Available online on www.ijppr.com
International Journal of Pharmacognosy and Phytochemical Research 2017; 9(7); 1035-1044

ISSN: 0975-4873

Research Article

Pharmacognostic Studies of *Putranjiva roxburghii* Wall. (Putranjivaeceae)

Minj E*, John Britto S

The Rapinat Herbarium and Center for Molecular Systematics, St. Joseph's College (Autonomous) Tiruchirappalli, Tamilnadu, India.

Received 9th May, 17; Revised 27th June, 17, Accepted 14th July, 17; Available Online 25th July, 2017

ABSTRACT

The present investigation focuses on the pharmacognostic features of *Putranjiva roxburghii* Wall. (Putranjivaeceae). Plants have been studied from different perspectives of macroscopic, microscopic, powder analysis, histochemistry and extractive values. Macroscopic analysis revealed shape, size, odour and taste of leaf, bark, root and seeds. They showed shiny, smooth and rough texture with pungent and bitter taste. Microscopic analysis revealed the presence of upper epidermis, lower epidermis, cortex, vascular bundles, pericycle and pith region of the transverse sections. Histochemical analysis showed the presence of lignins, starch, alkaloids, tannins and calcium oxalate crystals. Saponins are present in leaf, root and stem except in seeds. pH analysis revealed the acidic and basic property of different plant extracts. Leaf, bark, root and seeds extracts showed pH values below 7. Among methanolic extracts, leaf, bark and root showed higher value. Among aqueous extracts root and bark showed higher value. Fluorescence analysis of plants showed different colours in the UV and visible light due to presence of secondary metabolites.

Keywords: *Putranjiva roxburghii* Wall., Pharmacognostic study, Microscopic study, Putranjivaeceae, Chhattisgarh.

INTRODUCTION

Traditional medicines are well known for their affordability and easy accessibility. They are also best source for treatment for poor communities as primary health care. Uses of medicinal plants are as old as 4000-5000 B.C. Long before people were depending on herbal plants for their medicinal uses. Earlier reference of medicinal plant usage has been reported in Rig-Veda later ancient records also documented in detail its practice by physicians (an indigenous system of medicine)[1]. Medicinal plants are an important element of indigenous medical system[2] and good the source of secondary metabolite. It is used for drug development and synthesis. Medicinal plants play vital role in the development of human culture around the world. Herbal medicines reduces the use of chemical remedies[3]. They possess low occurrence of side effects and problematic effects[4]. There have been tremendous increase in past two decades in the usage of herbal medicine. However, there is large scope for research data in this field[5]. Natural products have been in use all over the world by as for example in Traditional Chinese medicine, Ayurveda, kampo, traditional Korean medicine and Unani. Though, there may be areas that need validation in there systems, they are valuable clues for further research[6]. The World Health Organization (WHO) found significance of herbal medicines and created strategies, guidelines and standards for botanical medicines, applied for cultivation and manufacture[6].

Putranjiva is a small genus consisting of trees as in *Putranjiva roxburghi* which is a dioecious, evergreen tree with pendent branches. In Hindi it is known as putra jeevak. It is an endemic plant and popularly known as Kudrajuvi, Patravanti, Jivputrak and Nageia. In Sanskrit it is termed as Jivanputra, Putranjiva, Kumarajiva, Mava, Pavitra and Putrajiva. Karupali or Irukolli in siddha system of medicine. "Pootranjeeva" pootra means a son and jeeva means life. It grows to a height of 18m and a girth of 2m. They are found in both wild and in cultivation in almost all parts of India. The bark is grey, shiny, dark green, 5-10cm long leaves. Male flowers are yellowish, small, dense and in rounded clusters but female flowers are solitary[8].

P. roxburghii is also known as lucky beans and is known for its medicinal properties. It is reported to be effective for infertility, fever and liver diseases. Action of *P. roxburghii* has properties such as Anthelmintic, Anticancer, Anti-inflammatory, Antioxidant, Aphrodisiac, Diuretic and Laxative. It is also known as. *P. roxburghii* (syn. *Drypetes roxburghii*). The leaves, fruits and stones of fruits are given as medicine in colds and fevers and also in rheumatic affections[9].

P. roxburghii (childlife tree) has been the centre of controversy because of its misleading nomenclature of ability of begetting male child. A concept behind this was alteration in the sex of baby post-conceptionally. Leaves and seed paste are used to treat burning sensation, filarial, inflammatory and eye diseases[10]. In Ayurvedic texts it was reported for its antipyretic, anti-inflammatory & anti-rheumatic which is useful for gynaecological and fertility ailments properties. Its preliminary phytochemical

*Author for Correspondence: emmasuzan04@gmail.com

Putranjiva roxburghii Wall.

profiling showed the presence of glycosides, saponins, triterpenes and flavonoids. Green synthesis of Gold nanoparticles was successfully preformed using leaf sample[11].

Pharmacognostic investigation of medicinal plants are very essential. It deals with the study of naturally occurring drugs from plants, standardization and authentication[12]. Secondary metabolites not only promotes pollination but also known for its defensive and protective properties[13]. Pharmacognostic study contributes assurance and correct identification[14]. It explores the aspects of the secreting structure of secondary metabolites, which reveals correct information of extraction of medicinal chemicals and its location[15]. Pharmacognostic investigation of leaves showed the presence of febrifuge and sterility activity.

The study aimed to investigate anatomical structure, macroscopy, microscopy, histochemistry and extractive values.

MATERIALS AND METHODS

Pharmacognostical studies

Collection of plant material

The fresh plants of *Putranjiva roxburghii* Wall. were collected from Kunkuri, district Jashpur (Chhattisgarh, India) in the month of August 2015. Identification and authentication of the plant specimens were done by Dr. S. John Britto, The Director and Head, The Rapinat Herbarium and Centre for Molecular Systematics, St. Joseph's College (*Autonomous*) Tiruchirappalli, India. The voucher specimen has been deposited at the centre with accession no. RHT 67164 and RHT 67530. The leaves, bark, root and seeds were washed properly with deionised water to remove dust and dirt. The plant samples were air dried under shade at room temperature, ground with electric grinder into fine powder and stored in air tight container for further use. The fresh samples were used for macroscopic and microscopic observations.

