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A CONCISE REVIEW ON *DALBERGIA SISSOO* (FABACEAE)

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Abstract:

The medicinal plant Dalbergia Sissoo species belongs to genus Dalbergia, with interesting secondary metabolites, consisting of main classes of flavonoids, phenol, and sesquiterpene derivatives, as well as several aryl benzofurans, quinones, and fatty acids[1]. Biological studies were carried out on extracts, fractions, and compounds from this species involved in Cytotoxic assays; antibacterial, antioxidative, anti-inflammatory, antithrombotic, antiplatelet, antiosteosarcoma, antiosteoporosis, anti-angiogenesis, and prostaglandin biosynthetic enzyme inhibition activities; vasorelaxant activities; alpha-glucosidase inhibitory activities; and many other effects. In terms of the valuable resources for natural new drugs development, D. Sissoo species are widely used as medicinal drugs in many countries for treatment of cardiovascular diseases, cancer, diabetes, blood disorders, ischemia, swelling, necrosis, or rheumatic pain[2].

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INTRODUCTION:

The medicinal plant Dalbergia Sissoo also called Dalbergia, belongs to genus Dalbergia, family Fabaceae (Leguminosae) . It is commonly known as 'Shisham' in Hindi. This plant has been widely distributed in the tropical regions of Central and South America, Africa, Madagascar, and East and Southern Asia, especially in China. It is a mediumto large deciduoustree, maximum 25m in height, young parts pubescent, branchesnumerous and spreading. Trunks are often crooked when grown in the open. Leaves areleathery, alternate, pinnately compound andabout 15 cm long.Flowers are whitish to pink, fragrant, nearly sessile, up to 1.5 cm long and in dense clusters 5-10 cm in length. Pods are oblong, flat, thin, strap-like 4-8 cm long, 1 cm wide, andlight brown. They contain 1-5 flat bean-shaped seeds 8-10 mm long 1. The extract of Dalbergia sissoo Roxb was reported as anti-inflammatory , antidysentric [3], analgesics and antipyretic [4]. The bark and wood are bitter, hot and acrid used as aphrodisiac, abortifacient, expectorant, antihelmintic, antipyretic and diseases of the blood. A decoction o the leaves are given in the acute stage of gonorrhea.

PHYTOCHEMISTRY

Due to the economic value of D. Sissoo species, it received much more attention from phytochemists. Nowadays, the processes of isolation, purification, and structure elucidation of interesting secondary metabolites are facilitated by continual development of chromatographic techniques such as thin-layer chromatography (TLC), column chromatography (CC), gas chromatography (GC), high-performance liquid chromatography (HPLC), ultra performance liquid chromatography (UPLC), and spectroscopic analyses, for instance, nuclear magnetic resonance (NMR) and mass spectrum (MS). Apart from the chemical constituents only detected by HPLC and GC-MS, components of D. Sissoo species are classified into a wide range of compounds, including Flavonoids, phenols, sesquiterpenes, arylbenzofurans, quinines, and several other components[5].

Flavonoids

Flavonoids derivatives were obtained as major components from either D.sissoo or other species of the genus Dalbergia. In general, Phytochemical studies on D. Sissoo species Phytochemistry showed that most of the naturally occurring mono- and bisflavonoids occurred as free forms, and their glycosyl derivatives were seldom found[5].

Phenols

In the same manner as the class of flavonoids, phenolics are displayed as renowned components of the genus Dalbergia. Phenolic compounds, from D. Sissoo species consist of simple structures. Meantime, the known ones were Phenolic derivatives with skeleton of cinnamyl phenols[6]

Sesquiterpenes

Phytochemical and NMR structural elucidations also reported the existence of essential oils, which were sesquiterpenes. Significantly, most of these compounds were identified as sesquiterpene alcohols [7]

Arylbenzofurans

This typical class was not well known for the genus Dalbergia. However, the naturally occurring benzofuran were available in D. Sissoo species. The most striking feature of these heterocyclic chemical compounds was aryl units directly or indirectly substituted at carbon C-2 or C-3 in the furan ring[8].

Quinones and Other Components

A few quinones in the heartwood could have been observed with the biotransformation of phenyl units in compounds into quinonyl units in compounds[9]. This phenomenon was also detected in flavonoids, for instance, compound.

BIOLOGICAL ACTIVITIES

Cytotoxic Activities

The cytotoxic activity of chemical constituents of D. sissoo species is related to their structure and the organisms that they affect. Phytochemical investigation from the heartwood of D. sissoo species led to the isolation and structure elucidation of nine new compounds, along with five known ones, which were all tested against human chronic myelogenous leukemia cell line (K562), human gastric carcinoma cell line (SGC-7901), and human hepatocellular carcinoma cell line (BEL-7402)[10]. However, the inactive results had been received for all tested compounds except for only two components, in which (6aR,11aR)-6a,9-dimethoxy-3-hydroxypterocarpan showed the IC50 values of 15.9 and 12.7 μM against SGC-7901 and BEL-7402 cell lines, respectively; meantime, phenylbenzofuran[11]

Antiparasitic effect

The petroleum ether, carbon tetrachloride, benzene and ethanol extracts of leaves of Dalbergia sissoo were assessed for anthelmintic activity against Indian earthworms (Pheretima posthuma) at different concentrations of and compared with piperazine citrate[12]. All the extracts revealed anthelmintic activity against the earthworms, carbon tetrachloride extract exhibited the most potent activity with the paralysis time of 19.14±2.78 min and death time of 48.15±3.23 min at the concentration of 100 mg/ml,

