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Organic Large Cardamom Production Technology in Sikkim

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Large cardamom (*Amomum subulatum* Roxb.) is a member of the Zingiberaceae family. It is the main cash crop cultivated in Sikkim and Darjeeling district of West Bengal. Sikkim is the largest producer of large cardamom (3681 t) and contributes 88 per cent of the annual production of India. Despite the fact that the seeds contain around 2-3% essential oil, a powerful flavouring ingredient, they are primarily utilized in India as a spice and food flavouring. Demand for natural flavour and aroma goods has increased in the culinary sector, perfumeries, and other areas where large cardamom offers enormous promise. Sikkim is the greatest producer of large cardamom, accounting for the lion's share of the Indian and global markets. During 2011-12, the total area under big cardamom in Sikkim was 15600 ha, with 3681 tons produced and a productivity of 235 kg/ha (Anonymous, 2011). Sikkim supplies 88 percent of India's annual crop.

Climate

Large cardamom, a shade-loving plant (sciophyte), grows naturally in the humid subtropical semi-evergreen forests of the mountainous sub-Himalayan region. The lands receive an annual rainfall of 2000-3500 mm spread over 200 days. Cloudy conditions occur throughout the majority of the monsoon season. It grows at altitudes ranging from 600 to 2000 m amsl. The lower altitudes of cooler zones (near the snow line) and the upper levels of warmer zones are ideal for its growth. Large cardamom belts have an annual ambient temperature range of 6°C (December-January) to 30°C (June-July), accompanied by persistent high relative humidity. Continuous rain during flowering is negative because it reduces pollinating bees' foraging activity, damaging the flowers and resulting in poor capsule placement and barren spikes. Plants remain dormant throughout harsh winters and can endure temperatures as low as 2°C, although frost and hailstorms are harmful to huge cardamom.

Soils

Large cardamom is typically grown in forest loamy soils with a depth of a few centimetres to several inches. The colour of large cardamom soil varies from brownish yellow to very dark greyish brown. Texture ranges from sandy, sandy loam, silty loam, to clay. In general, large cardamom soils are acidic in character, with pH ranging from 5.0 to 5.5 and more over 1% organic carbon content. On

average, these soils have high nitrogen availability and medium phosphorus and potassium levels. The steepness of the terrain reduces the chance of water logging, and water-logged conditions are not suitable to plant growth; thus, adequate drainage is critical for crop success.

Varieties of large cardamom in Sikkim

There are mainly six popular cultivars of large cardamom *viz*., Ramsey, Ramla, Sawney, Varlangey, Seremna and Dzongu Golsey. Several others include Chivey, Ramsey, Gardo Seto Ramnag, Madhusey, Seto Golsey, Slant Golsey, Red Sawney, Green Sawney and Mingney.

Field preparation

Large cardamom thrives in forest loam soils with gentle to medium slopes. Luxuriant growth has been reported near perennial water sources. However, waterlogged conditions are damaging to plants. It performs well in partial shade (50%). *Alnus nepalensis* (*Utis*) is the most frequent shade tree and *Alnus-large* cardamom is a most suitable agro-forestry system for sustainable production in the region. Pits measuring 30 cm x 30 cm x 30 cm are constructed on contours with a 1.5 m x 1.5 m separation from the pits' center. A wider spacing of 1.8 m × 1.8 m is advised for sturdy cultivars such as Ramla, Ramsey, Sawney, Varlangey, and others. Non-robust growers such as Dzongu Golsey and Seremna benefit from a narrower spacing of 1.45 m x 1.45 m. Pits are left open for a fortnight to weather before being filled with topsoil mixed with cow dung compost/FYM (1-2 kg per pit). The pit-making and filling operation should be completed by the third week of May, before the arrival of pre-monsoon showers. Planting takes place between June and July, when the soil is sufficiently moist. A mature tiller with 2-3 immature tillers or vegetative buds is utilized as a planting unit. Quality planting materials should be raised in nurseries or collected from certified nurseries to improve yield. Suckers/seedlings are planted by scooping a small amount of dirt from the centre of the pits and placing it up to the collar zone. Deep plantings should be avoided. Staking is required to prevent lodging during heavy rain and wind, and mulching is done at the plant base.

Propagation technique in large cardamom

Large cardamom is propagated through seeds and suckers. Seed-based propagation allows for the creation of a large number of seedlings. Virus infections are not transferred through seeds, therefore seedlings are virus-free if proper precautions are taken to isolate and protect the nursery from new infection. Plants grown from seeds are inherently low yielders, even if they are derived from highly prolific plants due to cross-pollination. Bumble bees are the primary pollinators, while honey bees also contribute to pollination. Planting suckers, on the other hand, ensures true to type/parents with high production if they are gathered from disease-free, high-yielding plants.

