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1. INTRODUCTION

Natural products have been an important source for the maintenance of life for ages. Plants afford most of the drugs obtained from natural resources. The use of drugs derived from plants dates back to antiquity and it is quite clear that the present day application of pure isolates and crude forms of plants in the treatment of alleged disorders was foreshadowed in the folk remedies of the older days. Even today, natural products are becoming increasingly important as alternative medicines and as a source of pharmacotherapeutics either directly, for example in the application of herbal drugs for the treatment of chronic diseases, or as raw materials from which more or less complex chemical structures with particular biological activity are isolated. Cragg et al (1997) reviewed the role of natural products in drug discovery and concluded that for the anti-cancer and anti-infective diseases, more than 60 percent of the new approved drugs are derived from botanicals or herbal medicinal preparations.

Botanicals or herbal medicinal preparations are comminuted or powdered vegetables drugs, extracts, tinctures, fatty or essential oils, expressed plant juices etc prepared from herbal drugs and preparations whose production involves a purification or concentration process.

The last couple of decades have seen a resurgence of interest in the use of herbal products. The interest may have been revived by factors such as inadequate treatments for chronic conditions and the need to overcome the short comings of the established conventional healthcare systems. Besides a large number of articles in the popular magazines and scientific journals started extolling the virtues of herbal products. This popularity is also aactivated by the advantage of cost control, which is generally perceived in Phytotherapy. This interest in the herbals as a form of health providers have given momentum to a rapid and enormous amount of research work on the components of the plants, their pharmacological properties, methods to isolate them and bring out medicines or health supplements and improve them. Herbal medicine is now practiced worldwide and has been recognized by the world health organization as an essential building block for primary health care. Exploring traditional herbal medicines in the context of modern science is the need for today for optimum and proper utilization of these plant drugs.
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Earlier, plant parts such as roots, barks, leaves, fruits etc were used to treat disease. Later with the development of traditional system of medicine like Ayurvedic system, same crude drugs in the form of powders, infusions, decoctions, tinctures etc made their place in therapy. Today the Ayurvedic practitioners largely use herbal and herbo-mineral preparations to treat the diseases. With the advent of science, many crude drugs used in traditional system came under chemical scrutiny and led to the isolation of therapeutically active principles like morphine, quinine, reserpine, digoxine etc. Some of these active principles were even synthesized and the same later gave birth to synthetic drugs which comprise the modern day medicine. However, it is important to note that, phytomedicines that are standardized extracts consisting of primary active components and accompanying compounds (co-effectors) manifest better effects and a greater therapeutic range of activity than individual isolated compounds1.

Today, however the pendulum has started to swing back. WHO estimates that 80 % of global population still relies on the plant based medicines and in most developed countries, 25 % of currently prescribed medicines were first identified in plants. Presently a good number of herbal remedies have been tested particularly for the treatment of allergic, metabolic, digestive and degenerative diseases associated with ageing. However no scientific data regarding their identity and effectiveness are available except that in the treatise of Ayurveda and Unani medicine.

In the view of above, pioneering research on indigenous medicinal plants was initiated by Sir Ram Nath Chopra, which is well documented in his comprehensive treatise (Chopra et al, 1958). This inspired number of scientists to take independent investigations on a number of medicinal plants but due to lack of co-ordination, their identity and effectiveness, could not be authenticated. Therefore, integrated multi-disciplinary research on indigenous medicinal plants was sponsored by many regional science and medical institutions besides CSIR laboratories. However, very few drugs of plant origin could gain confidence for clinical use by practitioners of modern medicine.

In spite of several pitfalls encountered in the medicinal plant research, the prospects of development of indigenous drugs for health care delivery system should not be considered so bleak in the view of the development of some drugs of promising therapeutic utility. The
recent discoveries have been responsible for the introduction of extremely useful drugs like artemisinin for drug resistant malaria, centchroman as contraceptive and vincristine and taxol for treating different types of cancer. Thus the research in herbal area is to gain knowledge about the molecules in the plant and their structures and fundamental behaviour to envision the pharmacological activity and often to predict the pharmacokinetics and bioavailability. The knowledge of plant biosynthetic mechanisms inspires the chemists to propose biomimetic synthesis.

Herbal research is now encompassing the attempts to synthesize new molecules from natural products, which have a better application. For example, turmeric can be converted to pure curcuminoids for application as antioxidants. The research was taken further to produce a white form of curcuminoids namely tetrahydrocurcuminoids which has extensive application in cosmetics. Black pepper, traditionally used as a spice, has been refined to piperine, a pure chemical entity, which has been shown to have bio-enhancing properties. Further research produced tetrahydropiperine as a dermal penetration enhancer.

