

## **Cultivation of Large Cardamom in Sikkim**

**Dr. Anjali Pathak\***  
**Organic farming consultant**  
**& social activist**

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Large Cardamom (*Amomum subulatum*), a member of Zingiberaceae family under the order Scitaminae is one of the main cash crops cultivated in the sub-Himalayan State of Sikkim and Darjeeling District of West Bengal covering an area of about 23,500 ha. The annual production varies from 4500-5000 metric tonnes. It is also cultivated in parts of Uttaranchal and in some other North-eastern States. Nepal & Bhutan are the other countries where large cardamom is cultivated. It is used as a spice and in several ayurvedic preparations. It contains 2 to 3 per cent of essential oil and possesses medicinal properties like carminative, stomachic, diuretic, cardiac stimulant, antiemetic, etc. Large cardamom has a pleasant aromatic odour, due to which it is extensively used for flavouring vegetables and many food preparations in India. In this article, Dr. Anjali Pathak, who is a writer, educator and organic farming consultant, dwells on the cultivation, harvesting and curing of large cardamom, which would greatly benefit those interested in cultivation of large cardamom.

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*Author*

## **Introduction**

Large cardamom (*amomum subulatum*), is one of the main cash crops cultivated in Sikkim and the Darjeeling district of West Bengal. With annual production of over 4,500 MT from a total cultivation area of about 23,500 hectares, large cardamom is the main cash crop of Sikkim. India is the largest producer of large cardamom with 54% share in world production, and Sikkim contributes upto 88% of India's production. Large cardamom is also cultivated in parts of Uttarakhand and in some other North-eastern states. It is also cultivated in Nepal and Bhutan. It is used as a spice in several ayurvedic preparations. It contains 2-3% essential oil and possesses medicinal properties.

Large cardamom has a pleasant aromatic odour, due to which it is extensively used for flavouring vegetables and many food preparations in India. It is also used as an essential ingredient in mixed spices preparation. Apart from aroma, large cardamom also has high medicinal value. The decoction of seeds is used as a gargle in infection of teeth and gums. Large cardamom seeds are considered as an antidote to either snake venom or scorpion venom. It is also reported that large cardamom seeds are used as preventive as well as curative measure for throat troubles, congestion of lungs, inflammation of eyelids, digestive disorders and in the treatment of pulmonary tuberculosis.

## **Climate and soil**

The crop grows well under the shade of forest trees at altitudes ranging from 1000-2000 metres with a rainfall of 3000-3500 mm per annum. Deep and well drained soils with a loamy texture are best suited for cardamom. The soil in Sikkim is generally rich in organic matter and nitrogen, medium in available phosphorus and medium to high in available potash. The soils have a pH range from 4.5 to 6.0. Even though the crop can be grown in undulating and steep terrains, land with a more moderate slope is preferred.

### **Cultivars**

There are mainly five popular cultivars of large cardamom, viz., Ramsey, Sawney, Golsey, Varlangey and Seremna. Bebo, Boklok Tali, Jaker and Belak are the other cultivars found in Arunachal Pradesh.

### **Propagation**

Propagation of large cardamom is done through seeds and suckers. Propagation through seeds enables the production of a large number of seedlings. Virus diseases are not transmitted through seeds and therefore the seedlings are free from viral diseases, if adequate care is taken to isolate and protect the nursery from fresh infection. Plants raised from seeds need not necessarily be high yielders even if they are collected from very productive plants due to cross-pollination. The major pollination is done by wild bees and the rest by honey bees. Planting suckers on the other hand ensures true to type and high productivity if they are collected from high yielding plants.

### **Primary nursery**

Cardamom seeds are generally sown in September-October. Seed beds are prepared in well drained soil dug to a depth of 30 cm and left for weathering. Raised beds with 15 to 25 cm height, 1 metre width and convenient length, preferably 6 metres, are prepared. Well decomposed cattle manure is mixed with the soil and the surface of the bed is made to a fine tilth. 80-100 gm of seeds are sown per bed in lines spaced 10 cm apart. The seeds are then covered with fine soil and mulched with paddy straw/dry grass (10-15 cm thick). Watering is done at regular intervals to keep the surface of the bed moist. Germination of acid treated seeds commences after 25- 30 days of sowing. When average germination is noticed the mulch materials are removed. The inter space between rows is then remulched with chopped paddy straw. Shade *pandals* are immediately erected by using bamboo mats/reed mats or agro-shade nets. The beds are watered regularly and weeding is done as and when required. When the seedlings attain 3-4 leaf stage, they are transplanted to secondary beds.

