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Research Article

Pharmacognostical and phytochemical studies on the leaves of *Anacardium occidentale* Linn

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ABSTRACT

This present work was conducted to explore the micro morphology and physico chemical parameters of the leaves of *Anacardium occidentale* Linn. (Anacardaceae). Macroscopy, microscopy, physicochemical analysis, preliminary phytochemical screening and other WHO recommended parameters for standardizations were performed. *A.occidentale* Linn is a small, spreading, evergreen tree reaching upto a height of 12 m. Leaves (10-20 cm long) are opposite, Obovate or Obovate- oblong, green and glabrous with entire often undulated margin, Obtuse –retuse or rounded tip apex and cuneate base with stout petiole. Microscopic evaluation revealed the presence of abaxial epidermis with paracytic stomata, apostomatic adaxial epidermis with thick wavy anticlinal walls, xylem vessels, parenchyma, tanniniferous cells, fibres and glandular trichomes. Petiole showed epidermis, vascular strands, ground tissue, secretary cavities, and calcium oxalate crystals. Vein islet numbers, vein termination numbers, stomatal number, stomatal index and other physico chemical tests like ash values, loss on drying, extractive values were determined. Preliminary phytochemical screening showed the presence of sterols, tannins, proteins and aminoacids, flavonoids, mucilage, glycosides, volatile oil, terpenoids, saponin, carbohydrates and absence of alkaloids, fixed oil. Microscopic analysis was informative and provides useful information in the botanical identification, standardization for purity & quality and immense value in authentication of the leaf.

Keywords: *Anacardium occidentale*, Anacardaceae, Microscopical evaluation, Physicochemical analysis, Powder microscopy.

INTRODUCTION

Anacardium occidentale Linn (Eng: cashew nut, Hindi: Kaju, Duk, Tamil: Muntiri). Family: Anacardiaceae, commonly known as cashew. This family contains 73 genera and about 600 species. *Anacardium* contains 8 species, native to tropical America. A small, spreading, evergreen tree, reaching a height of 12m. It is traditionally known to be useful for the treatment of wide panel of diseases like ulcers, diabetes, inflammation etc [1]. Leaf is traditionally used for hypoglycemic [2, 3], anti- rota virus [4], anti- tyrosinase [5], anti-ulcer [6-8], anti- cancer [9], anti-inflammatory [10], vasorelaxant [11] and anti- convulsant [12].
In short, there is good level of traditional and experimental evidences to support various claims and advantages of this widely available plant. An investigation to explore its pharmacognostic examination is inevitable. Microscopical prospective is an integral component of pharmacognosy especially while proposing diagnostic protocols for establishing botanical identity and ascertaining the quality control of raw material [13].

This current study was focused on microscopic evaluation, physicochemical determination and phytochemical screening for the standardization and quality assurance purposes of this cultivar. Hence it helps in the standardization of this herb but also guarantee the quality, purity and to prepare a monograph for the proper identification of this plant.

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MATERIALS AND METHODS

Chemicals: Formalin, ethyl alcohol, acetic acid, toludine blue, glycerine, pholoroglucinol, chloral hydrate and all other chemicals used were analytical grade.

Plant collection and authentification: The leaves of *Anacardium occidentale* Linn. selected for this study was collected from Uppodappatti, Madurai District, Tamilnadu, India during the month of July 2011 and was authenticated by Dr.P. Jayaraman, Director of Plant Anatomy Research Institute, Tambaram, Chennai, Tamilnadu, India and Prof. Dr. Stephen. Department of Botany, American college , Madurai-2.

Macroscopic Analysis: Macroscopical study on the plant was done. The shape, size, colour, texture, odour etc were noticed [14].

Microscopic Analysis: Pharmacognostical evaluation including histochemical were carried out by standard procedure [15-17]. Safranin 4% in 50% alcohol was used to stain transverse section of leaf and petiole. Reagents like potassium iodide, ferric chloride, Sudan III, concentrate HCl, ruthenium red and phloroglucinol with dilute HCl were used for histochemical tests. Concentrated nitric acid (50%) with pinch of potassium chlorate crystals was used as the macerating fluid. Photomicrographs were obtained by observing drug under compound binocular microscope (Laboscope model) with inbuilt analogue camera (Nikon)

Powder microscopy: Coarse powder of the leaf was used to study the microscopical characters of the leaf powder [18, 19].

