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Medicinal Properties of *Ziziphus mauritiana*: A Review Article

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ABSTRACT

Ziziphus mauritiana is the traditional plant belonging to family "Rhamnaceae". It is also known as Chinese date, Ber, Indian jujube. It is believed that this species come from the Indo-Malaysia region of Southeast Asia. It has been largely naturalized in the tropics, from South Africa to Middle East and Indian subcontinent. It is a spiny, evergreen shrub on small tree. *Z. mauritiana* is one of the rarely used herbs that can cure various diseases. According to ancient literature, all part, such as leaves, seed, fruits, and have pharmacological activity. *Z. mauritiana* having tremendous healing properties attributes by a diverse faction of derivative metabolite such as alkaloids, flavonoids, and terpenoids properties. This plant is a useful resource of phytochemicals, bioactive, vitamins, etc. which make it to be in effect in curing or prevention from many diseases. The study backed medicinal properties and pharmacology activities of plant like anti-cancer, anti-diabetic, anti-oxidant, anti-microbial, anti-ulcer, anxiolytic etc, and included medicinal uses. This review article provides an overview of the medicinal properties of *Z. mauritiana* for the scientific orientation of underused medicinal plant.

INTRODUCTION:

India is a land of biological and culture diversity. It is one of the mega bio-diverse countries of the world. The medical herb has played an enormously focal job in the upbringing of being society. A lot of studies say been conducted every one of over humanity to clarify the effectiveness of plant which are proving to be wonderfully. Plants could be normally found in large group and economically complete as basic resources for industry. The expense of plant as resource in good for your health province with their due to therapy and check diseases in cheap. *Ziziphus mauritiana* is an exceedingly deficiency lasting and native fruit of India. *Z. mauritiana* lam. Sym. *Z. jujuba* Lam., non-mill is species of the species *Ziziphus tourn*. Past L. family "Rhamnaceae". The appellation Ziziphus is connected to an Arabic word second hand for Z. lotus **(**L.) Desf. But plus associated to the prehistoric Persian lexis Zizfum or Zizafun; and dated Greek used the word Ziziphon for the jujube. *Z. mauritiana* is the traditional plant belonging to family "Rhamnaceae". In India, it is commonly called as "Ber" in Hindi and "Badrah" in Sanskrit. It is disseminated at first from the intermediate East or the India subcontinent but now cultivate throughout the tropics and subtropics for its nutritious. It is a potential plant both for the food and phytomedicine application. Ziziphus plant and bushes inhabit uninspired environment on every constituent owing to their flexibility in consciousness gifted to adapt to deficiency stress. The plant give feed to livestock, the pitiless converted is old for turning, building agriculture implement, fuel, and high quality charcoal.[20]Remedial plant are beneficial in traditional system of medicine to cure a variety of disease and lots of these plant experience been evaluated for their different pharmacological activities. [20]

Traditionally, numerous parts of the plant is handy in category of disease get used to like, roots are functional in vitiated prepare of pitta, fever, wounds, ulcer and cephalalgia. Bark is used in dysentery, diarrhea, gingivitis, boil and ulcer. Seed are useful in encephalopathy, ophthalmopathy, cough and asthma, vitiated condition of pitta, burning sensation, diarrhea, vomiting and insomnia etc. Leaves are beneficial in stomatitis, wounds, syphilitic ulcer, asthma, leucorrhoea, typhoid fever, diarrhea and obesity. The mixture of leaves is applied on wounds, cuts and boil, etc. Fruits are beneficial in vitiated condition of pitta, hyperdipsia, consumption, vomiting, constipation, flatulence, dyspepsia, nausea, leprosy, thirst, anorexia, fatigue, leucorrhoea, purities, wounds and ulcer.[3][14][17]The review paper focus on the learn of a variety of medicinal properties of the plant *Z. mauritiana* (Rhamnaceae). As it passes a

range of pharmacological properties which are proven a variety of studies hence conducted.

Vernacular name –It is also known as Indian Jujube; common jujube.

