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## *Wrightia tinctoria*: A review

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### Abstract

*Wrightia tinctoria* is a tree widely used by the peoples of India as a traditional medicine for pain and inflammations. Latex form the plant especially from leaves is directly applied on inflammation. This plant is very closely related to other species of *Wrightia* and hence pharmacognostical and preliminary phytochemical studies of *Wrightia tinctoria* leaves were carried.

**Keywords:** *Wrightia tinctoria*, phytochemical, Pharmacological

### Introduction

*Wrightia tinctoria* belongs to family Apocynaceae. It is known by common name as “Indrajav”. It has got very important place traditional healing and also is widely recognized medicinal plant. The medicinal value of this plant for the treatment of a large number of human ailments is mentioned in Ayurveda, Siddha, Unani and folk medicine. The seeds are claimed to be useful as anthelmintic, anti diarrhoeal, antidysenteric, astringent, febrifuge, seminal weakness and as an aphrodisiac. The leaves and bark (decoction) are used, as febrifuge, in toothache, stomachic and tonic in bowel complaints. The bark is used as an antidysenteric, especially useful in piles, to treat skin diseases and biliousness in AYUSH<sup>[1]</sup>.

### Traditional Use

The flowers, leaves, fruits and seeds of the species are used as vegetables. The timber obtained from the species is high in quality and valuable. The white wood, which is very fine, is used for turnery, carving, toy making, matchboxes, small boxes and furniture. The leaves, flowers, fruits and roots are sources of indigo yielding glycosides, which produce a blue dye or indigo like dye. The local community uses different parts of *W. tinctoria* for various dietary needs. The juice extracted from fresh unripe fruits is used for coagulating milk. The seeds are reported to have aphrodisiac and anthelmintic properties<sup>[2-4]</sup>. The oil emulsion of the pods, “777 Oil,” is used to treat psoriasis<sup>[5]</sup>. The leaves are lopped as livestock fodder. The pods from species contain floss, which is used for stuffing cushions. The cream coloured latex derived from species has a rubber content varying from 2 to 28% that can be exploited commercially. Many artisans in Chennapatna, Etikoppaka and Kondapally (India) depend on wood of *W. tinctoria* for earning their livelihood and it is used by the lacware handicraft industry generally in toy making.

### Distribution

The plant of *W. tinctoria* is widely distributed in Asia, Africa and Australia and are known to be the native of Australia, India, Myanmar, Nepal and Vietnam. The plant mostly occurs in the Western, Central and Peninsular India. The plant grows well in arid, semi-arid and moist regions with a wide range of soil types.

### Botanical description

*Wrightia tinctoria* is a small and deciduous tree which grows up to 10m with milky latex, scaly, smooth and ivory colored bark. Leaves are about 8 -15 cm, opposite, variable, elliptic lanceolate or oblong lanceolate. Leaves are acute or rounded at the base, acuminate at the apex, petioles 5mm long. Flowers are usually seen at the tip of branches with 6 cm long cymes, white with fragrance. Calyx and corolla with 5 lobes. Anthers are sagitate, ovary bilocular and stigma bifid. Fruits are long follicles up to 50 cm with adhered tips. Seeds are many, linear 1-2 cm long, pointed at the apex. The seeds are released as fruit dehisces. Flowering and fruiting is seen between March to November<sup>[6]</sup>.

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**Fig 1:** Different stages of *Wrightia tinctoria*

**Phytochemical studies**

Most of the health promoting and disease curing potential of plants and their plant products are associated to their phytoconstituents. Accumulating evidence showed the presence of bioactive phytoconstituents in leaf, bark, root and seed of *W. tinctoria*.

The mature powdered pod showed the presence of co-occurrence of  $\beta$ -amyrin, ursolic acid and oleanolic acid along with  $\beta$ -sitosterol. The wrightial, a new terpene and other phyto constituents such as cycloartenone, cycloeculanol,  $\beta$ -amyrin and  $\beta$ -sitosterol were isolated from methanol extract of the immature seed pods. In addition to this, a new sterol 14  $\alpha$ -methylzymosterol along with four rare plant sterols, desmosterol, clerosterol, 24-methylene-25-methylcholesterol and 24 dehydropollinastanol have also been obtained from seeds. The hexane extract of seed pods contains oleonic acid; whereas ursolic acid and isoricinolic acid have been further separated from the seedpods and seed oils. Thus far, root of *W. tinctoria* received less research interest pertaining to phytochemical constituents. However, our preliminary phytochemical studies of root reported the presence of cardiac glycosides, saponins, pseudotannins and terpenoids [7].

**Pharmacological activity**

**Anthelmintic activity**

Anthelmintic activity of crude petroleum ether and

chloroform extracts of leaves of *W. tinctoria* using *Pheretima posthuma* as a model organism were studied at three concentrations (2.5, 5.0, 7.5 mg/mL) of each extract. Petroleum ether and chloroform extract of *W. Tinctoria* caused significant paralysis (125.83 and 94.5 seconds) and death (162.33 and 140.28 seconds) of *Pheretima posthuma* respectively. Minimum time taken by the methanol extract of *W. tinctoria* leaves (100 mg/mL) were 13.97 and 23.3 min to cause paralysis and death of the worms respectively [8].

