Review Article

The Medicinal Potential of *Wrightia tinctoria*: A Review

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ABSTRACT

The herbal tree *Wrightia tinctoria* commonly known as vettpalai or indrajava, is native to southeast Asia and India and is a member of the Apocynaceae family. This study highlights the phytochemical composition, pharmacological properties and potential medicinal use of *Wrightia tinctoria* by systematically reviewing academic research on the plant. The plant is rich in compounds containing alkaloids, saponins, indoxy yielding O-glycoside(s), phenolics, flavonoids, isatin tryptanthrin, anthranilate, rutin, β-isatin, tryptophan, indigotin, indirubin, wrightial and sterols. The vast number of literatures found in database revealed that the extracts of different parts of W. tinctoria showed significant pharmacological actions. Clinical studies indicated a broad range of applications in the treatment of psoriasis and other skin diseases.

Keywords: *Wrightia tinctoria*, Apocynaceae, vettpalai, pharmacognostical studies, traditional medicinal uses, phytochemical constituents, pharmacological activities.

INTRODUCTION

Indigenous communities around the world have cultural beliefs and health interpretations that are intricately linked to the study of traditional medical practices. Traditional Chinese medicine and Indian Ayurveda are two systems that are still widely used, mostly because of their all-natural methods of enhancing health and quality of life[1,2,6]. There is now more interest in finding novel bioactive compounds from botanical sources because plants, in particular, have been essential to these practices as sources of herbal medicine.

In the lush terrains of India and its neighbouring areas, a small but resilient tree flourishes, recognized worldwide as *Wrightia tinctoria*, commonly known as vettpalai. This inconspicuous leafy tree which is a member of Apocynaceae family, historically has been an essential part of herbal medicine. The *W. tinctoria* plant is found extensively throughout Asia, Africa and Australia are recognized as the origin of Australia, india, Myanmar, Nepal etc. The vegetation predominantly takes place in western, central and peninsular India. The plant thrives in dry, semi-dry, wet areas and particularly seen on slopes and in lowlands[6,9]. *Wrightia tinctoria* leaves have unique anatomical and micromorphological traits, including paracytic and anomocytic stomata that improve water retention and gas eexchange. The thickness variation of the foliar cuticle indicates environmental flexibility. Multicellular trichomes on the abaxial surface act as a defence mechanism against herbivory. In addition to a focused mesophyll for ideal photosynthesis, the dorsiventral leaf has a uniseriate epidermis or a collenchymatous hypodermis. A crescent-shaped vascular bundle with endarch xylem makes up the midrib. Histochemical investigations show the presence of lignin and starch, supporting the durability of structure and carbohydrate storage, whereas quantitative microscopy shows a stomatal index of 21 and a rather thick venation structure[8,10]. *Wrightia tinctoria* is a small deciduous tree, reaching heights of 5-8m characterized by its smooth, scaly bark. The foliage ranging from 6-15cm long and 3to 6cm wide, showing an elliptic-lanceolate shape with pointed tips. The tree produces fragrant white flowers in loose terminal clusters that is joined by small oval bracts. The calyx lacks any hair and has glands and glandular the corolla presents a small tube featuring lobes that are 6-8mmin size. The corona includes several linear scales associated with the filaments and a few on the corolla lobes. Stamen is situated at the top of the corolla tubes, marked by brief filaments and extending anthers that curve and connect to the stigma. The ovary consists of two carpels, which can be either distinct or combined, containing numerous ovules. The resulting fruits are two distinct hanging follicles, varying from 20-40cm long, cylindrical form and slightly tapered at both ends. At first, they attach at the apex, seeds range in length from 1.2to 2cm and possess a pointed tip.

