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A PHARMACOGNOSTIC REPORT ON THE LEAF AND ROOT OF POLYSCIAS FRUTICOSA (L.) HARMS

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ABSTRACT: *The major diagnostic characters and qualitative chemical and physical tests responsible for the pharmacognostic identity of the leaf and of root of Polyscias fruticosa (L) Harms have been reported. Literature survey showed the absence of any systematic pharmacognostic studies for this plant.*

INTRODUCTION

Polysicas fruticosa (L) Harm[1] (Araliaceae), (Fig1) is available throughout the warmer parts of India, Malaysia and Polynesia. This plant has synonyms [2,3,4] like *Panax fruticosa*, *Nothopanax fruticosam*, *Parsley panax*, *Ming aralia*, *Dinhlang* or Indian *Polyscias*. The plant species included I this family containing large quantity of saponins have long been used in many parts f the world for their detergent properties. These saponins are characterized by their property of producing a forthing aqueous solution and also its haemolytic property. *Panax ginseng* one of the well known species included in the family Araliaceae have held and honored place in Chinese medicine as a good adaptogenic drug [5,6]. Since *Panax fruticosam* also having large amount of saponins in its leaves and roots this plant can very well substitute its costlier Chinese counterpart – *Panax ginseng* if cultivated with care. In our report we made and attempt to standardize this plant pharmacognostically by studying is morphology, macro and microscipical features, histological characters, qualitative physical and chemical analytical reports, TLC data, etc.

MATERIALS AND METHODS

The plant was collected from N. Parur, Ernakulam district, kerala and also from Coimbatore, Tamil Nadu and authenticated at the Horticulture Dept., Tamil Nadu Agriculture University, Coimbatore, Tamilnadu. Voucher specimen was deposited in the herbarium, Pharmacgnosy laboratory, college of pharmacy, SRIPMS.

Morphology[7]: *Polyscias fruticosa* is a woody, glabrous, erect evergreen shrub reaching a height of 11/2 – 21/2 meters. The stems are hollow in the internodes and solid at the nodes.

Leaves (Fig2): Spiny, Bi- serrate, compound, mostly lanceolate acuminate, sharply and irregularly spinulose toothed, often lobbed and about 5-10 cm in length. The terminal segments usually larger than the other and more often lobbed.

Flowers are umbellate inflorescence with epigynous flowers. There are five petals and the base is broad with petals and the base is broad with petals alternate. Fruits are

compressed ovoid and about 4 cm in length. Seeds are also found compressed.

Histological studies

Anatomy of *P. fruticosa* leaf: Leaf is dorsiventral in appearance. The transverse section of the leaf of *P. fruitcosa* showed the following characters. (fig.5)

Lamina: A single layer of upper epidermis is present. The mesophyll cells consist of calcium oxalate crystals and occurred in large quantity in the ground tissue of the veins. Lower epidermis is similar to upper epidermis which is also single layered.

Unicellular covering trichomes can be seen very rarely in the epidermal cells.

Mid rib: Mainly occupied by cortical parenchyma with vascular bundles present in the middle. Vascular bundles are bi collateral in nature and in addition to the external phloem, another patch of phloem also can be seen on the inner side. Collenchyma is visible below the upper and above the lower epidermis. Anisocytic type of stomata are present I the leaf. A few secretor canals can be seen in the collenchymatous region and also in the mesophyll tissue.

Tissues of Diagnostic importance in the leaf powder (Fig.6)

P. fruticosa leaf powder is dark green in colour with a characteristic aromatic odour, and having a slightly bitter taste. The following are the salient features observed in the leaf powder.

A) Covering trichomes are unicellular with more or less pointed apex. The bases of the trichomes are slightly bulged in appearance. Small hair like projections can be seen on the margin of trichomes.
B) Fragments of mesophyll cells, containing green sport or pigments.
C) Fragments of veins with cells arranged longitudinally.
D) Anisocytic type of stomata.

P. Fruticosa root (Fig.3): Roots are cylindrical, lengthy, and slightly fasciculated in appearance. Roots are yellowish brown in colour, usually much branched and woody. Te taste of the roots is slightly bitter followed by sweet and mucilaginous.

Anatomy of P. fruticosa Root (Fig 4)

The major features in the T.S. of root are cork, phelloderm, secondary phloem, secondary xylem and medullary rays.

Cork: Consists of 10-15 rows of cells arranged longitudinally. The outer cells are darker in appearance.

