Introduction about Cardamom

The term *spice* is derived from the word ‘species’ which was applied to different groups of exotic food stuff in the Middle Ages. It was formerly applied to all pungent or aromatic foods, to ingredients of incense or perfume and to embalming agents. Modern usage also tends to limit the term to flavourings used in foods or drinks.

The spices trade has been a big business from time immemorial. Spices from India and Far Eastern Asia were in demand from ancient times. They were carried by caravan across China and India to ports of the Mediterranean Sea or the Persian Gulf and from there to the market places of Athens, Rome and other cities where they were sold on exorbitant prices. The use of spices from the East became a ‘status symbol’ by the year 1200. Indian spices also fitted into philosophic concepts of improving health. For instance, ginger was used to heat the stomach and improve digestion and clove was believed to comfort the sinus.¹ There are sixty three spices grown in India and almost all spices can be grown in India because of the varied climate-tropical sub-tropical and temperate prevailing in India." However, only 52 spices have been brought under the Spices Board Act 1986 (See Appendix-II)

Some of the common Indian spices include cinnamon, cardamom, pepper, turmeric, chilli. At present, India produces around 2.5 million tones of different spices valued at approximately 3 billion US$ and holds the premier position in the world. In each of the 25 states and 7 union territories of India at least one spice is grown in abundance. No other country in the world produces as many kinds of spices as India³.
Cardamom is one of the world’s ancient spices. It is popularly known as “queen of spices” because of its very pleasant aroma and taste. Cardamom is often named as the third most expensive spice in the world next to saffron and vanilla. The Western Ghats forest of the Malabar is the centre of origin and diversity for cardamom and it might be nature’s desire that the king and the queen of spices (black pepper and cardamom) originated in the same forest.

**Cardamom: Description**

The term *cardamom* has been applied to the aromatic capsules of plants, most of them from India, belonging to the family of *Maton Zingiberaceae*\(^4\). The generic name *Elettaria* originated from the Malayalam word *Elathari* meaning literally the seeds of *Elam*. The specific name is the Latin word *Amomum*\(^5\). Cardamom, otherwise known as *Malabar cardamom* or *true cardamomes* or *small cardamom* was second to pepper in importance during the Renaissance period. The official Latin name for true cardamom is *Elettaria Cardamom*\(^6\).

Cardamom comes from the seeds of a ginger like plant. The small, brown black sticky seeds are contained in a pod in three double rows with about six seeds in each row. The pods are 5.20mm \(\frac{1}{4} - \frac{3}{4}\) long, the larger variety known as black cardamom being brown and the smaller being green. White bleached pods are also available. The pods are roughly triangular in cross section and oval or oblate. Their dried surface is rough furrowed, the large blocks having deep wrinkles. The texture of the pod is that of tough paper. Pods are available whole or split and the seeds are sold loose or ground. It is better to buy the whole pods as ground cardamom quickly loses flavour\(^7\).

Cardamom has certain characteristics. It is colourless to pale yellow liquid with a sweet-spicy, warming fragrance and a woody-balsamic undertone. It blends well with rose, olibanum, orange, bergamot, cinnamon, cloves, caraway, ylang labdanum, cedarwood, organge blossom, and oriental bases in general\(^8\).
Etymology

The spice has identical or at least phonetically similar names in almost all languages of Europe, e.g., Cardamom (German, English), Kardemomme (Norwegian, Danish) Cardamon (Italian, Portuguese, Spanish), Kardamon (Polish Croatian, Bulgarian, Russian) and Kardemumma (Finnish). Yet, there is no satisfying explanation of that name. The modern genus name Elettaria is derived from the local name in south Asian tongue: of Hindi elaichi “green cardamom” and Nepali alaichi “black cardamom”. The common source is Sanskrit, where cardamom is called ela or elka, which itself is borrowed from a Dravidian language from the corresponding Dravidian root, EL. Many modern names of cardamom are directly derived, e.g., Tamil elakkai, Kannada elakki and Telugu yelakulu.