Figure 1: *Wrightia tinctoria* plant

The leaves of *Wrightia tinctoria* are commonly infused with herbal oils and are applied topically to soothe inflamed scalps, reduce flaking and restore microbial balance. The therapeutic efficacy of the plant is attributed to there rich phytochemical profile that includes flavonoids, sterols, alkaloids and phenolic compound, which exhibit potent anti-inflammatory, anti-fungal, anti-dandruff and antioxidant activities[22,23]. A chronic scalp condition that is dandruff characterized by flaking and itching, is often associated with fungal invasion, sebaceous unevenness and inflammation. Conventional treatments typically involve antifungal agents like ketoconazole or zinc pytithione, that may cause irritation or resistance with prolonged use. In contrast, *Wrightia tinctoria* offers a gentle, holistic alternative that not only targets the root cause of dandruff but also nourishes the scalp and strengthens hair follicles[11,21].

PHARMACOGNOSTICAL STUDIES

Pharmacognostical studies of *Wrightia tinctoria* have revealed its distinct macroscopic and microscopic features, aiding in botanical identification and quality control. The leaves are opposite, elliptic-lanceolate with entire margins, while transverse sections show dorsiventral anatomy with well-defined palisade and spongy parenchyma.

Leaves: The leaves are dorsiventral and amphistomatic. The stomata are paracytic and the trichomes are 3-7 celled, they are thick walled and uniseriate[8]. The epidermis on the adaxial side exhibit striations. Mesophyll refers to differentiating into a single layered palisade and spongy tissue of sparsely organised cells. Midrib shows an arc shaped vascular bundle. In quantitative microscopy, the indexes of stomata have been determined to be 21.0. The vein islet number and veinlet termination number are 21.0and 21.8 respectively[8]. The histochemical color reactions were performed in cross-sectional part of the new leaf. The findings revealed the existence of the lignin, starch, lipids, alkaloids, saponins, tannins, flavonoids and calcium oxalate crystals[8,10]. Histochemical mapping of specific significant compounds allows for an initial understanding of type of compounds and their accumulation in the plant tissues.

Seeds: Seeds of *Holarrhena antidysenterica* are widely recognised to address dysentery and are stumped with those of *W. tinctoria*. A comparative study of pharmacognosy was conducted on the seeds from both species. The kernels of the pervious taxon have been defined by possessing hairs located on the micropylar, whereas in *W.tinctoria* they are developed at the chalazal side. The kernels of these two taxa exhibit various patterns in the folding of cotyledons and spermodermal decoration as well. Dense tannin rich accumulation in the external epidermal cells of the seed coat in *H.antidysenterica* and its limited accumulation in *W. tinctoria* serves as an extra feature to be utilized as an identifying characteristic. *Wrightia tinctoria* demonstrates considerable pharmacological promise, exhibiting verified analgesic, anti-inflammatory, a parasitic agent and anticancer effects, in addition to a favourable safety profile[9].

Flowers: *Wrightia tinctoria* is notable for its fragant, jasmine -fragant flowers, showing a hue that changes from white to yellow two pale brown. The plant has actinomorphic, perfect, hypogynous blossoms that appear in terminal corymb-like clustures, varying from 5 to 15 cm in diameter, defined by rectangular petals that have rounded edges advice. In India, blooming occurs regularly starting in March to May. The significance in pharmacology has driven through pharmacognostic studies to create quality assurance practice including levels of ash and extractive value, along through phytochemical examination. These efforts ensure the genuineness and consistency of herbal preparations, emphasising the plant's scientific and therapeutic significance[6].

Bark: The transverse section of bark is made up of tangentially stretched thick-walled suberized 6-8 layers of cork cells, organised in radial order or lines followed by phellogen made up of slightly elongated parenchyma cells. Phelloderm is a broad, parenchymatous and interspersed layer including phloem fibers and sclereids. The tissue beneath the surface consists of rock cells in aged bark. Grains of starch and prisms of calcium oxalate crystals exist within the parenchymatous cells. Phloem fibers and medullary rays are predominantly uniseriate, with only few being biseriate. A comprehensive pharmacognostic assessment, encompassing combined macroscopic and microscopic traits, facilitates quality control for herbal formulations, assuring precise identification and preserving the integrity of therapeutic products sourced from this significant species[10].

