REVIEW ARTICLE

Pharmacognosy and Quality Control Analysis of "*Berberis aristata*"

Rahul Sharma[1]*, Sanjeev Sharma[2], Gaurav Sharma[3]

[1]*Department of Shalya Tantra (Surgery), National Institute of Ayurveda- Deemed to be University, Jaipur (Rajasthan)- 302002. India.*
[2]*National Institute of Ayurveda- Deemed to be University, Jaipur (Rajasthan)-302002.India.*
[3]*Department of Dravyaguna, National Institute of Ayurveda- Deemed to be University, Jaipur (Rajasthan)-302002. India.*

Received: 12th April, 2021; Revised: 27th May, 2021; Accepted: 1st June, 2021; Available Online: 25th June, 2021

ABSTRACT

Berberis aristata is commonly known as "Darut haldi" and "chitra" family Berberidacea. The stem is nearly cylindrical, surface rough, and color yellow, plant contains different types of alkaloids, including berbamine, berberine, oxycanthine, epiberberine, palmative, dehydrocaroline jatrorrhizine and columbamine, karachine, dehydrokarachin, etc. The major alkaloid was isolated from *B. aristata* is berberine having a yield of 2.23%. According to references, therapeutic use of *B. aristata* is diaphoretic, laxative, and helpful in rheumatism. Fruits, stem, bark, and root have been used in ethno-medicine and many Ayurvedic preparations for several medicinal properties. Organoleptic observation, pH value, alcohol/ water soluble extractive value, water-soluble ash, acid insoluble ash, total ash, and Phytochemical Screening: TLC was done according to guidelines or procedures drafted, by CCRAS and AYUSH.

Value obtains from pharmacognosy and quality control analysis of *B. aristata* was matched with reference pharmacopeia value. It indicates that the collected sample was authentic and standardized.

Keywords: *Berberis aristata,* Daruthaldi, Pharmacognosy, Quality Control

International Journal of Pharmaceutical Quality Assurance (2021); DOI: 10.25258/ijpqa.12.2.04

How to cite this article: Sharma R, Sharma S, Sharma G. Pharmacognosy and Quality Control Analysis of "*Berberis aristata*". International Journal of Pharmaceutical Quality Assurance. 2021;12(2):21-24.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Berberis aristata, commonly known as "Daruthaldi" and "Chitra," and belongs to the family Berberidaceae and is commonly spread in evergreen areas of temperate and subtropical. 650 species of Berberis are found worldwide, and 54 have been reported from Indian Himalaya, especially in Himachal Pradesh, India. *B. aristata* is used in Ayurveda medicines for a very long period, and this plant prepares Rashut.[1]

It grows at the height of 2000–3000 meters, especially in the Manali and Chamba region of Himachal Pradesh. It is a large deciduous shrub, usually 1.8 to 3.6 meters in height. Its leaves are obviated or elliptic, entire, base gradually narrowed with reticulate nerves and glossy dark green color. Its flowers are numerous and stalked. Its roots are thick, woody, yellowish-brown, cylindrical, knotty, and covered with thin, brittle bark.[2] It is an erect spinous shrub, often found in small patches on the hill slopes. In India mainly found wild in the sub-Himalayan tract.[3] The stem is nearly cylindrical, surface rough, and the color yellow.[4]

B. aristata is a critically endangered species of Indian Himalaya due to extensively collection of roots for its berberine alkaloid. Roots of plant *B. aristata* contain different alkaloids, including berbamine, berberine, oxycanthine, epiberberine, palmatine, Dehydro carolin jatrorhizine, and columbamine, karachine, dehydrokarachin, etc. The major alkaloid was isolated from *B. aristata* is berberine, having a yield of 2.23%.[5] The stem is used for a diaphoretic, laxative, and useful in rheumatism. Fruits, stem, bark, and root of *B. aristata* DC have been used in ethno-medicine and many ayurvedic preparations with several medicinal properties.

Properties and Action

- Rasat: Tikta
- Gunat: Ruksha
- Viryat: Ushan
- Vipakat: Katu
- Karmat: Stanya shoodhana, Stanya Doshahara, Dosha Pachana[6]

MATERIAL AND METHOD

Test Sample

The stem of *B. aristata* was collected from Solang valley, Himachal Pradesh, India, in the month of October 2018. The samples were identified and authenticated by CSIR National Institute of Science Communication and Information Resources, Raw material Herbarium, and Museum, New

**Author for Correspondence: rahulsharma5rs@yahool.com*

Delhi, India vide reference number NISCAIR/RHMD/ Consult/2018/3304-05-2 on date 18/12/2018.

METHOD

Organoleptic Study: The collected sample was studied organoleptically with naked eye & magnifying lens for determines Taste, Odour, and color.

pH: 10 gram of powder sample + 100 mL of distilled water, dissolved it, and pre-calibrated pH meter electrode was dipped and noted pH value.

