

LARGE CARDAMOM

Scientific Name : *Amomum subulatum* Roxb.

Family : *Zingiberaceae*

English Name: Large Cardamom, Greater cardamom, Nepal cardamom

Indian name : Badi Elaichi

Large or greater cardamom is also known as Nepal cardamom and is an important spice crop of India. The seeds of large cardamom, which are commercially important. The volatile oil present in the seeds of large cardamom is one of the principle constituents responsible for its typical characteristic odour. The volatile oil is pale yellow in colour and consists of (in%) α -pinene (2.0), β -pinene (2.4), sabinene (0.2), myrcene (0.3), α -terpinene (0.2), limonene (10.3), 1,8 cineole (74.0), γ -terpinene (0.2), *r*-cymene (0.2), terpin-4-d (2.0), *d*-terpineol (5.6) and nerolidol (1.0).

Due to its pleasant aromatic odour, large cardamom is used for flavouring various vegetables and meat preparations. It is also used as a flavouring agent in confectionery, hot or sweet pickles and in beverages. The seed is used as an essential ingredient in mixed spice preparations. The ripe fruits are eaten raw by the inhabitants of Sikkim and Darjeeling during September and October.

The seeds have a sharp, good taste and are a tonic for heart and liver. They are an astringent to the bowels, are hypnotic, appetizing and aid digestion. The outside covering is good for headaches and for the teeth and heals stomatitis. The decoction of the seeds is used as a gargle to cure problems of the teeth and gums. In combination with melon seeds, they are used as a diuretic in case of kidney stones. In certain disorders of the digestive system, marked by scanty and viscid secretion from intestines, they promote elimination of bile and are useful in congestion of the liver. The seeds are used in treating gonorrhoea and as an aphrodisiac. They have also been found useful for the cure of neuralgia, in large doses in conjunction with quinine.

The seeds are used as antidotes to snake or scorpion venom. The seeds are also widely used in India as a spice or condiment and in the preparation of sweets. In medicine, they are fragrant adjuncts to other stimulants, bitters and purgatives. The oil extracted from the seeds is applied to the eyelids to allay inflammation. It is an aromatic cardiac stimulant, stomachic, diuretic, carminative and is a remedy for throat and respiratory ailments. Large cardamom is native to the moist, deciduous and evergreen forests of the sub-Himalayan region. It is an important crop of Sikkim from where it has spread to the North-eastern states and parts of West Bengal, Assam and neighbouring countries like Nepal and Bhutan.

Origin and Distribution:

The large or Nepal cardamom is indigenous to Sub-Himalayan region. Sikkim, West Bengal, Nepal, Arunachal Pradesh, Himachal Pradesh and Uttaranchal are the important states cultivating large cardamom in India.

Area and production

Sikkim is the leading state in area (26,151 ha) and production (4,200 t) followed by Darjeeling in West Bengal. Arunachal Pradesh, parts of Himachal Pradesh and the Garhwal hills of Uttaranchal have just initiated its cultivation with the present average yield being only 160 kg/ha. The bulk of the large cardamom produced is consumed in the country and a limited quantity (about 775 Mt) is exported to Singapore, Pakistan and the United Kingdom. Among the other countries, Bhutan produces about 3000 to 3400 Mt and Nepal around 1000 Mt of large cardamom annually.

Botany:

Large cardamom is a herbaceous perennial with subterranean rhizomes, which gives rise to leafy shoots and spikes. The mature plant height ranges from 1.5 to 3.0 m. Leafy shoots are formed by long sheath-like stalks encircling one another. The leaves are green or dark green, glabrous on both the surfaces, with an acuminate apex. The inflorescence is a dense spike on a short peduncle bearing 40 to 50 flower buds in an acropetal sequence. The fruit is a trilocular, many-seeded capsule. The capsule wall is echinate and is reddish-brown to dark pink in colour. Wild species of *Amomum* also exist in Sikkim.

Soil and Climate

Large cardamom is a shade-loving plant (seophyte) and grows luxuriously from 600 to 2300 m above sea level in a humid, subtropical natural habitat on slopes under the canopy of lofty, evergreen forest trees. Moderate shade, high humidity and cool surroundings are essential for its satisfactory growth and production. The temperature varies from 10-30°C in the growing areas. The average annual rainfall ranges from 200 to 350 cm spread around 200 days. It is highly sensitive to wind and drought.

The crop grows best on well-drained, rich forest soils with plenty of humus and leaf mould. Since the plant has a lot of surface feeding roots, the soil should essentially be well-drained. Cardamom plantations established on rich and well-drained soils, besides giving

higher yields, maintain their productivity for a considerably long period, sometimes for more than 20 years. Water-logged areas are not suitable and hence adequate drainage is essential for better growth along with a pH of 5.8 to 6.5.

