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Review Article

AMOMUM SUBULATUM ROXB: AN OVERVIEW IN ALL ASPECTS

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ABSTRACT
Amomum subulatum Roxb. (Family Zingiberaceae) is commonly known as 'Badi Elaichi' or Greater Cardamom. The present study deals with the an overview in all aspects of *Amomum subulatum* Roxb. It contain Protein 6.0%, Starch 43.21%, Crude fiber 22.0%, Non-volatile ether extract 2.31%, Volatile ether extract 3.0%, Alcohol extract 7.02%, Volatile extract 2.8%, Water soluble ash 2.15%, Alkalinity of water soluble ash 0.90%, Ash insoluble in acid 0.42%, Volatile oil 2.80%. The essential oil having characteristic aroma and possesses medicinal properties. The pericarp is used in headache and heals stomatitis. In Ayurvedic and Unani medicine, large cardamom are used as preventive as well as a curative for throat trouble, congestion of lungs, inflammation of eyelids, digestive disorders and in the treatment of pulmonary tuberculosis. The seeds contain mainly essential oil, flavonoids, carbohydrates and fats.

Keywords:- *Amomum subulatum* Roxb, Phytoconstituents, Quality issue, Bioactivities.

INTRODUCTION

Amomum subulatum Roxb (Zingiberaceae), commonly known as large cardamom, is a perennial herbaceous plant with subterranean rhizomes which produces several leafy shoots and panicles. It is a native to Sikkim and from there it is spread to neighboring areas like Darjeeling, Assam, Bhutan and Nepal. India is the largest producer of large cardamom with an annual production of 4000 MT, followed by Nepal (2500 MT) and Bhutan (1000 MT)[1]. Sikkim state of India alone contributes 50% of the world's production of large cardamom[2]. The fruit is a trilocular many-seeded capsule. It contains 1.95 to 3.23% of essential oil having typical characteristic flavor and possesses stimulant, stomachic, alexipharmic and astringent effects [3-5]. The fruits are prescribed to treat indigestion, vomiting, biliousness, abdominal pains, rectal diseases, throat troubles, congestion of the lungs, inflammation of the eyelids, digestive disorders, pulmonary tuberculosis, loss of appetite, gastric troubles, and liver complaints [6-8]. Due to its pleasant aroma, it has been used as an essential ingredient in mixed spices. The major constituent of large cardamom essential oil is 1,8-cineole (65–80%) while the content of terpenyl acetate is low (traces to five per cent). The monoterpene hydrocarbon content is in the range of 5–17% of which limonene, sabinene, and the pinenes are significant components. The terpineols comprise approximately five to seven per cent of the oil. The high cineole and low terpenyl acetate probably account for the very harsh aroma of this spice in comparison with that of true cardamom [9].

Vernacular (common) names:

Sanskrit: Bhadr, Bhadrail; Hindi: Bari elachi; Urdu: Badi Elaichi, Heel Kalan; Bengali: Baara aliach; English: Greater or Nepal cardamom; Gujrati: Elaicho, Mothi Elichi, Kannada : Dodda Yalakki, Nepdi Elakki; Malayalam: Valiya Elam, Perelam; Marathi: Mothi Elayachi; Oriya: Bada aleicha, Aleicha; Punjabi: Budi Eleichi; Tamil: Periya Elam, Beraelam, Kattu Elam; Telugu: Pedda Elakulu [10].

French: Cardamome; German: Kardamom; Italian: Cardamomo, Cardamone; Spanish: Cardamomo; Burmese: Phalazee; Chinese: Ts'ao-k'ou; Indian: Elachi,e(e)lachi, ela(i)chi, illaichi; Indonesian: Kapulaga [11].

Habitat and Description

A tall, perennial herb, evergreen, herbaceous monocot plant indigenous to eastern Himalayas and cultivated in Nepal, northern West Bengal, Sikkim, Bhutan and Assam hills. The plants are usually grown along jhoras (small springs), in moist and shady side of mountain streams and hilly slopes, usually at an elevation of 765 to 1675 metres above the main sea level. Rhizomes are creeping and branched, with several erect leafy shoots and panicles. The leaves are oblong lanceolate, 30-60 cm in length. Leafy shoots are formed by long sheath-like stalks encircling one another. The spikes are globose, very dense and shortly peduncled. Calyx and corolla tube segments are sub-obtuse, shorter than the tube and the upper one is cuspidate. Lip is obovate-cuneate, emarginated, yellowish white and rather longer than the corolla-segments. Capsules are 2.5 cm long, irregular obcordate, echinate, trilocular, dark red-brown in color, containing several aromatic seeds in each cell and held together by a viscous sugary pulp. The fruit is anterio-posteriorly flattened, having 15-20 irregular, dentate-undulate wings which extend from the apex to downward for two-thirds of its length. The plant matures during the third year of its growth and its height ranges from 1.5 to 3 m. Harvesting is usually carried out during August to October [12,13].

