

PHARMACOGNOSTICAL AND PHYSICOCHEMICAL CHARACTERISTICS OF ROOTS OF LESSER KNOWN MEDICINAL PLANT CAESALPINIA DIGYNA ROTTL.

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ABSTRACT :

Caesalpinia digyna Rottl. (Caesalpiniaceae) is shrubby perennial climber found in Eastern Ghats. Roots are astringent and used in Ayurveda and Unani systems of medicines. Bergenin, Caesalpinine A and Caesalpinine C were isolated from the roots. However, this medicinal plant has not been studied pharmacognostically. Hence, the present investigation reports pharmacognostical and physicochemical properties of roots of *Caesalpinia digyna*.

Keywords:

Caesalpinia digyna, Caesalpiniaceae, Pharmacognosy, Physicochemical properties, Ayurveda

INTRODUCTION

Caesalpinia digyna Rotl. (Caesalpiniaceae) is a large, perennial, prickly and shrubby climber. Leaves are bi-pinnate and racemes are axillary as well as terminal. It is called as Vakeri mul in Hindi, Nune-Gacca in Telugu and Umul-Kuchi in Bengali. It is chiefly found near villages in Eastern Ghats of Andhra Pradesh, Madhya Pradesh, and West Bengal and also reported to be found in parts of Eastern Himalayas. Roots are medicinally useful. They are astringent, given internally in phthisis, scrofulous affections and diabetes. It is

also useful as a febrifuge and is said to have an intoxicating effect¹⁻³. A crystalline like substance provisionally named as Vikerin was isolated⁴ and later confirmed as Bergenin⁵, which has anti-inflammatory property⁶. Caesalpinine A and Caesalpinine C were isolated and their structures were determined^{7,8}. 2,3-Dihydro-7-hydroxy-3-[(4-methoxyphenyl) Methylene]-4 H-1-benzopyran-4-one was isolated from the leaves and twigs⁹. However, this medicinal plant has not been studied pharmacognostically. Hence, the

present investigation reports pharmacognostical and physico-chemical properties of roots of *Caesalpinia digyna*.

MATERIALS AND METHODS

Authentic plants found in villages of Godavari Dt., Andhra Pradesh were identified with local flora¹⁰ and roots were collected and shade dried for further studies. Organoleptical, macroscopical and microscopical characters were studied as described in quality control methods¹¹⁻¹³. Physicochemical tests¹⁴, fluorescent analysis¹⁵ were carried with powdered specimen. Qualitative phytochemical tests¹⁶ were carried on extracts successively using different solvents.

RESULTS AND DISCUSSION

Organoleptical and macroscopical Characters

The bulk material of roots consists of root pieces of up to 15 cm in length and up to 5 cms in thickness. They are slightly astringent with characteristic pleasant odor. They are reddish brown to dark brown to brick red in color. Cut ends and wood are mild brown to reddish brown in color. Outer surface is longitudinally shrunk and has root scars. They are very hard in nature. The bark is easily peeled off on handling. Texture is rough and fracture is fibrous. Lenticels are circular or irregularly shaped, nearly cup like, white in color and few in young barks and

abundant in matured ones. Wood is finely porous and vessels are visible with naked eye at broken and cut ends. Surface of the woody portion (where the bark was peeled) is smooth with longitudinal running ridges. Secondary and tertiary roots of 1-3 mm in thickness and up to 40 cm in length are observed.

Microscopical characters

TS of young roots or rootlets are circular with cracked margins. Outermost layer is single layered epidermis followed by 10-25 layers of cork cells and then by the secondary cortex, secondary phloem and central xylem. Secondary cortex and secondary phloem are not easily distinguishable. Patches of fibers are observed in the secondary phloem. Ray cells are unicellular or multicellular in secondary xylem. Few resin ducts or cells are observed with yellowish brown contents.

The bark is easily peeled off on handling from the woody portion and hence the description is given individually for bark and wood. TS of bark from matured root shows phellem, phelloderm, phellogen, secondary xylem and centrally located remnants of primary vascular tissue. Cork or phellem, the outermost tissue is fissured and hence the outline is irregular and the thickness of the cork zone is not uniform. The cells are yellowish brown in color and number of rows of cells varies from 15-30 and even more. The cells are suberised and lignified.

