

Pharmacognostical and Phytochemical Evaluation of the stem of *Ziziphus xylopyrus* (Retz) Willd

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ABSTRACT

The present study deals with detailed pharmacognostic profile of stem of *Z. xylopyrus*, family Rhamnaceae an important plant in the Indian system of medicine. Stem samples of *Z. xylopyrus* were studied by morphological, microscopical, physicochemical, phytochemical and powder characters of the plant and other methods for standardization recommended by WHO. Macro and microscopical studies indicated the presence of stem reddish brown in colour externally and internally whitish in colour, odourless and having pungent taste with smooth, irregular fracture. Xylem fibers arranged in radial rows, xylem parenchyma, vessel or xylem vessels, medullary rays were uni to tetraserate and pith. Powder microscopy revealed the presence of sclerenchyma, sclerenchymatous fibre and wood elements. Phytochemical evaluation have been performed which clearly reveals the occurrence of alkaloids, carbohydrates, steroids and sterol, glycosides, saponins, flavonoids, phenolic compounds, triterpenoids. Physicochemical parameters such as ash value extractive values were also determined and results showed that water soluble extractive value was higher than alcohol soluble extractive value. The results of the study can serve as a valuable source of information and provide suitable standards for identification of this plant material in future investigation and application.

Keywords: Pharmacognosy, Phytochemical, macroscopy, microscopy, powder microscopy, *Z. xylopyrus*

INTRODUCTION

Z. xylopyrus family Rhamnaceae is commonly known as Jujab in English [Ayurvedic pharmacopoeia, 2006]. It is a large, straggling shrub or a small tree, armed with spines, up to 4 m in height. Fruits are globose, 3- rarely 2- or 4-celled, with usually a seed in each cell, very hard and woody. It is found in Pakistan and China, North-Western India, Uttar Pradesh, Bihar, Central and South India [Anonymous, 1976]. The fruit decoction of this plant is used toward increase sterility in woman intended birth control in some parts of Rajasthan, India [Jain A et al., 2006]. This plant is widely used in Turkish medicines as a potent sedative [Jagtap SD et al., 2006]. Bark and leaf powder paste applied externally for chest pain due to cough. In stomach ache and indigestion fruit powder (3-4 gms) administered with pinch ginger powder thrice in a day. The leaves contain quercetin

and quercitrin. The bark contains tannins (7.2%) 7, 3, 4-trihydroxy flavan-3, 4-diol and oleanic acid [Yadav M et al., 2011]. *Z. xylopyrus* is used in Pyorrhoea and to check oogenesis [Meena AK and Rao MM, 2010]. The bark is used for its astringent activity and as dental sticks for teeth cleaning. In different parts of India this plant is also used in the treatment of diarrhoea [Dash SK and Padhy S, 2006]. Leaf paste is applied on pimples and it is ground along with latex of *Ipomea carnea* applied on boils [Naidu KA and Khasim SM, 2010]. One to two inches of the fresh stem bark of this species are chewed with 1-2 peppers, and the sap swallowed once daily for five days in the treatment of cough [Reddy KN et al., 2006]. Xylopyrine-A and Xylopyrine-B, the two new 13-membered cyclopeptide alkaloids are also present in *Ziziphus* species i.e. *Z. xylopyra* [Singh AK et al., 2007]. However the available literature

revealed that pharmacognostic study on stem was not reported.

Thus, establishment of the pharmacognostic profile of the stem of *Z. xylopyrus* will assist in standardization of the latter that can assure quality, purity, and identification of samples.

MATERIALS AND METHODS

Plant Material:

Fresh stem of the plant was collected in the month of July from Tirupati district, Andhra Pradesh, India. The Plant was authenticated by the botanist, Dr. K. Madhavachetty, Assistant Professor, Department of Botany, Sri Venkateshwara University, Tirupati, Andhra Pradesh, India.

Macroscopy:

The following macroscopic characters for fresh stem were noted: size and shape, colour, odour and taste [Evans, 2002] [Kokate CK, 2007].

