

## A REVIEW ON *ARTEMISIA NILAGIRICA* (CLARKE) PAMP, A TRIBAL MEDICINAL PLANT SPECIES FROM GARHWAL-UTTARAKHAND REGION

Shivani Bhardwaj\* and Chandra Shekhar Tailor

School of Pharmaceutical Sciences, Shri Guru Ram Rai University, Patel nagar, Dehradun  
(Uttarakhand) India (248001).

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### \*Corresponding Author

Shivani Bhardwaj

School of Pharmaceutical  
Sciences, Shri Guru Ram  
Rai University, Patel nagar,  
Dehradun (Uttarakhand)  
India (248001).

### ABSTRACT

Nature always stands as a golden mark to exemplify the outstanding phenomena of symbiosis. Natural products from plant, animal and minerals have been the basis of the treatment of human disease. Medicine system has been improved a lot; novel discoveries, new techniques, better diagnostics, potent drugs and a lot more. These discoveries, however, are beneficial have a quick onset of action but not to forget that all the natural products are essential as well as mainstay of the alternate system of medicine. One such natural product is *Artemisia nilagirica* also known as Indian wormwood belonging to family Asteraceae, mostly abundant in hilly areas of India. Many natives used this plant for many medicinal purposes. Pharmacological

activities of this plant is noticeably great. Traditional use of this drug is in management of epilepsy, nervous disorders, as diuretics, anti-inflammatory and skin disorders. Essential oil constituents include camphor 1,8-cineole,  $\beta$ -eudesmol, *Artemisia* alcohol,  $\alpha$ -gurjunene, paracymene, terpinene-4-ol and  $\alpha$ -pinene and these possess antifungal, antimicrobial, insecticidal and larvicidal activity. Past studies has shown other actions of aerial parts of *Artemisia nilagirica* such as antifungal, antibacterial, antimicrobial, insecticidal, antiulcer, anticancer, antioxidant and anti-asthmatic activity. Hence proving that the plant is of great therapeutic value providing with the future prospect including preclinical studies on the aerial part as well as root.

**KEYWORDS:** *Artemisia nilagirica*, Indian wormwood, epilepsy, nervous disorders, antifungal, antimicrobial etc.

## INTRODUCTION

*Artemisia nilagirica* locally known as 'Indian wormwood' belongs to Asteraceae family. It is a medicinal plant which has been reported to be used over ten decades and is treating diseases and symptoms like, malaria, inflammation, diabetes, stress, depression, diabetes and many other microbial diseases.

*Artemisia nilagirica* is an aromatic herb composed of many volatile oils and biologically important compounds and the plant is perennial and is found mainly in the hilly areas of India.<sup>[1]</sup> Here are many species of the genus *Artemisia* which are recognized and considered to have many therapeutical importance. The plant has been exploited to derive many biochemical molecules and essential oils which taken into consideration for the treatment of various diseases and ailments. *Artemisia nilagirica* has been reported to have traditional as well as Ayurvedic and homeopathic medicinal uses. *Artemisia* species are composed of active components which has shown to possess properties to treat parasitic and helminthic diseases. *Artemisia nilagirica* also has been reported to have efficiency against many neurological disorders, dermal infection and antifungal, antimicrobial, larvicidal, anti-inflammatory activities. The healing potential of this medicinal plant is so efficient that it is still recommended as Ayurvedic drug. It is used for the treatment of human parasites, animals and plants.<sup>[2]</sup>

### Classification

**Kingdom** - Plantae

**Family** – Asteraceae

**Order**- Asterales

**Genus** – *Artemisia*

**Species** – *nilagirica* (Clarke) pamp

### Plant description

The plant grows throughout the hilly regions of India. It is tall aromatic shrub. This medicinal herb is erect, hairy, often half-woody. The stems are leafy and branched. Leaves are alternate, large, ovate and lobbed, beneath; upper most leaves are smaller, 3-fid or entire, lanceolate. The flowers are small. They are brownish yellow in colour. Leaves and flowering tops are bitter, astringent and aromatic. The fruit are minute, bracts ovate or oblong. The percentage of oil constituents and the yield of oil vary with the distribution of the plant and also depend on the growth phases.<sup>[3]</sup>