Sanskrit - "Badrah"

Sans- (Ajapriya, kuvala, madhuraphala, karkandhu);

Hindi - (Ber, Baer);

Bengali - (kool, ber, boroi);

Marathi - (Bar, bera);

Gujarati, - (Bor, bordi);

Telgu - (Reegu, gangareegu);

Tamil - (Elandai, yellandeelladu);

Rajasthan - (Bor, bordi).[2,9]

Geographical Distribution-This species is thought to have originated in India and is considered native to southern Asia, eastern Africa and many islands in Indian Ocean. Chinese Apple (*Z. mauritiana*) is widespread in the northern parts of Australia but is most common in the northern and central region of Queensland. It is also naturalized in southern Africa, southern-eastern Asia (i.e. Malaysia and the Philippines) and the fruit is cultivated for the last 400 years in both India and China. *Z. mauritiana* is a beneficial fruit crop in its native range and in some of its introduced range, it is not under cultivation anywhere in Australia. In Fiji, the growth of *Z. mauritiana* produces along roadside and on agriculture land. [3]

Morphology-

- Plant - *Z. mauritiana* is a spiny, evergreen shrub on a small tree up to 15m high, with trunk 40m and more in diameter.

- Stem - *Z. mauritiana* is a fast growing, long-lived, spiky hierarchy emergent up to 15m high with a dispersal crown and relaxed twigs.

- Leaves - The plant leaves are alternate, ovate, or four-sided figure elliptic with a rounded

height and three depressed longitudinal veins at the base. The tree is dark green and glassy on the fringe and young and pale-green to grey-green on the lessen section.

 Flowers - The flowers are very small and yellowish in colour with fine petals and occur in leaves axils.

 Fruits - The fruits safe to eat and diverge in profile and size. The fruits of wild tree are small and circular in shape (about 3cm in diameter), in fig. in comparison of the fruits of cultivated tree which are usually large (5cm long and 4cm wide) and in profile, it is oval, circular, obonate, oblong depending upon on their category.

Leaves

Flowers

Fruits

Stem

Plant taxonomy- There are about 86 species of genus Ziziphus, which are distributed in warm-temperature to subtropical region of the world. In 86 species there are 20 species of Ziziphus are found in India and 14 of species are found in China (Liu & Zhao, 2009). [(3)] In Ziziphus section, there are two species, *Z. mauritiana*, a tropical and evergreen crop and Ziziphus jujube, cold-hardy and deciduous species, which are multipurpose tree cultivated extensively as horticulture crops for fruits. In China, there are more than 750 cultivars of *Ziziphus jujube* and there are about 170 cultivars of *Z. mauritiana* in India, which vary widely in the habit of the tree, fruits, shape, colour, leaf shape, keeping quality, and fruiting season.

The dense silky underside of the leaves is a way to found out the difference between *Z. mauritiana* and *Z.jujuba*. There are two native Ziziphus spp.in Australia, Z.quadrilocularis F.Muell. And *Z. oenoplia* (L.) Mill, both is section perdurans. *Ziziphus oenoplia* is also native to India, Sri Lanka and tropical Asia.

Chemical Constituent: The chemical constituent of the leaves are protein, amino acid, flavonoids, alkaloids, glycoside, terpenoids, saponins, fibers, tannin and phenolic compound. Fruits rich in protein, phosphorus, calcium, carotene and vitamin C. Pulp contain carbohydrate 12.8%-13.6% which have, 5.6% is sucrose, 1.5% is glucose, 2.1% is fructose, 1% starch. It also contain some constituent are Vitamin C = 70-167mg/100g Sugar= 20-30% Protein=2.5% Benzaldehyde= 26.5%. The main characteristic constituents are triterpen and triterpens saponins with alphitolic, betulinic, maslinic, oleanolic, ursolic, 3-O-trans-alphitolic, 3-O-cis-p-alphitolic, 3-O-cis-pcoumaroylalphitolic, 3-O-trans- pcoumaroylalphitolicacide, and Ziziphus saponins 1, 2, 3, jujube B, spinosin and swertisin. These build up with 4(14)-element ring class: Mauritiana C, amphibine F and Frangrfoline, the 5(14) element ring class: mauritiana A and B.

Phytochemistry: More than 150 cyclopeptide alkaloids are found from various species of Ziziphus. Different compounds are present in the *Z. mauritiana* like pectin A, glycoside, triterpenoic acid, lipids and alkaloids. [19]

Pectin A- Pectin A was found from *Z. mauritiana* fruits and *Ziziphus jujube* fruit. Pectin A was found to contain 2, 3, 6-tri-O-acetyl D lactose unit. Pectin has a number of pharmaceutical activities such as binding bile acid, lowering plasma cholesterol and anti-diarrheal activity.