Microscopy:

In histological studies Transverse sections of fresh stem were prepared, stained and observed under Motic digital microscope at projection 10X. In microscopy of stem of *Z. xylopyrus* standard procedure were followed [Sass JE, 1940] [O'Brien TP et al., 1964]. Descriptive terms of the anatomical features are as given in the standard anatomy books [Easu K, 1964].

Powder microscopic Examination:

The powdered stem was examined for sclerenchyma, sclerenchymatous fibre, wood element and other following standard methods [1 Kokate CK, 1986].

Phytochemical investigation:

Chemical tests were performed in the Preliminary phytochemical screening to identify various secondary metabolites such as alkaloids, glycosides, saponins, flavonoids, sterols using the standard procedure. [Kokate CK, 1991] [Khandelwal KR, 2007].

Physicochemical Investigations:

Physical parameters determined for the powdered stem such as percentage of ash values and extractive values were determined according to the well established official methods and procedure [Indian

Pharmacopoeia, 2010] [Ayurvedic Pharmacopoeia, 2008].

Results:

Macroscopic character of Stem of *Z. xylopyrus* (Retz) Willd:

The observed macroscopical characters of stem of *Z. xylopyrus* were as follows:

Size : 10 to 15 cm long 1 to 2 cm in width
Shape : Cylindrical
Colour : Outer side reddish brown and inner side whitish in colour
Odour : Odourless
Taste : Pungent
Fracture : Smooth, irregular

Microscopical studies:

The transverse sections of the stem of *Z. xylopyrus* (Retz) Willd. Showed the following characters:

Xylem fibers: These are thick walled, pitted arranged in radial rows (Fig1b).

Xylem parenchyma: It is small, polygonal, less thickened, consisting of pitted wall (Fig 1b).

Vessels or xylem vessels: The vessels are big, It is found either single or in group of few (Fig 1c).

Medullary rays: The medullary rays are prominent, uni to tetraserate; radially elongated, pitted, contain few starch grains (Fig1a).

Pith: Large rounded cells with dark brown mucilaginous substance (Fig 1d-1e).

T.S. FIGURES OF STEM OF *ZIZIPHUS XYLOPYRUS*

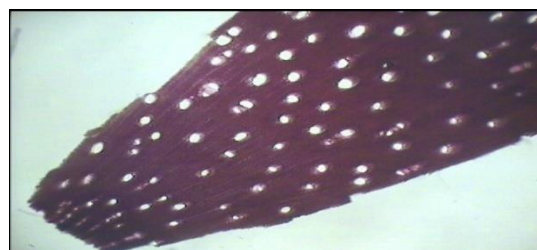


Fig 1a: T.S. of stem entire view of *Z. xylopyrus* (Magnification 10X).
MR- medullary rays

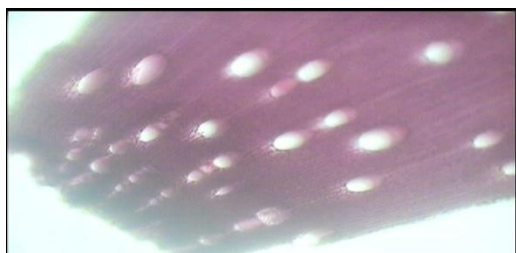


Fig 1b: T.S. of stem enlarged of *Z. xylopyrus* (Magnification 10X).

Xb- xylem fibres, Xp- xylem parenchyma.

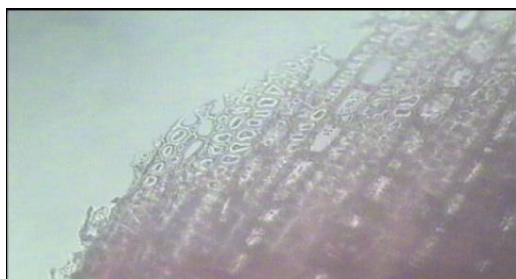


Fig 1c: T.S. of stem showing xylem of *Z. xylopyrus* (Magnification 10X).

X- xylem.



Fig 1d: T.S. of stem pith entire of *Z. xylopyrus* (Magnification 10X).

