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# A Review on applicability and therapeutic uses of Caesalpiniapulcherrima plant

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Abstract :

*Caesalpiniapulcherrima* is a herbal medicinal plant. It is known as **peacock's pride**. Herbal medicine or Herbal drugs are popular in the healthcare system. These plants are used for medicinal purposes. For a long time, the current popularity of herbal medicine research in this area should be boosted. This plant is widely used in the traditional medicinal system of India. It has been found to be as useful as anti-inflammatory agent, antioxidant agent, antineoplastic agent, antibacterial agent and immunosuppressive agent. This review is focused on information about all therapeutic activities of *caesalpiniapulcherrima* Herbal plant.

**KEY WORDS:**Antiinflammatory agent, antioxidant agent,antimicrobial agent, purgative agent, analgesic agent, antidiabetic agent, *caesalpiniapulcherrima* , medicinal plant, herbal medicine, pharmacognosy, pharmacological activities.

## Introduction :

Family of *Caesalpiniapulcherrima* is *Caesalpiniaceae*. It is a small spiky tree, its height is 6-9 meter and diameter is 15-25 cm with a few thorny branches. In India it is commonly known as **'Patag'**. Also in english known as *caesalpiniapulcherrima* wood & Brazil wood. It grows in wild areas, in mountain areas & is cultivated in the gardens for its large panicles of yellow flowers. The tree was previously cultivated in South-East Asia for its red dye & is obtained from its **heartwood**.

*Caesalpiniapulcherrima* is distributed in states of Tamilnadu, Kerala, Karnataka, Andhra Pradesh and West Bengal. The leaves of Caesalpiniapulcherrima are compound type & have 8-12 pairs of oblong leaflets and small thorns.The colour of flowers is yellow in terminal and axillary panicles, fruits are woody pods in nature sub compressed with a hard recurved short beak. Seeds are 3-4, yellowish-brown in colour.Wood is orange-red in colour, hard, very heavy. Weight is 1.073kg/m3 of air dry.it is straight-grained with a fine texture.(1)

***Plant Profile : (2)***

| **Scientific classification** | |
|---|---|
| **Kingdom :** | **Plantae** |
| **Clade :** | **Tracheophytes** |
| **Clade :** | **Angiosperms** |
| **Clade :** | **Eudicots** |
| **Clade :** | **Rosids** |
| **Order :** | **Fabales** |
| **Family :** | **Fabaceae** |
| **Subfamily :** | **Caesalpinioideae** |
| **Genus :** | **Caesalpinia** |
| **Species :** | **C. pulcherrima** |
| **Binomial Name :** | **Caesalpiniapulcherrima (L) SW.** |

## THERAPEUTIC USES :

The wood is bitter in taste , dry, sour, cooling in nature. It is used to cure diseases like Vata, biliousness, fever, delirium, ulcers, strangury, urinary concentration and blood complaints. It is considered as having astringent and sedative properties. It is useful intreating the spoiled conditions of pitta. An infusion of the wood part is a powerful astringent and promotes menstrual discharge. It is useful in atonic diarrhea and dysentery conditions, and its paste dosage form in rheumatism, hemorrhages and to treat wounds. Hot aqueous extract and chloroform extract of wood material displayed inhibitory action on cyclic AMP phosphodiesterase enzymes. The methanolic extract of the caesalpiniapulcherrima lignum exhibited sleep time-increasing effect in mice and significant antihypercholesterolemic activity. Brazilien dye has been found to be exhibiting anti- inflammatory activity. The trunk wood part has demulcent and haemostatic properties. It is used in treatment of contusion, wounds, dysmenorrhoea, colic furunculosis, impetigo, leucorrhoea and anemia conditions. "caesalpiniapulcherrima is one of the constituent of an native drug 'Lukol' which is given via oral route for the treatment of non-specific leucorrhoea.(3)

## Anti-inflammatory activity :

Assessment of Carrageenan induced rat paw edema of extract of *Caesalpiniapulcherrima*, for the anti-inflammatory activity using carrageenan induced hind paw edema was executed as per technique by Winter et al. (1962). The Anti-inflammatory activity was studied using the Carrageenan induced rat paw oedema according to the method of Winter et al. After 16 hours of fasting on rats, the rats of weight 150-200 gm were split into eight groups of six rats each. Group I of six groups worked as a control group and got distilled water (DW), orally. Group II of six groups received the drug Diclofenac as standard at a dose of 5 mg/Kg. Rats from Group III, IV and V got Pet Ether extract of *Caesalpiniapulcherrima* at a dose of 100, 200 and 400 mg/kg respectively; Rats from Group VI, VII, VIII got methanol extract of *Caesalpiniapulcherrima* at a dose of 100, 200 and 400 mg/kg respectively; After one hour , 0.1 ml of 1% w/v Carrageenan suspension was injected subcutaneously into the plantar surface of the right hind paw. The paw volume was estimated using a device called Digital plethysmometer PLM-01 (Orchid Scientifics, India) right away and 3 hours after carrageenan injection was administered. (Pandurangan et al 2008)Granuloma formation was induced by cotton pellets in rats After 16 hours of fasting, the rats of weight 150-200 gm were split into eight groups of six each in a group. Group I of eight groups served as a control group and got distilled water (DW), by oral route

.Group II of eight groups got the drug Diclofenac as a standard at a dose of 5 mg/Kg. Rats from Group III, IV and V got Pet Ether extract of Caesalpiniapulcherrima at a dose of 100, 200 and 400 mg/kg respectively.

