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REVIEW ARTICLE

Pharmacognostic and Pharmacological Studies of *Ammomum Subulatum*

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ABSTRACT

Large cardamom (fruit of *Amomum subulatum* Roxb, Zingiberaceae) commonly known as 'Bari Ilaichi' is a tall, perennial, evergreen, herbaceous monocot plant. The drug consists of ripe or nearly ripe seeds and capsules of *Ammomum subulatum.* It is an important economic crop in the Eastern Himalayas and typically, cultivated in woodland areas with overhead shade and access to regular irrigation from mountain streams. Different chemical constituents such as Subulin, Alpinetin, Cardamonin, Diphenyl picrylhydrazyl, α-terpineol, α-pinene, β-pinene, 1, 8- cineole and many others have been isolated from the plant. *Ammomum subulatum* is well known plant, is traditionally used as mankind for heart related ailments, stomachic, antiemetic, antibilious, astringent, alexipharmic, cough; used for the treatment of indigestion, biliousness, abdominal pains, in congestion of liver. It is vata and kapha suppressant and pitta aggravator. It is helpful in improving the skin complexion. It is used for relieving pain from body. It also useful in urine related disorders. It helps in lowering down the raised body temperature is also effective in poisoning and other infection.

KEY WORDS: *Amomum subulatum*, seeds, anti-inflamatory.

1. INTRODUCTION

The drug consists of seeds, bark, leaves and root of *Ammomum subulatum* Roxb of family Zingiberaceae commonly known as 'Bari Ilaichi', is a well-known plant in the ayurvedic system of medicine. It is an important economic crop in the Eastern Himalayas and typically cultivated in woodland areas with overhead shade and access to regular irrigation from mountain streams.

This species is native to the eastern Himalayas; the production regions are Nepal and Sikkim, a tiny Indian union state located between Nepal and Bhutan. It grows vigorously during the summer mansoon months.[1]

Several species of the Amomum are distributed all over the mountains area from the Himalayas to Southern China. Furthermore, some African cardamoms (genus Aframomum) are also cultivated in Aladagascar, Somalia and Cameroon. Another member of this genus is pungent.[2]

Elaichi is mostly cultivated on private land in the eastern part of Nepal in districts such as Ilam, Sankhuwasabha, Panchathar, and Taplegunj.[3]

Large cardamom is cultivated between altitudes of 500 and 1,800 m on slopes under chequered shades, preferably along the streams. Temperatures near freezing point adversely affect the growth. Moderate shade, high humidity, cool surroundings are essential, but water logging is injurious. The plants exposed to direct sunlight may get scorched during the drier months from Nov. to Feb. The crop grows best in rich, well-drained forest soils with plenty of humus. Cardamom plantations on rich not only give better yield, but also last longer, the period extending to 20 years.[4]

The harvesting starts during August-September and is continued over four or five months. Harvesting is generally done by cutting the mature panicles with along chisel-shaped narrow knife which is specially made for this purpose. On an average the fruits constitute 50% weight of the panicles. After harvesting, the fruits are separated and dried or cured. Over the kiln it takes about three days of continuous smoking for complete curing or drying. The dried cardamoms weigh about 25% of the fresh ones.

The first flowering results in an eligible yield of which 25 kg/hec. Subsequently the yield increases with every harvest, reaching its maximum of 300 kg to 1 tonne/hec. at 4th or 5th harvest. The maximum yield is maintained for a year or two and then there is a decline, however, depends on the upkeep of plantations can yield profitably even up to 20 years.[5]

Ammomum subulatum is an herb with leafy stem up to 90-100 cm in height, large coarsely striated fruit of dark brown color, measuring 2 to 3 cm in length and up to 1.5 cm in width. It is a trilocular capsule, anterior-posteriorly flattened having a number of irregular, dentate-undulate wings which extend from the apex down words for two third of its length. Internally, the capsule contains several seeds held together by a viscous pulp of dark brown color having strong and camphoraceous odour, pungent and slightly sweet taste. Flowers are white in colour, globose and shortly peduncle spikes.[6]

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2. CLASSIFICATION[7]:

Kingdom	Plantae
Subkingdom	Tracheobionta
Super division	Spermatophyta
Division	Mangnoliophyta
Class	Liliopsida
Subclass	Zinziberidae
Order	Zinziberales
Family	Zinziberaceae
Genus	Amomum
Species	Subulatum