Phelloderm: Consists of 2-3 rows of thin walled cells. Specialized secretary canals are present in scattered form in the cortex region.

POLYSCIAS FRUTICOSA (L) HARMS
ENTIRE PLANT

P. FRUTICOSA (L) HARMS LEAF

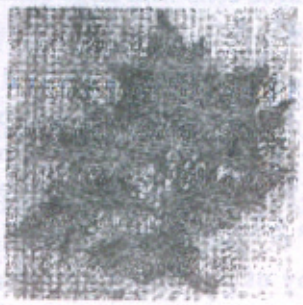
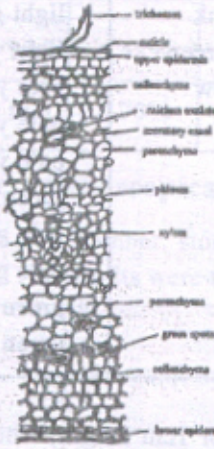


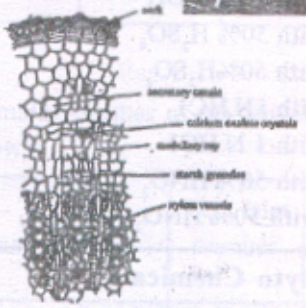
Fig. 2

P. FRUTICOSA
ROOT

Fig. 3



T.S OF LEAF
POLYSCIAS FRUTICOSA
Fig. 5



T.S OF ROOT
POLYSCIAS FRUTICOSA
Fig. 4

POWDER MICROSCOPY (LEAF)

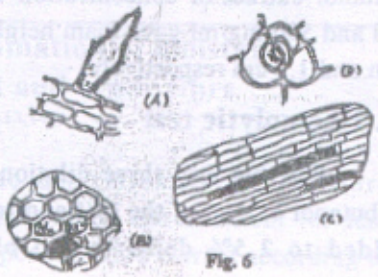


Fig. 6

POWDER MICROSCOPY (ROOT)

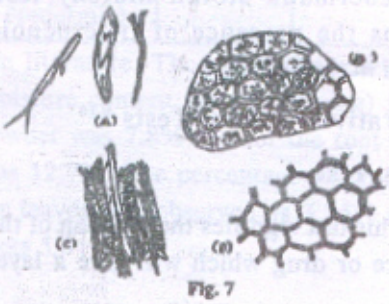


Fig. 7

Secondary phloem consists of closely arranged cells with large quantities of starch grains.

Secondary xylem is divided into sections by lengthy medullary rays of 1-2 cells wide. The wood parenchyma is lignifies. Xylem parenchyma cells contain small starch granules.

Microscopy of powdered root (Fig 7)

The powdered *P. fruticosa* root is yellowish brown in color with a bitter followed by sweet taste.

The major tissues of diagnostic importance is the root powder are the following
a) Fragments of small thin root hairs.
b) Segments of cortical parenchyma with green pigments and starch grains.
c) Short pitted lignified xylem vessels.
d) Fragments of cork with cells polygonal in shape.

Fluorescence Analysis

	(UV light 365 nm)	In daylight
Leaf powder (PL) as such	Greenish pink	Light green
Root powder (PR) as such	Yellowish green	Light yellow
PL treated with 1 N NaOH	Bright yellow	Pale yellow
PR treated with 1 N NaOH	Pale yellow	Pale yellow
PL treated with 50% H_2SO_4	Light green	Pale yellow
PR treated with 50% H_2SO_4	Light green	green
PL treated with 1NHC1	Pale green	Pale green
PR treated with 1NHC1	Pale green	Pale green
PR treated with 50% HNO_3	Light green	Green
PL treated with 50% HNO_3	green	Green

Qualitative Phyto Chemical Analysis[8]

n-butanol extract of the leaf and root answered positive for salkowsky test, and liebermann storch morsky test confirm the presence of triterpenoid saponins in the extract,

Quantitative physical tests [9,10]

i. Foam test

This test signifies the dilution of the substance or drug which will give a layer of foam of 1cm height, when the aqueous solution is shaken in a graduated cylinder for 15 seconds and allowed to stand for 15 minutes before the reading was made. N-butanol extract of concentration 100 mg/ml and 500 mg/ml gave foam height of 1.4 cm and 1.8 cm respectively.