Botanical parameters

Macroscopy

A fresh and matured leaf of *P. roxburghii* Wall. was examined macroscopically. The colour, texture, shape and size of the leaf were noted. In some of cases the general appearance of the plant is similar to related species. Detailed study of the morphological characters can be helpful in differentiating them. The macroscopy of a drug includes its visual appearance for the naked eye. It depends to a large extent on the part of the plant from which the drug is obtained. For each particular morphological group, a particular systemic examination can be carried out. Size, colour, odour and taste are important parts of morphology of a particular drug[16].

Microscopy

The plants part (leaf, bark, root and seeds) were cleared and were sectioned. Sections were mounted on safranine and glycerine water and examined microscopically using 4X, 10X, 20X and 40X objectives. The presence and features of some anatomical characters were noted.

The powder of leaves was boiled with conc. HNO3 to remove coloring matter and mounted on glass slide using glycerine, covered with cover slip and viewed under microscope. The powder was also strained with saffranin and examined under microscope.

Histo-chemical Studies

Histochemical localization of lignins, starch, alkaloids, tannins, saponins and calcium oxalate crystals was carried out by using the respective staining methods. The photographs were taken with a Nikon digital sight DS Vi1 camera, pixel 600X 800. A proper care was taken to select healthy plant organs for the current study. The fresh form of the organs was separately placed in FAA (formalin-acetic acid-70% ethyl alcohol) in a ratio of 1:1:18. They were subjected to histo-chemical analysis. Hand sections of the leaf, stem and roots were mounted in suitable chemical reagents to determine the presence of various chemical substances and their zone of distribution. They were treated with the following reagents to study the histochemical reactions: conc.H_2SO_4, conc. HCl, $FeCl_3$, iodine, wagner's reagent, and safranine. Temporary mounts of sections were employed for the test of histochemical studies with respective reagent to localize component, viz. Starch, protein, tannin, saponin, fat, glucosides and alkaloids in the tissue.

Lignins

Sections of leaf, root, stem and seed were immersed for a minute in safranine (1%) and mounted in glycerine-water solution. Appearance of red colour in cells showed the presence of lignins.

Starch

Sections of leaf, root, stem and seed were immersed for a minute in iodine. Appearance of blue colour in cells showed the presence of starch.

Alkaloids

Sections of leaf, root, stem and seed were immersed for a minute in Wagner's reagents. Appearance of orange or golden yellow colour in cells showed the presence of alkaloids.

Tannins

Sections of leaf, root, stem and seed were immersed for a minute in dil. $FeCl_3$. Appearance of blackish blue colour in cells showed the presence of tannins.

Saponins

Sections of leaf, root, stem and seed were immersed for a minute in Conc. H_2SO_4. Appearance of orange or golden yellow colour in cells showed the presence of saponins.

Calcium oxalate crystals

Sections of leaf, root, stem and seed were immersed for a minute in Conc. HCl. Appearance of bright effervesces in cells showed the presence of calcium oxalate crystals.

Extraction value

Leaf, bark, root and seeds were washed thoroughly, and finally air dried. 10gms of air dried samples were dissolved in 150ml of solvent and shaken frequently for 72hrs and was filtered by using Whatmann No. 1 filter paper. The filtrate was then taken for evaporation and the dried form of the samples were weighted immediately.

Fluorescence analysis

A small quantity of dry plant powder was placed on grease free clean microscopic slide and 1-2 drops of freshly prepared reagent solution is added, mixed by gentle tilting the slide and wait for few minutes. Then samples were checked in UV light and visible light. short (254 nm) and long (365 nm) ultra violet radiations. The colour observed by application of different reagents in different was recorded. Samples were treated with various reagents such as Conc. and dil. HCl, Conc. and dil. H_2SO_4, Conc. and dil.HNO_3, acetic acid, $FeCl_3$, iodine, methanol, NaOH, petroleum ether, potassium hydroxide, ammonia, water and picric acid[17].

RESULTS AND DISCUSSION

Macroscopy

The shape of the leaves are elliptic-oblong, size is 3.5-12 x 1.5-4.5cm, dark green in color, surface smooth and shiny, texture smooth, its odour pungent and it taste bitter. Bark is dark grey, scars on nodal region are rough, sign of shrinking on drying, long, tough and woody in texture, light pungent. Roots are light brown, strong and woody in texture, odour is similar to soil and tasteless. And seeds are ovoid-ellipsoid, size is 1.3-2 x 1.5 cm, slightly rough in texture, odour is similar to mustard oil and bitter in taste (Table 1).

Microscopical study

Leaf

Epidermal cells are distinct, having anomocytic stomata and unicellular and multicellular cystolithic covering trichomes.

Lamina of transverse section shows an upper epidermis covered by thin cuticle. Unicellular and multicellular cystolithic covering trichomes are present mainly on the lower epidermis. Underlying the upper epidermis is a bi-layered, compact, radially elongated palisade followed by spongy mesophyll composed of 3-4 layers of loosely arranged parenchymatous cells. Midrib consists of well-developed collenchyma beneath the epidermis. Vascular bundles are bicollateral and crescent shaped. Continuous layers of lignified pericyclic fibres with a small lumen are found surrounding the vascular bundles. Ground tissue consists of loosely arranged polygonal parenchymatous cells, some of which are have scattered prism crystals of calcium oxalate. Several idioblasts filled with cystolithic crystals of calcium carbonate are also found in the ground tissue. These cystoliths are also found in many multicellular covering trichomes of the leaf.

Powder analysis

The powdered drug is dark brown with no distinct odour or taste. The important diagnostic features of the powder include abundant cystolithic covering trichomes, prisms of calcium oxalate, pitted xylem vessels and pericyclic fibers.

