Research Article

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A Pharmacognostical Study on Stem of *Capparis decidua* Edgew.

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ABSTRACT
Capparis decidua (Family, Capparidaceae), commonly known as 'Kair', is a xerophytic plant distributed throughout the arid regions of India and other countries. The plant is used traditionally for various medicinal purposes. The present study deals with the development of pharmacognostical and physico-chemical parameters of *Capparis decidua* stem. Fresh stems were studied for macroscopical and microscopical characters. The stem is much branched; each branch is slender and bears spines. Mature branches are leafless and show brownish bark. Microscopically, young stem shows epidermis with sunken stomata and a thick cuticle, hypodermis made up of palisade-like cells and sclereids, cortex with stone cells band and group of cortical fibres, pericyclic fibres, a ring of vascular bundles and well-developed pith with pitted and lignified cells. Crystals of calcium oxalate and starch grains are found throughout the transverse section. Old stem shows a similar structure, but epidermis and hypodermis are replaced by cork. Powder of stem shows epidermis, stone cells, sclereids, fibres, xylem vessels, crystals of calcium oxalate, starch grains and fragments of cortex and pith. The moisture content, water and alcohol soluble extractives and ash values were also determined. The quality parameters developed would serve as useful tool in standardization of *C. decidua* stem.

KEY WORDS: *Capparis decidua*, Capparidaceae, Macroscopy, Microscopy, Quality parameters.

INTRODUCTION

Capparis decidua Edgew. (Syn. *Capparis aphylla* Roth.), commonly known as 'Kair' in Gujarat, is a xerophytic plant belonging to the family Capparidaceae [1, 2]. It is much branched, glabrous, spiny and almost leafless shrub or a small tree found to be growing in dry wastelands throughout the tropical and sub-tropical regions of India and other countries [3]. Its fruits and flower buds are used in pickles. Ethnomedically, the plant is reported to possess laxative, digestive, analgesic, anthelmintic, antibacterial, antifungal[4], hypoglycaemic [5, 6], diaphoretic activities and are also useful in rheumatism[7], gout, dropsy, asthma, ulcers, piles, cough, intermittent fever and as an antidote to poison [1]. The fruits are astringent and useful in cardiac and hepatic troubles [8-10]. Tender branches and leaves are chewed to relieve toothache [2]. Literature survey revealed the presence of β-sitosterol, spermidine alkaloids, glucosinolates, l-stachydrine, rutin, hydrocarbons and terpenolides [11-17].

MATERIALS AND METHODS

Plant Material

The fresh stems of *C. decidua* were collected from Gujarat University area, Ahmedabad in May 2011, during flowering season and authenticated by a taxonomist at the Department of Botany, Gujarat University, Ahmedabad. A voucher specimen no LMCP/PHARMACOGNOSY/2011/ 29 was deposited in the Department of Pharmacognosy of L. M. College of Pharmacy, Ahmedabad. The collected material was cleaned, dried at room temperature, powdered to 60# and stored in airtight container.

Pharmacognostical Studies

Macroscopical and Microscopical Studies

The stem and its powder were studied for macroscopical characters. Microscopical study was performed for fresh stem (by taking free hand transverse sections of young and old stem) and powder of stem.

Fig. 1 A Flowering Twig of *Capparis decidua*

Fig. 2 The Dried Stem of *C. decidua*

Physicochemical Evaluation

Physico-chemical parameters i.e. loss on drying, ash values and extractive values were determined according to the official methods [18,19].

