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PHARMACOGNOSTICAL AND PHYTOCHEMICAL EVALUATION ON THE BARK OF *PARKINSONIA ACULEATA* LINN.

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ABSTRACT

The bark of *Parkinsonia aculeata* Linn. is also called as vilayati kikar, belonging to the family Fabaceae. It is found throughout the drier part of India. The present study attempt pharmacognostic studies of bark, extraction, and identification of chemical constituents from alcoholic and aqueous extracts of *Parkinsonia aculeata* bark. Macroscopic as well as microscopic studies of any crude drug are the primary steps to establish its botanical quality control before going to other studies. The Transverse section (T.S) features of the bark indicate the presence of cork, phellogen, phelloderm, sclerides, vessels, medullary rays etc with some of the powder diagnostic features of the bark are the presence of fibers associated with vessels, center one sclereid, starch grains and tracheids and physico-chemical characteristics. The presence of alkaloids, flavonoids, tannins, steroids and lactones was confirmed during preliminary phytochemical screening. Hence Pharmacognostic studies of crude drug plays a very important role in identification the purity and quality of crude drugs. The present investigation reveals Pharmacognostic characters which include morphology, T.S, powder microscopy, physico-chemical characteristics of bark and phytochemical screening from alcoholic and aqueous extracts of *Parkinsonia aculeata* bark.

Keywords: *Parkinsonia aculeata*, Alcoholic extract, Aqueous extract, Physico-chemical parameters, Phytochemical screening.

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INTRODUCTION

Herbal system of medicine has been practiced since historical times and traces its roots to ancient civilizations. Although, we define alternative systems of healing as subject that are not taught in medical schools, it is worth while to mention that before the availability of synthetic drugs, plant-based remedies formed the basis of primary healthcare system. Herbal infusion,

decoction and tincture were house-hold remedies for common ailments[1].

Parkinsonia (Leguminosae) is a small genus containing three species which are common in tropical America and have been recently naturalized in hotter regions, e.g. Egypt and India[2]. *Parkinsonia aculeata* is a tree from the family Fabaceae; common names include Mexican Palo Verde, Parkinsonia, Jerusalem thorn, or Jellybean tree[3]. Previous investigations showed that the leaves from the plant contains orientin, iso-orientin, vitexin, isovitexin, lucenin-II, vicenin-II, diosmetin 6-C-Bglucoside, apigenin, luteolin, kaempferol, chrysoeriol, epiorientin, parkinsonin-A, parkinsonin-B, and parkintin[2,4-6]. All the parts of the plant are known as antipyretic, diaphoretic, and abortifacient[7,8], hot water extract of leaves used orally as abortifacient in pregnant women. It cures boils and tumors if young twigs are crushed and applied. Leaf, fruit and stem decoction are taken orally to treat fever, malaria. Reported phytoconstituents include β- amyrenone, β-amyrin, daucosterol, palmitic acid and β- sitosterol in dried aerial parts, L-dopa isolated from dried seeds, β- amyrin from dried stem bark, prencence of alkaloids in flower, leaf and stem, Amino acid trytophan from dried seeds, Glycerol β-butanoate α, α' 1- dipentanonate, β- Sitoeryl- β-D-glucoside, β-Sitosterol, glycerol α-heptanone kappa octanoate from stem of *Parkinsonia* aculeate[9], reported to possess Antimicrobial activity[10]. Many pharmacological activities viz Antioxidant activity of the 70% hydroalcoholic extract of leaves of *Parkinsonia* aculeata[11], Amoebicidal activity of different concentration of isolated rotenoids also reported[3], CNS depressant activity of ethanol-water(1:1) extract of dried aerial part, Smooth muscle stimulant activity of aqueous extract of dried aerial part of *Parkinsonia aculeata*, Antibacterial activity ethanol-water extract of dried leaf of *Parkinsonia aculeata*, Antidiabetic effect taking water soluble fraction of aerial part of *Parkinsonia aculeata*, Antidiabetic activity of the bark of *Parkinsonia aculeata*[9], Hepatoprotective activity of *Parkinsonia aculeata* leaves extract posses potent against carbon tetrachloride(CCl_4), Antispermatogenic activity of ethanolic extract of stem bark of *Parkinsonia aculeata*, Antimalarial activity of crude extract of aerial parts (leaves and flowers) of *Parkinsonia aculeata*[12], Analgesic, Anti-inflammatory and Antipyretic activity of total alcoholic and aqueous extract of leaves of *Parkinsonia aculeate*[13]. However, though literature showed this as useful sedge, so far the Pharmacognostical and Phytochemical studies have not been reported for the bark of this plant. Therefore, the present study was undertaken to establish the pharmacognostical characters and phytochemically studies of the bark.

