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Parthenium hysterophorus Being Boon and Bane for Human Beings: A Review

Nishtha, Rishika Rana

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ABSTRACT

Talking about the invasive species of plants there are many of them like *Ageratum conyzoides, Cannabis sativa*, *Parthenium hysterophorus*, *Lantana camara*, *Tribulus terrestris* and, many more. And one of these is *Parthenium hysterophorus* which we will be discussing in this paper. *P. hysterophorus* is native species to tropical America, Mexico and the southern USA. This invasive plant belongs to the Asteraceae family. This is said to be a poisonous annual herb that grows aggressively. It has certain harmful effects on agriculture, livestock and human life. This herb tends to cause skin problems, respiratory problems, fever and bronchitis-like problems in humans. Despite having many harmful elements this weed is also known to have health benefits examples as urinary tract infection, rheumatic pain and Diarrhoea. This herb is spreading all over India badly. Certain experiments and methods are being done on this plant to know the impactful parameters of the plant which can be used in a productive way. It has the potential to be used as bio-pesticides and for removing heavy metals and dyes. In this paper, we have discussed this noxious herb and its benefits. The goal of the review is to impart basic knowledge about, morphology, discovery, harmful and beneficial effects, active compounds and preventive measures about *P. hysterophorus*.

Key words: Active compounds, Bio-pesticides, Invasive, Morphology, *P. hysterophorus*.

Invasive plant species harm our environment especially the native species. They dominate the native plants by spreading more and more and reducing their diversity (Belgeri *et al.,* 2020). *Parthenium hysterophorus* is supposed to be a hybridized form of *Parthenium confertum* and *Parthenium bipinnatifidum*. Invasive plant species can alternate the food chain in an ecosystem by destructing or substituting the domestic food origin. These species may not be able to provide food for wildlife. Invasive plants may also change the diversity of certain species that is crucial habitat for domestic wildlife. This weed contains allelopathy chemicals. Allelopathy means when a plant or organism contains certain harmful biochemical which can inhibit the growth and germination of plants. So in this paper, we will have a take on *Parthenium*. *Parthenium hysterophorus* commonly called carrot grass, congress grass or Santa Maria feverfew is a noxious annual herb. Some ordinary people call this herb “chatak chandni”. *P. hysterophorus* is a member of Asteraceae family and considered one of the most invasive species in plants therefore, has also been added to the list of global invasive species database. Bhateria *et al.,* (2015) have spread almost all over the world. In India, it is found in almost every part of the state, but the most affected states are Punjab, Haryana and Uttar Pradesh. We get a glimpse of this herb almost everywhere. This weed is majorly found in Australia and India as suggested by Dhileepan and Strathie, (2009). It is an upright, branched, ephemeral perennial herb that can grow up to 2 metre high with a tap root system. The stem of this plant is greenish, longitudinal with small stiff hairs all over the stem part and they tend to get branched with maturity. It is capable of causing a drastic loss in crop production and also responsible for threatening biodiversity Patel, (2011). Although this weed can grow in any type of soil it is found generally in semi-arid, subtropical, tropical and hot temperate regions. This weed is known to be fast inhabiting herb which is found widely found near the watercourses, flood plains along roadsides, railways and in place of grazing, summer crops and deserted land. It is assumed that this weed has come to India *via* food grains that were imported from the USA Maharjan *et al.,* 2020. In India, it was reported first time in 1810 in the state of Arunachal Pradesh. Gnanavel *et al.,* (2013) and was further recognized in many other states like Pune and Maharashtra in 1955 and then it kept spreading in all other states too. Many effective measures have been taken to control this weed.

This experiment was conducted at Biosciences laboratory of Chandigarh University which is located at Mohali, Punjab in session 2020-2021. I and my guide studied the plants morphology and about its phytoconstituents thoroughly to know about its beneficial and harmful aspects which are as follows:

Department of Botany (Biosciences), Division-UIBT, Chandigarh University, Mohali-140 413, Punjab, India.