History of Cardamom

Cardamom is one of the oldest spices in the world, and the most popular spice in ancient Rome was probably cardamom. By the first century AD, Rome was importing substantial quantity of cardamom from India. India and Arabic writers of very early times knew and noted cardamom. The first written mention is in the famous Ebers papyrus, discovered in Egypt and dating back to 1550BC, which lists about 800 medical drugs and their uses. The Indian writer Sushruta (around the 18th century) mentioned cardamom under the Sanskrit name Eta. Cardamom is mentioned in the list of spices liable to duty at Alexandria in 176-180 AD.

The word cardamom has passed into all the languages of Europe. In the past, cardamom triggered historical events. Indian spices of which cardamom is the queen, were the main reason why Columbus from Spain set out to discover India and ended up discovering America. Indian cardamom, along with other spices provoked the entire Roman and Greek people, which led to the historic invasion of India, by Alexander of Macedonia. In the subsequent centuries, the
Arabs, the Portugese, the Dutch and the English came to India across the seas to take cardamom with them.\textsuperscript{11} As early as the 4\textsuperscript{th} century BC, cardamom was used in India as a medical herb. The poetical work of \textit{Kalidasa} in the 4\textsuperscript{th} century AD abounds in reference to its spicy fragrance. Among the ancient literature in Tamil the cardamom plant finds mention in \textit{Chilappatikaram}, written in the 4\textsuperscript{th} century AD.

Cardamom cultivation in India is concentrated mainly in those regions which form the natural habitat of the species, except for a small area in Maharashtra where it is grown as a subsidiary crop in the arecanut gardens. Approximately, 40,500 ha of area scattered throughout the hill forest zone of the Western Ghats is under cardamom. Some 50 per cent of the area lies in the cardamom hills in Travancore - Cochin, some 23 per cent in Shimoga, Hasan and Chikmaglur Districts, 13 per cent in Kodagu District in Karanataka and 13 per cent in Tamil Nadu in the southern foothills of the Nilgiris and the Anamalai, the Nelliampatty and the Kodaikanal hills.\textsuperscript{12} It was only after the formal invitation by the Travancore Maharaja, in the 1850s, the crop it was commercially cultivated in the forests of the Western Ghats in Kerala.\textsuperscript{13} Today cardamom is cultivated in India, Nepal, Srilanka, Guateamala, Mexico, Thailand and Central America.

\textbf{Difference between small cardamom and large cardamom}

There are two types of cardamom, viz., Small and Large. Small Cardamom is cultivated in the Western Ghats of South India and Large Cardamom is grown in the Himalayan ranges spread across Sikkim and the Darjeeling District of West Bengal.
The differences between small cardamom and large cardamom are described below:14

<table>
<thead>
<tr>
<th>Small cardamom</th>
<th>Large cardamom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small cardamoms popularly known as chhoti elachi (Elettaria cardamom) or the true cardamom,</td>
<td>Large cardamom known as bada elalchi (aframomum and amomum spices).</td>
</tr>
<tr>
<td>Small cardamom is one of the most exotic and highly priced spices</td>
<td>Large cardamom is the dried fruit of a perennial herbaceous plant.</td>
</tr>
<tr>
<td>It belongs to cardamom family named as a zingiberaceae, other names, of small cardamom are lesser cardamom, true cardamom, Malabar cardamom.</td>
<td>Large cardamom also belongs to the family zingiberaceae, its other names are big cardamom and black cardamom.</td>
</tr>
<tr>
<td>The small cardamom, described as a queen of spices, is a rich spice culled from the seeds of elettaria cardamom.</td>
<td>In large cardamom is also referred to as ‘Black Cardamom’. It is a dried fruit of a perennial plant. The fresh fruits are hand picked when mature dried and cured. The fruit is almost the size of a nut Meg. The dark red brown capsules contain several seeds in each cell, held together by a viscid, sugary pulp. Propagation is by seeds or portions of rhizomes.</td>
</tr>
<tr>
<td>Small cardamom is a native of Western Ghats of South India. It is cultivated in three states, viz., Kerala, Karnataka and Tamilnadu.</td>
<td>Large cardamom is a native to Eastern Himalayan region. It is cultivated in India mainly in Sikkim, Assam and West Bengal.</td>
</tr>
<tr>
<td>The harvesting season of small Cardamom is August to March and marketing season is October to May</td>
<td>But the harvesting season of large Cardamom is August to December and Marketing season is October to February.</td>
</tr>
<tr>
<td>Small cardamom is used for preparation of medicine, food, perfume and beverages.</td>
<td>It is used for preparation of food and pan masaala and medicine.</td>
</tr>
<tr>
<td>Small cardamom is exported to West Asia, European countries and Middle East countries like Japan and Russia</td>
<td>The large cardamom is exported to Pakistan, Afghanistan, Singapore and UK.</td>
</tr>
</tbody>
</table>
Chemical and Natural Composition of Cardamom

