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## A Pharmacological Review of *Muchakunda* (*Pterospermum acerifolium* Willd)

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### ABSTRACT

*Ayurvedic* herbology deals with description of herbs and plants with medicinal properties and various applications in disease therapy. *Muchakunda* is one such tree which is valued for its therapeutic potential in diseases of cough and cold, in skin disorders like scabies, a potential wound healer and also useful in inflammation and pain. *Ayurvedic* texts also refer its uses in headache and bleeding disorders. It belongs to the family Sterculiaceae and is commonly found all over India. This article deals with a comprehensive review on various pharmacological activity of this tree to validate its use in *Ayurvedic* practice. The subject matter has been reviewed from *Ayurvedic* texts, various research article published in journals and review articles on the internet.

### KEYWORDS

*Muchakunda*, *Pterospermum acerifolium*, *Phytoconstituents*, *Pharmacological action*



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## INTRODUCTION

*Muchakunda* (*Pterospermum acerifolium*) belonging to Sterculiaceae family is a well-known medicine in *Ayurvedic* texts. It is also known with these synonyms such *Chhatravruksha*, *Chitrakand* *Prativishnuk*, *Bahupatra*. The habitat for this tree is eastern and south western coast of India, especially Bengal, Orissa, Assam and Konkan region. The phytochemistry suggests presence of volatile oil in the flowers. *Muchakunda* has been described as a useful plant in various disorders like headache, bleeding disorders, cough, skin diseases, wound healers and anti-inflammatory. Traditionally it has been described as astringent, bitter and pungent in taste, slightly hot and a little dry. Currently a lot of experimental work has been done to explore the therapeutic potential of *Muchakunda*.

## TAXONOMY:

Kingdom: Plantae

Division: Angiospermae

Order: Malvales

Family: Sterculiaceae

Genus: *Pterospermum*

Species: *Aacerifolium*

## VERNACULAR NAMES<sup>1</sup>:

Sanskrit names-*Bahupatra*,

*Sudala*, *Harivallabha*,

*Supushpa*, *Kshtravruksha*, *Chitrak*,

*Prativishnuk*, *Adhyarhi*, *Lakshmanav*,  
*Raktaprasav*, *Vasu* .

Hindi -*Muchakunda*,

*Kanakchampa*, *Kaniar*, *Katha champa*.

Marathi - *Gujarati-Muchakunda*

English- *Bayur tree*, *Maple leaf Bayur tree*, *Dinner plate tree*

## AYURVEDIC

### CLASSIFICATION<sup>2,3,4</sup>:

*Bhavprakashnighantu- Pushpavarga*

*Kaidevanighantu- Aushadivarga*

*Rajnighantu- Karviradivarga*

### RASA PANCHAK :

*Guna-Laghu*, *Ruksha*

*Rasa-Kashaya*, *Katu*, *Tikta*

*Virya -Slightly Ushna*

*Vipaka-Katu*

### HABITAT:

Sub Himalayan tract and outer valleys from Yamuna eastwards to west Bengal, Assam, Manipur up to an altitude of 1200 m extending towards Bihar, Western Ghats of Konkan and North Karnataka and Andaman's islands<sup>5</sup>.

### BOTANICAL DESCRIPTION:

An evergreen tree, up to 24 m in height and 2.5 m in girth with a clean bole up to 12 m, Bark: greyishbrown, Leaves: variable in size and shape 25-35 cm × 15-30 cm, entire or variously lobed, oblong, cordate or sometimes palate. The leaves are rough



and rubbery to limit the loss of moisture in a hot climate.(Figure 1) The bottom side of the leaves range from a silver to rust colour and are pubescent.Flowers: Large 12-15 cm in diameter, axillary, solitary or in pairs, white, fragrant. Capsules: Oblong 5 angled, dark brown and woody, Seeds:Winged, brown. The tree coppices well and produces root suckers. Natural regeneration is by both seeds and root suckers<sup>5</sup>. (Figure 2- Figure 3)



**Figure 1** Muchkunda Leaf



**Figure 2** Muchkunda Flower



**Figure 3** Muchkunda Fruits

## AYURVEDIC USES OF MUCHKUNDA

It is used in painful and inflammatory conditions hence used in headaches. It is also hemostyptic hence used in bleeding piles and Raktapitta. In measles a paste is applied to reduce the burning sensation of the skin. In bleeding piles flowers is given with ghee and sugar orally to reduce bleeding. It is useful in cough and sore throat. It can also be used as an antidote for various types of poisoning (vishaghna)<sup>6</sup>.