Ethanol / Water Extractive Value: 5 g coarse powder shake in 100 mL of air ethanol /water (6 hours are shaking + 18-hour standing position). Filter it, dry it, and calculate the percentage of extractive value.

Total Ash: 5 gm of sample in a Crucible and placed in a muffle furnace, ignited at a temperature of 450°C for until the ash was free from Carbon, and percentage o was calculated concerning the raw material drug.

Acid Insoluble Ash: Boiled ash with 25 mL of 2M HCl for 5 minutes, filter with ashless filter paper, wash with hot water, ignites, cools, and weighed. Calculate the percentage of acid-insoluble ash.

Water-soluble Ash: Boiled ash with 25 mL of water for 5 minutes, filter with ashless filter paper, wash with hot water, ignites, cools, and weighed. Calculate the percentage of water-soluble ash.[7]

Table 1: Phytochemical Screenin g

Name of Test	*Procedure*	*Observation*	*Result*
	CARBOHYDRATE.		
Molisch's test.	2 mL sample + 2 mL Molisch's. reagent & shake carefully. + 1 mL conc. H2SO4.	Purple color ring at the junction appears.	Carbohydrate. Present.
Benedict's test.	4 mL Sample + 1 mL Benedict's sol. + ▲	Green/yellow/ orange/red/ brown color appears.	Reducing sugars present.
Fehling's test.	Fehling A 1 mL + Fehling B 1 mL + 2 mL Sample. + ▲	Brick Red precipitate appears.	Generally used for reducing sugars.
Barfoed's test.	Sample + Barfoed's reagent. + ▲	Red precipitate appears.	Presence of monosaccharides.
	Alkaloids		
Dragendorff's test.	Sample + 2 mL Dragendorff's reagent.	Orange ppt appears.	Alkaloids present.
Wagner's test.	Sample + few drops of Wagner's reagent.	Reddish-brown ppt appears	Alkaloids present.
Hager's test.	Sample + Hager's reagent	Orange/yellow ppt. appears	Alkaloids present.
	Amino acids		
Ninhydrin.	Sample + Ninhydrin sol. + ▲	Yellow color appears	Amino acid present
Protein			
Biuret test.	Sample + 1 mL 4% NaOH sol. + 1 drop 1% Sol. CuSo4.	Violet color appears	Proteins Present.
Xanthoprotic-test.	Sample + 2 mL water + 0.5 mL conc. HNO3	Development of yellow color appears	Proteins present.
Millon's test.	Sample + 2–3 mL Millons reagent	White precipitate appears	Proteins present.
Saponin.			
Foam test.	Sample+ Water + shake	Characteristic honeycomb-like structure appears	Saponins present.
	Glycosides.		
Borntrager's test..	1 mL Benzene. + 0.5 mL Dil. NH4 Sol. + sample	Reddish pink color appears.	Anthraquinone glycosides present.
	Phenolic compound.		
Phenolic test.	Sample + ▲ + 2 mL FeCl3 sol.	Blue color appears.	Phenols present.
	Steroids.		
Salkowski. test	Sample + 2 mL chloroform + 2 mL conc. H2SO4 and shake.	Red color appears	Steroids present.
	Tannins.		
Fecl3.	Sample + 5% solution of FeCl3 in 90% alcohol	Deep blue color appears	Tannins Present.
Lead acetate.	Sample + 10% w/v lead acetate in distilled water.	Precipitate develop	Tannins present.
Pot. Dichromate.	Test Sol. + Potassium dichromate. Sol.	dark color appears	Tannins present.

Thin Layer Chromatography (TLC)

Chromatography plates- Percolated TLC plate with silica gel 60 F_{254} with fluorescent indicator.
Activation: Dried in a hot oven at 105°C for 1.5 hours.
Mobile phase: Toluene and Ethyl Acetate (7:3)
Test solution: Ethanol Extract
Sample application: One drop of sample place in TLC plate with the help of capillary 1 cm above from baseline.
Visualization: Iodine Vapors

R_f Values: Distance of each spot from the application point and calculated Rf. value by dividing the distance traveled by the spots by the distance traveled by the front of the mobile phase.[8,9]

Observation, Result

Table 2: Organoleptic Study

S. No	*Organoleptic Study*	*Value*	*API Reference Value*[6]
1	Color	Yellowish	Yellowish
2	Odour	Characteristic	Characteristic
3	Taste	Bitter	Bitter

Table 3: Physiochemical Analysis

S. No	*Tests*	*Value*	*API Reference Value*[6]
a.	pH	5.8	—
b.	Ethanol Extractive (%)	6.78 %	N.L.T 6%
c.	Water Extractive (%)	9.72 %	N.L.T. 8%
d.	Total Ash. (%)	5.17 %	N.M.T. 14%
e.	Acid Insoluble. Ash (%)	1.14 %	N.M.T. 5%
f.	Water-soluble. Ash (%)	3.47 %	—

