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PHARMACOGNOSTICAL EVALUATION AND PHYTOCHEMICAL ANALYSIS OF *AVERRHOA CARAMBOLA* LEAF

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ABSTRACT: Herbal medicine and their application have always been the basis of for man's curiosity from the time immemorial. *Averrhoa carambola* is one of the best Indian cooling medicine. It is believed to be responsible for its sweet or sour taste, of which most of the members are traditional it reported remedies to disease in rural India. However, proper justification and validation of their traditional practice are lacking. *Averrhoa carambola* traditionally knew as "kamrakh" and commonly known as star fruit because of its peculiar shape. It was widely in Ayurveda preparations of its fruits and leaves are used to pacify impaired kapha, pitta, skin diseases, pruritis, worm infestations, diarrhoea, vomiting, hemorrhoids, intermittent fever, over-perspiration, and general debility. The medicinal properties of *Averhoa carambola* include anti-inflammatory, analgesic, hypotensive, anthelmintic, antioxidant, anti-ulcer, hypocholesterolemic, hypolipidemic, antimicrobial and antitumor activities. Hence, we intended to explore a comprehensive account of pharmacognostic and phytochemical updated profile.

INTRODUCTION: Nature always stands as a golden mark to exemplify the outstanding phenomena of symbiosis [1]. Herbs are staging a comeback and herbal resistance happening all over the potency and side effects of synthetic drugs; there is an increasing interest in the natural product remedies with basic world [2]. In the Western world, as people are becoming aware of the approach towards nature. Herbal medicine is the oldest form of healthcare known to mankind. Plants have always been an exemplary source of drugs and many of the currently available drugs have been derived directly or indirectly from them [3].

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Herbal medicines have often retained popularity for historical and cultural ingredients and are used primarily for treating mild and chronic ailments. India has an ancient heritage of traditional medicines; Materia medica of India provides lots of information on the folklore practices and traditional aspects of therapeutically important natural products [4].

Population in developing countries depends mainly on indigenous traditional medicine for their primary healthcare needs. In recent years, the use of herbal medicines worldwide has provided an excellent opportunity to India to look for therapeutic lead compounds from an ancient system of therapy, *i.e.,* Ayurveda, which can be utilized for the development of the new drug. Over 50% of all modern drugs are of natural product origin, and they play an important role in drug development programs of the pharmaceutical industry [5].

The World Health Organisation (WHO) estimates that about 80% of the population living in the developing countries relies almost exclusively on traditional medicine for their primary healthcare needs [6].WHO has listed over 21000 plant species used around the world for medicinal purposes. In India, about 2500 plant species belonging to more than 100 genera are being used in indigenous systems of medicine [7]. At the present juncture, the modern conventional healthcare is burdened with great problems of unsafe medicines, chronic diseases, resistant infections, autoimmune disorders and degenerative disorders of aging despite great advances [8]. Undoubtedly, the plant kingdom still holds many species of plants containing substances of medicinal value which have yet to be discovered[9].

MATERIALS AND METHODS:

Plant Material: The leaves of *Averrhoa carambola* collected from the village area near to Palakkad district of Kerala and botanically identified and authenticated by Dr. Maya C. Nair, professor, Department of Pharmacognosy, Government Victoria College. A voucher specimen of the collected sample (RRSSF001) was deposited in the department of Pharmacognosy for future reference.

Pharmacognostic Studies:

Macroscopic Study: [10] The plant was macroscopically examined for shape, size, surface characteristics, texture, color, consistency, odor, taste, apex margin, base, *etc*. **Fig. 1**.

Microscopic Study:

Histology: Microscopic studies were done by preparing a thin hand section of midrib and lamina region of *Averrhoa carambola* leaf. The section was stained by safranin **Fig. 2**.

Powder Microscopy: The powder of the dried leaf was used for the observation of powder microscopic characters **Fig. 3**.

Phytochemical Studies:

Physiochemical Studies: Physicochemical parameters like total ash value, loss on drying, water soluble ash, acid insoluble ash value, alcohol-soluble extractive, and water-soluble extractive values, were determined as per WHO guideline (2002) **Table 1**.

Preliminary Phytochemical Screening: Phyto-chemical test for following chemical constants like carbohydrate, alkaloid, steroids, flavonoids, tannins, amino acid, glycosides, proteins were performed **Table 2**.

RESULTS AND DISCUSSION:

Pharmacognostical Studies:

Macroscopic Study: The pharmacognostical study is the major and reliable criteria for identification of plant drugs. The pharmacognostic parameters are necessary for confirmation of the identity and determination of quality and purity of the crude drug. The detailed and systematic pharma-cognostical evaluation would give valuable information for future studies. The plant *Averrhoa carambola* showed general characteristics of a dicot plant. Macroscopically the leaf was green in color. Apex and base were acute, the margin was entire leathery, the shape was oblong, and petioles were 8.5 cm long **Fig. 1**.

