

Phyto-Pharmacological Potential of *Zizyphus jujube*: A Review

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Abstract

Natural world has been a resource of curative agents for thousands of year and an inspiring number of modern drug have been isolated from natural sources, many based on their use in traditional medicine. Plants from the genus *Zizyphus* have been used in conventional medicine by many cultures. Flavonoids, phenolic compounds tri-terpenic acids and polysaccharides constituents have been reported as the major phyto-constituents of the *Zizyphus species*. This review describes pharmacological reports of the *Z. jujube*. Various virgin areas of investigate on the *Z. jujube* have been spotlighted with a sight to explore, isolate and identify the medicinally important phyto-constituents which could be utilized to alleviate diverse diseases distressing the mankind.

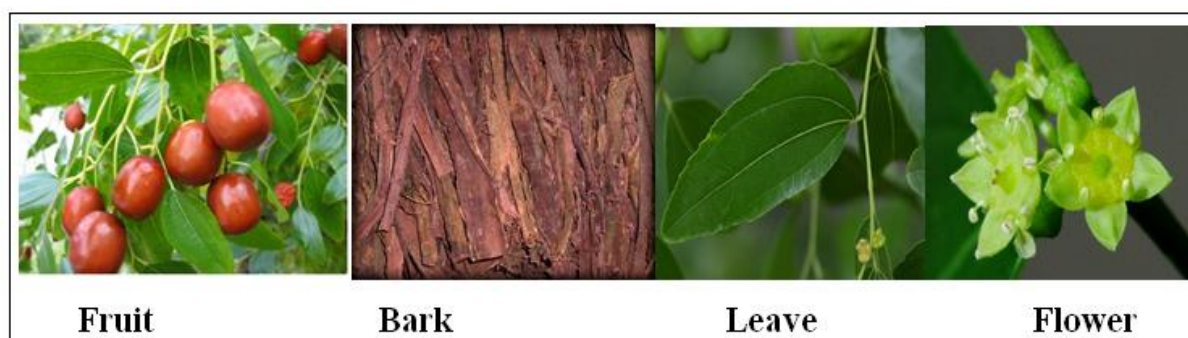
Keywords: *Zizyphus*(*Z. jujube*); Phyto-pharmacology; Phyto-constituents; Pharmacological-report.

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INTRODUCTION

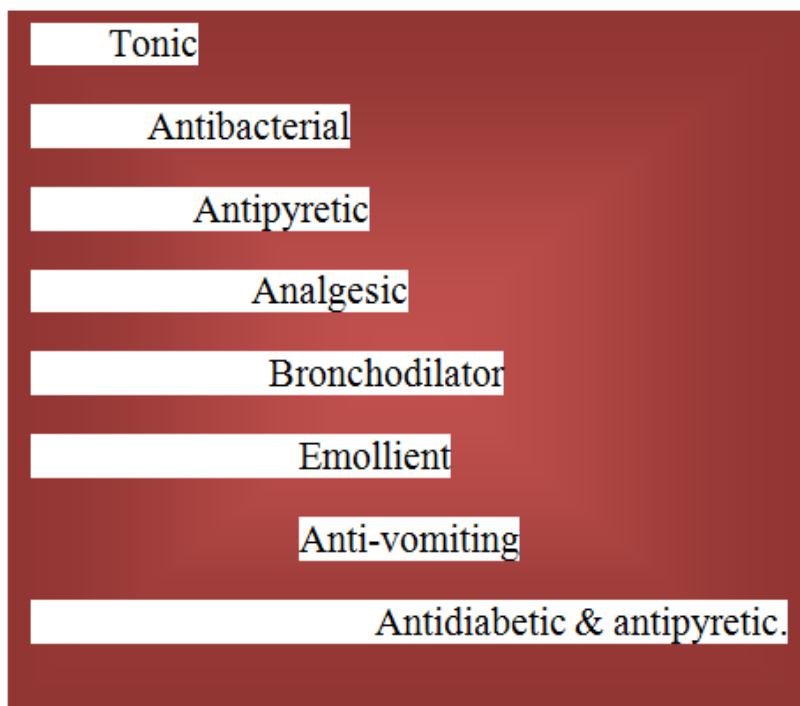
Medicinal plants are of enormous value to the health of individuals and communities. India is well recognized as the “Emporium of Medicinal Plants”.

Due to their great consequence, demand of medicinal plants has increased abundant folds [1, 2]. A variety of species of *Zizyphus* have medicinal implication and it is broadly used in India, China and Japan.