Physicochemical analysis: Total ash, acid insoluble ash, water soluble ash, loss on drying, extractive values and leaf constants such as vein islet numbers, vein terminal number, stomatal number and stomatal index, palisade ratio were determined [20, 21,22].

Preliminary phytochemical screening: Preliminary phytochemical screening was carried out to find out the presence of various phytoconstituents using standard procedure [23].

RESULTS AND DISCUSSION

Macroscopy of the leaf: *A.occidentale* L is a small, spreading, evergreen tree reaching up to a height of 12 m (Fig 1). Leaves (10-20 cm long) are opposite, Obovate or Obovate- oblong, green and glabrous with entire often undulated margin, Obtuse –retuse or rounded tip apex and cuneate base with stout petiole (Fig 2a, 2b). Flowers are small, yellow, with pink stripes, borne in15-25 cm long, terminal panicles with both staminate and hermaphrodite flowers. Fruit is thin yellow to scarlet skin kidney shaped nut, 2.5 cm long, borne on a 5.0-7.5 cm long, pyriform, fleshy receptacle.

Microscopy of the leaf: Transverse section (T.S) of the leaves through the midrib showed the following tissue systems.

Shape: Leaves are dorsiventral with mesomorphic, even smooth and both surface with fairly prominent midrib (Fig 3a, 3b).

Epidermis: Thin, small cells with thick walls, and heavy cuticle. The abaxial cells are very thick wavy anticlinal walls, stomatiferous with parasitic type stomata. Adaxial cells are wider with thick anticlinal walls and dense simple pits. It is apostomatic (Fig 4a, 4b).

Mesophyll: It contains adaxial zone of two rows of palisade cells (70µm height). Upper row is compact and lower row are loosely arranged cells. Spongy parenchyma contains 5 or 6 layers of loosely arranged lobed cells. Vascular strand are wide bowl shaped abaxial strand, with laterally extended rim but adaxial strand is thin and flat plate. It is surrounded by thick cylinder of sclerenchyma on both sides.

Midrib: Xylem elements are wide, radial, closely aggregated, short rows of xylem elements along with lignified fibers. Phloem occurs on the outer part of the xylem with small angular, compact sieve element (Fig 5). Secretory canals or cavities present as quite frequent along the peripheral zone, ,lysigenous type, 15 µm wide.Ground tissue consist of small, compact and thick walled cells most of them containing dense accumulation of tannin. Multicellular, thick walled glandular trichomes are sparsely distributed with dense cytoplasm except in the lower end (stalk) (Fig 6). In the previous report [24] some important observations like tanniferous cell, type of stomata, secretory cavity (Lysigenous), glandular trichomes, adaxial epidermis apostomatic have been not mentioned. All the observations are included in this study and moreover clear microscopical plates are displayed.

Petiole: Transverse section of petiole is slightly convex on the adaxial side and semicircular on the abaxial side, 1.7mm thick, 2.2 mm wide. Epidermis is narrow, small thick-walled cells with heavy cuticle (Fig 7). Ground tissue is paranchymatous, tanniniferrous and some calcium oxalate crystals were observed (Fig 8). Vascular strands wide bowl shaped, abaxial side, flat and thick on the adaxial

side entirely surrounded by thin wavy cylinder of sclerenchyma. Xylem occurs as short, radial, parallel thick walled rows of vessel and thick walled fibres. Phloem Occurs all around the xylem with some secretory cavities.

Powder microscopy: The analysis of the dried powder of the leaf showed abaxial epidermis with stomata, adaxial epidermis with thick wavy anticlinal walls, paracytic stomata, xylem vessels, crystal, parenchyma, tanniniferous cells, fibres, glandular trichome (Fig 9).

Physicochemical analysis: Physicochemical parameters were found as follows: total ash 5.36%w/w, acid insoluble ash 1.89, water soluble ash 3.13%w/w, ethanol soluble extractive value 13.37%w/w, water soluble extractive value 21.10%w/w, loss on drying 10.13%w/w and foreign organic matter was nil. Leaf constants were as follows vein islet number 7.2, vein termination number 14, stomatal number (lower epidermis) 44.8, stomatal index (lower epidermis) 22.35.

Preliminary phytochemical screening: Preliminary phytochemical screening showed the presence of flavonoids, terpenoids, sterols, tannin, volatile oil, saponins, proteins and amino acids, mucilage, carbohydrates, glycosides, reducing sugars, and absence of alkaloids and fixed oil.

