

# A Comprehensive Review of *Zanthoxylum* with its Medicinal Application and Phyto-Chemical Composition

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## ABSTRACT-

*Zanthoxylum armatum* of the Rutaceae family has a significant healing factory which is frequently called as Toothache tree, Indian Prickly Ash or Nepal Pepper. Original names of this factory are Timur (Nepal), Tejowati (Sanskrit), and Tejphal (Hindi). *Zanthoxylum armatum* DC. is a medicinally important evanescent shrub from the family Rutaceae, astronomically set up in the Eastern and Southeastern Asia. It's aboriginal in the Himalayas, Jammu and Kashmir, Andhra Pradesh, and numerous other places in India and is a pivotal species of the medicinal shops. The factory's stem dinghy has been described as a great source of medicinal composites and is used as an anti-diabetic, antioxidant, and anti-inflammatory. This factory is substantially a treatment for stomachic, toothache, carminative, antiseptic and casket infections. This report has handed information about its botanical bracket, phytochemical and pharmacological characteristics of *Z armatum*. Ethanolic and petroleum ether excerpt were prepared by Soxhlet birth process. The analgesic exertion was carried out by Tail film, Tail absorption and Hot plate system. Anti-inflammatory exertion performed by carrageenan convinced paw edema. Crude methanol excerpts of fruits, seeds, and dinghy of *Zanthoxylum armatum* were looked for in vitro for the antimicrobial conditioning against 9 different bacterial strains using agar well proximity system.

**Keywords:** *Zanthoxylum*, toothache, analgesic, antidiabetic, bacterial

## **INTRODUCTION-**

Before the discovery of synthetic drugs, humanity relied on the medicinal properties of herbal medicines. These botanical resources are largely esteemed by many people for the reason that plants have been believed to be naturally intended to nourish, doctor, and serve humankind in various other ways. The products of flora, fauna, and minerals constitute the very basis of the treatment of a wide range of human diseases. In the absence of plants, humans and other living organisms would not be able to maintain a sustainable existence. Traditionally, herbalist's especially medicinal herb specialists, have identified and exploited the potential of plants in their surroundings for clothing, fuel, food and shelter gaining a level of awareness of their properties. In fact, the therapeutic use of medicinal plants to treat illnesses can be historically traced all the way back to the earliest records of human existence; because since the dawn of mankind, people have sought to find remedies in their surroundings for recovery from diseases, and so, it has placed an exclusive reliance on plants as a source of medical treatment. Of those plant species, more than ten percent of species are used in pharmaceutical and cosmetic preparation- in excess of 50,000 species. Medicinal plants around the globe are not uniformly distributed geographically, and medicinal herbs are predominantly of wild origin.<sup>[1][2]</sup>

*Zanthoxylum armatum* DC, also known as winged prickly ash or Timur, is an erect tree or shrub of the Rutaceae family that occurs in the Himalayan range between 1000 to 2100 m, and the lesser Himalayan ranges of north-eastern India and Andhra Pradesh and the eastern Ghats of Orissa, usually at about 1200 m sea level. The genus *Zanthoxylum*, to which *Z. armatum* belongs, has been used to treat diseases like gastralgia and odontalgia, helminthiasis, envenomation by serpents, rheumatism, scabies, pyrexia, and cholera. It is also used in dentifrices because of its deodorizing, disinfecting, and antiseptic properties. Studies conducted on the extracts of *Zanthoxylum* have shown good antibacterial and antioxidant activities. High concentrations of linalool as a volatile oil have been reported for seeds of *Z. armatum*. For the full- fillment of commercial demand and for the improvement of the conservation status of the species, tissue and cell culture methods are an accelerated way to propagation.<sup>[3]</sup>

Among the vast medicinal floras existing in the Indian Himalayan Region, IHR, the genus *Zanthoxylum* is one that shows importance medicinally, economically, and ecologically, with around 250 species reported world over. In the Indian sub-continent, eleven species of this genus have been reported. Among them, four species; *Z. armatum* DC., *Z. acanthopodium* DC., *Z. oxyphyllum* Edgew, and *Z. budrunga* are available in the geographical boundary of Uttarakhand.<sup>[4]</sup>

Although the species is very important, yet an exhaustive and comprehensive review on *Zanthoxylum armatum* is still lacking. Thus, it has made an effort to collect any scattered data related to *Zanthoxylum armatum* with regard to its applications, phytochemical properties, pharmacological aspects, and evaluation of existing knowledge and future directions that could be followed for the betterment of rural communities in general. Hence, validation of the ancient ethno-medicinal practices against the conventional knowledge systems and modern research

techniques is basically crucial. In all probability, therefore, the information compiled herein would be of immense value to all concerned, students, and researchers alike, for further researches in the area.<sup>[5]</sup>



**Fig-1. Fruits of *Zanthoxylum armatum***



**Fig-2. Leaves of *Zanthoxylum armatum***

### **TAXONOMY:**

The table below shows the taxonomical classification of *Zanthoxylum armatum* <sup>[6]</sup>:

<b>Family</b>	Rutaceae
<b>Species</b>	<i>Z. armatum</i>
<b>Genus</b>	<i>Zanthoxylum</i>
<b>Order</b>	Sapindales
<b>Kingdom</b>	Plantae
<b>Division</b>	Tracheophyta
<b>Class</b>	Angiosperms

