Original Research Article

A Review: Antidiabetic Activity Of The Bark Of Cordia Dichotoma

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Abstract:
Cordia dichotoma Forst. has been utilized in the administration of diabetes in conventional medication.Nonetheless, the antidiabetic movement of the methanolic concentrate of C. dichotoma (MECD) bark has not been accounted for up to this point. In this review, the antidiabetic action of C. dichotoma was surveyed in alloxan-actuated diabetic Wistar rodents. The intense harmfulness study demonstrated that the MECD was protected up to the portion level of 2000 mg/kg body weight. In oral glucose resilience (OGT) test, the pre-treatment of MECD showed fractional security from hyperglycemia prompted by a glucose load (2 g/kg, body weight) in rodents at the portion levels of 250 and 500 mg/kg, body weight. The MECD altogether decreased the blood glucose levels in the alloxan-prompted diabetic rodents at the portion levels of 250 and 500 mg/kg, body weight when contrasted with ordinary control creatures. Examination of biochemical boundaries and histopathological examinations additionally exhibited the antidiabetic capability of the MECD with critical improvement of biochemical boundaries including body weight, serum lipid profile and cancer prevention agent chemicals/biomarkers in contrast with the ordinary control. The exercises of the MECD (500 mg/kg body weight) were similar somewhat with that of the standard medication, glibenclamide (5 mg/kg). Our concentrate experimentally approves the folkloric guarantee as well as customary purposes of C. dichotoma as antidiabetic medication. It is proposed that the antidiabetic movement of C. dichotoma might be because of the presence of phenolic phytoconstituents or plant flavonoids in the methanolic bark extricate.

Keywords: cordia dichotoma, phytoconstituents, pharmacological activity, antidiabetic activity, anticancer , analgesic , anti-inflammatory, antipyretic , antifungal,,hepatoprotective action.

INTRODUCTION:

Diabetes mellitus (or diabetes) is a persistent metabolic problem described by hyperglycemia coming about because of deformities in insulin emission, insulin activity, or both. The ongoing hyperglycemic state of diabetes might prompt a few unexpected problems including cardiovascular (cardiomyopathy), neurological (neuropathy), renal (nephropathy) and visual (retinopathy) [1,2]. In diabetic patients, the hyperglycemic condition is chiefly a direct result of the diminished insulin emission because of the strange working of insulin delivering beta cells (present on the islets of Langerhans in pancreas) which subsequently neglect to create sufficient insulin bringing about temperamental blood glucose level followed by the event of insulin opposition by utilizing tissues [3,4]. The pervasiveness of diabetes is expanding with the worldwide ascent of weight and way of life problems

As indicated by World Wellbeing Association (WHO) reports, it has been assessed that there were 422 million grown-ups living with diabetes mellitus with 1.6 million passings every year internationally. The sort 2 diabetes has been represented the larger part (> 90-95%) of diabetes with roughly 1.5 million passing yearly (WHO, 2020). Different manufactured hypoglycemic specialists have been utilized to control the raised glucose level in patients with diabetes mellitus. A few normal hypoglycemic specialists supported by FDA incorporate sulfonylureas, biguanides, thiazolidinediones, etc. Regardless of the accessibility of numerous viable oral hypoglycemic specialists, diabetes is as yet hazardous on account of the restricted clinical adequacy of existing medications. A few normal incidental effects that are related with engineered antidiabetic drugs incorporate weight gain, shortcoming, weariness, migraine, palpitation, expanded LDL chlosterol level and so forth [4].