CONCLUSION

Today sophisticated modern research tools for evaluation of plant drugs are available but microscopic method is still a simplest and cheapest method to start for establishing the correct identity of source material. The above findings in this account provide detailed descriptions of anatomy of the leaf useful to supplement existing information with regard to the identification of *Anacardium occidentale* Linn. This pharmacognostic evaluation of *A. occidentale* leaves can be used for further research and revalidation so that the vast economic potentiality of this crop can be adequately established by its consumption which can create employment opportunity to an agricultural worker throughout the year.

Conflict of interest: We declare that we have no conflict of interest

ACKNOWLEDGEMENT

The author thanking for all helping hands particularly **Dr. Stephen,** Department of Botany, American college, Madurai for plant authentification and **Dr. P. Jayaraman**, Director of Plant Anatomy Research Institute, Tambaram, Chennai for microsopical studies.

Figure 1: Habit of *A.occidentale* Linn

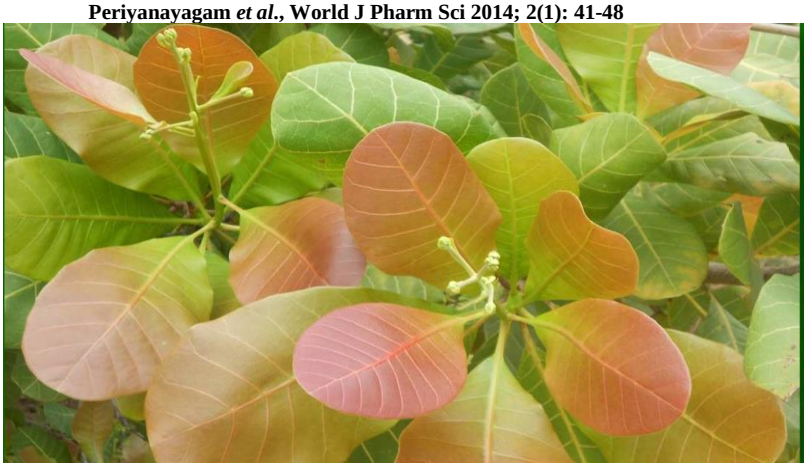

Figure 2a: Leaf arrangement

Figure 2b: Dorsal and ventral view of the leaf

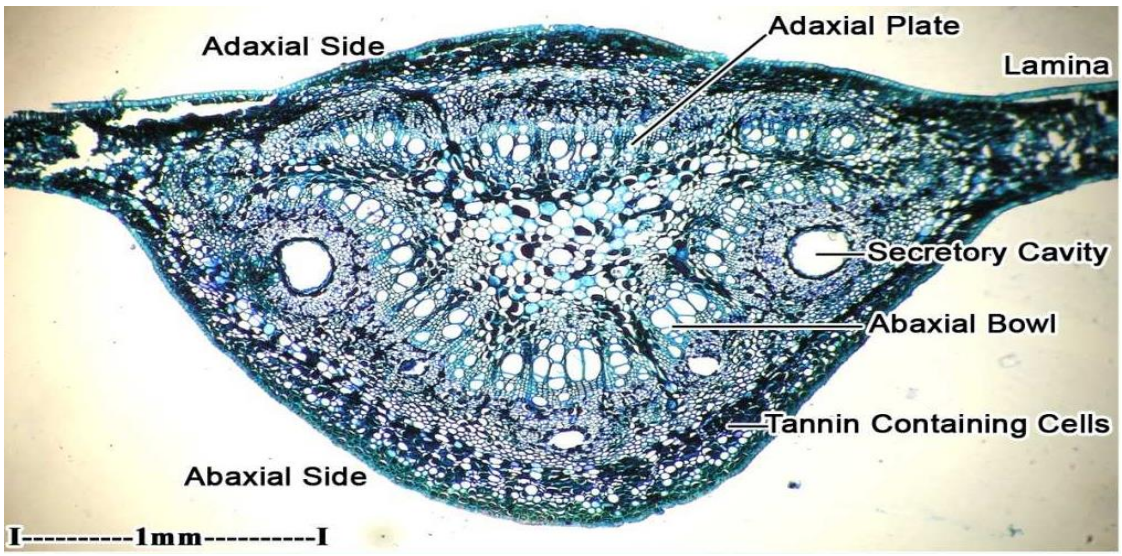

Figure 3a: Transverse Section of Midrib (4×)

