

Research Article

PHARMACOGNOSTICAL AND PHYTOCHEMICAL STUDY OF *ACACIA CATECHU* (LINN. F.) WILLD. & *AZADIRACHTA INDICA* (A. JUSS.)

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ABSTRACT

Objective: In the present study *Acacia catechu* (Linn.f.) Willd. And *Azadirachta indica* (A. Juss.) were chosen for Pharmacognostical study and also evaluated chemically. **Method:** Bark of *Acacia catechu* (Linn.f.) Willd. And *Azadirachta indica* (A. Juss.) were chosen for Pharmacognostical study and bark powder were also evaluated chemically along with the determination of TLC. **Results :** The word analysis means the detailed examination which reveals the minor but most important aspects regarding the drug. So without analytical study, the drug study is incomplete. Analytical study of a product provides some standards and new facts to judge its quality. It is useful to decide the future work plan and objective parameters to know the exact status of the drug by conducting the comparative study of various samples during drug preparation. The Phytochemical and Analytical research, in fact, can play a very crucial role in such research works. With the help of these studies, it is possible to standardize the plant and differentiate the adulterants, which is the need of the hour. The therapeutic efficacies of medicinal plants depend upon its quality and percentage of active principles in it. Finally, both fresh samples of Khadira and Nimba twak are procured and authenticated Pharmacognostically (Macroscopic & Microscopic characteristic). In the Phytochemical study, the observations prepared during the physiochemical analysis of Khadira and Nimba powder according to the different parameter with TLC profile. **Conclusion :** In Ayurveda, the description regarding the plants is available in the Nighantus, where in various synonyms are given to each plant while describing it. In this pattern, many drugs are available with the same name. So while going through the Ayurvedic texts, no one properly understood as to which exact drug should be taken. While Marketing Ayurvedic drugs, the business minded peoples mix spurious and adulterant drugs in the original drug which make it difficult to identify the original drug. Apart from that, by the help of Pharmacognostical and Phytochemical study, we can suggest substitutes to some rare species and save them from extinction.

Keywords: Khadira, Nimba, Pharmacognostical and Phytochemical study.

INTRODUCTION

According to various Acharyas, Tikta-Kashaya Rasa, Katu Vipaka is the Pramehaghna. Khadira and Nimba are also Tikta-Kashaya Rasa, Katu Vipaka [1]. So, here we want to access the effect of Nimba bark in diabetes mellitus. The selected plants Khadira and Nimba are very popular and easily available throughout the India. By its references in Bhavprakash & Kaidev Nighantu [2,3], decided to the efficacy of both drugs by using Khadira and Nimba in Diabetes mellitus and also to do a Pharmacognostical and Analytical study of the drugs used.

Pharmacognosy is an important link between pharmacology and medicinal chemistry. Let the Vaidya be highly educated and experienced unless he gets the correct drug; he cannot provide relief to his patients on which depends his success & reputation ultimately. So the crux of the entire problem virtually revolves around proper identification of the drug. The original and basic approach towards pharmacognosy includes the study of morphological systems which still hold a key in the identification of the correct species of the plant. Pharmacognostical study of plants helps us to differentiate between closely related species of the same genus or related genera of the same family. It is also the first step to standardize a drug which is the need of the hour. If the plant's drugs are adulterated, then the quality of preparation could not give the desirable results. Ayurvedic system of medicine uses the drug as a whole whereas the modern system of medicine has given much importance to the fractions of the drugs.

That's why they usually extract the active principles of the drug and use it for therapeutic purposes. Ayurvedic pharmacies have adopted this trend to a large extent, and they have also started to extract the active principles of the drug and use them.

The plant kingdom has lots of hidden secrets, such as their complex compounds or active principle which is thought to be responsible for their therapeutic efficacy. So the search for a potent and effective drug against diseases led the scholars to develop newer and more advanced techniques.

So before using a drug, it is quite essential to carry out its detailed Pharmacognostical and Analytical study as it is not only helpful for correct identification but also to get a due for its pharmacological and medicinal properties.

AIMS AND OBJECTIVE

The present study mainly aims to search out the authenticity of the test drug as well as to determine the various constituents.

Plan of study

- Material
- Collection of sample
- Preservation of sample
- Pharmacognostical study

Material

Khadira twak and Nimba twak were used as a material for the present study.

Collection of Sample

Khadira and Nimba twak were collected from the periphery forest area of Indore (M.P.) by self-efforts.

Preservation

After collection of wet drugs both twak were dried naturally. After dried, both twak were grinded in the pulverizer. The powder was kept in air tight jars safely.