They are narrowly rectangular, tangentially elongated, tightly packed and lack intercellular spaces. Phellogen is not clearly observed in commercial samples. Phelloderm or secondary cortex is divided in to outer few layers of polygonal shaped, thin walled and compressed parenchyma cells and inner many layered sclerenchyma cells. Sclerenchyma cells are nearly in a continuous ring with large lumen and pits. The presence of sclerenchyma ring is a character similar to roots of *Abrus precatorius*¹⁷. Inner to this is the secondary phloem that consists of individual or grouped fibers, parenchyma cells and rays. Other cells are not clearly visible. Secondary xylem consists of vessel elements, parenchyma cells, fibers and ray cells. Ray cells are one or two layered and square or elongated. Parenchyma cells and fibers are alternatively arranged in-between two rays. Ferric chloride solution turns the cell contents to black indicating the presence of tannin. Vessel elements are not distinctly characterized. Few resin ducts or cells are observed in secondary xylem region with yellowish brown contents. Isolated prismatic calcium oxalates are found in parenchyma cells of phelloderm, secondary phloem and secondary xylem. Starch grains are simple spherical to irregular. The hilum and striations are not clear. They measure from 3.75 –15 μ in size.

Powder analysis

Powder is yellowish to mild brown with dark brown or black spots of cork cells. It primarily consists of vessel elements, fibers, parenchyma cells, cork cells and starch grains. Vessel elements are smaller (25-35 μ X 90-190 μ) or larger (40-230 μ X 220–450 μ), with bordered pits. Some are broad and short whereas others are narrow and long. Some are with blunt ends while others with tailed ends. Bast fibers have broad lumen (30-35 μ in thickness) than fibers from wood, which are thin with narrow lumen and both are 10-20 μ X 450-1020 μ in size with tapering ends. Stone cells vary in size (35-80 μ) and are either rounded or polygonal or elongated or oval in shape with pits. Parenchyma cells are rounded or polygonal, thin walled and 30-110 μ in size.

Physicochemical parameters

Physical constant values like total ash, acid insoluble ash, and successive extractive values in petroleum ether, benzene, chloroform, alcohol and water are tabulated in Table 1. Color of the powder with different chemical reagents and fluorescent behaviors are tabulated in Tables 2 and 3 respectively. Preliminary phytochemical analysis for alkaloids, glycosides, carbohydrates, tannins, flavonoids, amino acids, steroids, terpenoids, saponins, fatty acids and essential oils are tabulated in Table 4. Methanol extract tested positive result for all tests except for amino acids are essential oils. Glycosides, tannins, terpenoids and

fatty acids were present in all the extracts. Alkaloids and saponins were not found in aqueous extract. Glycosides were present in equal quantity in all the extracts. In

general, roots are rich in terpenoids and tannins.

Table 1: Physical constant values of root of *C. digyna*

Parameters studied		Value in %
Total ash		2.89
Acid insoluble ash		0.19
Extractive values in	Petroleum ether	0.39
	Benzene	2.59
	Chloroform	4.51
	Alcohol	10.38
	Water	4.40

Table 2: Behavior of powdered root of *C. digyna* with different solvents

Powder + reagent used	Color obtained
Powder as such	Brown
P + Conc. HNO ₃	Yellow
P + Conc. HCl	Brownish
P + Conc. H ₂ SO ₄	Black
P + Acetic acid	Brown
P + 10% NaOH	Brownish black
P + 1N HCl	Brown
P + 5% Ferric chloride	Violet

Table 3: Fluorescent behavior of root of *C. digyna*

Powder + Reagent used	Color obtained
	UV light
Powder as such	Yellow fluorescence
P + 1N NaOH in water	Nil
P + 1N NaOH in alcohol	Bluish fluorescence
P + 1N HCl	Nil
P + 50% HNO ₃	Nil

Table 4: Preliminary phytochemical investigations of roots of *C. digyna*

Extracts of	Alkaloids	Glycosides	Carbohydrates	Tannins	Flavonoids	Amino acids	Steroids	Terpenoids	Saponins	Fatty acids	Essential oils
Chloroform	++	+	-	+	-	-	-	+++	+	+	-
Methanol	+	+	++	++	+	-	+	+++	+	+++	-
Water	-	+	-	+	-	-	-	+	-	+	-
- Nil; + Less; ++ More; +++ Abundant											

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