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Survey of Sesbania Grandiflora Nephropathy Diabetic Action

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ABSTRACT

The Sesbania grandiflora is utilised in folk medicine for different ailments and infections as tuberculosis, anaemia, microbial infections, etc. Additionally, S.grandiflora is utilised as a strong As a traditional medicine, Sesbania grandiflora's many parts offer a wide range of pharmacological actions to treat conditions like diabetes, liver disorders, antioxidant properties, hypouricemia activity, and enzyme inhibitors. Sesbania has 60 global species that can be found. These species are typically found in Australia, Africa and Asia. All components of the plant have various therapeutic properties. Pharmacologists are seeking to produce innovative drugs from natural sources, notably Sesbania grandiflora. The therapeutic usefulness, pharmacological activity, and medicinal qualities of Sesbania grandiflora are the subjects of the current review.

Keywords: *Sesbania grandiflora, Folk medicine, Medicinal properties, Anti-diabetes Activity.*

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Introduction:

Sesbania grandiflora leaves can potentially be used as a treatment for thrombosis, diarrhea, inflammatory illnesses, as well as against a few key bacterial pathogens. According to some sources, S. grandiflora leaf juice can be used to treat bron-chitis, cough, vomit-ing, wound ulcers, diarrhea & dysentery. The blooms' anti-microbial activity has been observed. To alleviate rheumatic swell-ing, powdered roots of this plant are mixed with H2O & used topically as a massage or poultice. The

leaves are traditionally used to treat cephalagia, nasal catarrah & nycta-lopia. Anti-oxidant, anti-uroithiatic, anti-convulsive, anti-ligament, anti-inflammatory, anti-helminthic, anti-bacterial & anxiolytic actions may be exhibited by S. grandiflora, according to research [1–8].

The Sesbania grandiflora tree, commonly referred to as the vegetable humming-bird, is a small tree in Sesbania genus. The tree thri-ves in direct sunlight and is particularly sensitive to frost [9].

This quick-growing tree is widely grown in Sri Lanka and India and has a variety of traditional uses [10].

The flowers have an astrin-gent effect on body & are used for rhinitis, night blind-ness, abdominal pain & other conditions, as well as to help body detoxify. The leaves' tonic qualities make them helpful for worm infestations & ailments that induce bleeding. Additionally, throat & mouth conditions are treated with the leaf paste. To reduce pain & inflammation in gout & arthritis, root bark is administered topically [11–13].

Throughout the world, DM, a complex chronic ailment, is leading cause of illness. Hyper-glycemia and an unbalanced protein, carbohydrate, and lipid metabolism are its defining characteristics [14-16].

As a direct result of loss & dys-function of pancreatic beta-cells, this may be connected to insulin inactivity & resistance [17–19].

The diabetes capital of the world is quickly becoming India. According to current estimates, one in five diabetics worldwide is Indian, adding to the burden of the effects the disease entails. Also, according to statistical predictions, India will have highest number of diabetics in the world 57 million by the year 2025, up from 15 million in 1995. Causes for this trend include increase in sedentary life-style, intake of energy-rich diet, obe-sity, greater life duration, etc. [10-21].

Because it can significantly reduce postprandial rise in blood glucose follow-ing a mixed carbohydrate diet, inhibition of amylase enzymes involved in carbohydrate digestion may be helpful for managing post-prandial blood glucose levels in type 2-diabetic patients & borderline patients [22].

The key to treating type 2 diabetes mellitus and the consequences linked to it is control of postprandial hyperglycaemia. The

conventional method of combating this disease is pricy, fraught with negative side effects, and out of reach for some populations. As a result, there is growing interest in evaluating plant products because they contain a variety of bioactive compounds. Physiological effects of plant-based medications being modulated for the treatment and prevention of diabetes and obesity are currently of renewed interest [23].

Taxonomy: [24]

Kingdom: Plantae

Subkingdom: Vascular Plant- Tracheophyta

Super division: Seed Plant- Spermato-phyta

Division: Magnoliophyta

Class: Magnoliopsides

Subclass: Rosidae

Order: Fabales

Family: Fabaceae

Genus: Sesbania

Species: Sesbania grandiflora (Linn.)

Vernacular Names: [25]

English: Hummingbird tree, Swamp Pea, Agate.

