



## LARGE CARDAMOM: A POTENTIAL CASH CROP OF HILL COMMUNITY

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**Abstract:** Large cardamom, *Amomum subulatum* Roxb. is extensively used for flavouring vegetables and food preparations across India due to its pleasant aromatic odour. It is also used as an essential ingredient in mixed spices preparation for making food delicious. It contains 2-3% essential oil having medicinal properties. It is also used as a preservative for food materials. The crop of this plant grows well in hilly areas on slopes. Present article is an attempt to collect information about the large cardamom for farmers and researchers so that they can get proper information regarding this cash crop. Researchers can use this information for the development of disease and heat resistant varieties, so that this crop can be grown in the plains of India too. Micropropagation techniques can also be used for the development of new varieties of this crop.

**Keywords:** Cash crop, Essential oil, Large cardamom, Medicinal value, Sikkim.

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### INTRODUCTION

*Amomum subulatum* Roxb. belongs to family Zingiberaceae, is commonly known as large cardamom or Nepal cardamom (Vernacular names: Bengali-Bara Elachi; Hindi-Badi Elaichi; Malayalam-Perelam; Sanskrit-Brihadaela; Tamil-Periyelam; Telugu-Peddayalakai and so on in different languages). It is one of the most important spices grown in India Roxburg (1820). The genus *Amomum* is the second largest genus of the family Zingiberaceae (Order: Scitaminae) with more than 150 species (Tripathi and Prakash, 1999). This perennial herb is a monocot and monoecious plant (Sajina *et al.*, 1997). It is

characterized by the position of radical inflorescence, absence of involucre of sterile bracts and reduced lateral staminodes. *A. subulatum* was described for the first time by Roxburgh in detail in his 'Plants of the Coast of Coromandel' and in 'Flora Indica', 1820 (Thomas *et al.*, 2009). The cultivars of *A. subulatum* namely cv-Ramsey, cv-Golse and cv-Sawney were studied by Gyatso *et al.* (1980), Subba (1984) and Rao *et al.* (1993). *Amomum subulatum* is indigenous to moist deciduous and semi-evergreen forests of sub-Himalayan tracts (Gupta, 2000). The medicinal plants are associated with socio-cultural evolution in India (Pandey, 2019).



Cardamom is one of most important and oldest spices known to Indians since 6<sup>th</sup> century B.C. as mentioned in Sashruta (Sharma *et al.*, 2009; Singh *et al.*, 2022). It was also known to Greeks and Romans during 4<sup>th</sup> century B.C. recorded by Theophrastus (Mukherjee, 1972). At present seven cultivars are grown globally are cv-Ramsey, cv-Golse, cv-Sawney, cv-Seremna, cv-Varlangey, cv-Dzongu and cv-subulatum (Sharma *et al.*, Sharma, 2000; Thomas *et al.*, 2009). Cardamom is cultivated in India, Nepal, China and Bhutan. In India, the states of Sikkim including the Darjeeling district of West Bengal are the leading areas for its production. Large cardamom is also cultivated to a limited extent in parts of Uttarakhand, Arunachal Pradesh and in some other North-Eastern states. India is the largest producer of large cardamom with 54% share in world production, and Sikkim contributes up to 85% of India's production. According to Thomas *et al.* (2009), some of the important cultivars grown in Sikkim are Dzongu, Sawney, Green-Golsey, Varlangey and Seremna.

#### PLANT DESCRIPTION

*Amomum* is rhizomatous perennial herb (Thomas *et al.*, 2009). Rhizomes are woody, fibrous, hard, subterranean, dark pink, nodal markings are prominent, outer side dull pink, brighter towards centre; roots are pink outside. Leafy shoots are 100-285 cm in height, girth 7-7.5 cm, robust, swollen at base and green to pink. Leaves are simple, alternate, distichous, 5-9, sessile to petiolate, produced mainly towards the upper 2/3 of shoot; lower 1/3 of plant is covered by sheaths; lamina, oblong-lanceolate, 30-81 x 7.5-10.5 cm, thick, drooping, dark green on upper side, pale beneath, glabrous, margin entire, wavy, hyaline, slightly revolute, apex long-acuminate, up to 4.5 cm long; base oblique, tapering, oblique ends 0.5-1.0 cm apart; midrib shallowly ridged, white, glabrous; nerves many, running parallel at an angle 25-30° with the midrib, originate from midrib and runs parallel with the midrib a little long, then slanting; petiole up to 2.5 cm long, grooved above, shallowly ribbed with nerves, emarginate, apex nearly rounded, margin ciliate, glabrous, light pink; gland usually not prominent, rarely present in the adjoining

portion between petiole and ligule, dark pink, glabrous. Spike 6-12 x 3-6 cm, 1-3 per leafy shoot, radical, clavate, compact, 1 or 2-flowered, a little elevated above the soil, elongate during flowering; bracts, bracteoles, calyx and beak of dorsal corolla lobe with pale yellow pointed apical process; involucre of sterile bracts absent; peduncle 3.5-6 cm long, with 6 or 7 bracts; the uppermost bracts of peduncle often enclose the spike.