The chemical and natural composition of cardamom (small) is given in Table LI

Table 1.1
Chemical and Natural Composition of Cardamom

<table>
<thead>
<tr>
<th>Item</th>
<th>Composition</th>
<th>Composition</th>
<th>ASTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>20.0 g</td>
<td>Water</td>
<td>8.0</td>
</tr>
<tr>
<td>Protein</td>
<td>10.1 g</td>
<td>Food energy (k.cal)</td>
<td>360.0</td>
</tr>
<tr>
<td>Fat</td>
<td>2.2 g</td>
<td>Protein (gram)</td>
<td>10.0</td>
</tr>
<tr>
<td>Minerals</td>
<td>5.4 g</td>
<td>Fat (gram)</td>
<td>2.9</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>42.1 g</td>
<td>Carbohydrate (gram)</td>
<td>74.2</td>
</tr>
<tr>
<td>Energy</td>
<td>229.0 cal</td>
<td>Ash (gram)</td>
<td>4.7</td>
</tr>
<tr>
<td>Calcium</td>
<td>13.0 mg</td>
<td>Calcium (gram)</td>
<td>0.3</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>160.0 mg</td>
<td>Phosphorous (mg)</td>
<td>210.0</td>
</tr>
<tr>
<td>Iron</td>
<td>5-0 g</td>
<td>Sodium (mg)</td>
<td>10.0</td>
</tr>
<tr>
<td>Thiamin</td>
<td>0.22 mg</td>
<td>Potassium(mg)</td>
<td>1200.0</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>0.17 mg</td>
<td>Iron (mg)</td>
<td>11.6</td>
</tr>
<tr>
<td>Niacin</td>
<td>0.8 mg</td>
<td>Thiamine (mg)</td>
<td>0.18</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0.1 mg</td>
<td>Riboflavin (mg)</td>
<td>0.23</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.1 mg</td>
<td>Niacin (mg)</td>
<td>2.3</td>
</tr>
</tbody>
</table>

The average chemical content of Indian cardamom seeds is as follows: moisture (8.3%), volatile oil (8.3%), non-volatile ether extracts (2.9%), vitamin C (12%) and vitamin A (175 international units) per 1 gm seeds.\textsuperscript{15}

Uses of cardamom

Cardamom is used for flavouring various food preparations, confectionery, perfumes, beverages, liquors and preparation of medicine in India and other countries. In medicine, it is used as a powerful aromatic, stimulant, carminative, stomachic and diuretic, but rarely used alone. It also checks nausea and vomiting, helps in combating digestive ailments. Herbal lores on this spice suggest that it can be used to freshen breath and support smooth digestion.\textsuperscript{16}
In Ayurvedic medicines, cardamom is used to treat disorders of the stomach and the urinary system, asthma, bronchitis and heart problems. When mixed with neem and camphor, cardamom is used as a nasal preparation to treat colds. An infusion of cardamom can be used as a gargle to relieve sore throat, which has led to its use in cough sweets.

Cardamom is widely used as a flavouring for savoury and sweet dishes and the antibacterial properties of its oil are exploited as a food preservative. The dried fruits and seeds of cardamom are used to add a unique taste to rice, meat, vegetables and other savoury dishes. Whole and ground cardamom seeds are added to flavour coffee, tea, confectionery and baked foods. It is highly valued in Kashmir as an essential ingredient of the drink gahwa, a fragrant and sweet Kashmiri black tea. The cardamom essential oil is produced in small quantities in India. It is mainly used in the flavouring of processed foods and drinks such as cordials, bitters and liqueurs and occasionally in perfumery. Cardamom oleoresin too has similar applications as that of essential oil. It is mainly used to flavour meat products with a short shelf life, such as sausages.

