



Research Article

PLANTATION ESTABLISHMENT AND MANAGEMENT FOR LARGE CARDAMOM (*AMOMUM SUBULATUM* ROXB.)

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Abstract: Large cardamom (*Amomum subulatum* Roxb.), a member of the family, Zingiberaceae is the main cash crop cultivated in the sub-Himalayan state of Sikkim and Darjeeling district of West Bengal. It is also cultivated in parts of Uttarakhand and in some other North Eastern Hill states like Arunachal Pradesh, Nagaland, Mizoram, Manipur, Meghalaya and Assam. The large cardamom plant is a perennial herb with subterranean rhizomes with leafy shoots. Propagation of large cardamom is mainly done through seeds and suckers in field level. However, tissue culture techniques also used for propagation now a days. The propagation through seeds enables production of large number of seedlings. On the other hand, producing planting material through suckers ensures true to the type/parents with a high productivity if they are collected from high yielding, disease free plants. This techniques produce sucker ready for field planting in next season itself. The suckers collected from high yielding disease-free, elite plantations having one mature tiller with one or two immature tillers or vegetative buds is used as planting units. This being an economically important cash crop, there is a need to increase the area under its cultivation for increasing the productivity of the crop in this region. The plantation establishment and management practices for large cardamom are presented in this paper.

Keywords: Large Cardamom, Nutrient Management, Shade management, Water Management, Weed Management

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Introduction

Large cardamom (*Amomum subulatum* Roxb.), a member of the family, Zingiberaceae is the main cash crop cultivated in the sub-Himalayan state of Sikkim and Darjeeling district of West Bengal. It is also cultivated in parts of Uttarakhand and in some other North Eastern Hill states like Arunachal Pradesh, Nagaland, Mizoram, Manipur, Meghalaya and Assam [1]. The plant is a perennial herb with subterranean rhizomes with leafy shoots. Propagation of large cardamom is mainly done through seeds and suckers in field level. It grows well in forest loamy soils with gentle to medium slopes. Luxuriant growth is observed in nearby perennial water sources. However, water logged condition is detrimental to the plants [2]. It performs well under partial shade (50 percent). *Alnus nepalensis* (*Utis* in Nepali) is the most common shade tree. *Alnus nepalensis* (Himalayan alder) - large cardamom is very good agro-forestry system for sustainable production in the region [5].

Selection of site

Large cardamom grows well in forest loamy soils with gentle to medium slopes. Luxuriant growth is observed in nearby perennial water sources. However, water logged condition is detrimental to the plants. It performs well under partial shade (50 percent). *Alnus nepalensis* (*Utis* in Nepali) is the most common shade tree. *Alnus nepalensis* (Himalayan alder) - large cardamom is very good agro-forestry system for sustainable production in the region. Deep, well-drained soils with loamy texture, medium availability of phosphorus and potash, and pH 5.0-5.5 are best suited. Usually the soil is rich in organic matter and nitrogen as the plants are cultivated under alder trees and other local varieties of trees.

Land preparation

The land selected for planting is cleared of all the under growth, weeds etc. before on set of monsoon. Old large cardamom plants, if any may also be removed Pits

of size 30 cm x 30 cm x 30 cm are prepared on contours at a spacing of 1.5 m x 1.5 m from the centre of the pits. Wider spacing of 1.8 m x 1.8 m is recommended for robust cultivars like Ramla, Ramsey, Sawney, and Varlangey etc. while closer spacing 1.2 m x 1.2 m is advised for non-robust cultivators like Dzongu Golsey, Seremna etc. [7]. Pits are left open for weathering for a fortnight and then filled with topsoil mixed with cow dung compost/FYM @ 2-3 kg per pit. Pit making and filling operation should be completed in the third week of May before the onset of pre-monsoon showers.

Planting

Planting is done in June-July in Sikkim and Darjeeling [Fig-1]. In Arunachal Pradesh planting is done in the month of May when there is enough moisture in the soil. A mature tiller with 2-3 immature tillers/vegetative buds is used as planting unit. Quality planting material is to be raised in the nurseries or collected from certified nurseries for better production. 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. Staking is needed to avoid lodging from heavy rain and wind and mulching is done at the plant base [Fig-2].



Fig-1 Planting large cardamom



Fig-2 Staking the plants

Organic nutrient management

Replenishment of nutrients is very essential for sustained good yield and to compensate the nutrient loss from the soil. Application of well-decomposed cattle manure/compost or organic products @ 5 kg/plant at least twice a year in April-May and August-September is beneficial [Fig-3]. Vermicompost, having favorable impact on soil physical properties and good source of nutrients, particularly in the beds is gradually becoming popular organic manure and may be applied @ 1 kg/clump in two equal doses in combination with FYM. Soil base with gentle slope from the plant is beneficial for application of inputs to the plants viz., FYM, vermicompost, etc [Fig-4].