Phytoconstituents

The chemical composition varies with variety, region and age of the product. The fruit on average comprises 70% seeds and 30% skin [9].

- Protein 6.0%
- Starch 43.21%
- Crude fiber 22.0%
- Non-volatile ether extract 2.31%
- Volatile ether extract 3.0%
- Alcohol extract 7.02%
- Volatile extract 2.8%
- Water soluble ash 2.15%
- Alkalinity of water soluble ash 0.90%
- Ash insoluble in acid 0.42%
- Volatile oil 2.80%

The essential oil of the seeds was investigated by several workers [13,14]. The seeds were reported to contain about 2.5%

essential oil with 1,8-cineol as the major constituents. The spice was also extracted with liquid carbon dioxide and the oil thus obtained compaired with the steam distilled oil [14].

The volatile oil present in the seeds of large cardamom is one of the principal constituents responsible for providing the typical odour. The essential oil is obtained on steam distillation of crushed seeds and yields 2.5% dark brown coloured mobile liquid with cineole-like aroma, having the following physical constants: specific gravity at 29 ºC, 0.9142, refractive index at 29 ºC, 1,460, optical rotation in chloroform is18 ºC [9].

The highest volatile oil content was recorded as 3.32% in variety Golsey Dwarf, whereas the lowest was 1.95% in variety White Ramna [3]. Quantitative chromatographic analysis of the composition of distilled essential oil was reported previously by[14,16]. The major constituent of large cardamom essential oil is 1,8-cineole (65–80%) while the content of terpenyl acetate is low (traces to five per cent). The monoterpene hydrocarbon content is in the range of 5–17% of which lamonene, sabinene, the terpinenes and the pinenes are significant components. The terpineols comprise approximately five to seven per cent of the oil. The high cineole and low terpenyl acetate probably account for the very harsh aroma of this spice in comparison with that of true cardamom [9].

The seeds were found to contain cardamonin (2'.4'-dihydroxy-6'-methoxychalcone) and alpinetin (7-hydroxy-5-methoxyflavanone) and the glycosides viz., petunidin 3,5-diglucoside, leucocyanidin-3-O-β-D-glucopyranoside and a new aurone glycoside subulin whose structure was established as 6,3',4',5'-tetrahydroxy-4-methoxyaurone-6-O-α-L-rhamnopyranosyl (1 4) – β – D – glucopyranoside[12,16,17]. Protocatechualdehyde, 1,7-bis (3,4-dihydroxyphenyl) hepta-4E,6E-dien-3-one, protocatechuic acid , and 2,3,7-trihydroxy-5-(3,4-dihydroxy-E-styryl)-6,7,8,9-tetrahydro-5H-benzocycloheptene, are isolated from greater cardamom [18].

Quality issues

The quality of large cardamom depends mainly on:

• External appearance, which provides visual perception of quality as influenced by colour, uniformity of size, shape, consistency and texture

• Flavour, which is influenced by composition of aromatic compounds. Cineole contributes to pungency while terpinyl acetate towards pleasant aroma [19].

A draft International Standards Organisation (ISO) proposal on large cardamom was prepared by Spices Board, India in conjunction with CFTRI, Mysore and submitted to the Bureau of Indian Standards (BIS). The draft proposal for BIS adoption reads as follows:

Capsules

1 Extraneous matter - Not more than 5% by weight
2 Insect damaged capsules - Not more than 5% by weight
3 Moisture - Not more than 14% by weight
4 Volatile oil (%) ml/100 g - Not less than 1.5%
5 Colour should be natural and capsules free from added colures

Seeds

1 Moisture - Not more than 13% by weight
2 Volatile oil - Not less than 2% by weight
3 Total ash - Not more than 5% by weight
4 Acid insoluble ash - Not more than 2% by weight
5 Extraneous matter - Not more than 2% by weight
6 The seeds should be free from moulds and insects
7 Insect damaged seeds - Not more than 2% by weight
8 Colour and flavour - Should be natural and characteristic

Bioactivities

Analgesic activity

A. subulatum seeds extract showed significant ($p<0.001$) analgesic effect with methanolic extract at dose 100 and 300 mg/kg and ethyl extract at dose of 200 and 400 mg/kg [20].