Although not strictly for food use, the aromatic properties of cardamom are utilized as a breath freshener. It is frequently chewed after meals and may sometimes be included as flavouring in a betel quid. It is also used to a small extent to flavour tobacco. Traditionally extracts of cardamom seeds and fruits have been used to treat skin conditions and to aid digestion. It was also used to treat cases of food poisoning and has been widely used in Ayurvedic medicine.

Cardamom seeds have been used in a range of preparations. Roasted seeds are boiled with betelnuts to make a drink to be used to treat indigestion and nausea.

They are also added to tea to make a tonic to relieve the symptoms of stress due to overwork or depression. Cardamom seeds are given to patients with bad breath and a capsule of cardamom taken with honey is reputed to improve eyesight.
The traditional uses of cardamom to treat skin conditions have attracted the attention of those developing plant-based cosmetics, especially as it has been used traditionally to treat areas of the body that have re-pigmentation. It is often incorporated into soaps and hand creams.\textsuperscript{17}

Cardamom oleoresin, which is produced in India, has similar applications to the essential oil in the flavouring of processed foods but is less extensively used. Both the oil and oleoresin tend to develop “off-flavours” when exposed to the air for prolonged periods.\textsuperscript{18} Thus, cardamom is the most versatile spice known to mankind. Perhaps, this is the only spice that can flavourfully blend with anything edible or drinkable. Cardamom goes extremely well with coffee, tea, milk, fruit juices, soft drinks and alcoholic beverages. It also enhances the taste and flavour of coffee and bakery products, vegetable curries and meat preparations. Hot or cold, sweet or soft or hard, simple or complex; if it is a food or drink cardamom makes it more tasty. Cardamom flavour is smooth, spicy, slightly bitter, camphoraceous, alcoholic, and sweet, cooling, lemony with a tingling mentholic after taste. With its substantial aromatic content, it is ideal for supplementing or fortifying an existing flavour or for camouflaging or modifying some undesirable flavour characteristically inherent in the base product. In addition to the use of cardamom in medicine, food and drinks, it also finds a place as an agent of fragrance in airfresheners, shampoos, toilet cleansers, colognes, soaps, perfumes and paints.\textsuperscript{19}

The usage pattern of cardamom in the world differs from country to country. In West Asian countries, where the highest per capita consumption of cardamom is prevalent, it is mainly used for the preparation of \textit{kawha} or cardamom coffee. It can be reasonably estimated that at least 7000M.T. of cardamom go into the preparation of coffee in West Asia. The Arabs buy bold green capsules of cardamom and use it, grinding it afresh, \textit{kawha} is generally offered to guests at social and religious functions. They also use cardamom in
rice preparations. The Americans use cardamom in baked foods, the Russians in pastries, cakes and confectionery, the British and the Japanese in curry, ham and sausages, the Germans in various spice-mixes for sausages and processed meat products, the Scandinavians in the baking of coffee cake. In certain European countries cardamom is used in beverages including alcoholic liquors. In France, it is used in perfumes, colognes and toiletries.  

In most of the European countries and in North America cardamom is used mainly in the ground form as an ingredient in curry powder, some sausage products, and canned fishes, and to a small extent in the flavouring of tobacco.

Cardamom is widely used as a flavouring material in whole and ground form. In Asia, it can add a lingering sparkle to every kind of dish, both traditional and modern. In Scandinavian countries it is used in baked goods and confectioneries.

In Sri Lanka cardamom is used in manufacturing liquors. The essential oil is used for flavouring certain liquors and also in the manufacture of perfumes. Cardamoms are used in curry-powder, and for flavouring cakes, especially in Russia, Sweden, Norway, and parts of Germany.

