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A REVIEW ON NEUTRACEUTICAL VALUE OF *SESBANIA GRANDIFLORA* (AGATI)

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ABSTRACT

Sesbania grandiflora, commonly known as Agati or Hummingbird tree is used as folk medicine for various infection and diseases. The whole plant is loaded with pharmacological activities and used for treating anemia, microbial infections, tuberculosis etc. The antioxidant property of Agati is due to the presence of phytochemical constituents making it a potent anticancer and hepatoprotective agent. The present review focusses on the medicinal properties of *Sesbania grandiflora.*

KEYWORDS: *Sesbania grandiflora*, Folk medicine, Antioxidant, Phytochemicals, Pharmacological activity**.**

INTRODUCTION

Medicinal plants or herbs are used as human aliments from ancient cilization. Most of the world population rely on medicinal plants for curing various diseases and infections.[1] All parts of the medicinal plants or herbs are edible and used for treating hepatic diseases, microbial infections, diabetes, anemia, tuberculosis, gout, leprosy and urinary stones etc. In India, various parts of medicinal plants such as leaves, stem, fruits, flowers, roots and seeds are used in Unani, Sidhha and Ayurveda as therapeutic agents. Even perfumes and dyes are prepared from various parts of plants. The whole plant parts of *Sesbania grandiflora* posses therapeutic values. The various plant parts are used in different dosage forms such as paste, cream, powder, tablets, capsules, tincture, extracts, and tonic.[2,3,4]

Sesbania grandiflora or hummingbird tree is commonly known as agathi or agate. It is a perennial tree and grows upto a height of 10m. It is used as human food and animal fodder. It also possess ornament value. *Sesbania grandiflora* is originated in India (Gujarat, Tamilnadu,

Assam, Kerala, Adhra Pradesh) and Southeast Asia.[5,6] The leaves are used in Ayurveda for treating itchness, fever, toxicity, sinus, respiratory disorders and used as anthelmintic, purgative, diuretic, laxative for constipation and coolant. The flowers are used traditionally by tribals to treat nightbliness, cataract and headache . The leaves of *Sesbania grandiflora* have high nutritive value. *Agathi keerai, is a south Indian dish prepared from the* young edible leaves are and delicious soup, fritters are prepared from the flowers. Leaves are also used for treating anemia, as antidote for tobacco and cigratte smoking related respiratory problems. Steamed flowers are used as a traditional Indonesian dish, *Peal*.[7,8,9,10] The antipyretic, anti-inflammatory, antioxidant, antimicrobial, thrombolytic and membrane stabilizing properties of *Sesbania grandiflora* is attributed by the phytochemicals. Recent Scientific studies has revealed potent hepatoprotective, cardioprotective, antiurolithiatic and anxiolytic activities of *Sesbania grandiflora*.[11,12,13,14]

TAXANOMY[15]

Kingdom : Plantae
Superdivision : Spermatophyta
Class : Magnoliposides
Order : Fabals
Family : Leguminosae
Genus : Sesbania
Species : Sesbania grandiflora

VERNACULAR NAMES[16,17]

Latin : Sesbania grandiflora
Sanskrit : Agati, Augastya, Kanali
Hindi : Augest, Basna, Agustiya, Agati
English : Hummingbird tree, Agate, Swamp Pea
Marathi : Hadga
Tamil : Agati, Agatti-Keerai
Telugu : Agase, Agise
Kannada : Agastya
Punjabi : Jainta
Bengali : Jainti,Jayant

Other names: Australian Corkwood tree, Tiger Tongue, West Indian Pea, White Dragon tree.

Synonyms: *Agatigrandiflora, Robinia grandiflora, Aeschynomene grandiflora(L).*

BOTANICAL DESCRIPTION[18,19,20]

Leaves: The leaves of *Sesbania grandiflora* are deep green, pinnate, approximately 30cm long and mild tart in taste.

Flowers: The flowers are 7-9cm long, deep pink to red in colour. It tast acrid, bitter and astringent.

Bark: The bark of *Sesbania grandiflora* are lightly grey in colour, corky and deeply furrowed.

Seed: The seeds are oblong, brown or dark green coloured.

Pod: The pods are slender and straight, pale yellow coloured, 20-60cm long and contains 15-50 seeds, each 8 mm in size.