Alkaloids- Ziziphus species have many alkaloids in stem bark. A sapogenin, zizogenin has been isolated from *Z. mauritiana*. The *Z. mauritiana* isolate the cyclopeptide alkaloid, mauritiana A, B, C, F, G, H. Frangufoline, amphibines B, D, E, & F, cyclopeptide alkaloid, mauritiana J was isolated from the root bark of *Z. mauritiana*.

Triterpenoic acid- There are many triterpenoic acid which have isolate from the *Z. mauritiana*. Triterpenoic acid isolated from the roots of *Z. mauritiana* show cytotoxic effects. Triterpenoic acid such as colubrinic acid, alpehitolic acid, 3-O-cis-p-coumaroylaphitolic acid, 3-O-trans-p-coumaroylalphitolic acid, 3-O-cis- pcoumaroylmaslinic acid, 3-O-trans-pcoumaroylmaslinic acid, olenonic acid, zizybronalic acid and betulinic acid.

Betulinic acid- Betulinic acid is a biologically stirring pentacyclic triterpenoids which has demonstrated selective cytotoxity against a quantity of limitation tumour type Betulinic acid has also been found to have anti-inflammatory activity and anti-bacterial activity.

Alkaloids- The seed and pericarp contain phosphatidycholines; phosphatidylglycerols and fatty acid like linoleic, oleic acid and steric acid are the main active components of the seed. More than 150 cyclopeptide alkaloids are found from various species of Ziziphus. Alkaloids are found in *Z. mauritiana* are mauritiana A, B, C, D, E, F, H, and Cyclopeptide alkaloids have sedative, anti-microbial, anti-diabetic, anti-plasmodia, analgesic, anti-conversant and anti-inflammatory activity.

Uses of *Z. mauritiana*:

Medicinal uses-

a) Fruits: A fruits is useful to purify blood. Joshanda preparation from fruits is beneficial in chest complaints. Dried ripe fruit is also used as laxative. These fruits are consumed as digestant with salt and chili peppers.

b) Seed: The kernels act as soporific and also have a sedative effect; it is beneficial in pregnancy to cure nausea, abdominal pain and vomiting. The kernels give as an antidote – poisoning and used to cure diarrhea. The seeds pasts is applied on the wounds for quick healing.

c) Leaves: The leaves act as an astringent, and beneficial for the treatment of diarrhea. They act as diaphoretic and prescribed for thyroid in children. Leaves are also applied on the wounds for quick healing. Leaves also used in treatment of asthma and liver troubles.

d) Barks: The barks act as astringent in gingivitis and also applied to sores. A decoction of twigs is used for the treatment of dysentery and diarrhea.

e) Flowers: It is used in the treatment of skin ulcer and eye disease. Internally it is beneficially remedied for jaundice.

f) Roots: powder of roots is beneficial to old wounds and ulcer for quick healing and decoction of roots is used to cure fever.

Traditional uses: Traditionally, numerous parts of the plant are handy in category of disease like vitiated prepare of pitta, fever, wounds, ulcer and cephalalgia. Barks are used in dysentery, diarrhea, gingivitis, boil and ulcer.

Non-medicinal uses-

a) Fruits: Fruits are eaten green and in desiccated form. The fruits can be beneficial for refreshing drinks, alcoholic and non- alcoholic. The fruits are also used in the preparation of jams and the powder of the frits is used in the baking. It is also used in chutneys, pickles and jellies.

b) Seed: Seeds are rich in protein and often eaten in times of famine.

c) Leaves: The leaves are very healthy and nutritious and regenerated very fast, they also eaten in the form of vegetables. The leaves are important as the fodder. They are also important to feed silkworm. The plant is developed as a host for the lac insect, *Kerria lacca*, which suck the juice from the leaves and encrusts them with an orange-red resinous substance.

d) Barks: The bark yields a non-fading, cinnamon-coloured dye and is old in the tanning activity for tanning hides and dyeing.

e) Wood: Wood is important fuelwood and very beneficial as the source of charcoal. The wood is close-grained, soft texture, hard, tough, durable and good for planning and polishing. It is mainly used for the domestic purposes like as, making legs for bedsteads, boat ribs, agricultural implements, lining well, house pole, tool handles, yokes, gunstock, sandals, toys and general turning and saddle trees. The flexible branches can also be used to retain livestock by twining together to form thorny corral walls. [9]

f) Flowers: The flowers are very sweet and used as sweeting agent, and they are rated as a small basis of nectar for honeybees.

