CHEMICAL INVESTIGATION ON THE STEM BARK OF *MESUA FERREA* LINN., AN ETHNO MEDICINALLY IMPORTANT PLANT

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Abstract: Thousands of plant parts have been utilized for treatment of diseases since centuries worldwide. About 80% of the world population primarily in the developing countries is depending on herbal remedies for primary health care according to WHO reports. To assure the quality of the drug, standardization has become essential and is the need of the day. The present paper deals with a phytochemical study on the stem bark of an ethno medicinally important plant, *Mesua ferrea* Linn., known as Nagachamba in Malayalam and Nagakesar in Hindi. The study was based on the physico-chemical as well as preliminary phytochemical properties of the plant material to lay down the pharmacopoeial standards. *Mesua ferrea* Linn. (Family: Clusiaceae), is perennial short, erect, grayish green, woody tree. It is an important medicinal plant which finds varied use in Ayurveda, Siddha and Unani. The analytical methods employed include determination of physico-chemical parameters, thin layer chromatography (TLC) and High performance liquid chromatography (HPLC) profiles. The results can be conveniently used as a tool for standardization of the single drug.

Key words: *Mesua ferrea,* Pharmacopoeial standards, Physico-chemical parameters.

Introduction: Thousands of plant parts have been utilized for treatment of diseases since centuries worldwide. About 80% of the world population primarily in the developing countries are depending on herbal remedies for primary health care according to World Health Organisation (WHO) reports. The efficacy and popularity Fig .1.*Mesua ferrea* tree of herbal medicines depends on the quality of the material used for the treatment. To assure the quality of the drug, standardisation has become very much essential and is the need of the day. The objective of the present work is to establish the identity of a herbal raw drug by chemical methods. *Mesua ferrea* Linn. (Fig.1), Family: Clusiaceae), known as Nagakesar plant, has been used in many herbal formulations for centuries. It is an important medicinal plant which finds varied use in Ayurveda, Siddha and Unani. Bark and roots in decoction or infusion or tincture is a better tonic and are useful in gastritis, bronchitis, in fever, itching, nausea, leprosy, skin disorders, bleeding piles, menorrhagea, excessive thirst, snake bite and sweating. The plant is used in inflammation and septic conditions. The tribal's of Assam use this plant for its antiseptic, purgative, blood purifying, worm controlling and tonic properties .In Thai traditional medicine,it is used to treat fever, cold, asthma and also as a carminative, expectorant, cardiotonic, diuretic and antipyretic agent . The aerial plant parts are spasmolytic, diuretic, abortifacient and used in fever, dyspepsia, renal disorders and in cosmetics. *M. ferrea* is an ingredient of various ayurvedic formulations like dasamoolarishta, mahakaleshwara rasa and in various churnas used to cure many diseases [1]-[5]. The present paper deals with a detailed study on the stem bark of *Mesua ferrea* Linn. based on its physicochemical and preliminary phytochemical properties to lay down the pharmacopoeial standards.

Materials and Methods: The stem bark of *Mesua ferrea* Linn. was freshly collected from herbal garden of College of Horticulture, Vellanikkara campus, identified by the botanist . For chemical analysis, the plant material was dried and powdered and kept in airtight containers. This sample was used for all experimental purposes. The physicochemical parameters like determination of weight loss on drying at 105°C, ash content, acid insoluble ash, volatile oil, solubility in water and alcohol, pH of water extract etc were carried out by standard methods. The fluorescence characters of the drug in different solvents were also detected in visible, short UV and long UV light, in order to examine the presence of different natural products in the plant. Characteristic phytochemical tests for sugar,starch, poly phenols, saponin, mucilage, steroid, alkaloid and flavonoid were performed using different extractives of the plant material employing standard procedures[6]-[8].Development of thin layer chromatographic (TLC) profile: TLC profile of the methanol extract of the plant material (10%) was performed on silica gel G 60 F254 pre-coated aluminium sheet and the plate was developed using chloroform:methanol (9:0.1) mobile phase. Then the plate was air dried and visualized under UV light (short& long). Rf values of the spots were recorded. Development of High Performance liquid chromatographic (HPLC) profile:Methanol extract of

the plant (HPLC grade 10%) was injected into a C18 Reverse Phase (RP) column at 25 °C. Mobile phase used was methanol:water (Ratio 65:35,UV-detector,256 nm). The specific fingerprint developed was recorded [9].

