

## A Mini Review on a *Pistacia Integerrima* Well-Known Medicinal Plant: its Active Phytochemicals with Exciting Pharmacological Profile

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### Abstract

*Pistacia integerrima* (Anacardiace), is well-known medicinal plant, commonly known as kakarsinghi. *P. integerrima* as a medium sized deciduous tree that can achieve a height of 40 feet distributed in the eastern Himalayan range from Indus to Kumaon. *P. integerrima* is used as a folk medicine for treatment of different ailments including; hepatitis, liver disorder, anti-inflammatory, antidiabetic agent, blood cleanser, gastrointestinal disorders, cough expectorant, jaundice, stomach aches, fever and diarrhea. *P. integerrima* comprise various active phytochemicals such as, pistagremic acid (PA), pisticianstenoic acid, n-octadecan-9, 11-diol-7-one, hydroxydecanyl arachidate, pistiphloro-gluciny ester, 2, pistaciaphenyl ester, 3 and pistiphlorogluciny ether, 4. Present review critically evaluates the traditional uses, phytochemical screening, chemical constituents, and pharmacological profiling of *P. Integerrima*.

**Keywords:** *Pistacia integerrima*, Pharmacological Profile; Phytoconstituents; Traditional Uses

### Introduction

*Pistacia integerrima* is also known as Kakar singhi, which belong to Anacardiaceae family. It is found in the India, Pakistan [1] at a height range from 12000 to 8000 feet. *P. integerrima* is a single stemmed, multi-branched, deciduous tree, up to 25 m tall [2].

*P. integerrima* is typically asiatic and shows a preference for dry slopes with shallow soils. *P. integerrima* does not tolerate fire and is strongly susceptible to acidic soils area. *P. integerrima* is wind firm, termite resistant, frost hardy and moderately drought resistant. *P. integerrima* well drained deep entisols and inceptisols and is tolerant to heavy clay soils [3].

long and 1 to 3 inch broad, they are ovate shaped and are present in pairs. Leaves are pinnate (frequently paripinnate) and bearing 2 to 6 pairs of lanceolate, long leaflets. The terminal leaflet is much smaller than the lateral ones or even reduced to a mucro, inflorescence red. The fruit are shiny, globular, apiculate and 5 to 6mm in diameter. The fruit arises in early summer, brown in colour and become purplish or blue at maturity. The fruit have bony endocarp and after maturity followed by fruiting [4,5].

### Reproductive biology

It is a dioecious tree shedding its leaves during the dry season is wind pollinated. *P. integerrima* give flowers from March to May and fruit from June to October. *P. integerrima* is interbred with *Pistacia atlantica*. The wilding, direct seed sowing and use of stumps are used to propagate the tree [4].

### Galls of *Pistacia integerrima*

The galls are horn-like excrescences caused by a kind of insects (aphis) on the leaves, petioles and branches. They are hard, hollow, thin-walled, generally cylindrical, tapering to either extremity [6]. On breaking open the galls, a reddish inner surface is seen and appears to be covered with dust but actually the debris of the insects and their excretory substance [7].

### Distribution and habitat

Natural distribution is obscured in native Asia temperate zones (Afghanistan), Asia tropical (India, Pakistan, Nepal, and Indochina) and United states of America [8]. Its plant requires dry slopes with

**Figure 1:** *Pistacia integerrima* Stewart ex Brandis.

### Botanical description

*P. integerrima* tree has low, dense crown base and roots deeply. Single stemmed. The bark is light brown colour. Leaves 6 to 9 inch

shallow soils and in valleys along rivers at 2400 m. The tree does not tolerate fire and is strongly susceptible to acidic soils. However, it is termite resistive, frost hardt, and moderately drought resistant. Found it 1200 to 8000 feet height [9].

### Traditional uses

*P. integerrima* as a medicinal plant used for the treatment of different diseases. The galls are used as a folk medicine for the treatment Cough, Phthisis, Asthma, Fever, Want of appetite, Irritability, Infantile diarrhea, Gastro-intestinal troubles during teething, Psoriasis, Suppress bleeding from nose, Discharge from mucous membrane such as gleet, leucorrhoea etc, Also used as antidote to snake-venom and scorpion-sting in various region of Pakistan and India [10-12]. In India *P. integerrima* galls is used for the treatment of various ailments of the respiratory tract and dysentery. The galls are also used in vomiting, and appetite. It is considered very effective in pulmonary affections. Pharmacological oil extracted from *P. integerrima* is used as a carminative. In moderate doses, it has an antispasmodic action on involuntary muscles inhibiting excessive peristaltic movements of intestine [13]. The oil has a slight irritant action on the skin and mucous membrane. It shows extracted from the title plant have antibacterial and antiprotozoal activities. The oil is reported to possess CNS-depressant activity [13].