Figure 2: The bark of *Wrightia tinctoria*

Fruit: The fruit is slender, cylindrical and elongated measuring 15-30cm in length and typically occurred as paired follicles. It exhibits a smooth surface with a dark green to brown hue upon maturation, containing numerous linear seeds embedded in silky trichomes that aid in wind dispersal. The transverse sections reveal a multilayered pericarp comprising an outer epidermis with cuticularized cells, followed by a collenchymatous and parenchymatous zones. Vascular bundles are scattered within the mesocarp and an endocarp is lined with sclerenchymatous fibers, that contributing to the fruit's rigidity[6].

Figure 3: The fruit of *Wrightia tinctoria*

Root: The root epidermis consists of composed arranged smaller cells. The formation of periderm has been noted. Numerous layered corks consist of rectangular pieces arranged in a radial alignment cell. Beneath it are numerous layers of cortex and phloem. phloem cells exhibit the presence of starch and oxalate crystals. Medullary rays consist of 1-2layers of cells. Vessels elements in the roots vary in length and diameter featuring basic holes. Pits are simple, alternate and thickly arranged. The tail is short or long with mostly pointed end[9].

EXTRACTION AND PHYSICOCHEMICAL PARAMETER

In the research conducted, *Wrightia tinctoria* leaves, seeds and bark taken. Ethanol based extraction often yields the highest concentration of active metabolites. Physicochemical profiling includes moisture content, ash value and solubility. Moisture content across the different plant parts ranges from 5-8%. The Total ash value help to assess inorganic residues and the acid-insoluble ash determine the purity. The pH of the extracts generally falls between 5.5-6.5 which is suitable for topical formulation. Solubility tests in water and alcohol confirm extract compatibility with various delivery system.

TAXONOMY AND BOTANICAL DESCRIPTION OF PLANT

- **Kingdom**: Plantae
- **Order:** Gentianales
- **Family:** Apocynaceae
- **Genus:** *Wrightia*
- **Species:** *Wrightia tinctoria* (Roxb.) R.Br.
- Common names include Pala Indigo Plant, Dyer's Oleander, and Ivory Tree.

Wrightia tinctoria is a small to medium-sized deciduous tree, typically growing 3–15 meters tall, occasionally reaching up to 18 meters. It has smooth, yellowish-brown bark that exudes a milky latex. The leaves are simple, opposite, ovate to elliptic-lanceolate, glabrous above and sometimes pubescent beneath, measuring 10–20 cm in length.

PHYTOCHEMICAL CONSTITUENTS

Alkaloids: Wrightiadione is an innovative isoflavone derivative that exhibits anticancer properties. Indirubin exhibits antifungal and anti-inflammatory properties. Isatin is said to possess antimicrobial and anticancer properties[4,17,20].

Phenolic compound & flavonoids: Kaempferol is an anti-inflammatory and antioxidant. Quercetin has anti-inflammatory, hepatoprotective, and antioxidant properties. Rutin has antioxidant properties and fortifies capillaries[13,18].

Triterpenoids: Lupeol has anti-inflammatory, hepatoprotective, and anti-cancer properties. β-amyrin is an anti-inflammatory and analgesic. β-sitosterol has anti-inflammatory, wound-healing, and cholesterol-lowering properties[17,24,25].

Glycosides: Wrightiosides A and B are biologically active cardiac glycosides. Indican, the raw material for indigo dye, has biological activity as well[6].

Saponins: Found in seeds and bark, it has antibacterial and anti-inflammatory properties.

Coumarins and associated substance: Scopoletin possesses antioxidant, antimicrobial, and anti-inflammatory properties. Esculetin has hepatoprotective and antifungal properties[6,7].

Oils and fatty acids (from seeds): Oleic acid is good for heart health and skin healing. An essential fatty acid that has anti-inflammatory and barrier-protective properties is linoleic acid[17].