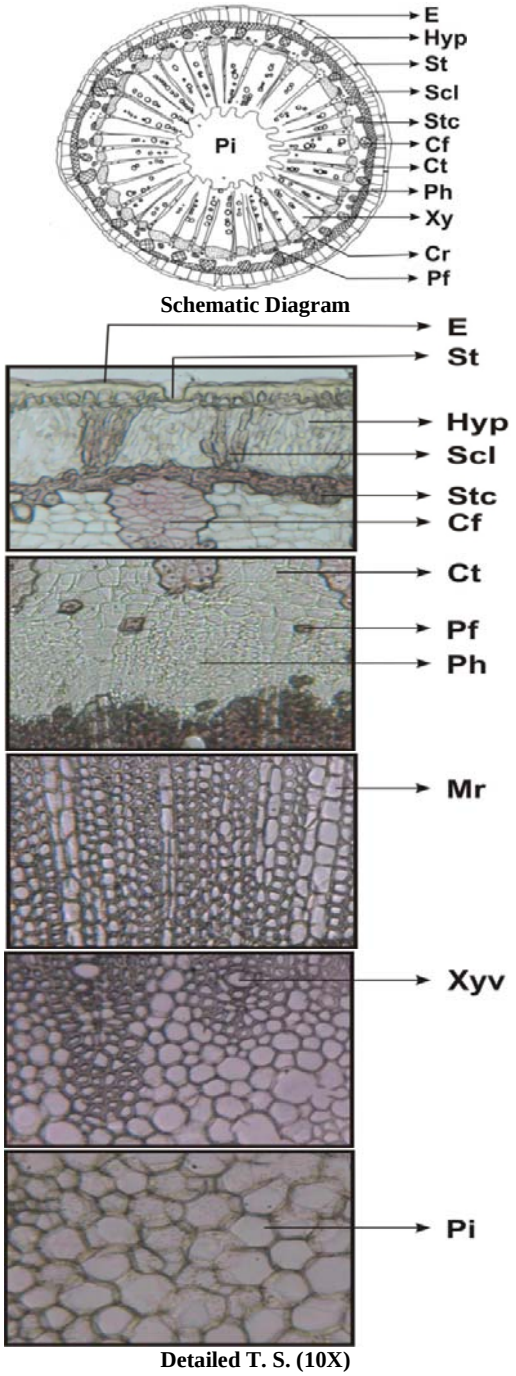


Fig. 3 T. S. of Young Stem of *C. decidua,* Cf, Cortical fibre; Cr, Crystals; Ct, Cortex; E, Epidermis; Hyp, Hypodermis; Mr, Medullay rays; Pf, Pericyclic fibres; Ph, Phloem; Pi, Pith; Scl, Sclereid; St, Stomata; Stc, Stone cells; Xy, Xylem; Xyv, Xylem vessel

