



Taxonomical and Phytochemical Characterization of Two Highly Traded Medicinal Species of Genus *Berberis*

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Abstract: The medicinal plants serve as an important natural source and potentially safe medicinal drugs that can play a significant role in moderating human health by contributing towards herbal medicines. The genus *Berberis* exhibits evergreen and deciduous shrubs like *Berberis aristata* DC and *Berberis lyceum* Royal. These medicinal plants are used as a remedy for swollen and sore eyes, skin diseases, healing of broken bones, curative piles, jaundice and diarrhea. The morphological and organoleptic studies concluded that fruit of *Berberis aristata* encloses two seeds while *Berberis lyceum* encloses three seeds. The total flavonoid content (134.33mg GAE/g) and phenolic content (39.23 mg QE/g) in *Berberis aristata* is high as compared to flavonoid content (115.01 mg GAE/g) and phenolic content (33.03 mg QE/g) of *Berberis lyceum*. The results achieved provide us with valuable information for botanical quality control and species identification and assist us to detect adulterations in commercial as well as in laboratory samples.

Keywords: Berberis, medicinal uses, flavonoids, phenols

1. INTRODUCTION

The medicinal plants are the valuable natural resource and offers raw material for pharmaceutical industry, modern and traditional practices as well as preservation of traditional knowledge. The increased demand of plant extracts used in cosmetic industries, pharmaceutical and food industries recommends that systematic studies of plants is essential for trace of their chemical compounds and their role in medicine [1]. There are almost 8000 species of known medicinal values in South Asia that are considered as cheap and effective traditional source against many diseases. A survey of natural plant wealth of Pakistan displayed that there is abundant growth of valuable medicinal species in Azad Kashmir, Kotli Sattian, Murree Hills, Hazara, Kurrum Agency, Northern areas and Baluchistan [2]. The evergreen and deciduous shrubs of *Berberis aristata* and *Berberis lyceum* belongs to family Berberidaceae and are a part

of traditional medicines long time ago. They are semi deciduous shrub, 2 to 4 meter high, leaves are lanceolate or narrowly obovate-oblong, entire or with a few large spinous teeth, arranged alternately on stem [3]. Inflorescence a racemes, flowers yellow born in auxiliary clusters longer than the leaves. The fruit of *Berberis aristata* is edible with medicinal and nutritional values both in fresh and dried form [4]. It is an ovoid, bluish black berry almost 10 mm long [5, 6] and exhibits a central position in Georgian and Persian cuisines [7]. It is rich in vitamins, minerals and fibers that are vital for good health. Its fruit is used to prepare prickles, jams, syrups, candies and acts as a food additive. Medicinally, it is laxative, useful in sores, piles, and eye infections, and effective against kidney dilemmas [8].

Berberis lyceum is considered important medicinal plant in practice of herbal medicine. Its roots are used as remedy for swollen and sore

eyes, healing of broken bones internal injuries, gonorrhoea, curative piles, unhealthy ulcers, acute conjunctive and in chronic ophthalmic [9]. It is also used as bitter tonic and possesses antifungal, antibacterial, diaphoretic, anti-inflammatory, anti-diabetic and hypoglycemic properties [10-12]. The fruit is rich in vitamin A, calcium, copper, potassium and phosphorus [13, 14]. The increasing trend in plant based natural medicines has directed the phytochemical evaluation of numerous plant species [15]. Phytochemicals are chemical compounds occurred in plants and implies different characters to them. Spectrophotometric and chromatographic techniques are applied to measure quantity of bioactive compounds like flavonoids, alkaloids and polyphenolic compounds [16]. The flavonoids and phenolics are one of the important antioxidants which are used either to enhance nutrition or treated as antioxidant additives [17]. Among flavonols, Quercetin is very important and exhibits good antioxidant activity. Plants are compared with reference to presence of quercetin level as they supposed to show antioxidant properties [18]. Their antioxidant potential serves as a leading role in advancement of modern medicines for hepatitis and cancer [19]. It helps in protection of human body from various diseases by termination of free radicals. This Study is aimed to carry out microscopy of taxonomical characters and chemical evaluation of species within genus to show variation in qualitative and quantitative characters as well as serves as an innovation for pharmaceutical industries to extract valuable compounds for drug preparation.