Steroids: Steroids, stigmasterol, and β-sitosterol help control cholesterol and lessen inflammation.

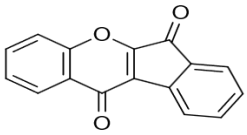
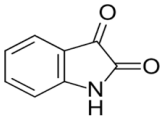
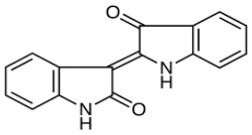
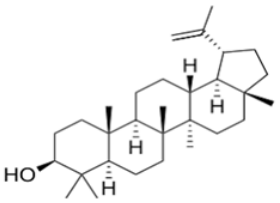
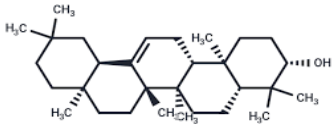
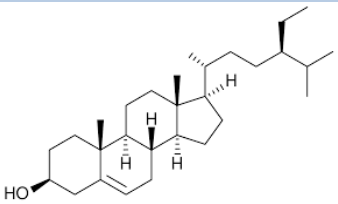
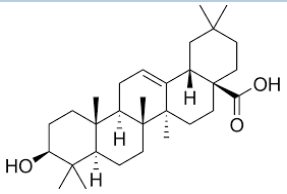
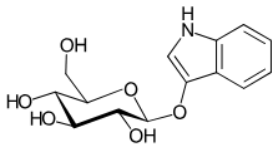
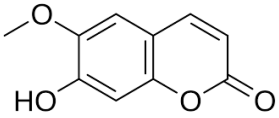
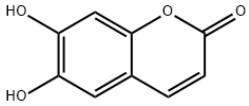
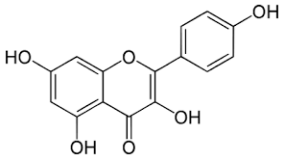
Additional notable substance: Cycloartenone has anti-inflammatory properties.

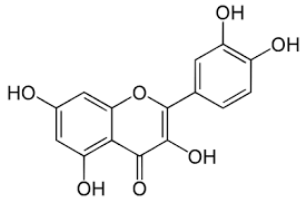
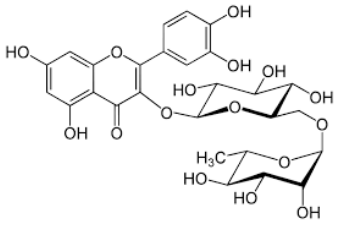
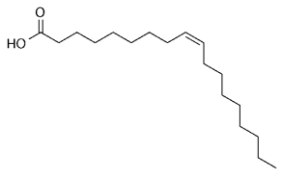
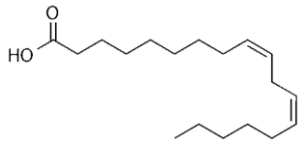
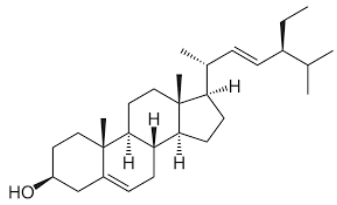
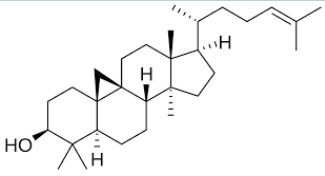
TRADITIONAL MEDICINAL USES

W.tinctoria have been recorded for a wide range of traditional uses. The bark of this plant is traditionally utilized to boost lactation, alleviate abdominal discomfort, address skin issues and injuries, act as a fever reducer, combat dysentery, diarrhoea, and hemorrhaging, and serve as an antidote for snake venom. In Karnataka and Tamil nadu, the tree named as "jaundice curative tree", since the juice of its tender leaves is used as an effective drug for treatment of jaundice. Fresh leaves have a strong scent and can be chewed under teeth or crushed and placed in the hollow of a decayed tooth to ease toothaches. Leaf juice is also used as a tonic, stomachic, and febrifuge to prevent serpent bites[2,6,9].