Bark

Bark shows cork composed of uniformly arranged 10-15 layers of small elongated cells covered with loosely packed cells of lenticels. Below the cork is a zone of cortex, composed of 2-5 layers of stone cells followed by 8-10 layers of parenchymatous cells. Pericycle consists of 3-5 layers of sclerenchymatous cells or sclereids. Secondary phloem is composed of parenchyma fibers and medullary rays are composed of cells, uni- or bi- seriate near cambium and widening as they approach pericycle.

Stem

Epidermis, cortex, endodermis, pericycle, vascular bundle and pith. Epidermis layer contain trichomes. Parenchymatous cells contain oil globules and calcium oxalate crystals. Vascular bundle consist xylem and phloem. Xylem consists of sclerenchymatous cells.

Powder analysis

The powder analysis of the bark shows the presence of multiseriate medullary rays, phloem fibers tapering at both ends with narrow lumen and well marked calcium oxalate crystals where observed these characters verily help in the identification of this plant. Cork in surface view shows distinct lenticels and in sectional view exhibit Calcium oxalates crystals, lignified fibers, and medullary ray cells.

Root

The transverse section of the root contains root cork, cortex, and vascular bundles. The cork regions consist of the epidermis and hypodermis. The epidermis is made up of two to three layers of dead cells and is followed by the hypodermis, which consist of three to four layers of horizontally compressed and elongated cells. The cortex regions consist of several layers of parenchymatous cells, only few of these cells contain starch grains, but Presence of calcium oxalate crystals are more. The vascular bundles consist of phloem, cambium, and cortex. Phloem regions are made up of two to six layers of irregularly arranged cells; phloem fibers are also present in this region. The cambium is made up of two to four layers of small cells. Xylem occupies the major portion of the root; secondary xylem vessels are larger than primary xylem vessels.

Powder analysis

The powdered drug of the root contains unicellular trichomes, compound and simple starch grains, lignified fibers and also oil globules. Elongated and lignified parenchymatous cells are present. Prismatic calcium oxalate crystals and short tracheids with pitted and reticulate thickenings are present. Xylem vessels with reticulate and pitted thickenings are also found in the powder.

Table 1: Macroscopic characteristic of plant parts.

S.No.	Constants	Features			
		Leaf	Bark	Root	Seed
1	Shape	Elliptic-oblong	_	_	Ovoid-ellipsoid
2	Size	3.5-12 x 1.5-4.5 cm	_	_	1.3-2 x 1.5 cm
3	Colour	Dark green	Dark grey	Light brown	Brown
4	Surface	Smooth & shiny	Presence of scars on nodal region, rough, sign of shrinkage on drying	Rough	Slightly rough
5	Texture	Smooth	Long& tough/woody	Strong &Woody	Rough
6	Odour	Pungent	Little pungent	Soil odour	Mustard oil odour
7	Taste	Bitter	Tasteless	Tasteless	Bitter