Results and Discussion: The results of the physicochemical parameters of the bark samples are given in Table I. The test for loss on drying determines both water and volatile matter. Ash value includes both physiological ash, which is derived from the plant tissue itself, and non physiological ash which is the residue of the extraneous matter adhering to the plant surface. So ash values are helpful to determine the quality and purity of a drug. Acid-insoluble ash measures the amount of silica present, especially as sand and siliceous earth. Alcohol soluble extractives and water soluble extractives determine the amount of chemical constituents extracted with these solvents from the drug. The pH value (6.5) indicated that the water extract of the drug is slightly acidic.

Table. I: Physicochemical parameters of *Mesua ferrea* Linn. (stem bark).

1	Loss on drying at 105°C (%)	12.5
2	Total ash (%)	3.76
3	Acid insoluble ash (%)	0.53
4	Water soluble extractives (%)	6.10
5	Alcohol soluble extractives (%)	3.11
6	pH of water extract	6.5
7	Volatile oil (%)	nil

Fluorescence characters: Details of observations recorded with respect to behaviour of different solvent extracts under visible and fluorescent light at 254 nm and 366 nm are given in Table II.

Table II: Fluorescence behaviour of different extracts of *Mesua ferrea* Linn stem bark.

Sl. No.	Extractives	Visible light	Short UV 254 nm	Long UV 365 nm
1	Petroleum ether	Yellow	Green	Pale rose
2	Chloroform	Yellow	Green	Pale rose
3	Methanol	Reddish brown	Green	Grey green
4	Ethyl alcohol	Pale brownish yellow	Green	Grey green
5	Distilled water	Reddish brown	Green	Green

Phytochemical screening tests revealed the presence of sugar, starch, mucilage, poly phenols, steroids, alkaloids and flavonoids and are recorded in the Table III.

Table III: Results of preliminary phytochemical tests.

Sl.No:	Natural products	Test performed	Inference
1	Sugar	Molisch'test	Present
2	Poly phenols	Neutral $FeCl_3$ test	Present
3	Saponins	Foaming in water	Present
4	Mucilage	Swelling in water	Present
5	Steroid	Liebermann's test	Present
6	Alkaloid	Mayer's test	Present
7	Flavonoid	Shinoda test	Present

Chromatographic studies: The TLC chromatographic profiles were developed by the method described in Materials and Methods. The Rf values and colour of the spots in UV-L light were noted and recorded in Table IV and the TLC finger print specific for *Mesua ferrea* bark giving a set of 6 bands is shown in (Fig 2). Rf value is characteristic for a given stationary phase and solvent combination. The specific HPLC finger print of methanol extract of the stem bark of *Mesua ferrea* Linn obtained is shown in (Fig.3).

Bark

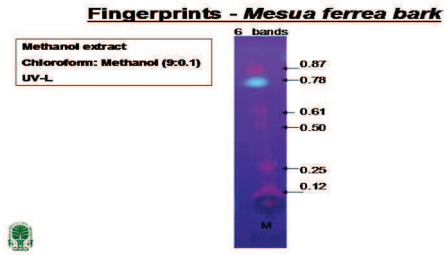

Fig2
TLCfinger print of *Mesua ferra*

Fig 3. HPLC finger print of *Mesua ferrea* bark

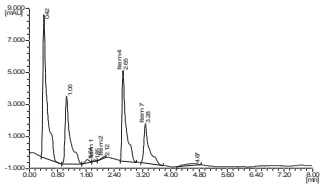

Table IV: TLC profile of methanolic extract of *Mesua ferrea* Linn. stem bark.			
Rf values in UV-Long	Colour of band under UV- long	Rf values in UV-Long	Colour of band under UV- long
.87	Pink	0.50	Pink
0.78	Bluish green	0.25	Pink
0.61	Pink	0.12	Pink

Conclusion: The specific TLC profile and Rf values obtained are important parameters for standardization of the raw any HPLC profile of the plant material also gave characteristic pattern which can be used to establish the identity of this drug. TLC and HPLC profiles developed along with the physico-chemical parameters can be conveniently utilised as a tool for the standardization of *Mesua ferrea* Linn. (stem bark) which is an ethnomedicinally important raw drug. The various physico chemical standards developed in this study will help in quality control and standardization of the drug in crude form.

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