MATERIALS AND METHODS

Plant Material

Barks of *Parkinsonia aculeata* L. were collected from local areas of Ajmer road, Jaipur, Rajasthan. The taxonomical identification of the plant was done by Dr. Gajendra Pal Singh, Department of Botany, University of Rajasthan, Jaipur, and voucher specimens were deposited at the herbarium, Department of Botany, University of Rajasthan, Jaipur (Specimen no. RUBL20684). Bark was dried under shade, coarsely powdered and stored in airtight container for further use.

Preparation of Extract

Alcoholic extract: The barks of *P. aculeata* were shade dried at room temperature, pulverized, and coarse powder was extracted exhaustively with 95% ethanol at temperature 40-60^{0}C, in a Soxhlet extractor. The extract was concentrated in a rotary flash evaporator and residue was dried in a desiccator over sodium sulfite. The extract, on removal of solvent in vacuum, gave dark green semisolid residue.

Aqueous extract: The bark of *P. aculeata* were shade dried at room temperature, pulverized, and coarse powders was macerate exhaustively with water then being kept for 5 days in tightly sealed vessels at room temperature, protected from sunlight and shaken several times daily and add preservative. Concentrate extract by distilling off the solvent and then evaporating to dryness on water –bath gave yellowish brown semisolid residue[14,15].

Transverse Section of the Bark

Few dried bark were soaked in water for some time (till it get soften). The bark cut in the slices with the help of sharp blade thin transverse sections were taken and placed in a watch glass; the sections were cleared by warming in chloral hydrate solution and stained with staining reagents containing a mixture of phloroglucinol and concentrated hydrochloric acid. Dilute hydrochloric acid and glycerol were used as mounting fluids for stained and unstained sections respectively[16-17].

Powder Microscopy

A pinch of powder was taken on a glass slide, treated with chloral hydrate solution, glycerin and water and observed under microscope using 45X and 10X objective lens for different characters. A

drop of phloroglucinol and conc. was used to detect lignin content of the powder[18,19].

Physicochemical Parameters[20-23]

Physico-chemical parameters were determined and reported as total ash, acid insoluble ash, water soluble ash, alcohol soluble extractive, water soluble extractive and moisture content.

The following proximate values were determined for the powder drug of bark of *P. aculeata*.

A. Extractive values

The determination of Extractive values helps to determine the amount of soluble constituents in a given amount of medicinal plant material, when extracted with solvents. The extraction of any crude drug with a particular solvent yields a solution containing different phytoconstituents. The composition of these phytoconstituents in that particular solvent depends upon the nature of drug and solvent used. The use of single solvent can also be used by means of providing preliminary information of quality of a particular drug sample.

- **Alcohol soluble extractive value:** 5g of shade-dried bark of *P. aculeata* powder was macerated with 100ml of 95% ethanol in a closed flask, shaking frequently during the first 6hrs and allowed to stand for 18hrs. Thereafter it was filtered rapidly taking precaution against loss of ethanol. Evaporated 25ml of filtrate to dryness in a tarred flat bottom shallow dish dried at 105^0C and weighed. Percentage ethanol soluble extractive was calculated with reference to the shade-dried plant powder.
- **Water soluble extractive value:** 5g of shade-dried bark of *P. aculeata*. Powder was macerated with 100 ml of water in a closed flask, shaking frequently during the first 6hrs and allowed to stand for 18hrs. Thereafter it was filtered rapidly. Evaporated 25ml of filtrate to dryness in a tarred flat bottom shallow dish dried at 105^0C and weighed. Percentages of extractive values were calculated with reference to the shade-dried bark powder.

