



Karkatshringi (*Pistacia Integerrima*): A Review on Functional and Pharmacological Properties

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ABSTRACT:

Karkatshringi (*Pistacia integerrima*) is a vital ayurvedic medicinal plant belonging to the family Anacardiaceae. It has been widely known for its effective medicinal use and it is commonly used in pediatric diseases. Ayurveda, Siddha, and Unani systems of medicine have been utilizing this herb for the treatment of various diseases. The plant sprung in India and is found in the ranges of the north-western Himalayas. It is distributed over China, Afghanistan, Pakistan, and Nepal. This plant has a tiny, red flower. The fruits of this plant are shiny and brown in colour. Galls of a planet are used for medicinal purposes and are hollow, horn-shaped, and bitter. The different parts of the plant contain a large amount of alkaloids, tannins, anthraquinones, glycosides, reducing sugar, saponins, flavonoids, steroids, terpenoids, anthocyanins, and phenols. *Pistacia integerrima* is conventionally effective against rheumatic pain and has analgesic, and antipyretic effects. LC-MS, NMR, and IR spectroscopy were used to examine the structural explanations of the isolated compound.

Karkatshringi is an essential ayurvedic ingredient found in formulations like Chavyanprasa, Dashmularista, and Shringyadi Churna. These formulations are mainly used for pediatric diseases. *Pistacia integerrima* galls also show anti-diarrhoeal activity. It is also used for diabetic patients. Generally, the secondary metabolites present in the plant such as steroids, flavonoids, tannins, saponins, and phenols show activities including antimicrobial, anticancer, anti-inflammatory, antifungal, etc.

Keywords: *Pistacia integerrima*, morphology, physicochemical analysis, angiogenesis.

Introduction:

Karkatshringi is regarded as the most significant medicinal plant in Ayurveda. It is widely known for its use in pediatric diseases. In general, pediatric diseases are treated with the galls of *Pistacia integerrima*. It is a significant medicinal plant that has been used for treating asthma, coughs, and dysentery in the past. The karkatshringi is a broad-leaved, medium-sized tree that grows in Nepal, China, Afghanistan, Pakistan, Armenia, and the northwest and west Himalayan ranges. It is a deciduous tree that grows at an altitude of 800-1900m. The *Pistacia integerrima* tree, a member of the Anacardiaceae family, has many branches with broad leaves. It falls under the *Pistacia* genus. There are roughly 70 genera and 600 species in the genus *Pistacia*. The Persian name of *Pistacia integerrima* is Pesteh and means green almond in English. *Pistacia integerrima* is also called as zebra wood. When the bark is pierced, the scented liquid is released. An insect known as *Dasia asdifactor* produces the galls. This insect produces a horn-like shape that grows on the branches and leaves of the herbs, known as karkatshringi. Secondary metabolites like steroids, flavonoids, tannins, saponins, and phenols are believed to be stored in the galls. Galls are produced by an insect called *Aphis* which is present on the leaves and petioles of the plant. Galls are hollow from inside and hard in structure while it is a horn-like structure. Galls are sized of about 2.5 to 30.0cm. Gall's content is mostly useful in the Indian medicine system. It contains various phytoconstituents such as alkaloids, tannin, saponin, flavonoids, steroids, terpenoids, phenols, pistacieonic acid, gallic acid. *Pistacia integerrima* galls are used to treat leucorrhea, skin diseases, allergies, dysentery, hiccups, stomach issues, fever, and problems concerning the nervous system. The analgesic and anti-inflammatory drugs particularly record their characteristic using suppressing cyclo-oxygenase (COX) pathways of arachidonic acid metabolism responsible for prostaglandin synthesis. Biosynthesis of golden nanoparticles (Au-NPs) which have been developed using UV-Vis spectroscopy, Fourier transformation infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). Bronchial asthma is an emerging international difficulty. It can affect anyone, regardless of age, unhealthy eating habits, stressful lives, economic circumstances, and so on. Gall produced by an average tree of 15-20 years old is

0.40 kg. Shringyadi Churna works properly for bronchial allergies. Shringyadi Churna is properly useful for bronchial allergies. *Pistacia integerrima* has an anti-asthmatic activity. *Pistacia integerrima* is used as an antihyperglycemic agent associated with diabetes. Chyawanprash is formulated with *Pistacia integerrima* galls used for the gastrointestinal system, immune system, and many others.



Pistacia Integririma Galls

Vernacular Name:

Latin name – *Pistacia integerrima*

English name – Crabs Claw and Zebra wood

Sanskrit name- sringi, karkatsringi, kulir vishanika, ajsringi, karkatakhya Urdu name – Kakarasingi

Hindi name – Kakadasrangi Panjabi name – kakar, kakarsingi

Kannada – kakadshingi

Marathi – kakadshringi, karkatshringi.

