

Pusa Purple Broccoli-1: A high-yielding first anthocyanin-rich subtropical heading broccoli

Pusa Purple Broccoli-1, developed by ICAR-IARI, New Delhi, is India's first short-duration, subtropical purple-heading broccoli variety, offering a breakthrough for the National Capital Region. This innovative variety is rich in powerful antioxidants, containing 30.31 mg/100g fresh weight of anthocyanins alongside essential health-beneficial glucoraphanin to combat non-communicable diseases. Unlike the traditional varieties, Pusa Purple Broccoli-1 matures in just 75–85 days after transplanting. This allows it to set seeds abundantly in the North Indian plains and expands market availability from December through March. Yielding compact, intense purple heads with an average weight of 570g, it offers a high potential marketable yield of 20.9 t/ha. Its versatile, medium-stature profile allows high-density planting and presents excellent prospects for premium diversified uses like health-secure sprouts, attractive microgreens, and fresh edible heads.

Keywords: Broccoli, Pusa Purple Broccoli-1, Seed production, Short duration variety

PURPLE heading Broccoli (*Brassica oleracea* var. *italica* Plenck) is an important exotic annual vegetable crop that belongs to cole group. Broccoli, in general, is a rich source of vitamins, minerals and health-beneficial glucoraphanin (2.8–15.43 mg/100 g on dry weight basis), a strong anticancer phytochemical. It has diverse natural variants for head colour, such as green, purple and yellowish green. Green broccoli is commercially grown in India but the purple heading type presents a new option with added value to health. It has higher amount of anthocyanins in addition to other nutrients present in green broccoli. Pusa Purple Broccoli-1, a first-of-its-kind as sub-tropical type has been developed through recurrent breeding at the Division of Vegetable Science, ICAR- Indian Agricultural Research Institute, New Delhi. It is rich in anthocyanins, a powerful antioxidant that takes care of cardiovascular problems. It produces seeds abundantly in North Indian plains during winter season. It has diverse use options such as sprouts, microgreens and edible heads.

Development of Pusa Purple Broccoli-1: 'Pusa Purple Broccoli-1' was developed by recurrent breeding from the segregating exotic material. It is recommended for the National Capital Region of Delhi and similar climatic conditions. During the development process, the major criteria for desirable traits were medium head size, fine to medium-size buds, partial to compact, medium to intense purple heads, early maturity, seed production ability, etc. It is distinct from the purple-heading broccoli 'Palam Vichitra' in India which takes around 120 days after transplanting to marketable maturity and thus able to set

seeds in hills only. The availability of 'Palam Vichitra' in market remains for a short period (February–March) while Pusa Purple Broccoli-1 takes around 85–95 days after transplanting and produces heads in December–January, thus expanding the purple broccoli availability period from December to March, benefiting broccoli growers, traders and consumers. It gets ready for harvesting 35–45 days earlier as compared to 'Palam Vichitra' and grows profusely in North Indian plains during winter season.

MAIN FEATURES

- First anthocyanin rich short duration purple heading broccoli variety.
- Suitable for sowing during mid-August to mid-October.
- Attains marketable head in 75–85 days after transplanting.
- Rich in anthocyanins (30.31mg/100 g fw).
- Average plant height is 52.5 cm and spread is 48.3 cm.
- Average head weight is 570 g with a potential marketable head yield of 20.9 t/ha.
- Produces satisfactory seeds under Delhi condition.
- Suitable for staggered planting from September to October to extend availability.
- Attractive cotyledon and nutritionally rich profile highlighting prospect for microgreens.
- High acceptance by health-conscious consumers, as observed in a limited sample survey.
- Medium-stature variety accommodating more plants per unit area thereby.

Important plant traits and marketable yield are given in Table 1 and 2.

Nutritional and health value: Nutritionally, broccoli (100g edible portion) is a rich source of protein (3.0–3.60 g), dietary fibre (1.40–2.60 g), vitamin A (2,500 IU) and folate (115 µg). It also contains riboflavin (0.23 mg), thiamin (0.10 mg), niacin (0.9 mg) and folate (0.71 mg), against their daily requirements viz., 1.7 mg, 1–2 mg, 19 mg and 1 mg, respectively. It is low in energy (32 Kcal) and fat (0.35%). For every 100g on dry weight basis it also contains micronutrients such as potassium (316 mg), iron (0.7 mg), selenium (3.0 µg), calcium (48 µg) and zinc (0.4 mg), making it an example of ‘low energy – low fat healthy food’.

Today when non-communicable diseases (NCDs) such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes etc. are emerging as the biggest challenge for public health, proper lifestyle and intake of antioxidant-rich foods are crucial for minimising the incidence of NCDs. Pusa Purple Broccoli-1 contains anthocyanin (30.3 mg/100g fresh weight) in addition to vitamin C, carotenoids and flavonoids present in common green broccoli. Anthocyanins are powerful antioxidants and potential anti-platelet therapeutics reducing thereby the risk of cardiovascular diseases. The high level of anthocyanins makes Pusa Purple Broccoli-1 a nutritionally and functionally better and healthy food option.