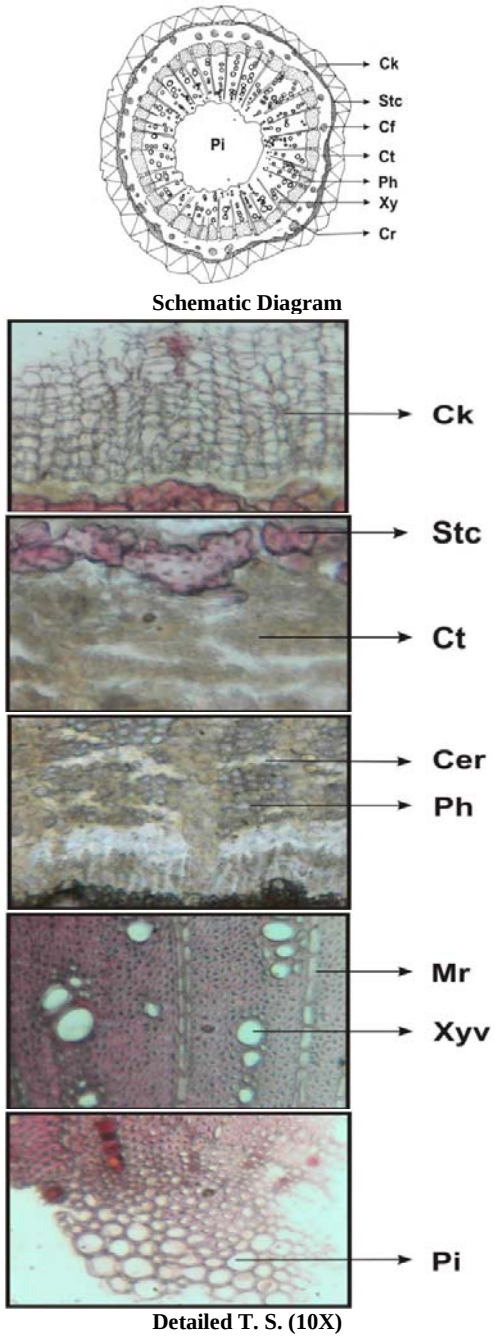


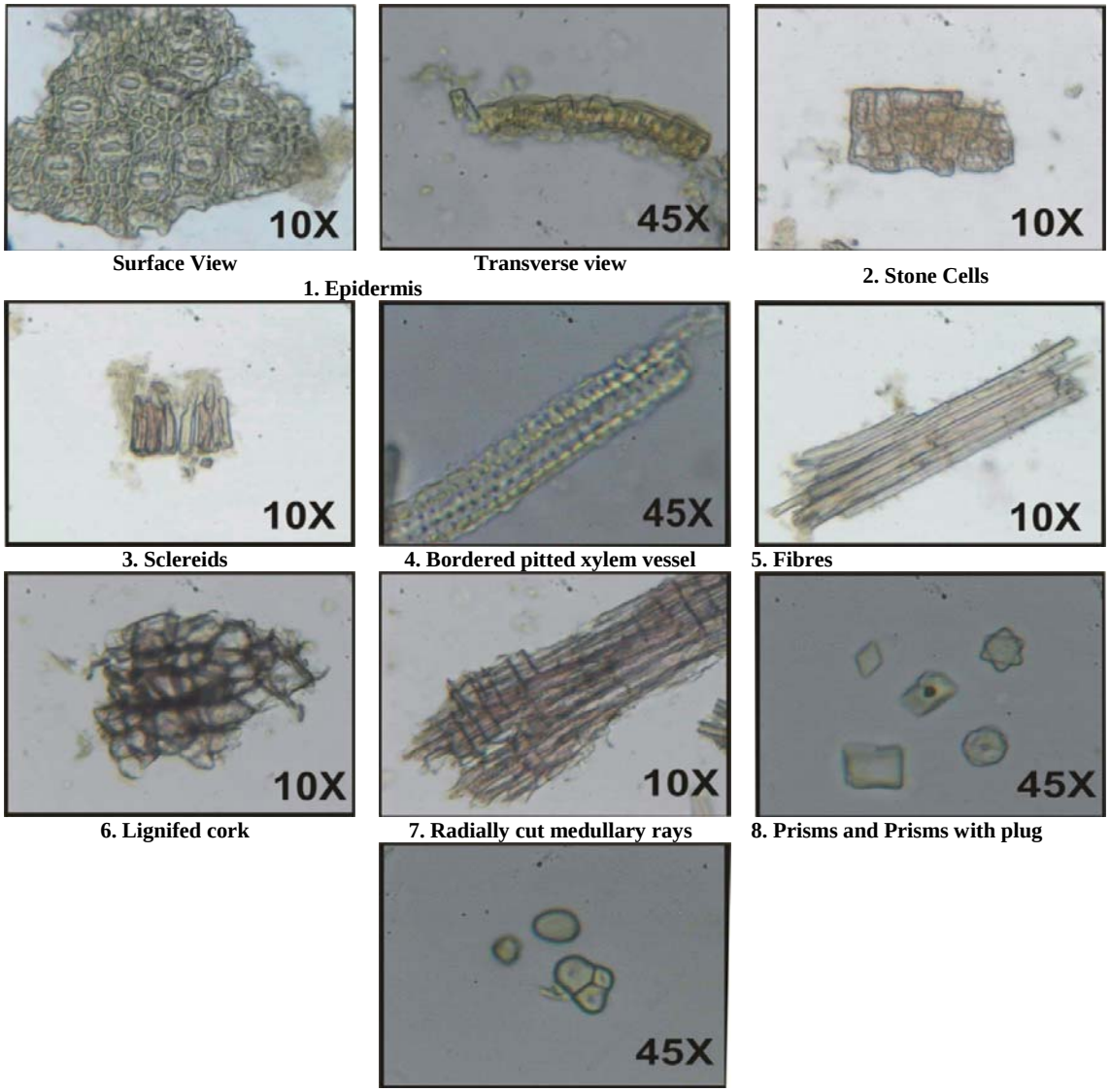
Fig. 4 T.S. of Old Stem of *C. decidua,* Cer, Ceratenchyma; Cf, Cortical fibre; Ck, Cork; Cr, Crystals; Ct, Cortex; Mr, Medullay rays; Ph, Phloem; Pi, Pith; Stc, Stone cells; Xy, Xylem; Xyv, Xylem vessel

RESULTS AND DISCUSSION

Macroscopical Study

The stem is highly branched; each branch is glabrous, slender, erect or slightly bent at the nodes, cylindrical to slightly angular, up to 5 m in height and 0.1 to 2 cm in diameter. The nodes are swollen, 0.5 to 2.5 cm in diameter

and bear a pair of small, straight, sharp and pale brown coloured spines. Leaves are present only on young shoots, so mature branches are leafless. Internodes are 1.5 to 4 cm in length, longitudinally striated with glossy surface and fibrous fracture. Young stems are generally dark green in colour, but they become pale green to brownish when dried. As the plant grows old, the stems develop a whitish gray coloured bark. The stems have a characteristic odour and taste (**Fig. 1 and Fig. 2**).