B. Moisture content

An accurately weighed quantity of the shade-dried coarsely powdered bark of *P. aculeata*. powder was taken in a tarred glass bottle and the initial weight was taken. The crude drug was heated at 105^0C in an oven and weighed. This procedure was repeated till a constant weight was obtained. The moisture content of the sample was calculated as percentage with reference to the shade-dried material.

C. Ash values

- **Total ash**: 2g of accurately weighed quantity of the shade-dried coarsely powdered bark of *P. aculeata* was taken in a tarred silica crucible and incinerated at a temperature not exceeding 450^0C until free from carbon, cooled and weighed. The percentage of total ash was calculated with reference to shade-dried leaf powder.
- **Acid-insoluble ash**: Total ash obtained was boiled for five minutes with 25 ml of dilute Hydrochloric acid. The insoluble matter was collected on an ash-less filter paper, washed with hot water and ignited, cooled and weighed. The percentage of acid insoluble ash was calculated with reference to shade-dried bark powder.
- **Water-soluble ash** : Total ash obtained was boiled for five minutes with 25ml of distilled water, cooled and collected the insoluble matter on an ash-less filter paper, washed with hot water and ignited for 15 minutes at temperature not exceeding 450^0C. Subtracted the weight of the insoluble ash. The percentage of water-soluble ash was calculated with reference to shade dried bark powder.
- **Sulphated ash :**Silica crucible is heated to redness for 10 minutes; cooled and weighed. 1 gram of air-dried roots powder is placed in silica crucible, moistened with Sulphuric acid, ignited gently, again moistened with Sulphuric acid and ignited at about 800^0C. Cooled and weighed, once again ignited for 15 minutes and weighed. The percentage of sulphated ash was calculated with reference to air-dried bark powder.

Preliminery Phytochemical Screening

Preliminary Phytochemical investigation was carried out for alcoholic and aqueous extracts. Presence of alkaloids was determined by Mayer's, Dragendorf's, Wagner and Hager's test, Flavonoids by Shinoda, Ferric chloride and lead acetate tests, Saponins by Foam and haemolysis test and sterols by Salkowaski and Libermann and Burchards tests, Carbohydrate by molisch and fehling test, Tannins by ferric chloride test, gelatin and other tests[18, 19].

RESULTS AND DISCUSSION

Organoleptic or Macroscopically Characters of Bark

The bark is smooth and yellow-green or blue-green and the branches and twigs are often the same colour. Twigs are slender and slightly zig zag in shape; finely hairy when young, often have paired short spines that may remain on the branches and trunk in groups of three or singly and remaining at nodes, including 2 short spines.

Microscopy

The diagrammatic T.S of the bark showed roughly six type characters such as Cork, Phellogen, Phelloderm, Sclerides, Vessels, Medullary rays. Periderm is composed of cork, Phellogen and Phelloderm. Cork is stratified and consists of several layers of radially arranged rows of thin walled elongated cells. Phellogen is made up of one to two layers of thin walled, rectangular, lignified cells. Phelloderm is one to two layered in thickness and exhibits thin walled, non-lignified. Sclerides are a reduced form of scleremchyma cells with highly thickened, lignified walls. Secondary phloem resion contains phloem fibers and medullary rays. Phloem fibres occur in group 2-3 embedded in phloem parenchyma. Medullary rays which are generally 1-3 cells wide divide radially the phloem parenchyma. Results showed in Figure 1.

Powder Study

The morphological analysis of the bark powder of the plant revealed that, it is brown green in color with characteristic odor and acrid taste, having vessel, center one sclereid, fibers, starch grains and tracheids. Results showed in Figure 2.

Physicochemical Parameters

Physical constant values like extractive values, ash values and moisture content are tabulated in Table 1.