Plant-based conventional cures have been utilized for the treatment of human illnesses for millennia. Around 80% of total populace depend on customary homegrown prescriptions for essential medical services. Conventional drugs got from plants assume a critical part in the administration of various human issues including malignant growth, neurological problems, diabetes and torment and fiery problems, just to give some examples. WHO has suggested the antidiabetic assessment of conventional plant-based cures or natural arrangements since they are successful with less or no poison levels when contrasted with manufactured antidiabetic drugs. Besides, natural medications have the property of synergistic activity because of the presence of various dynamic constituents in a solitary medication/restorative readiness [5]. Numerous native Indian restorative plants have been viewed as helpful in the treatment of diabetes mellitus. Ayurveda, Unani and Siddha, are the prominent frameworks of prescription reported in antiquated practice fundamentally using plants/plant-based arrangements as drugs for relieving human illnesses/sicknesses like diabetes. Considering their customary and ethnopharmacological significance, natural medication might play likely part in the administration of diabetes as well as its confusions.

CARDIO DICHOTOMA FOR TREATMENT OF DIABETES

Introduction:

Natural treatments for a variety of ailments in a variety of dosage forms have been tried since ancient times. The researchers now face a significant obstacle in the form of the safe and effective management of diseases using these agents. There isexpanding interest in normal medication attributable to thesereasons. In well known medication, the plant types of thesort Cordia have been pursued for the treatment ofdifferent sicknesses that influence numerous human frameworks. C. dichotoma is a tropical and subtropical plant.Numerous phytoconstituents like flavonoids, terpenes,alkaloids, tannins and glycerides having uniquepharmacological activity were screened and disconnected fromC. dichotoma. Anti-ulcer[6], contraceptives[7], anti-inflammatory[8-11], anthelmintic, analgesic, anticancer[9-12], antioxidant[13-14],antimicrobial[15], antifungal[15], hepatoprotective, diuretic, and digestive system, respiratory, urogenital, cardiac, vascular, and blood disorders are among the many pharmacological uses of C. dichotoma that have been reported by numerous researchers. Up until this point just couple of quantities of exhaustiveaudits has been accumulated from the writingenveloping the therapeutics uses of welcomingdichotoma. In this way goals of the current audit are togive an outline of the new status onphytoconstituents and pharmacological purposes of plants C.dichotoma.Alimentation Source of Cordia dichotoma

Botanical Description of cordia dichotoma

C. dichotoma is a moderate tree developing with little branches, turned trunk, and a broad shade that arrives at a level of 5-10 m [16,18]. It has smooth, grayish brownwood wrinkled longitudinally. Leaves of C. dichotoma are substitute, 6-10 cm long, complete and reasonably undulate, elliptic-lanceolate to wide elongated with a round and cordate base, and elliptic-lanceolate to expansive praise with a round and cordate base. The calyx bears broadened and detached curves, as well as the neck furthermore, stamens of the corolla, are shaggy [50]. Blossoms are white and short-followed that is trailed by 1 in. (25 mm) long, pale ruddy tempting berries with gooey mash [17]. Natural product is a globose or ovoid stunning yellow or pinkish-yellow drupe resting in a saucer-like extended calyx [16,17,18]. In various locales of Himachal Pradesh, blossoming and fruiting happens from Spring to July [19].

Phytoconstituents[20,21,22,23,24]

Different analyzers were utilized to recognize different phytoconstituents and different classes of optional metabolites from different pieces of C. dichotoma with the assistance of the acknowledgment and detachment techniques. Which have been appeared in the changed plant parts are as follows:

Seed: Sugars (D-arabinose,L-fructose,D-glucose,D-xylose, galacturonic and glucuronic acids, lactose, D-ribose, and L-rhamnose) alanine, aspartic corrosive, cysteine, glutamic acids, glycine, leucine, proline, threonine, - amyrins, betulin, octacosanol, lupeol-3rhamnoside, - sitosterol, - sitosterol, glucoside, hentricontanol, hentricontane, taxifolin - 3 - 5 - dirhamnoside, hesperitin – 7 rhamnoside, and unsaturated fats, for example, palmitic corrosive stearic corrosive, arachidic corrosive, behenic corrosive, oleic corrosive, furthermore, linoleic corrosive. Four flavonoid glycosides (robinin, rutin, rutoside, datiscoside, and hesperidin), a flavonoid aglycone (dihydro-robinetin) and two phenolic subsidiaries (chlorogenic corrosive and caffeic corrosive) were separated from seeds. The critical mitigating movement of seeds is a direct result of - amyrins and taxifolin-3-5- dirhamnoside (71.4% and 67.8%, separately).