In European medicine they are chiefly used in tincture of cardamoms, as a stomachic, and in combination with other drugs as an aromatic mainly used as a flavouring agent in cooking, chewing and as a common ingredient of special seasoning and curry powders and for flavouring sweetmeats, pastries, cakes, bread, pudding and other culinary preparations. Its oil is used for flavouring liquors, processed food, perfumery and in beverages. It is also used for masticatory, flavouring tea and confectionery. Cardamom is a powerful aromatic stimulant, carminative, stomachic and diuretic.
Morphology

A mature cardamom plant may measure about two to four meters in height. It is a shallow rooted plant. Leaves are distichous, lanceolate or oblong-lanceolate or ovate in shape with short petioles. Primary leaves are uniform or roundish in shape. Ligules are green or red tined purple in colour with pigmented or non-pigmented midrib. Leaves are glabrous or pubescent. Pseudostem has light green or reddish purple or purple colour. Tiller production takes place throughout the year. However, peak period is from January to March. Flowers are born on panicles which emerge directly from the swollen base of the aerial shoot. Flowers are open, bisexual, with calyx, corolla, staminode, anther, stigma and well-developed labellum. Stigma is positioned above the anther. It is a cross pollinated plant and pollination occurs by external agents like honey bees—the chief pollinators. Labellum is prominent, and attract honey bees which insert their proboscis into the two nectar glands situated at the base of the flower. The foraging activities lead to pollination in flower. The panicles are erect in the ‘Mysore’, prostrate in the ‘Malabar’ and intermediate (pendent) in Vazhukka’ types. Panicles may be branched or simple. The peak period of panicle emergence is from November to March. Flowering normally commences from February and extends up to October and May-August being the peak flowering period. After fruit set, about 90-120 days are required for the fruits to attain maturity. The capsules are globose or ovoid or narrowly sllipsoid to elongate in shape, triloeular, containing 15-20 seeds. On maturity, seeds turn dark brown to black in colour.

Varieties of Cardamom

There are three distinctive types of cardamom grown in India, namely Malabar, Mysore and Ceylon wild. The Malabar type also known as Alleppy green cardamom is famous and preferred. It is the best grade available in the world. Indian cardamom is slightly smaller but more aromatic. Two varieties of cardamom plants are identified, and they are *Elettaria cardmomum maton* variety, major comprised of wild indigenous types of SriLanka and *Elettaria*
cardamomum Maton variety, minor comprising of cultivars like, Mysore, Malabar and Vazhukka. These types are grown in different tracts and are mostly identified based on the nature of panicles, size of plants and other morphological characters. Cardamom varieties are highly location specific.

**High Yielding Varieties and Selections**

Various research institutions working on the crop improvement aspects of cardamom have selected a number of elite high, yielding clones having a yield potential of above 250Kg/ha (rainfed)and superior capsule characters. They are being successfully taken up for cultivation in planters’ fields according to their agro climatic adaptability.

Three botanically distinct varieties exist. The characteristics of these three varieties are detailed in Table 1.2 The new varieties of cardamom recommended for release are given in Table 1.3.

### Table 1.2

**High Yielding Varieties and Selections**

<table>
<thead>
<tr>
<th>Type</th>
<th>Plant Stature</th>
<th>Panicle Type</th>
<th>Capsule Type</th>
<th>Adaptability</th>
<th>States recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Var. Malabar</td>
<td>Dwarf (2 to 3m)</td>
<td>Prostrate</td>
<td>Round/oblong</td>
<td>600-900m (lower elevation)</td>
<td>Karnataka and Parts of Tamilnadu and</td>
</tr>
<tr>
<td>2. Var. Mysore</td>
<td>Tall (3 to 5m)</td>
<td>Erect</td>
<td>Bold elongated</td>
<td>900-1200m (higher elevation)</td>
<td>Kerala</td>
</tr>
<tr>
<td>3. Var. Vazhukka</td>
<td>Tall (3 to 5m)</td>
<td>Semi Erect</td>
<td>Round oblong</td>
<td>900-1200m (higher elevation)</td>
<td>Kerala and suited for wide range of environmental conditions</td>
</tr>
</tbody>
</table>
### Table 1.3
**New Varieties of Cardamom**