Fig-3 Plant base cleaned before application of organic inputs

Fig-4 Application of manure at plant base

Mulching and soil management

If the land is not terraced the soil base may be made by cutting the top soil from the upper half and placed on the lower half followed by mulching. Mulching at the plant base with easily degradable organic materials is good for conserving both moisture and soil. Mulch is well-known to improve the soil physical condition and fertility. Dried organic matter, leaves, weeds etc. can be used as mulch [Fig-5].



Fig-5 Mulching at plant base

Weed management

Weed control in the plantations is the important operation for maximum utilization of available soil moisture and nutrients by the plants. Three rounds of weeding are required for effective control of weed growth in initial two to three years. Weeding is generally done by using a sickle or by hand depending upon the intensity of weed growth [Fig-6].



Fig-6 Plant base weeding

Fig-7 Slash weeding in plantation

From around the plant base weeds are pulled out by hand and in inter-space needs only slash weeding with sickle [Fig-7]. Clean weeding is not advised as the crop is found to be a good colonizer. While weeding dried shoots and other thrashed materials are used as mulch around the plant base which will help to

conserve moisture in the ensuing dry months, cover the exposed roots and prevent weed growth around the plant base. During flowering period, the thrashed materials should not cover the inflorescences [6].

Water management

Large cardamom plants cannot thrive well under water stress. In the first year of planting irrigation is required at least once in 10 days during dry months in October to March for better growth thereafter. It is observed that plant growth and productivity is higher in plantations where irrigation is provided [Fig-8]. Depending on the availability of water sources hose/sprinkler/flood irrigation through small channels is advised. Water harvesting pits made in between four plants of nearby rows during rainy season can to some extent support the water requirement of the crop in the dry season and is a cost-effective option [Fig-9].



Fig-8 Jalkund

Fig-9 Pit between four plants

Shade management

It is noticed that dense shade or less shade hinders optimum crop growth and production. About 50% shade is found ideal. The lopping of branches of the shade trees to remove excess shade is very important and should be done before the onset of the monsoon during May - June. But simultaneously over-exposure to direct sunlight causes yellowing of leaves. Therefore, judicious shade management is very important for good growth, timely flowering and for better yield. *Alnus nepalensis* (Utis in Nepali)/ (*Taram* in Nyishi) is the most common shade tree and *Alnus*-large cardamom is a most appropriate agro-forestry system for sustainable production in the region. The other species of shade trees are *Terminalia myriocarpa* (Panisaj), *Bucklandia* spp. (Pipli), *Macaranga denticulata* (Malato), *Edgeworthia gardneri* (Argeli), *Viburnum erubescens* (Asare), *Maesa chisia* (Bilaune), *Symplocos theifolia* (Kharane), *Albizia lebbeck* (Siris), *Erythrina indica* (Phaledo), *Eurja tapanica* (Jhingani), *Schima wallichii* (Chilaune) etc. However, presently in Sikkim, Darjeeling of West Bengal and other areas there is an increasing trend of planting large cardamom in open field without any shade with varying response.



Fig-10 *B. haemorrhoidalis*

Fig-11 *B. breviceps*

Fig-12 Nest of Bumblebe in soil

Pollinators of large cardamom

The bumble bees, *Bombus breviceps* [Fig-11] and *B. haemorrhoidalis* [Fig-10] have been recorded as important pollinators of large cardamom in all the altitudes. These bumble bees are called locally as *Bhomora* (Nepali), *Boom boom Taka* (Bhutia), *Tungboom* (Lepcha) in Sikkim and Tai- Taga (Galo), Ngonia, Tong, Taga (Nyishi) in Arunachal Pradesh [3]. Foraging activity of bumble bees is maximum during morning hours on clear days and their activity becomes less or even nil when it is rainy. It is known that *Apis dorsata* plays a positive role on productivity of large cardamom capsule.

However, reports suggest that *A. cerana* works as the pollen robber. It is observed that for optimum capsule and seed set a minimum 50 visits by pollinators are required. A well-set spike gives a small pineapple look. When the capsules get mature, the seeds are turned into blackish colour [4]. Decline of bumble bee population throughout the world is a cause of concern now. There is practice of consuming the adult, brood and also hive of bumble bees by local communities in Arunachal Pradesh. It causes adverse effect in the augmentation of bumble bee population. Care should be taken during farm operations to keep the nests in the soil undisturbed to conserve the pollinators in their natural habitat [Fig-12]. Maintenance of natural vegetation as well as micro-climate of the bumble bee nests in the plantation bears significant importance. Flowering plants need to be grown in the plantation throughout the year to maintain continuous supply of their food.

Conclusion

Large cardamom (*Amomum subulatum* Roxb.) is an economically important cash crop and there is a need to increase the area under its cultivation for increasing the productivity of the crop in the North Eastern region. The good agriculture practices for plantation establishment and management for large cardamom are presented here.

Application of research: Study of cash crop cultivation of Large cardamom

Research Category: Spices research

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Study area / Sample Collection: Sikkim, Darjeeling, Arunachal Pradesh

Cultivar / Variety name: Ramla, Ramsey, Sawney, and Varlangey

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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