Berberis lycium a Medicinal Plant with Immense Value

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Abstract: Berberis lycium belong to family Berberidaceae is an evergreen shrub growing in Himalayan region. The various parts of the plant like root, bark, stem, leaves and fruits are used by the people as a medicine or food. This plant has also gained wide acceptance for its medicinal value in ayurvedic drugs. The plant is known to prevent liver disorders, abdominal disorders, skin diseases, cough, ophthalmic etc. Moreover the pharmacological studies have shown that plant is hypoglycemic, hyperlipidemic, hepatoprotective, anticarcinogenic and antipyretic properties. The fruits of the plant are also very nutritious and are rich source of vitamins, minerals, antioxidants, anthocyanin etc. These fruits are consumed in raw form or are utilized in the preparation of juices, jams, preserve etc. by the local inhabitants. In the present article an attempt has been made to summarize the various properties of Berberis lycium plant.

Keywords: Berberis lycium, kasmal, wild plants, medicinal plant.

INTRODUCTION

In ancient time vegetative plant parts probably maintained our nutrient supply. Our ancestors ate whatever fruit was at their hand. Some of such fruits were acidic, or high in tannins or even mildly toxic until very ripe, but the vitamin C content was often high. There would have been times of year when fruit was either not available at all, or scarce. Today, we have a very good variety of fruit, and fruit that is better than just edible. On the other hand, fruit consumption has to compete with industrial foods of all kinds, and it doesn't compete well. Fruits are full of antioxidants and cancer suppressing chemicals, they are a valuable energy source, and have fibres, gums and pectins whose health qualities are only just beginning to be discovered. Many fruit species have not been domesticated, for a variety of economic and cultural reasons but such fruits contain high amounts of various nutrients as well as medicinal properties. Such fruits are called as underutilized fruits and Berberis lycium is one among them.
Berberis lycium is an evergreen shrub belongs to family Berberidaceae. It is also known as Indian berberry in English, kashmal or kasmal in Hindi and Ishkeen in Urdu. It is a suberect, rigid, spiny shrub 2.7- 3.6 m in height. The genus Berberis is widely distributed in America, Europe and Asia. It is well known medicinal plant with overall edibility rating 3 (1-5 scale) and medicinal rating 3 (1-5 scale). Every part of this plant has some medicinal value. Its root, bark, stem and fruits are used in various ayurvedic preparations (Bhattacharjee et al., 1990). It is extensively used for the treatment of various diseases like liver disorders, abdominal disorders, skin diseases, cough, diabetes mellitus etc. (Ahmed, M et al., 2009)

OCCURRENCE
Berberis lycium is native to Nepal, globally distributed in various parts of world. It occurs abundantly in the Himalayan region of India and Pakistan. Within India, it has been found in Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim, Madhya Pradesh and Tamil Nadu between altitude ranges of 850 - 3500 metres. In Pakistan it is distributed in northern areas such as Gilgait, Baltistan, Ghizer, Astor, Diamer and Swat. It is also found in Nilgiris and Ceylon.

MORPHOLOGY
The shrub of Berberis lycium is attractive and is easily grown shrub, which is erect or suberect and semideciduous with dimorphic shoot (the long shoot forming the structure of the plant and short shoot 1-2 mm long) the stem and branches are pale whitish to grayish and contain spines arranged alternately on the stem. Leaves of this plant are brightly coloured, thick, entire or toothed with oblongate to oblong-obovate shape. Inflorescence is corymbose racemes with 11- 16 flowers per cluster and the flowers are hermaphrodite means have both male and female organs which are pollinated by the insects, usually the flowers are pale yellow in colour, born in axillary clusters and are longer than the leaves. The fruits of the plant are called as berries and are ovoid or obovoid-subglobose which acquire bright red colour or purplish colour on ripening. On an average they are 7 mm long, 4 mm in diameter and weighing 227 mg. The colour of the pulp or juice is plum purple. On an average the fruit contain 2-5 seeds colour varying from yellow to pink. 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 (Ahmed et al., 2009).