**Anti cancerous Activity**

*In vitro* cytotoxic activity of alcoholic extracts of the bark of five different plants, *Artocarpusheterophyllus*, *Alangium salvifolium*, *Buchanania lanzan*, *Seesbania grandiflora* and *Wrightia tinctoria* which are traditionally used in Chhattisgarh was studied against human breast cancer (MCF-7) and human leukemia (HL-60) tumor cell lines using the thiazolyl blue test (MTT) assay. *Wrightia* was found to be effective on MCF-7 and moderately effective on HL-60 cell line [9].

**Immunomodulatory activity**

*Bignonia et al.* reported immunomodulatory activity of *W. tinctoria* bark alcohol extract on nonspecific and specific immune responses, studying the parameters such as survival study, carbon clearance test, delayed type hypersensitivity

and hem agglutinating antibody titer. *W. tinctoria* extract at 400 mg/kg body weight increased the survival rate of rats against *E. coli* induced abdominal sepsis up to 15 d post infection. The extract showed significant homeopathic activity and raised neutrophils count significantly, which was further confirmed by increased phagocytic response against inert particles. *W. tinctoria* exhibited decreases in delayed type hypersensitivity response. Further, extract enhanced both primary and secondary humoral responses in rats sensitized with bovine serum albumin. The results of this study substantiate that *W. tinctoria* bark extracts have moderate non-specific immunostimulant. In another study, Thabah *et al.* investigated the immunomodulatory activity of the bark extracts such as petroleum ether, ethanol and aqueous alcohol of *W. tinctoria* by using delayed type hypersensitivity reaction and carbon clearance assay. Petroleum ether and aqueous alcohol extracts (200 and 400 mg/kg, p.o.) produced a significant increase in delayed type hypersensitivity in response to sheep red blood cells. Petroleum ether extract showed better activity than aqueous alcohol in delayed type hypersensitivity response. Aqueous alcohol extracts at dose 200 and 400 mg/ kg, p.o., showed a significant dose dependent increase in the phagocytic activity. The results revealed that aqueous alcohol possesses immunostimulant activity in carbon clearance assays whereas the petroleum ether extract and aqueous alcohol showed immunomodulatory activity in the delayed type hypersensitivity model <sup>[10]</sup>.

#### Anti diabetic activity

The investigation has been carried out to evaluate the effect of the different extracts of the leaves of *Wrightia tinctoria* on alloxan induced diabetic rats of wistar strain. The experiment was carried out using six groups of albino rats. Chloroform extract showed a significant anti-diabetic activity when compared to the standard drug Glibenclamide <sup>[11]</sup>.

#### Wound healing activity

Wound healing activity was evaluated by 70% ethanolic and methanolic extracts of leaves of *Wrightia tinctoria* (Roxb.) R. Br (Apocynaceae) using incision and excision wound models on Wistar rats. Wound contraction and period of epithelization where assessed in excision wound model whereas wound tensile strength was determined in case of incision wound model. 4% *Wrightia tinctoria* methanolic leaf extract phytosome exhibited significant wound healing potential when compared with standard 0.2% nitrofurazone ointment <sup>[12]</sup>.

#### Antiviral activity

Experimental study reported the antiviral activity of chloroform extract of *Wrightia tinctoria* and *Morinda citrifolia* leaves and fruit powder respectively. The chloroform extract of *Wrightia tinctoria* and *Morinda citrifolia* showed the potent antiviral activity against cytopathic effect of HIV-1 (III B) in MT-4 cells <sup>[13]</sup>.

#### Hepato protective activity

A triterpene fraction containing lupeol, -amyrin and  $\beta$ -sitosterol isolated from the stem bark of *W. tinctoria* was investigated for its hepatoprotective effect on CCl<sub>4</sub> induced hepatotoxicity in the rat <sup>[14]</sup>.

#### Anti-bacterial activity

Leaf extract was effective against Gram negative, Gram positive bacteria and drug-resistant *S. aureus*. Efflux pump inhibition of indirubin constituent of leaves of *Wrightia* synergistically increases the activity of ciprofloxacin against *Staphylococcus* <sup>[15]</sup>.

#### Effect age nest psoriasis

The current treatments available for psoriasis include local application of emollients, moisturizers, tars, anthralins, topical corticosteroids, vitamin A and D analogs and systematic treatment in the form of corticosteroids, methotrexate, cyclosporine, etretinate and other immunomodulators as well as hydroxyurea. Photo chemotherapy and alternative medicine have been also extensively used for health care and are supporting to be a new era of medication. There are increasing research efforts to develop herbal formulations to treat psoriasis. Clinic and histopathological evaluation of ointment formulation prepared from *W. tinctoria* and *Cocos nucifera* suggests superior efficacy of herbal formulation with a best result of formation of the granular layer and marked disappearance of the spongiform pustules, dermal vessel tortuosity and normalization. The reduction of the dermal infiltrates observed with herbal treatment. The formulation is found to be safe and non-toxic to liver, kidney, and haemopoietic system. Emulsion of *W. tinctoria* showed reversal of parakeratosis to orthokeratosis in mouse tail test with enhanced hyperplasia and diminished parakeratotic scales with tendency for separation forming healthy layer beneath the response that matches with standard method of treatment of retinoids <sup>[16]</sup>.

#### Conclusion

*Wrightia tinctoria* is the species found in wild, having health beneficial effects due to presence of potential secondary compounds. The presence of high amount of active phytoconstituents such as phenolis, falvonols, alkaloids, steraol and several terpenes make the a fore mentioned plant extract a good candidate for more exploration in pharmacological activity. The outcome of present study suggests that the species of *Wrightia tinctoria* may prove to be quality product for the production of medicine and useful therapeutics provided thorough resource mapping and phytochemical investigation conducted.

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