ECOLOGY

Sesbania grandiflora is well adapted to hot, humid climate. It has an ability to grow in saline and alkaline soil conditions. It can withstand water logging condition.

PHYTOCHEMISTRY[21,22,23,24,25]

The phytochemical constituents of *Sesbania grandiflora are* alkaloids, flavonoids, glycosides, tannins, steroids, proteins, carbohydrates, terpenoids, anthraquinone and saponin.

NUTRITIVE VALUE OF *SESBANIA GRANDIFLORA*[26]

Sesbania grandiflora leaves, flower, bark and seeds contains water, carbohydrate, proteins, fats, fibres, minerals (Iron calcium, sodium and potassium), vitamins(thiamine, riboflavin, niacin, ascorbic acid and β- carotene) and essential amino acids(Arginine, histidine, isoleucine, leucine, lysine and methionine). The roots contains isoflavonids, isovestitol, medicarpin and sativan. Leucocyanidin and cyaniding are the active ingredients of *Agati* seeds.

MEDICINAL USES[27]

In Ayurveda, whole plant and their preparations are used for the treatment of various infections and diseases.

Leaves: Fresh leaves are used as an ailment for migraine, sinusitis, rheumatism, arthiris, gout and wound healing. Leaves are used as tonic or paste to treat oral and throat infections.

Flowers: The juice of *Sesbania grandiflora* flowers are used for treating nightbliness, headache and constipation.

Bark: Bark is used to treat diarrhea, small pox, malaria, eruptive fever and gonorrhea.

Root: The roots of red flowered variety *Sesbania grandiflora* is used to treat rheumatism.

Seed: The oil of *Sesbania grandiflora* seed has anthelmintic activity.

THERAPEUTIC USES

a) Antibacterial and antifungal activity

Polyphenolic extracts (PE) of *Sesbania grandiflora* flower was evaluated using both *invitro* and *insitu* methods. *Invitro* studies of PE of *Sesbania grandiflora* has showed inhibitory effect against *Staphylococcus aureus, Shigella flexnesi, Salmonella typhi, E.coli* and *Vibrio cholera.* Among all this microbes, *S.aureus* was more sensitive and showed minimum inhibition at a concentration 0.013mg/ml.[28]

The ethanolic and aqueous extracts of *Sesbania grandiflora* leaves was screened for their antibacterial activity against *Staphylococcus aureus, E.coli, Klebiella pneumonia, Pseudomonous aeruginosa* and *Bacillus subtilus* using agar diffusion technique. The study showed a significant antibacterial activity of ethanolic extract on *Staphylococcus* and *E.coli.*[29]

A comparative study on antibacterial activity of ethanolic leaves extracts of *Sesbania grandiflora* using agar diffusion technique against *E.coli* and *Pseudomonas aeroginosa* exhibited a significant inhibitory effect on *Pseudonomas aeroginosa* producing a zone of inhibition of 12mm at a concentration of 100µl**.** Even the two fungal pathogens *Candia albicans* and *Aspergillus niger* were inhibited by *Sesbania grandiflora* leave extract.[30]

The minimum inhibitory concentration (MIC) and zone of inhibition was determined in *Sesbania grandiflora* ethanolic root extract by disc diffusion technique against *Staphylococcus aureus, Staphylococcus epidermis, E.coli and Bacillus subtilis* at different concentration. The highest zone of inhibition (25.7mm) was obtained for *Staphylococcus epidermis* at a dosage of 250mg/disc, where as *E.coli* showed lowest inhibition zone of 1.5mm at a concentration of 50mg/disc.[31]

A study on antibacterial activity of aqueous, ethanol and chloroform extract of *Sesbania grandiflora* against *Staphylococcus aureus, S.epidermis, S.pyogenes,S.mutans, S.pneumonia, B.cereus and B.subtilis* was carried out using disc agar diffusion method. The chloroform extract of *Sesbania grandiflora* exhibited maximum inhibitory zone against *S. aureus, S.pneumonia and B.subtilis.*[32]

b) Antituberculosis activity

The chemical components namely isolflavonoids, isolated from *Sesbania grandiflora* root extract has exhibited maximum antituberculosis activity against *Mycobacterium tuberculosis* H37Rv.[33]

c) Anthelmintic activity

Anthelminitic activity was studied in acetone, ethanol and aqueous extracts of *Sesbania grandiflora* flowers at a concentration of 100,150,200mg/ml. The ethanolic extract of flower showed a significant anthelmintic activity *(Pheretima posthuma)* at a concentration of 200mg/ml. The presence of various phytochemical contributes anthelmintic property.[34]

