A Review on Morphology, Phytoconstituents and Related Medicinal Properties of *Lavatera cashmeriana* Camb. an endemic medicinal plant of Kashmir Himalaya

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ABSTRACT

*Lavatera cashmeriana* Camb. a member of family Malvaceae is an endemic and important medicinal plant species of Kashmir Himalaya. It is a perennial herb or shrub which inhabits forest clearings, shrubberies, wet meadows, and sunny rocky slopes. It is widely used in traditional folk medicine and is sold as crude drug in Kashmir markets due to its various medicinal properties. Although, *Lavatera cashmeriana* possess huge medicinal properties, there is no review article mainly about the structures of the phytochemical constituents, morphology and distribution of the plant. The present paper reviews the medicinal properties alongside with peculiar phytoconstituent of the plant and also gives detailed account of the morphological traits and distribution pattern of the plant species. Various medicinal effects of these plants may be due to the presence of a broad range of secondary bioactive metabolites such as flavonoids, phenolic acids, coumarins, and terpenes which have been frequently reported from the genus *Lavatera*.

Key Words: Bioactive Metabolites, Coumarins, Malvaceae, Morphology, Phytoconstituent

I INTRODUCTION

The plant kingdom is a treasure house of potential drugs and in the recent years there has been an increasing awareness about the importance of medicinal plants. Drugs from the plants are easily available, less expensive, safe, and efficient and rarely have side effects [1]. Medicinal plants are essential natural resource which constitutes one of the potential sources of new products and bioactive compounds for drug development. Plants have the ability to synthesize wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals [2]. In last five decades, these
plants have been extensively studied by advanced scientific techniques and various medicinal properties viz, anticancer, antibacterial, antifungal, antidiabetic, antioxidant, hepatoprotective, haemolytic, larvicidal and anti-inflammatory activities have been reported [3, 4]. Biosynthesis of these secondary metabolites is not only controlled genetically, but is also strongly affected by different biotic and abiotic stresses [5,6]. Broad range of environmental factors such as precipitation, mean temperature, soil characteristics, radiation etc changes with altitude [7].

Knowledge of the chemical constituents of plants is desirable because such information will be of value for the synthesis of new bioactive compound/s for treating the specific disease [8]. Phytochemicals from medicinal plants serve as lead compounds in drug discovery and design. WHO pointed out that more than 80% of world’s population depends on plants to meet their primary health care needs [9].

*Lavatera cashmeriana* Camb. a member of family Malvaceae is an endemic and important medicinal plant species of Kashmir Himalaya. The plant is a perennial herb or shrub and has a wide distributional range growing in the mountain ranges of Kashmir Himalaya mostly confined to temperate and sub-alpine habitats preferring wet meadows, grassy and rocky sunny slopes ranging in altitude from 1600-3200m asl [10, 11]. It is widely used in traditional folk medicine and is sold as crude drug in Kashmir markets due to its various medicinal properties [12].

**II DISTRIBUTION**

*Lavatera cashmeriana* commonly known as wild hollyhock/Kashmir mallow and locally known as saz-mool or saz-posh is an endemic and important medicinal plant of Kashmir Himalaya. It is found in India (Himalayan Mountains), Pakistan, Afghanistan, U.S.S.R, Iran. The species is distributed in the mountain ranges of Kashmir Himalaya confined to temperate and sub-alpine regions ,grows in early spring in forests, grassy and rocky slopes ranging in altitude from 1500-3200m asl. In Kashmir it is found in Sonamarg, Aharbal, Baltal, Harwan, Hadurah, Naranag, Kangar, Ferozpur [13]. Stewart [14], reported it from Poonch, Jammu. As per KASH (Kashmir University Herbarium) the distribution of *Lavatera cashmeriana* is given in table 1.

<table>
<thead>
<tr>
<th>Date of collection</th>
<th>Locality</th>
<th>Altitude (m)</th>
<th>Collector</th>
<th>Accession number</th>
</tr>
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<td>Naranaag</td>
<td>2250</td>
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<td>10815</td>
</tr>
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</table>
III MORPHOLOGY

Habit: Herbs, perennial, 1 m tall, stellate pilose. Stipules filiform, ca. 8 mm, stellate tomentose; petiole 1–4 cm, stellate pilose [10]. The species is perennial, stellate tomentose herb, glabrous, 1-2m in height [11].

Leaf: Leaf blades dimorphic, basal leaf blades nearly orbicular, apical blades usually 3–5 lobed, 4–8 × 5–9 cm, lobes triangular, abaxially stellate tomentose, adaxially stellate pilose, base cordate, margin crenate, apex obtuse [10]. Leaves orbicular, palmate, slightly cordate at base, upper surface of leaves with dense simple, fascicled or stellate hairs, lower surface densely stellate hairy, lobes ovate or obtuse, stipule linear lanceolate [11].

Root: The plant bears tap root system and the primary root length in the species varies in plants growing at different habitats [11].