Taxonomical position:

Kingdom: Plantae Phylum: Tracheophytes Division: Angiosperm Subdivision: Eudicots Class: Rosids

Order: Sapindales

Family: Anacardiaceae Genus: *Pistacia* Species: *P. integerrima*.

Binomial name: *Pistacia integerrima*

Medicinal Properties:

1. Taste – bitter and astringent
2. Physical properties – Dry
3. Qualities – Light to digest
4. Potency – Hot
5. Metabolic property (after digestion) – Pungent.
6. Pharmacological action – Astringent, Expectorant, Stimulant.

Distribution:

It is a native of China and Japan. But also found in England. In India, it is grown in North- West Himalayas (Indus to Kumaon) at 350 to 2500 m. and in the Punjab plains.

Morphology:

Pistacia integerrima is a multi-branched deciduous tree that grows to be about 40 meters tall. Each leaf is 25 cm long and 1 to 3 inches wide, with ovate-shaped lanceolate leaflets and 2 to 6 leaflets. This tree's bark is grey or light brown.

Flowers are small, reddish, and dioecious. Yellow or brownish flowers are 0.2 cm wide. When mature, the fruits are globular, shiny, purplish-blue in colour, and 5-6 mm in diameter. Galls on tree leaves are produced by an insect called Aphis (*Dasia asdifactor*), which lives inside the tree and absorbs its juice. This insect makes horn-like structures that are hollow on the inside. It has a greyish-brown exterior and a reddish-brown interior. The galls range in length from 2.5 to 30 cm.



Chemical Constituents:

It contains about 60% tannin and 1.2% volatile oil. The karkatshringi contains various chemical compounds, commonly in its galls, consisting of tetracyclic triterpenes, resin, pistacieonic acids A and B, essential oils, camphene, caprylic acids, cineol, α -pinene, and others. Oil is laevorotatory, which indicates that it incorporates hydrocarbons. It includes positive phenolic compounds specially pistiphlorogluciny ester, and Pistacia phenyl ether. Leaves and bark are rich in tannin. Seeds contain amino acids, triterpenoids, proteins, sterols, and dihydromalvic acid. The galls contain pistagremic acid which acts as a natural terpene inhibitor of β -secretase.

Indigenous uses:

Pistacia integerrima is used in ethnobotany for a variety of purposes, including scorpion sting, among others. In these circumstances, galls can be boiled in water or roasted with honey and consumed orally. A decoction of the bark is administered to people who have hepatitis or jaundice.

Pistacia integerrima is a valuable ethnobotanical plant, and its parts can be used for a variety of things, including firewood and fodder. To treat medical conditions like asthma, dysentery, cough, vomiting, and other related issues. Resin is present in the stem as it promotes wound healing. To treat medical conditions like asthma, dysentery, cough, vomiting, and other related issues. It is orally consumed after being boiled in water in their bark.

In Pakistan, galls are used to treat liver diseases or hepatitis. Galls are mixed with other medications that are effective against scorpion and snake bites. Additionally helpful for vomiting, diarrhoea, and loss of appetite. When cooked with water or honey, galls are given orally to treat this condition. *Pistacia integerrima* galls are the most useful part to treat asthma, loosening of the intestines, diarrhoea, dryness of the nose, and fever. The concentrated plant is used in the treatment of domesticated animal disease. It shows the action against nectar to crack down on asthma. Galls are also effective for pain relief, alleviating hyperuricemic impact and depression.



Medicinal uses:

It is an important healing herb that has traditionally been utilized to treat dysentery, cough, and asthma. The central nervous system is depressed by the *Pistacia integerrima* galls, which causes a decrease in heart rate, a decrease in breathing rate, and a loss of consciousness. Karkatshringi is a spermatogenic herb used to increase vigor and vitality. *Pistacia integerrima* galls powder is marketed as churna, which is most commonly used in pediatric diseases such as fever, vomiting, diarrhoea, and respiratory diseases.

Pistacia integerrima galls powder is sold under the brand name Shringyadi Churna and is used to treat asthma. In addition, Chyawanprash is a preparation of *Pistacia integerrima* galls that have digestive, a bronchodilator, and antitussive properties. It has been used to treat a variety of conditions, including blood purifiers and gastrointestinal disorders such as vomiting, diarrhoea, expectorant, cough, asthma, and fever. Because of its antioxidant properties, *Pistacia integerrima* leaf gall extract is used in medicinal health, functional food, and nutraceutical applications.