Selection of site

Large cardamom thrives in forest loam soils with gentle to medium slopes. Luxuriant growth has been reported near perennial water sources. However, a waterlogged situation is harmful to the plants. It performs well in partial shade (50%). *Alnus nepalensis* (Utis) is the most prevalent shade tree, and *Alnus nepalensis* (Himalayan alder)-large cardamom is an excellent agroforestry system for long-term production in the region. The other species of shade trees are *Termalia myriocarpa* (*Panisaj*), *Bucklandia* spp. (*Pipli*), *Macaranga denticulata* (*Malato*), *Edgeworthia gardneri* (*Argeli*) *etc*.

Planting technique

Planting is done in June-July. The suckers collected from high yielding disease-free, elite plantations having minimum of one mature tiller with two immature tillers or vegetative buds are used for planting. Suckers/seedlings are planted by scooping a little soil from the centre of the pits and planted up to collar zone. Deep planting should be avoided. Mulching at the plant

base with easily degradable organic materials is good for conserving both moisture and soil. Dried organic matter, leaves, weeds *etc*. can be used as mulching materials.

Organic nutrient management

Nutrient replenishment is critical for maintaining high yields and compensating for soil nutrient loss. It is recommended to apply well-decomposed cattle manure/compost or organic products at a rate of 5 kg per plant at least twice a year, from April to May and August to September. Vermicompost, having a positive impact on soil physical qualities and an excellent source of nutrients, particularly in the beds, is increasingly becoming popular organic manure and can be applied at 1 kg/clump in two equal doses in combination with FYM.

Mulching and soil management

If the ground is not terraced, the soil base can be formed by cutting the top soil from the upper half and placing it on the lower half, followed by mulching. Mulching the plant base with easily degradable organic materials helps to conserve moisture and soil. Mulch is widely known for improving soil structure and fertility. Mulching materials include dried organic debris, leaves, and weeds.

Water management

For better growth after the first year of planting, irrigation is required at least once every ten days throughout the dry months of September to March. It has been discovered that plant growth and productivity are higher in plantations with irrigation. Depending on water availability, hose/sprinkler/flood irrigation through small channels is recommended. Water collection pits built between four plants in adjoining rows during the rainy season can help to meet the crop's water requirements in the dry season and are a cost-effective choice.

Shade management

It has been shown that dense shadow or a lack of shade impedes optimal crop growth and yield. Around 50% shade is considered good. It is critical to prune the branches of shade trees before the monsoon season begins in June-July. However, overexposure to direct sunlight causes yellowing of leaves. As a result, proper shade management is critical for healthy growth, timely flowering, and increased production. However, in Sikkim and other locations, there is a growing trend of cultivating large cardamom in terraces and pen fields without shade, with different results. This will be a future subject of interest for researchers studying crop lifespan.

Weed management

Three rounds of weeding are required to effectively control weed development in the first two to three years. Weeding is typically done with a sickle or by hand, depending on the severity of weed growth. Weeds are plucked by hand from around the plant root and slashed in between with a sickle.

Clean weeding is not recommended because the crop has been discovered to be an excellent colonizer. While weeding, dried branches and other thrashed materials are used as mulch around the plant base, which helps to save moisture in the coming dry months, covers the exposed roots, and prevents weed development. During the blossoming phase, thrashing materials should not be covering the inflorescences.

Pollinators of large cardamom

The bumble bee, *Bombus breviceps* and *B. haemarrhoidalis* have been identified as essential pollinators of big cardamom at all altitudes. These bumble bees are known locally as *Bhomora* (*Nepali*), *Boom boom Taka* (*Bhutia*) and *Tungboom* (*Lepcha*). Flowering in large cardamom spikes will last 60 days. It is observed that during the initial flowering period (about 20 days from the starting of flowering) *B. breviceps* visits more frequently at all altitudes. Later, during the middle and peak flowering phase (21-60 days), *B. haemorrhoidalis* is the most common visitor. Each spike produces 40 to 50 flowers and only 10 to 15 capsules per spike. The blossoms are viable for around 14 hours after being opened. On sunny days, anthesis begins at 8 a.m. and concludes at 8.30 a.m., whereas on gloomy and rainy days, it begins at 9.15 a. The stigma is responsive for 24 hours on rainy and cloudy days, but only for 2 hours on sunny days from 1.00 to 3.00 pm. Bumble bees forage most actively in the morning on clear days, and their activity decreases or ceases entirely when it rains. *Apis dorsata* is reported to enhance the output of large cardamom capsules. However, findings indicate that *A. cerana* acts as a pollen robber.

