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Sesbaniasesban, A Plant with Diverse Therapeutic Benefits: An Overview

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Abstract

In the current scenario tropical countries including India are opting alternative medicines to treat the ailments. From the ancient period of time our tradition and cultures are using herbal treatments successfully including their versatile uses. *Sesbaniasesban*is one of them. This plant belongs to the family Fabaceae(Leguminosae). This plant is mainly distributed in Africa, Asia and Australia. Traditionally this plant is used in menorrhagia, spleen enlargement, diarrhea and asanthelmintic, astringent, emmenagogue, anti-inflammatory and dysuria. The important aurvedic formulations are Ratnagiri Rasa and Mahapaisachikaghritam. The chemical constituents of this plant as reported are saponins, tannins, alkaloid, phenolic compounds, and flavonoids and oleanolic acid 3-β-D-glucuronide. Apart from the agricultural uses the plant has the diverse therapeutic benefits like antidiabetic, anti-inflammatory, anthelmintic, spermicidal and as sleeping aids. The present review work reveals the plant kingdom, active constituents present and different pharmacological properties evaluated of *Sesbaniasesban*.

Key-words: *Sesbaniasesban*, oleanolic acid 3-β-D-glucuronide,menorrhagiaantidiabetic, anthelmintic.

Introduction

Because of better cultural acceptability, better compatibility with the human body and lesser side effects the herbal medicine is still the mainstay of about 75 - 80% of the world population, mainly in the developing countries, for primary health care. Traditional preparations comprise medicinal plants, minerals and organic matter etc. Herbal drugs constitute only those traditional medicines which primarily use medicinal plant preparations for therapy. The earliest recorded evidence of their use in Indian, Chinese, Egyptian, Greek, Roman and Syrian texts dates back to about 5000 years. The classical Indian texts include Rigveda, Atharvaveda, CharakSamhita and SushrutaSamhita. The herbal medicines / traditional medicaments have therefore been derived from

rich traditions of ancient civilizations and scientific heritage.[1] *Sesbania* species are widely used as fertilizer in different agricultural systems because it improves soil fertility, soil organic matter, water infiltration and holding capacity.[2] *Sesbania*species are belonging to Leguminosae family[3] (in some literature it was given as Fabaceae[4]) and there are almost 50 species of *Sesbania* described in tropical and subtropical regions of the world. 33 of these species are found in Africa

[5], 10 in Australia[6], 7 in Hawaii and in Asia the number of species is not known [7].Some of the species of *Sesbania* is given in Table No.1 [8].Apart from the agricultural values some of the species are long being used as folk-lore herbal medicine for the treatment of different ailments. Among all those species very few researches have been performed for *Sesbaniasesban, Sesbaniagrandiflora,Sesbaniadrummondii.*In this present article a complete recent review has been performed for the species *Sesbaniasesban.*

Botanical Description:

SesbaniaSesban Linn., commonly known as „Egyptian Sesban" is one of the six species of genus *Sesbania.*The plant is widely grown for its nitrogen fixing ability and as wind shades.[9] It is a short-lived shrub or small tree up to 8 m tall. Its leaves are pinnately compound, 2-18 cm long with 6-27 pairs of linear oblong leaflets (26 × 5 mm). The raceme has 2-20 flowers which are yellow with purple or brown streaks on the corolla. Pods are sub cylindrical, straight or slightly curved up to 30 cm long and 5 mm wide containing 10-50 seeds. Five varieties of S. sesbanare recognized botanically but their differences do not correlate strongly with their agricultural value.[10]

Plant Kingdom:

Kingdom : Plantae

Order : Fabales

Family : Fabaceae/Leguminosae

Genus :*Sesbania*
Species : *S. sesban*[3,11]

Synonyms:

*S. aegyptiaca*Pers.[12]

Vernacular names:

Hindi: Jaita, Jayanti

Bengali:Jayanti
Marathi: Sevari
Telugu: Jalugu

Arabic: Sesban
Ayurvedic: Jayantikaa, Jayanti, Jayaa,Jwaalaamukhi, Suukshma-muulaa, Suukshma-patraa,

Keshruuhaa,Balaamotaa.
Siddha/Tamil: Sembai, Karum-sembai (leaf).
Folk: Jainta.[10,12]

Origin:
The exact origin of *S. sesban* is unclear, but it is widely distributed and cultivated throughout tropical Africa and Asia. It has also been introduced in tropical America. It is an exotic plant to Ethiopia and is originally from east Africa.[13]

Phytochemical Constituents:
Many researchers have been reported about the presence of carbohydrates, glycosides, proteins, amino acids, saponins, tannins, alkaloid, phenolic compounds, and flavonoids.[10]The pods and leaves contain cholesterol, campesterol and beta-sitosterol. Flowers containcyanidinanddelphinidinglucosides. Pollen andpollen tubescontainalpha-ketoglutaric, oxaloacetic and pyruvic acids [12]. In the seeds the presence of oleanolic acid, stigmastane-5.24(28)-diene-3β-O-β-D-galactopyranoside and galactomannan has been reported. The isolated oleanolic acid 3-β-D-glucuronide from the root extracts has been reported and evaluated.[14]The study of % dry matter present in *Sesbania* species indicates the presence of crude protein and crude fibre in dried leaf which is more in content than fresh leaf.[15] The Ayurvedic Pharmacopoeia of India states the presence of Calcium and Phosphorus.[16] The details are given in **Table-2.**