Pharmacological action:

Karkatshringi is a crucial medicinal plant, and its galls are used in traditional Indian medicine to treat asthma, chronic bronchitis, phthisis, diarrhoea, fever, and other reported activities such as antispasmodic, carminative, antiamoebic, and anthelmintic. It has phytotoxic, antibacterial, anti-cancer, anti-inflammatory, anti-asthmatic, anti-diarrheal, anticonvulsant, and antioxidant properties.

- 1. Antibacterial activity:** *Pistacia integerrima* Gall's extracts have higher antibacterial activity than other parts of the plant. The karkatshringi inhibits the growth of *E. coli* bacteria and vibrio cholera. The diffusion method is used to achieve the antibacterial activity. As a medium, agar is used. The culture is taken in triplicate and incubated at 37 degrees Celsius for 24 to 72 hours. Following the incubation period, the diameter of the zone of inhibition of microbial growth on the plate was measured in millimeters (mm). *Staphylococcus aureus* is resistant to the bark's antibacterial properties. The presence of active constituents in gall aqueous extract increases anti-bacterial activity. In a 200L concentration, the ethanolic gall extract inhibited *Bacillus subtilis* with a maximum zone of inhibition of 25mm. *Proteus Vulgaris* is a type of *Proteus*. *Bacillus subtilis* is a Gram-positive spore formed by bacteria caused by food spoilage. *Bacillus subtilis* spores are difficult to kill, but *P. integerrima* completely inhibits bacterial growth. Au-NPs were tested for antibacterial activity against *Klebsiella pneumoniae*, *Bacillus subtilis*, and *staphylococcus aureus* as well as an antifungal activity using the agar well diffusion method.
- 2. Phytotoxic Activity:** Phytotoxic activity can be used to develop herbicides. Allelochemical is formed by the extract of plant tissue or decomposing of a dead organ in the environment. These allelochemicals act as secondary metabolism in the plants which is known to have allelopathic effects on other plants. This chemical inhibits the growth of weeds without any effects on the main crop. The phytotoxic activity is shown by ethyl acetate with 90% growth inhibition, chloroform with 70% growth inhibition, and methanol with 60% growth inhibition at the concentration of 500ppm.
- 3. Chemotherapeutic Activity:** *Pistacia integerrima* galls have anticancer properties. The crude extract of *Pistacia integerrima* has cytotoxic activity against the human bosom growth cell line Michigan Cancer Foundation-7. The crude extract of this plant's stem is effective against antitumor activity. The methanol extract of *pistacia integerrima* acts against the MCF-7 human breast cancer cell line. Gold particles are reduced and stabilized by Soursop and exhibited greater inhibition against breast cancer cells. The cell was maintained in Dulbecco Modified Eagle Medium (DMEM) supported with fetal bovine serum (FBS), penicillin, streptomycin, and L-glutamine at the temperature of 37°C, humidity of 95%, and under 5% CO₂. The *pistacia integerrima* galls extract in a different solvents like hexane, chloroform, and ethyl acetate fractions are used against human cervical cancer (HeLa) and baby hamster kidney (BHK-21) cell lines. *Pistacia integerrima* methanol extract inhibits the growth of the MCF-7 human breast cancer cell line. Soursop reduces and stabilizes gold particles, resulting in greater inhibition of breast cancer

cells. The cell was grown in Dulbecco Modified Eagle Medium (DMEM) supplemented with foetal bovine serum (FBS), penicillin, streptomycin, and L-glutamine at 37°C, 95% humidity, and 5% CO₂.