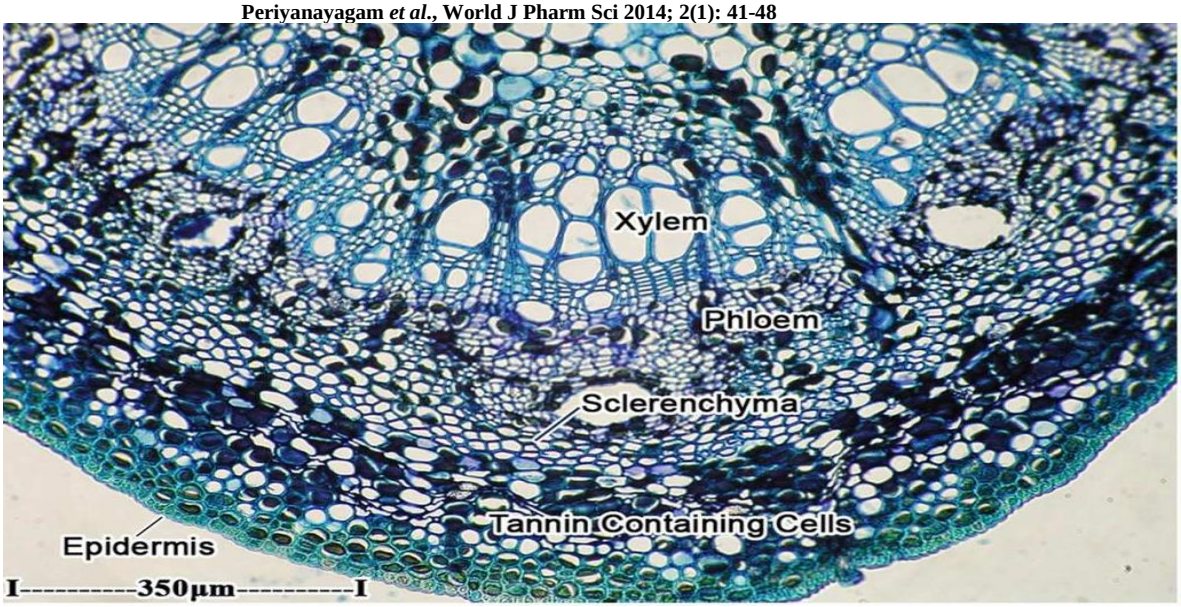

Figure 3b: Midrib- A portion enlarged (10×)

Figure 4a: Lower epidermis (40×)

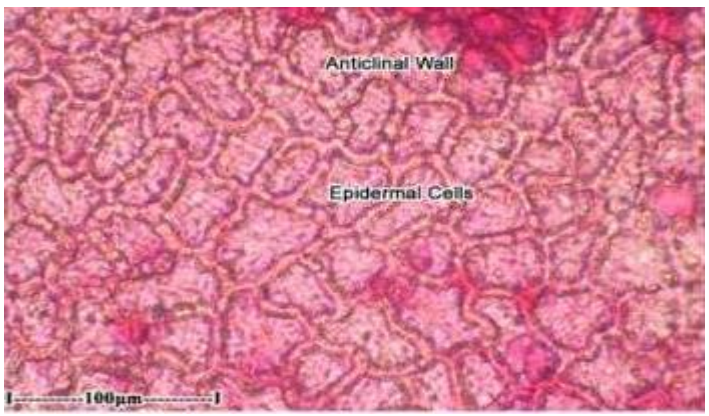

Figure 4b: Upper epidermis (40×)