Table 4: Phytochemical Screening

Name of Test	*Aqueous Extract*	*Ethanol Extract*
	Carbohydrate	
Molish test.	Present	Absent
Benedict test.	Present	Present
Fehling test.	Present	Present
	Alkaloids	
Dragendorff test.	Present	Present
Wagner's test.	Absent	Absent
Hager's test.	Absent	Absent
Amino acids.		
Ninhydrine.	Absent	Present
	Protein	
Biuret test.	Present	Present
Xenthoprotic test.	Present	Present
Millon test.	Absent	Present
	Saponin	
Foam test.	Present	Absent
	Glycosides	
Borntrager's test.	Absent	Present
	Steroids	
Salkowaski.	Absent	Absent
	Tannins	
$FeCl^3$.	Absent	Absent
Lead acetate.	Present	Present
Pot. Dichromate.	Absent	Present

Thin Layer Chromatography: R_f Value 0.66, 0.73, 0.97

DISCUSSION AND CONCLUSION

A macroscopic Study is an identification tool for identifying test substance *B. aristata* having taste bitter, odor characteristic, and color Yellowish. pH value plays a significant role in the compatibility of the drug with body fluid, site of action, and stability of drug pH value was found 5.8. The strength or potency of the drug was estimated by water and Ethanol extractive value. Water extract value was found at 9.72%, and Ethanol extractive value was found at 6.78%. Ash value is the indicator of the presence of inorganic & earthy matter in the plant. Total ash was found at 5.17%. Heavy metals and siliceous matter were identified with the help of insoluble acid ash and a sample having 1.14% of insoluble acid ash. Inorganic water-soluble salt was identified with water-soluble ash, and in samples, was found 3.47%.

A qualitative phytochemical test indicates primary metabolites (Carbohydrate, protein, fat, etc.) and secondary metabolites (alkaloids, glycosides, tannin, etc.). In *B. aristata* Molisch test is positive in aqueous extract it indicates that monosaccharides/ disaccharides/ polysaccharides are present. Benedict test is positive in aqueous and ethanol extract of samples which indicates the simple sugar may be present. Fehling test was positive in both extracts of the sample that indicates reducing sugar was present. Alkaloids were identified in aqueous and ethanol extract due to approval of the Dragondroff test. Amino acid is present in ethanol extract due to positive results in Ninhydrine test and proteins present in the test sample due to positive in Xenthoprotic in aqueous and Ethanol extract. Millon test is positive in ethanol extract. The foam test was positive in the aqueous extract of the sample that indicates saponine was present.

Borntrager's test was positive in ethanol extract of the sample that indicates Glycosides were present. Salkowaski's reaction was adverse in both extracts of the sample that indicates steroids were absent. Lead acetate, Pot. Dichromate test was positive in the test sample that's indicating that tannin is present in the sample. For phytochemical screening and drug, identification TLC plays a vital tool. In TLC, under Iodine vapors, three spots were found R_f values of spots are 0.66, 0.73, 0.97.

Value obtains from pharmacognosy and quality control analysis of *B. aristata* was matched with reference pharmacopeia value. It indicates that the collected sample was authentic and standardized.

REFERENCES

1. Sharma K, Bairwa R, Chauhan N, Shrivastava B, Saini NK. Berberis aristata: A review. Int J Res Ayurveda Pharm. 2011;2(2):383-388.
2. Ali M, Malik AR, Sharma KR. Vegetative propagation of Berberis aristata DC. An endangered Himalayan shrub. Journal of Medicinal Plants Research. 2008 Dec 31;2(12):374-377.
3. Anonymous. The Ayurvedic Pharmacopoeia of India. (Part-I) Vol. II. New Delhi: Controller of Publications; 1980, 34
4. Anonymous. The Wealth of India, Raw Materials. Vol II-C. New Delhi: Council of Scientific and Industrial Research; 2001.

5. Chakravarti KK, Dhar DC, Siddiqui S. Alkaloidal consistuents of the bark of Berberis aristata. Journal of Scientific and Industrial Research. 1950(7):161-4.
6. Anonymous. The Ayurvedic Pharmacopoeia of India. (Part-I) Vol. II. New Delhi: Controller of Publications; 1980, 35
7. Anonymous. The Ayurvedic Pharmacopoeia of India. (Part-II) Vol. II. New Delhi: Controller of Publications, 1980, Appendices- 2.2
8. Lavekar, G. S., Ema Pāḍhī, and Pramila Pant. «Laboratory guide for the analysis of Ayurveda and Siddha formulations.» (2010). CCRAS, Dept. of Ayush, ministry of health and family welfare, govt. of India New Delhi.
9. Lohar, Protocol for Testing Ayurvedic, Siddha & Unani Medicines, Pharmacopoeial Laboratory for Indian Medicines, Ghaziabad.