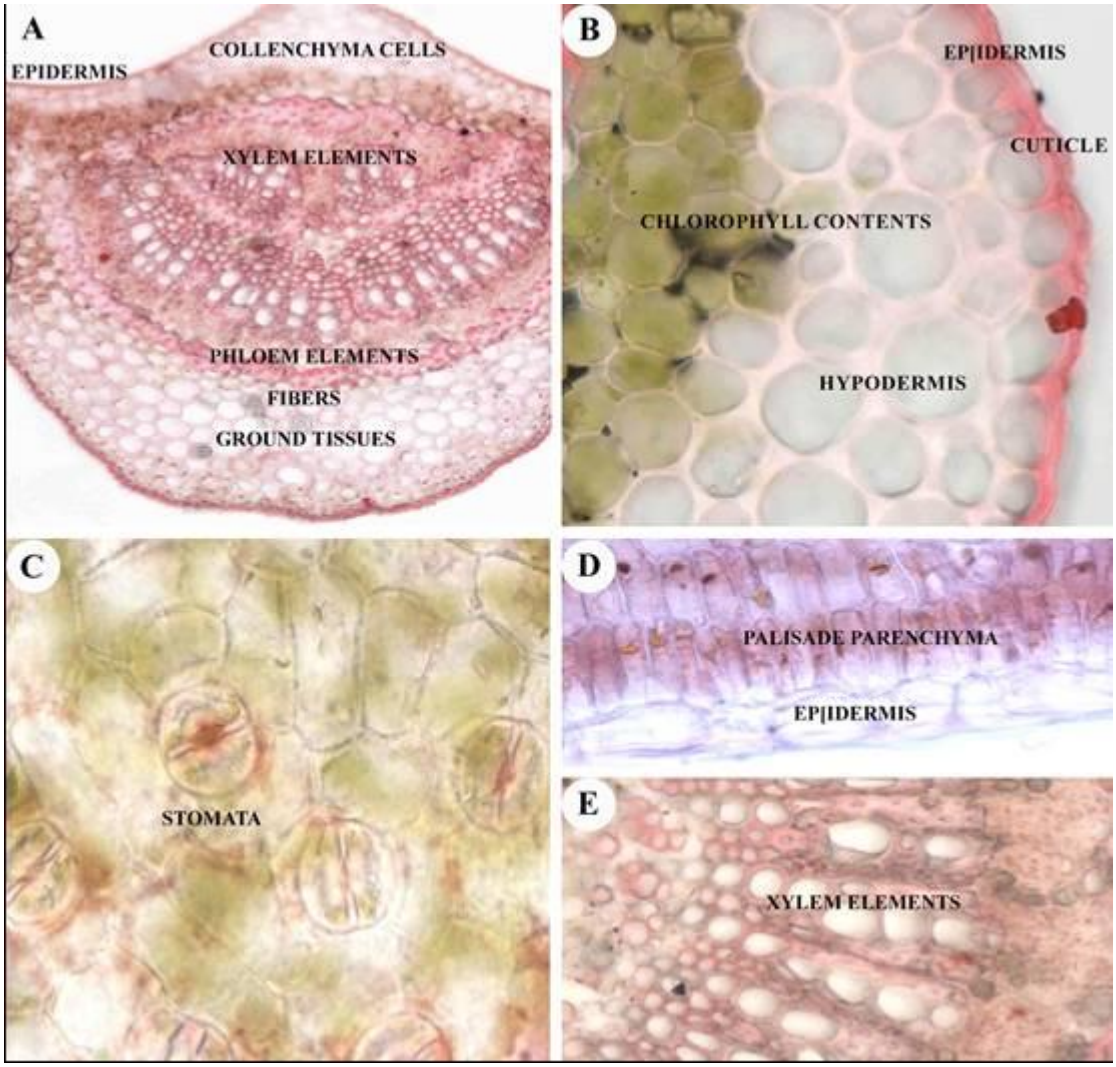

Figure 1: Microscopy of p. roxburghii Wall. (A) Outline of T.S. through midrib; (B) Upper epidermis of midrib and hypodermis; (C) Stomata; (D) Palisade parenchyma cells; (E)Xylem elements.

Seed

The transverse section of the seed contains parenchymatous cells filled with oil globules.

Powder analysis

The powdered drug of the seeds once with unicellular trichomes, vessels and tracheids, and starch grains. Presence of alkaloids, tannin, and calcium oxalate crystals.

Histochemistry

Histochemical analysis was done by testing the plant parts with different reagents for visualizing the accumulated phyto-constituents in tissue system (Table 2).

Lignins, starch, alkaloids, tannins, calcium oxalate crystals are present in all four leaf, root, stem and seed. Starch is present in very less amount. Saponins present in leaf, root and stem region.

Histochemical study on the leaf

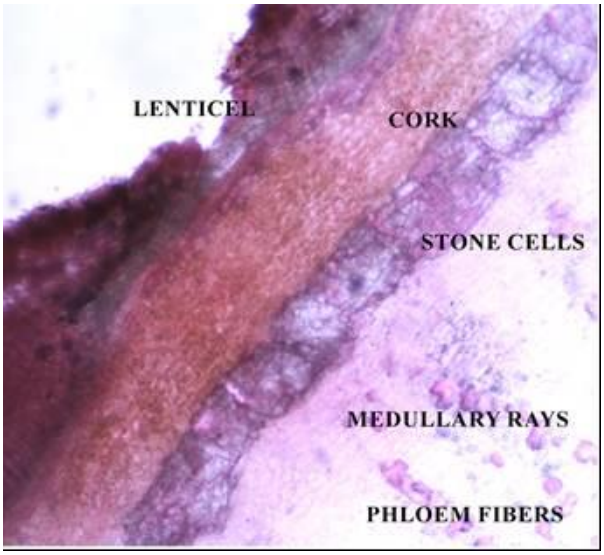

Figure 2: Microscopy of *P. roxburghii* Wall. Bark T.S.

It showed the presence of lignins (red colour- safranine) in upper and lower epidermis, hypodermis and vascular bundle. Starch (blue colour- iodine) in epidermis, cortex and vascular bundle. Alkaloids orange or golden yellow colour - Wagner's reagent) in upper and lower epidermis and sclerenchymatous tissue. Tannins (blackish blue colour – dil. $FeCl_3$) in upper and lower epidermis and sclerenchymatous tissue. Saponins (light yellow - Conc. H_2SO_4) in upper and lower epidermis. Calcium oxalate crystals (bright effervesces – Conc. HCl) in cortex.

Histochemical study on the root

It showed the presence of lignins (red colour - safranine) in epidermis, cortex and pith region. Starch (blue colour- iodine) in cortex. Alkaloids orange or golden yellow colour - Wagner's reagent) in epidermis and pith. Tannins (blackish blue colour – dil. $FeCl_3$) in cortex and endodermis. Saponins (light yellow - Conc. H_2SO_4) in epidermis. Calcium oxalate crystals (bright effervesces – Conc. HCl) in cortex.

Histochemical study on the stem

It showed the presence of lignins (red colour- safranine) in epidermis, cortex, pericycle, vascular bundle and pith. Starch (blue colour- iodine) in cortex, vascular bundle and pith. Alkaloids orange or golden yellow colour - Wagner's reagent) in epidermis and sclerenchymatous tissue. Tannins (blackish blue colour – dil. $FeCl_3$) in Pith. Saponins (light yellow - Conc. H_2SO_4) in epidermis. Calcium oxalate crystals (bright effervesces – Conc.HCl) in cortex, vascular tissue and pith.

Histochemical study on the seed

It showed the presence of lignins (red colour- safranine) in seed coat and cortex. Starch (blue colour- iodine) in cortex. Alkaloids orange or golden yellow colour - Wagner's reagent) in seed coat and cortex. Tannins (blackish blue colour – dil. $FeCl_3$) in cortex. Calcium oxalate crystals (bright effervesces – Conc. HCl) in cortex.

Extractive values

The pH analysis of *P. roxburghii* Wall. showed acidic and basic properties of the components present in the plant extracts. The pH values of acetone extracts of leaf, root, bark and seeds are 4.63, 5.68, 7.88 and 4.86 respectively. Aqueous extracts of leaf, root, bark and seeds are 5.12, 5.62, 5.33 and 4.13 respectively. Dichloromethane extracts of leaf, root, bark and seeds are 6.67, 5.6, 5.27 and 5.83 respectively. Ethanol extracts of leaf, root, bark and seeds are 6.15, 7.2, 6.9 and 6.1 respectively. Methanol extracts of leaf, root, bark and seeds are 6.24, 6.36, 6.05 and 6.74 respectively. Petroleum ether extracts of leaf, root, bark and seeds are 6.62, 7.1, 7.07 and 6.64 respectively. Among these

Table 2: Histochemical profile.

