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## Review Article

# Exploring The Ethnobotany and Therapeutic Potential of *Zizyphus xylopyrus*

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## ABSTRACT

*Zizyphus xylopyrus* (Retz.) Willd. (Rhamnaceae) is an evergreen shrub of North-Western India, Pakistan, and China that has ever-growing relevance for medicine. Different parts of the plant have been used in Ayurveda and traditional medicine for obesity, diabetes, snake bites, fever, diarrhea, insomnia, and many more. Moreover, the plant has numerous pharmacological actions, including antisteroidogenic, anticonvulsant, antinociceptive, anti-inflammatory, antidepressant, antidiarrheal, Antibacterial activity, Anti-cataract activity, Mast cell stabilization, Anti-microbial activity and Wound healing activity. Many of these traditional claims have been scientifically validated by several researchers adopting different approaches. This review aims to provide an up-to-date and comprehensive account of the ethnobotanical aspects, phytochemistry, and pharmacology of *Zizyphus xylopyrus* with special emphasis on its therapeutic value and possible future studies.

## INTRODUCTION

Medicinal plants have been an integral part of human civilization for centuries, serving as a primary source of healthcare across cultures and traditions. Traditional medicine is defined as the knowledge skills and practices used by various ethnic groups to preserve, prevent, diagnose, mitigate, and treat 'physical and/or psychological' health problems with reference to theories, beliefs,

and experience.<sup>[1]</sup> The use of medicinal plants for treating illness dates back centuries, as evidenced by historical records and monuments.<sup>[2]</sup> Plants medicinally accepted by different cultures have always been available at reasonable costs which made them an important part of people's life across the globe. In the present context, interest in plant-based products is increasing rapidly across the globe. Herbal medicine is becoming one of the

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components of both modern and traditional medicines used to manage different types of ailments and diseases. *Ziziphus xylopyrus* (Retz.) Willd. is one of several plant components being studied for their possible medicinal uses. *Zizyphus* has about 40 species multiplied all over the Asia in the warm temperate and subtropical regions. *Zizyphus* is a genus of sometimes spiny shrubs, infrequently spined trees in the family Rhamnaceae.<sup>[3]</sup> It is known that several species of the genus *Zizyphus* are of medicinal interest. Great attention has been paid to species of *Zizyphus xylopyrus* and a great number of papers have emerged which prove the stance with regard to their medicinal and biological activity. *Zizyphus xylopyrus* (Retz.) Willd. (Rhamnaceae) is a straggling shrub or a small tree, armed with backbones, upto 4 m in height, set up throughout north- western India, Pakistan and China. The arial and root barks, leaves, and fruits of *Zizyphus* species used in Indian system of drug for the treatment of various conditions such as weakness, liver complaints, obesity, diabetes, skin infections, fever, diarrhoea, wakefulness and digestive disorders.<sup>[4]</sup> The pharmacological properties of *Zizyphus xylopyrus* have gained more popularity in its phytochemistry. This review gives the idea about scientific research activity on this plant. This review aims to provide a detailed and updated overview of the ethnobotanical significance, phytochemical constituents, and pharmacological activities of *Zizyphus xylopyrus*.

## METHODOLOGY

### Search Strategy:

A systematic search conducted using keywords “*Zizyphus xylopyrus*” “*Zizyphus*” in electronic databases, including, Web of Science, PubMed, and Google Scholar.

### Inclusion Criteria:

Articles published in English between 2000 and 2024 focused on *Zizyphus xylopyrus*.

### Data Extraction:

Extracted information related to the traditional uses, phytochemistry and pharmacological activities of *Zizyphus xylopyrus*.

### Data Analysis:

Collected data was qualitatively examined in order to discuss critical aspects as well as to summarize major findings.

### Ethical Considerations:

No ethical approval was required as the review involved analyzing existing literature without human or animal subjects.

### Dissemination:

Findings will be disseminated through publication in peer-reviewed journals, presentations at conferences, and sharing with relevant stakeholders in the medical and research communities.