PHARMACOGNOSTICAL STUDY [4,5]

Botanical Source

Khadira - *Acacia catechu* (Linn.f.) Willd. Belonging to the family Leguminosae.

Nimba - *Azadirachta indica* (A. Juss.) belonging to the family Meliaceae.

Habits & Habitat

Khadira

Acacia catechu is a small or medium-sized, thorny tree up to 15 m tall; bark dark grey or greyish-brown, peeling off in long strips, or sometimes in narrow rectangular plates, brown or red inside; branches slender, puberulous when young but glabrescent, with 2 curved, 8-mm prickles at the base of each petiole. Leaves bipinnately compound, with 9-30 pairs of pinnae and a glandular rachis; leaflets 16-50 pairs, oblong-linear, 2-6 mm long, glabrous or pubescent. Flowers in 5-10 cm long axillary spikes, pentamerous, white to pale yellow, with a campanulate calyx, 1-1.5 mm long, and a corolla 2.5-3 mm long; stamens numerous, far exerted from the corolla, with white or yellowish-white filaments. Fruit a strap-shaped pod, 5-8.5 cm x 1-1.5 cm, flat, tapering at both ends, shiny, brown, dehiscent, 3-10 seeded; seeds broadly ovoid. In India, three varieties, namely: var. *catechu*, var. *catechuoides* and var. *sundra* are recognized. The generic name, 'Acacia', comes from the Greek word 'akis', meaning a point or a barb. The species name comes from 'cutch,' a tanning extract isolated from its heartwood.

Nimba

Neem is a medium sized to large tree characterised by its short straight trunk, furrowed dark brown to grey bark, and dense, rounded crowns of pinnate leaves. Native to India, Neem is widely planted and naturalized in semiarid areas throughout Asia and Africa. Neem is an evergreen of the tropics and sub-tropics. With an extensive and deep root system, the hardy Neem can grow luxuriantly even in marginal and leached soils and thrives up to an elevation of 1500m. The Neem flowers profusely between February and May. The honey-scented white flowers, found in clusters, are a good source of nectar for bees. Neem fruits are green drupes which turn golden yellow on ripening in the months of June, July and August in India.

MACROSCOPIC CHARACTERS OF DRUGS

Bark of Khadira

Bark dark grey or greyish-brown, peeling off in long strips, or sometimes in narrow rectangular plates, brown or red inside, young trees have Corky. It is bitter and astringent in taste.

Bark of Nimba

Bark varies much in thickness according to age and parts of the tree from where it is taken; external surface rough, fissured and rusty-grey; laminated inner surface yellowish and foliaceous, fracture, fibrous; odor, characteristic; taste, bitter.

MICROSCOPIC CHARACTERS OF DRUGS

Khadira (Stem bark with heartwood)

Transverse section shows, numerous, uni-to bi-seriate medullary rays, vessels occurring isolated or in small groups of two to four, xylem fibres with narrow lumen occupying major portion of wood, xylem parenchyma usually predominantly paratracheal, forming a sheath around vessels, wood consists of crystal fibres with 14-28 segments, each having one prismatic crystal of calcium oxalate, a few tracheids with scalariform thickening, some of cells, including

vessels, filled with brown content, prismatic crystals of calcium oxalate present in a number of cells throughout the wood.

Nimba (Stem bark)

Shows outer exfoliating pieces hard, woody, considerably thick in older barks; almost entirely dead elements of secondary phloem, alternating with discontinuous tangential bands of compressed cork tissue, former composed of several layers of stone cells occurring in regularly arranged groups together with collapsed phloem elements filled with brown contents; in between the successive zones of cork tissue 3-5 layers of fibre groups with intervening thin-walled and often collapsed phloem elements present; each zone of cork tissue consists of several layers of regular, thin-walled cells occasionally with a few compressed rows of thick-walled cells towards 133 outer surface; within exfoliating portion a number of layers of newly formed cork composed of thin walled, rectangular cells and one or two layers of cork cambium, below which a wide zone of secondary phloem present; secondary cortex absent in most cases; secondary phloem commonly composed of well-developed fibre bundles traversed by 2-4 seriate phloem rays and transversely separated by bands of parenchymatous tissue of phloem; phloem elements of outer bark mostly collapsed; a few fairly large secretory cavities also occur in phloem; most of the phloem parenchyma contain starch grains and prismatic crystals of calcium oxalate; starch grains, simple, round with central hilum, measuring 2.75-5 μ structure of bark varies considerably according to gradual formation of secondary cork bands.

POWDER MICROSCOPY OF BOTH DRUGS

Khadira

Brown colored, under a microscope shows some xylem fibers, vessels, crystal fibers, prismatic crystals of calcium exalate.