Anti-inflammatory

Ammomum subulatum fruit extract dose of 100 mg/ml and 200 mg/ml of ethanolic and aqueous extract exhibited anti-inflammatory activity against carrageenan induced paw edema in rat [21].

Antimicrobial activity

The *in vitro* antimicrobial activity of *Amomum subulatum* and *Elettaria cardamomum* fruit extracts with acetone, ethanol and methanol were studied against *Streptococcus mutans, Staphylococcus aureus, Lactobacillus acidophilus, Candida albicans* and *Saccharomyces cerevisiae* [22,23]. Secondary metabolites such as tannins, alkaloids and flavonoids found in *A. subulatum* displayed antimicrobial activities. Petroleum ether extract of large cardamom showed antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli* (-ve) and *Pseudomonas aeruginosa* [24]. The essential oil from seed of *A. subulatum* was found to have significant inhibitory effect against various keratinophilic and dermophytic fungi[25].

Antioxidant activity

Different study showed antioxidant activity of *A. subulatum*. The antioxidant is the term used to describe a dietary component that can function to decrease tissue damage by reactive oxygen that's why antioxidants have great value in preventing the oxidative diseases such as chronic fatigue, premature ageing symptoms, degenerative cardiovascular and neurovascular diseases associated with ageing [26]. 1,8-Cineole, alphaterpineol, protocatechualdehyde and protocatechuic acid present in the seeds of *A. subulatum* presented antioxidant activity and has potential health benefits by inhibiting lipid peroxidation [18,27]. The seed has antioxidant activity on hepatic and cardiac antioxidant enzymes and is attributed to their ability to activate antioxidant enzymes [8].

Antiulcer activity

Large cardamom fruit is used in the Unani system of medicine to treat gastrointestinal disorders. Ulcer is one of the most common global health problems affecting a large number of people worldwide and shows major cause of morbidity and mortality [28]. Crude methanolic extract of the fruits of *A. subulatum* exerted antiulcer activity [7]. Similarly, methanolic fraction, petroleum ether soluble fraction and ethyl acetate soluble fraction, produced significant ulcer protection against ethanol induced ulcer [29]. Likewise, essential oil of *A. subulatum* inhibited ulcer formation by 60.91% ($p<0.001$), significantly in ethanol and aspirin induced gastric ulcer (Farah et al., 2005).The methanolic extract of *A. subulatum* seeds elicited hepatoprotective activity against ethanol-induced liver damage in rats, as evidenced by the functional, physical, biochemical and histological parameters [31].

Cardio-adaptogen activity

Greater cardamom has protective effect against the effect of acute or severe stress induced myocardial damages. Regular consumption of *A.subulatum* may therefore be useful in treatment for patients with Ischemic Heart Disease (IHD), facing regular stressful conditions [8].

Hypolipidaemic activity

Large cardamom has significant ability to suppress lipid peroxidation due to the presence of polyphenol content. Similarly, *A.subulatum* supplementation increased the

antioxidant enzyme activities, and the lipid conjugated dienes and hydroperoxides also inhibited of lipid peroxidation in rat liver homogenate due to their polyphenol content, strong reducing power and superoxide radical scavenging activity[32-34].

Toxicology

No toxic effects noticed from the research so far.

Therapeutic Uses

The dried seeds of this plant are used in the cure of dyspnoea, cough, thirst, vomiting, disease of the mouth, nausea, itching indigestion, vomiting, biliousness, abdominal pains and rectal diseases [10]. Greater cardamom is prescribed to treat and prevent throat troubles, congestion of the lungs and pulmonary tuberculosis, and inflammation of the eyelids. Medicinally, the seeds are stimulant, stomachic, alexipharmic and astringent properties. A decoction of the seeds is utilized as gargle in afflictions of the teeth and gums. With melon seeds, large cardamom seeds are recommended as diuretic in case of gravel of the kidney and as an antidote for both snake and scorpion venom.