A study on anthelmintic activity of aqueous extract of *Sesbania grandiflora* leaves was carried out against *Acaridia galli* revealed a definite anthelmintic efficiency, which was mainly because of the presence of phytochemicals like flavonoid, phenol,tannin,alkaloid, saponin, steroids and terpenoids.[35]

Evaluation of antihelmintic activity of ethanol, methanol and ethyl acetate crude extract of *Sesbania grandiflora* leaves was carried out on Indian adult earthworm (*Pheretimaposthuma)* at different concentrations of 10-100mg/ml. This study suggested that the ethanolic extract has higher anthelmintic property when compared to extracts due to the presence of phenolic and alkaloid compounds[36].

A study on antihelmintic property of *Sesbania grandiflora* alcoholic extract showed a significant effect against Indian earthworm. A dosage of 50mg/ml, not only showed paralysis, but also caused death of worm in a shorter period of time when compared to standard drug Piperazine Citrate.[37]

In vitro antihelmintic property of various seed oils (*Passiflora edulis, Jatropa curucas, Tinospora cordifolia, Sesbania grandiflora* and *Sapindus lauridolia)* was evaluated at a concentration of 10, 50 and 100mg/ml). *Sesbania grandiflora* seed oil exhibited highly

significant anthelmintic activity at a concentration of 100mg/ml against *Pheritima pasthuma* in both parameters (paralysis and death) when compared to standard drug Piperazine citrate(10mg/ml).[38]

d) Antidiabetic property

The 70% alcoholic extract of *Sesbania grandiflora* flower has shown a significant antidiabetic activity in alloxan induced diabetic rats at a dose of 250mg/kg and 500mg/kg administrated for 28days. Even a marked reduction in serum total cholesterol, TG, SGOT, SGPT and BUN was observed. The histopathological studies showed the repair and regeneration of the damage islet of pancreatic cell.[39]

The antidiabetic activity of ethanolic leave extract of *Sesbania grandiflora* was studied in STZ induced diabetic rats. The rats were injected with STZ at a dose of 45mg/kg of body weight and orally treated with leave extract for 30days. A significant ($p< 0.05$) decrease in blood glucose, glycosylated hemoglobin, blood urea, uric acid serum creatinine was noticed. The activity of aspartate transaminase(AST), alanine transaminase (ALT) and alkaline phosphatase (ALP) was also markedly reduced.[40]

The aqueous extract of *Sesbania grandiflora* has shown a decrease in plasma glucose, serum insulin, hepatic glycogen and glycosylated hemoglobin and serum enzyme marker (ALT, AST and ALP) in alloxan induced diabetic rats (150mg/kg.b.wt).[41]

e) Hepatoprotective activity

Hepatoprotective activity of aqueous extract of *Sesbania grandiflora* leaves was studied in albino rats. The rats orally fed with carbontetrachloride to induce liver damage at a dosage of 500mg/kg b.wt. Treatment of rats using aqueous extract has shown a decline in serum level of glutamic pyruvate transaminase(SGPT), alkaline phosphatase(ALP) and total bilirubin, cholesterol.[42]

A study on hepatoprotective activity of petroleum ether extract of *Sesbania grandiflora* fruit has shown a significant reduction in ALT, AST, ALP and total bilirubin level at a dosage of 400mg/kg of b.wt in ethanol induced heptotoxic rats. Histopathological studies has also revealed the presence of normal liver cells.[43]

Hepatoprotective activity of aqueous, ethanol and acetone extract of *Sesbania grandiflora* leave extracts was studied in CCl4 induced rats. The ethanolic extract at a concentration of

