Review Article

Current status of *Ulmus wallichiana*: Himalayan endangered Elm

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ABSTRACT

Ulmus wallichiana is important traditional and endangered plant species of western Himalaya used for treatment of fractured bones in animals as well as human being. The *U. wallichiana* (Planchon) is a mountain tree ranging from central Nuristan in Afghanistan, through Northern Pakistan and Northern India to western Nepal at elevations from 800 m to 3000 m. In Pakistan restricted to Nandiar and Hillian sub valleys of district Battagram between 1300 to 2000 m., *U. wallichana* is found in spruce pine, temperate and lower temperate forest area. The Himalayan Elm grows to 30 m tall, with a broad crown featuring several ascending branches. Mostly flowers exist in a clusters form on branches and maximum flowering offers during March. A strong fibre is obtained from the inner bark. Plant is used for cordage, slow matches and sandals. Chemical investigation of *U. wallichiana* revealed flavonoides present in stem bark. In IUCN red list *U. wallichiana* falls in vulnerable category. However, *U. wallichiana* falls under criteria D of critically endangered species in Pakistan as only 44 mature individuals were found in different parts of district Battagram. There are number of threats responsible for decrease in *U. wallichiana* number in western Himalayan which may include deforestation, over exploitation and climate changes. Conservation strategies need to follow and improve number of *U. wallichiana* number. *U. wallichiana* has the potential to prevent and treat osteoporosis, so an attempt should be made to conserve this important plant species with possible ant osteoporosis properties.

Key words: Endangered elm, Osteoporosis, *Ulmus wallichiana*, Western Himalaya.

Distribution of *Ulmus wallichian*:

Ulmus wallichiana is a member of family Ulmaceae. *U. wallichiana* (Planchon) is a mountain tree and found at elevations from 800 m to 3000 m. Its ranges start from central Nuristan in Afghanistan, through Gilgit Baltistan Pakistan and Northern India & goes to western Nepal (Fig. 1) **[1]**. *U. wallichiana* is a rare and endemic plant species of western Himalayas. In Pakistan it is restricted to Nandiar and Hillian sub valleys of district Battagram (1300 to 2000 m) **[2]**. Most of the plants are found in districts Battagram along graveyards and only few plants of this taxon are found along the paddy fields and other water bodies **[3]**.

Figure.1: Distribution of *Ulmus wallichiana* (Yellow dots shows plant distribution)

Habitat and community structure

U. wallichana is found in broad leaved, moist ravines, temperate and lower temperate forest at a height of 1800 to 3000 meter and mostly with *Celtis tetrandra*, *Juglans regis*, *Hippophae salicifolia* and *Betula alnoides* **[4, 5]**.

Morphological description of *Ulmus wallichiana*

The Himalayan Elm grows upto 30 m height (Fig. 2), with a broad crown featuring several ascending branches. The bark of the trunk is greyish brown and longitudinally furrowed. The leaves are elliptic-acuminate, less than 13 cm long and 6 cm broad (Fig. 3). The samarae are usually orbicular, less than 13 mm in diameter **[6]**. Flowers present in clusters on branches, maximum flowering time is March to April. Inflorescence is elongated pedicels in fruit more than 5 mm long, articulated to lower portion one third of the length of pedicel, uniformly pilose. Perianth tube is narrowed into the pedicel, lobes 5.6, obtuse, pubescent to subglabrous. Stamens are 5-6 in number, filaments longer than the perianth and anthers red. Ovary is slightly pubescent nature. Samara is orbicular-obovate with 12-15 mm in length and narrowed into a short stipe of 2-3 mm long. Stipe is longer than the perianth. Ulmus seeds are central and hirsute to sub glabrous.

Figure. 2: *Ulmus wallichiana* (30 mTall plant)

[7]

Figure. 3: *U. wallichiana* twig, Inflorescence and fruit credit goes to Brandis, 1874 (leaves 6- 10 cm long and 4-6 cm broad)

Importance of *Ulmus wallichiana*:

Plant biodiversity is a precious endowment of nature upon which mankind has always been dependent. The authentic knowledge of plants is based on trial and error and passed on from one generation to another, after refinements and additions (3)**.**

Fuel Wood Species

The local people use plant species as fuel wood, for cooking and heating during winter. They lack the natural gas facility **[8]**

Thatching / Sheltering Plants

Young shoots of *U. wallichiana* are used to make strong ropes as strong fibre is obtained from the inner bark. It is used for cordage. Due to lack of facilities in the area, the local people construct their houses from stones and clay and use Ulmus species for timber upon which thatching and sheltering plant species are kept to support the roof **[5]**.