Flower 4.7-5.1 cm long, yellow, borne singly from each bract and bracteole. Bract broadly obovate, obtuse with a horny cusp, 3-5 x 2-3 cm, imbricate, leathery at centre, membranous towards the margin, pubescent outside, glabrous inside, green to pink; margin hyaline, ciliate; beak subulate, 3-4 mm long, glabrous. Bracteole obovate or spathiform, 2.7-3.1 x 2-2.4 cm, opening on one side, thick at centre, membranous towards margin, pubescent outside, glabrous inside, light green, light green; margins membranous, ciliate; beak subulate, 2-4 mm long, glabrous. Calyx cylindrical, tubular, 2.5-3.5 x 0.6-0.9 cm, 3-clefted, longer than corolla tube, reaches  $\frac{3}{4}$  of the flower, pubescent outside, glabrous inside, pale green-yellow at tip, white towards base; splitting unequal, one split is longer than others; beaks 3, 0.5-1.0 cm long, nearly equal in length, glabrous; beak base notched, apex c. 1 mm long.

Corolla tube 1.8-2.0 cm long, c. 4 mm at mouth, shorter than lobes, glabrous outside, densely hairy towards mouth, glabrous towards base, downwardly directed, pale pink-yellow; dorsal lobe obovate-oblong or boat shaped, concave, broader than laterals, 2.1-2.5 x 1.1-1.2 cm, pale yellow, glabrous, apex hooded, margin sparsely ciliate; beaks subulate, 3-4 mm long, some hairs below, many-nerved, 3 nerves continuous till apex; lateral lobe oblanceolate, 2.4-2.6 cm, glabrous, pale yellow; margin sparsely ciliate, one side of apex slightly folded, many-nerved, 1 nerve extends up to the apex. Labellum 2.4-2.6 x 1.2-1.3 cm, oblong, longer than corolla lobes, dark yellow, 9-12 pairs parallel nerves from mid nerve, bright yellow, all nerves nearly equidistant, laterals hyaline, close, not reaching up to the margins, unsplit; apex nearly truncate,

emarginate, ends overlapping, crumpled; margin crenulate, crumpled; base cuneate, densely hairy, slightly pink-tinged. Lateral staminodes subulate, 4-9 mm long; base slightly bulbous, hairy. Stamen 1, perfect, 2.2-2.6 cm long, nearly equal to the lip; filament slightly concave, 6-9 x 2-3 mm, hairy inside, glabrous outside, creamy white; connective slightly hairy, produced into a crest; crest fan-shaped, unlobed, apex inflexed, 0.8-1.0 x c. 2 cm, petaloid, glabrous, yellow; anther 2-celled; thecae oblong, 0.9-1.1 x c. 0.1 cm, glabrous, creamy white, apex diverging, base sharply ending, equal, dehiscing throughout the length. Epigynous glands 2, 1-2 mm long, yellow, warty, irregularly minutely lobed, glabrous, placed above the ovary; style passes between the glands.

Ovary inferior, barrel-shaped, 4-5 x 3-4 mm, pink, pale towards tip, sparsely hairy, 3-loculed; ovules many, placed a little apart from the axis, 2 or 3 in each row, 2 groups in each locule; style filiform, 3.7-3.9 cm long, sparsely hairy, white; stigma subglobose, one side slightly bulged, c. 1 mm across, minutely red-spotted, situated at the tip of the anther thecae, not exceeding the crest, opening terminal, elliptic, ciliate around the mouth. Infructescence 13-19 cm long; peduncle 6-11 cm long, elongate during fruiting. Fruit a capsule, 14-20 per spike, conical, 2.5-3.0 cm long, 5.5-6.0 cm in girth, fresh weight c. 4.39 g, dry weight c. 0.64 g, maroon-coloured; 10-13-winged, wingless towards base, irregularly lobed, glabrous; bract, bracteoles and calyx are persistent in fruit; bract c. 3.5 \_ 3 cm, with c. 6 mm long beak; bracteole c. 3 \_ 2.2 cm, with c. 5 mm long beak; calyx 3-3.7 cm long. Seeds 40-50, c. 2.5 mm, black, bold, glabrous, arillate; aril white, sweet (Thomas *et al.*, 2009).