In Siddha medicine, the herb is utilized in the management of psoriasis and other dermatological conditions. The leaves are immersed in coconut oil and are placed in direct sunlight for a day and then the oil is utilized for the management of psoriasis.

Table 1: Phytochemical constituents and their chemical structures

SL.NO	Phytochemical constituents	Chemical unit	Chemical formula	Chemical structure
1.	Alkaloids	Wrightiadione	$C_{16}H_8O_3$	
		Isatin	$C_8H_5NO_2$	
		Indirubin	$C_{16}H_{10}N_2O_2$	
2.	Triterpenoids	Lupeol	$C_{30}H_{50}O$	
		β-amyrin	$C_{30}H_{50}O$	
		β-sitosterol	$C_{29}H_{50}O$	
		Oleanolic acid	$C_{30}H_{48}O_3$	
3.	Glycosides	Indican	$C_{14}H_{17}NO_6$	
4.	Coumarin	Scopoletin	$C_{10}H_8O_4$	
		Esculetin	$C_9H_6O_4$	
5.	Phenolic compound & flavonoids	kaempferol	$C_{15}H_{10}O_6$	

		Quercetin	$C_{15}H_{10}O_7$	
		Rutin	$C_{27}H_{30}O_{16}$	
6.	Oils & fatty acids	Oleic acid	$C_{18}H_{34}O_2$	
		Linoleic acid	$C_{18}H_{32}O_2$	
7.	Steroids	stigmasterol	$C_{29}H_{48}O$	
8.	Additional notable substance	Cycloartenone	$C_{30}H_{50}O$	

The oil prepares from the fresh leaves of plant combined with coconut oil has been designated to serve as an analgesic, anti-inflammatory and antipyretic activities to be beneficial in the management of psoriasis[22,23]. The bark serves as a tonic, anthelmintic and antidiarrheal and aphrodisiac. It is utilised in the therapy of seminal fragility, gas, abdominal pain, diarrhea, Hansen's disease, skin psoriasis, etc[6]. *W. tinctoria* have been recommended for the treatment of infections of the chest (in asthma), colic and as diuretic. Extracts of the root and leaves possess hypotensive activity. Seeds serve beneficial purposes as a tonic, carminatie and anthelmintic, astringent, aphrodisiac and antipyretic as well as for the management of digestive disorder In Unani medicine the seeds of plant are also referred to as "Lisanul-e-Asafir"[6]. In tribal villages of Chitheri Hills of Dharmapuri district in Tamil Nadu, the bark decoction is given to cure piles, whereas bark and seeds are used together to treat various ailments. The native practitioners in and around Chitoor district, India, have claimed that the leaves of *W. tinctoria* are used for treating diabetes. Tribes of Southern Rajasthan use the latex of plant externally on vagina for easy delivery. These assertions of therapeutic properties must be validated through clinical trials in human[2,6].

VERNACULAR NAMES

Table 2: Vernacular Names

Languages	Vernacular names
English	Sweet Indrajao, Pala indigo plant
Hindi	Dudhi, Mitha-indrajau, Karayaja
Kannada	Kodmurki, Beppalli, Kirikodasige
Malayalam	Danthappala, Ayyappala, Kambippala
Marathi	Kala-kuda, Kaddu, Bhurevada
Sanskrit	Svetakutaja
Tamil	Veppalai, Irumpaalai, Vetpalai
Telugu	Amkuda, Tella paala, Jeddapala
Odia	Dhala Kurai

PHARMACOLOGICAL ACTIVITIES

Antimicrobial activity

Studies confirm that silver nanoparticles (AgNPs) prepared from *Wrightia tinctoria* can efficiently prevent the growth of Gram-positive and Gram-negative bacteria like Staphylococcus aureus and E. coli. The nanoparticles clearly show zones of inhibition and thus testify to their high antibacterial potential. As they are prepared by an environment friendly green synthesis process, they not only perform well but are also a sustainable solution. This renders W. tinctoria nanoparticles a worthwhile candidate to set out for future drug applications[11,12,15].

