AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 09 (September, 2026)
Available online at http://www.agrimagazine.in

Chow Chow (*Sechium edule* (Jacq.) Sw.) – An Underutilized Vegetable Crop: Biology, Cultivation, Nutritional Importance and Future Prospects

*Sarafath Assan S, Saravanan R, Karthick S and Robin R
Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram, Cuddalore, Tamil Nadu, India
*Corresponding Author's email: sarafathassan2003@gmail.com

Chow chow (*Sechium edule* (Jacq.) Sw.), commonly called chayote, is a lesser-known vegetable crop belonging to the family Cucurbitaceae. Although it has been cultivated for many years in several tropical and subtropical regions, its production and commercial importance remain much lower than those of other cucurbit vegetables. As a result, it is recognized as an underutilized crop with considerable scope for wider cultivation and use.The crop is appreciated for its versatility, as its fruits, tender shoots, leaves, seeds, and tuberous roots are all edible. It is a valuable source of dietary fibre, vitamins, minerals, and natural phytochemicals that support a healthy diet. In addition to its nutritional benefits, chow chow is known for its adaptability to diverse growing conditions, relatively low cultivation cost, and good yield potential.With increasing emphasis on nutritious foods, sustainable farming, and climate-resilient crops, chow chow is gaining attention as a promising vegetable for the future. Expanding research, improving production technologies, and creating greater consumer awareness can help promote its cultivation and enhance its contribution to food security, rural livelihoods, and sustainable horticultural development.


Origin, History and Distribution

Chow chow (*Sechium edule* (Jacq.) Sw.) is believed to have originated in the Mesoamerican region, particularly southern Mexico and parts of Central America, where it has been cultivated since ancient times. Historical evidence indicates that the crop was an important food source for indigenous civilizations before spreading to other parts of the world through trade and exploration.Today, chow chow is widely cultivated across tropical and subtropical regions because of its adaptability to diverse climatic conditions. It is grown in countries such as Mexico, Costa Rica, Brazil, China, the Philippines, and India. In India, commercial cultivation is concentrated in the hill regions of Tamil Nadu, Karnataka, Kerala, Himachal Pradesh, and the North Eastern states, where the cool and humid climate favours its growth.

Although the crop is well adapted to these regions, its cultivation is still limited compared with other vegetable crops, highlighting its status as an underutilized species with considerable potential for future expansion.

Geographical Distribution as an Underutilized Crop

Although chow chow(*Sechium edule* (Jacq.) Sw.) is cultivated in many tropical and subtropical countries, it continues to be classified as an underutilized vegetable because its commercial cultivation is confined to specific regions. The crop is widely grown in Mexico, Central America, Brazil, China, the Philippines, Nepal, and parts of Africa, but its production remains limited when compared with major cucurbit vegetables.In India, chow chow is mainly cultivated in the hilly and high-rainfall regions of Tamil Nadu, Karnataka, Kerala, Himachal Pradesh, Sikkim, and the North Eastern states. It is generally grown on a small scale in the home gardens and by smallholder farmers rather than under large commercial production systems. Limited availability of improved cultivars, poor market infrastructure, and low consumer awareness have restricted its wider adoption. However, its adaptability to diverse agro-climatic conditions, nutritional richness, and potential for value addition make chow chow a promising underutilized crop with significant scope for expansion in sustainable horticultural production.

Why Chow Chow is Considered an Underutilized Crop

Chow chow (*Sechium edule* (Jacq.) Sw.) is considered an underutilized vegetable crop because its cultivation, consumption, and commercial utilization remain limited compared with major cucurbit crops such as cucumber, pumpkin, and bitter gourd. Although the crop possesses high nutritional value, adaptability to different environments, and multiple edible parts, it has received relatively less attention in research, breeding, and market development.

The limited availability of improved cultivars, inadequate seed/planting material supply, low consumer awareness, and poor post-harvest and processing facilities are major factors restricting its wider adoption. In many regions, cultivation is mainly based on traditional farmer-selected types rather than scientifically developed varieties. Additionally, the crop has a limited presence in organized markets and export chains, reducing its commercial visibility.

However, its low input requirement, high productivity, climate adaptability, nutritional richness, and potential for value-added products make chow chow a promising crop for sustainable agriculture, nutritional security, and livelihood improvement. Increased research efforts, improved production technologies, and market promotion can help transform chow chow from a neglected crop into a commercially important vegetable.

Botanical Description

Root System: Chow chow has a well-developed taproot with numerous lateral roots. Mature plants produce fleshy tuberous roots that store food reserves and are edible.

Stem: The plant is a vigorous perennial climber with soft, green, branched stems and simple tendrils that help it climb on supports. Vines can grow up to 10–15 m under favourable conditions.