Timber Yielding Plants

U. wallichiana wood is fairly hard, scented and fine grained. Wood takes a good polish and in used for furniture making.

Allelopathic effect

Allelopathic components play an important role by influencing the growth and establishment of plants and availability of soil inorganic ions. *U. wallichiana* shows allelopathic potential **[9]**.

Medicinal importance

Bark of *U. wallichiana* is commonly used for treatment of fractured bones in animals as well as in human beings in folk tradition of Himalaya **[10, 11]**. Local people collect *U. wallichiana* fresh bark, crushed minutely and boiled in water for 1/2 h to make fine semi-solid substrate. As bark contains strong fibers and high percentage of mucilage, substrate became laxative and sticky. Fractured part of body is washed and properly set by experienced bone setter. Cooled semisolid laxative substrate is thoroughly poured and lapped around fractured part and tightened with a clean cloth followed by giving proper support to fractured part with thick card board. Patient is then allowed for minimum 30 days rest **[12, 13]**.

Glycosylation is a common metabolic fate for majority of flavonoids, an event that is also known to influence their stability. For example, rutin (quercetin-3-*O*glucose rhamnose), distributed in many plants, dietary glycosides, are converted to aglycones, such as quercetin, in the large intestine in reactions catalyzed by the glycosidase of intestinal bacteria **[14]**. *C*-glycosylated flavonoids will be better therapeutic candidates given their stability over aglycone or *O*-glycosylated flavonoids **[15]**. From *U. Wallichiana*, a plant known in traditional Indian medicinal practice to treat the bone fracture, flavonoid-*C*-glycosides have been isolated and assessed for their activity in stimulating osteoblast differentiation. Stimulation of osteoblast differentiation is a bone anabolic function that is desirable for osteoporosis therapy **[16, 17, 18, 19].** Chemical investigation of *Ulmus wallichiana* by **[15]** revealed that stem bark resulted in isolation and identification of three new compounds (2S,3S)-(+)-3',4',5,7 - tetrahydroxydihydroflavonol-6-*C*-b-D-glucopyranoside, (2S, 3S)-(+)-4',5, 7 trihydroxyhydroflavonol-6-C-b-Dglucopyranoside and 3-C- β-D-glucopyranoside-2,4,6-trihydroxymethylbenzoate, together with five known flavonoid-6-Cglucosides. During chemical investigation, Ulmoside A & Ulmoside B (Fig. 4) were isolated from bark of this plant species.

