



SHORT COMMUNICATION

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## Kashi Purvi: A newly developed high-yielding early variety of vegetable pea (*Pisum sativum* var. *hortense* L.)

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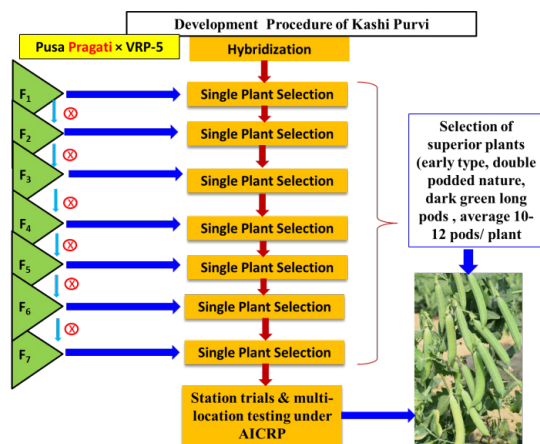
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Peas (*Pisum sativum* L.), a highly valued annual legume vegetable with a rich history of domestication, are grown globally as a valuable export-oriented cash crop (Dhall *et al.* 2021; Devi *et al.* 2023a,b). Peas are grown over an area of 7.04 and 2.59 million hectares for dry and green seeds, respectively (FAOSTAT, 2021). Green pea farming is predominantly carried out in Asian countries, where the average productivity is high and accounts for more than 87% of the total production share in comparison to European countries (Devi *et al.* 2019). Peas are rich sources of various nutrients, including starch, protein, fiber, minerals, vitamins and other phytonutrients. These nutrients provide numerous health benefits that can help manage diabetes, cardiovascular problems, certain cancers, and many degenerative diseases (Kumari and Deka, 2021). Peas are also a popular export-oriented cash crop worldwide with an export value of more than 1000 million U.S. dollars in 2021 (<https://www.tridge.com>). According to F.A.O.'s 2021 report, China is the largest producer of green peas with 11.46 million tonnes, while India ranks second with 5.85 million tonnes production. Earliness is a highly desirable and focused trait in pea breeding. The early maturing/picking varieties are most preferred by the farmers as well as consumers in India, owing to their economic importance and quality attributes. For higher prices in early market, farmers want to grow early cultivars, preferably from the last week of September to mid-October. Such cultivars also offer additional advantages to their growers, as farmers can grow next succeeding crop, such as wheat as a main crop in the cropping sequence. In addition, early maturing varieties could escape devastating diseases like powdery mildew and rust (Devi *et al.*, 2022) and the effect of high temperatures late in the season under North Indian conditions. However, the farmers have very limited choices of early cultivars in vegetable peas. ICAR-Indian Institute of Vegetable Research, Varanasi, is

the leading institute in vegetable peas research with its landmark varieties, Kashi Uday and Kashi Nandini. These varieties are quite popular among farmers due to short growing period of 65 to 70 days and are suitable for single picking such that farmers can grow wheat as a succeeding crop during December under the Indo-Gangetic Plains of India. Both these varieties bears single pod (6–8) on most of its peduncles with average yield potential of around 100 to 110 q/ha. Further, developing short-duration, high-yielding and single-picking varieties of peas has been identified as a key research area at Indian Institute of Vegetable Research, Varanasi. One of the notable outcomes Of the project 'Genetic improvement of vegetable pea' is the development of new variety Kashi Purvi and this variety has the potential to significantly enhance the productivity and efficiency of pea cultivation in the region and will be a good substitute for the decade-old varieties like Kashi Uday, Kashi Nandini, AP3 and Arkel along with the yield advantage.

Variety 'Kashi Purvi' i.e. IC0642309 or VRPE-105 was developed by single plant selection approach from a cross 'Pusa Pragati × VRP-5'. The developmental procedure of this variety is given in Figure 1. Single plant selection approach was adopted from F<sub>2</sub> onward with special emphasis on the traits viz., earliness, dark green long pods, pod numbers, double pod bearing habit *etc.* After F<sub>6</sub> onward, the advanced breeding line (VRPE-105) was tested in different station trials at ICAR-IIVR, Varanasi and was then entered in AICRP (V.C.) trials for its multi-location testing throughout the country (AICRP proceeding of XXXIX Group Meeting, 2021). The D.U.S. characters of the variety were recorded according to the descriptor described by PPV & F.R.A. (2007) and D.N.A. fingerprinting of the variety was done through ISSR primers.