Corresponding Author: Rishika Rana, Department of Botany (Biosciences), Division-UIBT, Chandigarh University, Mohali-140 413, Punjab, India. Email: rishika0rana@gmail.com

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Botanical description

It is an annual herb with maximum branching forming a cluster of leaves at the base at its growing stage. It typically grows up to 2 m high. The stem of this plant is green with small white stiff hairs all over. The leaves are arranged alternately at each node (Fig 1). Leaves are larger at the base and are highly divided while the leaves at the upper branches are less divided.

There are many small white or creamy beads like flowers (capitula) are present at the tips of branches (Fig 2). The white flowers are surrounded by bracts which are very small and green in color. Color changes to brown when they start getting mature. This plant can grow in any type of soil. Flowering can occur in any season but most likely to occur in the rainy season. This weed can produce 25,000 numbers of seeds per plant (Evans, 1997).

Emergence and occurrence

Parthenium hysterophorus is said to be a native species to central, north, South America and Mexico. But due to its nature as a weed, it has spread all over the world. India and its neighboring countries have also been facing this weed at an alarming rate. This weed has probably entered India *via* a food grain contaminant in 1910. And people got to know about this in 1955. Since then this has been spreading all over India like a fire. The major affected states are Andhra Pradesh, Karnataka, Madhya Pradesh and Uttar Pradesh (Lalita and Kumar 2018). This weed cannot vegetatively reproduce but rather it reproduces through seed dispersal (Masum *et al.,* 2013). The out spread of the specie has already been managed in countries like Australia and India with the help of many biological agents like insects and pathogens (Rubaba *et al.,* 2017).

Chemical compounds in parthenium

Many numbers of chemical compounds are shown by this plant. They are responsible for their harmful and beneficial nature. Each part of the plant be it hairs, trichome and pollens contain toxins like sesquiterpene lactones (SQL) a poignant glycoside parthenin and certain specialized metabolites or secondary metabolites (organic compounds obtained by bacteria, fungi and plants) like flavonoids, phenolic, alkaloids the compounds are responsible for allelopathy which inhibits the growth and germination of plants, therefore also known as allelochemicals. Hysterin, ambrosin, fumaric acid, P hydroxy benzoin, caffeic acid and vanillic acid, are some of the flavonoids present in the plant. We can easily find the phytotoxic compounds by simply isolating and structurally illuminating their active principles (Sahrawat *et al.,* 2018).

Harmful aspects of parthenium

This is one of the most dangerous and fast-spreading weeds and therefore has many harmful effects as discussed below:

Effects on biosphere

Parthenium tends to deplete the biosphere. There is no secret that this weed is a cause for the change in the environment in native Australian grasslands, large woodlands and near the seaside. It grows aggressively in the wasteland, roadsides, along railways sides, in cultivating lands and grazing land (Kaur *et al*., 2014). It grows aggressively in our ecosystem and thus causing rapid decrease in our native plant species (Abdulkerim-Ute and Legesse 2016).

Effects on agricultural fields

Parthenium shows allelopathy which inhibits the growth and germination of radicle in monocots and dicot plants. Due to the presence of certain chemicals like hysterin, ambrosin and parthenin. This weed does not let form nodules in legumes by inhibiting the working of symbiotically associated bacteria such as Azotobacter and rhizobium. Many pollen grains are carried out by wind and get lay down on the surface of the stigma of flowers of vegetables and fruits like

Fig 1: *Parthenium hysterophorus.*

Fig 2: *P. hysterophorus* showing numerous white flowers.

tomato, brinjal, capsicum. This is responsible for loss in many agricultural fields; it reduces the yield of crops up to 40% (Kanaujia *et al.,* 2018).

Parthenium hysterophorus can adapt the new habitats and thus it can easily adapt to any type of environment and acts as a threat to the indigenous plant species (Jayaramaiah *et al.,* 2017).