### Phytochemicals constituents

In Pakistan, the galls *Pistacia integerrima* are used as a fold medicine for the treatment of hepatitis and liver disorders [3]. *Pistacia integerrima* different parts such as leaves, bark, roots and galls contain different classes of secondary metabolites. The galls extract is common practice in folk medicine which revealed the presence of alkaloids, terpenoids, flavonoids and tannins. The bark

showed the presence of terpenoids, flavonoids and the leaves and roots extracts contain the terpenoids and tannins [3].

Previous reported of *P. integerrima* showed that different class of chemical constituents have been isolated such as n-decan-3'-ol-yl-n-eicosanoate, n-octadecan-9,11-diol-7-one and 3-oxo-9 $\beta$ -lanost-1,20(22)-dien-26-oic acid along with the known compound  $\beta$ -sitosterol [14].

Pistagremic acid (PA) is bioactive compound isolated from the title plant are responsible for its folk use in diabetes. Pistagremic acid isolated from the galls of *P. integerrima* also showed  $\alpha$ -glucosidase inhibitory potential [15]. The Pistagremic acid has also potent enzyme inhibitory activity. Pistagremic acid showed potential activity against yeast and rat intestinal  $\alpha$ -glucosidases. Pistagremic acid was found to be more than 12 times more potent an inhibitor against mammalian (rat intestinal) enzyme as compared to the microbial (yeast) enzyme. Galls, leaves and bark of *Pistacia integerrima* are used in the traditional medicine for the treatment of fever, cough, asthma, diarrhea, jaundice, and snake bites from which interesting compounds such as Tetracyclic triterpenoids from galls of *P. integerrima* have been isolated. Pistagremic acid also showed significant leishmanicidal activity against Leishmania major as earlier available from literature [18]. Literature revealed that phenolic compounds such as Pistiphloro-gluciny ester, 2, Pistaciaphenyl ester, 3 and Pistiphlorogluciny ether, 4, are also reported from *Pistacia integerrima* [16]. Two new source flavonoids namely with excellent phosphodiesterase-1 inhibitory potency have been documented from galls of *P. integerrima* [17].

Chemical structure of some isolated compounds from *P. integerrima* is given below.

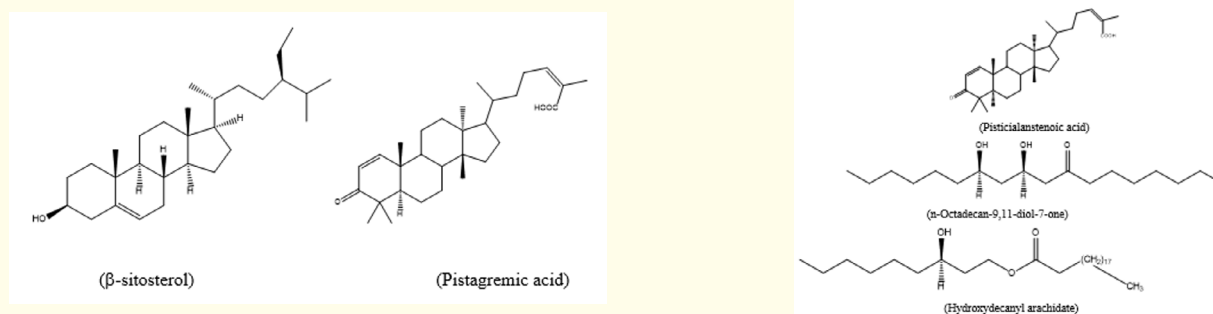


Figure 2

### Phytochemical profile

Phytochemical profiling is an important for isolation of new and novel compounds. *Pistacia integerrima* different parts such as leaves, bark, roots and galls contain different classes of secondary metabolites. It has been reported previously that the galls extract is common practice in folk medicine for the treatment of various diseases. *Pistacia integerrima* galls contain alkaloids, terpenoids, flavonoids and tannins. The bark extract of the title plant contain terpenoids, flavonoids whiles the leaves and roots extracts contain terpenoids and tannins [3].

### Pharmacological profile

#### Radical scavenging activity (DPPH)

Antioxidant, compounds makes the medicinal plants ideal candidate for the triad of ailments: hyperuricemia and gouty arthritis. It is reported that Ethyl acetate and Butanol fractions of *P. integerrima* has enriched with monoglycosides and polyglycosides which showed higher antiradical activity as compared to aqueous and ethanol extracts. The active phytoconstituents isolated from *P. integerrima* extract showed good antioxidant activity. The flavonoids and phenolic compounds present in the extracts of *P. integerrima* leaves have significant radical scavenging and xanthine oxidase inhibitory activity [18]. The antiradical properties of crude extract and various isolated fraction may due to the presence of phenolic compounds present in the extract [19,20].

