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Research Article

Pharmacognostic and Phytochemical Evaluation of Stem of *Capparis decidua* (Forsk) Edgew

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ABSTRACT

Capparis decidua (Forsk) Edgew. Belongs to family Capparaceae, a small much branched tree. The plant possesses anthelmintic, hepatoprotective, antidiabetic, hypolipidemic activity. Pharmacognostic investigation of fresh, powdered and anatomical sections of stem were carried out to determine its macromorphological, micromorphological and chemomicromorphological profiles. Phytochemical investigation indicated the preparation of different extracts using different solvents and different tests were carried out for confirmation of alkaloids, tannins, phenolic compound, flavanoids, steroids, glycosides & carbohydrates. The result of the study can be useful in setting some diagnostic indices for the identification and the preparation of the monograph of the plant.

INTRODUCTION

The plant *Capparis decidua* (Forsk.) Edgew. Belongs to family Capparaceae [1], a small much branched tree or shrub of arid regions in Africa, Middle East and Southern Asia, including the Thar Desert [2]. It occurs in vegetative cover in dry, hot, sandy desert and arid regions where little else grows and is an extremely hardy species. It is a bushy shrub in dense tufts, 4-5 m high, or occasionally a small tree with many green vine-like apparently leafless branches, hanging in bundles. Bark turns whitish-grey color with age, but most branches and twigs are a glossy dark green. Small, light brown caducous, linear 1-2cm long apex short, stiff, pale mucro-like prickle occur in pairs on the twigs at each node; flowers red or pink, rarely yellow in lateral corymbs, berries globose or ovoid 1-2cm in diameter, dull red; seed globose, 2-5mm in diameter [3]. From alcoholic extract of root bark six oxygenated heterocyclic constituents capparisesterpenolide (3-carboxy-6, 17-dihydroxy-7, 11, 15, 19 tetramethyleicos-13-ene-d-lactone) and deciduaterpenolides (d-lactone derivatives of 1, 3, 3-trimethyl- 1, 4-cyclohexadien-6-one) A, B, C, D and E were isolated and characterized [4].

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Stem [5], fruits and flowers [6] contains n-triacontanol, water soluble stachydrine (2-Carboxy-1, 1-dimethyl Pyrrolidine), N-pentacosane, *β*-Sitosterol and *β*-Carotene and hydrocarbons Nonacosane and Triacontane. The stem possesses anthelmintic activity, hepatoprotective activity [7], antidiabetic activity, hypolipidemic activity [8]. Flowers and fruits are sedative and anticonvulsant [9]. Flowers are antiatherosclerotic [10], anti-inflammatory, analgesic [11]. The current study is therefore aimed out to provide requisite pharmacognostic and phytoconstituents details about the plant. Pharmacognostic investigation of the anatomical section of the stem as well as powder study will be carried out to determine its morphological, anatomical and phytochemical diagnostic features. Physicochemical properties and qualitative phytochemical measures will be established. Hence, it may be an absolute necessity to create a profile in regards to their identification and then standardization which may lead to further scientific investigations.

MATERIALS AND METHODS

Collection of plant material

The stem of *Capparis decidua* (Capparaceae) was collected in and around Jaipur and was identified in the Department of Botany, Rajasthan University Jaipur. A voucher specimen (No RUBL20861) was deposited in the department.

The stem was subjected to shed drying and further crushed to powder, and then the powder was passed through the mesh 40.

Chemicals and instruments

Compound microscope, glass slides, cover slips, watch glass and other common glass ware were the basic apparatus and instruments used for the study. Solvents used for extraction includes viz. petroleum ether, ethanol (99%), water and reagents viz. phloroglucinol, glycerine, KOH, saffarin.

Macroscopic and Microscopic analysis

The plant was morphologically examined for organoleptic examination like colour, odour, taste, fracture, shape and structure. As a part of quantitative microscopy, transverse section and longitudinal section were prepared and mounted in glycerin on glass slide for identification of internal structures like vascular bundles, pith, cortex and other parts using with iodine and safranin solution by using fresh stem bark of plant [12,13]. Stem were cut into small pieces and allowed to dry in the shade. Dried materials were ground in a mixer to a coarse powder. Powder of the dried stem was used for the observation of powder microscopic characters. The powder drug was separately treated with phloroglucinol, saffarin, glycerin and iodine solution to determine the presence of lignified cells, calcium oxalate crystals and starch grains [14].