Herbal research is required to derivatise a natural product to suit a particular application. For example, Forskholin is useful as lean body mass enhancer but its solubility in water is very poor. If the soluble form is available, it can be used in mineral water, so that the person desirous of taking Forskholin for weight management can drink water containing the required dose of Forskholin. Similarly the potassium salt of hydroxy citric acid for weight management was the result of a need for water solubility.

Research is continuing in the areas of most common forms of cancer of lung, colon, stomach, breast and prostate. Recent research have indicated that isoflavones from soyabeans are good for preventing breast cancer and free fatty acids from saw palmetto effective against prostate enlargement. In spite of tremendous advances in the modern system of medicine, there are still a large number of conditions for which suitable drugs are not available in the modern system of medicine such as rheumatic diseases, viral infections, liver diseases, bronchial asthma, diabetes, peptic ulcer, immunomodulators as adjuvant for chemotherapy and adaptogens.

Peptic ulcer is a perennial problem encountered by physicians all around the world. It is one of the most common diseases affecting mankind. It affects 5-10 % of the population and
represents a major health issue in terms of human suffering and cost to society in terms of requirements for healthcare resources. Despite the several alternative unconventional approaches to its treatment, the recurrence of ulcer on cessation of therapy represents a grave problem. Hence the search continues for more effective and safer drugs which may accelerate the healing process and prevent recurrence of peptic ulcers. The first systematically effective drug against gastric ulcer was carbenoxolone, discovered as a result of research on commonly used indigenous plant Glycerrhiza glabra. Studies on cabbage, used as an antiulcer agent in folk medicine led to the development of gefarnate. Banana fruit has also been found to inhibit peptic ulceration.

_Soymida febrifuga_ – a highly reputed plant in Ayurvedic system of medicine has been evaluated for its various pharmacological actions, particularly antiulcer activity. In the local language, the plant is known as 'Ron', 'Rohini' or 'Rohina'. In Indian system of traditional medicine, only the bark of _Soymida febrifuga_ is used for its medicinal properties. The bark enjoys considerable reputation in Ayurvedic system of medicine for its excellent wound healing, febrifuge, astringent, antiperiodic, tonic, antidiarrhoeal, anthelmintic and aphrodisiac properties.

Our survey on the ethanopharmacological aspects of _Soymida febrifuga_ (Adr. Juss) led us to determine the use of bark in gastrointestinal disorders like gastric ulcers and diarrhoea and topically for the treatment of wounds, burns and ulcers. Since modern pharmacological studies evaluating these claims of _Soymida febrifuga_ bark are lacking, the present study was undertaken to investigate its various pharmacological actions particularly antiulcer activity, and the phytoconstituents responsible for such actions.

Literature on _Soymida febrifuga_ sites the presence of 15-20 % of tannins (polyphenols) in the bark and since the major medicinal properties are attributed to the bark, it was thought worth while to evaluate the pharmacological actions of its major phytoconstituents. In the present study, the parent extract (containing mainly tannins with mixture of other constituents and not the chemically defined isolated constituents) and its various fractions have been studied for their pharmacological actions.
1.1 FAMILY MELIACEAE

Meliaceae or Mahagony family is primarily a tropical family with 40-50 genera and 800 - 1000 species, which are frequent in the warm regions of Asia and America.

Plants are trees or shrubs often with fragrant wood – leaves are usually alternate, compound, exstipulate and pinnate with entire leaflets. The family is distinguished from the related taxa by the peculiar cup-shaped staminal tube, the discoid or capitate stigmas and the usually winged seeds. Plants lack the resin ducts of the closely related family burseraceae. The family is characterized by hairs of various kinds (I) unicellular or uniseriate (ii) two armed (iii) stellate (iv) peltate (v) glandular trichomes of various types. Lamina is always dorsiventral and characterized by presence of variously shaped secretory cells containing resin present between the palisade and spongy mesophyll. Stomata in leaf are rununculaceous. Mesophyll of a few genera shows spicular cells and crystal idioblasts. The midrib shows variously oriented, isolated or collateral bundles. A few yield important timber and some are grown as ornamental plants. Two alkaloids margonine and chloroxylonine have been isolated.

Plants of this family are more or less acrid, bitter and astringent. Many are tonic, stimulant, antiperiodic, emetic and cathartic.

1.2 SOYMIDA FEBRIFUGA AND ITS PROFILE

Genus Soymida Adr. Juss (meliaceae)

A small genus of trees distributed in east tropical Africa and India. Literature states the presence of following two species under the name of Soymida genus.