Species of Large Cardamom

SPECIES	COMMON NAME	COUNTRY	USES
<i>A. aromaticum Roxb.</i>	Bengal Cardamom or Nepal cardamom	Eastern india, Pakistan	Rhizomes are used as a spice and flowering shoots are used in curries
<i>A. compactum soland</i>	Round cardamom	Malaysia, Java	Fruits are used as spice
<i>A. glabosum Cour</i>	Round Chinese Cardamom	China	Seeds are used as spice
<i>A. krevanw Pierre</i>	-	Cambodia, Indo-China	Fruits are used as spice and to flavour curries sausages and cordials
<i>A. maxiumum Roxb.</i>	Java Cardamom	Malaysia	Used as spice
<i>A. xanthiodies Wall.</i>	Wild bastard Siamese Cardamom	Myanmar, India	Used as spice

Varieties

There are mainly 6 varieties of large cardamom. In addition, there are several sub-varieties or strains which are named in the local dialects of Lepchas, Bhutias and Nepalese. These varieties are *Bebo*, *Bharlangy*, *Golsey*, *Ram/a*, *Ramsey* and *Swaney*. Among these, three popular cultivars grown in Sikkim are *Ramsey*, *Sawney* and *Golsey*. Other cultivars are derivatives of these varieties. These cultivars are white *Ram/a*, *Chivey Ramsey*, *Garday Seto Ramnag*, *Madhusay* (Madhusai), *Seto Golsey*, *Slant Golsey*, *Red Sawney* and *Mingney*. The same cultivar is called by different names in different localities, as variations in growing conditions cause changes in plant colour, whereas, harvesting at different stages of fruit development changes the fruit- skin colour.

The characters of the three major cultivars are

Ramsey or Ramsmeiy

It is a Bhutia word which means yellow colour (ram—colour, *shai* or sey-yellow). Plants of this cultivar are tall (approx. 2.5 m) having many shoots (10-15) with thin and long leaves. The fruits are the smallest in size and are of inferior quality. The cultivar is grown mostly on higher altitudes (around 1,500 m and above). In lower altitudes, the plants are severely affected by the Forkey virus disease.

Sawaney or Sawney

This is a Nepali word which means that the cultivar is harvested in sawan, i.e., August. The plants are tall (approx, 2.5m) but the leaves are wider and shorter compared to those of

Ramshai. The fruits are bold in size and brown in colour. This cultivar is very popular in the lower altitudes (below 1,500 m) as it is comparatively less susceptible to the Forkey virus disease.

Golshai or Golsey

This is a derivative of the word golraund in Hindi and shai or seyyellow (Bhutia), indicating the round shape and yellow colour of the fruits. The plants are short with fewer shoots (5-6). The leaves are comparatively short and broad. The fruits are big and bold and are sold at premium prices because of their good appearance. The salient features of different cultivars, studied at the ICAR Complex for NEH Region and Sikkim are given in the table below.

Salient characters of large cardamom cultivars

Sl.No.	Particulars	Golsey	Sawney	White Ramna
1.	Number of bearing shoots per clump	11.4	25.2	21.0
2.	Number of flower panicles per clump	5.8	12.2	26.0
3.	Number of capsules per panicle	8.9	9.9	7.1
4.	Total number of capsules/clump	51.6	120.8	185
5.	Weight of fresh capsules/clump	243.6 g	263.8	425.5 g
6.	Weight of dry capsules/clump	50.0 g	64.1 g	98.0
7.	Single fresh capsule weight	4.7 g	2.1 g	2.3 g
8.	Single dry capsule weight	0.97 g	0.53 g	0.53 g
9.	Number of plants/ha	12.345 (90x90 cm)	6.410 (1.25 x 1.25 m)	6.410 (1.25 x 1.25 m)
10.	Total weight of dry capsules/ha	617.8 kg	410.8 kg	628.6 kg
11.	Volatile oil content	2.8%	1.8%	1.5%

Dried capsule characters of large cardamom

Cultivars	Av. Weight of 100 capsules (g)	Av. Number of seeds/capsule	Length of capsule (mm)	Diameter of capsule (mm)	Remarks
Red Sawney	64.00	40	20.6	13.5	Large –sized, greyish-brown capsules, with seeds of dull brown colour and moderate pungency
White Green Golsey	77.0	46	20.3	12.4	Medium to large-sized dark black capsules, with black seeds and high pungency
Sawney	54.3	38	19.9	12.1	Medium –sized, light brown capsules with brown seeds of lesser pungency. The volatile oil content of the seeds is 1.8-2.5%
White Golsey	80.0	59	22.0	14.0	Large-sized, pinkish-brown capsules with large black seeds of high pungency
Golsey	104.0	58	23.3	14.8	Large-sized. Roundish, brown capsules, with light brown seeds that are highly pungent. The seeds contain 2-3% volatile oil.
White Ramna	53.0	24	17.0	10.0	Small-sized, yellowish capsules with light grey seeds of less pungency.

