



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2023; SP4: 104-107

Dr. Amita Singh
DPG College Gurgaon,
Haryana, India

Shweta
DPG College Gurgaon,
Haryana, India

(Special Issue)
“National Conference on
Multidisciplinary research for sustainable development”

Study of biochemical, physiological activity and composting behaviour of *Parthenium hysterophorus* L.

Dr. Amita Singh and Shweta

Abstract

Parthenium hysterophorus L. is a plant species which belong to the Asteraceae family. It is commonly known as congress grass. It is an annual herb which easily found in every type of soil. It is mostly found at the roadsides, railway roads, water channels public lawns, forestlands, overgrazed pastures, etc. reduced pasture, and lack of water in soils such as drought condition leads a favourable or ideal situation for their germination and growth. It shows medicinal value namely allopathic, homeopathic as well as traditional. They absorb large amount of nutrients from the soil. So, they are rich in nutrient. IUCN considered this weed plant as one of the 100 most invasive plant species found in world. This invasive plant shows some harmful effect like damaging crops, skin allergy in human and mouth ulcer in animals. The standard methods used for its phytochemical screening and nutrients in it. Qualitative analysis of leaf extract of aqueous *Parthenium hysterophorus* L. show the presence of protein, alkaloid, steroid, carbohydrates, saponin, chlorophyll, tannin, sterols terpene. The phytoconstituents in parthenium is checked by using its fresh leaves which assessed with different chemical reagents. The nutritional quality of parthenium were utilised for nourishing the other plant after using it as a compost and well mix it within the soil. Then plant absorbs nutrients from this soil which is rich in nutrients like nitrogen, potassium, sulphur, phosphorus mainly and produces better quality of organic manure. It gives better results as compare to the other organic waste. The allelopathy effect was determined by using it as bio- pesticides and spraying their solution on the plant which affected by the pest for 45days.

Keywords: *Parthenium hyterophorus* L. soil moisture content, bio-pesticides, naphthalene acetic acid, manure

1. Introduction

Parthenium hysterophorus is a plant species which belong to the tribe Heliantheae of the Asteraceae family. The Parthenium name is derived from the latin word parthenice. It is a native plant of American tropics. It is commonly known as Santa Maria, Famine weed, white top weed, Bitter weed, Broom brush, Santa Maria feverfew. In India, commonly called congress grass, carrot grass and locally known as gajar grass and chatak chandini. It is type of invasive species of plant which is accidentally introduced in country like Australia, Oceania, Pacific Islands some part of Africa and India. In India, this alien weed is introduced as contaminates in PL 480 wheat (Public Law 480 passed in 1954 to give food grains to developing country for eliminating starvation and malnutrition) imported from USA in the 1950s. It is an annual plant or ephemeral herb. It have capability to grow on most or any type of soil, but most favourably on clay soil, alkaline soils and the loam soils. It is normally 2 – 4.5 feet in heights, with upright, more branched and short lived.

It is mostly found at the roadsides, railway roads, water channels public lawns, forestlands, overgrazed pastures, etc. reduced pasture and lack of water in soils such as drought condition leads a favourable or ideal situation for their germination and growth. In India, the lifecycle of *Parthenium* is of 180- 240 days, it starts to germinate during months of end of February and start of March and highest peak of its growth in the month of June – July and starts

Correspondence Author;
Dr. Amita Singh
DPG College Gurgaon,
Haryana, India

producing seeds in the month of September. During the month from November to January their growth stunted or reduce because of cold weather.



Fig 1: Parthenium plant

Uses of *Parthenium hysterophorus* L.

Traditional Uses

- *Parthenium hysterophorus* have many health benefits as it uses as remedy for skin inflammation, diarrhoea, dysentery (mainly root extract), malaria, rheumatic pain, urinary tract infection and it also used as a prospect of nano medicine.
- It is used for the larger production of crops and for the better yield.
- Their leaves used as manure in the ratoon rice crops by which influence the increase in height of these crops, compost and also as bio pesticides.
- It is used as slurry in biogas
- During the rainy the flowering and non-flowering part of *Parthenium hysterophorus* L. plastered with mud layer used as compost which later put in the under shade of tree.
- In skin disorder and decocation it applied outer surface of plant.
- If the allergy occurred by parthenium it easily treated by using of extract from itself.
- