



Pharmaceutical Standardization

Comparative pharmacognostical and phytochemical study on *Bergenia ligulata* Wall. and *Ammania buccifera* Linn

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Abstract

“*Pashanbheda*” is a controversial plant. Pharmacopeia considers *Bergenia ligulata* as official source of *Pashanbheda* and official substitute is *Aerva lanta*. Review of the literature reveals that 23 different plants are reported in name of “*Pashanbheda*”. *Ammania buccifera* is an adulterant, which is used in Kerala under the name of *Pashanbheda*, found in moist places of India. The present study was undertaken to compare the roots of both the plants and to have a brief view point on similarities and dissimilarities between the plants. The pharmacognostical evaluation reveals that the rosette crystals of *B. ligulata* are bigger in size compared to that of *A. buccifera* and cork is present in *B. ligulata*, whereas it is absent in *A. buccifera*. HPTLC shows similar R_f values of both the drug. The quantitative estimation showed that total phenol content of both the drug was almost equal.

Key words: *Ammania buccifera*, *Bergenia ligulata*, *Pashanbheda*, pharmacognosy, phytochemistry

Introduction

Bergenia ligulata is considered as official source of *Pashanbheda* and in Kerala *Ammania buccifera* is used under this name.^[1] Plant is mostly found in water logging places throughout India.^[2] The chemical constituents on *B. ligulata* and *A. buccifera* are well-established,^[3,4] but no pharmacognostical study has been reported till date. Therefore, the present study was aimed at comparing the pharmacognostical and phytochemical profile of *A. buccifera* roots with that of *B. ligulata* rhizome.

Materials and Methods

Macroscopic evaluation

Macroscopic characters of both the rhizome and root were recorded as per visual observation.^[5,6]

Organoleptic evaluation

The color, odor and taste of both the rhizome and roots and the powder were recorded separately.^[5,6]

Microscopic evaluation

Free hand sections were taken, cleared with chloral hydrate and then with phloroglucinol and hydrochloric acid. Histochemical tests for constituents such as tannin, mucilage etc., was done.

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Microphotographs were taken by using Carl Zeiss binocular microscope attached with camera.^[5,6]

Phytochemical evaluation

Physical evaluation

In physical evaluation, moisture content, total ash, acid insoluble ash and extractive values viz., alcohol and water soluble extractive values were determined. The ash value represents the inorganic salts present in the drug^[7,8] [Table 1].

Preliminary phytochemical screening

The Methanol and water extractive was used to carry out the preliminary screening. The extract was further subjected for the presence of various constituents such as alkaloids, tannins, phenols and for Flavonoids. Quantitative estimations of total tannin content and total Phenol content^[9] were done. High performance thin layer chromatography^[10] was carried out for spectral comparison of both the samples^[7,8] [Tables 2-4].

Result and Discussion

Macroscopy

A. buccifera

Is an herb belonging to the family *Lythraceae* and grows in water logging areas. Roots are dicot, externally spongy, leaves sessile, axillary inflorescence, flower sessile, red in color, fruit capsule globose. Roots arises at nodal region, spongy, whitish, measuring about 10-15 cm long, 0.3-0.5 cm in diameter, transversely cut surfaces shows outer spongy smooth in touch, no distinct odor, with astringent taste. [Plate no. 1].

B. ligulata

It belongs to family *Saxifragaceae*. It is a perennial herb with thick rootstock. Leaves simple, orbicular to broadly obovate, fleshy, entire, strongly ciliate, inflorescence corymbose scapes, fruit Globose. Rhizome is solid, barrel shaped, cylindrical, 1.5-3 cm long and 1-2 cm in diameter. With ridges, furrows and root scars distinct, odor - aromatic, taste - astringent.

A. buccifera (root)

T.S. of A. buccifera root

Circular in shape, outermost layer epidermis somewhat barrel shaped epidermal cells loosely connected filled with yellowish brown coloring matter followed by loosely arranged spongy parenchyma with numerous air spaces between cells, i.e. aerenchyma. Parenchyma cells filled with numerous rosette crystals of calcium oxalate, starch grains and yellowish brown contents. Endodermis single layer slightly barrel shaped cells followed by a single layer pericycle. Vascular bundle radially arranged protoxylem toward center metaxylem toward the

periphery each xylem pockets separated by biserrate-multiserrate medullary rays, phloem occupies above the xylem, xylem consists xylem parenchyma and few fibers [Plate no. 2].

Table 1: Physicochemical parameters

Physicochemical parameters (% w/w)	<i>B. ligulata</i> (rhizome)	<i>A. buccifera</i> (root)
Loss on drying at 105°C	7	0.5
Ash value at 450°C	10.59	13.33
Acid insoluble ash at 450°C	0.05	0.03
Water soluble extractive	20	7.4
Alcohol soluble extractive	26	33.8

B. ligulata: *Bergenia ligulata*, *A. buccifera*: *Ammania buccifera*

Table 2: Qualitative test

Chemical constituents	<i>B. ligulata</i> (rhizome)	<i>A. buccifera</i> (root)
Alkaloids	++	-
Tannin	++	++
Flavonoids	++	++
Phenols	++	++
Carbohydrate	++	++

++: Present, -: Absent, *B. ligulata*: *Bergenia ligulata*, *A. buccifera*: *Ammania buccifera*

Table 3: Quantitative test

Sample	% of tannin	Total phenol content %
<i>B. ligulata</i> (rhizome)	9.86	4.03
<i>A. buccifera</i> (root)	0.42	4.04

B. ligulata: *Bergenia ligulata*, *A. buccifera*: *Ammania buccifera*

Table 4: High performance thin layer chromatography

<i>B. ligulata</i> (rhizome)				<i>A. buccifera</i> (root)			
R_f values		R_f values		R_f values		R_f values	
Spots	254 nm	Spots	366 nm	Spots	254 nm	Spots	366 nm
5	0.01, 0.04, 0.17, 0.25, 0.41	8	0.01, 0.04, 0.14, 0.17, 0.25, 0.31, 0.54, 0.88	4	0.01, 0.12, 0.19, 0.92	5	0.01, 0.03, 0.11, 0.92, 0.96

A. buccifera: *Ammania buccifera*, *B. ligulata*: *Bergenia ligulata*



Plate no. 1: Photos of raw drug

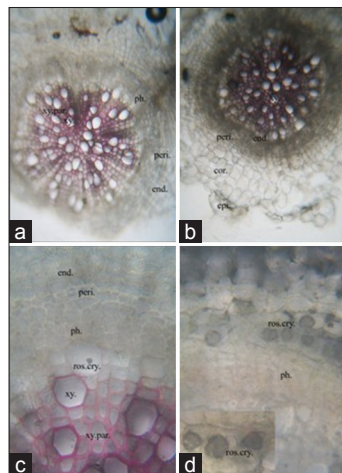


Plate no. 2: T.S. of *Ammania buccifera* (root)

Powder microscopy

B. ligulata rhizome

Organoleptic characters: Odor aromatic, taste astringent, pinkish brown and coarse powder.

The diagnostics character of *B. ligulata* root powder shows cork cells in surface view, big rosette crystals and simple starch grain also in groups along with prismatic crystals of calcium oxalate in cortical zone, tannin contents in the epidermal region, fragments of parenchyma with tannin content, fibers and sclereid, fragments of pitted and annular vessels are observed from vascular bundle region [Plate no. 3].

A. buccifera root

Organoleptic characters: No distinct odor, with astringent taste, blackish brown and coarse powder.

The diagnostics character of root powder shows rosette and prismatic crystals smaller in size compared to that of *B. ligulata*, lignified fibers, starch grains are seen in groups from cortex zone, lignified and beaded parenchyma from stellar region, pitted, spiral and annular vessels fragments are seen from the vascular bundle region [Plate no. 4].

Comparative pharmacognostical study

Many similar and dissimilar characters were observed between powdered roots of *B. ligulata* and *A. buccifera*. The similar characters were rosette crystals, groups of starch grains are

found in both the powders, moreover tannin content is found in both powders. The dissimilar characters were rosette crystals of *B. ligulata* is bigger in size compared to that of *A. buccifera*. Cork is present in *B. ligulata*, whereas it is absent in *A. buccifera*.

Phytochemical results

Comparison between track 1 and track 2 was done by spectral comparison on similar R_f value found in the short and long UV radiations, the different R_f values overlapping in both the samples are 0.04, 0.24, 0.35, 0.55, 0.94, 0.96. These graphs show the overlapping zones present in *B. ligulata* (rhizome) and *A. buccifera* (root) [Plate no. 5].

Discussion

Habit and habitat of both plants are similar in nature, both the roots are dicot, have simple leaves, pharmacognostical studies shows evidence of rosette and prismatic crystals of calcium oxalate, which shows the maximum accumulation of calcium content in the plants, coloring matter and simple starch grains in groups are observed in both the plants. The Phytochemical evidence shows 60% similarity. Thus it can be concluded that *A. buccifera* may be used instead of *B. ligulata*. Further, studies require its genome analysis and

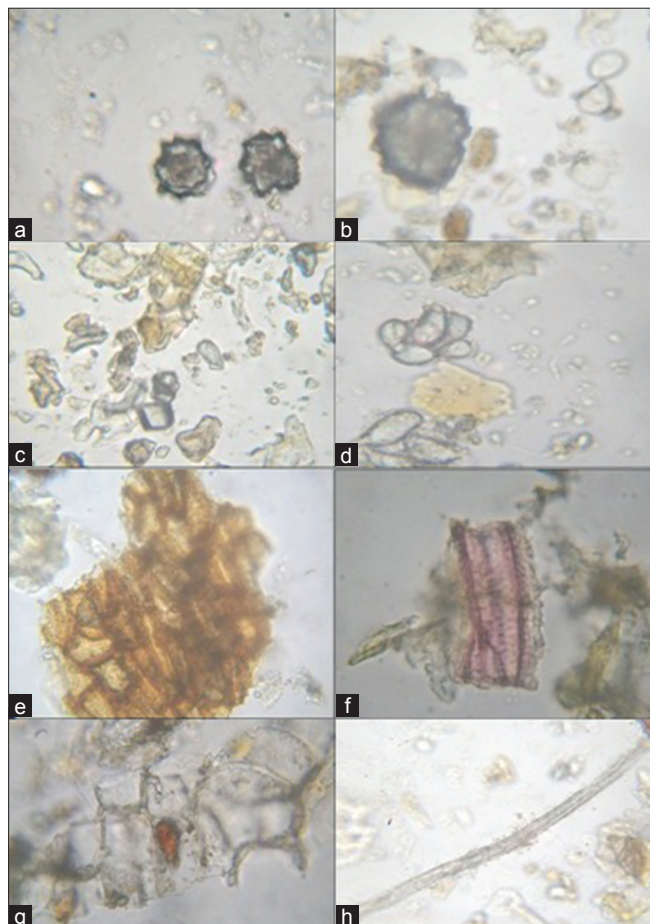


Plate no. 3: *Bergenia ligulata* powder characters

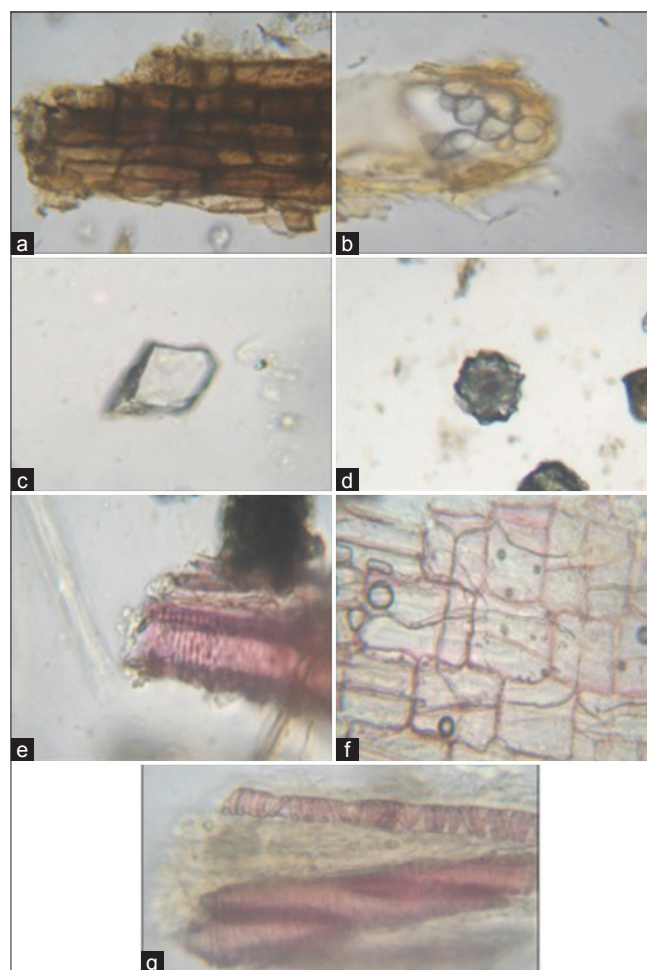


Plate no. 4: *Ammania buccifera* powder characters

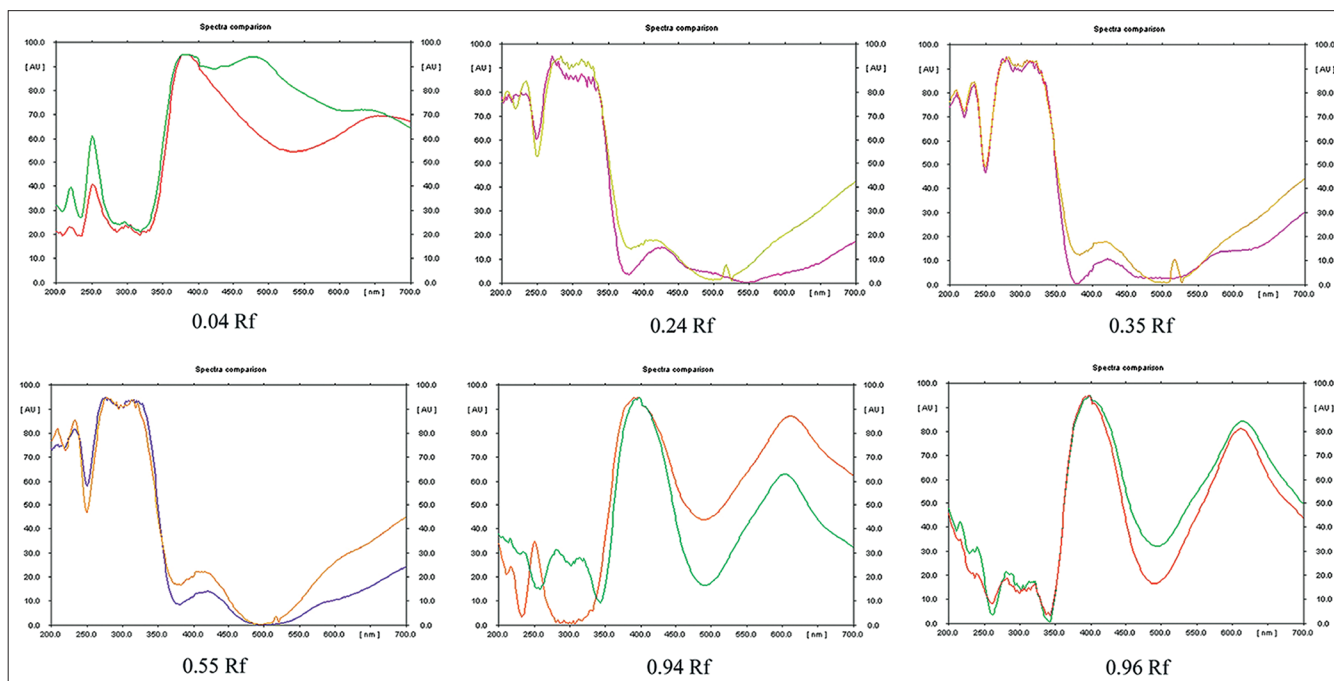


Plate no. 5: Comparative high performance thin layer chromatography profiles

noble compound investigations, isolation, pharmacological evidences.

Conclusion

A. buccifera used in place of *B. ligulata* regionally in many parts of India, morphologically shows similar identity as well as in habitat, pharmacognostical evidences shows that presence of rosette crystal, which play very significant role in identification. Phytochemical evidence shows 0.04, 0.24, 0.35, 0.55, 0.94, 0.96 R_f values similarity with help of spectral comparisons, The quantitative estimation also shows that total phenol content is *B. ligulata* (rhizome) 4.03%, whereas, *A. buccifera* (root) 4.04%. This study is helpful in identification. It further requires scientific evaluation at molecular level, marker compounds and some more pharmacological evidence for establishment.

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हिन्दी सारांश

बर्जेनिया लेग्युलेटा और अमानिया बक्सिफेरा का फार्माकोग्नोस्टिकल और फायटोकेमिकल परीक्षण का तुलनात्मक अध्ययन

स्वीटु जानी, विनय जे. शुकला, सी. आर. हरीशा

पाषाणभेद एक विवादात्मक द्रव्य है। फार्माकोपिया में बर्जेनिया लेग्युलेटा को पाषाणभेद का अधिकृत स्रोत माना है और अवेरा लानेटा प्रतिनिधी द्रव्य है। साहित्य की समीक्षा से पता चलता है कि अन्य २३ वनस्पतियों का भारत के अलग-अलग क्षेत्रों में पाषाणभेद के नाम से उपयोग किया जाता है। अमानिया बक्सिफेरा यह वनस्पति केरल प्रांत में पाषाणभेद के नाम से जानी जाती है और भारत के नम स्थानों में पायी जाती है। प्रस्तुत अध्ययन, दोनों वनस्पतियों के मूल की तुलना कर दोनों के बीच समानता और असमानताओं को जानने हेतु किया गया है। फार्माकोग्नोस्टिकल परीक्षण से यह पता चलता है कि, बर्जेनिया लेग्युलेटा में पाये गये रोझेट क्रिस्टल आकार में अमानिया बक्सिफेरा से बड़े हैं और बर्जेनिया लेग्युलेटा में कॉर्क सेलस मौजूद है। एचपीटीएलसी परीक्षण में दोनों द्रव्यों में समानता पायी गयी। फायटोकेमिकल मूल्यांकन से दोनों द्रव्यों के कुल फिनोल मात्रा में लगभग समानता पायी गयी।