**Figure no. 01: *Artemisia nilagirica* Clarke pamp.**

### **Chemical constituents**

- Artemisia species are reported to contain sesquiterpene lactones, coumarins and acetylenes as the main metabolites. The main constituents of the essential oil of the *Artemisia nilagirica* were reported as camphor,  $\beta$ -eudesmol, 1,8-cineole, borneol, artemisia alcohol, camphene,  $\alpha$ gurjunene, p-cymene, terpinen-4-ol and  $\alpha$ -pinene 8-9. Lactones are common components in the essential oils bearing plants. This essential oil reveals the unexpected pharmacological activity of the plants. The plant was also reported for  $\beta$ caryophyllene, l-linalool,  $\beta$ -thujone, azulene, thujyl alcohol and an unidentified hydrocarbon. The plant contains a crystalline pentacyclic alcohol fernenol, stigmasterol,  $\beta$ -sitosterol, and  $\alpha$ -amyrin and its acetate. The plants obtained from lower altitude had more percentage of cineol, thujone, thujyl alcohol and citral where as plants from higher altitudes contained a higher percentage of limonene, tripinoline and aromadendrene. The structure of inositol, which was extracted from the dried leaves of *Artemisia nilagirica*, has been established.<sup>[4]</sup>
- Some contains volatile oils and some contains essential oils:- Thujone, caryophyllene, terpineol, artemisinin phytoconstituents.<sup>[5]</sup>

### **Uses in traditional medicine**

- Infusions of the leaves are applied as haemostatic and to allay the burning sensation in conjunctivitis.
- The herb is also considered to be emmenagogue, antihelmintic and stomachic.
- The roots are used as tonic and antiseptic.<sup>[6]</sup> Some pharmacological effect have been corroborated in experimental biological models such as animals, plants and humans, Of

this medicinal herb other interesting pharmacological activities have been described, such as insecticidal, antimicrobial, antiulcer, anticancer, antioxidant and anti asthmatic.<sup>[7]</sup>

## PHARMACOLOGICAL STUDIES

### Antimicrobial activity

The diethyl ether extract of the leaves of *Artemisia nilagirica* showed antimicrobial activity against the soil-borne plant pathogen *Phytophthora capsici*, which causes foot rot in pepper. Shafi *et al.* used disc diffusion method to assess the antioomycetical activity. The result showed that the mycelial growth of *P. capsici* was completely inhibited by a concentration of 100 ppm of the oil in the carrot agar medium. The inhibitory property against *P. capsici* is due to thujones, which is present in high amount (41.9 %). They also studied the same activity using cedar leaf oil and found that *Artemisia nilagirica* oil was as equally effective as the cedar leaf oil.<sup>[8]</sup>

### Antifungal activity

In vitro antifungal activity using the essential oils of *Artemisia nilagirica* and *Juglans regia* var. *kumaonica* against *D. sorokiniana*. The essential oil of *Artemisia nilagirica* was found as more effective than *J. regia* var. *kumaonica* in inhibiting the spore germination and mycelia growth of the fungus. The EC50 value for *Artemisia nilagirica* and *J. regia* var. *kumaonica* was found out to be  $12.06 \times 10^{-2}$ ,  $21.64 \times 10^{-2}$  and  $10.00 \times 10^{-2}$ ,  $18.63 \times 10^{-2}$  % for spore germination inhibition and mycelial growth inhibition respectively.<sup>[9]</sup> Most of the studies are done on plant pathogens, some studies were done to evaluate the antifungal and antimicrobial activity using the leaves of *Artemisia nilagirica*. Also, the essential oil of the leaves of *Artemisia nilagirica* was reported to possess complete antidermatophytic activity against *Epidermophyton floccosum* and *Trichophyton violaceum* by the poisoned food technique. Essential oil prepared in polyethylene glycol showed pronounced efficacy as an herbal antifungal agent against dermatomycosis induced in guinea-pigs. The extract showed the effect within 14 days of application. The minimum inhibitory concentration of the oil was reported as 200 ppm.<sup>[10]</sup>

### Antibacterial activity

The leaf extract of *Artemisia nilagirica* showed antibacterial activity against the Gram negative bacteria *E. coli*, however the extracts were reported as not much effective against some Gram positive bacteria like *Staphylococcus aureus* and *Bacillus subtilis* and Gram negative bacteria like *Klebsiella pneumoniae* when compared to *E. coli*.

