LEAF FLAVONOID AGLYCONE PATTERNS, ETHNOBOTANY AND CONSERVATION OF *SCHIMA WALLICHII*

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ABSTRACT

Schima wallichii (DC.) Korth (Chilaune) is widely distributed in the various habitats of Himalaya. Information regarding chemical constituents of this species is very limited. During the chemotaxonomic study of some angiosperms, flavonoid aglycone : flavonol quercetin was isolated from the leaves of *Schima wallichii* using standard procedures after separation and purification by paper chromatography and TLC (thin layer chromatography) plates in several solvent system, but other flavonoids were not detected. The ethnobotanical study of *Schima wallichii* was also carried out. Various parts and the products of this species are locally used for medicine, fuel and other domestic purposes. This indigenous knowledge can be integrated in the local plan that can help to the poverty alleviation and economic development of the villages. But at present, this plant is under serious threat due to habitat destruction and over-exploitation. A holistic approach is, therefore, essential for the sustainable conservation of this species. In this paper, strategies for conservation of the plant, its resources and habitats have also been proposed.

Key words: *Flavonoids, quercetin, ethnobotany, conservation, holistic approach.*

INTRODUCTION

Schima wallichii (DC.) Korth (Local name: Chilaune), a large sized evergreen tree, is widely distributed in the various habitats in northern India, Bhutan, Southern Tibet, Nepal, Bangladesh, eastward to western China, Myanmar and Sumatra (Manandhar 2002). In Nepal, it is dominantly found in evergreen and semi-evergreen forests of central and eastern Nepal between 900-2100 m. Though some sporadic information relating to taxonomy, ecology, chemical constituents and uses of the plants are available (Coburn 1984, Joshi and Edington 1990, Bhattarai 1991, Siwakoti and Siwakoti 2000, Manandhar 2002), the studies on chemical constituents, especially flavonoid patterns, and comprehensive documentation of traditional uses and practices of this species are not carried out so far. Therefore, an attempt has been made to study the leaf flavonoid aglycones as well as ethnobotanical aspects of this plant, which might help to assist to fill up the gaps in our knowledge on flavonoid patterns and uses of the species.

MATERIALS AND METHODS

Plant Materials: Fresh leaves of *Schima wallichii* were collected from the Sundarijal, Shivapuri National Park, Nuwakot District and Godavari Forest, Lalitpur District, Nepal. Voucher specimens have been lodged in the Department of Botany, Tribhuvan University, Patan Campus, Nepal.

Extract and Chromatography: Flavonoid constituents were extracted from leaf materials using 70% hot ethanol and run two dimensionally on Whatman No. 1 chromatography paper in BAW

(n-butanol, acetic acid and water,4:1:5, top layer) and 15% HOAc (acetic acid) using Rutin as an authentic marker compound to obtain a profile for each taxon. Acid hydrolysis of the extracts was carried out in 2N HCl at 100^0 C for 30 to 45 min. They were extracted into ethyl acetate and run one dimensionally on Whatman no 1 and TLC (thin layer chromatography) plates for descending 1-D chromatography against the authentic flavonol markers myricetin, quercetin, and kaempferol and the flavone marker apigenin in four solvents: HOAc (50% acetic acid); BAW (*n*-butanol-acetic acid-water, 4:1:5) top layer; Forestal (acetic acid-conc. HCl-water, 30:3:10) and PhOH (phenol saturated with water). The presence of proanthocyanidins was observed by further extraction with amyl alcohol and was run on solvent BAW, Forestal and Formic acid. Aglycones were identified by their chromatographic properties in these solvent systems, their colour in UV (360nm) with and without NH_3 and their UV visible spectra and comparison with authentic marker compounds (Harborne, 1973, Joshi, 2003).

Collection and Documentation of Ethnobotanical Information: During fieldwork, ethnobotanical information were also collected using field techniques such as direct interview, discussion with local people (key informants like village elders, school teachers, traditional healers) and by direct observations on the way the useful parts of this species were being collected and used.

Documentation of Conservation Status: The conservation status of the plant and existing practices and management were also documented during the field survey.

RESULTS AND DISCUSSION

The present flavonoid aglycone survey revealed that flavonoids were present in the leaves of *Schima wallichii*. The significant finding in the present investigation was the detection of flavonol quercetin as major aglycones, which was first time detected in this species, whereas flavonol kaempferol, myricetin and flavone luteolin, apigenin and proanthocyanidins were not detected in this investigation (Table 1). Previously, during the screening of chemical constituents, presence of flavonoid has been reported in bark of *Schima wallichii* (Karanjit and Singh 2003), but patterns of the flavonoids were not isolated. In respect to the presence of flavonol quercetin, the data of the present flavonoid study agreed with the results of Joshi (2001, 2002, 2003a, b, c), who found flavonol aglycone quercetin to be universally present in acid hydrolysis of the dicot plants. From the taxonomic viewpoint, absence and presence of myricetin and proanthocyanidin character is very significant (Bate-Smith and Whitmore 1959, Joshi 2001, Harborne 1966). The absence of myricetin and proanthocyanidin is considered as a advanced character in dicots, particularly in woody plants (Bate-Smith 1962). On the basis of absence of myricetin and proanthocyanidin, this species can be regarded as advanced in their flavonoid chemistry. So in this context it can be suggested that *Schima wallichii* can be regarded as chemically more advanced.