Kashi Purvi is early maturing pea variety that took 35 to 40 days for days to 50% flowering and first picking becomes ready in 65-70 days after sowing. Plant bear 10 to 13 pods with pod lengths of 8.0 to 8.5 cm , with double pod-bearing



**Figure 1:** Flow diagram showing the breeding technique used for development of Kashi Purvi

**Table 1:** Superior horticultural traits of variety 'Kashi Purvi'

S. No.	Traits	Average Performance
1	Days to first flowering (No.)	35–40
2	Days to first picking (No.)	65–70
3	Number of primary branches (No.)	1–2
4	Plant height (cm)	60–70
5	Pod length (cm)	8–8.5
6	Pod width (cm)	1.3–1.4
7	Number of pods per plant (No.)	11–13
8	Average pod weight (g)	7.5–8
9	Number of seeds per pod	8–8.5
10	Yield per plant (g)	95–110
11	1000 dry seed-weight	255
12	Yield per hectare (q)	108–117
13	Shelling (%)	50–52
14	T.S.S. (°B)	13.9
15	Protein content (% dry basis)	26.5
16	Days to seed maturity (days)	120–130



**Figure 2:** Plant, pod and seed characters of variety 'Kashi Purvi'

habit on most of its peduncle and higher pod yield than VRP-5 (Kashi Nandini), which is also an early maturing variety type (Table 1). Figure 2 provides a visual representation of the key phenotypic features of the plant, pods and seeds of Kashi Purvi. The genotype was further tested across the country as part of the All India Coordinated Research Project (Vegetable Crops) (as VRPE-105, proceedings of the XXXIX Group Meeting, 2021) and demonstrated its superior performance, particularly in the North Indian plain (AICRP, V.C., Annual reports 2018-19; 2019-20 and 2020-21).

The average pod yield of Kashi Purvi is around 108 to 117 q/ha with 50 to 52 shelling%. Due to early maturity/picking, this newly developed variety also escapes the major disease of pea viz., powdery mildew and rust. The variety has been recommended for commercial cultivation in Uttar Pradesh by SVRC (UP Govt.). The D.U.S. characters of the variety are

given in Table 2. The D.N.A. fingerprinting (generated by ISSR primers) of the variety is given in Figure 3.

Kashi Purvi requires mild to cool temperatures with an average day time temperature between 15 to 21°C and night temperature between 8 to 10°C for its optimum growth. A temperature range of 12 to 18°C is ideal for flowering and pod set. The sowing of this variety in Northern plains could

**Table 2:** D.U.S. characterization of Kashi Purvi (VRPE-105)

D.U.S. S.No.	Type of Assessment	D.U.S. Characteristics	Kashi Purvi (VRPE-105)
1.	VS	Stem: Anthocyanin coloration	Absent
2.	V.G.	Foliage: color	Green (Yellow-green group 147A)*
3.	V.G.	Foliage: waxy bloom	Absent
4.	V.G.	Leaf: leaflets	Present
5.	VS	Leaf: axil color	Green
6.	V.G.	Stipule: rabbit-eared stipules	Present
7.	V.G.	Stipule: type	Normal
8.	V.G.	Flower: opening (days)	Early
9.	V.G.	Flower: standard petal color	White
10.	VS	Pod: number/axil	Double
11.	V.G.	Pod: curvature	Present
12.	VS	Pod: shape of distal part	Pointed
13.	V.G.	Pod: intensity of green color	Green (Yellow-green group 146B)*
14.	MS	Plant: height	Medium (60–70 cm)
15.	V.G.	Seed: shape	Dimpled
16.	V.G.	Seed: surface	Curved
17.	V.G.	Seed: cotyledon color	Green
18.	M.G.	Seed: weight of 1000-seed	255g
19.	V.G.	Seed: testa mottling	Absent
20.	V.G.	Seed: parchment	Absent

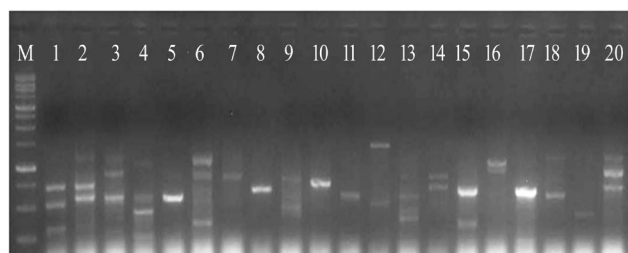
**M.G.:** Measurement by a single observation of a group of plants or parts of plants

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

**V.G.:** 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 colour measured by Royal Horticultural Society Color Charts (1804)



**Figure 3:** D.N.A. Profile of Pea (Kashi Purvi) 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-814 (8).UBC-815 (9).UBC-822 (10).UBC-823 (11).UBC-824(12) UBC-825 (13).UBC-834 (14).UBC-835 (15).UBC-836 (16).UBC-840 (17).UBC-841(18).UBC-842 (19). U.B.C.- 843 (20).UBC-844. M depicts 1 kb ladder.

be done in second fortnight of October to first fortnight of November. Since plants are shorter, a 130 to 150 kg seed rate is desirable for optimum 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 cm while plant to plant of 10 cm is found to be an ideal spacing. The soil should have optimum moisture at the time of sowing to facilitate optimum seed germination. Adequate rainfall or irrigation (50–60 cm) during the cropping period is found to be optimum for good crop growth and yield.

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