Pharmacological Activities:

1. Antidiabetic Activity: Diabetes is a disease that results in too much sugar in the blood, fact research was conduct by Jarald E.E. et.al 2009 on petroleum ether, chloroform, acetone and aqueous extract of *Z. mauritiana* induced selected capable result. Petroleum ether, chloroform, acetone and aqueous and crude aqueous remove of fruit of *Z. mauritiana* were experienced for antihyperglycemic action in glucose overloaded hyperglycemia rat. The effect of antihyperglycemic extracts and small percentage were experienced for their hypoglycemic interest at two dose level, 200 and 400 mg/kg respectively.

The aqueous extract out and the non-polysaccharide part of the aqueous take out of *Z. mauritiana* were initiate to exhibit large antihyperglycemic and hypoglycemic action. The activity of the non-polysaccharide fraction was comparable to that of the standard drug "Glibenclamide". [(9)(10)(16)]

2. Anticancer Activity: MTT analyze was prepared to sense the cytotoxic impression of methanolic obtain of fruits *Z. mauritiana*. As phytochemical profiling of fruits, methanolic extract shows the presence of various phytochemical. Ziziphus is inducing significant cytotoxicity towards cancer cells. [(4)]

Anticancer ability of seeds extract of *Z. mauritiana in-vitro* against atypical cubical ranks (HL-60, Molt-4, HeLa, and normal cell line HGF) by MTT against Ehrich ascites, carcinoma orientation Swiss albino mice was investigation. Agarose harden electrophoresis definite gene distraction in HL-60 cells after 3h incubation with extract. The extract also exhibited compelling anti-cancer ability in-vivo. [(9)(19)]

3. Antibacterial Activity: Methanol extract of *Z. mauritiana* and *Ziziphus nummularia* were investigation for their antibacterial action against *Staphylococcus aureus* and *Escherichia coli*. To determine the antibacterial activity The methanol extract of Ziziphus show moderate to good antibacterial activity. [(4)]

Methanol extract of *Z. mauritiana* and *Z. nummularia* were study for their antibacterial potential against nine bacteria extract should important antibacterial active against both gram positive and gram negative bacteria.[(9)] Ethanolic extract of leaves mauritiana was investigation for anti-bacterial activity against *E.coli, S. aureus*, *Streptococcus pyrogen*, *Aspergillus niger* and *Candida albicans*, *S. pyogenes* was the most susceptible followed by

E.coli while S.aureus was the least susceptible. The extract of Ziziphus is very beneficial to cure the nosocomial infection, opportunistic infection of urinary tract(UTI) and wounds infection, which are disease particular by some of these organisms.(1)

4. Anti-Steroidogenic Activity: The ethyl acetate extract of *Z. mauritiana* bark was study for anti-steroidogenic activity in the adult female mouse. Extract up arrested the natural oestrus round of adult female mouse at Oestrus stage and cut rate the wet stress of ovaries significantly cholesterol and ascorbic acid contented in ovaries of crude extract treated mice were extensively elevated. Anti-fertility activity of crude extract was create to be reversible, average estrus rotation and ovarian steroidogenesis were restored after withdrawal of treatment with wheedle out on regular 27 days.(18)

5. Immunomodulatory: The aqueous ethanolic seed extract (100-400mg/kg) of *Z. mauritiana* study for immunomodulatory activity in mice. The obtain was standardized with HPLC via betulinic acid as a marker.