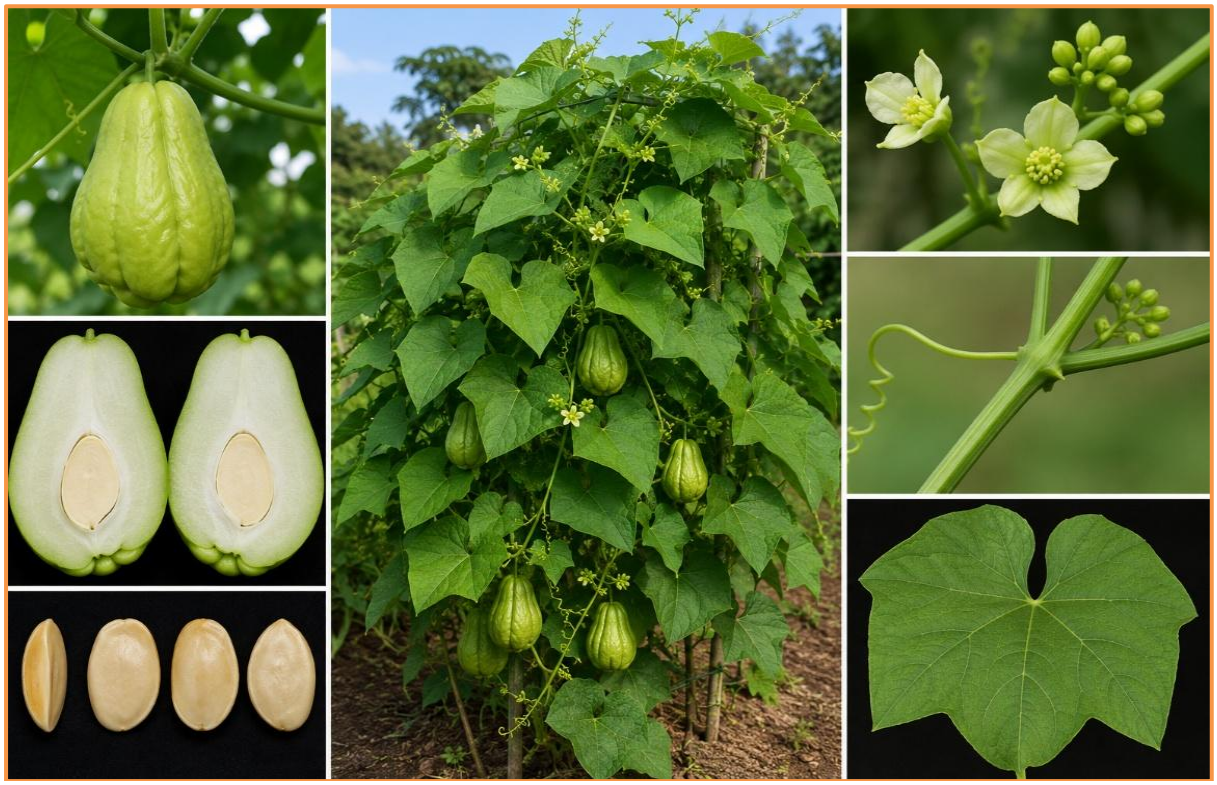
Leaf Morphology: Leaves are simple, alternate, broad, heart-shaped with shallow lobes, and borne on long petioles. Their large surface area supports efficient photosynthesis.

Flower Biology: Chow chow is a monoecious plant with separate male and female flowers on the same vine. Male flowers occur in clusters, while female flowers are solitary. Pollination is mainly carried out by insects, especially bees.

Fruit Morphology: The fruit is a fleshy, pear-shaped berry that varies in size, shape, colour, and surface texture. Depending on the genotype, fruits may be smooth or spiny and range from white to dark green.

Seed Characters: Each fruit contains a single large seed enclosed within the fruit. The seed shows vivipary, germinating inside the mature fruit; therefore, the whole sprouted fruit is used for propagation.

Chromosome Number: Chow chow is a diploid species with a chromosome number of **2n= 28**.



Climate and Soil Requirements

Chow chow (*Sechium edule* (Jacq.) Sw.) grows best under cool, humid tropical and subtropical conditions. An optimum temperature of 18–25°C favours vigorous vegetative growth, flowering, and fruit development. The crop requires adequate rainfall or irrigation and performs well in areas with moderate humidity. It is sensitive to frost and prolonged waterlogging. The crop thrives in well-drained, fertile loamy soils rich in organic matter. A soil pH of 5.5–6.8 is considered ideal for optimum growth and yield. Good drainage is essential, as stagnant water can cause root rot and reduce plant vigour. Incorporation of organic manure before planting improves soil fertility and moisture retention.