Colour : Green
Odour : Odourless
Taste : Aromatic
Margin : Entire
Apex : Acute
Base : Assymetrical
Shape : Oblong

FIG. 1: MACROSCOPIC CHARACTERISTIC OF STAR FRUIT LEAF

Microscopic Study: The microscopy study revealed the presence of lower and upper epidermis, xylem, phloem, vascular bundles, mesophyll, trichome, and collenchyma. Mesophyll was differentiated into palisade and spongy parenchyma. Palisade was formed from compactly arranged elongated, narrow columnar cells with beaded anticlinal walls. Spongy parenchyma was

made up of parenchymatous cells with varying size and shape. Vascular bundles were arc-shaped. Xylem was lignified, and phloem was non-lignified. Unicellular trichome was observed on the epidermis **Fig. 2**. Microscopy study of powder showed the presence of upper epidermis cells which were thick and irregular walled, prisms of calcium oxalate crystals, simple unicellular trichome, simple pitted vessels, anisocytic stomata and xylem vessels in longitudinal sectional view showed spiral thickening **Fig. 3**.

Physiochemical Characters: The moisture content of dry powder of leaves of *Averrhoa carambola* was 24.0% which seems to that necessary to support the growth of microbes to bring any change in the composition of the drugs. Physical constant like ash value of the drug gives an idea of the earthy matter or the inorganic composition and other impurities present along with the drug. The results of the physical constants of the drug powder are given in **Table 1**.

TABLE 1: PHYSICAL CONSTANTS OF DRUG POWDER OF STAR FRUIT

Parameter		Result (% w/w)
Ash value	Total ash	69.6±0.005
	Water soluble ash	13.5±0.01
	Acid soluble ash	13.0±0.01
Loss on drying		24.0±0.15
Extractive value	Water-soluble extractive	9.0±0.1
	Alcohol soluble extractive	5.0±0.2
Other parameter	Stomatal index	33.3±1
	Vein islet number	49.0±1