2. MATERIALS AND METHODS

2.1. Plant samples

The medicinal plants were collected in the year 2016-2017 according to their flowering time for current study. The precise and correct botanical name authorization is achieved through the International Plant Name Index (IPNI). The voucher specimens were submitted in the Herbarium of Pakistan (ISL), Quaid-i-Azam University, Islamabad. The collected plants were washed, shade dried and some part was ground for phytochemical analysis.

2.2. Extraction procedure

The dried plant powder was mixed in methanol in a

ratio 1:10 w/v, centrifuged at 6000 for 15 minutes. Then mixture was filtered through what man filter paper no. 1 and concentrated the filtrate using a rotary evaporator.

2.3. Examination of Taxonomic Characters using Light and Scanning Electron Microscopy (SEM)

2.3.1. Morphological Examination

The morphological characterization constitutes analysis of macroscopic and microscopic characters. The binocular dissecting microscope (SZF model Kyowa, Japan) of 5X, 10X and 20X magnifying power was used. The plant specimens were studied both qualitatively and quantitatively along with aid of different floras [20].

2.4. Phytochemical analysis

2.4.1. Quantification of Total Phenolic Content (TPC)

The total phenolic content was estimated by method given by [21]. Each plant extract was taken in methanol solution in concentration of 1mg/1mL. Take 1 mL of this extract and mixed with 5 mL of 10% diluted Folin –Ciocalteu's reagent and 4 mL NaHCO_3 (7.5%). Place this mixture at room temperature for 90 min and then absorbance was measured at 760 nm. Gallic acid was taken as a standard and results were expressed as mg Gallic acid equivalents per gram dry weight (mg GAE/g).

2.4.2. Quantification of Total Flavonoid Content (TFC)

The flavonoid content was measured by Aluminium Chloride calorimetric method described by [22] with some modifications. Add 2 mL methanol extract of each plant sample, 0.1 mL 10 % diluted AlCl_3 , 0.1 mL 1 molar KCH_3COOH and 2.8 mL ionized water. Place this mixture for 40 min at room temperature and then measured absorbance at 415 nm. Quercetin was used as a standard and results were expressed as mg Quercetin equivalents per gram dry weight (mg QE/g).

3. RESULTS AND DISCUSSION

The detailed taxonomical and phytochemical characterization of *Berberis aristata* and *Berberis lyceum* is documented in Table 1. The *Berberis*

Table 1. Botanical description of Medicinally important plants species of *Berberis aristata* and *Berberis lyceum*

