

## ***Parthenium hysterophorus*: Weed of Pharmacological Importance**

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### **Abstract**

*Parthenium hysterophorus*, often known as congers grass, is a noxious weed that is a member of the Asteraceae family of plants. Its natural habitats include the areas surrounding the Gulf of Mexico, Central America, Southern North America, the West Indies, and Central South America, among other places. Congress grass has risen to become one of the world's seven most destructive and deadly weeds, according to the World Health Organization. This invasive plant is also a significant concern in India. It is responsible for a variety of illnesses and allergies in both people and animals. Aside from that, there is some potential for this plant to be used as an insecticide, herbicide, fungicide, wood preservative, anti-amoebic, and even for medicinal purposes. If any species, particularly an invasive weed, is to be evaluated for its ability to benefit living organisms, it is necessary to have a thorough understanding of both its positive and negative impacts. As a result, this review paper is an attempt to describe the present state of knowledge regarding the hazardous and helpful effects of *Parthenium hysterophorus* on people and animals.

### **INTRODUCTION**

*Parthenium hysterophorus* is a weed plant belonging to the Asteraceae family that has become invasive. This upright, short-lived plant is noted for its abundant growth and flourishing development, particularly in hot conditions, and for its short lifespan. Originally from north-east Mexico, parthenium was thought to be unique to the continent of America, but it is now found in nearly all nations throughout Asia and Europe [Bhowmik and sarkar, 2005]. A variety of names for *Parthenium* (*Parthenium hysterophorus* L.) are used in different nations, including carrot weed, white top, and the "Scourge of India." *Parthenium* is also known as wild feverfew, ragweed, bitter weed, and white top in the United States. The present review investigates the potential of *Parthenium hysterophorus* occurrences by studying the plant's habitat, distribution, biology, and chemical characteristics. Central America, Southern North America, the Gulf of Mexico, the West Indies, and central South America are among the regions where *Parthenium hysterophorus* is found in its natural habitat. The plant has now spread to every continent and island on the planet, including the United States. It has spread at an alarming rate throughout India and other nations on the Asian continent, including China, Bangladesh, Nepal, Pakistan, and others. In India, this

plant poses a major threat to public health in nearly all states, including Karnataka, Andhra Pradesh, Haryana, Bihar, Madhya Pradesh, and Uttar Pradesh, among others.

## MORPHOLOGICAL CHARACTERS

is a rosette-forming herbaceous plant that is densely branching, short lived (annual), and upright (erect). During the early stages of its life, it forms a rosette habitat. At maturity, the plant can grow up to 2m or even more in height; however this is not always the case. The stem is cylindrical and solid, with longitudinal lines that correspond to the expansion of the midrib of the leaves. It is more or less fluted and has a rounded top. The stems of mature plants are greenish in colour and coated with tiny soft hairs known as hirsutia. As the plant matures, the stems become tougher to handle. The leaves are alternately arranged and are stalked (petioles) up to 2 cm long, which can be found in two distinct forms depending on the species. Rosette habitat is formed during the early stages of the organism's existence. Leaves are alternating, simple, and deeply pinnatifid, and they are arranged alternately on the stem. The blade is 11 to 15 cm long and 6-10 cm wide; the blade of lower leaves is broad and strongly divided when compared to the blade of higher leaves. The blade of lower leaves is 11 to 15 cm long and 6-10 cm wide. The abaxial surface of leaves is covered with short, stiff hairs that are near to the surface of the leaf's surface. A large number of tiny flower-heads, collectively known as capitulum, are arranged in clusters at the tips of the branching structures (in terminal panicles). Each flower-head (capitulum) is borne on a stalk, which is supported on the ground (pedicel). Capitulum (3-5 mm in diameter) is off-white or white in hue and contains ray florets (ray florets are little flowers) (0.3-1 mm long). They also feature a centre with a variety of (15-60) tiny flowers (tubular florets) that are flanked by two rows of small green bracts on either side (an involucre). Even though it may bloom at any time of the year, it is most frequently seen during the rainy season. Each flower-head produces five tiny "seeds," which are more often referred to as achenes. In appearance, the seeds are black and oval in shape, measuring approximately 2 mm long and 1.5 mm broad. They are composed of two or three tiny scales known as pappus, which measure about 0.5-1mm in height, two straw coloured papery structures (which are really dead tubular florets), and a flat bract.

## Phytochemistry

GLC-MS and GLC were used to identify and quantify the volatile components of essential oils extracted from the leaves of the weed species *Parthenium hysterophorus* and *Ambrosia polystachya*. The allelopathic activities of these essential oils were assessed using techniques that examined the volatile effects and direct application of these essential oils on lettuce seed germination and seedling vigour. They discovered 27 compounds in the essential oil of *P. hysterophorus*, including germacrene-D (35.9%), trans-ocimene (8.5%), and -myrcene as the major components (7.6 %). There were 40 components discovered in *A. polystachya* essential oil, with the main ones being germacrene-D (29.3 %), trans-ocimene (13.6 %), and -caryophyllene (9.8 %). In all techniques, the essential oil from *A. polystachya* had a stronger potential for decreasing seed germination and seedling vigour in lettuce than the essential oil from *P. hysterophorus*, which may be ascribed to its higher monoterpene concentration (Wang et al., 2020).