Preliminary Phytochemical Screening

Preliminary Phytochemical screening indicated presence of alkaloid in alcoholic extract and flavonoids, tannins, steroids and lactones give positive test in both alcoholic and aqueous extract, results are tabulated in Table 2.

CONCLUSION

The diagnostic features have been established to identify *Parkinsonia aculeata* bark. Some of the important diagnostic features of the bark are smooth and yellow-green or blue-green and the branches and twigs are often the same colour. The T.S features of the bark are the presence of cork, phellogen, phelloderm, sclerides, vessels, medullary rays etc with some of the powder diagnostic features of the bark are the presence of fibers associated with vessels, center one sclereid, starch grains and tracheids and physico-chemical parameters were also determined. The presence of alkaloids, flavonoids, tannins, steroids and lactones was confirmed during preliminary phytochemical screening.

The present studies on the bark of *Parkinsonia aculeata* will be useful for its identification and authentication and further research regarding to its chemistry.

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TABLES AND FIGURES

Table 1 Physico-chemical parameters

Parameters	Determined value (%)
Moisture content	11.8
Extractive value	
Water soluble extractive	23.56
Alcohol soluble extractive	21.8
Ash value	
Total ash	8.66
Water soluble ash	4.59
Acid insoluble ash	2.30
Sulphated ash	7.21

Table 2 Preliminary phytochemical screening of *Parkinsonia aculeata* Linn Bark

Sr No.	Chemical Test	*Parkinsonia aculeata* Linn bark	
		Alcoholic extract	Aqueous extract
1	**TESTS FOR STEROLS**		
	A) Salkaowski test	+	+
	B) Lieberman Bruchard test	+	+
2	**TESTS FOR TRITERPENES**		
	A) Salkaowski test	-	-
	B)Lieberman Burchard test	-	-
3	**TESTS FOR SAPONINS**		
	A) Foam test	-	-
	B) Haemolysis test	-	-
4	**TESTS FOR ALKALOIDS**		
	A) Wanger's test	+	-
	B) Mayer's test	+	-
	C) Dragendroff's test	+	-
	D) Hager's test	+	-
5	**TESTS FOR CARBOHYDRATES**		
	A) Fehling's test	+	+
	B) Molisch test	+	+
6	**TESTS FOR TANNINS**		
	A) Ferric chloride test	+	+
	B) Gelatin test	-	-
	C) Vanillin HCl test	-	-
	D) Match stick test	-	-
7	**TESTS FOR FLAVANOIDS**		
	A) Shinoda test	-	-
	B) Ferric chloride test	+	+
	C) Lead acetate test	+	+
	D) Zinc-hydrochloric test	+	+
	E) NaOH test	+	-
	F) NaOH- HCl test	+	-
8	**TESTS FOR LACTONES**		
	A) Legal's test	+	+
	B) Baljet test	+	+

("**+**" indicates presence and "-" indicates absence of constituent)