Test for	Reagents used	Nature of change	Leaf	Root	Stem	Seed
Lignins	Safranine (1%)	Red	Upper and lower epidermis, hypodermis and vascular bundles	Epidermis, cortex and pith region	Epidermis, cortex, pericycle, vascular bundle, pith	Seedcoat, cortex
Starch	Iodine	Blue	Epidermis, cortex, vascular bundle	cortex	Cortex, vascular bundle, pith	Cortex
Alkaloids	Wagner's reagent	Golden yellow	Upper and lower epidermis, sclerenchymatous tissue	Epidermis, pith	Epidermis, sclerenchymatous tissue	Seedcoat, cortex
Tannins	Dil.$FeCl_3$	Blackish blue	Upper and lower epidermis, sclerenchymatous tissue	Cortex , endodermis	Pith	Cortex
Saponins	Conc. H_2SO_4	Light yellow	Upper and lower epidermis	Epidermis	Epidermis	-
Calcium oxalate crystal	Conc. HCl	Bright effervesce	Cortex	Cortex	Cortex, vascular tissue, pith	Cortex

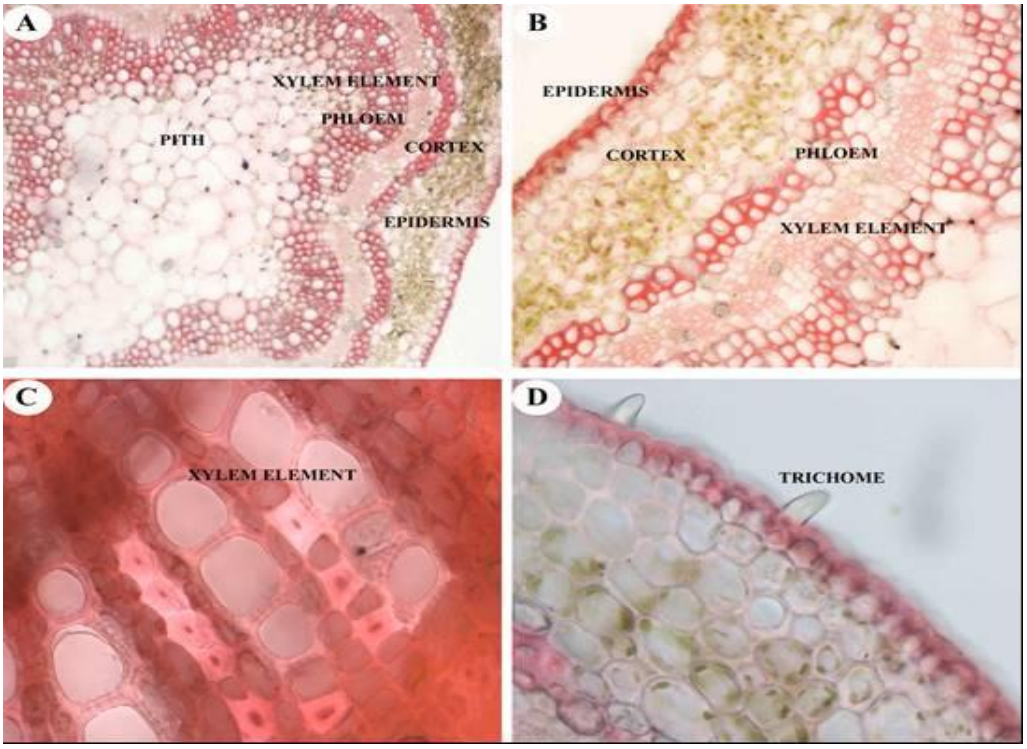

Figure 3: Microscopy of *p. roxburghii* Wall. (A) Outline of T.S. of stem; (B) Enlarged portion of stem; (C) Enlarged portion of vascular bundle; (D) Trichome.

Table 3: Extractive value.

Extracts	pH value	Weight(gm)
Acetone		
ALE	4.63	0.8
ARE	5.68	0.35
ABE	7.88	0.2
ASE	4.86	4.15
Aquaous		
AqLE	5.12	1.5
AqRE	5.62	0.85
AqBE	5.33	0.65
AqSE	4.13	1.45
Dichloromethane		
DLE	6.67	0.3
DRE	5.6	0.2
DBE	5.27	0.2
DSE	5.83	1.95
Ethanol		
ELE	6.15	1.5
ERE	7.2	0.7
EBE	6.9	0.35
ESE	6.1	1.2
Methanol		
MLE	6.24	1.6
MRE	6.36	0.65
MBE	6.05	0.35
MSE	6.74	1.3
Petroleum ether		
PLE	6.62	0.15
PRE	7.1	0.1
PBE	7.07	0.05
PSE	6.64	2.85

values, pH values of acetone bark, ethanol bark and petroleum ether back extracts showed slightly basic or neutral property (Table 3).

The physio-chemical analysis is an important parameter for testing adulteration on improper handling of drugs. The extractive values of *P. roxburghii* Wall. for acetone extracts of leaf, root, bark and seeds are 0.8gm, 0.35gm, 0.2 gm and 4.15 gm respectively. Aqueous extracts of leaf, root, bark and seeds are 1.5 gm, 0.85 gm, 0.65 gm and 1.45 gm respectively. Dichloromethane extracts of leaf, root, bark and seeds are 0.3 gm, 0.2 gm, 0.2 gm and 1.95 gm respectively. Ethanol extracts of leaf, root, bark and seeds are 1.5 gm, 0.7 gm, 0.35 gm and 1.2 gm respectively. Methanol extracts of leaf, root, bark and seeds are 1.6 gm, 0.65 gm, 0.35 gm and 1.3 gm vrespectively. Petroleum ether extracts of leaf, root, bark and seeds are 0.15 gm, 0.1 gm, 0.05 gm and 2.85 gm respectively (Table 3).