Insect pests and disease management

Leaf eating caterpillar (*Artona chorista* Jordon), mealy bug (*Paraputo theacola*), stem borer (*Glyphipterix* spp.), tea mosquito bug (*Helopeltis theivora*) and shoot fly are the important pests. Blight (*Colletotrichum gloeosporioides*), capsule rot (*Rhizoctonia solani*) and wilt (*Fusarium oxysporum*) *chirke* and *foorkey* are the important diseases. The important organic plant protection measures are as follows:

- Regular monitoring and application of recommended cultural practices in large cardamom field.
- Sanitation: remove infected plants, leaves and leaf sheaths and burn in a pit.
- The knife and other implements used for the sanitation should not be used on healthy plants since disease could be transmitted through sap.
- Application of *Trichoderma* formulation at the time of planting (2.5 kg formulation in 50 kg FYM) and subsequently during October-November and April-May.
- Treatment of planting materials with *Pseudomonas fluorescens* @ 0.5 percent.
- Drenching and spraying with COC @ 0.25 percent during monsoon season. Controlling of vectors by application of neem oil 0.3 percent or petroleum oil-based spray @ 1 per cent.
- For management of insect pests spray neem oil (1500 ppm) @ 3 ml/l at 20 day intervals (minimum four sprays).

Harvesting and threshing

The seeds of the topmost capsules become brown, indicating that it is harvest time. As soon as the desired color appears, bearing tillers are clipped at a height of 30-40 cm from the ground and left for another 10-15 days to mature. The spikes are harvested with specialized knives known as "Cardamom-knife" (Elaichi chhuri).

Yield, storage and post-harvest operations in large cardamom

Harvesting begins early in lower altitudes, between August and September, and might last until November or December at higher altitudes. The typical yields range between 100 and 400 kg/ha. The fruit is trilocular, with numerous seeded capsules. The capsule wall is echinated and ranges from reddish-brown to dark-pinkish in color. The seeds are diangular, whitish when immature, then dark-greyish as they mature. Usually, capsules produced near the basal section are larger and bolder than others.

Curing in large cardamom

The quality of large cardamom is determined by its exterior appearance, which is influenced by color, uniformity of size, shape, consistency, and texture, as well as flavour, which determines taste and odour and is affected by aromatic chemical composition. Appearance provides a visual illusion of uniformity in size, shape, and consistency. The flavour of large cardamom is extremely similar to that of Elettaria cardamom. The fresh capsules are fleshy with almost 85 per cent moisture. Their keeping quality is poor and is highly perishable. They are cured or dried to about 10-13 per cent moisture on dry weight basis to prolong its shelf life. Cardamom is cured (*i.e*., dehydration of the fruits over low sustained heat) in a curing furnace, the heat invariably coming from burning of wood fuel. Traditionally, locally made furnace, the "*bhatti*", crude and primitive in operation, is a stone mud structure, cheap to erect and moderately efficient where capsules are dried by direct heating. Considerable loss of quality characteristics is seen with the *bhatties*, yet, they are common place in the entire cardamom belt. Retaining natural color and flavour ingredients has importance for market valuation. On the one hand, the extremely volatile flavour ingredients are readily lost due to direct heat and/or high temperatures, whilst the circumstances of standard curing chambers result in color loss and leaky capsules. This needs the use of a suitable curing method / system that includes indirect heating at an optimum temperature range of 50-55^{o}C, quick air circulation within, and depletion of damp air from the drying unit. To operate near or nearby distant plantations, the equipment must be easily maintained and portable.

REFERENCE

1. Das, S.K., Avasthe, R.K., Singh, M., Roy, A., 2018. Managing soil fertility under organic production system through integrated approach. Green Farming 9 (3), 449-454.
2. Das, S.K., 2014. Role of micronutrient in rice cultivation and management strategy in organic agriculture-A reappraisal. Agricultural Sciences 5 (09): 765.
3. Das, S.K., Avasthe, R.K., Yadav, A., 2017. Secondary and micronutrients: deficiency symptoms and management in organic farming. Innovative Farming 2 (4), 209-211.

4. Das, S.K., Avasthe, R.K., 2018. Soil organic nutrients management through integrated approach: A policy for environment & ecology. Environmental Analysis and Ecology Studies 4 (1), 1-8.

5. Das, S.K., Avasthe, R.K., Kalita, H., Yadav, A. and Gopi, R. 2020. Organic Soil Nutrient Practices in Sikkim and Impact at Field Level for Tribal Farmers': A Success Story. Biotica Research Today. 2, 2 (Feb. 2020), 24-26.