6. Anti-Diarrhoeal Activity: Antidiarrhoeal effect of the methanolic take out as evaluated exhibited a concentration needy inhibition of the spontaneous pendular pressure group of the exceptional rabbit jejunum and inhibited acetylcholine induced short form of rat ileum. A dose needy drop of gastrointestinal transit was experimental with extracts 25 and 50 mg/kg which and secluded mice against castor oil induced diarrhoea and castor oil induced fluid accumulation, correspondingly.(31)

7. Anti-Oxidant Activity: Anti-oxidant activity of methanol extract of *Z. mauritiana* analyzed for radical-scavenging effect of 1, 1- diphenyl-2-picrylhydrazyl (DPPH) radical apply colorimetric method. If the concentration of sample is increased than the radical-scravenging effect also increased.(1). The calculated IC50 was found to be 38.07 ug/ml for DPPH method.

8. Positive Inotropic and Chronotropic: *Z. mauritiana*, on the rat heart showed the positive inotropic and chronotropic effect of the aqueous extract of the *Z. mauritiana*. These positive action were inhibited by the pretreatment of the heart with propanolol. It was purposed that of *Z. mauritiana* limited adrenomimetic substances, which almost certainly act on rat heart by the use of β adrenoreceptor. (32)

9. Hepatoprotective: The aqueous take out of *Z. mauritiana* fruit was evaluated for its protective action against CCL4 induced liver damage. 250, 500 mg/kg fruit extract or 100 mg/kg silymarin (standard) were administered to different groups of rats former to CCl4 administration. These results were supported by liver histology and advised that fruit have hepatoprotective principles. [33]

10. Hypotension: Extract *Z. mauritiana* in the dose reach 0.4 to 122 mg/kg Pc, causes dose-dependent hypotension in rabbits, alike to that achieved with acetylcholine (ACh). In the presence of growing doses of atropine, ranging from 4.10-3 to 4.84 µg/kg PC, hypotension induced in rabbits by acetylcholine (ACh) at 4.10-3 and Zizyphus mauritiana at 22 mg/kg at PC is ever more inhibited.[34]

11. Antiulcer Activity: The methanolic extract of *Z. mauritiana* stem bark was investigation for its anti-ulcer activity. The study is done with using two models, ethanol induced gastric ulcer model and aspirin induced gastric ulcer model in mice. [14] .The methanolic extracts (100, 250 & 500 mg/kg) of *Z. mauritiana* reduce the gastric lesion at 8%, 66.67% & 82.67% respectively.

12. Anixolytic Activity: The ethanolic extract of leaves of *Z. mauritiana* investigated anixolytic activity with elevated pulse maze and light and dark box paradigm and the action of extract on neurotoxicity was studied using Rota-rod apparatus. The studies show that, treatment with diazepam and *Z. mauritiana* extract. The extract shows absence of neurotoxicity on Rota-rod. So, the extract of *Z. mauritiana* leaves shows anixolytic action. [7]

13. Thrombolytic Activity: The methanol extracts of *Z. mauritiana* show the thrombolytic activity. The thrombolytic activity of extract was evaluated by the method developed by Daginawala et.al (2006) and slightly modified by Kawsar et, al (2011) using streptokinase (SK) as the standard.

14. Anti-Inflammatory Activity: The methanolic extract of *Z. mauritiana* leaves shows the anti-inflammatory action was evaluated by cotton pellet-granuloma in Wistar rat. The methanol extract of *Z. mauritiana* leaves shows dose dependent inhibitor weight of cotton pellets. The extract at the drug of the 500mg/kg have 31.1% protection to the inflammation compared to the 16.9% in 250mg/kg. [1]

15. Analgesic Activity: The methanol extract of *Z. mauritiana* investigated the antinociceptive property by the tail-flicking method. In this method, the reaction time of rats and animals to radiant heat was recorded by placing the tip (last 1-2 cm) of the tail on the heat source. The extract moderately elegant the reaction time in a dose dependent manner. (28)

CONCLUSION:

Z. mauritiana is an important forestry species. It is multi-purpose tree providing leaves fodder, fuel wood, charcoal and fibers. The plant of *Z. mauritiana* has the potential of cure various types of diseases and have many medicinal activities like anticancer, antidiabetic, antiulcer, antioxidant, anti-inflammatory, wound healing, thrombolytic activity and many more. The presence of medicinally active component such as flavonoids, alkaloids, saponins, terpines and more component make it very potent plant. The review of literature concludes that the plant is very important and useful in medicinal plant and can have a very wide application in the future. Always seek advice from a professional before using a plant medicinally.

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