Review
Therapeutic Importance of *Berberis lycium*: A comprehensive review

1 Hasnain Nangyal*, 2 Sikander Khan Sherwani, 3Nighat Ziaudin, 4Upvan Bhushan, 5Gokhan Zengin

1 Department of Botany, Hazara University Masehra Khyber Pakhoonkhwa, Pakistan.
2 Department of Microbiology, Federal Urdu University of Arts Science & Technology, Karachi, Pakistan.
3 Department of Biochemistry, University of Agriculture, Faisalabad, Pakistan.
4 Department of Botany, Jammu University, Jammu and Kashmir, India.
5 Faculty of Biology, Selkuk University Konya, Turkey
*Corresponding author: Email: hasnain308@gmail.com

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Abstract

*Berberis lycium* is an important plant with immense medicinal value. This plant belongs to family *Berberidaceae*, and most of the species of this family are used to obtain different medicines. *Berberis lycium* is an evergreen deciduous shrub grown in tropical and sub-tropical areas. Various parts of this plant have been traditionally used to cure different diseases. *B. Lycium* is known to possess antidiabetic, antihyperlipidemic, hepatoprotective, antibacterial, antifungal, anticoccidial, pesticidal, antimutagenic and wound healing properties, supporting its traditional uses. Moreover it also has edible properties. In this review some of its medicinal aspects have been discussed to throw light on its importance.

Keywords: *Berberis lycium*, Antidiabetic, Antioxidant, Antimicrobial activities

Introduction

Nowadays there are many products obtained from plants to be used in medicine. *Berberis lycium* is a native to Nepal but now distributed worldwide. It is found abundantly in Himalayan regions of Pakistan and India. It is named in English as barberry [1], whereas, its fruit is called as “kashmal” [2, 3]; and roots are known as “Darhald” [4].

The plant is rich in nutritional elements. *B. Lycium* was traditionally used to cure various diseases. Traditionally, the plant has been used against intestinal colic, piles, jaundice, internal wounds, rheumatism, Diabetes, ophthalmia, gingivitis, throat pain, backache, scabies, bone fractures, sun blindness, Pustules, manorrhagia, fever and as diuretic, expectorant and diaphoretic. This plant also has antidiabetic, antioxidant and antimicrobial properties [5, 6]. It is used to reduce serum cholesterol level in broilers. It also has many ayurvedic properties [7]. Its fruit is also used as food by local people. Fruit is laxative and used to cure different diseases.

Occurrence

The plant is native of Nepal but now it is distributed worldwide. It is also found abundantly in Himalayan regions in Pakistan and India. In Pakistan it is found in Baluchistan, NWFP, Punjab and Azad Kashmir at elevation of 900 to 2900 m [8, 9] and in India it is found in Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim, Madhya Pradesh and Tamil Nadu between altitude ranges of 850 - 3500 meter.

Morphology

It is an evergreen deciduous shrub. It has dimorphic branches (long and short). Leaves are dark in color and have yellowish or grayish branches. Plant is hermaphrodite that is both male and female flowers present on same plant. The fruits of the plant are called as berries and are ovoid or obovoid-subglobose which acquire bright red color or purplish color on ripening [10]. Root is hard 3-8 cm in diameter, branched
and gradually tapering and occasionally split longitudinally however its wood is smooth and bright yellow in colour. Root bark can be up to 3mm thick, externally fissured and internally smooth [11] Flowering season is march to July. The fruits start ripening from the second week of May and continue to do so throughout June. They can be retained on the shrub for a longer period after ripening but fall off soon after the onset of rain. The plant is not fastidious but grows well in thin dry and shallow soil [10]. Root is extensively used for the treatment of several human diseases under local practices in Pakistan [12].

Chemical and nutritional constituents

*Berberis lycium* is rich in nutritional value. Various parts of the plant were traditionally used to cure different diseases and for healing wounds. *B. Lycium* contains alkaloids like berberine [9,13-15], palmitine [14, 15], berbamine baluchistanamine, karakoramine, giglitine, jhelumine, punjabine, sindamine, chinabine [16] and umbellatine [3]. Plant is documented to possess proteins, carbohydrates, lipids, vitamin C [15], hydrolysable tannins, cardioactive glycosides and saponins [11]. Especially, fruits have moisture, vitamin A, fibre content, cellulose, hemicelluloses, ß-carotene, anthocyanins, phytic acid and phytate phosphorous. A wide variety of minerals are also documented such as Sodium, Calcium, Sulphur, Iron, Zinc [15], copper, lead, manganese [17], Potassium and Phosphorus.