Bark: Allantoin, β-sitosterol and 3', 5-dihydroxy- 4'- methoxy flavanone - 7 - O - alpha – L rhamnopyranoside, Holocellulose, lignin, tannin.

Leaves: Pyrrolizidine alkaloids, coumarin, flavonoids, saponins, terpenes, sterols 4 (for example 4-hydroxy-transcinnamate ester 8, 13, β-sitostero l4, 14, quarcetin and quercitrin, protein, tannins.

Fruits: Arabinoglucan and polysaccharidecompound of (1-6) connected D-glucopyranosyl and(1-2) L-arabinofuranosyl deposits. Pyrrolizidinealkaloids, coumarins, flavonoids, saponins,terpenes and sterols 4, D-glucose (67.6%) and L-arabinose (13.2%).

Wood: α-, β-, furthermore, y-eudesmol, guaiol**Roots:** lupa - 20 (29) - ene - 3 - O - α - L - rhamnopyranoside.

Functional uses:[25-28]

1. Food The immature fruits are pickled and eaten as vegetables. Fodder: The leaves make excellent fodder and are trimmed for this reason. C. dichotoma seed kernel has a high concentration of fatty oils and proteins (46 and 31%, respectively), making it suitable for cow feed.
2. Fuel: The tree is utilized for fuel. Timber: Wood is used to produce agricultural tools.
3. Insecticide: C. dichotoma fruit extract inhibits Meloidogyne incognita larval hatching.
4. Pharmaceutical applications: The therapeutic properties of C.dichotoma have long been known. The seeds of the species exhibit anti-inflammatory properties, and two substances, alpha-amyrin and 5-dirhamnoside, have been identified.

The bark is medicinal, and various compounds have been extracted from it, including allantoin, beta-sitosterol, and 3', 5-dihydroxy-4'-methoxy flavanone-7-O-alpha-L-rhamnopyranoside. The seed kernel also has several therapeutic qualities.

5. Providers of services C. dichotoma is a fast-growing fruit tree that does well in semi-arid situations and is good for planting along boundary lines and farm roads.
6. Corrosion Inhibitor Study used C. dichotoma extracts to prevent corrosion of mild steel. Alcoholic extracts were shown to be a superior corrosion inhibitor than harmful chemicals.
7. Medicinal applications

Antiulcer, wound healing, analgesic, antidiabetic, antimicrobial, anti-aging, hepatoprotective, anthelmintic (chloroform extract), laxative (fresh fruit), gonorrhea, expectorant. Ayurvedic practitioners utilized the leaves and stem bark to treat dyspepsia, fever, diarrhea, and leprosy. on

speed ripening, the bark is soaked and used on boils and tumors. It is also used to treat headaches and stomachaches. Bark has antidyspeptic and febrifuge properties. Powdered bark is used to treat mouth ulcers. Gargle with a bark infusion. Colicky pains are relieved by combining the bark juice with coconut milk. The bark is used as a tonic in Java and Bengal. In Java, the bark is used to treat diarrhea, while the pomegranate rind is used to treat fevers. To strengthen the teeth, the bark is rubbed on them. The leaves are used to treat ulcers and headaches. Coughs and disorders of the chest, uterus, and urethra are treated with the extremely mucilaginous fruit. It can be used as a laxative in big dosages. It is historically used in India to treat ulcerative colitis, ulcers, and colic discomfort. Fresh fruit is used as a laxative and a pectoral in Bengal. Its fruit is used to treat gonorrhea in Java. Its dried fruit is used as an expectorant in Punjab and Kashmir.
8. Other applications: - In the Philippines, bast is used to make rope. - The white gelatinous fluid extracted from the fruit is used as glue. - Wrapped in leaves, fish is cooked. - In Burma, the leaves are used as cigar wrappers.