HABITAT
*Berberis lycium* is a common garden bush growing wild along the roadside or is commonly found in local forest region. These plants can grow in sandy, loamy and clay soils. They can grow well in nutritionally poor soil and requires semi-shade or no shade.

**FLOWERING AND FRUITING SEASON**
The flowering and fruiting season of *Berberis lycium* is from the month of March-July. The flowers start appearing from the first fortnight of March and ends up to April. The fruits of *Berberis lycium* are relished from the month of June- July. The fruit 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 so, the fruiting season ends abruptly with the commencement of rain.

**CULTIVATION AND PROPAGATION**
The plant is not fastidious but grows well in thin dry and shallow soil (*Huxley et al.*, 1992). It is a hardy plant but suffer severe damage in winters. It can be hybridized freely with the other members of the genus. They can be pruned severely but they easily resprout from the base. The plant is propagated by the mean of seeds. The seeds of the over ripe fruit will take longer time to germinate. The seedling can be raised in nursery and then transplanted when small plants are grown and are easy to handle. However, proper ventilation is required to prevent the damping off of the seeds.

**CHEMICAL CONSTITUENT**
*Berberis lycium* is one of the plant species being abundantly available, the whole plant especially root is extensively used for the treatment of several human diseases under local practices in Pakistan (*Khan et al.*, 2001). The various chemical constituent of *Berberis lycium* are berberine, berbamine, chinabine, karakoramine, palmatine balauchistanamine, gilgitine, jhelumine, punjabine, sindamine, chinabine acetic acid, maleic acid, ascorbic acid (*Khare et al.*, 2004). The plant contains major alkaloid berberine which is an isoquinoline alkaloid and umbellitine. This is usually taken from root or root bark of the *Berberis lycium*, and other Berberis species abundantly available in local forests. The fruits contain malic, tartaric, citric acids and tannins (*Sharma et al.*, 2003).

**NUTRITIONAL COMPOSITION**
The fruits of the *Berberis lycium* are very nutritious and are known to contain appreciable amount of various nutrient. The moisture, ash, crude protein, crude fat and crude fibre content in fruits are 84.0, 0.53, 1.49, 1.28 and 1.48 per cent (*Katiyar et al.*, 1990). The extractable juice of the fruit is 26.6 per cent however, total soluble solids of the juice amount to 18.90 per cent, having 1.07 per cent acidity, 13.58 per cent total sugars, most...
of which are in the form of reducing sugars i.e. glucose and fructose and contained lower concentration of phenolic compound. The fruit contains 0.37 per cent pectin. Its vitamin C content is only 24.60 mg per 100 ml of juice. The β carotene content in the fruit is in the range of 343.0- 453.0 µg/100g. However the anthocyanin content which leads to colour in the fruit and are indicator of maturity is 82.47 mg/100g (Srivastava et al., 2003). These fruits are also an appreciable source of various minerals like calcium, phosphorus, iron, sodium, potassium etc. The various antinutrients like oxalates, phytic acid, phytate phosphorus etc. are absent in these fruits however tannins are present at very low concentration of 7 per cent (Kharitonova et al., 1986). The leaves of Berberis lycium have maximum moisture content (59.84±0.19%) followed by shoot and root (44.75±0.25%, 31.55±0.05%), whereas fat and fiber contents (0.46±0.01, 43.85±0.46%, respectively) decreased in ascending order i.e. root > shoot > leaves. When mineral composition in the separate parts of the Berberis lycium was analysed, it was revealed that Zn, Cu and Na were maximum (56.15±0.01, 95.67±0.12, 115.00±0.03 µg g⁻¹, respectively) in root and while Mn, P, Ca (136.12±0.01, 1315.00±0.01, 2389.00±0.04 µg g⁻¹, respectively) in leaves whereas K (5824.00±0.58 µg g⁻¹, respectively) in shoot (Shah et al., 2003).