Physico-chemical analysis

Physicochemical constant and fluorescence analyses were carried out as per the standard procedures in visible/daylight and UV light (254nm & 365nm) [15]. Physico-chemical analysis i.e. percentage of ash value, extractive value, loss on drying, foreign organic matter, swelling index, crude fibre content were also determined [16].

pH determination

pH 1% Solution

1 gm of the accurately weighed powder of stem of *Capparis decidua* was dissolved in water and filtered. pH of filtrate was determined by using pH meter.

pH 10% Solution

10 gm of the accurately weighed powder of stem of *Capparis decidua* was dissolved in water and filtered. pH of filtrate was determined by using pH meter [17].

Preliminary Phytochemical studies

The powder of dried stem was subjected to successively soxhlet extraction with various organic solvents such as petroleum ether (60-80^{0}C), ethanol & water respectively. After concentration and drying of each extract identification of phytoconstituents was carried out using chemical test and thin layer chromatography method by different detecting reagents [18,19].

RESULTS AND DISCUSSION

Pharmacognostical Studies

Figure 1: The plant Capparis decidua

The morphological study of the stem of *capparis decidua* is shown below in the Table 1.

Table 1: Morphological examination of stem of capparis decidua

Characters	Observation
Shape and structure	Curved
Colour	Green
Taste	Characteristic
Odor	Odorless
Fracture	Rough and corky covered with paired thorns

Microscopical examination of stem of *Capparis decidua*

Transverse section of stem

Observed characters in transverse section of stem of *Capparis decidua* include: Epidermis, non-lignified fibres, cortex, medullary rays, pericycle fibres, vascular bundle and pith.