Uses of *Sesbaniasesban*
Traditional uses:
All the parts like Seed, Bark and Leaf have been indicated for folklore use in menorrhagia, spleen enlargement, diarrhea,anthelmintic and also used as astringent, emmenagogue, anti-inflammatory. The bark juice can be applied to cutaneous eruptions. The Ayurvedic Pharmacopoeia of Indiarecommends the use of the leaf indysuria.[12,17] The details are given in
Table 3.

AyurvedicUse:
The important formulations of S. sesban like Ratnagiri Rasa (used as antipyretic), Vajrakapata

Rasa have the therapeutic uses in Galaganda, Mutrakrcchra and Visaroga.[16] The Mahapaisachikaghritam is used in aurveda to increase the memory power.

Agricultural Uses:

S. sesban is a fast growing nitrogen-fixing leguminous tree species which has the capacity of rapid decomposition when incorporated into soil serving as a green manure.[18]*Sesbaniasesban* is one of the exotic multipurpose fodder trees introduced in the Ethiopian highlands for livestock feed and soil conservation. Several on-station studies showed that supplementation with Sesbania improved intake and digestibility of basal diet and growth rate of animals[19]. Not only the digestibility, but also rumen fermentation and milk production of animal can be affected by *S.sesban*[20]. Moreover, this plant is suitable and safe for feeding and supplementing during the reproductive cycle [21].

Therapeutic benefits of *Sesbaniasesban*

Antioxidant activity

The antioxidant activity has been evaluated by DPPH and NO scavenging activity of the ethanolic extract of the plant. The researchers found the result as dose dependent. For 100µg/ml concentration was found as most active free radical scavenger. 76.25% and 72.18% have been reported as % scavenging activity for 100µg/ml respectively for DPPH and NO scavenging.[10]

Antinociceptive activity

Petroleum ether, choloroform, ehyl acetate, ethanol and aqueous extracts of the wood part of the plant have been evaluated for antinociceptive activity using two models viz. hot plate test and acetic acid-induced writhing test in mice. Among them the first three extracts (50 and 100 mg/kg body weight) showed promising significant dose dependent result in both the tests. [22]

Antidiabetic activity

The aqueous extract of the leaves of *S. sesban (L) Merr*reported as significant hypoglycemic agent in normal, glucose-loaded hyperglycemic and STZinduced diabetic rats. Increase in body weight, HDL cholesterol and decrease in triglycerides, total cholesterol, LDL and VLDL reported by the researchers. At the dose of 500 mg/kg body weight the results were reported more significant $p < 0.01$. [23]

Anti-inflammatory activity

Methanol, petroleum ether and chloroform extracts of the leaves of *S. sesban (L) Merr* were evaluated for anti-inflammatory activity in which the former extracts showed significant result. The activity has been repeated with the isolated chemical constituents also. [24]

The crude saponin extract (SAP) was isolated, characterized by modern analytical techniques and

reported for anti-inflammatory activity using *in vivo*and*in vitro* models. Both the model was reported as significant at the dose of 500 mg/kg body weight. [25]

Antimicrobial activity

Methanolic extract of stem of *S. sesban (L) Merr* was tested against ten bacteria and five fungi. Significant antibacterial activities were reported at the dose of 100 and 500µg/ml and at 500µg/ml responses were reported against all fungi.[26]Antimicrobial activity of n-hexane, carbon tetrachloride andchloroformsoluble fractions of methanolic extract of leaves has also been reported. [27]

In Fertility Control and Spermicidal Activity

In searching of alternative herbal replacement of "Pill", the antifertility effect of seed powder of the plant has been studied with different doses. At 250and 400 mg/kg dose 100% antifertility effect was reported. The weight of genital organ decreased significantly in response to dose for 30 days treatment. 400 mg/kg dose caused degenerative effects on ovarian tissue and the same dose affected the endometrial height along with caused shrinkage in uterine glands.[28] Isolated active constituents from Sesbania, oleanolic acid 3-β-d-glucuronide (OAG), was reported as spermicidal activityin dose dependent pattern in which the researchers reported that the sperm membrane integrity was affected by OAG.[14]

As Sleeping Aids

N-acetyl-5-methoxytryptamine (Melatonin) is a hormone which controls the sleep-wake cycle. Stress, emotions and work pressure of today"s world affect the sound sleep of an individual. In Thailand, recently some researchers have studied the melatonin content in some herbs including *S. sesban (L) Merr* using HPLC- Fluorescence analytical techniques and the report concluded the plant contains 7.3 ± 2.8ng/g dry weight Melatonin (determined by ELISA) and 8.7 ±1.3ng/g dry weight (determined by HPLC).[29]