### Description of the plant

*Zizyphus xylopyrus* is known as a weakly thorny evergreen tree. It is referred to as Jujab all around the world. *Z. xylopyrus* is an enormous, expansive shrub 6 – 10 m tall with rudimentary shoots and rusty covered with hair. The fresh stems have two spines; the first is straight, while the second is a bit curved and has swollen joints at the leaf scars.<sup>[3,5]</sup> The tree is collected from the natural habitat for use as a food source, material, and for medicine. It is harvested in bulk for trade because of its medicinal value and is sometimes grown as a useful tree in South East Asia.<sup>[6]</sup>





**Figure 1: *Ziziphus xylopyrus* (Retz.) Wild plant**

**Fruits:** *Z. xylopyrus* bears a fruit which is dark brown in color with an astringent taste. This is rounded or globular with a somewhat fibrous pericarp and hard stone like endocarp. The fruit contains three cells and has ridges on its surface. The stalk of the plant bears a seed which is long with a concave diameter of 2 mm at the separation point. The seed is long measuring 5-8 mm. [5,7]



**Fig 2: *Ziziphus xylopyrus* Fruits**

**Leaves:** The foliage of *Z. xylopyrus* is green, has a strong taste, and slight fragrance. Their surface is glabrous and is arranged in an alternate disposition. The leaves are symmetrical and obliquely rounded at the base, while the apex is obtusely rounded. The length of the leaves ranges from 2 to 7 centimeters with a serrulate margin; the leaves also have pinnate venation.



**Fig 3: *Ziziphus xylopyrus* Leaves**

**Flowers:** The flowers of *Z. xylopyrus* are a pale structure with 2 to 5 lobes, the petals at the base being whiter and the stem more yellow. They are youthful, round and compacted measuring 3-4 mm with the seed stem forming the cup shape. Folded calyx lobes which measure up to 2-2.5 mm long shift towards the center. The flat petals of 1.5 to 2 mm are egg shaped.



**Fig 4: *Ziziphus xylopyrus* Flowers**

**Vernacular names:** [9]

English	Jujab
Sanskrit	Ghoti, Gotika
Hindi	Kaath ber, Ghunta, Kakora
Kannada	Yeranu
Tamil	Kottai, Mulkottai

**Scientific Classification of *Z. xylopyrus*:** [10]

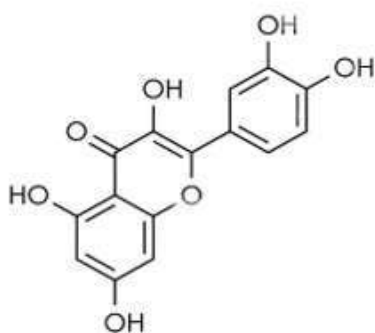
Kingdom	Plantae
Phylum	Magnoliophyta

Subphylum	Euphyllophytina
Class	Magnoliopsida
Subclass	Rosidae
Order	Rhamnales
Family	Rhamnaceae
Genus	<i>Ziziphus</i>
Species	<i>xylopyrus</i>

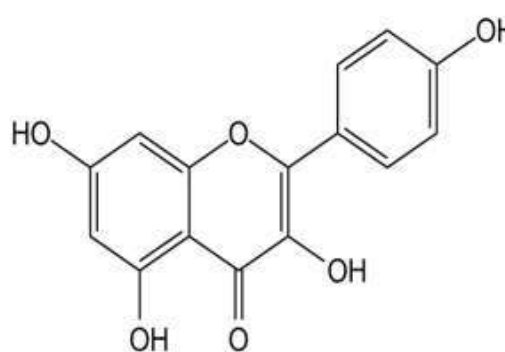
### Phytoconstituents of *Ziziphus xylopyrus*:<sup>[9]</sup>

The information of chemical constituent and medicinal uses of plant is essential to

understanding the pharmacological activity as well as to enhance the extraction procedure. A large number of compounds have been extracted from *Ziziphus xylopyrus* such as flavonoids, carbohydrates, tannins, saponin, alkaloids, glycosides, proteins and amino acid. From *Ziziphus xylopyrus*, mauritine D, nummularine B, have been isolated for the first time. Ning hua et al have isolated amphibine H, mauritine D, nummularine B and K.



**Quercetin**



**Kempferol**

**Table 1: Phytoconstituents present in different parts of *Z. xylopyrus*.**

Plant parts	Phytoconstituents
Leaves	Quercetin and quercitrin <sup>[11]</sup>
Flowers	E-4-hydroxy cinnamic acid, E-4-hydroxy-3-methoxy cinnamic acid, p-coumaric acid, ferulic acid, 5,7,3',4'-tetra hydroxy-3-O-a-L-rhamnosyl favone: quercitrin, 5,7,3',4'-tetrahydroxy 3-O-P-D-galactosyl, hyperoside, kaempferol, 3-O-rutinoside and Rutin. <sup>[11]</sup>
Fruit	3,3,4-tri-O-methyl-ellagic acid, l-leucocyanidin, vitamin C, carotene, citric acid, Oleanolic acid, sucrose and reducing sugars. <sup>[4]</sup>
Seed	Unsaponifiable matter: sterol; insoluble mixed fatty acids: myristic, linoleic and oleic acid. <sup>[12]</sup>
Stem Bark	Tannins, d-7,3',4'-trihydroxyfavan-3,4-diol, oleanolic acid, Cyclopeptide alkaloids: Amphibine H, Nummularine- K. <sup>[11]</sup>
Root Bark	Kempferol-4'-methylether and Kempferol, Cyclopeptoidal alkaloid; XylopyrineA, B, C, D, E, F, G and H, nummularine-p and sativanine-H. <sup>[13,14]</sup>
Stem wood	Triterpenoids, lupeol, betulinic acid and isoceanothic acid. <sup>[15]</sup>