Dosage: 3-6 gms

Ayurvedic formulation: Himanshutailla

## PHYTOCHEMISTRY

The alcoholic extract of flowers contain kaempferol and kaempferide-7-glucoside<sup>2</sup>. A mixture of acids like myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, linoleic and linolenicacids. And saturated hydrocarbons were found from the light petroleum extract of the dried flowers<sup>7</sup>. The bark contains Betulin, lupeol, bauerenol, friedelin and  $\beta$ -sitosterol. The bark also contains Kaempferol, kaempferol-3-O-galactoside, luteolin-7-O-glucoside, luteolin-7-O-glucuronide, kaempferide-7-O-beta-Dglucopyranoside,D-galactouroniacid,D-galactos and L-rhamnose<sup>8,9</sup>.The seeds contain palmitic, stearic, arachidic, behenic, mystric, lignoceric, oleic, linoleic,



linolenic acids. Trunk bark and seeds gave the amino acids tyrosin, cystine, glycine, alanine and leucine<sup>10</sup>.

### **BIOLOGICAL AND PHARMACOLOGICAL ACTIVITY**

Many pharmacological studies have been conducted on *Pterospermum acerifolium*. A summary of these findings by various investigators is described briefly in the following sections.

#### **ANTIDIABETIC ACTIVITY**

A study of Inhibition of  $\alpha$ -amylase was carried out on the ethanol extract of flowers of *Pterospermum acerifolium* and its various fractions. The ethyl acetate fraction showed significant inhibition of alpha amylase promising anti diabetic activity hence, it was further reduced to 3 fractions and all were screened for antidiabetic activity in streptozotocin-nicotinamide induced type II diabetes in rats. Diabetic animals treated with fraction 2 at the dose of 30 mg/kg reduced the levels of fasting blood glucose, significantly compared to that of the control. The mode of action can be attributed to increasing the glucose usage by peripheral tissues and by inhibiting glucose formation<sup>11</sup>.

#### **OSTEOGENIC ACTIVITY**

The study on ethanol extracts of the *Pterospermum acerifolium* flowers

helped in isolation and identification of two new flavones and one new lactone, along with 14 other known phytochemicals. The osteogenic activity was studied in the primary cultures of rat osteoblast which revealed a marked increase in expression of ALP and alizarin red-S staining of osteoblasts. These new compounds stimulated osteoblast differentiation and mineralization<sup>12</sup>.

#### **WOUND HEALING ACTIVITY**

The study was done to assess wound healing activity and effect on tumour necrosis factor  $\alpha$  of ethanolic extract of *Pterospermum acerifolium* flowers on excision model of wound repair in Albino Wistar rats. The rats were divided into three groups with 1 group serving as a control with only application of petroleum jelly while the other two groups got local application of petroleum jelly with 10% extract and the final was prefed with *P. acerifolium* extract and local application. *P. acerifolium* extract showed faster wound healing activity. Also (TNF- $\alpha$ ) levels were higher in rats prefed with 250mg/ kg body weight of *P. acerifolium* extract daily for 20 days. The study gives conclusive evidence of wound healing activity with suggestion of induction of TNF –  $\alpha$  activity found in *P. acerifolium* flower<sup>13</sup>.

#### **ANTI-CANCER ACTIVITY**



Ethanol and Water extracts of *Pterospermum acerifolium* showed good antimetabolic activity against meristematic cell growth. Both extracts also showed good inhibition on yeast cell growth with IC<sub>50</sub> 47.88 mg/ml and 39.15 mg/ml respectively. The mode of action of both extract with anti-proliferative activity was due to fragmentation effect on the DNA<sup>14</sup>.

#### **ANTIULCER ACTIVITY**

The role of ethanolic fraction of *Pterospermum acerifolium* bark extract on different experimental ulcer models in rat's demonstrated significant antiulcer activity against aspirin, indomethacin & ethanol induced ulcerations, significant inhibition of gastric secretory volume, and total acidity in pylorus ligated rats were observed. The possible reasons of the antiulcer effect of *Pterospermum acerifolium* may be due to (i) the inhibition of 5-LO enzyme (ii) blockade of LTC<sub>4</sub>, LTD<sub>4</sub> synthesis (iii) generation of free radicals; and/or (iv) inhibition of histamine release following mast cell degranulation. One or more of the mentioned reasons may be responsible for the antiulcer activity *Pterospermum acerifolium*<sup>15</sup>.

#### **ANTHELMINTIC ACTIVITY**

The investigation of anthelmintic activity was established by a study on crude

extracts and different fractions like Ether, Chloroform, Ethyl acetate and n-Butanol from leaves, barks and flowers of *Muchakunda*. Anthelmintic activity of these crude extracts and fractions were investigated against regular intestinal worms like earthworms, Nematodes and tapeworms. The reference standards used were Albendazole and Piperazine citrate. The observation over time taken for paralysis and death of the worms revealed that, the ethyl acetate fraction of all the parts showed action almost comparable with both standard drugs followed by n-butanol fractions of those parts, which was dose dependent<sup>16</sup>.