### **CHEMICAL CONSTITUENT –**

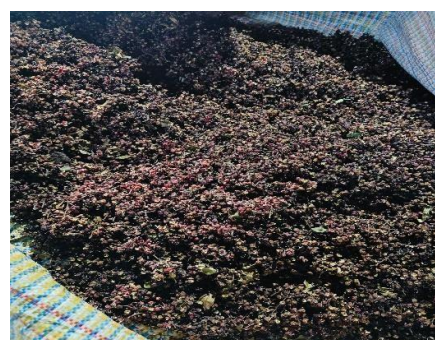
Phytochemical constituents that are found in various parts of *Zanthoxylum* are sterols, alkaloids, phenolics, coumarins, lignins, flavonoids, terpenoids and their glycosides and benzenoids, fatty acids, alkenic-acids, amino acids.<sup>[7][8]</sup> The table below shows the phytochemical present in *Zanthoxylum* with their sources:

<b>S.NO</b>	<b>Phytochemical</b>	<b>Source</b>
1.	Terpenoids	Seed, fruit, bark, leaf oil, pericarp of fruit, dry fruit, aerial part
2.	Alkaloids	Bark, Root, seed oil, parts not specified
3.	Sterols & Steroids	Bark, Seed, seed oil

4.	Lignins	Bark, parts not specified
5.	Flavonoids	Bark, Seed, parts not specified
6.	Coumarins	Bark, seed oil
7.	Amides	Bark
8.	Carbonyl Compounds	Fruit, Seed, leaf oil, aerial part
9.	Aromatic Compounds	Seed, Bark, seed oil, leaf oil, parts not specified



**Fig.3 Dried Seed of Zanthoxylum**



**Fig.4 Dried Seed of Zanthoxylum**

### **PHARMACOLOGICAL ACTIVITIES-**

*Zanthoxylum* contents many therapeutical effects. Its chemical components and crude extracts have powerful biological activities in vivo and in vitro. *Zanthoxylum* exhibits activities like larvicidal activity, antioxidant activity, hepatoprotective, insecticidal, anti- bacterial, anti-infectious, anti-viral, hypoglycemic, anti-tumor, hypolipidemic, analgesic, and anti-inflammatory.<sup>[9][10]</sup>

1. Larvicidal Activity: The essential oil from the seeds of *Zanthoxylum armatum* yields 28 compounds which are used against three mosquito species viz; *Culex quinquefasciatus*, *Anopheles stephensi* and *Aedes aegypti*.<sup>[11]</sup>
2. Antioxidant Activity: Ethanol extract of stem bark of *Zanthoxylum* shows antioxidant activities.<sup>[12]</sup>
3. Hepatoprotective: Ethanol extract of leaves of *Zanthoxylum armatum* exhibits vital hepatoprotective activity.<sup>[13]</sup>
4. Insecticidal: The essential oil of *Zanthoxylum* works as natural insecticides against mosquitoes.<sup>[14]</sup>
5. Antibacterial: The extracts and monomer components of *Zanthoxylum* have broad-spectrum of antibacterial activity.<sup>[10]</sup>
6. Anti-inflammatory: Extracts and the compounds derived from *Zanthoxylum* such as flavonoids, amides, alkaloids, phenylpropanoids and volatile oils exhibit anti-inflammatory properties.<sup>[10]</sup>

7. Analgesic: *Zanthoxylum* and its active ingredients shows analgesic effects by the mechanism of signal transduction.<sup>[10]</sup>

Anti-tumor: Various parts of the *Zanthoxylum*, including its roots, stems, leaves and fruits, and its individual components extract possess a wide-range of anti-tumor effects and inhibit the growth and proliferation of various tumor cell lines.<sup>[10]</sup>

8. Hypoglycemic: *Zanthoxylum* and their active ingredients exert hypoglycemic effects by regulating glucose and lipid metabolism and inhibiting  $\alpha$ -glucosidase.<sup>[10]</sup>

9. Hypolipidemic: *Zanthoxylum* and its extract from fruit, bark, and leaves exhibit hypolipidemic activity. It decreases LDL levels and improve cholesterol, triglycerides, urea, creatinine, and blood haemoglobin.<sup>[10]</sup>

10. Anti-viral: *Zanthoxylum* and its chemical constituent such as alkaloids and collinin exhibits inhibitory effects on viruses.<sup>[10]</sup>

11. Anti-infectious: *Zanthoxylum* contains a range of pharmacological active compounds which can combat against infections.<sup>[10]</sup>

In addition to the pharmacological activities mentioned earlier, *Zanthoxylum* also possesses other pharmacological activities such as anti-platelet aggregation<sup>[15][16]</sup>, neuroprotection<sup>[17]</sup>, cardio- protection<sup>[18][19]</sup>, digestive system protection<sup>[20][21]</sup>, and skin protection<sup>[22][23]</sup>.

## **CONCLUSION-**

It is proposed that medicinal flora act as a cornerstone for medicine discovery and are responsible for both the ancient medicines as well as modern ones, due to their active constituents. The following review highlights the recent details of *Zanthoxylum armatum*. The essential oils obtained from *Z. armatum* have remarkable antibacterial, antifungal, and anthelmintic activity. The essential oil isolated from the seed of *Zanthoxylum armatum* shows significant antimicrobial potency. There has been significant antibacterial, antifungal, and anthelmintic activity exhibited by the essential oils of *Z. armatum*. Each one of these botanical constituents possesses major medicinal importance. This review is expected to serve as a research guide towards developing new agents with therapeutic and agro-industrial applications, which are based on bioactive chemical compounds derived from indigenous plant species as a natural alternative to synthetic chemical agents.

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