Diagnostic Morpho-Anatomical Characteristics of *Arctostaphylos uva-ursi* (L. Spreng. and Its Adulterants

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Abstract

rctostaphylos uva-ursi (L.) Spreng. is well known medicinal plant for the treatment of cystitis (bladder inflammation) and kidney catarrh (mucous) and the official drug of Homoeopathic System of Medicine. The leaves of Uva-ursi have high trade value in the national and international markets in the herbal drug industry. The leaves of Cowberry (Vaccinium vitis-idaea L.) and the Box (Buxus sempervirens L.) are commonly adulterated with the leaves of *Arctostaphylos uva-ursi* (L.) Spreng. Present communication deals with the morphological and anatomical characteristic features of the leaf of *Arctostaphylos uva-ursi* (L.) Spreng. and also the comparative characters of its possible adulterants Vaccinium vitis-idaea L. and Buxus sempervirens L. with a view to check adulteration in the genuine drug to ensure manufacture of quality medicines.

Keywords: Morpho-anatomy, Uva-ursi, *Vaccinium vitis-idaea* L. and *Buxus sempervirens* L.

Introduction

Arctostaphylos uva-ursi (L.) Spreng., commonly known as 'bearberry' (English) and 'Uva-ursi' in herbal trade, belongs to Ericaceae family. It is an evergreen shrub with short creeping reddish-brown branches bearing pink or white bell shaped flowers that bloom in the summer, followed by clusters of berries (Figure 1). It is distributed throughout northern hemisphere alpine including North America, Europe, the Iberian Peninsula and Siberia (Bailey, 1961; Gleason, 1968 and Polunin, 1969).

Leaves of Uva-ursi have a long-traced history of medicinal use since 2nd Centaury and were used very commonly until the discovery of sulfa drugs and antibiotics in the treatment of urinary bladder and urinary tract infection. Till date, the drug is used to treat urinary tract infections and cystitis (bladder inflammation) and also listed in many official Pharmacopoeias of various countries.

The leaves of Uva-ursi contain a compound called arbutin that is metabolized into the antibacterial compounds hydroquinone glucuronide and hydroquinone sulphate. Uva ursi leaf tea is also listed in the German Pharmacopoeia as a urinary disinfectant for the treatment of bladder and kidney catarrh (mucous) and inflammation. One of the important mechanisms of action of bearberry leaves is their ability to influence the surface characteristics of microbial cells

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and thereby their putative virulence properties. Uva-ursi extract and arbutin are also therapeutic against immuno-inflammation (such as that sometimes related to painful bone and joint inflammations) (Hering, 1879; Allen, 1874; Clarke, 1900, Chevallier, 1996 and Matsuda *et al*., 1992).

In India, the herb is imported by the Homoeopathic drug manufacturers to prepare the mother tincture named 'UVA URSI'. The leaves of Uva-ursi have the high trade value in the national and international market in the herbal drug industry. The leaves of other plants have been mistaken for uva ursi leaves, notably those of the Cowberry (*Vaccinium vitis-idaea* L.) and the Box (*Buxus sempervirens* L.), and have occasionally been used to adulterate the drug, but uva ursi leaves are readily distinguished by the characteristics given, viz. the spatulate outline, entire margin and rounded apex (Wallis, 1985). Present study deals with the pharmacognostical study of uva ursi leaf which will be very helpful to check the adulteration.

Material and methodology

Fresh leaves were arranged from various sources. Vertical sections of lamina were cut with the help of sharp razor. The fine sections were double stained with safranin and light green and mounted in Canada balsam. Organoleptic characters and histological data were studied as per methods described in Youngken (1951) and Trease & Evans (1983). Photomicrographs of anatomical details of section and powder were obtained through Motic digital microscope

Results and Discussion

The observations made in the study on *Arctostaphylos uva-ursi* (L.) Spreng., *Buxus sempervirens* L. and *Vaccinium vitis-idaea* L. are given in table 1 elaborating diagnostic characteristics in respect of taxonomical, morphological/ organoleptic and anatomical features.

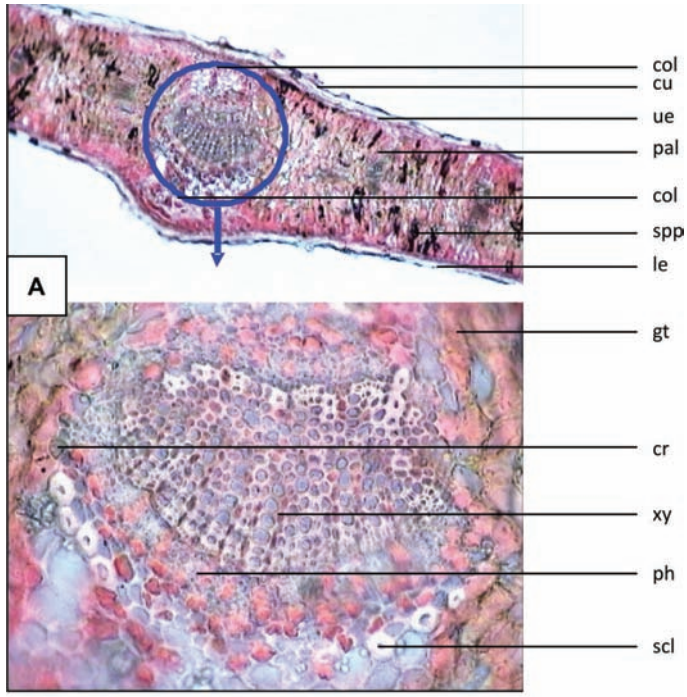
Table 1: Dignostic characteristic

Dignostic characteristics	Arctostaphylos uva-ursi (L.) Spreng.	Buxus sempervirens L.	Vaccinium vitis-idaea L.
Taxonomical			
i. Family	Ericaceae	Buxaceae	Ericaceae
ii. Common name	Bearberry	Box, Boxwood	Blue berry
iii. Life form	Evergreen trailing shrub with ascending branches.	Evergreen shrubs or small tree.	Small glabrous shrub with sharply angled branches.

iv. Distribution	Europe, United States, northern Asia	Europe, USA, north Africa.	
Morphological / Organoleptic			
i. Colour	Dark green to brownish-green above and paler beneath.	Dark glossy green above and paler beneath.	Dark green above, paler and dotted with dark glands beneath.
ii. Shape	Obovate to oblanceolate or spathulate, entire; apex obtuse to emerginate and margin entire; short petioled; usually pubescent on midrib and margin	Ovoid, oblong or elliptical; shortly peotioled; apex emerginate margin somewhat revolute; short petioled.	Elliptical to oblong or obovate; apex abtuse, margin entire, revolute.
iii. Size	12-30 X 4-12mm	15-30 X 7-15mm	10-12 X 6-15mm
iv. Texture	Brittle, coriaceous	Coriaceous	Coriaceous
v. Taste	Astringent, bitter	Bitter	Slightly bitter
vi. Odour	Odourless	Odourless	Odourless
Anatomical			
i. Cuticle	Thick	Thick	Thick
ii. Epidermis	Single layered	Single layered	Single layered
iii. Stomata	Aomocytic, only on lower epidermis; more grouped in patches on midrib, venation fine reticulate	Aomocytic, confined on lower epidermis, each stomata is surrounded by rosette of clearly defined subsidiary cells, guard cells strongly crusted	Aomocytic, only on lower epidermis.
iv. Hairs	Hairs few, unicellular, conical, thick-walled, present on petiole and margin of young leaves; a few glandular hairs with 2-celled uniseriate stalk and multicellular secretory head also present.	Simple, unicellular and multicellular.	Both, simple multicellular, short and long-stalked glandular hairs.
v. Crystals	Crystals common in petiole and in midrib ground tissue subepidermal collenchyma as single prism or irregular crystals, sometime associated with numerous small crystals.	Clusters or solitary crystals of calcium oxalate present; coarse crystal sands with corroided appearance also present.	Crystals present in petiole.

vi. Mesophyll	3 to 5 layered, having droplets of oils.	Differentiated in palisade and spongy parenchyma; secretory ducts prominent in palisade region.	Differentiated in single layered (somewhere double layered) palisade and spongy parenchyma; tanniniferous contents present.
vii. Stone cells	Few thick-walled fibrous sclerotic patches cells present.	Not seen	Not seen

On the basis of diagnostic characteristics commercial samples sold under the name of uva ursi can be authenticated for genuineness prior to use in a various herbal formulations.



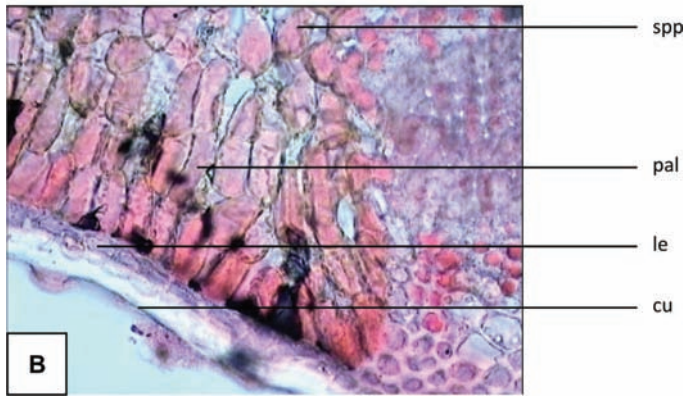


Fig. 2. Anatomical structure of lamina of Arctostaphylos uva-ursi (L.) Spreng.

A. Mid-rib region

B. Vertical section

Abbreviations: col, collenchyma; **cr,** rosette crystals of calcium oxalate; **cu,** cuticle; **gt,** ground tissue; **le,** lower epidermis; **pal,** palisade; **par,** parenchyma, **ph,** phloem; **scl,** sclerids; **spp,** spongy parenchyma; **ue,** upper epidermis; **xy,** xylem.

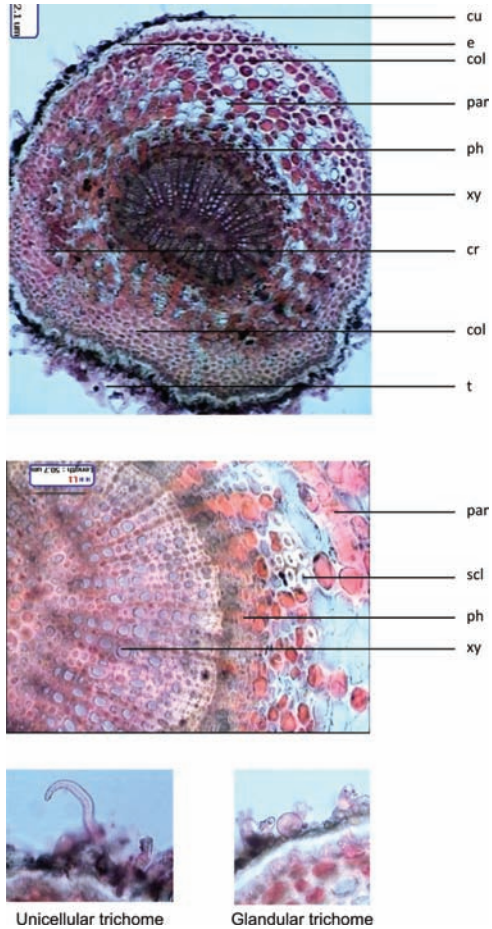


Fig. 3. Anatomical structure of petiole of Arctostaphylos uva-ursi (L.) Spreng

Abbreviations: col, collenchyma; **cr,** rosette crystals of calcium oxalate; **cu,** cuticle; **e,** epidermis; **par,** parenchyma, **ph,** phloem; **t,** trichome; **scl,** sclerids; **xy,** xylem.

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