#### **ANTI-INFLAMMATORY AND ANTI-NOCICEPTIVE ACTIVITY**

The study was to ascertain anti-inflammatory and anti-nociceptive effect of unsaponified petroleum ether extract of *Pterospermum acerifolium* with a dose range of 100- 200 mg/kg orally, along with isolated  $\beta$  sitosterol (10 & 20 mg/kg) from its leaves. The study done on mice for anti-nociceptive activity were acetic acid induced writhing test, hot plate induced and formalin induced paw licking models, while the anti-inflammatory activity was seen with carrageenan induced paw edema in albino rats. Unsaponified petroleum ether extract of *Pterospermum acerifolium* and pure  $\beta$



sitosterol shows peripheral and central analgesic effect in experimental models of mice like, reduction in writhing and hot plate stimuli response respectively in a dose dependent and statistically significant manner. Unsaponified petroleum ether extract showed significant results in formalin induced nociceptive tests. Unsaponified petroleum ether extract of *Pterospermum acerifolium* and pure  $\beta$  sitosterol produced a marked inhibition of carrageenan induced paw edema confirming its anti-inflammatory activity in animal models<sup>17</sup>.

#### **ANTI-INFLAMMATORY, ANALGESIC AND ANTIPYRETIC ACTIVITY**

The study was conducted on Swiss albino mice and Wistar albino rats for the effects of the ethanolic extract of leaves of *Pterospermum acerifolium* to ascertain both peripheral and central analgesic properties at the doses of 300mg/kg and 400mg/kg body weight. The peripheral analgesic activity was ascertained with its inhibitory effects on acetic acid induced writhing response method. The centrally acting analgesic effect was confirmed from tail flick and tail immersion methods. The anti-inflammatory effect of the leaf extract on acute inflammatory process like carrageenan-induced oedema in rat paw was dose dependent. The anti-pyretic

effect of the extract on yeast induced pyrexia in rats was also dose-dependent<sup>18</sup>.

#### **HEPATOPROTECTIVE ACTIVITY**

Hepato-protective activity of the ethanol extract of the leaf of *Pterospermum acerifolium* in rats was evaluated by inducing hepatotoxicity in male Wistar rats by injecting Carbon tetrachloride intraperitoneally at the dose of 0.1 ml/kg/d. for 14 days. Ethanolic extract of *Pterospermum acerifolium* leaves were administered to the experimental rats at the dose range 25 mg/kg/day for 14 days and showed significant hepatoprotective activity which was comparable to the reference standard Silymarin, probably due to presence of flavonoids in the leaves<sup>19</sup>.

The hepatoprotective activity of petroleum ether and hydro alcoholic extracts of *Pterospermum acerifolium* was studied in albino rats with paracetamol induced liver damage. The petroleum ether extract at the dosage of 50 mg/kg was having best activity as it decreased the mean bilirubin level significantly and was also showing significant protective activity for the liver enzymes like alkaline phosphatase, SGOT, and SGPT. Both extracts were having remarkable protection against oxidative damage to the liver between the dose of 25-50 mg/kg<sup>20</sup>.

#### **IMMUNO-SUPPRESSANT ACTIVITY**



Immunomodulatory activities is investigated by utilizing the effects of the hexane and ethanolic extracts prepared from the seeds of plant *Pterospermum acerifolium* on humoral and cellular immune arms of BALB/c mice after oral administration for 14 consecutive days at different log doses. In order to analyse the immunomodulatory characteristics of the plant at 3, 10 and 30 mg/kg doses, various immune parameters viz. lymphoproliferative index, oxidative burst in peritoneal macrophages, modulation in T/B cell population and regulation of Th1/Th2 cytokines in mice were observed. Phenomenal dose-dependent immunosuppressive effect with down-regulation of all the immune markers was exerted by both the extracts. Administration of extracts in immune-stimulated mice (by treatment with levamisole) further validated the immunosuppressive action<sup>21</sup>.

## CONCLUSION AND DISCUSSION

Ayurveda makes use of resources widely present in the flora of the land. For the fullest benefit of mankind each herb need to be well identified and exploited. Plant based drugs have an important place in traditional and modern medicine. Use of traditional system of medicine to explore

new therapeutic entities is the need of the time. Many plant based medicines are currently been explored and a synergy of both modern tools and ancient wisdom helps to shed light on various therapeutic molecules. *Pterospermum acerifolium* or Muchakunda is a promising herb which has been explored on various parameters to strengthen its use in Ayurveda as antidiabetic, osteogenic, wound healing, anticancer, antiulcer, antihelmentic, antipyretic, antinociceptive, analgesic, anti-inflammatory and in skin diseases. The current review summarises updated work on Muchakunda as available through various sources.





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