3. CHEMICAL CONSTITUENTS:

Plant parts of *Ammomum subulatum* mainly contain the glycosides, petunidin 3, 5-diglucoside, leucocyanidin-3-O-β-D-glucopyranoside, cholcone, cardamonin, flavanone, alpinetin and subulin. Acid hydrolysis of subulin gave the aglycone, subulaurone. The seeds on steam distillation yield a dark brown, mobile essential oil (2.5%) having a characteristic odor of cineol. Volatile oils present in seed containing cineol (74%), limonene (10.3%), myrcene (0.3%), α-terpinene (0.2% and 4-terpinene (0.2%).[8]

4. PHARMACOLOGICAL STUDIES:

4.1 ANTIMICROBIAL ACTIVITY:

Essential oils prepared by hydrodistillation of *ammomum subulatum* seed contained 1,8-cineole (72.7%), cinnamaldehyde (79.8%), linalool (78.1%), cuminaldehyde (37.4%), α-pinene (30.7%), terpinen-4-ol (20.0% and 31.3%), respectively having antifungal activity against various pathogenic fungi (*Aspergillus flavus, A. niger, Candida albicans, Fusarium oxysporum var. lycopersici, Microsporum canis, Pseudallescheria boydii, Trichopyton mentagrophytes and T. simii*).

Methanol extract of fruits of *A. subulatum* showed remarkable antimicrobial activity against *Escherichia coli* whereas in case of other microorganisms used it was found inferior to the standard drug used. Methanol extract of rind showed good antimicrobial activity against *Staphylococcus aureus*. It was found that the essential oil isolated was effective against majority of microorganisms used viz. *Bacillus pumilus*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, Saccharomyces cerevisiae.[9]

4.2 ANTI-INFLAMMATORY ACTIVITY:

Ahmad et al 2006 studied the effects of cardamonin (2′,4′-dihydroxy-6′-methoxychalcone), a chalcone and evaluated upon two cellular systems that are repeatedly used in the analysis of anti-inflammatory bioactive compounds namely RAW 264.7 cells and whole blood and found that Cardamonin inhibited NO and PGE_2 production. Analysis of thromboxane B_2 (TxB_2) secretion from whole blood either stimulated via the COX-1 or COX-2 pathway revealed that cardamonin inhibits the generation of TxB_2. Cardamonin also inhibited the generation of intracellular reactive oxygen species and secretion of TNF-α from RAW 264.7 cells.[10-12]

4.3 ANTIOXIDANT ACTIVITY:

Ethanolic and aqueous extracts of leaves of *Amomum subulatum* is evaluated for antioxidant activity by the 1, 1-Diphenyl-2-picrylhydrazyle (DPPH) free radicalscavenging activity. The ethanolic extract showed significant antioxidantactivity.[13]

4.4 GASTRIC ANTIULCEROGENIC ACTIVITY:

Fruit of *Amomum subulatum* is used in Unani system of medicine in gastrointestinal disorders. A crude methanolic extract and its different fractions, viz. essential oil, petroleum ether (60-80°), ethyl acetate and methanolic fractions, were studied in rats for their ability to inhibit the gastric lesions induced by aspirin, ethanol and pylorus ligature. In addition their effects on wall mucus, output of gastric acid and pepsin concentration were recorded. The crude methanolic extract of *A. subulatum* and its fractions, viz. essential oil, petroleum ether and ethyl acetate, inhibited gastric lesions induced by ethanol significantly, but not those which were induced by pylorus ligation and aspirin. However, ethyl acetate fraction increased the wall mucus in pylorus ligated rats. The results suggest a direct protective effect of ethyl acetate fraction on gastric mucosal barrier. While the observation of decrease in gastric motility by essential oil and petroleum ether fractions suggests the gastroprotective action of the test drug.[14]

4.5 CARDIO-PROTECTIVE ACTIVITY:

Methanol extract of *Amomum subulatum* displayed strong free radical scavenging activity using the 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical. *A. subulatum* were further partitioned into a hexane, chloroform, ethylacetate and water fraction, re-tested with DPPH assay. Fractions displaying strongest activity were examined *in-vitro* for their ability to protect human low density lipoprotein (LDL) from Cu^{2+} catalyzed oxidation measured using thiobarbituric acid reactive substances production and formation of conjugated dienes.[15]

4.6 ANTIDIABITIC ACTIVITY:

Anti-diabetic activity of *Amomum subulatum* seeds was evaluated in fructose fed metabolic syndrome in rats. *A. subulatum* extracts revealed a significant ($P<0.001$) increment of serum insulin levels and higher reduction in hyperglycemia when compared to the diabetic control rats. The histological studies of the endocrine region of pancreas of diabetic animals revealed that shrinkage of β cells of islets of langerhans.[16]

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