Fig 1: Plant parts of *P. hysterophorus*

*P. hysterophorus* chemical characteristics must be determined by the use of isolation and structural elucidation methods. Sesquiterpene lactones were discovered in all sections of *P. hysterophorus*, including the trichomes and pollen, after a chemical study was performed (SQL). Parthenin, a bitter glycoside found in *P. hysterophorus*, is a significant sesquiterpene lactone (Maishi et al., 1998). Other allelochemicals or phytotoxic substances include hysterin, ambrosin, flavonoids such as quercelagetin 3,7-dimethylether, 6-hydroxyl kaempferol 3-0 arabinoglucoside, and fumaric acid. Vanillic acid, p-hydroxy benzoin, caffeic acid, p-coumaric acid, anisic acid, p-anisic acid, chlorogenic acid, sitosterol and several unidentified alcohols are among the compounds found in this plant. According to the findings, parthenin, hymenin, and ambrosin are the perpetrators behind this weed's threatening function in inducing health risks (Lata et al. 2008). Parthenin, hymenin, coronopilin, dihydroisoparthenin, hysterin, hysterophorin, and tetranurin were found in *P. hysterophorus* collected from various geographical locations. In their sesquiterpene lactones, A is the primary component, followed by B and C. (De La Fuente et al.1997). *P. hysterophorus* pollen has a new hydroxyproline-rich glycoprotein that is the primary allergen. With the help of the whole plant, researchers were able to isolate a novel sesquiterpenoid, charminarone (the first secopseudoguaianolide), as well as numerous other recognised chemicals (Venkataiah et al. 2003).

## Traditional uses

Although there is an issue with *Parthenium hysterophorus*, it has been utilised in industry for its toxic, insecticidal, nematicidal, and herbicidal qualities, as well as for composting and other purposes (Sastri and Kavathekar 1990). Amoebic dysentery is treated with root bisque, which is made from the root. Sub-lethal dosages of parthenin extract have been shown to aid in the reduction of malignant activity in mouse cells. *Parthenium* has also been discovered to be effective in the treatment of hepatic amoebiasis, neuralgia, and some kinds of rheumatism, according to research (Singh, 2003). In the United States, it is administered topically to the skin as a treatment for a wide range of illnesses. In Jamaica, the elixir is used to kill fleas in livestock, which is a common problem.

## Pharmacological activities

### Antifungal activity

As mentioned earlier *Parthenium* have antifungal effects on different fungal species. This quality of *Parthenium* can be used to cure the human and animal fungal diseases. Antifungal potential of different extracts of *Parthenium hysterophorus* against human pathogenic fungi were investigated by (Rai, 1995). Fungi related to dermatitis found sensitiveto sequestoterpene lactone found in *Parthenium hysterophorus* and it can use for the remedy of skin diseases (Rai, 2003).

### Antioxidant

*Parthenium hysterophorus* methanolic extracts showed high antioxidant effect. Therefore, it can be utilized as natural antioxidants. It is naturally available antioxidant; if it will be commercially available it can replace synthetic antioxidant which has harmful impacts on human health (Khan et al., 2011). It is more valuable to produce antioxidant naturally after the research that synthetic antioxidants have high carcinogenicity in comparison to naturally produced antioxidant.

### Antitumor

*Parthenium hysterophorus*'s methanolic extract obtained from flower revealed antitumor activity in mice having transplantable lymphocytic leukemia. Level of neoplastic markers like glutathione, cytochrome P-450, glutathione transferase and UDP-glucuronyl transferase adjusted significant consequently backing off the advancement of tumors and expanded survival of animals (Mukherjee et al., 1993).

### Antimicrobial

*Parthenium hysterophorus* exhibits strong antimicrobial and antifungal activity. It inhibits the growth of rhizosphere flora such as *Rhizobium*, *azotobacter*, *Rhizospirillum* as well as it can inhibit bacterial and fungal growth such as those of *A. niger*, *F. oxysporum*, *C. albicans* *S. aureus*, and *E. coli* etc.

### Larvicidal

Use of synthetic insecticides to control insects and their larvae are extensively used but these are not eco-friendly source to kill the insects and their larvae because these are not safe for humans, having detrimental impacts on effects on environment as non-bio-degradable and hazardous effect on livestock. It can cause biomagnification which results in loss of biodiversity. Investigations on *Parthenium* revealed its larvicidal properties which can be used to control larvae of different insects such as mosquitos and aphids which harm human health and crop plants respectively. Larvicidal potency of *Parthenium* aqueous extract against *Aedes aegypti* larvae and other mosquito larvae. (Kumar et al., 2011).

## Conclusion

Although the present review article discusses the detrimental effects of *Parthenium hysterophorus* on agricultural plants and animals, the pharmacological activities of the plant are also examined in depth in the following section. In addition to amino acids, sugars and phenolic derivatives, *P. hysterophorus* also contains Caffeic acid, Vanillic acid, Anisic acid, Panisic acid, chlorogenic acid and parahydroxy benzoic acid are all found in high concentrations in the plant. Parthenolide (the most abundant sesquiterpene lactone), parthenin, and other solvent extracts all shown substantial analgesic, anti-inflammatory, and antipyretic properties when tested in vitro. Human and animal studies revealed that its extracts and constituents had both beneficial and harmful effects on both humans and animals. These effects included cancer prevention, pesticide and antimicrobial activity, allelopathic and allergic effects as well as larvicidal and ovicidal activity as well as herbicidal activity. However, due to the fact that *P. hysterophorus* is a poisonous plant, further scientific study and studies are required before it can be recognised as a conventional medical plant.

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