The activity possessed by *Artemisia nilagirica* extract towards *E. coli* was found much better than the root extract of *Aristolochia indica*.<sup>[11]</sup>

### **Antiparasitic activity**

Animal parasites Ethanolic extract from the root of *Artemisia nilagirica* reported for anti-malarial activity in mice. A dose level of 40 mg/kg to 640 mg/kg was administered in mice. The extract shows the activity in the dose range of 320- 640 mg/kg in vivo and it prolongs the survival time of mice. Chloroquine is the most effective and widely used drug in malarial therapy, but strains of *P. falciparum* was found resistant to the drug. Strains of *P. falciparum* are sensitive to the extracts of *Artemisia nilagirica*. Ethanolic extract of the flowering meristems of *Artemisia nilagirica* reported to show antifilarial activity.<sup>[12]</sup>

The ethanolic extract of flowering tops of *Artemisia nilagirica* was found active against *Trichinella spiralis*, a gastrointestinal nematode which causes trichinellosis. Trichinellosis is a cosmopolitan parasitic disease occurs in humans, domestic animals and wild animals. Cina 30® and Santoninum 30® prepared from the mother tincture of the flowering tops of *Artemisia nilagirica* was used in the study.<sup>[13]</sup>

### **Plant parasites**

Plant parasitic nematodes are one of the most devastating pathogen of food, fiber crop. The majority of the losses are caused by root-knot nematodes. Ethanolic extract of flowering meristems of *Artemisia nilagirica* (1 mg/ml) was reported to be effective against the root-knot disease of mulberry caused by *Meloidogyne incognita*.<sup>[14]</sup>

The homeopathic drug *Artemisia nilagirica* extract not only reduced root-knot disease but also improved the nutritive value of the treated leaves of infected plants. It reduces the nematode population in root and soil. Species of *Artemisia* was reported to contain various essential oils; these essential oils are known to possess nematicidal properties.<sup>[15,16]</sup>

### **Antiulcer activity**

Freeze-dried ethanolic extracts from the aerial part of *Artemisia nilagirica* was reported for the gastric antiulcer effect. The study was done on rats. Ulceration was induced by ethanol-hydrochloric acid, and the extract at a concentration of 500 mg/ kg protected the animal from the gastric ulcer effect, which was administered orally. They reported that the concentration (500 mg/kg) has given a highest level of gastric protection. They found that the mucus

content was increased and it was accompanied by a proportional increase in proteins which leads to the antiulcer effect. They used cimetidine as control, which did not show any effect on the mucus secretion in animal models.<sup>[17]</sup>

### **Anticancer and antioxidant activity**

Ethanollic extract of the *Artemisia nilagirica* (EEAN) have a significant effect on anticancer and antioxidant activity, which was studied on Ehrlich Ascites Carcinoma (EAC) bearing mice. The extract did not showed any mortality up to 800 mg/kg dose (LD50). Dose of 200 mg/kg and 400 mg/kg of extract on EAC controlled mice were found to be active. These studies indicate that the anticancer and antioxidant effect of EEAN may be due to free radical quenching properties of sesquiterpene lactones and flavonoid present in ethanollic extract.<sup>[18]</sup> methanollic extract of *Artemisia nilagirica* (MEAN) for its anticancer activity in Swiss albino mice. The dose of 150 mg/kg and 250 mg/kg were selected and the mean survival time (MST), % increase in life span was recorded. They reported that the administration of MEAN reduced the tumor volume, packed cell volume and viable tumor cell count in a dose dependent manner as compared to EAC control mice.<sup>[19]</sup>