Anti-inflammatory and analgesic effects

The anti-inflammatory activity of hexane and methanol extracts of Dalbergia sissoo and okanin was evaluated by carrageenan induced paw oedema in rats. The methanolic extract showed maximum activity. The antiinflammatory activity of a 90% ethanolic extract of Dalbergia sissoo bark was studied using a right hind paw oedema method in Wistar rats. After oral administration of ethanolic extract at different doses (300, 500 and 1000 mg/kg), inhibition of right hind paw oedema was observed at 30-, 60-, and 120-min time intervals. The antiinflammatory effects increased with increasing doses. The ethanolic extract of Dalbergia sissoo bark at 1000 mg/kg showed the most potent anti-inflammatory activity compared to the other doses (300 and 500 mg/kg) throughout the observation period.The analgesic and anti-inflammatory properties of the methanolic extract of leaves of Dalbergia sissoo were evaluated by using acetic acid induced writhing and hot plate tests in mice and carrageenan- induced paw oedema in rats. Oral pretreatment with the leaves extracts of Dalbergia sissoo significantly decreased the writhing movements in mice in acetic acid-induced writhing test and significantly increase the mean pain latency time in mice placed on the hot plate at 50°c at dose dependant manner. In the carrageenan-induced paw oedema model, the methanolic extract afforded 68.2% inhibition of hind paw oedema in rats at the highest dose (600 mg/kg) compared to 73.4% inhibition obtained with the reference drug, Diclofenac (5 mg/kg) at the third hour after carrageenan administration[13].

Antidiabetic effect

The ethanol, ethyl acetate, n-butanol and petroleum ether extracts of the leaves of Dalbergia sissoo were investigated for antidiabetic activity in alloxan induced diabetic rats. The extracts produced a significant antidiabetic effect on first, third, fifth and seventh days at 300 mg/Kg body weight[14]. Among all the extracts of Dalbergia sissoo, ethanol extract of leaves exhibited highly significant antidiabetic activity which was comparable with the standard drug, Glibenclamide.

Dermatological effects

The cytotoxicity and in vitro melanogenic activity on bark of Dalbergia sissoo were studied. The result indicated that ethyl acetate extract of bark of Dalbergia sissoo was non-toxic and increased melanin activity as compared to hexane and ethanol extracts. The authors concluded that the bark of Dalbergia sissoo stimulates B16F10 melanogenesis at very low concentrations which support the folk medicinal use of Dalbergia sissoo in the treatment of hypopigmentation diseases, such as vitiligo.

Osteogenic effects

The effect of Dalbergiphenol (DGP), the neoflavonoid isolated from heartwood was evaluated in bone loss in ovary ectomized mice. Adult BALB/c mice were ovary ectomized and administered DGP (1 and 5 mg/kg/d) or 17β-estradiol (E2) orally for 6 weeks. The sham group and the ovary ectomy (OVX) + vehicle group served as controls. Uterine estrogenicity, bone microarchitecture, biomechanical strength, new bone formation (based on bone formation rate and mineral apposition rate), and skeletal expression of osteogenic and resorptive gene markers were studied.

Antimicrobial effect

The methanol, hexane extracts and isolated okanin from methanol extracts were exhibited good antibacterial activity towards various pathogens, Gram positive (Micrococcus luteus and Staphlcocous aureus) and Gram-negative bacteria (Escherichia coli, R. planticola and Acinetobacter). 1,2-benzenedicarboxylic acid dibutyl ester (13.68%) and 5-nirto-2,4 (1H,3H)-pyrimidine dione isolated from the plant, showed antibacterial activity against Staph aureus, Bacillus cereus, Serratia marcescens and Proteus mirabilis. A herbal preparation containing Dalbergia sissoo and Datura stramoium was evaluated for its antibacterial potential against pathogenic strains of Gram positive (Staphylococcus aureus and Streptococcus pneumoniae) and Gram negative (Escherichia coli, Pseudomonas aeruginosa and Klebsiella pneumoniae) bacteria[15].

Antioxidant effect

Extract of bark of Dalbergia sissoo Roxb (Fabaceae) was assessed for its antioxidant activity by in vitro methods. Antioxidant activity was studied using hydrogen peroxide scavenging activity and reducing power assay. The extracts exhibited significant antioxidant activity,the ethanol extract of the bark of Dalbergia sissoo was screened for lipid peroxidation inhibitory (LPO). The bark extract showed 69.1% LPO inhibitory potential/10 µg of extract [20]. The antioxidant activity of the aqueous and methanol extracts of the stem bark of Dalbergia sissoo was evaluated by 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity, ferric ion reducing power, ferrous ion chelating activity and Au nanoparticle formation potential. In all the assays, aqueous extract showed significantly greater activity than methanol extracts.

CONCLUSION:

Taken together, the endemic plant D. Sissoo has already been fully researched and is outlined in this paper. Based on technical chromatography and spectroscopic studies, Phytochemical investigations of different parts (heartwood, root, root heartwood, and leaves) of the medicinal plant D. Sissoo species led to the isolation of major flavonoids, phenols, and sesquiterpenes, as well as arylbenzofurans, quinones, and several fatty acid derivatives. Regarding the some different flavonoids described in the current review paper.Parallel with Phytochemical analyses, biological experiments, such as Cytotoxic assays, antiparasitic, antidiabetic, antibacterial, antioxidative, anti-inflammatory and analgesic, dermatological, antimicrobial activities, Antioxidant activity suggested that the isolated compounds, along with the extracts, and fractions indicated the efficacious properties for drug development. Finally, extensive researches on D. Sissoo and its other related species are expected.

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