Effects on animals and human beings

This weed has many hazardous effects on the lives of humans and animals. In animals like cattle, it causes dermatitis with skin lesions and causes mouth ulcers and excessive saliva coming out of their mouth if eaten by them. When animals like cows, buffalo and goats have this weed thinking it is grass then they have to deal with acute sickness and diarrhea-like problems.in some animals, the extract of *Parthenium* reduces immunity by minimizing the WBCs count *e.g.* rat.

In humans, this weed causes allergies, skin-related problems, fever, asthma and chest cold. These are caused by pollen grains, roots stem, or any plant part. Coronopilin, Tetraneuris and ambrosin are some type of allergens which are found in this weed.

Beneficial aspects of parthenium

Being a weed this plant still has beneficial nature we can utilize it in many ways. It can be used medicinally or industrially on a large scale.

- This plant acts as an analgesic and treats diseases like muscular rheumatism also helpful in treating hepatic Amoebiasis. The chemical compound parthenin found in this plant is known to have anti-cancerous properties. The flower part of the plant has shown anti-tumor properties. It is also used as a traditional medicine in West Indies and America (Nabie *et al.,*1996).
- It also helps in biogas production. It acts as a substrate and is therefore used as an additive in manure and produces approximately 70% of methane gas (CH_4). During biogas production, phytotoxic chemicals get deteriorated (Saini *et al.,* 2014).
- *Parthenium hysterophorus* has also been used in biochar preparation by pyrolysis. Basically, biochar is a carbon-containing material that is left during the pyrolysis process (pyrolysis is a phenomenon in which organic material is heated, without the presence of oxygen). This is done for the improvement of soil quality and to retain carbon in the soil. It also helps in soil fertility and helps to yield productivity in crops (Kumar *et al.,* 2013).
- Leaf and roots extract has been used for dye degradation. As we know that dyes are used in industries like textiles, pharmaceuticals and polymers. And various numbers of dyes and pigments are used in these industries. Due to which a large amount of waste material is produced and thus is responsible for different types of pollution. Therefore *Parthenium* is good in the degradation of such dyes and chemical pigments which are harmful to our nature (Shahi and Sapkota, 2018).
- This weed has also been used for the removal of heavy metals as this can be used as plant extract and it helps in removing the toxicity of metals in an area where the soil is contaminated by metals and dyes and therefore can minimize the risk of toxic metals entering into the food chain of animals (Joshi *et al.,* 2016).
- *Parthenium* also have the capacity in treating the allergy caused by the plant itself, by using the drug extract from the plant. In addition to that it also act as a remedy against diseases like hepatic Amoebiasis (Sharma and Bhutani,1988).
- Control of this noxious weed can be done by using some toxic metabolites one of them is *Phorma herbarum* which acts as phytotoxin and on the basis of chromatography techniques *i.e.* gas chromatography and mass spectrometry it is also found that the structure of this phytotoxic compound 3-nitro-1,2-benzenedicarboxylic acid (3-nitropathalic acid) (Vikrant *et al.,* 2006).

P. hysterophorus weed is a home for many insect pest and many crop diseases like Tobacco streak virus which further reduces the productivity of the crops. Despite having many harmful effects this weed is helpful in many ways and many research work is going on this weed so that we can make good use of this weed plant. Without having the use of harmful chemicals we can still manage the spread of *Parthenium hysterophorus* by using toxic metabolites like *Phoma herbarum* FGCCno.75 shoots and leaves of which can be used as a toxic metabolite to target this noxious weed.

CONCLUSION

In this paper, we have discussed the *Parthenium hysterophorus* its origin, harmful and beneficial aspects. This weed is mainly known for its harmful impacts be it biodiversity, animals or human beings as well as it is capable of destroying crops and native species of any particular area. We need to discover more and more about this weed its utility potential so that the harmful aspects of this weed can be reduced or recovered. By doing this we can have advantages like, we can control this weed and also we can use this plant as an alternative to medicine. Research institutions, colleges, universities and governmental and non-governmental organizations need to take steps for its eradication. We need to take some strategic measures so that we can make use of this weed and can have control over this. I hereby conclude this topic by saying that I found this topic quite interesting and thus selected it for my review.

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