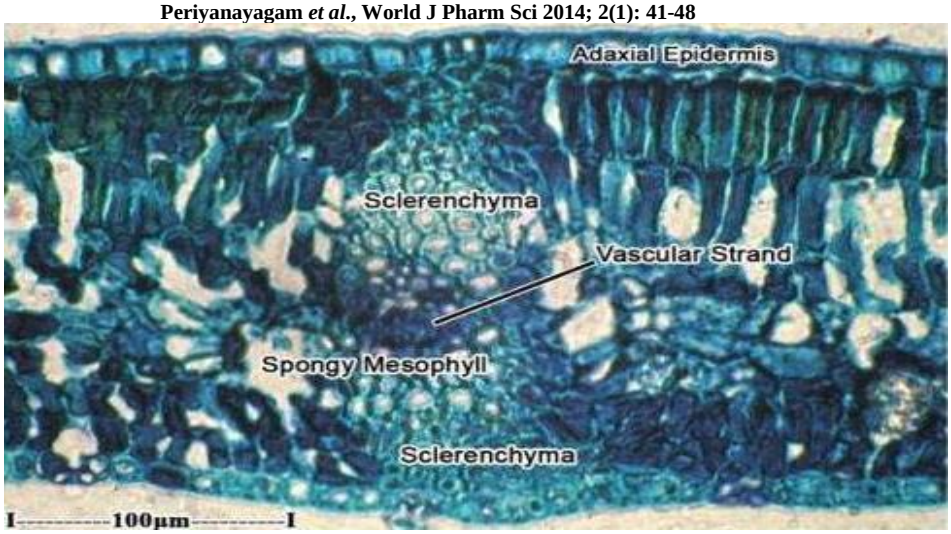

Figure 5: T.S of Lamina (40×)

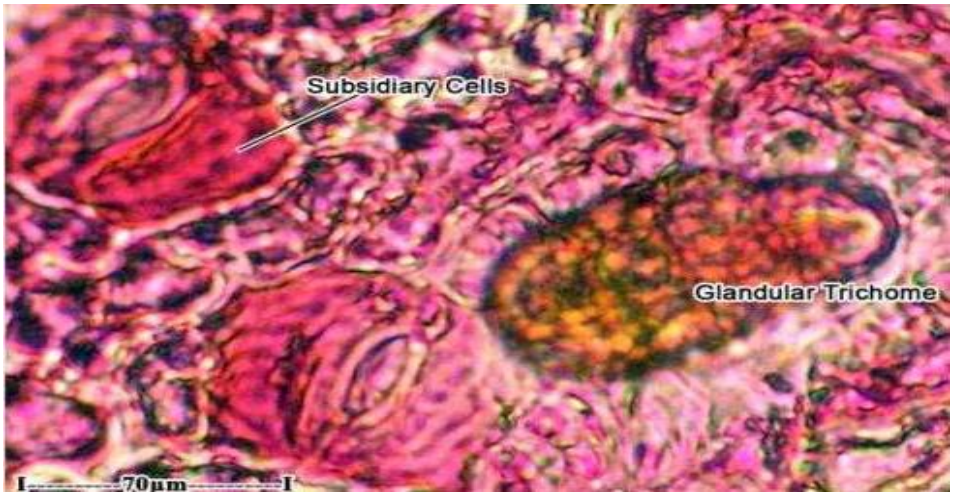

Figure 6: Stomata and glandular trichome enlarged (50×)

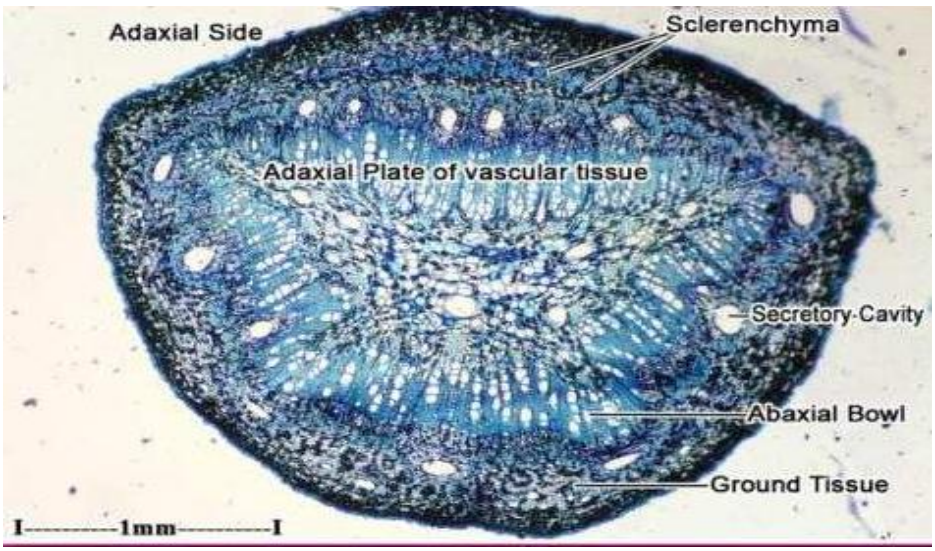

Figure 7: T.S of Petiole (4×)

