

Cultivation of Pigeon Pea

Rohit Kumar, Ajay Kumar Verma, Sudhanshu Kumar and Ekta Rajput

Janta Mahavidyalaya, Ajitmal Auraiya, Affiliated to Chhatrapati Shahu Ji Maharaj University, Kalyanpur, Kanpur-208024

*Corresponding Author: kumar823681@gmail.com

Abstract

Pigeon pea (*Cajanus cajan*) is an important legume crop widely grown in India and other tropical regions, valued for its high protein content (20–24%) and role in food and nutritional security. Commonly consumed as arhar or tur dal, it serves as a staple pulse in Indian diets. The crop improves soil fertility through biological nitrogen fixation and enhances soil structure by adding organic matter. Its deep root system provides drought tolerance, making it suitable for marginal and rainfed areas. Pigeon pea supports sustainable and eco-friendly farming systems and performs well in intercropping with cereals and oilseeds. Besides providing nutritious food for humans, it also supplies fodder for animals, while crop residues are used as fuel and fencing material. Economically, pigeon pea contributes significantly to farmers' income and rural employment. Overall, pigeon pea plays a vital role in sustainable agriculture, environmental health, and livelihood security.

Keywords: Nitrogen fixation, Soil fertility and Intercropping.



CITATION

Kumar, R.; Verma, A.K.; Kumar, S.; Rajput, E., Cultivation of Pigeon Pea. *AgriSustain-an International Journal*, 2026, 04(2), 13-16.

ARTICLE INFORMATION

Received: 02 February 2026

Accepted: 12 June 2026

Published: 01 July 2026

DOI: 10.5281/zenodo.21767592

COPYRIGHT

© 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the [Creative Commons Attribution license \(CC BY\)](https://creativecommons.org/licenses/by/4.0/).



Introduction

Pigeon pea (*Cajanus cajan* L.) is one of the most important grain legume crops of the tropics and subtropics, widely cultivated for its protein-rich seeds and multipurpose uses (Upadhyaya *et al.*, 2013). It belongs to the family Fabaceae (Leguminosae) and is commonly known as arhar, tur, or red gram in India, Congo pea or Angola pea in Africa, and yellow dhal in several Asian countries, while also serving as an important food and farm-support crop in many regions (Colorado State University, 2023; PROSEA, 1999). Pigeon pea occupies a prominent position among pulse crops due to its nutritional value, adaptability to diverse agro climatic conditions, and contribution to sustainable agriculture (ECHO Community, 2015). It is a major source of plant-based protein for millions of people, particularly in developing countries where animal protein is scarce or expensive.

India is the largest producer, consumer, and importer of pigeon pea, accounting for a substantial share of global production. The crop plays a vital role in ensuring food and nutritional security, especially for rural and low-income populations (Upadhyaya *et al.*, 2013). Pigeon pea seeds typically contain 20–24% protein along with essential amino acids, carbohydrates, vitamins, and minerals such as iron, calcium, and phosphorus. The split cotyledons (dal) are a staple component of daily diets in many parts of South Asia (Colorado State University, 2023). In addition to human consumption, pigeon pea residues such as leaves, husks, and broken grains are widely used as fodder for livestock, making it a valuable dual-purpose crop.

Botanically, pigeon pea is a deep-rooted perennial shrub that is usually cultivated as an annual crop. Plants grow to a height of about 1–4 meters, depending on genotype and growing conditions, and possess a woody stem with well-developed branches. The leaves are trifoliate, and the flowers are generally yellow with red or purple streaks. Pods are flat and slightly constricted, containing 2–9 seeds (ECHO Community, 2015; PROSEA, 1999) that vary in size, shape, and color across varieties. The crop also shows substantial genetic diversity, which supports breeding and adaptation efforts (Kinhoégbè *et al.*, 2022).

Pigeon pea is well adapted to marginal and rainfed areas where other crops often fail. It performs reasonably well under conditions of low fertility, limited rainfall, and high temperatures, making it particularly suitable for semi-arid tropics (Ariyo, 2000; Upadhyaya et al., 2013).

Farmers frequently grow pigeon pea as an intercrop or mixed crop with cereals such as sorghum, pearl millet, maize, or rice, as well as with oilseeds and other legumes. Such intercropping systems help optimize land use, stabilize yields, suppress weeds, and reduce pest and disease incidence while providing diversified income sources (Mula & Saxena, 2010; Upadhyaya et al., 2013).