Nutritional Composition

Chow chow (*Sechium edule* (Jacq.) Sw.) is a low-calorie, nutrient-rich vegetable that contributes to a balanced diet. Per 100 g of edible portion, it provides approximately **19 kcal of energy**, **4.5 g of carbohydrates**, **0.82 g of protein**, and **1.7 g of dietary fibre**. It is also a good source of **vitamin C (7.7 mg)**, **potassium (125 mg)**, and **folate (93 µg)**, which support immune function, electrolyte balance, and normal cellular metabolism. These nutritional attributes make chow chow a valuable vegetable for promoting health and nutritional security.

Cultivars and Varieties

Chow chow (*Sechium edule* (Jacq.) Sw.) exhibits considerable variation in fruit shape, size, colour, surface texture, and yield. Based on fruit characteristics, the cultivated forms are broadly classified into **smooth-fruited** and **spiny-fruited** types. Smooth-fruited cultivars are more popular because they are easier to harvest, transport, and market.

Variety/Cultivar	Distinctive characteristics
Green Smooth	Light to dark green fruits with smooth skin; high yielding and widely cultivated.
White Smooth	Creamy white to pale green fruits with smooth surface; tender flesh and good market preference.
Dark Green	Dark green fruits with firm flesh; suitable for fresh consumption and local markets.
Spiny Green	Green fruits covered with soft spines; cultivated mainly in parts of Central America and selected regions of Asia.

Propagation

Chow chow is propagated vegetatively using whole mature fruits because the single seed enclosed within the fruit exhibits vivipary, germinating while still inside the fruit. Healthy, disease-free fruits weighing 250–500 g are selected from high-yielding vines and stored under shade until sprouts emerge. The sprouted fruits are planted directly in prepared pits with the sprout facing upward, leaving the upper portion of the fruit slightly exposed above the soil surface to avoid rotting. This method ensures rapid establishment, uniform plant growth, and better field survival. Although propagation through seeds is possible, it is rarely practiced because separating the seed from the fruit reduces viability and hampers successful germination.

Crop Production Technology

Successful cultivation of chow chow (*Sechium edule* (Jacq.) Sw.) depends on the use of healthy planting material, proper field preparation, adequate support structures, balanced nutrient management, timely irrigation, and regular intercultural operations. As a perennial climbing crop, chow chow is generally trained on trellises or bowers to facilitate better vine growth, light interception, aeration, and fruit development. Adoption of recommended production practices enhances yield, fruit quality, and crop longevity.

Nutrient Management

Balanced nutrient management is essential for maintaining vigorous vine growth and obtaining higher fruit yield in chow chow. Well-decomposed farmyard manure (FYM) or compost should be incorporated into the soil before planting to improve soil fertility and structure. Application of recommended doses of nitrogen, phosphorus, and potassium at appropriate growth stages promotes healthy vegetative growth, flowering, and fruit development. Periodic application of organic manures, biofertilizers, and micronutrients further improves soil health and nutrient use efficiency.

Irrigation and Water Management

Chow chow requires adequate soil moisture throughout its growth period, particularly during flowering and fruit development. Irrigation should be scheduled based on soil moisture and weather conditions, avoiding both moisture stress and waterlogging. Drip irrigation is an efficient method as it conserves water, reduces weed growth, and improves nutrient uptake. Proper drainage is essential, especially during the rainy season, to prevent root diseases and ensure healthy plant growth.

Weed Management

Weeds compete with the crop for nutrients, water, light, and space, particularly during the early stages of growth. Regular hand weeding or shallow hoeing helps keep the field weed-free and improves crop establishment. Mulching with organic materials or plastic mulch effectively suppresses weed growth, conserves soil moisture, and regulates soil temperature. An integrated approach combining cultural and mechanical methods is recommended for sustainable weed management.

Major Insect Pests of Chow Chow

Pest	Damage	Management
Fruit fly (*Bactrocera cucurbitae*)	Larvae damage fruits, causing rotting and fruit drop	Field sanitation, pheromone traps, bait sprays
Red pumpkin beetle (*Aulacophora foveicollis*)	Feeds on leaves, flowers, and roots	Hand collection and need-based insecticides
Aphids (*Aphis gossypii*)	Sap sucking, leaf curling, virus transmission	Neem-based sprays and yellow sticky traps
Whiteflies (*Bemisia tabaci*)	Sap sucking and virus transmission	Weed control and sticky traps

Major Diseases of Chow Chow

Disease	Causal organism	Symptoms	Management
Powdery mildew	*Podosphaera xanthii*	White powdery growth on leaves and stems, reducing photosynthesis	Resistant cultivars, improved aeration, and fungicide application when required
Downy mildew	*Pseudoperonospora cubensis*	Yellow angular leaf spots with grey fungal growth on the underside	Ensure proper drainage, avoid overhead irrigation, and apply suitable fungicides
Anthracnose	*Colletotrichum orbiculare*	Dark, sunken lesions on leaves, stems, and fruits	Use disease-free planting material, field sanitation, and fungicide sprays
Root rot	*Fusarium spp. and Pythium spp.*	Root decay, wilting, and poor plant growth	Well-drained soil, avoid waterlogging, and treat planting material before planting

Harvesting

Chow chow fruits are ready for harvest 20–30 days after fruit set, when they attain full size but remain tender and green. Delayed harvesting results in hard, fibrous fruits with reduced market quality. Fruits are harvested manually using a sharp knife or secateurs, retaining a short portion of the stalk to minimize damage and extend shelf life. Under favourable conditions, harvesting is carried out at 7–10-day intervals.