Pharmacological activities of *C. dichotoma*

1. Antidiabetic activity and lipid-lowering or hypolipidemic activity

Diabetes mellitus (or diabetes) is a drawn out metabolic condition set apart by hyperglycemia brought about by insulin creation, insulin activity, or on the other hand both [29]. Betulin, α-amyrins, octacosanol, β-sitosterol, lupeol-3-rhamnoside, β-sitosterol-3-glucoside, hentricontanol, taxifolin-3,5-dirhmnoside, α-amyrin, hentricontane, and hesperitin-7-rhamnoside have been tracked down in the bark of C. dichotoma which are found answerable for plant antidiabetic movement [29]. Hussain et al. [29] additionally tracked down that the metabolic concentrate of C. dichotoma (MECD) bark has an antidiabetic impact in alloxan-actuated diabetic rodents. Thus,Wistar rodents, various measurements of the concentrate showed the significant ($p < 0.05$) hypoglycemic and antihyperglycemic impacts [30,31].

A significant gamble factor for coronary illness is hyperlipidemia. Myocardial ischemia and cardiovascular occasions are more normal in individualswith hyperlipidemia. C. dichotoma natural product was once remembered to have antihyperglycemicproperties in circumstances of glucose-actuated hyperglycemia [32,33]. C. dichotoma contains polyphenolics, flavonoids, tannins, and dietary filaments, which have been all demonstrated to be hypolipidemic.Likewise, flavonoid glycosides, for example, robinin, rutin, datiscoside, also, hesperidin, as well as phenolic subordinates like chlorogenic corrosive andcaffeic corrosive, were extricated from the natural product's ethanolic concentrate and seedsof C. dichotoma. The concentrates were found to contain a-amyrins, betulin, octacosanol, lupeol-3-rhamnoside, b-sitosterol, b-sitosterol-3-glucoside,hentricontanol, hentricontane and taxifolin-3,5-dirhamnoside, which are generally liable for the plant's hypolipidemic action of the plant [32,34]. In hyperlipidemic Wistar pale skinned person rodents, treatment with the C. dichotoma extricate upgraded the degrees of cancer prevention agent compounds (GR, GST, GPx, Turf, and Feline). Subsequently, the C. dichotoma separate moves along lipid digestion in both solid and hyperlipidemic Wistar pale skinned person rodents furthermore, can be utilized to treat dietary hyperlipidemia [32]. The organization of C. dichotoma mash at two fixations, 10% and 20%, was likewise observed to be viable in switching hyperlipidemia.These had a significant hypolipidemic impact, bringing down TC, TG, also, LDL-C while raising HDL-C. The hypolipidemic impacts created by C. dichotoma might be made sense of

by the way that CDP incorporates 10.19 g/100 g mash powder insoluble strands and 10.74 g adhesive/100 gmash powder as thick dissolvable polysaccharides [35].

Newary et al. [34] assessed the cancer prevention agent action of a watery remove from C. dichotoma natural products in vitro, as well as its effect on healthful boundaries in rodents took care of with high-fat eating regimen. The concentrate of C. dichotoma was tried and contrasted and two reference materials, ascorbic corrosive and butylated hydroxytoluene [32]. The lipid profile of serum and liver, as well as the lipid items in the eating regimen and defecation, were not entirely settled. All out body weight increment and absolute feed admission were both brought down by the concentrate. In contrast with hyperlipidemic control values C. dichotoma extensively decreased fat and cholesterol consumption while expanding those in waste discharges and a low measurement was better compared to a high measurement. C. dichotoma removes thus, safeguard against hyperlipidemia which might be owing to its defensive effect [36].