Agronomic management: Seeds to be sown in nursery from September to October months for raising the winter season crop @ 400–500 g/ha. Seed treatment with *Trichoderma viridae* 1.0 WP @ 4 g/kg seed or Bavistin 2 g/kg is necessary for healthy nursery raising. One month old seedlings are ready for transplanting at a spacing of 45 cm × 45 cm. Planting on ridges is ideal. It requires 120 kg N, 60 kg P, 60 kg K/hectare. Apply full P and K and half of N as basal dose before ridge making. Remaining half dose of nitrogen should be given during earthing up. Spray urea (1.0%) and boron (0.3%) after 15 and 45 days of transplanting, respectively. Need-based

irrigation should be done.

Harvesting: Heads are ready to harvest when they are compact, buds are medium coarse, attractive and well-grown but still unopened. Keep heads in an upright position in clean trays for markets.

Disease and pest management: Pusa Purple Broccoli-1 has field resistance to downy mildew, black rot and alternaria leaf spot diseases avoiding fungicide spray thereby. Need-based sprays of insecticides such as indoxacarb 14.5 SC @1 mL/L to control spodoptera and cabbage



Pusa Purple Broccoli-1:
Head view



Pusa Purple Broccoli-1:
Field view



Pusa Purple Broccoli-1: Fresh harvest



Pusa Purple Broccoli-1: Head internal structure

Table 1. Horticultural traits of Pusa Purple Broccoli-1 alongwith checks in Delhi conditions

Character	Days to harvest after transplanting	Plant height (cm)	Gross plant weight (g)	Seed yield (g/plant)	Head weight (g)	Yield (t/ha)	Yield increase over PKTS-1 (%)
Pusa Purple Broccoli-1	85	52.5	1350	18.0	528.9	20.5	43.3
Pusa KTS-1	83	60.1	1150	11.0	411.5	14.4	
Palam Vichitra	120	63.2	1870	1.5	647.2	23.9	

Table 2. Year-wise mean marketable head yield of Pusa Purple Broccoli-1

Entry	Yield (t/ha)					Avg. yield (t/ha)	Maturity period*
	2019-20	2020-21	2021-22	2022-23	2023-24		
Pusa Purple Broccoli-1	20.3	21.2	19.4	21.2	22.5	20.9	December–January
Pusa KTS-1	12.3	14.4	13.8	13.2	14.1	13.6	January–February
Palam Vichitra	26.5	24.5	-	22.7	23.4	24.3	February–March

*Related to temperature requirements for head development.

fly and cyantraniliprole 10.26% OD @ 60 g a.i. against diamondback moth, jassids and aphids are necessary.

Indigenous seed production in northern plains: Pusa Purple Broccoli-1, is the first tropicalised heading broccoli cultivar and flowers during January–February under Delhi conditions and produces seeds abundantly. An isolation distance of at least 1600 m is needed from other crops and varieties of cole vegetable group.

Suitability in different growing options: Pusa Purple Broccoli-1 has great potential for commercial scale farming due to high yield and remunerative price. Its short duration and stature make it suitable for customised gardens such as kitchen, container and vertical gardens where the nutrient rich pesticide free crop options are major concern. During winter season, it has least incidence of diseases and insect-pests, hence safe from pesticide burden. It has great prospects in school gardens which serve as an instant on-site source to integrate in mid-day meal schemes. It serves as an excellent source for microgreens or super sprouts due to the inherent triple antioxidants ‘vitamin C + glucoraphanin + anthocyanin’.

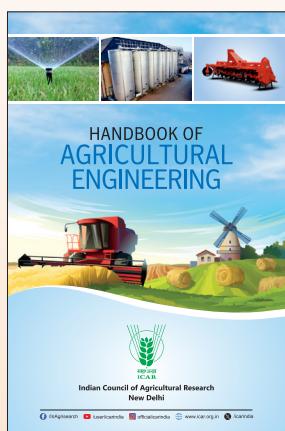
SUMMARY

Pusa Purple Broccoli-1, developed by ICAR-IARI, New Delhi, is India's first short-duration, subtropical purple-heading broccoli variety optimised for the National Capital Region. Rich in anti-cancer glucoraphanin and cardiovascular-protective anthocyanins (30.31 mg/100g fw), this low-fat superfood provides a highly profitable option for farmers and health-conscious consumers. Maturing in 75–85 days, it delivers an average marketable yield of 20.9 t/ha and expands market availability from December to March. Its unique climate adaptation allows abundant winter seed production in the Northern plains, breaking reliance on hilly seed production. Exhibiting excellent field resistance to major diseases like black rot and downy mildew, this medium-stature variety is ideal for high-density farming, microgreens and pesticide-free kitchen gardens.

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