Latin: Sesbania grandiflora

Hindi: Agustiya, Augest, Agati, Basna

Marathi: Hadga

Telegu: Avesi, Avasinara

French: Colbrivegetal, Pois valliere, Fleur Papillon

Spanish: Paloma, Pico de flamenco Cresta degallo,

Punjabi: Jainta

Bengali: Bak, Agathi, Bagphol, Bake, Agati, Jayant,Agusta

Sanskrit: Agastyah, Anari, Agati, Agasti

Morphological characters: [26-30]

Sesbania grandiflora is a branched tree that can grow to a height of 10-15 metres and a girth of up to 12 centimetres.

Leaves:

The leaves are oblong to elliptical in form, 15-30 centimetres long and dark green in colour. They are arranged opposite to one another.

Bark:

The bark is profoundly furrowed, corky, and lightly greyed in colour.

Sesbania grandiflora's wood is white in hue and soft in texture.

Flowers:

The flowers hang in a cluster at the base of the branches and range in colour from deep pink to red. They are oblong in shape and range in length from 7-9 cm, and they have an acrid, astringent, and bitter flavour.

Seed:

The shape of the seeds is oblong and brown or dark green in colour.

Pod:

The pods are sub-cylindrical or slightly curved and pale yellow in colour.

- Pods are 20-60cm long and 5-8mm wide and contain 15-50 seeds.
- The colour of the pods is reddish-brown.

Fig.1: Leaves, flowers and pods of agast tree species

Phytochemical Substances:

S. grandiflora leaves have a nutritional content of 73.1g of moisture, 8.4g of protein, 1.4g of fat, 3.1g of minerals, 2.2g of crude fibres, 11.8mg of carbohydrates, 93mg of energy, 80mg of phosphorus, and 3.9mg of iron [31].

This plant includes a range of proteins and amino acids, including arginine, cysteine, histi-dine, iso-leucine, phenyl-alanine, trypto-phan, valine, threonine, aspartic acid, leuco-cyanidin & cyaniding, according to a study of the literature on the subject. Sugar molecules galactose and rhamnose exist [31–33].

Phytochemicals discovered in S. grandiflora include alkaloids, tri-terpenoids, carbohydrates, saponins, tannin, chlorogenic acid, flavonoids, anthocyanins, steroidal glycosides & Phenolic compounds [34].

Betulinic acid and three iso-flavonoids, including isovestitol, medicarpin & sativan, were extracted from the root. The compounds that are present in seeds that are active are leuco-cyani-din & cyanid-ing. The primary components of flowers are Cyanamid, delphinidin gluco-sides, tannins, keamp-ferol, grandi-flora, pro-teins, oleanolic acid, cysteine, iso-leucine, asparagine, phenyl-alanine, valine, nico-tinic acid & vit-C [35–36].

Traditional uses:

- Anti-diabetic activities,

Antioxidant activities.

- S. grandiflora has historically been used as an anti-inflammatory.
- Antimicrobial properties.
- Anticancer.
- Anti-ulcer action; immunomodulatory activity; and diseases linked to it, like hepatic conditions.

Renal and respiratory conditions:

The leaves and pods of S. grandiflora have been described as tasty and non-toxic to livestock. According to a different report, S. grandiflora's purple flower variety is extremely toxic, despite the white flower variety being determined to be non-toxic [37-44].

Anti-diabetic Activity:

The 70% alcoholic S. grandiflora flower extracts demonstrated significant anti-diabetic activity in alloxan-induced diabetic rats at doses of 250 mg/kg & 500 mg/kg given daily for 28days. Additionally, the levels of TG, BUN, SGPT, SGOT, and blood total cholesterol all significantly decreased. The damaged islet of the pancreatic cell was repaired and rejuvenated, according to histopathological analyses. Multiple mechanisms are used by S. grandiflora to exert its anti-diabetic effects [45-46].

Inhibit Enzyme:

The digestive enzymes -amylase & glycosidase, which are in charge of the metabolism of carbohydrates, have been shown to be significantly inhibited by 2-proteins, namely SGF60 & SGF90, which were isolated from blossoms of this plant. A good indicator of diabetes is glycosylated haemoglobin, which is created when too much glucose reacts with haemoglobin. S. grandiflora plant extract significantly reduced the level of this marker [47–49].

Hypouricemia Activity:

A recent study also revealed that fructose-induced hyperuricemia contributes to the pathogenesis of the metabolic syndrome. As a result, Cutting edge treatment for diabetes may focus on decreasing uric acid. Urea, serum creatinine & uric acid levels were brought down to levels that were nearly normal after treatment with S. grandiflora leaves extract [50].