<table>
<thead>
<tr>
<th>Variety / Year of release</th>
<th>Pedigree</th>
<th>Institute / University</th>
<th>Av. Yield</th>
<th>Salient features</th>
<th>Recommended Region / State</th>
</tr>
</thead>
</table>
| Small Cardamom ICR1-6% (MHC-26)   | A hybrid between MCC-260 | Indian Cardamom Research Institute (Species Board) District-685 553 Kerala | *1543 kg/ha (dry)  
Yield potential - 2667.72 kg/ha  
(under good management) | First hybrid variety;  
high yield under intensive early  
maturity, moderately  
tolerant to drought,  
management (responds well to intensive  
management) capsule size - 68%;  
More than 7 mm volatile oil - 7.13%;  
dry recovery - 23.15% | Kerala (900-1200 m MSL with annual rainfall of 2000 mm) and parts of Tamil Nadu |
| 2006 (State release)              |                        |                                               |                    |                                                                                  |                                                                                              |
| ICRI-6 (MCC-73)                   | Selection from local germplasm (Anavilasam in Idukki Dist. Of Kerala) | Indian Cardamom Research Institute (Spices Board), Myladumpara, Idukki Dist.-685 553 Kerala | *1200 kg/ha  
Yield potential - 1887 kg/ha | High yield; medium maturity, relatively tolerant to drought  
high percentage of bold capsules and volatile oil content capsule size - 71%;  
More than 7 mm volatile oil - 7.33% dry recovery - 19.0% | Suitable / specific to cardamom hill reserve (Anamalai area) of Idukki District of Kerala State |

*Source: Spice India, August 2006*
Cultivation of Small Cardamom

The cultivation of cardamom depends on climate, soil, rainfall conditions and the like.

a. **Climate:** Cardamom thrives well in areas having warm humid climate and fairly well distributed annual rainfall (1500 - 4000 mm). A temperature range of 18-28 °C and an altitude of 600-1200 m above MSL is ideal. The crop requires 40-60% shade for proper growth and flowering. Being a surface feeder, availability of moisture during dry period is essential.

b. **Soil:** Cardamom requires loamy soil, which is acidic (pH range of 4.2 to 6.8), rich in humus and nitrogen and low to medium phosphorus and potassium content. The soil should be well drained as the crop cannot tolerate water logging.

c. **Propagation:** Propagation is largely through seedlings and also vegetatively through suckers.

d. **Plantation:** For planting in new area, the ground should be cleared or if it is replanting, old plants should be removed. In slopy areas, terraces should be made across the slopes before taking pits. Planting in trenches in terraces is recommended for better soil and moisture conservation. Planting should be done with the commencement of South West monsoon and before heavy rains, diagonally to the slope. A small mound may be formed inside the pit to cover the rhizome. Immediately after planting, the plant base should be mulched well with available dried leaves.

e. **Common diseases:** Cardamom plants are generally affected by the diseases caused by vims, fungi and bacteria. *Katte* (viral) and *chenthal* are the common diseases affecting the cardamom plants.

f. **After care:** The various cultural practices to be followed after planting are mulching, shade regulation, weeding, trashing, earthing up, fertilizer application, irrigation and gap filling".
Harvesting & Post-harvesting operations

Harvesting takes place 3 to 4 months after flowering. The ideal stage for harvesting of capsules is just before ripening, i.e., after attaining physiological maturity, i.e., when the seeds inside the capsule have become brownish/black. The per carp, i.e., the seed cover or skin of the capsule, at this stage will still be green. The capsules are harvested in 6-7 rounds with 30-40 day intervals depending up on the weather conditions. The hand picking method is used for harvesting of cardamom. The harvesting season generally begins in July and continues to March, depending on the varieties cultivated and the climatic conditions. However, over ripening is avoided as it results in loss of green colour and splitting at the time of drying, both results in lower market value. Such capsules also get spoiled in the field due to attack by rodents, squirrels and the like. Thus, timely harvesting helps to retain the quality as well as the quantity.