Nimba

Reddish-brown; shows numerous prismatic crystals of calcium oxalate, phloem fibres with narrow lumen and pointed ends; cork cells, stone cells mostly in groups, lignified rectangular to polygonal, having wide lumen and distinct striations, simple starch grains, measuring 2.75-5 μ in diameter.

MATERIALS AND METHODS FOR PHYTOCHEMICAL STUDY [6,7]

Both fresh samples of Khadira and Nimba twak are procured and authenticated pharmacognostically. The dried samples were powdered and were used for the present study.

The analysis of the samples was carried out by using physiochemical and chromatographic methods. Following parameters were employed.

- Determination of foreign matter
- Determination of pH
- Determination of moisture content
- Determination of total Ash
- Water soluble Extractive
- Alcohol soluble Extractive
- Ether soluble Extractive
- TLC Profile of *Acacia catechu* (Linn.f.) Willd.
- TLC Profile of *Azadirachta indica* A. Juss.

RESULTS

The observations prepared during the physiochemical analysis of Khadira and Nimba powder according to different parameter are discussed in below table.

Table.01: Results of Physiochemical analysis of *Acacia catechu* (Linn.)Willd. (Bark powder)

Parameter	Value	Standard value according to API
Foreign matter	0 %	Not more than 2%
pH	6.902	Not given
Moisture content	1.5%	Not given
Total Ash	4%	Not more than 8%

Water soluble extractive	11.2%	Not less than 3%
Alcohol soluble extractive	13.6%	Not less than 3%
Ether soluble extractive	0.80%	Not given

Table.02: Results of Physiochemical analysis of *Azadirachta indica* (A.Juss.) (Bark powder)

Parameter	Value	Standard Value
Foreign matter	0%	Not more than 2%
pH	6.903	Not given
Moisture content	1.8%	Not given
Total Ash	4.5%	Not more than 7%
Water soluble extractive	9.6%	Not less than 5%
Alcohol soluble extractive	12.8%	Not less than 3%
Ether soluble extractive	0.95%	Not Given

DETERMINATION OF TLC

Apparatus: TLC Chamber, Prepared TLC plate

Method: Thin Layer Chromatography-

Thin layer chromatography: T.L.C. is based on the adsorption phenomenon. In this type of chromatography mobile phase containing the dissolved solutes passes over the surface of stationary phase.

Sample application and development

- After plates had been activated, the sample, which may be range from a few µg to mg. was applied on the plates with the help of a capillary tube.
- Plates were placed in the chamber that contains a developing solvent to a depth of about 0.5 cm.
- Plates were then removed from the chamber, the mobile phase front is marked by scratching the surface, and the solvent was evaporated in an oven.

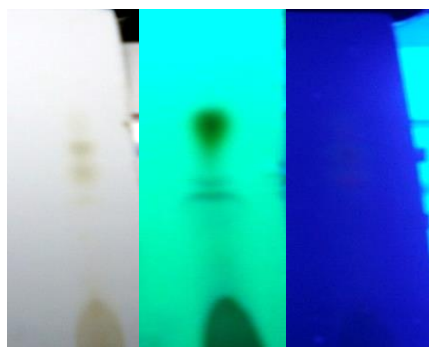
Detection and Calculation of R_f Value

1. Once the chromatogram was developed the spot of Quercetin that is solute appears yellow on silica gel plate.
2. The R_f Value of the spot was calculated using the formula -

$$R_f = \frac{\text{Distance traveled by solute}}{\text{Distance traveled by solvent}}$$

Table.03: Results of TLC Study of *Acacia catechu*.

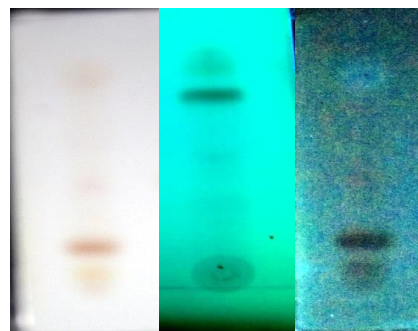
S.No.	Mobile phase	R _f value
1.	Chloroform : Ethyl Acetate : Formic acid (5:4:1 v/v/v)	0.34, 0.51, 0.64, 0.82



Normal light Short UV Long UV

Table.04: Results of TLC Study of *Azadirachta indica*.

S.No.	Mobile phase	R _f value
1.	Chloroform : Ethyl Acetate : Formic acid (5:4:1 v/v/v)	0.72, 0.86, 0.96



Normal light Short UV Long UV

Here descriptions of Physiochemical study of both drugs are discussed. Some of the values are not available in our texts. So addition of these values may be useful for further studies.

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