Five promising types of large cardamom, viz., ACC. No-3 (Ramea from Singhik), ACC. No.-4 (Romeo from Singhik), ACC. No.-9 and (Ramasey green type), ACC. No 12 (Burlangey) ACC, No 14 (Bebo) and five relatives, viz., Churumpa (*A. dealbatum*), Baklok (*A. kingii*), Belak, Tali and Jaker (all *Amomum sp*) have been identified from 34 germplasm types maintained at the experimental farm of the ICAR complex at Tadung, Sikkim.

Two high yielding varieties ICRI Sikkim-1 and ICRI Sikkim-2 (belonging to Sawney cultivar) were released from Regional Research Station, Sikkim for large cardamom. Yield of these two varieties are 800-900 kg/ha under rainfed condition.

Cultivation

Propagation

Large cardamom can be **propagated** by seed as well as by vegetative methods. The seedling plantation starts bearing fruits after five years, whereas plants raised by rhizomes start bearing after three years of planting. Therefore, the vegetative method is preferred for

the commercial plantation of large cardamom.

Vegetative propagation

Large cardamom is generally propagated by planting a section of the rhizome, called a bulb or slip, from an established clump. Care should be taken to select rhizome slips only from disease-free, healthy and high-yielding mother plants. The plants propagated by this method come to the yielding stage two years earlier than those grown by seed propagation. However, repeated vegetative propagation reduces plant vigour and hence should be avoided.

Seed propagation

Seeds and sowing

The seeds for sowing in the nurseries should be collected from well- matured capsules selected from high-yielding mother plants. The capsules are dehusked just after harvesting and the seeds are thoroughly washed in water to remove the mucilage coating. The seeds are then mixed with wood ash and dried in the shade for 2 to 3 days. Now the seeds are ready for sowing. Generally, about 30 to 50% germination is obtained in large cardamom. To increase the percentage of germination, treating the seeds with concentrated sulphuric acid for 2 minutes or concentrated nitric acid for 10 minutes is advised.

Primary nursery

Beds of 5m x 1m and about 15 cm to 25 cm in height are prepared. A thin layer of humus-rich jungle soil is spread on the beds. The seeds are sown in lines about 10 to 15 cm apart. They are covered with a thin layer of fine soil and the beds are mulched with paddy straw or any other dried grass to a thickness of 2 to 3 cm. The beds are irrigated daily to keep them moist. The mulch should be removed after germination and the beds should be kept free of weeds. There are two seasons for sowing the seeds: pre-winter (October-November) and post-winter (February-March). The seeds sown in October- November remain viable till the end of winter and start germinating in March. However, it is observed that the seedlings obtained from the pre-winter sowing are healthier and more vigorous compared to the post-winter sowing, hence pre-winter sowing of seeds is preferred. *Pandals* (thatched structures) may be provided to protect the seedlings from the sun. Regular weeding and watering should be done. The seedlings are ready for transplanting in June-July.

Secondary nursery

Here, the beds are prepared as in the primary nursery. The seedlings are transplanted to these beds in rows at spacing of 10 cm between plants and 15 cm between rows. After about 12 months, the seedlings will be ready for planting in the main field.

Land preparation

Virgin forest areas, if selected for plantation, should be cleared of all undergrowth and trees not suitable for the relatively heavy shade needed by cardamom. Where the tree growth

is sparse and shade insufficient or unsatisfactory, quick-growing trees are planted for temporary shade as well as other trees with a tall and spreading habit for permanent shade. The trees selected for providing permanent shade in cardamom plantations should have the following characteristics:

1. A tall and fast-growing habit, so that within 3 years of planting the tree attains sufficient growth to provide shade for the already-flowering cardamom plants.
2. The tree should provide maximum shade during the dry period.
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4. The leaves should decompose quickly when they fall on the ground.

Utis (*Alnus nepalensis*) has been recommended as an ideal shade tree. Other important shade trees are Chillowne, *Schima wallichii*, pan isaj, *Bucklandea populnea*, Malato, *Macaranga denticulate* and *Edgeworthia gardneri*. The shade trees are planted with a spacing of 7-10 m.