The post-harvesting operations include washing, pre-treatment with chemicals, curing, and cleaning/polishing and sorting/grading. The pre-treatment takes place immediately after harvest. The capsules after harvest, should be washed with water to remove the dirt present. Cardamom capsules that do not have deep green are bleached (in some places in Karnataka) with bleaching powder or sulphur dioxide or hydrogen peroxide to have uniform grey white colour, which is preferred in some of the overseas markets. Curing is the process in which the moisture level of green cardamom is reduced from 80% to 12% as an optimum. There are three types of curing systems which include fluepipe system, Eccard (Economical Cardamom Drier) and solar drier. Many models of electric driers are also available but the interrupted power supply and high cost of electricity are the limiting factors for their adoption. The use of LPG/diesel for drying cardamom is the best alternative to the firewood based traditional cardamom drying. Immediately after the curing the product is rubbed gently against a coarse surface of wiremesh or coir mat to remove the stalks and dried remains of the floral parts. Many cleaning
equipments are available in the spices industry. Air screen separator is the commonly used one. In some developed countries, compact units consisting of clippers, air classifiers, polishers, size graders and specific gravity inspection tables are being used. After cleaning, the product is sorted manually to separate the split, diseased or pest attacked and light coloured capsules. For grading as per the size of capsules, appropriate size meshes are used.

Grading

Grading is a means of adding value to a product. At the international level, the ISO (International Standards Organizations) prescribes several well defined trade grades and quality parameters which are rigorously implemented by Agmark in India for exported produce. AGEB (Alleppey Green Extra Bold) is considered to be the best quality from India. Thus, cardamom is graded by colour and size. The deeper the green colour and the larger the capsule, the higher the grade for cardamom.

Internationally accepted and most commercially imported varieties of cardamom are Malabar Cardamom, Sri Lankan Cardamom and Cambodian Cardamom.

The quality parameters of cardamom include colour, maturity of seeds, percentage of seeds, percentage of seed counts and litre weight (gms). These are the major criteria used in the market.

Packing and Storage

Cured cardamom is to be protected against light, air and temperature to prevent deterioration of colour and safe custody against pests and moulds. The product needs to be stored for at least a few months to reach the customer. Jute sack with polythene bag inside or colour polythene bag between two jute bags inside are good for long term storage of cardamom capsules. For short duration storage a five-ply multi-wall paper rack with LDPE200 gauge bag or gusset with HMWDPE liner, gusset inner line coated or polypropylene woven sack
with LDPE 400 gauge bag would be effective. It is better to store the bags in a wooden box instead of the open air.

The optimal condition for a store are low temperature, low humidity and freedom from pests. The store should be located in a shaded, dry place to keep the humidity as low as possible. Only fully dried products should be stored in it. The product should be checked regularly and if it is found to have absorbed too much moisture it should be dried again to prevent present pests entering. The roof should be completely sealed. Mosquito netting should be placed over the windows and the doors should have close fittings. They should be packed in airtight tins for export.

**Value added Products**

Under the auspices of the Spices Board, India, and the International Trade Center, Geneva, the Central Food Technological Research Institute (CFTRI), Mysore, India has made innovative R&D efforts for diversifying the uses of cardamom and to enhance its domestic as well as export market. Encapsulation of cardamom flavour Cardamom cola, a fizzy drink, a flan mix cardamom tea, cardamom coffee, dry powder for cardamom soft drink mix and instant pongal mix flavoured with cardamom are some of the products brought out by the CFTRI\textsuperscript{33}.