Fluorescence analysis

Powder drugs of *P. roxburghii* Wall. of leaf, root, bark and seeds were treated with different acid reagents of various concentrations observed for the colour under day light and ultra violet rays. Some constituents showed colour in day light in the visible range. In the ultraviolet light natural products showed fluorescence which did not fluorescence in visible range. Colours visible in leaf powder in visible range are green, light green, yellow and greenish yellow. Colours visible in bark powder in visible range are light brown and yellow. Colours visible in root powder in visible range are brown, light brown and greenish yellow. Colours visible in seed powder in visible range are creamy, white, light and pale yellow. Main colours observed in ultraviolet light in leaf powder are

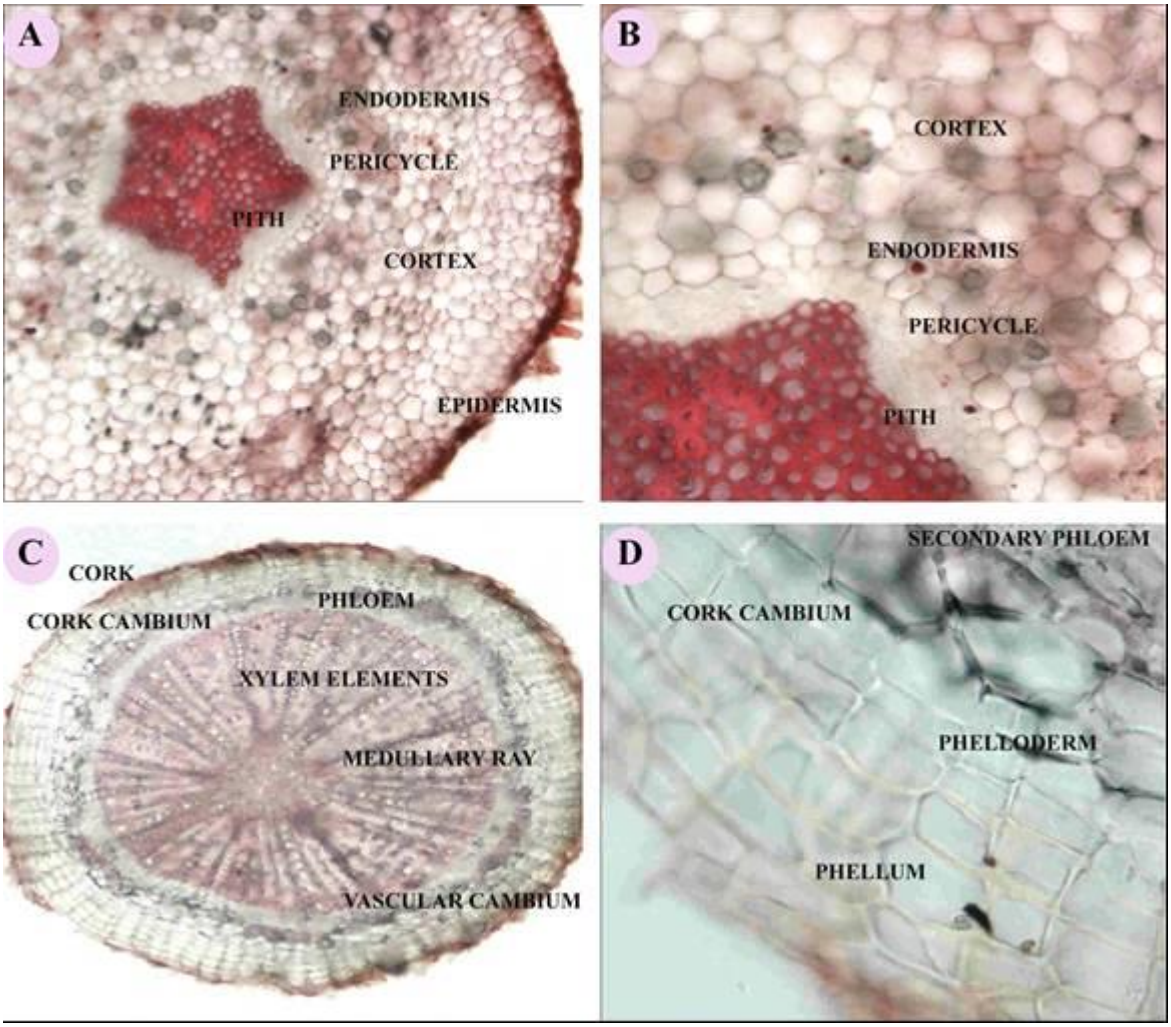

Figure 4: Microscopy of *P. roxburghii* Wall. (A) T.S. of root; (B) Enlarged portion of root; (C) Secondary growth of root T.S. (D) Enlarged portion of secondary growth of root.

brown, light and dark brown, red, reddish brown, brick red, fluorescence red and fluorescence light blue. Colours observed in bark powder are brown, light brown, light brownish yellow, light yellow, yellowish brown, creamy yellow and brick red, reddish brown, fluorescence yellow. Colours observed in root powder are creamy, brick red, light yellowish brown, brownish yellow, light and dark brown. Colours observed in root powder are creamy, creamy white, fluorescence yellow, light yellow, light brown and brick red.

CONCLUSION

Putranjiva roxburghii Wall. of putranjivaceae is a commonly found tree in tropical region. It is well known for its medicinal properties. It is also reported as cure for fertility problems, vaginal infection including various other diseases. The pharmacognostic analysis has been carried out. It is the method for standardization of crude drugs to locate the presence of secondary metabolites. Macroscopic analysis showed that the shape of the leaves are elliptic-oblong, size is 3.5-12 x 1.5-4.5cm dark green in colour, surface is smooth and shiny, smooth texture, its odour is pungent and it taste bitter. Bark is dark grey, presence of scar on nodal region, rough, sign of shrinkage on drying, long, tough and woody in texture, light pungent and bitter in tasteless. Roots are light brown, rough, strong and woody in texture, odour is similar to soil and tasteless. And seeds are ovoid-ellipsoid, size is 1.3-2 x 1.5 cm, slightly rough in texture, odour is similar to mustard oil and bitter in taste. Histochemical analysis helps to locate chemical compounds in the tissues reacting with different acids. Lignins, starch, alkaloids, tannins and calcium oxalate crystal present in leaf, root, stem and seeds. Saponins is present in leaf, root and stem accept in seeds. Upper and lower epidermis, cortex and vascular bundles in leaf section. Epidermis, cortex and pith region in root section. Epidermis, cortex, pericycle, vascular bundle, pith in stem and Seed coat, and cortex in seeds section. Oil globules are present in almost all parts but in different ratio.