Planting

Bulbs or slips or seedlings along with 1-2 shoots are planted in the prepared pits (30 cm x 30 cm) at 150 cm x 150 cm distance for Ramshai and Sawane^y and at a 90 cm x 90 cm distance for *Golshai*, by digging a hole in the soil. The plantin^g is done at 8-10 cm depth. After a few showers, the pits may be filled with surface soil. Well-rotten cattle manure, compost or leaf-mould should be mixed thoroughl^y with the top soil before planting. It is also advisable to add 100 g rock phosphate per pit and mix it with the top soil before filling the pits. Planting is done in June-Jul^y when there is sufficient soil moisture, atmospheric humidit^y and optimum temperature for growth.

Mulching

Soon after the planting, the base of the plant should be mulched during November-April with dried leaves. Mulchin^g will preserve the soil moisture and provide a source of nutrients after decomposition. Organic manures like FYM, compost, leaf-mould and humus, rich forest soil may be applied. As the soil is rich, generall^y no fertiliser is recommended.

Manures and fertilisers

As the inherent capacit^y of the soil to supply nutrients is high due to the presence of high organic matter, fertilisatioⁿ is not a common practice in cardamom. But it has been observed that the application of 30 kg N along with 30 tonnes of FYM or compost per hectare every year increases the yield of large cardamom. Wood ash is also effective. About 10 kg cowdun^g manure or compost along with 10 g N and 25 g superphosphate per clump are added each year for higher production.

Irrigation

Irrigation may be provided once in every 10 days during December Large plantations

require regular weeding during the first (3-4 times) and second (2-3 times) year of planting and, thereafter, the problem lessens as the foliage covers the entire field. The intensity and frequency of weeding depends upon the weed species, population and diversity. Weeding by scraping the soil surface is a common practice and it should be discouraged because it adversely affects the soil structure. Instead, weed threshing should be carried out twice a year once during May-June and the second time before harvesting.

Shade regulation

Tall growing trees are trimmed regularly to a height of 4-5 m to encourage the spreading habit with renewed vegetative vigour to provide uniform shade and higher quantity of leaf-litter.

Re-planting

Large cardamom starts bearing from the 3rd year after the final transplanting into the main field and continues to yield up to 25 to 30 years; but the economical production period is from the 5th to 10th year after which the yield decreases. Thus, replanting has to be done after the 9th year, gradually, as it is difficult and uneconomical to destroy the entire plantation at one time. However, the removal of the entire plantation is resorted to when virus diseases appear

Harvesting and yield

The crops raised by seeds start fruiting after 5 years, while vegetatively propagated crops fruit after 3 years of planting. Flowering starts from April-May and continues up to June-July. After fertilisation, the fruits ripen within 5-6 months. Harvesting is done by cutting the mature panicles with the help of a long narrow knife. The harvesting span is between August and November. The economic yield period varies between 12-15 years; however, some well-managed plantations can yield profitably up to 20 years. During the third year, when the first harvest is done, the yield is negligible (<25 kg/ha). The yield gradually increases and reaches the maximum in the sixth or seventh year. The yield at this stage varies greatly (3 to 10 q/ha of dry cardamom), depending on the management.

Curing

The fruits are separated from the harvested panicles for drying and curing. The freshly-shelled fruits are dried on a kiln. Over the kiln, a thin bamboo structure, just like a mesh, is placed, on which the freshly- harvested fruits are spread out for curing. Wet and freshly-cut wood which does not burn well and gives out a lot of smoke is used for fuel in the kiln, so that temperature does not rise too high. For good curing, a low temperature is required. Once the kiln is started, it takes about three days of continuous smoking for complete curing or drying. A kiln of 2.4 x 2.4 x 2.4 m has the capacity to dry 12 bags (40 kg each) of fresh fruits. Approximately 25% of the fresh weight of the fruits is recovered after the drying is completed. The dried capsules are dark pinkish-brown in colour and have a smoky odour and the dried material cannot be stored for a long time. The flue-pipe system of curing may be used as it is better than the kiln system, since the colour of the capsules

remains a shiny pink in the former method. In this system, a flue from the furnace passes through the pipes. The harvested wet cardamom is spread over wire meshes fixed above the flue pipes. The product is dried by the movement of hot air. It takes about 24-30 hours for the produce to dry. The cardamom cured by this system retains its colour and flavour, which fetches a good price in the market.

Storage

The cured produce needs to be packed in insect-proof bags. Coal-tar coated and polythene-lined gunny bags are effective against insect attack during storage.

Value-added products

The value-added products of large cardamom are the essential oil of the seeds and the oleoresin.