300mg/kg b.wt has shown decline in biochemical parameters such as serum glutamtate pyruvate transaminase, serum glutamate oxalate transaminase, total bilirubin and alkaline phosphatase activity in the rats.[44]

f) Antioxidant activity and Cardioprotective activity

The Cardioprotective activity of *Sesbania grandiflora* was evaluated against cigarette smoke exposed rats. The adult male Wister- Kyoto rats were exposed to cigratte smoke for 90days and orally treated with *Sesbania grandiflora* aqueous leave extract for 3 weeks at a dose of 1000mg/kg of body weight. After treatment there was a significant decrease in the activity of serum lactate dehydrogenase, cardiac superoxide dismutase, glutathione reductase, glutathione–S-transferase and glucose 6 phosphate dehydrogenase. Even the level of zinc, manganese and selenium was restored. This indicated the potential antioxidant activity of *Sesbania grandiflora.*[45]

g) Wound healing activity

Wound healing activity was evaluated in wistar rats using excision and incision wound model. The rats were treated with with 2 and 4% w/w ointment of ethanolic extract of *Sesbania grandiflora* flower in asimple ointment base. Both concentration had showed significant results when compared the control rats and Nitofurazone ointment (0.2% w/w) was used as standard drug.[46]

The methanolic extract of *Sesbania grandiflora* bark showed effective wound healing activity at a concentration of 10% w/w in Wistar albino rats using excision wound model when compared to standard 1% Framycetin sulphate.[47]

h) Antiulcer activity

The ethanolic extracts of *Sesbania grandiflora* leave at a dosage of 250mg and 500mg/Kg of body weight had showed reduction (50% and 74.22%) in ulcer of ethanol induced adult albino rats when compared to the control group. Omeprazole was used as standard drug. [48]

i) Anticancer activity

Sesbania grandiflora methanolic leave extracts had repored potent antiproliferative activity in human lung cancer cell line, A549 by activating caspase 3 leading to cell dealth by apoptosis.[49]

Evaluation of anticancer activity in *Sesbania grandiflora* leaves and flower ethanolic extracts had repored a marked reduction in GSH, SOD, CAT, lipid peroxidation, tumour volume, viable cell count at a dosage of 100 and 200mg/kg body weight and elevated the life span of Swiss albino mice against Ehrlich Ascite Carcinoma (EAC) cell line. Hematological profile such as RBC, Hb and lymphocyte were also reported to be normal.[50]

In vitro study of aqueous, ethanol and acetone extract of *Sesbania grandiflora* leaf at a concentration of 50-300 µg/ml showed showed apoptotic cell death in neuroblastima (IMR-32) and colon (HT-29) cell lines.[51]

The protein fraction SF2 extracted from the flower of *Sesbania grandiflora* had shown significant anticancer and chemoprotective efficiency in Dalton lymphoma ascites (DLA) and c human colon cancer cells (SW-480) by activating caspase 3, 8 and 9 and downregulating Bcl-2, p- Akt and cyclooxygenase -2 in cancer cells.[52]

j) Antiinflammatory activity

Methanolic extract of leaves of *Sesbania grandiflora* has revealed anti-inflammatory activity in formaldehyde induced rat paw oedema model at dosage of 400mg/kg of body weight. In this study 0.5mg/kg of Dexamethanone was used as standard drug.[53]

k) Antiurolithiatic activity

The leaves of Sesbania grandiflora exhibited good antiurolithiatic activity in rats induced with calcium oxalate type stones. There was no any behaviourl changes in rats except excessive urination.[54]

l) Immunomodulatory activity

The oral administration methanolic extract of *Sesbania grandiflora* at a dose of 200and 400mg/kg has reported a significant immunomodulatory activity in rats induced by sheep red blood cells to create hypersensitivity.[55]

m) Antiviral activity

Methanolic flower extracts of *Sesbania grandiflora* showed significant antiviral activity against herpex simplex-1, herpex simplex-2, vaccinia, vesicular stomatitis anad cox sackie. The antiviral activity is mainly due to flavonoid content.[56]

CONCLUSION

Medicinal plants or ethno medicine are in practice from Ancient times in many cultures and *Sesbania grandiflora* is one amoung them. In Ayurveda, the various parts of the plants are used as human aliment for treating microbial infections, anemia, as laxative, hepatoprotective and cardioprotective agents, preventing and treating urinary stones etc. The parts of the plant are used alone or in combination with other medicinal plants as a potent therapeutic agents. The presence of phytochemicals and phytonutrients contributes pharmacological activity of the plant.

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