#### Anti-inflammatory activity

*P. integerrima* is used as in folk medicine as an anti-inflammatory agent. It is reported that aqueous and ethanolic extracts of *P. integerrima* possess anti-inflammatory action. The extracts of *P. integerrima* leaves showed good reply against chemical pain induced by acetic acid but it was less than galls extract and diclomethane. The leaves extracts of *P. integerrima* did not show antinociceptive properties. The galls extract had 40.45% MPE ( $P < 0.05$ ) responses at a dose of 200 mg/kg. It is concluded that central analgesic effect of *P. integerrima* constituents is less marked because paw licking behavior is more affected by opioids. The galls extract had moderate activity against acute and chronic inflammation produced by formalin whereas leaves (200 mg/kg) exhibited response in chronic inflammatory pain only.

Phytochemical studies have revealed the presence of various class of bioactive compounds which is responsible for it activity [21].

#### Antidiarrheal assay

*Pistacia integerrima* is used as antidiarrheal agents in traditional medicinal system of Pakistan and India. It is reported that the crude Methanolic extract of *P. integerrima* at a dose of 100 mg/kg

exhibited excellent anti GIT motility influence. Generally it is proposed that the anti GIT motility of crude extract of bark of the title plant may be due to the blockage of muscarinic receptors in the GIT tract. Preliminarily studies showed that antidiarrheal and antidiarrheal properties of medicinal plants were due to the presence of tannins, alkaloids, saponins, and sterols. Phytochemical profiling of *Pistacia integerrima* showed the presence of tannins, sterols, alkaloids as earlier reported [3], therefore these secondary metabolite may be responsible for anti GIT motility potential of *Pistacia integerrima* [22].

#### Toxicity profiling

The literature studies showed that *pistacia integerrima* has a medical plant and not toxicity but some of experimental results available in literature indicate that high dose of extract are toxic. It has been reported that present cumulative death of experimental mice, subjected to crude extracts of *P. integerrima* bark at a dose of 500, 1000 and 1500 mg/kg for toxicological screening indicated that crude extract was safe at a dose of 1000 mg/kg body weight when administered. Still when administered at high dose of 1500 mg/kg it exhibited toxicity and caused 66.6% deaths mice, therefore at a dose of 1500 mg/kg it was reflected to be toxic [22]. It has reported previously that saponins causes hemolysis of red blood cells. The preliminary phytochemical screening results of *Pistacia integerrima* exposed the presence of saponins [3], therefore at high concentration the toxic effect of *P. integerrima* may be correlated due to the presence of high quantity of saponins.

#### Analgesic profile

The literature studies showed that pistacia integerrima bark possess analgesic properties. It has reported that the bark of *P. integerrima* showing its analgesic effect. The analgesic ability of traditional medicine treatment are recognized through biologically active compounds which are the secondary metabolites of plants such as flavonoids, glycosides, tannins, alkaloids, saponins which account for therapeutic properties of the plants like analgesic, anti-inflammatory and antipyretic. Some studies reported that, flavonoids are known to target prostaglandins involved in acute inflammation and pain perception and flavonoids have therefore been regarded with analgesic, anti-inflammatory and antipyretic activities [22]. Since the phytochemical screening of *P. integerrima* indicted the presence of flavonoids [3], so therefore it is concluded that the analgesic effect may be correlated due to the presence of flavonoids.

#### Conclusion

Wide literature studies exposed that *Pistacia integerrima* has a long history of traditional uses as a folk medicine for treatment of

different ailments. It has been proved experimentally that *P. integerrima* possess the properties such as liver disorder, Cough, Phthisis, Asthma, Fever, Want of appetite, Irritability, any conditions of respiratory tract, Infantile diarrhea, Gastro-intestinal troubles during teething, Psoriasis, Suppress bleeding from nose, Discharge from mucous membrane, radical scavenging activity (DPPH), Anti-inflammatory, Antidiarrheal, Analgesic properties. In recent years, stress of research has been employing on medicinal plants which has been used as traditional medicines for treating various ailments. Its appear from literature that a little work as available on phytochemical side of the title plant further extensively studies has need explore potential chemical constituents which may be a good candidate in treating disease.

### Conflict of Interest

There is no conflict of interest associated with the authors of this paper.

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