Description of genus *Z. jujube*³

Taxonomical classification	Vernacular names
Kingdom: Plantae	English -Chinese Date, Jujube
Division: Magnoliophyta	Hindi-Ber
Class: Magnoliopsida	Sanskrit-Rajabadari
Order: Rosales	Punjabi- Beri
Family: Rhamnaceae	Bengali- Kul
Genus: <i>Zizyphus</i>	Gujarati- Bordi
Species: <i>jujube</i>	

Traditional uses *Z. jujube* [4]**Major Phytoconstituent of *Z. jujube* [5-11]**

Alkaloids	mauritine-A, mucronine-D, Nummularine-D, sativanine-A and sativanine-B, frangulanine, nummularine-B mucronine
Cyclic peptide alkaloids	Stem bark: Sativanine-C, Sativanine-G, Sativanine-E, Sativanine-H, Sativanine-F, Sativanine-D Leaves: Cocclaurine, Isoboldine, Norisoboldine, Asimilobine, Iusiphine, Iusirine Seed: Sanjoinine, Franguloine, Amphibine-D
Saponins	jujubosides –B, acetyljujuboside B & ziziphin
Glycosides	Soyasapogenol B - 3 - O - α -L-rhamnopyranosyl(1 \rightarrow 2)- β -D-glucopyranosyl(1 \rightarrow 4)- β -D-glucuronopyranoside; juzirine, 6'''-feruloylspinosin(5-Hydroxy-6-[2-O-[6-O-[3-(4-hydroxy-3-methoxyphenyl)-1-oxo-2-propen-1-yl]-beta-D-glucopyranosyl]-beta-D-glucopyranosyl]-2-(4-hydroxyphenyl)-7-methoxy-4H-1-benzopyran-4-one).
Nutritional Value	Jujube fruit is rich source in nutritional content like vitamin C, phenolics, flavonoids, triterpenic acids, and polysaccharides.

Phytopharmacology of *Z. jujube***Antioxidant Potential**

Kar et al., 2013 studied antioxidant potential of methanolic extract of the leaves of the plant *Z. jujube*. The result revealed about 2.8% of total phenolic content in methanolic extract. The antioxidant activity showed vary potential result in both tested methods that is 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric ion reducing capacity. The antioxidant activity is directly related due to the existence of total polyphenol [12].

Antimicrobial activity

Study was undertaken to ensure the antimicrobial efficiency of crude leaves extract of *Z. jujuba*. The result revealed that the leaves of *Z. jujuba* have effective antimicrobial activity particularly against *Salmonella* and *staphylococcus aureus* infections. The crude methanol extract of *Z. jujube* plant showed modest activity against *P. aeruginosa*, *B. pumalis* and *E.*

aerogens and low against *S. typhi*, *S. epidermidis*, *S. pneumoniae*, *S. aureus* and *K. pneumoniae* [13].

In consequences to Abd-Alrahman et al., conducted study to assess the antimicrobial activity of ethanol extract of *Z. jujuba* seeds against six bacterial strains by determining minimum inhibitory concentration (MIC) and analyzed their content by using chromatographic techniques to recognize the principal bioactive phytochemicals. Additional, GC/MS analysis of ethanol extract of *Ziziphus jujuba* seed revealed the subsistence of 20 component, major components were 13-Heptadecyn-1-ol (12.95%), 7-Ethyl-4-decen-6- one (9.73%), Lineoleoyl chloride (8.54%), Linoleic acid (6.37%), 2,5-Octadecadiynoic acid, methyl ester (5.57%) and Palatinol A (4.81%). The results indicated that the ethanolic extract of *Z. jujuba* seed contains a many bioactive components that could have advantage offer a platform of using *Z. jujuba* seed

as herbal alternative for the current synthetic antimicrobial agents [14].

Sleep Disorder

Z.jujube (seed) are medicinally used in the insomnia. Research carried by Jiang et al., were investigated the hypnotic and sedative effect of three compounds flavonoids, saponins and polysaccharides. Oral administrated the extracted compounds to mice at a dose 17g/kg per day showed significant response [15].

Antipyretic effect

Z.jujuba leaves has been undertaken to investigate the antipyretic effect of methanolic extracts. The antipyretic activity of Z. jujuba (leaves) was evaluated using Brewer's yeast induced pyrexia in rats. The result revealed that Z.jujuba at a dose of 200mg/kg caused a highly noteworthy reduction at third hour ($p < 0.001$). However, the consequence increases significantly at the dose of 400 mg/kg having $p < 0.01$ at first, second and fourth hour. The antipyretic effect was comparable with that of a standard paracetamol. Thus above finding justified that methanolic leaves extract of Z.jujuba developed to have beneficial effects in antipyretic activity [16].