Rats from Group VI, VII, VIII got methanol extract of *Caesalpiniapulcherrima* at a dose of 100, 200 and 400 mg/kg respectively; by oral route for successive six days (Winder et al.,1962; Swingle et al., 1972). The cotton pellet of weight 50±1 mg was sterilized in an autoclave (Lab hosp, Mumbai, India) operated with a sterile instrument. The pellet was inserted into each rat on the backside. Control group (I) got the vehicle. The rats were given up on the seventh day and the cotton pellets together with granuloma mass were collected, weighed and dried at $60^0$ C temperature. Results of the assay carried out were computed as percent inhibition of dry weight of granuloma formation by using the formula: **100 (A-B)/A**, where, A= gain in dry weight of control pellet (mg), B= gain in dry weight of drug treated (mg).(4)

## Antioxidant Activity :

*Caesalpiniapulcherrima* heartwood was evaluated both by in vitro and in vivo methods. The ethyl acetate extract, methanol extract and water extracts displayed strong antioxidant activity as proved by the low IC50 values in both 1,1-diphenyl-2-picryl hydrazyl (DPPH) and nitric oxide methods. Administration of the consecutive methanol extracts and water extracts at 50 and 100 mg/kg body weight respectively administered for 4 days earlier to carbon tetrachloride (CCl4) treatment generated a remarkable improvement in the level of superoxide dismutase (SOD) and catalase and a noteworthy reduction in the level of thiobarbituric acid reactive substances (TBARS), in contrast to CCl4treated control in both liver and kidney. These changes were noticed at 100 mg/kg body weight, treatments were comparable to those observed for standard vit E at 50 mg/kg treatment. Ethyl acetate extracts of caesalpiniapulcherrima exhibit antioxidant activity. **Brazilien** is an antioxidative agent and it has a safeguarding property on the BrCCl3-induced depression of microsomal calcium sequestration activity.(5)

## Antimicrobial activity :

Antimicrobial assay was acquired for fungal and bacterial strains and sample preparation for microbial assay, Fungal strains were acquired from the culture collections of the Mycology Department and Microorganism Collection of Antibiotics Department of UFPE (UFPEDA), the isolated bacterias were given from the culture collection of the Antibiotics Department, both belonging to the Universidade Federal de Pernambuco, Brazil. The pathogenic microorganisms were used in this investigation and its respective register numbers were Candida guilliermondii (URM6558), Candida tropicalis(URM1150), Aspergillus terreu(URM4347), Aspergillus tamarii (URM4348), Candida trusei(URM4263), Candida krusei (ATCC6258), Candida albicans (URM4990)**,** Candida parapsilosis(URM22019), Staphylococcus aureus (U02); Enterococcus fecalis (UFPEDA09); Pseudomonas aeruginosa (UFPEDA416); Escherichia coli(UFPEDA224); and Klebsiella pneumoniae(UFPEDA396).(6)

## Purgative Activity :

Male albino rats weighing between 150-180 gm in weight were used in this investigation.. They were adapted to the environment in the animal housing unit ($25\pm1^0$60-80% relative humidity) and 12 hours photoperiod for 1 hour earlier to the onset of the experiment. The purgative activity of the crude extracts (300 mg/kg, p.o) were analysed. The essential diarrhoeal droppings were counted by giving the crude extract and standard drug both. The technique followed was actually that of Lou. Food and water were withdrawn from the male rats weighing between 150-180 gm in weight, early in the morning and the rats were put individually into each chamber of the cage. After 2 to 3 hours, the faeces were studied and any rat having soft or wet faeces was removed. They were split into five batches of ten rats in each. Sennosidetablets (7.5mg/kg, p.o) were used as standard drugs. Aqueous Tween 80 (2% w/v) solutions were used as control. For administration of the drug, the rats were kept securely and a stomach tube was then passed gently down the oesophagus. As the stomach tube passed into the stomach, the rats displayed a specific and significant gagging sound. The dose was then administered by using a syringe attached to the stomach tube. After administration of dose, the rats were held under inspection for at least 12 hours.During the testing time, moistened food and fresh water were provided in the food container.