Culinary uses

The pods can be used whole or split when cooked in Indian substantials-such as pulses. Cardamom is often included in Indian sweet dishes and drinks like punches and milled wines. It is used in pickles, especially pickled herring and flavors custard. It is also chewed habitually (like nuts) where freely available, as in the East Indies, and in the Indian masticory, betel pan. It is often used in baking in Scandinavia and in Danish pastries. Throughout the Arab world, cardamom is one of the most popular spices, with cardamom coffee being a symbol of hospitality and prestige. In the Moghul cuisine (Northern India) it abundantly used in the delicious rice dishes called biriyanis. A small amount of Cardamom will add a tempting flavour to coffee cake. Flans, rice puddings asnd porridges taste much better with a dash of Cardamom. Add whole cardamom to flavour tea drunk with milk [36].

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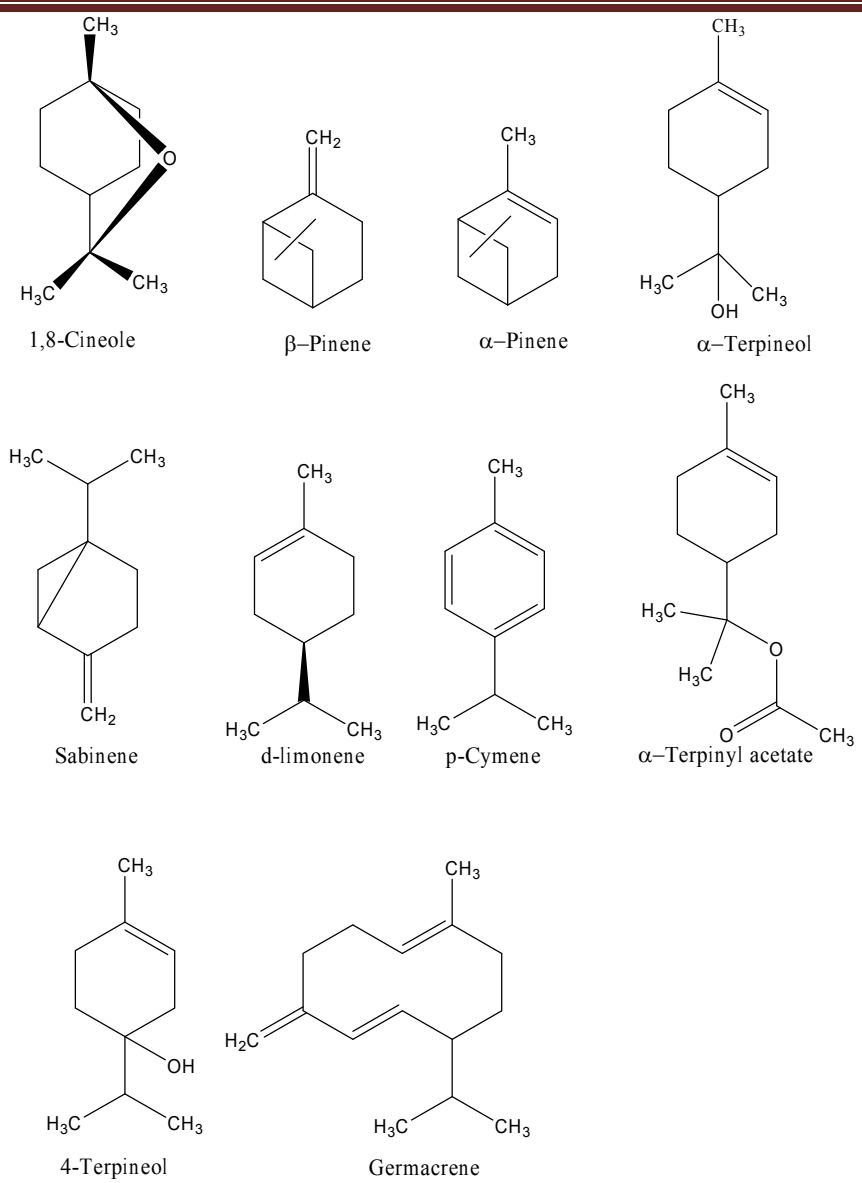

Chemical constituents of *A. subulatum*