`±` Mean deviation

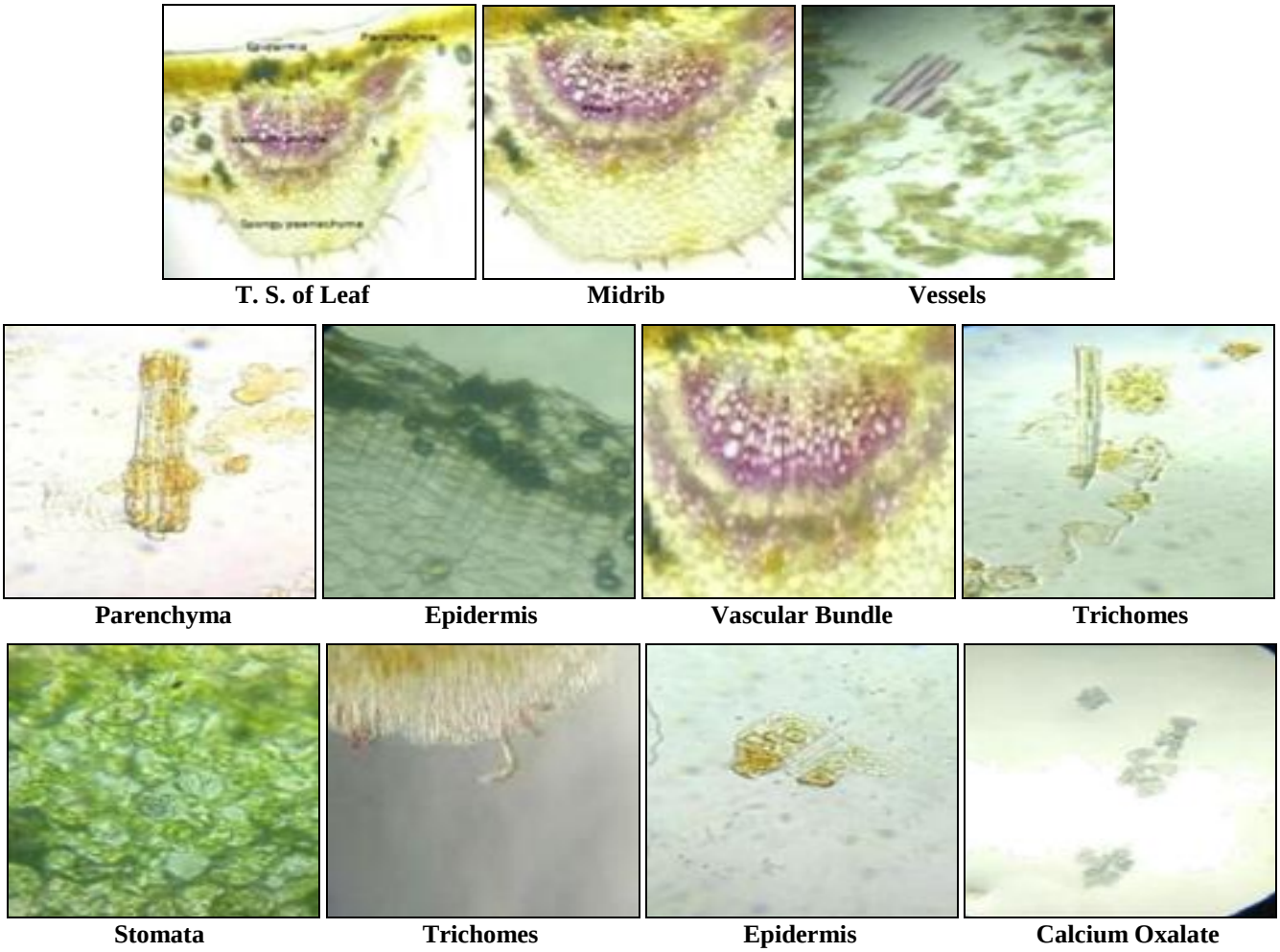

FIG. 2: TRANSVERSE SECTION OF STAR FRUIT

Total ash of crude powder of leaves of *Averrhoa carambola* was 69.6%, acid insoluble ash was 13.5%, and water soluble ash was 13.0%. The extractive yield of leaves of *Averrhoa carambola* water (9.0%) and alcohol (5.0%) **Fig. 1**. The variation in an extractable matter in various solvents is suggestive of the fact the formation of the bioactive principle of the medicinal plant is influenced by a number of intrinsic and extrinsic factors. High water soluble and alcohol soluble

extractive value reveal the presence of polar substance like phenols, tannins and glycosides **Table 2**.

Averrhoa carambola is used for the treatment of various diseases; therefore it is important to standardize it for use as a drug. The pharmacognostic constants for the leaves of this plant, the diagnostic microscopic features and the numerical standards reported in this work could be useful for the compilation of a suitable monograph for its proper identification.

TABLE 2: PHYTOCHEMICAL ANALYSIS OF STAR FRUIT

Phytochemical constituents	Test	Result
Carbohydrate	Molish`s test	+
	Fehling`s test	+
Alkaloid	Mayer`s reagent	+
	Dragendorff`s reagent	+
	Hager`s reagent	+
	Wagner`s reagent	+
Flavonoids	Shinoda test	+
	Lead acetate reagent	+
Tannins	Ferric chloride reagent	+
	Lead acetate reagent	+
	Nitric acid reagent	+

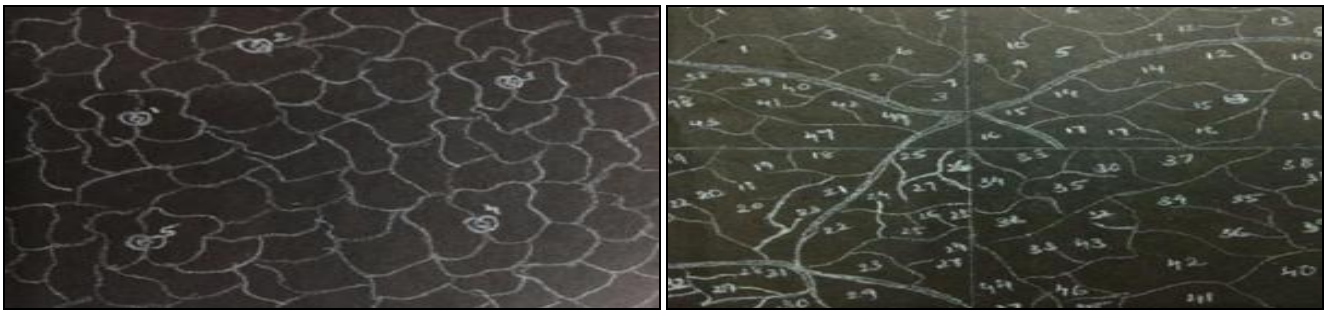

FIG. 3: POWDER MICROSCOPY OF STAR FRUIT

Stomatal index = S / E + S × 100
Vein islet number = 49.0
= 35 / 35 + 70 × 100 = 33.3

CONCLUSION: Standardization of herbal drugs is very much essential as they are derived from heterogeneous Sources which can lead to variations. These variations can lead to erroneous results in various pharmacognostic and phyto-chemical studies. *Averrhoa carambola* leaves are known for many medicinal properties; hence the present study may be useful to supplement the information in respect to its identification, authentication, and standardization. No such that comprehensive account of their pharmacognostic and phytochemical properties have been carried out so far. Hence, we designed the present study to explore the pharmacognostical and phytochemical profile on *Averrhoa carambola.*

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