### **Polybag nurseries**

Polythene bags of 15 cm x 15 cm with perforations at the base are used for planting the seedlings. The bags are filled with a potting mixture of soil, sand and cowdung in the ratio of 4:1:1. The bags filled with the mixture are arranged in rows of one metre width

and of convenient length under shade *pandals*. Seedlings with 3-4 leaves are planted in the bags in April-May and watered regularly. They become ready for field planting in 10-12 months.

### **Secondary nursery**

Beds of size 15 cm in height and 100 cm in width with convenient length are prepared and well-decomposed cattle manure is mixed with the soil and an even surface is formed. Seedlings with 3-4 leaves are transplanted to the beds in May-June at spacing of 15 cm between them. An overhead *pandal* is erected for providing shade and the soil is kept moist with irrigation. When the seedlings attain a growth of 45-60 cm in height with 2-3 tillers, they are planted in the main field during June-July of the subsequent year.

### **Sucker multiplication nursery**

As mentioned earlier, suckers should be generated only in sucker multiplication nursery where adequate precautions are taken to ensure that viral diseases are not transmitted through the suckers produced. The site for such a nursery should be located at least 500 metres away from large cardamom plantations. They are established either under the shade of forest trees or under shade *pandals* with 50% shade using black agro shade nets. Trenches of 30x30 cm are prepared at convenient lengths with an inter space of 30 cm. Well decomposed cattle manure or compost is mixed with the soil and the trenches are filled to the brim. Then the suckers from high yielding disease free plantations, with one grown up shoot with an emerging bud are planted at 30 cm apart in the trenches. The time for planting is May-June. After planting, the plant base is mulched with dried forest leaves. The multiplication rate in this method is about 1:8 in one year's time. The grown up tillers are split into units of one tiller with an emerging bud and planted in the main field during June-July.

### **Micropropagation**

For rapid multiplication of high yielding clones, vegetative buds from disease free high yielding mother plants are collected and plantlets are produced through the tissue culture technique. These plantlets are hardened in poly bags or in secondary nurseries and once sufficient growth is attained, they can be planted in the main field during June-July.

### **Planting**

Large cardamom grows well in forest loamy soils with gentle to medium slopes. Water logged conditions are detrimental to the growth of the plants. It performs well under shade. *Utis* (*alnus nepalensis*) is the most common and preferred shade tree for large cardamom. The other species of shade trees are **panisai** (*terminalia myriocarpa*), **pipli** (*bucklandia* spp.), **malito** (*macaranga denticulate*), **argeli** (*edgeworthes gardneri*), **asare** (*viburnus eruberens*), **bilaune** (*maesa cheria*), **kharane** (*symplocos* spp.), **siris** (*albizzia lebbeck*), **dhurpis** and Khasi cherry, **katuse**, **faledo** (*erythrina indica*), **jhingani** (*euria tapanica*) and **chillowne** (*schima wallichii*).

## **Land preparation**

Planting is done during June-July when there is enough moisture in the soil. The land selected for planting is cleared of all undergrowth, weeds, etc., for new planting, or if it is replanting, old plants may be removed. Pits of size 30x30x30 cm are prepared on the contour of the hill at a spacing of 1.5 x1.5 m after the onset of monsoon showers. A wider spacing of 1.8x1.8 m is recommended for robust cultivars like Sawney, Varlangey, Ramsey, etc. The pits are left for weathering for a fortnight and then filled with topsoil mixed with cowdung or compost at the rate of 1-3 kg. per pit. Seedlings/suckers are planted in the middle of the pit. Care should be taken not to plant the seedlings/rhizomes very deep in the pit. After planting the seedling/suckers may be staked and the base of the plant is mulched with dry leaves.

## **Manuring**

For a sustained production the soil fertility should be maintained at its optimum. Well decomposed cattle manure or compost and oil cakes may be applied at the rate of 2 kg per plant at least once in two years in April-May. If all the crop residues are recycled in the plantation, application of inorganic fertilizers may not be necessary.