Of these two species, only one specie *Soymida febrifuga* is endemic to India.

*Soymida febrifuga Adr. Juss*

It is commonly known as the Indian Red wood tree

**Synonym** : *Swietenia febrifuga*, Roxb.
*Swietenia soymida*, Duncan,
*Swietenia rubra*, Rottle
Family : Meliaceae

Distribution : It is distributed in north western, central and southern India, extending southward to Travancore and Ceylon. It is common in central and southern provinces of Gujarat, Mirzapur hills and Chotanagpur.

VERNACULAR NAMES :
Hindi : Rohun, Rohunna, Rakat rohan
Guj. : Rohini, Rohina, Ron
Beng : Rohan, Rohina
Mar. : Ruhin, Ruhan
Tel : Sumi, Sonida manu.
Tam : Shem, Wond.
Kan : Suani
Oriya : Karwi, Sohan
Deccan : Rohun, Rohunna
Santal : Ruhan

Plant description :
It is a lofty deciduous tree, 70 – 80 feet tall with rough bark which peels off in large scales or plates.

Leaves : Paripinnate, crowded at the end of the branches and leaflets are opposite and about 3-6 pairs.
Size : 2 – 4.5" x 1 – 2.5"  
Venation : Pinnate, reticulate
Shape : Elliptic or oblong  
Base : Oblique
Apex : Obtuse  
Petiole : 1/3 – ½ " long
Surface : Glabrous

Flowers : Bisexual, regular, existing in large terminal or axillary branched panicles with short pedicels or minute, triangular bracts.
Calyx : 4-5 sepals, joined and usually imbricate.
Corolla : 3-6 petals, free or rarely connate at the base and sometimes adnate below to the staminal tube. Petals are valvate, imbricate or contorted.
Androecium : Stamens are 8-10, hypogynous. Filaments are connate in a tube or rarely free. Staminal tube is short and cup-shaped. Anthers are 10, erect, usually sessile on the tube, 2
celled and dehiscing longitudinally. Disc is annular or flat, free or adnate to the ovary or obsolete.

Gynocium: Ovary is ovoid, superior, 2-5 celled, each cell containing 1-2 ovules. Style and stigma are single.

Fruit: Black woody capsule, 1-2.5" long, obovoid, 5 celled and 5 valved.

Seed: Numerous, flattish, winged at both ends, albuminous with foliaceous cyledons.

Flowering and fruiting: March and April.

USES:
In Ayurveda only the bark of *Soymida febrifuga* is used. It is considered bitter and used for its medicinal properties. It is recommended for its excellent wound healing properties. The bark has astringent and antiperiodic properties. It can be used as a substitute for Peruvian bark. Decoction of bark given in cases of Malarial fevers is beneficial but the action is slow and inferior to that of alkaloids of cinchona. It has also been recommended to be used as febrifuge and general tonic in intermitant fevers and general debility.

Also it has been used successfully in advanced stages of dysentery, diarrhoea and in cases requiring the use of astringents.

Decoction of the bark is used as a good substitute for oak bark and is well adopted for gargles in stomatitis and vaginal douche in leucorrhea. Powdered bark is applied on rheumatic swellings in the form of Poultice. Its hot water extract is used orally for menorrhagia in adult human females. Also, it is supposed to be an anthelmintic, appetizer, aphrodisiac and laxative. It is good for sore throat, ulcers and leprosy. It removes “Vata” and blood impurities. It also cures “tridosha” (fever, cough and asthma).

Besides these medicinal uses, the bark also has other non-therapeutic applications. It is used as a second rate dye substance for cotton fabrics and for intoxicating fish. Bark also yields a strong red fibre which is used for making ropes. Gum exuded from bark is a good adhesive mucilage.
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Pharmacognostical and Phytochemical review of *Soymida febrifuga*

- Raichaudhari, H. N. 23 (1961) has described the macroscopic and microscopic characters of the stem bark. Numerous corky warts on the outer surface of the stem bark are a distinguished character. Cells with deep coloured cell contents are found distributed throughout the bark. The cell contents are mostly tannin as confirmed by microchemical test. Complete absence of stonecells and the presence of prismatic, rhomboidal and cluster crystals of calcium oxalate were the chief diagnostic characters reported.

- Mell, C.D. 24 (1930) has discussed the bark as a possible source of natural dye and tannins.