Origin Place

Pigeon pea (*Cajanus cajan*) is believed to have originated in the Indian subcontinent, where it has been cultivated for more than 3,000 years. India is considered the primary center of origin and diversity, supported by the presence of wild relatives and wide genetic variability (Varshney et al., 2012). From India, the crop spread to East Africa, Southeast Asia, and later to the Americas through trade and migration (Ariyo, 2000; Upadhyaya et al., 2013). Today, pigeon pea is widely grown in tropical and subtropical regions of Asia, Africa, and Latin America. Its long history of cultivation in India highlights its importance as a traditional pulse crop and a major source of plant protein (Ariyo, 2000; Mula & Saxena, 2010).

Climate Requirement

Pigeon pea grows best under warm tropical to subtropical climates. It prefers:

- Temperature: 25°C – 35°C (warm weather).
- Rainfall: 600–1000 mm annually during early growth.
- Sunlight: Bright sunny weather during flowering and pod formation is ideal
- Photoperiod Pigeon pea is generally *short-day* sensitive, though varieties vary in photoperiod response. This combination of moderate moisture early on, warm temperatures, and dry conditions later makes pigeon pea ideal for semi-arid tropical regions where many other crops struggle.

Soil Requirement

However, it performs best in well-drained loamy to sandy loam soils rich in organic matter. Deep soils are preferred because the crop develops a strong taproot system that helps it tolerate drought by extracting moisture from lower layers. The ideal soil pH ranges from 6.0 to 7.5, although pigeon pea can tolerate slightly acidic to mildly alkaline conditions. Waterlogging is highly

detrimental to the crop, as stagnant water promotes root diseases and poor nodulation. Heavy clay soils with poor drainage should therefore be avoided. Pigeon pea is moderately tolerant to low fertility and can grow on marginal lands, but balanced nutrient availability improves yield. Being a legume, it fixes atmospheric nitrogen, which enhances soil fertility. Proper land preparation and good soil structure support healthy root growth, nodulation, and overall crop productivity.

Land Preparation

Effective land preparation ensures good germination and plant establishment. Clear the field of existing weeds and crop residues. Plough deeply (about 20–30 cm) during the dry season to loosen the soil. Follow with 2–3 harrowings to create a fine, clod-free seedbed. Remove stones and level the land. Deep tillage supports the crop's deep taproot system, helping it access moisture in deeper soil layers during dry periods.

Seed Selection and Treatment

Good seed selection is very important for getting a healthy pigeon pea crop. Always choose certified or improved seeds from a reliable source. Seeds should be clean, bold, mature, and free from diseases, insects, and damage. Avoid shriveled, broken, or discolored seeds. Select varieties that are suitable for your local climate and resistant to common pests and diseases. Before sowing, treat the seeds with fungicide or biofertilizer to protect them from soil-borne diseases and to improve germination. Using good quality seeds ensures better plant growth, higher yield, and uniform crop stand.

Sowing Time

Proper sowing time is very important for good growth and yield of pigeon pea. In India, pigeon pea is mainly sown with the onset of the monsoon during the Kharif season. The ideal sowing period is from mid-June to mid-July in most regions. In areas with early rains, sowing can start in early June, while in some southern states it may extend up to August. Timely sowing helps the crop use rainwater efficiently and escape severe pest and disease attack. Late sowing usually results in poor flowering and low yield. Therefore, farmers should sow pigeon pea at the recommended time for best results.

Method of Sowing

Spacing Proper spacing allows enough room for growth and sunlight.

Rainfed conditions 90–120 cm between rows and 30 cm between plants.

Irrigated fields 50–75 cm between rows and 15–20 cm between plants.

Depth sow seeda about 2.5 to 5 cm deep in the Soil.

Sowing Methods

Line sowing Most common and efficient.

Broadcasting For smaller plots or if row planting is difficult.

Intercropping Can be mixed with cereals like maize, sorghum, or millets.

Irrigation Management

Pigeon pea needs water mostly in the early stages and during flowering:

- Irrigate immediately after sowing if there's no rain.
- Maintain soil moisture for the first 6–8 weeks.
- After that, reduce the frequency; too much water during flowering reduces yield.
- Rainfall after flowers appear can affect pollination.

Fertilizer and Nutrient Management

Pigeon pea can fix nitrogen due to its association with Rhizobium bacteria, but a balanced fertilizer gives better yields as a legume, pigeon pea requires less nitrogen fertilizer due to its symbiotic relationship with Rhizobium. Still, soil test-based applications of phosphorus and potassium and addition of organic manure (FYM/compost) improve plant growth and yield.

- Apply organic manure or compost before planting.
- A basic fertilizer mix (e.g., NPK) helps early growth but should be based on soil test results.
- Too much nitrogen fertilizer isn't needed, as the plant fixes its own nitrogen.