## **Weeding**

Weed control in the plantations is important for the maximum utilization of the available soil moisture and nutrients by the plant. Three rounds of weeding are required for effective control of the weed growth in the initial two to three years. Weeding can either be hand weeding or sickle weeding depending upon the intensity of weed growth. From around the plant base the weeds can be pulled out by hand and the weeds in the inter space need only be slashed with a sickle. While weeding, dried shoots and other trashed materials can be used as mulch around the plant base to conserve moisture in the ensuing dry months, and to prevent weed growth around the plant base.

## **Soil and moisture conservation**

Cardamom is mainly grown in hilly terrain. The topography and the wet climate of Sikkim permits soil erosion to a considerable extent. Intensive operations which loosen and expose the soil will increase soil erosion and therefore only minimum tillage operations should be followed. As far as possible, contour terraces may be made well before taking up planting operations. This helps in reducing soil erosion and soil moisture conservation. Though contour terracing is expensive and requires high initial investment, the long term benefit will compensate the initial extra expenditure.

## **Irrigation**

In some of the large cardamom plantations, water sources are available which can be exploited to irrigate the crop by gravity flow, either through pipes, sprinklers or flood

irrigation through open channels. It is observed that productivity is higher in plantations where irrigation is provided. For sustainable and better yield the plants may be watered during the dry months. Depending on the availability of water sources, hose, or sprinkler or flood irrigation through channels can be adopted. Hose irrigation can be done at the rate of 40-50 litres per plant at fortnightly intervals. In case of sprinkler, irrigation equivalent to 35-45 mm of rain at fortnightly intervals is recommended.

### **Pests**

Large cardamom is by and large free from the attack of any major pests except for the sporadic incidence of leaf eating caterpillars. Aphids are found in most of the areas which transmit the viral diseases chirke and foorkey.

### **Leaf eating caterpillar**

Initially the caterpillar of the moth *Artona Chorista* feeds on the leaf lamina from under the surface of the leaf and finally defoliates the leaf completely leaving only the midribs. Their incidence is noticed in May-July and October-March. At present these insects are kept under control by their natural enemies. If insecticides are used to control them, then their natural enemies will also disappear which may lead to an outbreak of these pests in epidemic form. The best method of control is to inspect the plantations during May-July and October-March, to handpick the infected leaves along with the caterpillars and destroy them by burning.

### **Diseases**

Fungal or bacterial diseases are seldom reported in large cardamom. Only minor diseases like leaf streak or rot diseases are found in isolated areas. The major threat to large cardamom is the widespread occurrence of viral diseases, viz., chirke and foorkey. These diseases are seen throughout the large cardamom growing tracts of Sikkim and Darjeeling and cause considerable crop loss. These diseases have spread due to drastic change in the ecosystem, inadequate rain in dry months and absence of good agricultural practices by the farmers. Many cardamom farmers failed to plant varieties suitable to their altitude.

### **Chirke**

The symptoms are characterized by mosaic appearance on the tender leaves with pale streaks, which slowly turns into brown, resulting in withering and drying of the plants. Growth and yield of the affected plants gradually declines and ultimately they perish. The disease is transmitted by aphids. It also spreads by planting infected suckers. Transporting of infected suckers from one area to another leads to the spread of this disease. The disease is also transmitted mechanically through the knife used for harvesting.

### **Foorkey**

Numerous small tillers appear at the base of the affected plants which become stunted and fail to give any yield. Even the inflorescence is noticed to produce unproductive spikes.

### **Management of viral diseases**

Plants affected by the viral diseases cannot be cured but the losses can be minimized by adopting appropriate management practices.

- i) Keep a constant vigil to detect disease affected parts.
- ii) Uproot and destroy affected plants as soon as symptoms appear. Repeat detection and uprooting at regular intervals.
- iii) Use seedlings produced in certified nurseries.
- iv) Propagation through suckers is recommended only through certified multiplication nurseries.

### **Harvesting and curing**

The indication of the time of harvest is when the seeds of the topmost capsules turn brown. To enhance maturity, bearing tillers are cut to a height of 30-45 cm and left for another 10-15 days for full maturity. The spikes are harvested using special knives. The harvested spikes are heaped and capsules are separated and dried. The cured capsules are rubbed on a wire mesh for clearing and removal of the calyx (tail).