4. **Anti-inflammatory Activity:** Reducing inflammation by acting on body mechanisms. The study of a compound that is isolated from chloroform fraction of the galls is Flavonoids which act against anti-inflammatory during various assessment times. The anti-inflammatory potential of pistacia integerrima against carrageenan-induced paw edema. The methanolic extract of Pistacia integerrima galls determines the anti-inflammatory activity on the animal model by the in-vivo method. It possesses anti-inflammatory activity in acute and chronic phases of inflammation. In that condition formalin-induced in the rat's hind paw. The gall extracts had significant protection against thermal-induced algnesia in a dose-dependent way.
5. **Anti-asthmatic Activity:** It is used to prevent asthma attacks. *Pistacia integerrima* acts as an anti-asthmatic agent that causes inhibition of histamine release and 5-lipoxygenase activity. Bronchial asthma is due to the contraction of smooth muscle in response to multiple stimuli resulting in the release of chemical mediators like Ach and citric acid. Pistacia integerrima acts as an expectorant and helps in the clearance of mucus from airways, lungs, bronchi, and trachea. It is also used quite well in whooping cough and asthma in children. It also manages the hiccough. The Unani system of medicine karkatshringi is used in combination as well as a single formulation. Unani physicians have been treating asthma disease for thousands of years. It is known to help in cough and asthma and it gives strength to mucus membrane.
6. **Anti-diarrheal Activity:** The crude extract dose-dependently attenuated the induced diarrhoea. The crude extract exhibited more anti-diarrheal activity. The isolated flavonoid from pistacia integerrima galls has strong protection against diarrhoea. Karkatshringi helps to manage diarrhoea and stops the infection-causing bacteria in the large intestine. The pistacia integerrima galls extract and isolated compound acts as antidiarrheals activity by inhibiting mu and delta-opioid receptors.
7. **Anticonvulsant Activity:** Pistacia integerrima has anticonvulsant activity due to its ability to block sodium channel. The essential oil component in *Pistacia integerrima* (α -pinene, β - pinene, and 4-carvomenthol) which responsible for its anticonvulsant activity. PTZ and MES are the preliminary tests used to determine the anticonvulsant activity.³ These tests are used to determine whether drugs are effective against tonic-clonic seizure and human generalized absence.
8. **Action on the gastrointestinal tract:** *Pistacia integerrima* has carminative and astringent properties, it helps to reduce flatulence in the gastrointestinal tract.
9. **Action on the female reproductive system:** *Pistacia integerrima* are beneficial to support the health of the female reproductive system. It helps to eliminate debris and impurities after menstruation. According to Ayurveda *Pistacia integerrima* is valuable in symptoms of menstruation like pain or cramps. *Pistacia integerrima* helps to this illness due to its Ushna and vata-balancing properties.

The usefulness of Karkatshringi in Ayurvedic formulation:

Karkatshringi is one of the key components of various types of Ayurvedic formulations like Shringiadi Chura, Karkatadichurna, Brihat Talisadechurna, Kumari Asava, Kumari Kalp, 19 Devadar vayadi kwath churna, shatavaryadighrit, chayanprash-awaleha, Dashmularista, Kantakaryavaleha, Siva gutika and khadiradigutika, which are used in various therapeutic purposes. According to Acharya Charaka, karkatshringi is used in essential yoga. According to Acharya Charaka- important yoga is that karkatshringi is used.

1. **Chitrakadi Leha:** It is used to treat Kasa (cough), Hridya rog (cardiac disease), Shvasa (asthma), and Gulma (abdominal tumour, distension). The karkatshringi is used in combination with other drugs like Tulsi, Pippalimool, Ganjipal, Giloy, and Munakka.
2. **Duhsparsyadi Leha:** This medication is used to heal Vatika Kasa. This medication is used together with karkatshringi- Nagarmotha, Pippali, Bharangi, and Kachoor.
3. **Pathadi yoga:** It is used to treat kaphaja Kasa. The other drug used for preparing this medication is Sunthi, Shati, Pippali, Hingu, and Patha.
4. **Leham yoga:** Also, it is used as kaphaja Kasa. Other drugs combined with karkatshringi like Devdaru, Pippali, Nagara, and Rasna.
5. **Duralabhadi leha:** It is used in vataja kasa. The karkatshringi combined with other drugs like Duralbha, Shringver, and Kachoor.
6. **Dashmooladi yevagu:** It is used in the treatment of heart diseases, Kasa, parshav shoola (pain in the side of the chest), and hikka. Other drugs used in its preparation- are Dashmool, Kachoor, Rasna, Pippalimoola, and Amla.

Nidigdhika yusha: It is used for treating the patient Shvasa (Asthma) and tikka (hiccups). Other drugs used for its preparation like Duralbh, Gokshur, Guduchi, and Kultha.

Common Ayurvedic Formulation available in the market of Karkatshringi with their indications Lala Dawasaz Herbal Hair Oil, Dusparshadi Yog (herbal compound) used in tropical pulmonary Eosinophilia, Astangavaleha, Karkatshringi Churan or Powder gives antipyretic properties, Bharat Karkatshringi Tablets, Yuvika Kakra Singhi.

Conclusion:

Pistacia integerrima is most commonly used for the treatment of cold, cough, fever, vomiting, and diarrhoea. The use of isolated crude essential oil for antioxidant and antibacterial for various types of bacterial infection. It should be properly identified and used for medicinal purposes. Methanolic extract of *pistacia integerrima* galls studied anti-inflammatory activity in the in-vivo animal model. These drugs are useful in speeding up the cough suppressant, mucolytic, and expectorant. *Pistacia integerrima* essential oil component alpha-pinene, beta-pinene which helps to its anticonvulsant property. The main aim of this article is to focus on medicinal properties and recently used marketed formulations.

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