Weed Management

Frequent weeding during early growth prevents competition for nutrients and water. Two to three intercultural operations (weeding + hoeing) are typically necessary before plants canopy the field and suppress weeds naturally. Perform 2–3 weeding/hoeing during early growth.

- Mechanical weeding or hand removal works well for small farms.

Good weed control ensures better stand and higher yield.

Pest and Disease Control

Common pests and diseases include:

- Pod borer (*Helicoverpa armigera*)
- Wilt and sterility mosaic disease

Control measures include:

- Crop rotation
- Use of resistant varieties

- Proper field sanitation
- Integrated pest management (IPM) practices.

Harvesting

Pigeon pea is ready to harvest when the pods turn brown and dry. This usually happens 120–180 days after planting, depending on the variety's maturity group.

Hand pick mature pods for high seed quality.

For larger fields, cuts can be made at base when plant segments are dry.

Post-Harvest and Storage

- Seeds should be dried to low moisture content (10–11%) before storage.
- Store in clean, dry jute bags or containers to avoid insect damage.

Importance of Pigeon Pea

- Major source of plant protein (20–24%) for human diet.
- Staple pulse crop in India (arhar/tur dal).
- Improves soil fertility by fixing atmospheric nitrogen.
- Suitable for marginal and rainfed areas.
- Deep roots help in drought tolerance.
- Used as food for humans and fodder for animals.
- Crop residues used as fuel and fencing material.
- Supports sustainable and eco-friendly farming.
- Provides income and employment to farmers.
- Useful in intercropping systems with cereals and oilseeds.
- Enhances soil structure and organic matter.
- Important for food and nutritional security.

Conclusion

Cultivation of pigeon pea (*Cajanus cajan*) plays a vital role in sustainable agriculture due to its adaptability to diverse soil and climatic conditions. The crop is well suited to rainfed and marginal areas, requires relatively low inputs, and improves soil fertility through biological nitrogen fixation. Its deep root system enhances drought tolerance, while intercropping with cereals and oilseeds increases land-use efficiency and farm income. Besides providing protein-rich food for humans, pigeon pea also supplies fodder and useful crop residues. With proper seed selection, timely sowing, balanced nutrient management, and effective pest control, farmers can achieve better yields and profitability. Overall, pigeon pea cultivation supports food security, environmental sustainability, and rural livelihoods, making it an important pulse crop for present and future farming systems.

References

1. Ariyo, O. J. (2000). Pigeon pea for Africa: A versatile vegetable—and more. *Hort Science*, 38(6), 1073–1079. https://oar.icrisat.org/5871/1/HortScience_38_6_1073-1079_2003.pdf [Google Scholar]
2. Colorado State University. (2023, October 28). *Pigeon pea (Cajanus cajan) - Understudied indigenous crops*. Colorado State University. <https://colostate.pressbooks.pub/understudiedindigenouiscrops/chapter/pigeon-pea/> [Google Scholar]
3. ECHO Community. (2015, December 31). *Pigeon pea*. <https://www.echocommunity.org/en/resources/81d5fd86-74e7-41c9-af1e-a8da7a265bd2>
4. Kinhoégbè, G., Djèdatin, G., Saxena, R. K., Chitikineni, A., Bajaj, P., Molla, J., et al. (2022). Genetic diversity and population structure of pigeonpea (*Cajanus cajan* [L.] Millspaugh) landraces grown in Benin revealed by Genotyping-By-Sequencing. *PLOS ONE*, 17(7), e0271565. <https://doi.org/10.1371/journal.pone.0271565> [Google Scholar]
5. Mula, M. G., & Saxena, K. B. (2010). Lifting the level of awareness on pigeonpea: A global perspective. *ICRISAT*. [Google Scholar]
6. PROSEA. (1999). *Cajanus cajan*. Plant Resources of South East Asia. <https://prosea.prota4u.org/view.aspx?id=1>
7. Upadhyaya, H. D., Sharma, S., Reddy, K. N., Saxena, R. K., Varshney, R. K., & Gowda, C. L. L. (2013). Chapter 8. Pigeonpea. In *Genetic and genomic resources of grain legume improvement*. Elsevier. https://oar.icrisat.org/7096/1/BC_Pigeonpea_183-202_2013.pdf [Google Scholar]
8. Varshney, R. K., Chen, W., Li, Y., Bharti, A. K., Saxena, R. K., Schlueter, J. A., et al. (2012). Draft genome sequence of pigeonpea (*Cajanus cajan*), an orphan legume crop of resource-poor farmers. *Nature Biotechnology*, 30(1), 83–89. <https://doi.org/10.1038/nbt.2022> [Google Scholar]