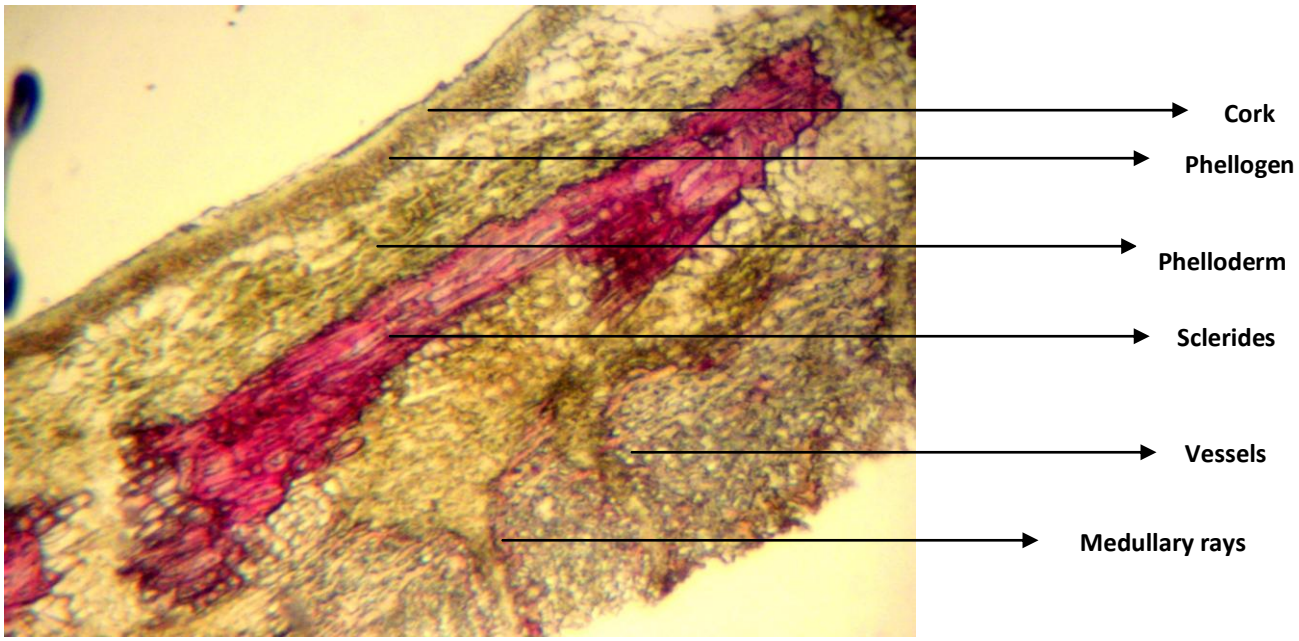
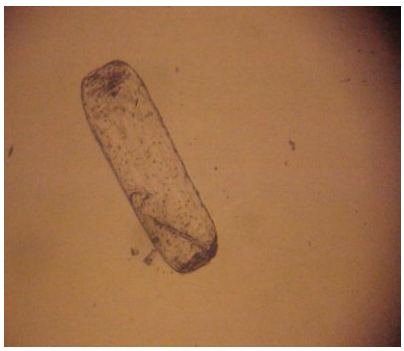
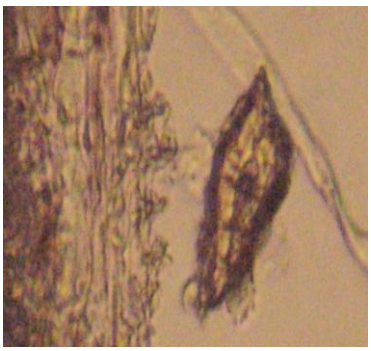


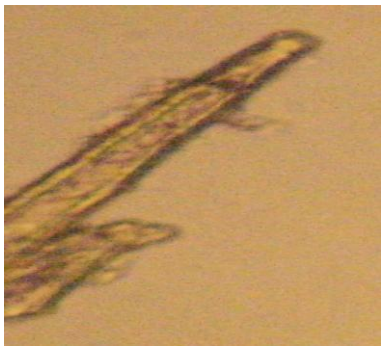
Figure 1 Transvers section of the *Parkinsonia aculeata* bark.



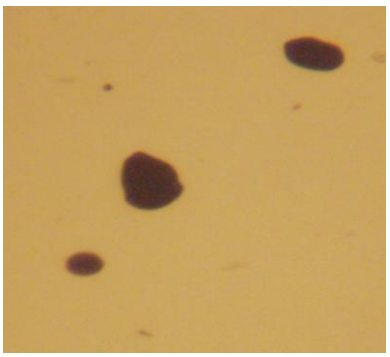
Vessel



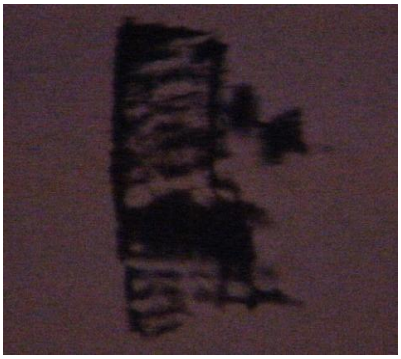
Center one sclereid



Fibers



Starch grain



Tracheids

Figure 2 Powder microsopy of *P. aculeata* bark