### Climate and Soil

Large cardamom grows well at altitudes ranging from 500-2000 meters from subtropical to the cool temperate zones with a rainfall of 3000-3500 mm per annum and temperature ranges from 6°C minimum in winter to 33°C maximum in summer on slopes of hills. (Mande *et al.*, 1999; Sharma *et al.*, 2000; Kashyapi, 2004). Large cardamom is shade loving plant (Sciophytes). It grows well under the shade of forest trees. Some of them are *Terminalia myriocarpa*, *Bucklandia* spp.,

*Macaranga denticulate*, *Edgeworthia gardneri*, *Viburnum ruberens*, etc. However, *Alnus nepalensis* is the most common and preferred shade tree for large cardamom (Mande *et al.*, 1999; Sharma *et al.*, 2010), as the *Alnus* forms symbiotic association with nitrogen fixers (Sharma *et al.*, 2009). During severe winter, plant remains dormant and becomes active onset of favourable condition. It can withstand up to 2°C temperature but frost and hailstorms are injurious. Continuous rain is also not good for cardamom cropping since it hampers with process of pollination.

Cardamom needs soil rich in organic matter, nitrogen, phosphorus and medium to high potash. The pH of soil should be 4.5 to 6.0. The crop can be grown in undulating and steep terrains but land with a more moderate slope is preferred. Deep and well drained soils with sandy, sandy loam, silty loam, to loamy texture with soil depth of few inches to several feet are best suited for cardamom. Water logged condition is not suitable and adequate drainage is quite essential for the crop (Varadarsan and Biswas, 2002). The cultivation of large cardamom is not only beneficial for farmers but also helps in conserving nature (Pradhan *et al.*, 2014).

### Plant Propagation

Large cardamoms are usually sown in September-October (pre-winter) and February-March (post winter). Propagation of cardamom occurs by the seeds as well as rhizomes. Seeds are sown to produce large number of seedlings. The pollination in large cardamom occurs by bumble bees (*Bombus* sp.) and honey bee (Varadarsan and Biswas, 2002; Sinu and Shivanna, 2007). Another way of propagating large cardamom is through the micropropagation. The micropropagation method provides better way to produce large number of high yielding, disease free plants.

### Challenges of Cardamom Farming

In recent few years, decline in production of large cardamom is observed in hilly areas due to improper management of crop; disease and pest; post-harvest and market related problems, socioeconomic conditions; lack of phytosanitation and scientific methods of cultivation; increased anthropogenic activities like

deforestation, forest fire (Sharma *et al.*, 2010; Bhattarai *et al.*, 2013). The crop is also susceptible to a number of diseases caused by viruses and fungi. There are two viral diseases causing severe damage to the crop *viz.* Chirkey and Phurkey (Sharma *et al.*, 2009, Saju *et al.*, 2013). Among fungal diseases, flower rot, clump rot, leaf streak and wilt are known to cause considerable loss (Varadarsan and Biswas, 2002). The uprooting and burning of infected plant is only remedy for above diseases. Most of the pesticides are ineffective.

### ECONOMIC IMPORTANCE

Large cardamom has a pleasant aromatic odour due to which, it is extensively used for flavouring vegetables and many food preparations in most parts of the country (Pathak, 2008). It is also an essential ingredient of readymade mixed spices of different brands available in the market.

The seeds have properties almost similar to those of true cardamom (*Elettaria cardamomum*, family Zingiberaceae). The seeds contain 2-3% essential oil, cineole which, possess medicinal properties as well as preservative properties and are used as adjuncts to various medicinal preparations (Sinu and Shivanna, 2007). It shows analgesic, antimicrobial, antioxidant and antiulcer activity and posses carminative, stomachic, diuretic, cardiac stimulant, antiemetic properties (Rao *et al.*, 1993; Bisht *et al.*, 2011; Pradhan *et al.*, 2014; Mal and Gharde, 2019; Singhal *et al.*, 2022). The decoction of seeds is used as a gargle to cure infection of teeth and gums. Seeds are considered as antidote to snake and scorpion venom, and are also used as preventive as well as curative agent for throat troubles, congestion of lungs, inflammation of eyelids, digestive disorders and in the treatment of pulmonary tuberculosis.

Large cardamom is grown on about 30,000 ha land in India with average production of about 150 kg/ha. Annual production in India is about 5000-5500 tons per year (Anonymous, 2004; Thomas *et al.*, 2009). The cultivation of cardamom is of great economic value for farmers of India. It helps in improving their economic status. India exports most of the large cardamom

produced for earning foreign currency. Large cardamom is mainly sold in the domestic markets of Northern India and used as spices, small amount exported to Pakistan, Singapore, Hong Kong, Malaysia, UK and some Middle East countries. It has good markets in Gulf countries, USA and West Germany (Thomas *et al.*, 2009; Parveen *et al.*, 2018). Hill farmers should be trained and subsidized so that they can earn money and make their livelihood comfortable. It can also be helpful in earning foreign currency.

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