- Chowdhary, P.S. 25 et al (1955) reported the presence of 15-20 % of catechol tannins in the bark. Only 2/3\textsuperscript{rd} of the total tannins was reported to be extracted in five successive 24 h extraction at room temperature. Good quality leather was also reported to be produced in tanning test.

- Ambaye, R. Y. 26 et al (1971) identified the presence of sterol methyl angolensate (m.p. 135– 6\textdegree) in the petrol ether extract of the bark.

- Pardhasaradhi, M. 27 et al (1972) investigated the petrol ether extract of root and heartwood and reported the presence of obtusifoliol, syringetin and a new plant constituent dihydrosyringetin.

- Adesida, G.A. 28 et al (1972) reported presence and absence of of 0.1 % Methyl angolensate and limonoids respectively in the extractives of wood.

- Misra, D.R. 30 et al (1973) investigated the powder of trunk bark and reported the presence of phytosterols like sitosterol and methyl angolensate.

- Purushathaman, K.K. 29 et al (1974) analysed chemically, the hexane and benzene extract of bark and reported the occurrence of two tetranórtriterpenoids. IR, NMR and other chemical evidence identified those two compounds as methyl angolensate and deoxyandirobin. Later’s presence was not reported earlier in the plant.


- Ramchandran Nair A.G. 31 et al (1975) isolated flavonoids like quercitrin and rutin from ethanol extract of leaves.
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• Purushotthaman K.K. 32 et al (1977) isolated and determined the structure of two tetranortriterpenoids from the bark.

• Rao M. M. 33 et al (1978) isolated a new tetranortriterpinoid febrifugin from the heartwood. It's structure was determined on the basis of IR, NMR and Mass of its acetyl derivatives.

• Atal C. K. 44 et al (1978) qualitatively and quantitatively tested the stem bark and reported the presence of 16.82 % of tannins.

• Rao M. M. 34 et al (1979) isolated flavonoids like naringenin, quercetin, myricetin and dihydromyricetin from wood.

• Mallavarapu G. R. 36 et al (1985) separated three new tetranortriterpenoids namely epoxy febrinin B, 14, 15 – dihydroepoxy febrinin B and febrinolide from the fruits. Their structure was assigned on the basis of their spectroscopic properties. Fruits were also reported to contain deoxyandirobin, 17 B – hydroxy 6 alpha acetoxy azadiradione, methyl angolensate and sitosterol.

Ethnomedical and Pharmacological review of *Soymida febifuga* :

• Gujral, M. L.40 (1955) tested the fruits for its antipyretic activity by Brownlee's method using acetyl salicylic acid as a standard compound. The extract of the fruits did not show any antipyretic activity.

• Bhakuni D.S.41 et al (1971) reported that the ethanol extract of stem bark when tested for a wide variety of biological activity, it was found to be devoid of any antibacterial, antifungal, antiviral, hypoglycaemic, CNS, diuretic and anticancer action. The extract however showed hypotensive action and positive effect on cardiovascular system.

• Kamboj, V. P.42 et al (1977) reported the 2% ethanol extract of stem bark to be active for semen co-agulation in adult male rats. The extract in the same concentration was found to be inactive in human males. The extract was also devoid of any spermicidal action in male rats.

• Atal, C. K.44 et al (1978) reported the stem bark of to be devoid of any insecticidal activity tested against Musca domestica and Tribolium castenum.

• Mudgal V.37 et al (1980) has reported that the tribals of Mayurbhanj Orissa use the decoction of stem bark as astringent. Water extract of stem bark was also used to relieve dysmenorrhea thus facilitating conception in later menstrual cycles.
• Hemadri, K.38 et al (1983) reported that the juice of stem bark with that of Phoenix sylvestris root were given orally to relieve dysmenorrhoea, thus facilitating conception in later menstrual cycles.

• Diwan, P. V.43 et al (1993) reported that 50% ethanol water extract of stem bark exhibited positive antioedema and antiulcer activity (P.L. model) at the dose of 100 and 300 mg kg$^{-1}$ respectively. The extract also showed +ve gamma glutamyl transpeptidase inhibition in rats in dose of 50 mg/kg by i.p. route.

• Jain, S. P.39 et al (1994) reported that 100 g of semisolid paste of stem bark was taken internally for treating gonorrhoea. The decoction of stem bark of S. febrifuga together with Neem leaves was applied to sex-organs for treating venereal diseases. Also powdered stem bark along with gun powder and a glass of local liquor was given as a cure for sterility in woman. The decoction was also used to reduce the post partum pain in woman.

• Simon, H.T.45 et al. (2001) reported the plant to be active in invitro studies against Plasmodium falciparum for the first time.