Anthelmintic activity

In vitro anthelmintic activity of hydroalcoholic and aqueous leaf extracts against *Moneiziaexpansa*and *Paramphistomes*was reported in support of folkloric use of the plant *S. sesban*. 5µg/ml and 10µg/ml dose were selected and the results were expressed as time for the paralysis of theworms which was significant ($p<0.05$). The hydroalcoholic extract was concluded as most potent candidature agaist the worms. [30]

The summarize therapeutic activity has been given in **Table 4.**

Conclusion

The variations in active constituents of the plants depend upon the geographical condition and

soil. The diverse therapeutic effects along with agricultural application make the plant biologically potential herb. The above review can help the ayurvedic researcher for the formulation of ayurvedic preparations and standardization to treat different ailments. The vast uses of the plant can encourage an analyst to isolate more and more active constituents responsible for the activity. The present work will help to evaluate the molecular level mechanism for every possible biological activity.

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Table No1: List of Sesbania species

Sesbaniabenthamiana	*Sesbanialongifolia*
Sesbaniabispinosa (Jacq.) W.Wight	*Sesbaniamacowaniana*
Sesbaniabrachycarpa	*Sesbaniamacrantha*
Sesbaniabrevipedunculata	*Sesbaniamacroptera*
Sesbaniacampylocarpa	*Sesbaniamadagascariensis*
Sesbaniacannabina Poir.	*Sesbaniamicrophylla*
Sesbaniachippendalei	*Sesbanianotialis*
Sesbaniacinerascens	*Sesbaniaoligosperma*
Sesbaniacoerulescens	*Sesbaniapachycarpa*
Sesbaniaconcolor	*Sesbaniapaucisemina*
Sesbaniadalzielii	*Sesbaniapunicea (Cav.) Benth.*
Sesbaniadrummondii (Rydb.) Cory	*Sesbaniaquadrata*
Sesbaniadummeri	*Sesbaniarostrata*
Sesbaniaemerus (Aubl.)	*Sesbaniasericea (Willd.) Link*
Sesbaniaerubescens	*Sesbaniasesban (Jacq.) W.Wight*
Sesbaniaexasperata	*Sesbaniasimpliciuscula*
Sesbaniaformosa	*Sesbaniasomaliensis*
Sesbaniagoetzei	*Sesbaniaspeciosa*
Sesbaniagrandiflora (L.) Poir.	*Sesbaniasphaerosperma*

Sesbaniagreenwayi	*Sesbaniasubalata*
Sesbaniahepperi	*Sesbaniasudanica*
Sesbaniaherbacea (Mill.)	*Sesbaniatetraptera*
Sesbaniahirtistyla	*Sesbaniatomentosa Hook. & Arn.*
Sesbaniahobdyi	*Sesbaniatransvaalensis J.B.Gillett*

Sesbaniajavanica	*Sesbaniavesicaria (Jacq.) Elliott*
Sesbaniakeniensis	*Sesbaniavirgata (Cav.) Pers.*
Sesbanialeptocarpa	*Seabaniaaculeata*

Table No2: Chemical Constituents of Sesbaniasesban

Parts	**Constituent**
Leaf and Pods	Cholesterol, Campesterol, Beta-sitosterol
Leaf	Carbohydrates, Glycosides, Proteins, Amino acids, Saponins, Tannins, Alkaloid, Phenolic compounds, Flavonoids, Crude protein and Crude fibre
Flowers	Cyanidin and DelphinidinGlucosides
Pollen andpollen tubes	alpha-ketoglutaric, oxaloacetic and pyruvic acids
Seeds	oleanolic acid, stigmastane-5.24(28)-diene-3β-O-β-D-galactopyranoside and galactomannan
Root	Oleanolic acid 3-β-D-glucuronide

Table No3: Traditional Use of Sesbaniasesban

Parts	**Traditional uses**
Seed	Astringent, Emmenagogue, Menorrhagia, Spleen enlargement, Diarrhoea
Unsaponifiable matter of fixed oil from seed	Cardiac depressant, Antibacterial
Leaves	Anti-inflammatory, Dysuria
Bark juice	appliedto Cutaneous eruptions
Leaf Juice (Orally)	Anthelmintic

Table No4: Therapeutic Benefits of Sesbaniasesban

Activity Reported	Parts Used	Extracts Used	Ref
Antioxidant	Leaves	Ethanolic	10
Spermicidal	--	--	14
Antinociceptive	Wood	Petroleum ether Choloroform Ehyl acetate Ethanol Aqueous	22
Antidiabetic	Leaves	Aqueous	23
Anti-inflammatory	Leaves	Methanol Petroleum ether Chloroform Crude Saponins	24,25
Antimicrobial	Stems, Leaves	Methanolic	26,27
Fertility Control	Seed	Powder	28
Sleeping Aids	Leaves	Melatonins	29
Anthelmintic	Leaves	Hydroalcoholic Aqueous	30