S. No	Features	<i>Berberis aristata</i> DC.	<i>Berberis lyceum</i> Royle
1	Family name	Berberidaceae	Berberidaceae
2	Common names	English name: Indian berberry, Tree turmeric. Local name: Zereshk, Sumlu, Kashmal Trade name: Tursh, Darhald	English name; Indian berberry Local name: Sumbloo, Ishkeen, Kala
3	Distributional range	Plant is native to Nepal and distributed in India, Bhutan, sub-tropical & temperate Asia, Europe and America. In Pakistan, plant is found in Kashmir and Himalayas.	In world, it is found in temperate and tropical Asia, Africa and Europe. In Pakistan it grows in Kashmir, Baagh, Muree, Swat, Gilgit, Hunza, Nagar, Chilas, Mansehra.
4	Habit and Habitat	Plant is spiny evergreen Shrub.	Plant is deciduous spiny shrub of 2 to 3 m height.
5	Phenological status (Flowering / Fruiting time)	Early April till end of May / June -July.	March-April/June-July
6	Medicinal Values	Fruit is used in vaginal, stomach and uterine disorders, wound healing, diarrhea, dermal and optical ailment.	Used to cure diabetes, piles and spleen ailments. Plant extract is good for cough, Ear, Nose and Throat troubles, and eye diseases. It is a good source for healing of broken bones
7	Botanical description	An erect, glabrous, spiny shrub, 2-3.5 m high with yellow fragile bark having deep furrowing. Internodes 3- 4.5 cm long. Leaves glossy, verticillate, reticulate venation, spinous toothed, sub-acute to obtuse, obovate to elliptic lamina, 4.2cm×1.3cm, dark green from upper and light green from lower side. Inflorescence has 16-20 flowers in drooping clustered position, golden yellow color, complete, hermaphrodite, actinomorphic, Sepals 6.5 mm long, obovate, smaller than inner 10 mm long; Petals elliptic, 8.5 mm long; Stamens 6.6 mm long; ovules 5. Fruit is oblong-ovoid, 6.2 mm × 3.4 mm bluish purple berries with 3seeds.	A deciduous shrub, 3 - 4.5 m high, erect, pale yellow branches. Internodes 2 cm long. Leaf sub sessile, lamina oblanceolate to obovate, acuminate tip, having larger spines arranged alternately on stem, 1.7-2.8 cm × 0.8-1.2 cm. Inflorescence raceme, flower pale yellow, 4-7cm long, born in axillary clusters longer than leaves, pedicels 6-12, tubular sepals obovate, 5-5.5 cm × 3.5mm, central and inner sepals are larger than outer ones, petals obovate with notch at tip, petals shorter than sepals and stamens are shorter as compared to petals; ovules 4, Fruit shiny black ovoid berries 0.9-1cm × 0.6-0.7cm.

species show variation in morphology and may shows complications in taxonomic identification [23]. The detailed morphology and organoleptic analysis depicted that fruit of *Berberis aristata* encloses two seeds (Fig. 1 A & B) and *B. lyceum* has three seeds (Fig. 2, C & D). Fruit of *Berberis lyceum* and its allied species are purplish black with seeds and appears in form of bunches [24].

It is necessary to evaluate chemical composition of medicinal plants with the help of standards to check their nutritional value as well as to authenticate genuine source. In present project, total phenolic and flavonoid content in *Berberis aristata* fruit is high in comparison with *Berberis lyceum* (Fig. 3). Earlier studies highlighted that different researchers developed various markers to differentiate *Berberis aristata* from its allied



Fig. 1. *Berberis aristata* (A:field photo B: Fruit)



Fig. 2. *Berberis lyceum* (C: field photo D: Fruit)

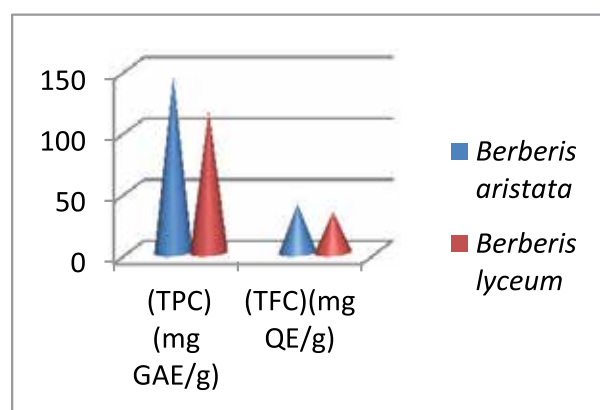


Fig. 3. Quantification of Total Phenol Content and Total Flavonoid Content

species [25].

4. CONCLUSION

The work will contribute towards correct identification and authentication of medicinal plants

and a milestone at industrial and pharmaceutical level. The microscopy and chemical evaluation of species shows a comparison within genera and provides data for antioxidant evaluation as well as preparation of antioxidant drugs from such remarkable plant sources.

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