Purgative activity was designated by the excretion for the wet faeces, which were acknowledged by their somewhat rounded shape and the existence of a brown stain- nearby each drop on the blotting paper. Sum up of wet faeces usually initiated 2 hours after administration repeated for every half an hour until the end of $5^{th}$ to $6^{th}$ hour. The final sum up was done prior in the upcoming morning. The purgative activity was in contrast to that produced by sennoside tablets, which were given as a solution prepared by dissolving the powdered tablets in 2% aqueous Tween 80 solution. The standard drug, sennoside was administered at a dose of 7.5mg/kg, p.o. The batches were appointed as follows: Group1-Control, Group 2-Standard (Sennoside-7.5mg/kg), Group3 Acetone extract (300 mg/kg), Group 4 -Alcoholic extract (300 mg/kg), Group 5-Aqueous extract (300 mg/kg).(7)

## Ornamental Use :

*Caesalpiniapulcherrima*is the broadly cultivated species in the genus *Caesalpinia*. It is a noticeable decorative plant, broadly grown in household and public gardens in warm weather with mild winters, and has beautiful flowers in yellow, red, and orange. Its small size and the fact that it permits prunning well allows it to be planted in groups to form a hedgerow; it can be also attractive to hummingbirds. For cultivation in the UK, this plant has achieved the **Royal Horticultural Society's Award of Garden Merit**.(8)

## Analgesic activity :

The outcome of ethanol extract of *Caesalpiniasappan*. and its different fractions on acetic acid-induced writhing in mice is summed up in Table 1. Acetic acid prompted the characteristic writhing response when injected intraperitoneally into Swiss albino mice. Treatment with ethanol extract (200 and 400 mg/k remarkably reduced the number of writhings 69.71 and 73.33%, respectively ($p < 0.01$).

Petroleum ether fraction (200 and 400 mg/kg) remarkably reduced the number of writhings 53.16 and 55.16%, respectively ($p < 0.01$). Diethyl ether fraction (200 and 400 mg/kg) remarkably reduced the number of writhings 48.08 and 49.02%, respectively ($p < 0.01$). Ethyl acetate fraction (200 and 400 mg/kg) remarkably reduced the number of writhings 62.47 and 68.84%, respectively ($p < 0.01$).

Aspirin (50 mg/kg) remarkably reduced the number of writhings (75.22%) in comparison with the control group ($p < 0.01$).(9)

## Miscellaneous :

*Caesalpiniapulcherrima* wood is beneficial for blood circulation and eliminates blood stasis and imparts subsidence of swelling and relieves pain. 5-hydroxy-1,4-naphthoquinone is isolated from heartwood of caesalpiniapulcherrima, when it is tested with Clostridium perfringens, it showed the strong (+++) inhibition at 5 and 2 mg/disk and moderate (++) inhibition at 1, 0.5 and 0.25 mg/disk.

Furthermore this isolate revealed a weak (+) growth inhibition casei at 5 and 2 mg/disk. It shows that the hydroxyl functional group of naphthoquinone appears to be required for selective growth-inhibiting activity against perfringens. As per the compound obtained from caesalpiniapulcherrima heartwood could be useful as a preventive agent in case of diseases caused by *C. perfringens. C. pulcherrima* extract from a study of screened Chinese herbal medicines were found to show potent activity for human sperm in vitro Exposure of sperm from healthy donors to this agent showed exceptional decreased sperm mobility. The antimobility effect of *caesalpinia. pulcherrima* is concentration-dependent and about 2.5 mg/ml concentration is needed to decrease mobility to 50% of the control medium (EC50).

This result advocates that this traditional Chinese herbal medicine has an anti mobility human sperm in vitro and has the prospect of becoming in the future a new and acceptable male oral contraceptive. Brazilien display the effect on glucose transport into isolated rat epididymal adipocytes. It might improve glucose transport by establishment of GLUT4 from intracellular pools to the plasma membrane of adipocytes via the activation of PI3-kinase5. Brazilien improved [3H] 2-deoxyglucose uptake in isolated rat adipocytes. The fact that calcium may be required for the stimulatory effects of insulin on glucose transport suggests that Brazilien might also need calcium for its glucose transport-stimulating activity. So the conservation of the intracellular calcium concentration, other than an increase in it, may be crucial for the stimulatory activity of Brazilien on glucose.(10)

## Antidiabetic Activity:

Brazilein is an active constituent of *caesalpiniapulcherrima* which reduces the blood glucose in diabetic animals. Brazilein prevents hepatic Gluconeogenesis by elevating the F- 2, 6-BP level in hepatocytes, perhaps by increasing the cellular F-6-P/H-6-P levels and PFK-2 activity. Elevated pyruvate kinase activity might also enact as antigluconeogenic action of braziline.(11)

## Conclusion:

The *Caesalpiniapulcherrima* is a herbal, medicinal plant. It is and considered as a valuable plant in both of Ayurvedic and modern drug development systems for areas of its versatile medicinal uses. Significant emphasis has been given to all therapeutic activities of*caesalpiniapulcherrima*. It has found to be showing the anti-inflammatory activity, antioxidant activity, antimicrobial activity, purgative activity, analgesic activity, antidiabetic activity.

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