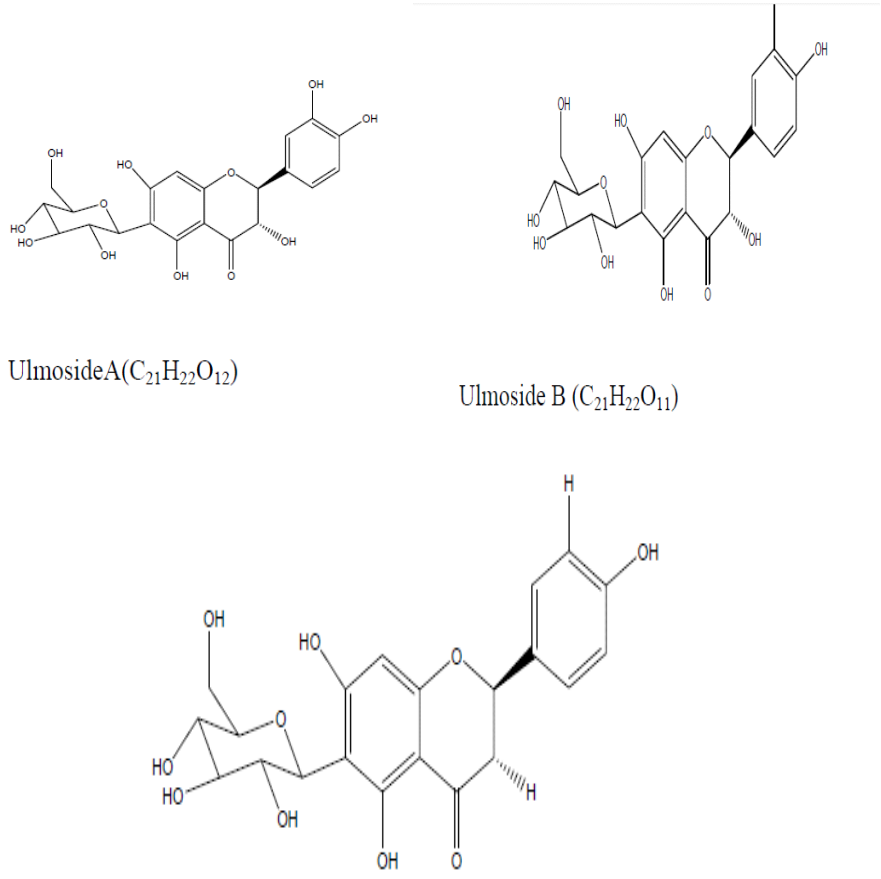

Figure.4: phytochemicals of *Ulmus wallichiana*

Conservation status

U. wallichiana is in vulnerable category of IUCN red list A1c ver2.3 [20]. However, Walter and Gillett in1998 categorised *U. wallichiana* as endangered plant. In Pakistan only 44 mature individuals of *U. wallichiana* are present in different parts of district Battagram [2, 5]. Hence locally it falls under criteria D of critically endangered species.

Threats towards Its Extinction

Increase in human population and constant unplanned overexploitation of plants for medicinal, timber, firewood, fodder and thatching purposes has resulted damage into the Ulmus spp.

Deforestation

Deforestation in the Himalayas is generally attributed to demographic pressure and other related effects like: increase in demand for land for cultivation; livestock population; use of the remaining forest to meet growing needs for fodder, fuel wood, and timber. On the other hand, social issues such as social relationships, perceptions and values about natural resources as seen by different social groups, issues of access to and control over resources, and issues of power in relation to deforestation, have rarely been discussed in current literature as possible driving forces to deforestation [21, 22].

Collection chain of medicinal plants in Pakistan:

In Pakistan medicinal plants are collected from the wild. Local collectors are unaware of the best collection procedures. *U. wallichiana* from the sites of collection to the national and international markets pass through various middle men. Consequently, the prices of the crude drugs increase more than 100% along the trade chain [23].

Environmental changes:

Seeds viability and vigor decreases with increasing moisture and temperature fluctuations *U.*

wallichiana seeds are short lived. Seeds may be damaged by temperature variation due climate changes **[24]**.

Conservation strategies

Extensive and intensive surveys are required to prepare a comprehensive inventory of fodder resources of Himalaya.

A mass awareness campaign should be launched on both governmental and community level in order to promote awareness among the people about the importance of plants and conservation of the flora.

Cultivation of medicinal plants on scientific lines will be useful to reduce pressure on natural flora.

Vegetative propagation of Elm (*U. wallichiana*) through hardwood stem cuttings treated with different plant growth regulator viz.. IAA, IBA, NAA, at varying concentrations of 200,400, 600,800, and 1000 ppm for 24 hours, revealed significant differences with respect to rooting percentage, average root number, average root length, plant height and collar diameter as compared to control **[25]**. Considering various combinations and parameters studied **[26, 27]**. *U. Wallichiana* seeds can be stored and germinate for a comparatively longer period if provided sufficient moisture content. Ulmus species should be introduced in botanical gardens. Public participation in conservation program and awareness through training or mass media should be ensured. Permanent monitoring programmes should be developed.

Conclusion

The paper gives comprehensive information about the status of *U. wallichiana*, conservation strategies and major threats to Himalayan elm. Scientific outputs of this plant also supports and validate knowledge of this patrimony and revealed scope for isolation of novel compounds for modern therapeutic value for osteoprotective drug from *U. wallichiana*. There is need to updating of IUCN red list and proper conservation measure should b taken.

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