Medicinal uses of *B. lycium*

It has many medicinal values some of which are discussed in this section;

Anti-diabetic properties

Many plant species have been reported to have antidiabetic activity [18]. *B. lycium* and various extracts from its roots lower the glucose level significantly. Oral glucose tolerance test showed that plant extracts reduced serum glucose level in a dose-dependent manner. The observed mechanism involved in hypoglycemia is insulin like effect, possibly through the peripheral glucose consumption. The applied doses were devoid of any behavioral changes or acute toxicity in experimental animals [19]. Antidiabetic activity of pure berberine was compared with ethanolic root extract of *B. lycium* in normal and alloxan-induced diabetic rats using similar doses (50 mg/kg) of each. Plant extract and berberine reduced blood glucose level significantly and demonstrated significant effects on glycosylated hemoglobin, glucose tolerance, serum lipid profiles and body weight. Plant extract was comparable in efficacy with berberine [20].

Antioxidant properties

It is well known that reactive oxygen species (ROS) such as superoxide anion, hydrogen peroxide, and -OH (hydroxyl radical) can lead to various human diseases such as Alzheimer’s disease, cancer, inflammation, aging, rheumatoid arthritis and atherosclerosis [21]. Reactive oxygen species are formed during metabolism or through the action of ionizing radiations and they can interact with biomolecules and result in diseases like cancer [22, 2]. Natural antioxidants prevent the formation of above reactive species-related disorders in human beings [2].

work on antioxidant property of *B. lycium* was done by Zia et al, they found that root extracts have strong antioxidant value. They worked on three different assays to measure antioxidant property including phosphomolybdenum, reducing power method and ABTS radical cation method. Compounds with reducing power indicate that they are electron donors, and have ability to reduce the oxidized intermediates that are formed as a result of lipid peroxidation processes thus they can act as primary and secondary antioxidants (Yen & Chen, 1995). Root extract of *Berberis lycium* has considerable reduction potential when extract reacts with potassium ferricyanide (Fe$^{3+}$), it converts potassium ferricyanide (Fe$^{3+}$) to potassium ferrocyanide (Fe$^{2+}$), which then reacts with ferric chloride and form ferric ferrous complex that has an absorption maximum at 700 nm. This assay is relatively simple and inexpensive. Reducing power assay does not however measures the thiol group containing reagents [23]. In reducing power assay concentration of antioxidant in the sample was directly proportional to the reduction potential of the sample and standard thus showed higher absorbance and higher reduction potential at increased concentration.

Antimicrobial property

*B. lycium* is very effective against many micro-organisms especially bacteria and fungi. Its various parts and extracts are used against different bacteria such as *Micrococcus luteum, Bacillus subtilis, Bacillus cereus, Enterobacter aerogenus, Escherichia coli, Klebsiella pneumonia, Proteus mirabilis, Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella typhimurium* and *Streptococcus pneumonia*. The hydroalcoholic extract of *B. lycium* has been reported to exhibit stronger and broad spectrum effect against bacterial strains as compared to fungal strains [24].
Other important uses of different parts of *Berberis lycium*

Differnt parts of plant such as roots, leaf, stem and fruits have been used to cure different diseases and have immense medicinal value. The berries of plant are also eaten raw. The leaves and shoots are also cooked in some parts of the world and a tea substitute is also being prepared from the leaves [25].

**Roots**

Extracts from roots are used to cure ophthalmia (swollen and sore eyes) and jaundice [26]. A crude extract is also prepared from roots by boiling crushed root, root bark and lower stem wood with water (and milk) followed by straining and concentrating to a dark brown sticky mass called as rasout. *Rasout* is fairly soluble in water. It is mixed with butter and alum, or with opium and lime-juice and is applied externally to the eyelids to cure ophthalmia and other eye diseases [27]. Root extracts also used for wound healing.

**Leaves**

A tea substitute obtained from leaves. It is also used in treatment of jaundice [27].

**Stem**

The stem is diaphoretic and laxative and is useful in rheumatism. The stem bark is very effective and used in case of ear injury, whooping cough, headache etc [1].

**Fruit**

The fruit is edible. It is use as laxative. Decoction of fruit is also used in typhoid and fever [26].

**Other uses**

The plant of *Berberis lycium* has also shown anticancer, gastro-irritant antifatigue, anticoagulant, antipyretic, local anesthetic, antiprotozoal, anti-tuberculosis, antibacterial, antitumor, anti-inflammatory and antitrachoma effects by using in variety of ways by the local inhabitants.

**Conclusion**

In this review paper various traditional and medicinal aspects of *B. lycium* have been discussed. Antidiabetic, antioxidant, antimicrobial and various traditional uses of the plant have been discussed in this review. Berberine, one of the main constituents of *B. lycium* has been shown to have a variety of biological activities and is currently one of the natural products with potential future in medicine.

**Conflict of interest**

The authors declare that there is no conflict of interest to reveal.

**References**


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