**AYURVEDIC PROPERTIES**

In ayurveda Berberis lycium found a wide range of application. In Charka Samhitta it is classified as lekhaniya (reducing obesity and scarifying), arsaghna (curative of piles and haemorrhoids) and kandughna (curative of pruritus) whereas in Sushruta Samhitta it is used for quick healing of wounds, for the treatment of dysentery, indigestion and uterine and vaginal disorders (Dev et al., 2006).

**USES**

The various parts of Berberis lycium like root, leaves, stem, bark and fruits are used in number of ways. The major applications include its use as an edible plant, therapeutic uses etc. Some of them are:

**I) Edible Use:** The berries of Berberis lycium are mostly consumed in raw form especially by the rural population and are rich source of vitamin C and anthocyanin although they have sharp taste. They are not very popular as the thorny shrubs make harvesting difficult of the fruits. The fruits are also cooked and made in to preserve. Juice is also extracted from the fruits which are slightly acidic. The leaves and shoots are also cooked in some parts of the world and a tea substitute is also being prepared from the leaves (Facciola et al., 1990).

**II) Therapeutic Use:** Berberis lycium is known to be antibacterial (kills microorganism), aperient (mild laxative), anticarcinogenic, carminative (reduce flatulence and expels gas from intestine), febrifuge (reduces fever) and ophthalmic (treats eye complaint). Various parts have different therapeutic application like:
III) Roots: The root of this plant is one of the few really good medicines of India. The watery extract from the root is used in the treatment of opthalmia (swollen and sore eyes) by local person and for treating jaundice. Powdered root bark mixed with mustard oil is used for massaging broken bones. They are also used as a remedy for wounds, gonorrhea, curative piles, unhealthy ulcers, acute conjunctive. It is also used as bitter tonic astringent, diaphoretic and febrifuge. The dried root extract is also an excellent medication against sun blindness.

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. Rasaut 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 opthalmia and other eye diseases (Dev et al., 2006). It is also used for the treatment of fevers such as malaria and intermittent fever. It is an antinflammatory agent which is specially used as a remedy for enlargement of liver and spleen. It is also used for the treatment of scrofula, fistula, acute spreading suppurations and other skin diseases.

IV) Fruits: Fruits of Berberis lycium are cool and laxative and are used for the relief of intestinal colic and pharyngitis. Decoction of fruit is also used in typhoid and fever (Hasanuzzaman et al., 2006)

V) Leaves: The leaves of the plant are used in the treatment of jaundice and as tea substitute.

VI) Stem: The stem of Berberis lycium are known to be diaphoretic and laxative and are useful in rheumatism. The stem bark is very effective and in combination with root it is used in case of ear injury, whooping cough, headache etc. The stem is also used in treatment of opthalmia and jaundice.

VII) Rhizomes: Berberine is the major alkaloid present in the rhizomes of Berberis lycium which has antibacterial effect. But this berberine is not appreciably absorbed by the body so it is used externally for the treatment of various enteric infections especially bacterial dysentery. Berberine is also known to have antitumor effect (Duke et al., 1985).

VIII) Other uses: This plant is also an important source of dye and tannin and is used for dyeing clothes and for tanning leather. According to experts, it is perhaps one of the best tanning dyes available in India. A herbal wine is also being prepared from Berberis lycium in Himachal Pradesh which is a self-preserving nutritive health drink of high valuation and it is unique with respect to must composition due to the fruit and water quality of the region, temperature, acidity and duration of fermentation carried out, process for activation and maintenance of the yeast culture and the unique climate and soil conditions of the region which helps for producing fine bouquet and taste to the product (Xueqing et al., 2005). Moreover in some part of the country this plant is also used as a fence or hedge to cover the area and prevent entering of the animals in to fields (Ahmad et al., 2009).
PHARMACOLOGICAL ACTIONS

Traditional plants and herbs are used for the treatment of various diseases because plant herbs are less toxic and free from side effects when compared with the synthetic one. Many pharmacological plants have been found by traditional use but their introduction to modern therapy needs testing of the compounds by modern research methodology. The various pharmacological effects studied of Berberis lycium are as under:

I) Antidiabetic effect
The extract of the root bark of Berberis lycium is known to produce antidiabetic effects on the rabbits and helps in reducing blood glucose level (Ahmed, M et al., 2009). The alkaloid or hydrolysable tannin or both have known to exert antidiabetic effect. The hydrolysable tannins have been known to stimulate glucose utilization (Xueqing et al., 2005). The berberine a tetra quinoline isoalkaloid present in Berberis lycium has also show antidiabetic effect (Gulfraz et al., 2008). It has shown hypoglycemic activity in steptozotocin-nicotinamide induce Type II diabetic rats by an extrapancreatic mechanism (Punitha et al., 2006).

II) Anti-hyperlipidimic Effect
The crude powder of Berberis lycium root has anti-hyperlipidemic effect in alloxanized rabbits. Hypercholesterolemia and hypertriglyceridemia have been reported to occur in alloxan induced diabetic rabbits (Wojtowich et al., 2004). Berberis lycium root bark powder significantly reduces the total cholesterol and triglyceride and LDL of treated rabbits as compared to untreated diabetic rabbits (Ahmed, M et al., 2009). Diabetic patients are more prone to athermatous complications such as ischemic heart disease (Way et al., 2001). This is due to the decrease of High-density lipoprotein levels in diabetic patients that ultimately lead to atheromatous disease (Rang et al., 2003). It was found that treatment with Berberis lycium root causes an increase in HDL and decrease in LDL levels that probably prevent the diabetic patients from developing heart diseases. Repeated administration of plant root bark powder thus had a beneficial effect on the hyperlipidemia associated with hyperglycemia.

The role of Berberis lycium in reducing serum cholesterol in broilers has also been proved. The dose of 0, 0.5, 1.0, 1.5, 2.0 and 2.5% of Berberis lycium root extract were fed to 240 broiler chicks, randomly distributed into 24 replicates, so as to have 4 replicates per group and 10 chicks per replicate. Average serum total cholesterol, triglyceride, high density lipoprotein (HDL) and low density lipoprotein (LDL) were used as criteria of response. It has been found that Berberis lycium significantly help in lowering the LDL, serum total cholesterol and triglycerides and help in increasing HDL level (Chand et al., 2007).
III) Hepatoprotective Effect

_Berberis lycium_ have shown hepatoprotective effect also. _Berberis lycium_ in combination with _Galium aparine_ and _Pistacia integerrima_ have shown this effect in rats treated with carbon tetra chloride. The results of this study indicates that a mixture of _Berberis lycium, Galium aparine_ and _Pistacia integerrima_ have hepatoprotective effects. These medicinal plants have more effect as curative agents rather than preventive agents (Khan et al., 2008).

IV) Other effects

The plant of _Berberis luciym_ have also shown anticancer, gastro-irritant, antifatigue, anticoagulant, antipyretic, local anaesthetic, antiprotozoal, anti tuberculosis, antibacterial, antitumour, anti-inflammatory and antitrachoma effects by using in various ways by the local inhabitants.

CONCLUSION

The medicinal properties of _Berberis lycium_ discussed in this review have highlighted significant traditional and pharmacological activities of this herb. The various pharmacological studies reported in this review support its traditional use and may prove to be useful in the development of some commercial drugs. Moreover, the nutritional properties such as high content of vitamins, minerals and anthocyanin of _Berberis lycium_ have added to its value. These plants are hardy in nature and grown in nature ‘premaculture’ so does not require chemical or pesticides and are ecofriendly. They can be grown as hedge or fence so perform double purpose. Moreover if people begin to derive an economic benefit from such wild plants, the natural environment of the area could be conserved and managed.

REFERENCE

22. Wojtowich, Z., Wrona, W., Kis, G., Blaszczak, M. and Solecka, A. Serum total cholesterol, triglyceride and high density lipoprotein (HDL) level in rabbit during
the course of experimental diabetes, *Ann Univ Mariae Curie Skłodowska*, 2004, **59**: 258-264