Traditionally large cardamom is cured in a *bhatti* where the capsules are dried by direct heating. Under this system the cardamom comes in direct contact with smoke which turns the capsules to a darker browner black colour with a smoky smell. Improved curing techniques are available by which cardamom is processed to give better quality and appearance. One such method is the ICRI Spices Board improved *bhatti* system of curing in which the cardamom is dried by indirect heating at 45-50 degrees C.

After studying the traditional *bhatti* system used for curing of large cardamom in Sikkim it was observed that apart from energy efficiency, emphasis for technological development should be to improve the quality of dried cardamom. Accordingly, under an ISPS (Indo Swiss Project Sikkim) sponsored project TERI has developed an advanced gasifier based system for improving the energy efficiency and quality of dried cardamom. To make available the system to the cardamom growers a fabrication unit of the gasifier system is required to be set up.

### **Packaging**

The properly dried capsules should be allowed to cool and then packed in polythene lined jute bags. The bags may be stored on a wooden platform to avoid absorption of moisture, which may result in fungus growth damaging the stored produce.

### **Spices Board Assistance**

The Spices Board is trying to promote the cultivation of large cardamom in Sikkim through the following schemes:

- 1) Certified nursery scheme: The Board supports the raising of nurseries in farmer's fields by offering a grant-in-aid of Rs. 10,000 per nursery producing 10,000 suckers.
- 2) Replanting scheme: This scheme is intended to encourage growers to take up replantation of senile and uneconomic gardens. A subsidy of Rs. 6,000 per hectare is offered to the growers.
- 3) Supply of sprinkler irrigation units: To tide over the drought situations during summer, the Board assists growers in procuring and installing sprinkler units and accessories by providing 50% of the cost as subsidy with a ceiling of Rs. 2500 per set.
- 4) Low cost driers: In order to improve the quality of the cured large cardamom the Board helps the growers to replace their traditional *bhatti* curing system with improved driers by providing a subsidy of Rs. 10,000 per drier.
- 5) Processing units: The conventionally cured cardamom does not fetch the right price because of unscientific processing and packaging. In order to overcome this situation, the Board proposes to assist the growers in setting up their own processing/powdering/packaging units by providing assistance to the tune of 50% of the cost, subject to a maximum ceiling of Rs. 50,000 per unit.

### **Cardamom Replantation**

10,000 hectares of land will be replanted with improved varieties of large cardamom in Sikkim and West Bengal under a Spices Board initiative. The potential of Himalayan cardamom, which is harvested in Nepal, Bhutan, West Bengal, Sikkim, Bangladesh, Pakistan, and other northern states, is more than 50,000 kg per ha. Though it loses out on pricing against small cardamom, it gains on higher yields and lower costs.

### **Sikkim: Becoming an organic state**

Sikkim, being a state with mixed farming system established long ago and being one of the states with the lowest consumption rates for chemical fertilizers and pesticides, has all the advantages for going organic. The present status of fertilizer consumption in Sikkim is 20.38 kg per hectare in terms of materials or 10.26 kg per hectare in terms of nutrients, whilst the present consumption rate of pesticides is 24 grams per hectare only. Sikkim is on its way to becoming a totally organic state soon. At present only Uttarakhand and Mizoram have passed legislation declaring themselves to be totally organic states. Large cardamom is by and large produced organically in Sikkim. However, getting organic certification from an accredited agency is a pending task for most of the growers. Hopefully this will be accomplished soon through the initiatives of the state govt.

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*\* Dr. Anjali Pathak is a writer, educator, organic farming consultant and naturopath. She firmly believes that wholesome, organic food, tastefully prepared, is the panacea for physical, mental and spiritual malaise. She is also an avid organic gardener and seed saver. For the past few years she has been a consultant to the Indian tea industry on organic methods of cultivation, including the ancient methods of **vrikshayurveda**. She has used these methods of organic cultivation successfully in the North-east and in the Nilgiris. She has helped several growers and planters to convert to organic methods of production successfully. She is currently based in North-east India and may be contacted through e-mail at [majjinaini@rediffmail.com](mailto:majjinaini@rediffmail.com); Mob: 0 97332 22567.*