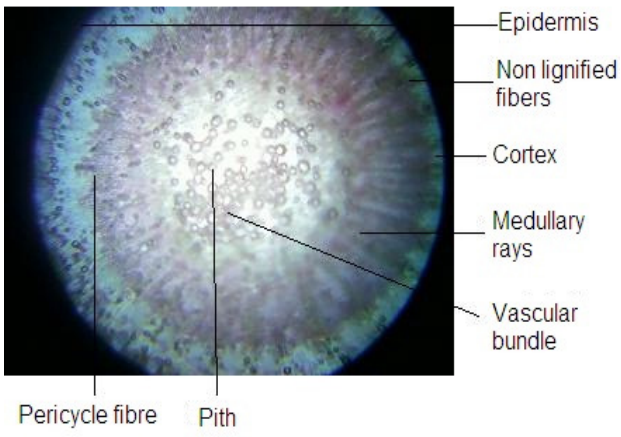

Figure 2: Transverse section of stem of Capparis decidua

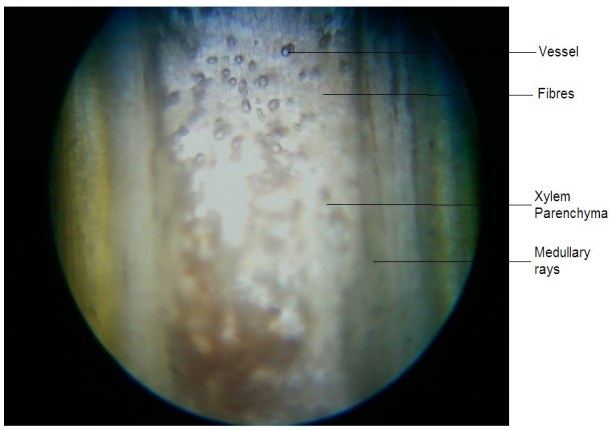

Figure 3: Longitudnal Section of stem of Capparis decidua

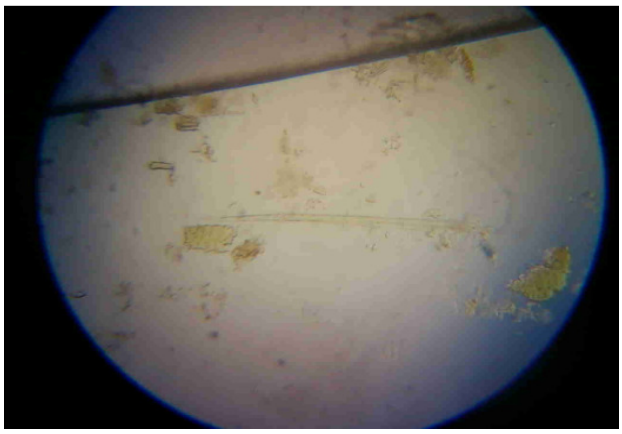

Figure 4: Trichome and Calcium crystal

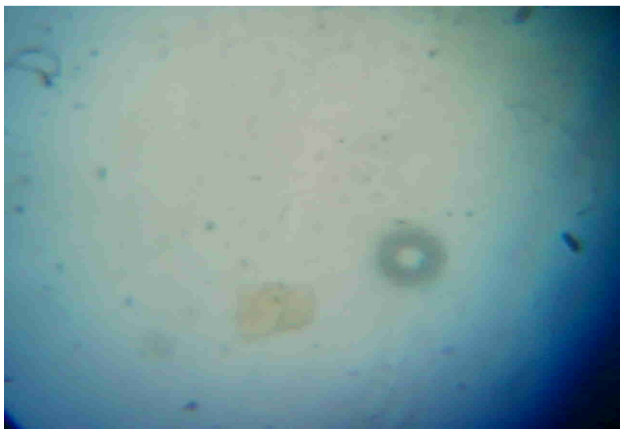

Figure 5: Oil globule

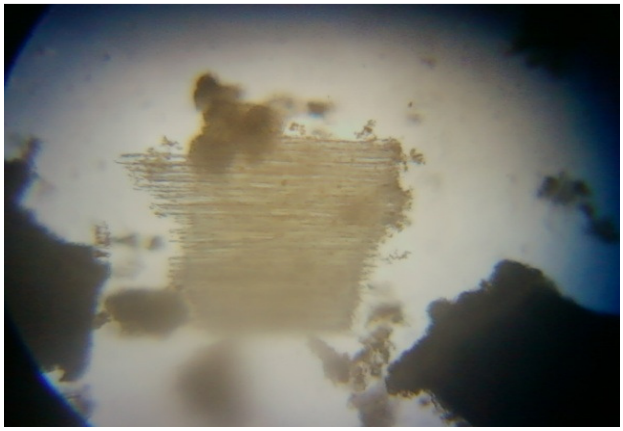

Figure 6: Xylem vessel

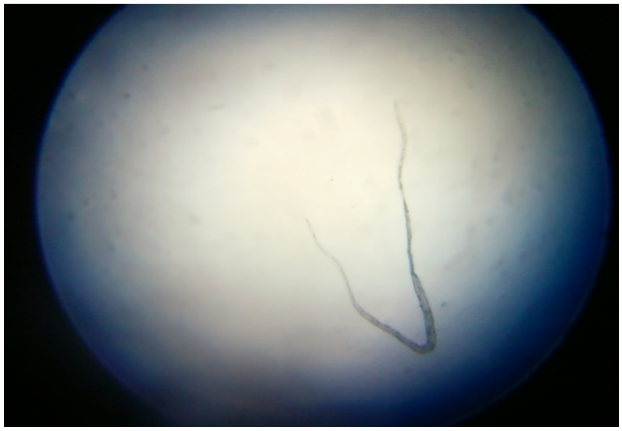

Figure 7: Fibre

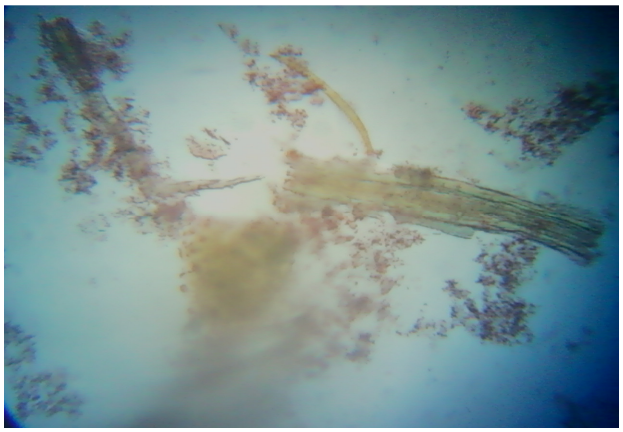

Figure 8: Pericycle fibre

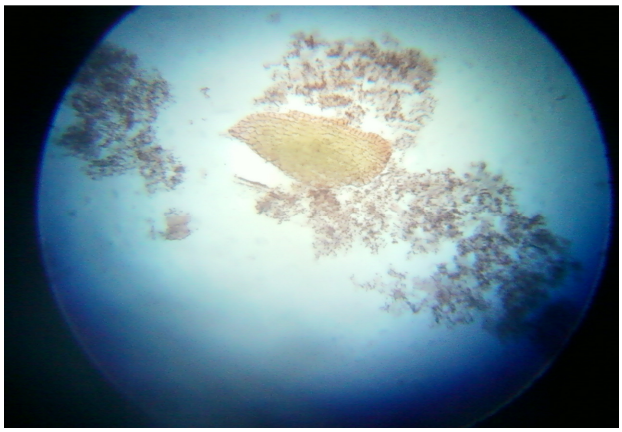

Figure 9: Tracheid

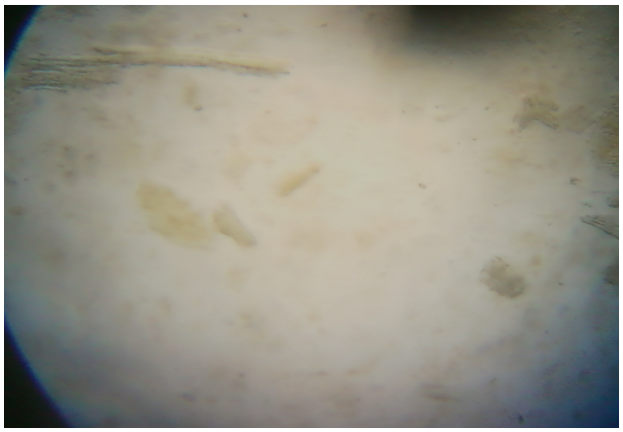

Figure 10: Starch grains

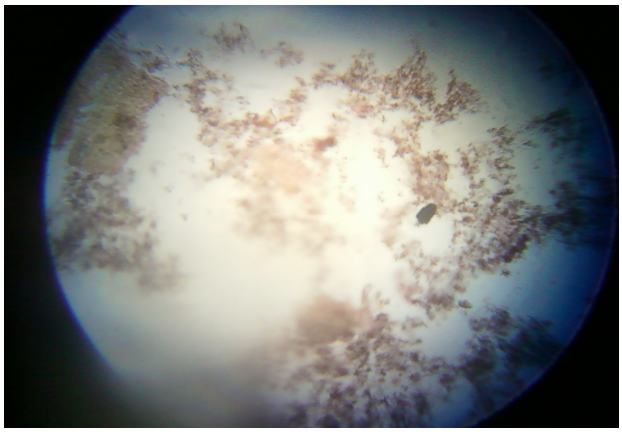

Figure 11: Tracheids with pits

Longitudinal section of stem

The longitudinal section of stem revealed the presence of vessels, fibres, xylem parenchyma and medullary rays.

Powder microscopy

Powdered microscopy showed the presence of trichomes, fibres, calcium crystals, starch grains, xylem vessels and oil globules,tracheids.

Behavior of powder drug with chemical reagents

Behavior of powder drug with different chemical reagents was studied to detect the presence of phytoconstituents with color changes under daylight by reported method and the results are shown in Table 2.

Fluorescence analysis of the powdered drug

Powdered drug are examined in short and long UV to detect the fluorescent compounds by the reported method. The results are compiled in Table 3.