**Cardamom in India and Guatemala**

Guatemala is one of the competitive countries to India in the cardamom production and marketing, particularly in the international market. It was way back in 1920 that cardamom found its way to Guatemala. The credit goes to a German settler who managed to get cardamom seeds from South India with the help of a person of Indian origin in New York. Planting began in the state of Alta Vera Paz to start with. Today, it has spread to several parts of the country and the country has been the leading competitor to India in the international market. A comparison of salient features in cardamom between India and Guatemala is shown in Table 1.5.\textsuperscript{34}
### Table 1.4
**Cardamom in India and Guatemala**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>India</th>
<th>Guatemala</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Area under cardamom Cultivation</td>
<td>73,000 ha.</td>
<td>91,000 ha.</td>
</tr>
<tr>
<td>2.</td>
<td>Altitude</td>
<td>600-1200 m</td>
<td>250-1500 m</td>
</tr>
<tr>
<td>3.</td>
<td>Rainfall (2000-2005)</td>
<td>1500-2500 mm</td>
<td>1700-2400 mm</td>
</tr>
<tr>
<td>4.</td>
<td>Rainy Day (2000-2005)</td>
<td>100-134 days</td>
<td>201-222 days</td>
</tr>
<tr>
<td>5.</td>
<td>Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Mean Maximum</td>
<td>25.3-26° C</td>
<td>24.9-26° C</td>
</tr>
<tr>
<td>7.</td>
<td>Mean Minimum</td>
<td>17.20° C</td>
<td>10.5-14.4° C</td>
</tr>
<tr>
<td>8.</td>
<td>Cost of Production - Rs. per kg.</td>
<td>120-250</td>
<td>70-105(*)</td>
</tr>
<tr>
<td>9.</td>
<td>Management</td>
<td>Medium to intensive</td>
<td>Poor</td>
</tr>
<tr>
<td>10.</td>
<td>Quality</td>
<td>High</td>
<td>Poor</td>
</tr>
<tr>
<td>11.</td>
<td>Advantage</td>
<td>Quality</td>
<td>Quantity</td>
</tr>
<tr>
<td>12.</td>
<td>Consumption Pattern</td>
<td>Internal - major portion</td>
<td>Export major portion</td>
</tr>
</tbody>
</table>

*Source: Spice India, August 2007*

**Plantations Labour Act 1951**

In India the plantation sector provides employment to more than a million workers. It was therefore, decided by the Indian Government to bring out a comprehensive legislation regulating the conditions of labour in this sector. The Plantation Labour Act, 1951 is administered by the State Governments and is applied to any land used as plantations, which measures 5 hectares or more in which 15 or more persons are working. The State
Governments are however, free to declare any plantation less than 5 hectares or employing less than 15 persons to be covered by the Act.

The Plantation Labour Act, 1951 provides for the welfare of plantation labour and regulates the conditions of work in plantations. The content of the Act includes rights of plantation workers, health and welfare of plantation workers, various benefits for workers and penalties and procedures for the employer under the Plantation Labour Act.

Plights of Cardamom growers

The cardamom growers are facing multifarious problems arising out of fall in prices, high cost of production and fall in exports. They are detailed below.

1. The cardamom planters are facing problems as some of the individual auctioneers dumped a huge quantity of cardamom in the market which slashes market prices. Upcountry buyers do not generally opt for stocking the produce and procure the produce on the basis of demand in the domestic market. The holding capacity of local buyers is also poor, as majority of them act as commission agents for upcountry buyers. Dumping of old stock on large scale too affects prices of cardamom in the domestic market.\(^{35}\)

2. The cardamom growers are affected due to the continuous fall in prices. Low price for cardamom has created problems for the growers, leaving nothing for them, as plough back to nurture their plantations. For instance, the average prices during 2005-06 is around Rs 200 per kg compared with the average auction price of Rs 622.87 during 2001-02. Since then, the prices have been declining and it has reached such a level that it is no longer remunerative.
3. Soaring cost of agricultural inputs, coupled with higher wages have pushed up the cost of production, making cardamom cultivation non-remunerative.\textsuperscript{36}

4. \textit{Azhukal} or capsule rot disease is one of the major problems faced by the cardamom growers. It is mostly prevalent in Idukki and Wynad Districts of Kerala. In recent years, it has been noticed in isolated pockets of Anamalai area also. The disease starts with the onset of the South-West monsoon in June and becomes severe during July-August. Continuous rainfall, excessive soil moisture, thick shade, over crowding of plants and prevalence of inoculums in the soil are the major causes for the capsule rot disease.

5. The vagaries of monsoon is another problem faced by the farmers. This affects the farmers’ schedules in the production and marketing of cardamom. Even the favourable monsoon affects the cardamom growers due to lack of production and marketing planning.

6. The prevailing non-remunerative price becomes a reason for mounting loan liabilities of farmers’. This affects the growers who mainly subsist on cardamom crop.

7. The cardamom growers are facing doom due to severe price undercutting and rampant smuggling of Guatemalan cardamom. While growers estimate that about 3000 tonnes of Guatemalan cardamom are being smuggled into India annually, neither the Spices Board nor the Union Commerce Ministry has any idea of the actual quantum involved in these operations\textsuperscript{37}.
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