Anti-inflammatory activity

The anti-inflammatory activity of *Wrightia tinctoria* bark has been evaluated in two models, namely carrageenan-induced rat paw edema and cotton pellet-induced granuloma. Mice given extract of *Wrightia tinctoria* powder produced suspension of 200 mg/kg significantly reduced paw swelling and granuloma compared with. Control group. The standard drug employed was diclofenac sodium (13.5 mg/kg, orally). The anti-inflammatory and analgesic activities of dried leaves from *Wrightia tinctoria* have been investigated. Using the HRBC membrane stabilization method and carrageenan-induced rat paw edema model, it was shown that ethyl acetate fraction at 400 mg/kg produced 67.21% protection. It was also explained that this fraction exhibited significant potential for pain relief in hot plate assay and acetic acid induced writhing assay[21].

Antifungal activity

The
study aims to examine the antifungal properties of indirubi n extracted from *Wrightia tinctoria*. The extracts of hexane, chloroform, methanol, and ethanol from six various plants were examined for their activity against dermatophytes, non-dermatophytes, and yeasts. The leaf extract of *Wrightia tinctoria* was fractionated via column chromatography, and the primary compound was characterized through spectroscopic methods. The plant's leaf and bark extracts especially those derived using ethanol and acetone have shown significant inhibitory activity against *M. furfur*. The spore germination test employing the agar dilution method was utilized to investigate anti-fungal activity. The broth micro dilution method was used to determine the minimum inhibitory concentration (MIC). *Wrightia tinctoria* demonstrated encouraging effectiveness against both dermatophylic and non dermatophytic fungi. Chloroform extract from leaves demonstrated efficacy at 0.5mg/ml against *Trichophyton rubrum*, *Epidermophyton floccusum*, *Aspergillus niger* and *Scopulariopsis brevicaulis*. The primary compound, recognized as indirubin, showed effectiveness against dermatophytes including Epidermophyton floccosum (MIC = 6.25 µg/ml); Trichophyton rubrum and Trichophyton tonsurans (MIC = 25 µg/ml); Trichophyton mentagrophytes and Trichophyton simii (MIC = 50 µg/ml). It also demonstrated activity against non-dermatophytes (Aspergillus niger, Candida albicans, and Cryptococcus sp.) with a MIC range of 0.75-25 µg/ml. The indole derivative indirubin obtained from *Wrightia tinctoria* exhibited antifungal properties and could be beneficial in treating dermatophytosis[11,19].

Antioxidant activity

The extracts were assessed using freeradicals assays for sca venging such as DPPH and ABTSThe power reducing capabilities of extracts were also observed through fluorescence recovery after photobleaching [FRAP] et TAC. In DPPH the IC50 was 45.4 µg /ml, and the TAC50 was in mg. GAE/g. In ABTS, *Wrightia*
tinctoria exhibited IC50. 31.7 µg/ml and FRAP 2.5 mMol Fe +2/g. Findings validated substantial antioxidant capability o f *Wrightia*
tinctoria in relation to other medicinal plants that are high i n antioxidants[13].

Anthelmintic activity

Anthelmintic properties of crude petroleum ether and chloroform extractions of foliage of *Wrightia tinctoria* when examined in Pheretima posthuma. Piperazine citrate was utilized as a standard medication along with saline solution administrated as regulation. Period of immobility and demise of the worms were examined at three different concentrations (2.5, 5.0, 7.5 mg/ml) for each of the extracts. The experiment demonstrated the possible advantage of *Wrightia tinctoria* leaves serving as an anthelmintic treatment[16].