Anti-oxidant Pro-perties:

Free radical-neutralizing antioxidants have been shown in numerous studies to prevent experimentally caused diabetes in animal models and lower the severity of diabetic consequences. The restored antioxidant status and elevated oxidative stress marker

indicate the plant's antioxidant capacity. Reported agathi leaf protein (ALP), a 29 kDa protein from leaves of S. grandiflora that has cytoprotective & anti-oxidant properties. On therapy with this plant, it was also shown that levels of antioxidants, both enzymatic & non-enzymatic anti-oxidants, were recovered. Additionally, S. grandiflora therapy considerably decreased amount of lipid per-oxidative indicators (thio-barbitric acid reactive compounds & lipid H2O2) [51].

Insulin Elevation:

Elevated insulin levels are believed to be the cause of the hypo-glycemic activity. These elevated levels are also thought to have an insulin-sparing effect [52].

Signalling Pathway:

DN is a significant diabetic complication, a persistent kidney condition, and a significant contributor to end-stage renal failure. Over the past few decades, DN incidence has quickly increased. Clinical studies on early-stage DN patients revealed that proteinuria, an increase in arterial BP, a decline in glomerular filtration rate & increasingly severe sodium & water retention that ultimately results in renal failure are the primary symptoms of DN [53].

Mesangial expansion, podocyte harm, thickening of the basement membrane & harm to glomerular & tubular cells are primary pathological characteristics of DN, which result in glomerular sclerosis & interstitial fibrosis [54-55].

Canonical signaling is triggered during renal damage, while being relatively inactive in normal adult kidney [56].

Although the non-canonical pathway is beginning to draw attention as a potential mechanism for DN pathogenesis, canonical pathway has been suggested as a key regulator in development of DN [57].

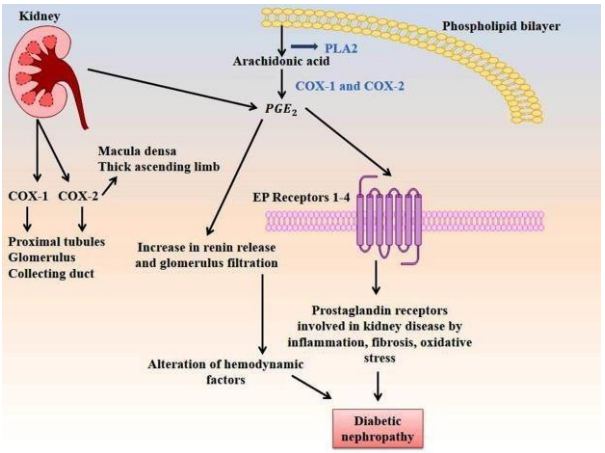

Fig.2: Signaling Pathway Responsible for Nephropathy

Conclusion:

In conclusion, the goal of this review was

too concentrated on the possible application of phyto-chemical components that may help S. grandiflora's anti-diabetic activity more significantly. It seeks to investigate a suggested use of this plant, particularly for human consumption, in complementary and alternative medicine. Today, a wide range of medicinal plants are used in Ayurveda and Unani medicine to address a wide range of illnesses and infections. It is an informational treasure as a medicinal plant. Sesbania grandiflora has a wide variety of pharmacological properties that can treat or prevent diseases like diabetes, liver disorders, antioxidant properties, hypouricemia activity, and enzyme inhibition, among others. Systematic study and development should be done to preserve Sesbania grandiflora and create products for better commercial and therapeutic use. Approximately 40% of diabetics experience nephropathy. Although end-stage kidney disease is one of most common complications of diabetic nephropathy, the majority of diabetics may pass away from infections and cardiovascular conditions before receiving renal replacement therapy. Additionally, diabetes' standard medical therapies come with unfavourable side effects. Clinicians and researchers are being compelled to look into complementary or alternative treatments by the diabetes epidemic. The present research and molecular mechanisms of resveratrol in diabetic renal damage are critically summarised in this review. We'll also talk about resveratrol's unfavourable and erratic impacts on diabetic nephropathy. Although there is growing evidence that resveratrol has great promise as a treatment for diabetic nephropathy, these findings need to be carefully considered before being applied in practise. Additionally, the drug's vast clinical applications may be constrained by unfavourable pharmacokinetics and/or pharmacodynamic profiles, such as low bioavailability. It is obvious that more investigation is required to address these issues and boost its effectiveness against diabetic nephropathy. Expanding our knowledge of resveratrol's pharmacological effects in diabetic kidney disease will also help us identify new possible targets for therapeutic intervention.

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