The pH analysis detects the acidic and basic properties of present secondary metabolites in different plant extracts. Extractive solvents are acetone, aqueous, dichloromethane, ethanol, methanol and petroleum ether. The pH values of leaf, root, bark and seed extracts showed below 7. The secondary metabolites present in

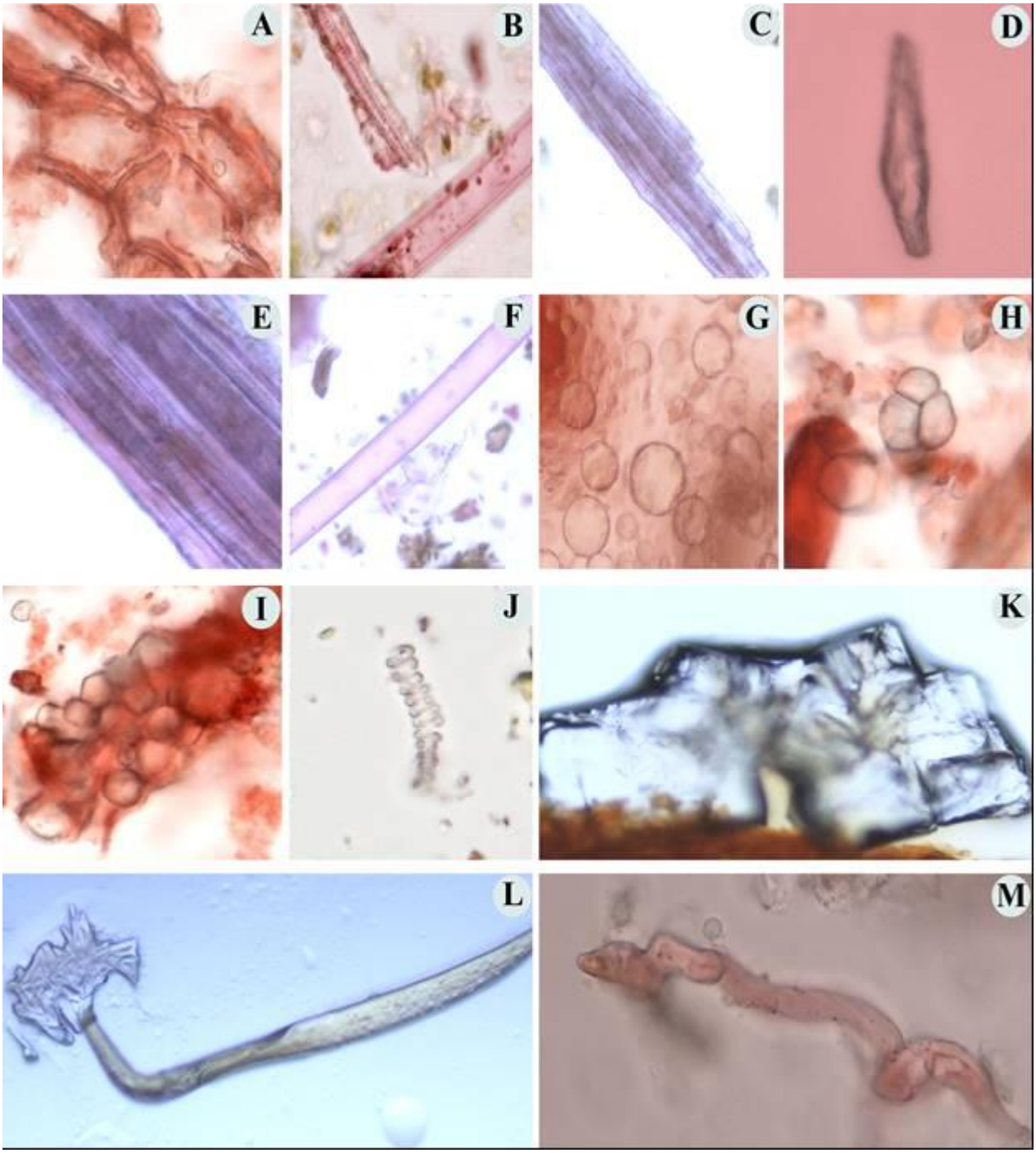

Figure 5: (A) Hypodermal cells, (B,C,D,E & F) Vessel, tracheid and fiber; (G) Oil Globules, (H, & I) Starch grains, (J) Spiral thickening, (K) Calcium Oxalate Crystal, (L) Trichomes, (M) Plumule.

these extracts of different solvent were slightly acidic nature. Except acetone bark extract, ethanol root extract, petroleum ether leaf and bark extracts. The extractive values of *P. roxburghii* plant parts were studied. In the case of leaf extracts methanol leaf extract showed the highest value of 1.6gm. The highest value of 0.85gm and 0.65gm showed by aqueous root extracts and aqueous bark extracts respectively, among the root and bark extractive values. In case of seed extractive values aqueous extract showed the highest value of 4.15gm. The fluorescence analysis of plant showed different colours in day/visible and UV light due to presence of secondary metabolites.

ACKNOWLEDGEMENTS

The author is grateful to the Director and Head, and also to the staff of the Rapinat Herbarium and Centre for Molecular Systematics, St. Joseph's College (Autonomous), Tiruchirappalli, Tamilnadu. She is also grateful to his Colleagues for their help and support. She thanks CSIR, New Delhi for financial support through Maulana Azad National Fellowship.