### Acute oral toxicity study

The acute oral toxicity study for the aqueous and ethanolic extracts of *Ziziphus xylopyrus* was conducted on Wistar Albino rats. The study was

performed by using OECD guidelines 420. Fixed dose procedure (FDP). Up to 2000 mg/kg/body weight of the rats was used and there was no mortality or any signs of toxicity. The *Ziziphus xylopyrus* extracts of ethanol, and aqueous was



found to have more than 2000mg LD50. Hence the biological dose was fixed 100 and 200 mg/kg for both the extracts.<sup>[16]</sup>

## Medicinal uses

### Traditional Uses:<sup>[6]</sup>

The folkloric uses of *Zizyphus xylopyrus* is numerous in preclinical medicine, even though it lacks clinical evidence. Different sections of the plant have been utilized by a folk practitioner for the cure of Ailments. It is suggested that the root bark of a plant is used in various crude surgical procedures including Skin rashes along with bleeding piles, nose and mouth. The herbalists use stem bark in Stomach ache and also in cholera. The fruit boasts multiple purported uses including treating Diabetes, Stomach ache, Urinary spasm, and Female sterility. The bark and fruit are used as folk medicine for Diarrhea. The flowers and leaves tend to solve the problem of Urinary issues, Pimples and boils, and is also worn as a protective charm against snake bites. Leaves and stems Antidote for a mad dog, used in Hysteria,

Antiseptic and Headache Remedy. The seed is used for folk treatment of Diarrhea and pain after cough and cold.

### Pharmacological Uses:

Despite its extensive application in *Zizyphus xylopyrus* for various apprehensive symptoms and diseases, there have been only a few reports of pharmacological investigation conducted. It is documented to have Anti-depressant activity,<sup>[11]</sup> Anti-nociceptive, anti-convulsant and anti-inflammatory activity,<sup>[17]</sup> Anti-steroidogenic activity,<sup>[18]</sup> wound healing activity,<sup>[19]</sup> Anti-bacterial activity,<sup>[20]</sup> Anti-cataract activity,<sup>[21]</sup> Mast cell stabilization.<sup>[22]</sup> and Anti-microbial activity.<sup>[23]</sup>