Anti-diarrhoeal Activity

Rao et al., has also been carried out to investigate anti-diarrhoeal efficacy of aqueous leaves extract by using castor oil and $MgSO_4$ induced diarrhea model. The leaves extract demonstrated significant inhibitory activity against castor oil and $MgSO_4$ induced diarrhea [17].

Anti-diabetic Activity

Balakrishnan et al., 2013 carried out study to evaluate anti-diabetic potential of dried bark methanolic extracts of Z.jujuba. The methanolic extract of Z. jujube was administered at the doses 100mg/kg and 200mg/kg doses. Both the doses caused a noteworthy decrease in the levels of total cholesterol, triglycerides and LDL-cholesterol, glucose level. The results signify that methanolic extract of Z.jujuba in the dose dependent manner acquire hypoglycaemic and hypolipidemic activity [18].

Immunomodulator Activity

Ganachari et al., 2004 studied the consequence of hydroalcoholic extract of Z.jujuba leaves on neutrophil phagocytic function. The result revealed that Z. jujuba leaves extract has stimulated chemotactic, phagocytic and intracellular killing potency of human neutrophils at the concentration range of 5-50 μ g/ml. The above finding concluded that the hydroalcoholic extract of Z. jujuba leaves stimulates cell-mediated immune system by increasing neutrophil phagocytic function [19].

Anti-fertility Activity

Rekha et al., 2014 was planned to assess the anti-fertility potential of Pet. ether leaves extract of Z.

jujuba. This study was proposed to assess the effect of pet. ether leaves extract of Z. jujuba on sperm morphology, progressive motility and sperm concentration irreversibly in Wistar rats. Extracts were found to produce significant inhibition of sperm motility and cause reduction in viability of sperm cell. The result of this studied revealed that Z.jujuba thoroughly affects male animal fertility parameters [20].

Anti-inflammatory effect

Dhananjay et al., 2013 carried out studied to evaluate the anti-inflammatory effect of ethanolic fruit extract of Z. jujube by using carrageenan induced paw edema model. The ethanolic extract of Z. jujuba was injected at dose 200 mg/kg body weight and the result was compared with standard drug Indomethacin (10mg/kg) [21].

Diuretic activity

Fruit extract of Z. jujuba in rats was evaluated for diuretic activity by Kabra et al., 2013. Various extracts Pet.ether, Chloroform, Alcohol extract of Z. jujuba was studied and the activity was compared with furosemide as standard. The surveillance of outcome showed alcoholic extract exhibited significant diuretic activity as evidenced by increased total urine volume and the urine concentration of Na^+ , K^+ and Cl^- [22].

Wound healing

Sampath et al., 2012 investigated the efficacy of methanolic bark extract of Z. jujube for wound healing activity. The outcome showed that group received high dose of extract (10%w/w) showed significant wound contraction (98.09%) on 24th day. Protein content was also increased in the treated group, which directly spotlight increased in collagen synthesis [23].

Anti-obesity and Hypolipidemic Activity

Powder of Z.jujuba investigated anti-obesity and hypolipidemic activity by Mostafa and Labban 2013. The conclusion of the study indicated a noteworthy reduction in total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), BMI, fat % and body weight after administration of doses (5, 15 and 30 g/day) of Z. jujuba powder in all groups. Triglycerides (TG) were reduced significantly after consumption 30 g/day of Z. jujuba powder. A slight increase in high density lipoprotein cholesterol (HDL-C) was observed. Z. jujuba impact on weight status was significant after consumption of 30 g/day of Z. jujuba powder, while the impact of other doses were not. It can be concluded that diverse doses of Z. jujuba powder possess hypolipidemic and anti-obesity properties, and did not show any negative impact on liver function as measured by ALT and AST [24].

Acute Toxicity Studies of Z.jujube

Z.jujube		
Extract	LD50	Reference
Methanolic root extract	447.21 mg/kg (ip) in mice	[25]
Ethanol and ethyl acetate extract(Endocarp)	1200.24 mg/kg in rat	[26]
Ethanollic root extract	450 mg/kg (ip)	[27]
Alkaloidal fraction(root)	400mg/Kg(ip)	

CONCLUSION

It is obviously exposed that this tree is of great value as food and medicine and should be fraction of healthy diet and life style. Much recent research was carried out on the various parts of the Z. jujube. On the basis of the reported pharmacological activity on the species Z. jujube open the doorway of the virgin areas of research to isolate and identify lead marker compounds which could be useful for combat the diseases.

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