### **Antioxidant activity**

Ethanollic extracts of leaves of *Artemisia nilagirica* was studied for its antioxidant potential in different in vitro models like 1,1-diphenyl-2-picryl hydrazyl (DPPH), 2,2-azino-bis-3-ethylbenzothiazoline-6- sulphonic acid (ABTS), nitric oxide, superoxide, hydroxyl radical and lipid peroxidation.<sup>[20]</sup>

The extracts reported to show maximum scavenging activity of ABTS radical (89.06 %), followed by the scavenging of DPPH radical (84.94 %) and superoxide radical (79.69 %).<sup>[21]</sup>

The extracts were reported to show moderate lipid peroxidation inhibition activity. Total phenols and flavonoids were found to be  $69.71 \pm 1.7$  mg gallic acid equivalent/g of dry material and  $28.41 \pm 0.6$  mg quercetin equivalent/mg of dry material, respectively. From these results it was reported that the phenols and flavonoids from leaves provides substantial antioxidant activity. Antiasthmatic activity Aqueous extracts of aerial parts of *Artemisia nilagirica* and seeds of *Sesamum indicum* were subjected to antiasthmatic activity on healthy adult Wistar strain rats. Asthma was induced in rats by the treatment with ovalbumin suspension, which is similar to clinical asthma.<sup>[22,23]</sup>



### Insecticidal activity

The essential oil of *Artemisia nilagirica* has been reported as an effective larvicidal against *Aedes albopictus*. The LC50 of the essential oil was reported as 5 µg/ml. A preliminary study on the larvicidal activity of *Artemisia nilagirica* was also reported by Verma *et al.* The essential oil of the plant was also reported for larvicidal, anti bacterial, antifungal and insecticidal activity.<sup>[24]</sup>

**Table no. 01: Uses of different species of *Artemisia* Genus medicinal plant.**<sup>[25-30]</sup>

| Species  | Location                                    | Used for   |
|--|---|--|
| <i>Artemisia dracunculus</i>                           | Kashmir                                     | <ul style="list-style-type: none"> <li>• Toothache</li> <li>• Fever</li> <li>• GIT problems</li> </ul>   |
| <i>Artemisia dubia</i>                                 | Nepal                                       | <ul style="list-style-type: none"> <li>• Cuts and wound</li> </ul>   |
| <i>Artemisia japonica</i>                              | Uttarakhand<br>Garhwal<br>Himanchal Pradesh | <ul style="list-style-type: none"> <li>• Cut and wound</li> <li>• Skin problems</li> <li>• Mosquito and insect repellent.</li> </ul> Himanchal Pradesh-Chew leaves for treatment of oral ulcers. |
| <i>Artemisia nilagiric</i>                             | Uttarakhand<br>Garhwal<br>Himanchal Pradesh | <ul style="list-style-type: none"> <li>• Cut and wound</li> <li>• Skin problems</li> <li>• Mosquito and insect repellent.</li> </ul>   |
| <i>Artemisia parvifora</i>                             | Uttarakhand<br>Kumaon                       | <ul style="list-style-type: none"> <li>• Skin problems</li> <li>• diuretic</li> </ul>  |
| <i>Artemisia vulgaris</i><br><i>Artemisia scoporia</i> | Asia<br>Europe                              | <ul style="list-style-type: none"> <li>• GIT disorders</li> <li>• Skin problems</li> <li>• Malaria</li> <li>• fever</li> </ul>   |

### CONCLUSION

*Artemisia nilagirica* is commonly found in the hilly areas of India. The plant has been used since centuries in antimicrobial, antifungal, antibacterial, insecticidal, antiulcer, anticancer, antioxidant and anti-asthmatic activity. It is reported to contain essential oils, sesquiterpene lactones, coumarins and acetylenes. The pharmacological studies reported in the present review confirm the therapeutic value of *Artemisia nilagirica*. It is important source of various types of compounds with diverse chemical structures as well as pharmacological properties. Presence of such a wide range of chemical compounds indicate that the plant could serve as a “lead” for the development of novel agents having good efficacy in various disorders in the coming years.

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