Post-harvest Management

Harvested fruits should be cleaned, graded, and sorted to remove damaged or diseased produce. Fruits are packed in ventilated plastic crates or bamboo baskets lined with soft materials to reduce mechanical injury during transport. Storage at 7–10°C with 85–90% relative humidity helps maintain freshness and extends shelf life for 2–4 weeks. Proper handling, suitable packaging, and refrigerated storage help reduce post-harvest losses and preserve fruit quality.

Nutritional Value

Chow chow (*Sechium edule* (Jacq.) Sw.) is a low-calorie vegetable rich in dietary fibre, vitamin C, folates, potassium, calcium, magnesium, and phosphorus. It also contains moderate amounts of carbohydrates and essential amino acids along with natural antioxidants such as flavonoids and phenolic compounds. Its high water content and low fat level make it a nutritious food suitable for a healthy diet.

Medicinal Importance

Chow chow has been traditionally used for its therapeutic properties. The fruits, leaves, and roots contain bioactive compounds with antioxidant, anti-inflammatory, antidiabetic, antihypertensive, antimicrobial, and diuretic activities. Regular consumption may help reduce oxidative stress, support cardiovascular health, improve blood glucose regulation, and promote digestive health. Owing to these health benefits, chow chow is increasingly recognized as a functional food with potential nutraceutical applications.

Value Addition

Chow chow offers excellent opportunities for value addition due to its mild flavour, high moisture content, and nutritional value. The fruits are processed into **pickles, chutneys, jams, candies, dehydrated slices, chips, soups, and ready-to-cook products**. They are also used in bakery items, beverages, and mixed vegetable products. Value addition improves shelf life, minimizes post-harvest losses, increases market value, and provides additional income opportunities for farmers and small-scale food processors.

Economics of Cultivation

Chow chow (*Sechium edule* (Jacq.) Sw.) is considered an economically viable vegetable crop because of its high productivity, low maintenance requirements, and prolonged harvesting period. The crop offers regular income to farmers through repeated harvests and has additional market opportunities through processing into products such as pickles, dehydrated slices, and other value-added foods. Globally, chow chow is cultivated on a commercial scale in countries such as **Mexico, Costa Rica, Brazil, and China**, while demand for fresh fruits is increasing in markets including the **United States, Canada, Europe, and Japan**. Among these, **Costa Rica and Mexico** are the major exporters. In India, however, the crop is grown mainly for domestic consumption, particularly in the hill regions of Tamil Nadu, Karnataka, Kerala, Himachal Pradesh, Sikkim, and the North Eastern states. Since export volumes are limited and official trade statistics are generally included under the broader category of fresh vegetables, separate export data for chow chow are not available. Improving production practices, post-harvest infrastructure, and market linkages can enhance the profitability and export potential of this underutilized vegetable crop.

Future Prospects

Chow chow (*Sechium edule* (Jacq.) Sw.) has immense potential to emerge as an important climate-resilient and nutritionally rich vegetable crop. Future research should focus on the development of high-yielding, pest- and disease-resistant cultivars through conventional breeding and molecular approaches. Conservation and characterization of diverse germplasm resources will broaden the genetic base for crop improvement. Advances in tissue culture, genomics, and marker-assisted breeding can further accelerate the development of superior cultivars. Expanding value-added products, improving post-harvest technologies, and strengthening market linkages will enhance the commercial value of the crop. Promoting consumer awareness, encouraging large-scale cultivation, and integrating chow chow into sustainable farming systems will help unlock its full potential for food, nutritional, and livelihood security.

Conclusion

Chow chow (*Sechium edule* (Jacq.) Sw.) is a promising yet underutilized vegetable crop with significant nutritional, medicinal, and economic value. Its adaptability to diverse agro-climatic conditions, high productivity, and multiple edible plant parts make it an important crop for sustainable agriculture and food security. Although its commercial cultivation is currently limited, growing interest in climate-resilient and nutrient-rich crops has created new opportunities for its wider adoption. Strengthening research on crop improvement, production technologies, post-harvest management, and value addition, together with improved market access and consumer awareness, will help realize the full potential of chow chow. Promoting its cultivation and utilization can contribute to diversified farming systems, enhanced farmer income, and improved nutritional security in the future.

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