ii. Haemolytic test

For this test, three dilutions of the n-butanol extract of the leaf and root were added to 2.5% defibrinated blood in physiological salt solution. Haemolysis took place within 10 minutes and the blood suspension became transparent. The greatest dilution of saponin causing total haemolysis is called hemolytic index. It is observed that 100 mg/ml of root n-butanol extract cause total haemolysis within 10minutes. But leaf n- butanol extract 500 mg/ml concentration only, caused comparable total haemolysis as that of the root extract.

iii. Fish lethal test

For this test, the result showed that 250 mg/ml of root n-butanol extract killed 60% of the fish taken for the study. But 500 mg/ml of the leaf extract was required for killing 60% of the fish.

iv. Ash values and extractive values[14]

	Water Soluble ash value	Total ash value	Acid insoluble ash value	Water soluble extractive value	Alcohol soluble extractive value	Ether soluble extractive
P. Fruticosa leaf	0.48%	4.489%	0.199%	8.2%	1.34%	4.5%
P. Fruticosa Root	0.70%	4.436%	0.919%	9.5%	2.53%	0.0

Quantitative Microscopical Analysis[11]

The vein islet umber, stomatal index, stomatal number of the leaves of P. fruticosa were found out. The results were tabulated as follows:

	Stomatal number	Stomatal index	Vein islet number	Vein termination number
P. Fruticosa leaf	Upper epidermis 2.0-4.0-5.0	1.05-2.0-2.94 (upper epidermis)	1-2	4-5.5-7.0
	Lower epidermis 15.0-17-19	13.04-14.82-17.27 (lower epidermis)	1-2	5-6.5-8.0

Determination of moisture content ad crude fibre content[13, 14]

The determination of moisture content and crude fibre content for leaf and root powder were carried according to the literature. The result showed that the moisture content (loss on drying) for leaf powder was 7.8% and for the root powder was 12.7%. The percentage of crude fibre for leaves was observed as 3.25% and for roots 5.64%.

Histochemical Analysis of Drug[5] (leaf & root sections)

		Observations	
		Leaf	**root**
i	Section mounted in water	Epidermis visible as a dark green layer, xylem vessels in vascular bundle are visible with dark margin. Green spots can be seen in the mesophyll cells.	Cork is visible with dark brow pigment in the cells, Xylem vessels with secondary xylem region are darker in appearance.
ii	Section mounted in	Xylem vessels turn	Xylem vessels turn

	phloroglucinol and co. HCI (1:1)	violet color	violet color
iii	Section mounted in a drop of H_2SO_4	No color change	No color change
iv	Section mounted in 10% NO_3	No specific color	No specific color
v	Section mounted with dilute iodine solution	Appearance of bluish spots scattered like in the mesophyll cells	Most of the cells in the cortex region turned deep blue-violet color
vi	Section mounted in 5% ferric chloride	A few cells changed into dark green color	No change
vii	Section mounted in aqueous picric acid with a little amount of sodium carbonate	No change	No change

Thin Layer Chromatographic Analysis[12]

The n-butanol extract (saponin fraction) of both leaves and root of P. fruticosa were subjected to TLC studies, using silica gel, was found to contain 6 spots for the leaves and 8 spots for the root; with solvent system: n-butanol: acetic acid: H2O (40:10:10); Detection UV – 254nm. The results are tabulated as follows.

	HRf values	UV fluorescence at 245NM
P. Fruticosa leaf n-butanol extract	30.0 41.0 56.0 71.6 83.0 93.0	Blue Green Intense greenish blue Intense blue Light blue Blue
P. Fruticosa root n-butanol extract	10.0 15.0 35.0 42.0 56.0 62.0 72.0 77.0	Blue Light blue Red Intense bluish green Intense blue Bluish green Blue Pale reddish brown

DISCUSSION

The macroscopic studies as well as the powder drug analysis for the leaf and root of P. Fruticosa revealed tat, using these diagnostic features one can identity the is plant very easily for further investigations. The characteristic shape of trichomes, the presence of secretor canals and the green spots present in some cells are useful features for studying histology of the laves and roots. Qualitative microscopically

studies also give valuable information regarding specific leaf constants like vein islet number, stomatal indeed etc. The information obtained for ash values and extractive values are useful during the time o collection of roots from the plants and also during the extraction process. These values are limits set to help identify samples of genuine drug. Using these standards especially morphological, powder drug analysis, TLC, studies etc. The plant can be authenticated, identified and differentiated form other related species. Also these pharmacognostic parameters, help in the detection of adulteration in commercial samples.

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