Anticancer activity:

Phenolics and carotenoids are abundant in the leaves of C. dichotoma and exhibit high antioxidant and anticancer activities. [37,38,39]

Rahman et al. investigated the anticancer activity (apoptosis inducing effect) of a methanolic extract of C. dichotoma leaves on the human cervical cancer cell line, HeLa, as well as the total phenolic content. MTT and DAPI staining tests were used to determine the anticancer potential and apoptosis-inducing impact of methanolic extract of C. dichotoma leaves (MECD) on human cervical cancer cell line (HeLa). MECD, with an IC50 of 202 g/mL, suppressed in vitro growth of human cervical cancer cells and induced apoptosis, showing its promising anticancer effect when compared to conventional tamoxifen, which had an IC50 of 202 g/mL reduced in vitro growth of human cervical cancer cells and induced apoptosis, showing potential anticancer efficacy when compared to conventional tamoxifen, which had an IC50 of 48 g/mL. The total phenolic content was 176.5 mg GAE/g dried extract. Because of its promising action, methanolic extract of C. dichotoma leaves might be a potentially strong chemotherapeutic treatment for human cancer and may be explored for additional clinical investigations in drug development [40.]

Analgesic, anti-inflammatory and antipyretic activity:

The anti-inflammatory effect of this plant is due to the presence and abundance of phytochemical substances such as α-amirins, betulin, oxoxanol, fatty acids and flavonoids. α-amyrin and toxifolin 3, 5, dirhamnoside [41,42,43,44]

Shahapurkar et al created transdermal films using a natural polymer derived from the fruit gum of C. dichotoma. The films' anti-inflammatory efficacy was evaluated using a carrageenan-induced raw paw odema model. The findings were compared to the conventional medication, diclofenac sodium. The percentage of inhibition odema was used to assess anti-inflammatory capability, and it was shown to be maximum in animals treated with 0.20% (w/v) glycerin, indicating that C. dichotoma has strong anti-inflammatory activity[45].

Sharma et al. found that C. dichotoma seeds had good anti-inflammatory action in Wistar rats. At a 500 mg dosageal The aqueous and ethanolic extracts showed maximal inhibition of edema (69.52% and 58.09%, respectively) in comparison to the control group at a dose of 500 mg/kg, revealing the efficacy of the C. dichotoma extract as an anti-inflammatory agent, which explains the widespread use of this plant as an anti-edema agent in popular medicine [46].

Gupta et al evaluated the analgesic, anti-inflammatory and antipyretic activities of methanol extract of C. dichotoma leaf extract in female SD rats. A high dose (400 mg/kg) of the methanol extract was found to be highly significant compared to the standard drug [47]. Thus, the results of several published studies confirm and support the traditional use of C. dichotoma for the treatment of fever. inflammation and painful conditions.

Antifungal activity

To evaluate the antifungal activity of C. boissieri extract against a clinical isolate of the yeast Candida glabrata microdilution assay to determine MIC values [48]. An MIC value of 125 g/ml was obtained, indicating that this species Cordia was active against this fungus. [49,] the bark extract of C. dichotomy was won against three common pathogenic fungi (Aspergillus niger, Aspergillus clavatus and Candida albicans) and zone of inhibition with the extract was compared to the common antifungal drug nystatin and griseofulvin. The results showedsignificant inhibition in the fungal growth zone, with better results for C. albicans than for A. niger or A. clavatus.

Hepatoprotective action

Methanolic extract of Cordia dichotoma shows hepatoprotective effect in male Wistar rats heart damage caused by carbon tetrachloride. factory The extract contains phenol and antioxidant action.[50].

CONCLUSION

It is concluded that the metabolic extract of C. dichotoma(MECD) bark possesses antidiabetic activity in alloxan-induced diabetic rats. Our study scientifically validates the folkloric claim as well as traditional uses of C. dichotoma as antidiabetic medicine. It could be attributed that the antidiabetic activity of C. dichotoma may be due to the presence of phenolic phytoconstituents orplant flavonoids in the methanolic bark extract. Further studies can be carried out in order to explore the specific phytochemical(s) responsible for the antidiabetic potential C. dichotoma.

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