Flower: Flowers in terminal sub-racemes or in axillary fascicles. Pedicel 4–8 cm, stellate pilose. Epicalyx lobes 3, broadly ovate, connate basally into cup ca. 1 cm, stellate tomentose, entire. Calyx campanulate, ca. 1.5 × 1.5 cm, 5-lobed, lobes ovate-lanceolate, stellate tomentose, apex acuminate. Corolla reddish purple, ca. 8 cm in diam.; petals obovate, ca. 4 × 2 cm, basally densely stellate hairy, base acuminate, apex 2-divided. Staminal column ca. 1.5 cm,

Source KASH (Kashmir University Herbarium)
sparsely hirsute. Mericarp 20–25, reniform, glabrous. Flowering period Jun–Aug [10]. Flowers axillary, solitary or in terminal sub-racemes; epicalyx lobes 3, broadly ovate- orbicular, mucronate, entire, calyx campanulate, 5 lobed, lobes ovate-lanceolate, apex acuminate; corolla pikish purple, 5 lobed, heart shaped, obovate, basally densely stellate hairy; staminal tube 1cm long, hairy at base, filaments very short, anthers reniform [11].

**Seed:** Seed glabrous, dark brown [10].

**Active compounds and Medicinal importance:**

Various active compounds were isolated from *Lavatera cashmeriana* like Lavaterone a Sesterpene, identified as 11-(4,8,10-trimethyl decalinyl)- 13,17-dimethyl decan-19-one, an unknown homoditerpene designated as Lavaterepene [M+ 306, C22 H42], new molecule named Lavater, [M+ 230, C13 H11O4], a novel sterol glycoside named as Lavateresterol [M+ 578, C35 H62O6], an unreported glucuronic acid derivative named as Lavateronic acid [M+ 274, C12 H18O7] [15].

*L. cashmeriana* is a medicinal plant widely used in traditional folk medicine [12]. Four protease inhibitors viz LC-pi I, II, III and IV were purified from seeds of *Lavatera cashmeriana* which inhibited trypsin, chymotrypsin and elastase in vitro [16]. *L. cashmeriana* extract also showed antibacterial activity against *Klebsiella pnueemoniae* and *Pseudomonas aeruginosa* [17]. *L. cashmeriana* root, leaf and flower extracts are used in many Unani medicinal preparations. It is supposed to be used in throat problems and the herb is given as a mild laxative. The roots are collected on large quantities and sold as crude drug in Kashmir market. The paste of dried flowers in milk is used to cure mumps in children [18]. The decoction of flowers of *L. cashmeriana* mixed with leaves of *Salix alba* is given to cure the skin irritation in pregnant womens [19].

**Biological activities:**

**a) Anticancerous activity:**

Protease inhibitors (PIs) are small proteins that are quite common in nature. PIs are present in multiple forms in numerous tissues of animals and plants as well as in microorganisms. PIs are emerging with promising therapeutic uses in the treatment of diseases like cancers. Four serine protease inhibitors named LC-pi I, LC-pi II, LC-pi III and LC-pi IV were purified from seeds of *Lavatera cashmeriana* Camb. by ammonium sulphate precipitation and purified by chromatography on DEAE-cellulose and Sephadex G-100 column. The potential anticancer activity of LC-pi I against these human cancer cell lines was investigated. LC-pi I exhibited a strong inhibitory effect on the proliferation of Prostate (PC-3) and Breast (MCF-7) cancer cell lines in in vitro. The anticancer activity of LC-pi I could be attributed in part to its inhibition of proliferation due to its protease inhibitor activity as LC-pi I is strong inhibitor of trypsin, chymotrypsin and elastase [16].
b) Antimicrobial activity:
Petroleum ether, chloroform and alcohol extracts of *L. cashmeriana* in various concentrations are found to be active against Gram-positive bacteria, while as only the alcohol extracts of this plant shows significant activity against Gram-negative bacteria. Chloroform extract of this plant also shows a weak activity against Gram negative bacteria [15].

LC-pi I was screened for antibacterial activity against *Klebsiella pneumoniae*, *Escherichia coli* and *Pseudomonas aeruginosa* by using agar well diffusion method. It exhibited strong antimicrobial effects on *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*, which are gram negative bacteria and cause many human infections like urinary tract infections, pneumonia and septicemia. However, the antimicrobial activity against *E.coli* was not very significant. Therefore, LC-pi I, a potent protease inhibitor may have the potential to serve a lead compound for the development of novel antimicrobial drug [17].

**IV CONCLUSION**

*Lavatera cashmeriana* is a perennial herb and has a wide distributional range. The review collected reveals that the species is sporidically distributed in the mountain ranges of Kashmir Himalaya mostly confined to temperate and sub-alpine habitats preferring wet meadows, grassy and rocky sunny slopes. Some of these traditional and folk usages have been evaluated showing the potential medicinal use of the plant. The activity of these plants against different bacteria might be due to the presence of a broad range of secondary active metabolites such as flavonoids, phenolic acids, coumarins, terpenoids (monoterpenes, sesquiterpenes, diterpenes, triterpenes) and sterols which have been isolated. Finally, presence of anti-cancerous compounds is another reason for importance of the plant as the potential source of medicinal compounds and drugs in future. This review reveals that the phytochemistry of *L. cashmeriana* will remain an important topic of pharmaceutical research.

**REFERENCES**