Table 2: Behavior of Capparis decidua stem powder with different chemical reagents.

S.No.	Treatment	Colour observed
1.	Powder as such	Light green
2.	Powder + Conc.HCl	Green
3.	Powder + Conc. HNO_3	Yellowish orange
4.	Powder + Conc.H_2SO_4	Dark red
5.	Powder + Glacial acetic acid	Green
6.	Powder + 5%NaOH	No change
7.	Powder + 5%KOH	Dark green
8.	Powder + 5%$FeCl_3$	Dark green
9.	Powder+ Picric acid	No change
10.	Powder +Ammonia solution	No change

Table 3: Fluorescence analysis of Capparis decidua stem

S.No.	Treatment	Short UV light (254nm)	Long UV light (365nm)
1.	Powder as such	Light green	Green
2.	Powder + 1N NaOH in methanol	Yellowish green	No fluorescence
3.	Powder + 1N NaOH in water	Light green	No fluorescence
4.	Powder + 50% H_2SO_4	Brownish black	Brownish
5.	Powder + Petrolium ether	No change	Yellowish green
6.	Powder + Chloroform	Dark Green	No fluorescence
7.	Powder + Picric acid	Green	No fluorescence
8.	Powder + 5% Ferric chloride solution	No change	Greenish brown
9.	Powder + 5% iodine solution	Green	No fluorescence
10.	Powder + Methanol	Yellowish green	Translucent
11.	Powder + HNO_3 + NH_3	Light green	No fluorescence

Table 4: Standardization parameter of stem of Capparis decidua

S.No.	Parameters	Value obtained w/w on dry weight basis
1.	Total ash	16.85%
2.	Acid insoluble ash	5.34%
3.	Water soluble ash	7.97%
4.	Water soluble extractive value	11.06%
5.	Ethanol soluble extractive value	3.7%
6.	Petroleum ether soluble extractive value	0.21%
7.	Loss on drying	6.84%
8.	Swelling index	0.15ml/mg
9.	Foreign organic matter	0.85%
10.	Crude fibre content	5.55%

Table 7: Qualitative phytochemical analysis of Capparis deidua stem extracts

S.No.	Tests	Powder	Petroleum ether extract	Ethanolic extract	Aqueous extract
1.	Alkaloids	+ve	-ve	+ve	+ve
2.	Steroids	-ve	-ve	+ve	-ve
3.	Glycosides	+ve	+ve	+ve	+ve
4.	Carbohydrates	-ve	-ve	+ve	-ve
5.	Flavanoids	-ve	-ve	-ve	-ve
6.	Protein	+ve	-ve	-ve	+ve
7.	Amino acid	+ve	-ve	-ve	+ve

Standardization parameter

Ash values of a drug give an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. Extractive values are primarily useful for the determination of exhausted or adulterated drugs. Total ash, acid-insoluble ash, water-soluble ash, and sulphated ash values, water soluble extractive value, ethanol soluble, petroleum ether soluble extractive value, Loss on drying, swelling index, foreign organic matter, crude fibre content of the powder drug were done as per the reported methods and the results are tabulated in Table 4.

Successive solvent extraction

Extracts were prepared with various solvents. Percentages of the extractive values were calculated with reference to air-dried drug. Color and consistency of extracts are given in Table 6

Table 5: pH determination of powdered drug of stem of *Capparis decidua*

pH	1% Solution	10 % Solution
	6.	8.2

Table 6: Extractive value *of Capparis deidua* stem

Solvent used	Color and consistency	Average extractive value in %w/w on dry weight basis
Petroleum ether	Blackish green and oily mass	0.39%
Ethanol	Brownish green mass	2.4%
Water	Brownish yellow dry mass	3.6%

Qualitative phytochemical screening

Freshly prepared extracts were tested for the presence of phytoconstituents using reported methods and the results are given in Table 7.

CONCLUSION

The present study on Pharmacognostical & Phytochemical evaluation of *Capparis decidua* will provide useful information for its identification. Macro, micro and physiochemical standards discussed above can be considered as the identifying parameters to substantiate and authenticate the drug.

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