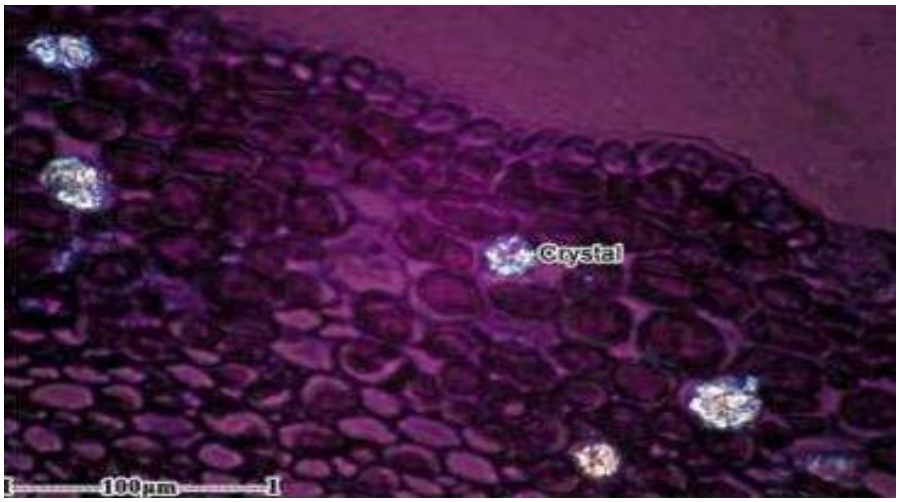

Figure 8: T.S of Petiole showing crystals

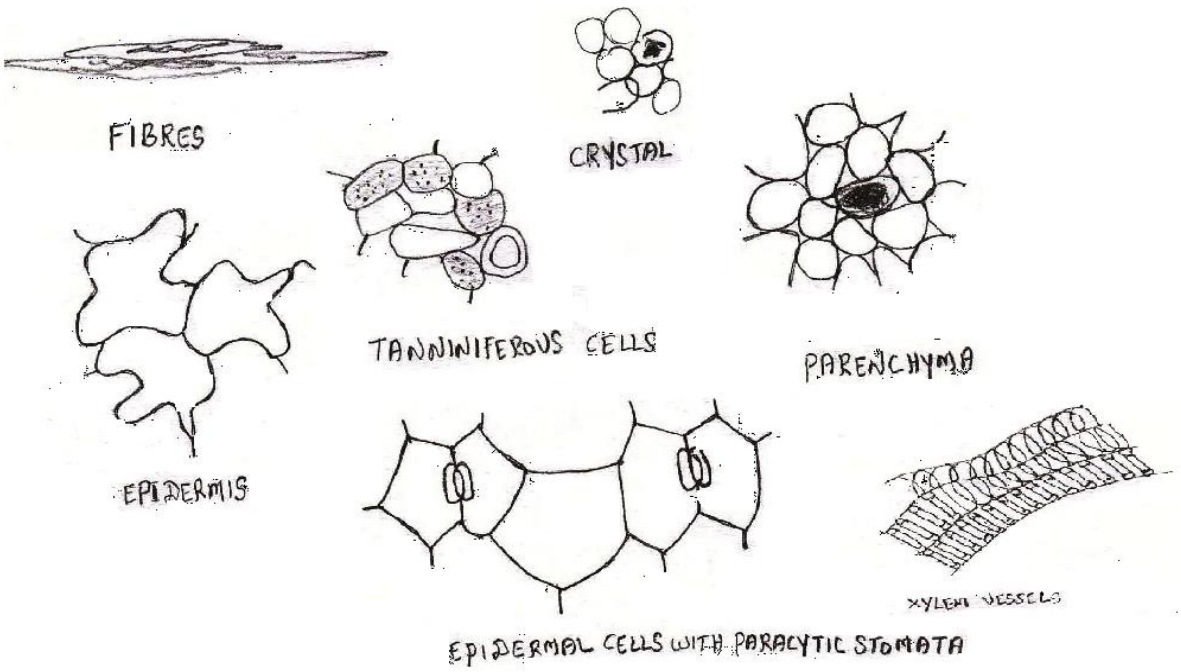

Figure 9: Powder microscopy of *A.occidentale* Linn

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