashi Tripti' as per the guidelines provided by Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) Government of India

DUS S. No.	Type of Assessment	DUS Characteristics	Kashi Tripti
1.	VS	Stem: Anthocyanin colouration	Absent
2.	VG	Foliage: colour	Dark Green
3.	VG	Foliage: waxy bloom	Absent
4.	VG	Leaf: leaflets	Present
5.	VS	Leaf: axil colour	Green
6.	VG	Stipule: rabbit eared stipules	Absent
7.	VG	Stipule: type	Normal
8.	VG	Flower: opening (days)	Medium (50-56 days)
9.	VG	Flower: standard petal colour	White
10.	VS	Pod: number/axil	Double
11.	VG	Pod: curvature	Absent
12.	VS	Pod: shape of distal part	Blunt
13.	VG	Pod: intensity of green colour	Light green (Yellow green group 146B)*
14.	MS	Plant: height	Long (80-90 cm)
15.	VG	Seed: shape	Dimpled
16.	VG	Seed: surface	Straight
17.	VG	Seed: cotyledon colour	Green
18.	MG	Seed: weight of 1000-seed	279.8 gm
19.	VG	Seed: testa mottling	Absent
20.	VG	Seed: parchment	Absent

MG: Measurement by a single observation of a group of plants or parts of plants

MS: Measurement of a number of individual plants or parts of plants

VG: Visual assessment by a single observation of a group of plants or parts of plants

VS: Visual assessment by observation of individual plants or parts of plants

* Intensity of color measured by Royal Horticultural Society Color Charts (1804)

Variety Kashi Tripti requires mild to cool temperatures with an average daytime temperature between 15 to 21°C and night temperature between 8 to 10°C for its optimum growth. For flowering and pod set, a temperature range of 12 to 15°C is found to be optimum. The sowing of this variety in Northern plains can be done in the second fortnight of October to first fortnight of November. Since plants are taller in height, a seed rate of 120 kg is found to be optimum for maximum pod yield. Well-drained loamy soil with an optimum pH range of 6 to 7.5 is ideal. The row-to-row spacing should be kept at 30 to 45 cm while plant to plant of 7 to 10 cm is ideal. The soil should have optimum moisture at the time of sowing to facilitate maximum seed germination. Adequate rainfall or irrigation (50–60 cm) during the growing season is needed.

Conclusively, demand for nutritious functional foods particularly among urban communities has led to an

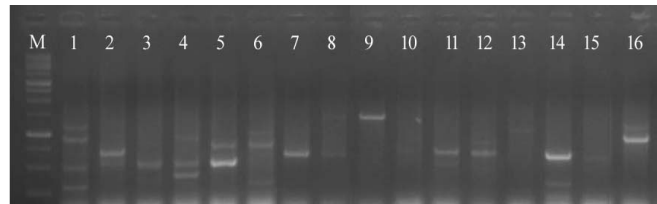


Figure 2: DNA Profile of Pea (Kashi Tripti) generated using ISSR primers No.(1).UBC-807 (2).UBC-808 (3).UBC-809 (4).UBC-810 (5).UBC-811 (6).UBC-812 (7).UBC-815 (8).UBC-822 (9).UBC-825 (10).UBC-835 (11).UBC-836 (12).UBC-840 (13).UBC-841 (14).UBC-842 (15).UBC-844 (16).UBC-848.M depicts 1 kb ladder.

increased interest in edible-podded pea due to their high protein, dietary fiber, and antioxidant content. Kashi Tripti is a newly developed edible podded pea variety, that belongs to mid maturity group that takes around 50 to 56 days for 50 % flowering and edible pods are ready for 1st picking at 80 to 85 days after seed sowing. The average pod yield of Kashi Tripti is between 95 to 100 quintals per hectare, which can be harvested in 2 to 3 pickings. The variety is also resistant to powdery mildew. Thus, this variety has the advantage of high yield along with powdery mildew resistance. Kashi Tripti could thus be an alternative variety for farmers who desire to cultivate the edible-podded variety of peas.

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