Anti-cancer activity

Leaves of *Wrightia tinctoria* were screened for anticancer activity against HeLa cells with a methanolic extract. The cytotoxicity was determined by an in-vitro MTT assay, with the decrement in viable cancer cells measured and compared to the control. The extract exhibited important antiproliferative activity with IC_{50} value 76.1 µg/mL. Results were shown to have a dose-dependent anticancer effect, with increased extracts at higher concentrations having greater inhibitions of HeLa cell growth[20].

Anti-diabetic activity

The flavonoids from *Wrightia tinctoria* seeds in an alloxan-induced diabetic model by measuring body weight, organ weight, blood glucose, and lipids. Flavonoid fraction did not significantly lower elevated blood sugar or other changed biochemical markers. It normalized serum creatinine, decreased triglycerides, and decreased liver weight, indicating kidney and liver protective effects. Likewise, *Wrightia tinctoria* petroleum ether extract demonstrated significant blood sugar–lowering activity, lowering glucose levels by 74.39% at a dose of 400 mg/kg in diabetic rats[18].

Wound healing activity

Wrightia tinctoria latex protease was assessed in an excision wound model of mice by using Neosporin as the reference standard drug. Healing was confirmed through histological analysis, contraction of the wound, content of collagen, catalase, and MMP activity. On day 9, histological findings

revealed complete restoration of skin structure, complete epithelialization, and accelerated wound closure, ascertaining the wound-healing activity of latex protease[14].

Antiulcer activity

The methanolic extract (TM) and 70% ethanolic extract (T70E) of *Wrightia tinctoria* were tested for antiulcer activity against an aspirin plus pylorus ligation–induced ulcer model. Their action was compared with carboxymethyl cellulose, pylorus control, aspirin, and the standard drug famotidine. The *Wrightia tinctoria* crude extracts showed good protective activities, exhibiting very good antiulcer activity against the experimentally induced acute gastric ulcers[18].

Anti psoriatic activity

Anti psoriatic activity of *Wrightia tinctoria* extract was tested using mouse tail test. Longitudinal sections of tail skin were cut, and it was stained with hematoxylineosin. Histometricalanalysis of sample revealed strong activity ofextract (63.94%) compared to standard isoretinoic acid (48.52%). Both standard and sample thickened the epidermal thickness compared to control[19,20].

Immunomodulatory property

The methanolic extract of *Wrightia tinctoria* leaf was tested for its immunomodulatory effect by investigating primary and secondary antibody responses, assessed by humoral antibody activity. Activation of neutrophils was tested using the neutrophil adhesion test. The extract, at 100 and 200 mg/kg body weight, caused significant enhancement of antibody production in terms of an increase in the hemagglutination antibody titer. It also increased neutrophil adhesion at 200 mg/kg and produced a dose-related inhibition of hypersensitivity responses, reflecting significant immunomodulatory activity[21,22].

Antispasmodic and Anti diarrheal property

Wrightia tinctoria bark was investigated for its antidiarrheal and antispasmodic activities. Ethanol bark extract and a pure steroidal alkaloid were evaluated in different experimentally induced models of diarrhea in rats, including isolated rat ileum experiments and enteric bacterium involving assays. At 500 and 1000 mg/kg doses, the extract markedly inhibited the frequency and wetness of stool in castor oil-induced diarrhea. Also, the purified steroidal alkaloid at 50 and 100mg/kg, caused similar effects. Both the extract and the alkaloid inhibited charcoal meal transit in intestine and attenuated prostaglandin E2-induced fluid secretion. The alkaloid also decreased the frequency, amplitude and tone of spontaneous intestinal contractions and blocked acetylcholine-induced contractions in isolated ileum of rat, establishing its antispasmodic effect[21,23].