Table 1. Flavonoid aglycones in the leaf of *Schima wallichii*.

Flavonols			Flavones		Proanthocyandin	
M	Q	K	L	A	D	C
–	+	–	–	–	–	–

Key: M=Myricetin, Q=Quercetin, K=Kaempferol, L=Luteolin, A=Apigenin, D=Delphinidin, C= Cyanidin, + = detected, – = not detected

Ethnobotanical Uses: Various parts and the products of this species are economically important and used for medicine, fuel and other domestic purposes:

Medicine: The leaf is pounded and paste is applied on cuts and wounds. The decoction of root is taken for the treatment of diarrhoea and dysentery. Juice of crushed young plant, root stock and leaves are used to reduce fever and is taken to cure gastric problem. Pounded stem bark or bark powder is applied in the infected part of the skin.

The findings of the present study indicate that the medicinal uses of the same species also vary greatly even one village to another village. For example, the bark powder or pounded bark of this species is used to cure skin diseases in the studied villages, whereas in Sybru village, Rashuwa district, the powder of bark is used to treat cuts and burn (Joshi and Edington 1990); in east Nepal, Satars used the pounded stem bark to cure fever, stomach pain and also applied for bone fracture (Siwakoti and Siwakoti 2000). Similarly, Gurungs of western Nepal apply crushed root of this species to scorpion bites (Coburn 1984), while the villagers of the present study areas used the crushed root to reduce fever and gastric problems.

Wood: The wood of this species is moderately hard. Though it has poor timber value, the local people use it for house construction as well as making furniture. It is also commonly used as fuel (its caloric value is relatively low, at 18230 KJ/kg (Jackson 1987). Some other utilization of wood is for making of agricultural implements and good charcoal.

Food: The matured leaves are lopped for fodder, though they are of only medium quality. The leaves are also widely used for bedding.

Environmental Protection: It is widely planted in eroded areas, roadsides and ravines. The plant helps to stabilize the soil.

Others: The bark is usually used for dyeing (dye bearing brownish black). Crushed bark and leaves are used for stupefying fish.

Conservation Status

The species and their habitats in the study areas are under stress from anthropogenic and natural influences. Consequently, this species and many of the useful species are now threatened indicating the need of integrated actions for sustainable development.

Strategies for Conservation

During the last few years, some initiatives have been taken for the sustainable management of bio-resources in Nepal. The Tenth Plan (2002-2007), Master Plan for the Forestry Sector, National Conservation Strategy (NCS) and Nepal Environmental Policy and Action Plan (NEPAP) have given emphasis on the research and sustainable uses of biodiversity, conservation of habitat and management of ecosystems. Despite the implementation of various activities for the conservation of the species and their habitats, there is a growing consensus among the conservationists that the conservation of bio-resources is entering into a stage of crisis, since there has been hardly any attempt to conserve these resources in an integrated manner (Joshi and Joshi 1998).Therefore, the following strategies should be implemented in order to conserve and sustainable use of bio-resources.

1. In the present national policies and programme, conservation and sustainable use of useful plant resources have not received high priority. Therefore, priority should be given to integrate conservation and sustainable utilization aspects and needs of the people in national policy, action plan and programme.
2. Proper assessment of the habitat of the species is essential for sustainable management. Hence, priority should be given to carry out assessment of habitats and conservation of critical areas with holistic approach.
3. Although investigation on useful plants has been conducted in different parts of the country, there is a paucity of quantitative and systematic data on species diversity and status of species, and biogeographical distribution,

chemical constituents of the species and characteristics of habitats. Many bio-geographical areas of the country have still remained unexplored. Therefore, it is strongly recommended that major thrust be given to an intensive inventory and documentation of useful plants and their chemical constituents.

4. The existing practice of conservation of the species is not systematic. An integrated initiative should be taken to conserve the species on *in situ* and *ex situ* conservation and *use* them in sustainable manner.
5. It is also obvious that the success and sustainability of the conservation activities depend upon the involvement of the local people. Emphasis should be made to launch special programme for raising people's awareness about conservation and sustainable management of species.

In conclusion, the leaves of the species showed the presence of flavonoid quercetin. The isolated flavonoids may be useful for industrial as well as pharmacological products. But, comprehensive research should be carried out before utilization of flavonoids in mass scale. The various parts of this plant are also being used for fulfillment of basic needs of the local people. Emphasis should be given to chemical analysis of the resources for proper utilization.

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