### Ayurvedic properties:<sup>[9]</sup>

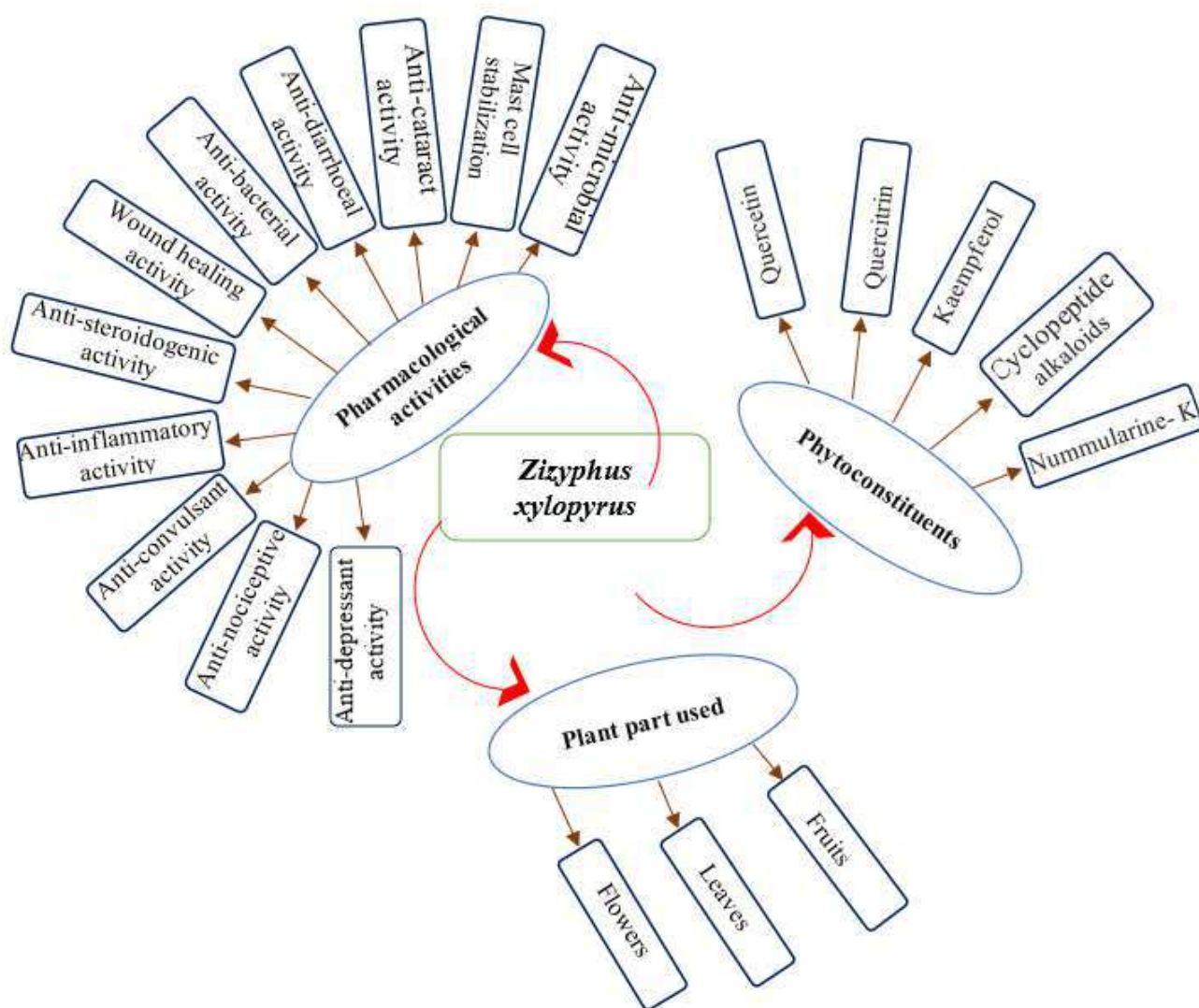
Rasa: Madhura

Guna: Laghu

Virya: Usna

Vipaka: Katu

Karma: Visghma, Vatakaphahara



**Figure 5: Pharmacological activities, plant part used, and phytoconstituents of *Zizyphus xylopyrus***

### Economic importance:<sup>[24]</sup>

The wood of the tree is yellowish-brown in colour, hard and durable in quality. It is mainly used as fuel. The fruits and bark are used in tanning. The leaves are used as fodder. The kernel, not the pulp, of the fruit is consumed by people.

### RESULTS AND DISCUSSION

The analysis for *Zizyphus xylopyrus* indicates huge medicinal promise which is already corroborated by its existing pharmacological applications and traditional uses. Sufficient preliminary

pharmacological research on the taxonomy would suggest that the phytochemicals of the plant are bioactive like xylopyrine A and B novel alkaloids, quercetin, oleanic acid, tannins, and quercitrin. The steps of traditional medicine that the plant is used for are very wide and include diabetes, stomach ache, urinary problems, and skin rashes. Though scant, the pharmacological research available suggests some degree of broad therapeutic promise via antisteroidogenic, anticonvulsant, antinociceptive, anti-inflammatory, antidepressant, antidiarrheal, Antibacterial activity, Anti-cataract activity, Mast cell stabilization, Anti-microbial activity and Wound

healing activity. The toxicological research conducted on rats demonstrate that *Ziziphus xylopyrus* extracts are non-toxic up to 2000 mg/kg body weight, making it safe.

### Future Directions

Further *Ziziphus xylopyrus* research should concentrate on proving the traditional claims and pharmacological activity in human subject clinical trials. Moreover, an in-depth analysis of the bioactive compounds will likely result in new therapeutic agents. Understanding its action mechanism, modifying the extraction processes, and/or seeking its role in developing new drugs can greatly increase its therapeutic uses.

### CONCLUSION

It is worth noting that *Ziziphus Xylopyrus* has significant medical potential considering the active biological principles such as flavonoids, alkaloids, and tannins present in it. Moreover, over the years, it has been employed traditionally for diabetes, digestive disorders, and skin related problems. Pharmacological investigations adduced its antisteroidogenic, anticonvulsant, antinociceptive, anti-inflammatory, antidepressant, antidiarrheal, Anti-bacterial activity, Anti-cataract activity, Mast cell stabilization, Anti-microbial activity and Wound healing activity. Toxicology studies have shown safety at elevated doses in animals, but further studies are needed to determine effectiveness and safety in human. Further examination of the compounds may lead to new drug discoveries.

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