Table 4: Behaviour pattern of powdered of plant parts to different chemicals reagent.

S.No	Drug + reagent	Day light				UV			
		Leaf	Bark	Root	Seed	Leaf	Bark	Root	Seed
1	Powder as such	Green	Light brown	Light brown	Cream	Red	Light brown	Light brown	Creamy white
2	Powder + Conc. HCl	Green	Light brown	Light brown	Cream	Reddish brown	Light brown	Brownish yellow	Creamy white
3	Powder + dil.HCl	Light green	Light brown	Light brown	Cream	Brick red	Light yellow	Light brown	Fluorescence yellow
4	Powder + Conc.H_2SO_4	Light green	Light brown	Light brown	White	Red	Brick red	Light brown	Creamy yellow
5	Powder + dil.H_2SO_4	Light green	Light brown	Light brown	White	Brick red	Light brownish yellow	Light brown	Creamy
6	Powder + Conc.HNO_3	Yellow	Yellow	Yellow	Light brown	Brick red	Yellowish brown	Brick red	Light brown
7	Powder + dil.HNO_3	Greenish yellow	Yellow	Yellow	Light yellow	Brick red	brown	Light brown	Light yellow
8	Powder + Acetic acid	Yellowish green	Light brown	Brown	Creamy	Fluorescence red	Creamy yellow	Light brown	Fluorescence light yellow
9	Powder + $FeCl_3$	Dark green	Yellow	Greenish yellow	Pale yellow	Dark brown	Brown	Brown	Light brown
10	Powder + Iodine	Yellowish green	Yellow	Yellow	Pale yellow	Light brown	Light brown	Light brown	Creamy white
11	Powder + Methanol	Green	Light brown	Brown	Cream	Brick red	Light yellowish brown	Light yellowish brown	Fluorescence light yellow
12	Powder + NaOH	Yellow	Yellow	Yellow	Pale yellow	Light brown	Fluorescence yellow	Light brown	Light yellow
13	Powder + Petroleum ether	Green	Light brown	Brown	Cream	Brick red	Light yellow	Light yellowish brown	Fluorescence light yellow
14	Powder + potassium hydroxide	Green	Brown	Brown	Cream	Fluorescence light blue	Creamy yellow	Light yellow	Brick red
15	Powder + ammonia	Green	Light brown	Brown	Cream	Light brown	Light brown	Fluorescence light green	Creamy
16	Powder + water	Green	Light brown	Brown	Cream	Reddish brown	Light brown	creamy	Creamy yellow
17	Powder + picric acid	Yellowish green	Yellow	Yellowish brown	Yellow	Brown	Reddish brown	Dark brown	Light brown

REFERENCE

1. Prakash, P. and N. Gupta, *Therapeutic uses of Ocimum sanctum Linn (Tulsi) with a note on eugenol and its pharmacological actions: a short review.* Indian journal of physiology and pharmacology, 2005. 49(2): p. 125.
2. Farnsworth, N.R. *The role of ethnopharmacology in drug development*. in *Ciba Foundation Symposium 154-Bioactive Compounds from Plants*. 1990. Wiley Online Library.
3. Rasool Hassan, B., *Medicinal plants (importance and uses).* Pharmaceut Anal Acta, 2012. 3: p. e139.
4. Cao, Y., T. Jiang, and T. Girke, *A maximum common substructure-based algorithm for searching and predicting drug-like compounds.* Bioinformatics, 2008. 24(13): p. i366-i374.
5. Cepae, B.A., *WHO monographs on selected medicinal plants.* Geneva: World Health Organization, 1999.
6. Yuan, H., et al., *The traditional medicine and modern medicine from natural products.* Molecules, 2016. 21(5): p. 559.
7. Hosseinzadeh, S., et al., *The application of medicinal plants in traditional and modern medicine: a review of Thymus vulgaris.* International Journal of Clinical Medicine, 2015. 6(09): p. 635.

8. Gangal, S., S. Sharmaa, and A. Raufa, *Putranjiva roxburghii seeds: oil content and fatty acid composition during different stages of seed maturity.* Journal of Pharmacy Research, 2009. 2(11): p. 1666-1668.
9. K, L.R., et al., *Research: Pharmacognostic and Phytochemical Evaluation of Leaves of Putranjiva roxburghii.* Pharmacie Globale : International Journal of Comprehensive Pharmacy, 2011.
10. Samal, J., *Putranjiva roxburghii Wall: The controversies and the concurrence.* International Journal of Green Pharmacy (IJGP), 2017. 10(04).
11. Gupta, M., *A review of pharmacological properties, pharmacognosy and therapeutic actions of Putranjiva roxburghii Wall.(Putranjiva).*
12. Chanda, S., *Importance of pharmacognostic study of medicinal plants: An overview.* Journal of Pharmacognosy and Phytochemistry, 2014. 2(5).
13. Evert, R.F., *Cell wall.* Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development, Third Edition, 2006: p. 65-101.
14. Mauro, C., et al., *Comparative anatomical study of the vegetative organs of boldo miúdo, Plectranthus ornatus Codd. and malvariço, Plectranthus amboinicus (Lour.) Spreng.-Lamiaceae.* Revista Brasileira de Farmacognosia, 2008. 18(4): p. 608-613.
15. Kuster, V.C. and F.H. Vale, *Leaf histochemistry analysis of four medicinal species from Cerrado.* Revista Brasileira de Farmacognosia, 2016. 26(6): p. 673-678.
16. Gupta, A.K., *Quality standards of Indian medicinal plants. Volume 1*. Quality standards of Indian medicinal plants. Volume 1, 2003.
17. Kokoski, C.J., R.J. Kokoski, and F.J. Slama, *Fluorescence of powdered vegetable drugs under ultraviolet radiation.* Journal of the American Pharmaceutical Association, 1958. 47(10): p. 715-717.