Pi- pith.

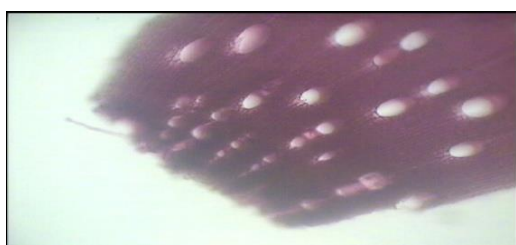


Fig 1e: T.S. of stem pith enlarged of *Z. xylopyrus* (Magnification 10X).

Pi- pith.

Powder microscopy:

Powder microscopic examination showed the presence of sclerenchyma, sclerenchymatous fibre, wood element in stem of *Z. xylopyrus* (Fig. 2a- 2c).

POWDER CHARACTERS OF STEM OF ZIZIPHUS XYLOPYRUS



Fig 2a: Sclerenchyma of *Z. xylopyrus* (Magnification 10X).

Sc- Sclerenchyma.



Fig 2b: Sclerenchymatous fibre of *Z. xylopyrus* (Magnification 10X).

Scf- Sclerenchymatous fibre.



Fig 2c: Wood element of *Z. xylopyrus* (Magnification 10X).

We – Wood element

Phytochemical Investigation:

The results of phytochemical screening of the various extracts of *Z. xylopyrus* stem revealed the presence of alkaloids, carbohydrates, steroids and sterol, glycoside, saponins, flavonoids, phenolic compounds, triterpenoids (Table No.1). These secondary metabolites are known to possess various pharmacological effects and may be responsible for various actions of *Z. xylopyrus*.

Table No.1: Preliminary phytochemical screening of various extracts of *Ziziphus xylopyrus* stem.

S. No.	Plant constituents	Ethanol extract	Aqueous Extract
1	Alkaloids	+	+
2	Carbohydrates	+	+
3	Glycosides	+	-
4	Saponins	+	+
5	Proteins and Amino acids	-	-
6	Phytosterols	+	-
7	Flavonoids	+	-
8	Phenolic compounds (Tannins)	+	+
9	Acidic compounds	-	-
10	Aleurone grains	-	-
11	Insulin	+	-
12	Lignin	+	+
13	Triterpenoids	+	+

Physicochemical Evaluation parameters:

The calculated physicochemical parameters such as ash values, extractive values of the stem of *Z. xylopyrus* are presented in (Table No.2)

Table No.2: Physical parameters of the stem of *Ziziphus xylopyrus* (Retz) Willd.

S.No.	Parameters	Result (%)
1	Total ash value	2.486
2	Acid insoluble ash value	0.576
3	Water soluble ash value	0.909
4	Sulphated ash value	1.623
5	Extractive value (water soluble)	2.37
6	Extractive value (alcohol soluble)	1.62

Conflict of interest: None

DISCUSSION

Ziziphus xylopyrus (Retz) Willd. is currently being used in the treatment of various diseases. The standardization of crude is an integral part of for establishing its correct identity. Before any crude can included in an herbal pharmacopoeia, pharmacognostic parameters and standards must be established as per WHO guidelines.

Z. xylopyrus is a plant that has been confused with other species due to their relative similarities. The results, of these investigations could serve as a basis for proper identification, collection and investigation of the plant. The macro and micro features of the stem described, distinguishes it from other members of genera. Powder microscopy and physicochemical parameters are unique to the plant and are required in its standardization. Phytochemical study is also useful to isolate the pharmacologically active principles present in the extract. Previous reports of preliminary phytochemical screening of the various species of *Ziziphus* suggest the presence of Xylopyrine-A and Xylopyrine-B, the two new 13-membered cyclopeptide alkaloids, β sitosterol, fatty acids and tannins. The information obtained from the ash values and extractive values are useful during the time of collection and also during extraction process. Using these standards, the plant can be differentiated from other related species.

CONCLUSION

The results of the study can serve as a valuable source of information and provide suitable standards for identification of this plant material in future investigation and application.

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