Larvicidal activity

The leaf and fruit of *Wrightia tinctoria* were screened for larvicidal activity against the filarial mosquito Culex quinquefasciatus using crude aqueous and petroleum ether extracts at concentrations between 0.06% and 1.00%. The deaths of larvae were observed after 24 and 48 hours. The highest potency was that of the aqueous fruit extract with an LC_{50} value of 0.17% and 0.09%, followed by the aqueous leaf extract with an LC_{50} value of 0.21% and 0.11%[19,22].

Post Coital interceptive activity

250mg/kg dosage of the ethanolic extract of the stem bark of *Wrightia tinctoria* suppressed pregnancy in all rats on days 1-7 or 1-5 post coitum. The fractions of hexane and chloroform and fractions that are soluble in water and those that are not soluble in water exhibited a total anti-implantation effect. The n-butanol fraction only prevented pregnancy in 75%of animals. They determined that the estrogen-agonistic properties of the active ethanolic extract and its components could be accountable for their contraceptive action[22,24].

Antinociceptive activity

The extracts of ethyl acetate, acetone and methanol were employed in the research utilizing acetic acid-triggered twisting in rodents. The drugs that were commonly used was acetylsalicylic acid. The extracts demonstrated activity similar to that of a conventional drug when administered to normal rats, noted dose-dependent antinociceptive properties in ethanolic extract of the bark *Wrightia tinctoria*, the pain-reliving effect was noticed against thermal and chemical harmful stimuli, but not seen in relation to the mechanical incentive[23].

Hepatoprotective activity

Liver-protecting impact on lone triterpene substances from *Wrightia tinctoria* contains compounds like lupeol, β-amyrin, and β–sitosterol. The approach used CCl 4 caused liver toxicity in the rat. Silymarin was a term used to describe a group of flavonoids extracted from milk thistle, known for their antioxidant and anti-inflammatory properties employed as the benchmark medication. Animals were subjected to treatment with triterpene fractions at concentrations of 125,250 and 400mg/kg orally. Once daily for 4 days then CCl 4 caused a rapid rise in serum SGOT, SGPT and ALP were reduced along with histopathological changes were significantly reduced. Hepatotoxicity was triggered by employing CCl4 and the animals were euthanised and examined for biochemical changes such as ALP, SGPT, SGOT and bilirubin among others. The methanolic extract showed the highest level of activity aqueous extract shown to exhibit low activity[24,25].

CONCLUSION

Wrightia tinctoria stands out as an adaptable medicinal factory with a rich ethnobotanical heritage and scientifically validated pharmacological eventuality. Its leaves, seeds, and dinghy are composed of bioactive composites that offer anti-inflammatory, antimicrobial, antifungal, hepatoprotective, antinociceptive, antispasmodic, antidiarrheal, etc. *W. tinctoria* are available in the requests for psoriasis, diarrhoea, dysentery, dandruff and for revivification of common function. It's the splint excerpt of *W. tinctoria* which forms the major element in the Siddha medication for the treatment of psoriasis. The condiment's

safety profile, supported by expansive study, establishes it as a believable natural option in ultramodern drug. nonetheless, to fully realize its eventuality, there's a critical demand for further exploration into its active factors and standardization of styles for rooting it. The excerpts attained from different organs in above mentioned pharmacological studies using colourful detergents have been estimated for multi-effective property of the factory *W. tinctoria*. It's worth to insulate some pure phytopharmaceuticals which in turn can be used as lead motes for synthesizing new agent having good remedial value.

An essential assessment of the current exploration suggests the reality that indeed though the quality of complaint for which *Wrightia tinctoria* functions as a remedy in colourful ways significantly, considering the expansive variety of remedial operations of *Wrightia tinctoria* substantiated in ethnobotanical studies, Ayurveda, Unani. Siddha system and others. It's essential that fresh clinical and pharmacological exploration need to be carried out to explore the untapped possibilities of the foliage.

Wrightia tinctoria is an extremely important medicinal condiment holding a wide range of essential phytoconstituents that gives the maturity of the attributes of the shops. Grounded on the substantiation, it's determined that this factory species could produce a precious eventuality resource in the medicine development.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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