Surface View **Transverse view** **2. Stone Cells**

1. Epidermis

3. Sclereids **4. Bordered pitted xylem vessel** **5. Fibres**

6. Lignifed cork **7. Radially cut medullary rays** **8. Prisms and Prisms with plug**

9. Starch grains

Fig. 5 Microscopical Characteristics of Powder of C. *decidua* Stem

Microscopical Study

Transverse Section of Young Stem (Fig. 3)

The transverse section of young stem is circular in outline and reveals the presence of following layers:

Epidermis: It consists of a single layer of tangentially running cells, covered with thick and papillose cuticle. It shows presence of sunken stomata at frequent intervals. Trichomes are absent.

Hypodermis: It follows the epidermis and is made up of 2 to 5 layers of elongated, compactly arranged palisade-like cells containing chloroplasts. These cells are alternated at intervals by a group of 5 to 20 elongated and lignified sclereids.

Cortex: It consists of 5 to 15 layers of isodiametric parenchymatous cells. In the peripheral part of cortex, 2 to 3 cells wide band of thick-walled, lignified and pitted stone cells are seen. Cortex also shows a group of 4 to 50 small-sized, thick-walled and lignified cortical fibres and sometimes few scattered stone cells also.

Pericycle: It may be present over the phloem and may consist of few lignified pericyclic fibres and sometimes stone cells also.

Stele: It consists of narrow zone of phloem, composed of sieve tissues, companion cells and parenchyma, which encircles a wide xylem, composed of radially arranged or scattered xylem vessels, tracheids, fibres and parenchyma.

The medullary rays are uni to triseriate and pitted, extending up to and becoming wider in the phloem region.

Pith: It is the small, centermost part which consists of pitted and lignified cells.

Cell content: Numerous irregular-shaped prisms of calcium oxalate, prisms with plugs and simple or compound starch grains are found throughout the parenchymatous tissues in the transverse section, especially in the medullary rays.

Transverse Section of Old Stem (Fig. 4)

It shows a similar structure, but epidermis and hypodermis are replaced by cork, which is made up of 10 to 20 layers of tangentially elongated and radially arranged lignified cells. Cortical and pericyclic fibres are few or absent. Stele region also shows secondary phloem, ceratenchyma and secondary xylem. Pith is wide and well-developed.

Powder Characteristics of Stem (Fig. 5)

The powder of stem is fibrous and pale green in colour with distinct odour and taste.

Microscopically, the diagnostic characters of *C. decidua* stem powder include the following:

- Fragments of epidermis in surface view with embedded sunken stomata.
- Fragments of epidermis in transverse view with papillose cuticle and embedded sunken stomata.
- Lignified and pitted stone cells which may be isolated or in groups of 2 to 25.
- Group of lignified sclereids of the hypodermis.
- Fragments of lignified and bordered-pitted xylem vessels.
- Group of lignified, septate fibres.
- Fragments of lignified cork in surface view.
- Radially cut medullary rays.
- Prisms of calcium oxalate in various shapes and Prisms with plugs.
- Simple or compound starch grains; compound starch grains containing 2 or 3 grains.

Physicochemical Evaluation

Data of physicochemical parameters of stem including loss on drying, ash values and extractive values are given in **Table 1**. Moisture content of the stems was found to be about 44% w/w. Water soluble ash value was found to be more than acid insoluble ash value. The stem also showed higher water soluble components than alcohol soluble components.

Table 1. Physico-chemical Parameters of *C. decidua* Stem

Quality Parameters	Values (%w/w ± S.D.)
Loss on Drying	44.12 ± 0.203
Ash Value	
Total ash	8.13 ± 0.030
Acid insoluble ash	0.50 ± 0.019
Water soluble ash	6.03 ± 0.025
Extractive value	
Water soluble extractive	20.00 ± 0.135
Alcohol soluble extractive	6.67 ± 0.127

CONCLUSION

The stems of *C. decidua* are having easy availability because of their xerophytic nature and are valued for their numerous medicinal properties in the Indian system of medicine. A survey of literature and screening of scientific data revealed that the plant is investigated as far as its phytochemistry and pharmacology is concerned, however, the pharmacognostical evaluation and systematic standardization study is still lacking. As the global market demands superior quality of crude drugs, their semi-processed forms and their finished products, it is essential to ensure quality control at all levels for standardization, efficacy, safety and consistency and also to purport the use of the plant in more rational way for its scientific predetermined therapeutic objectives. This includes assurance in terms of botanical and physicochemical standards. So, the pharmacognostical parameters developed in the present study would serve as useful tool in the standardization and documentation of monograph on *C. decidua* plant.

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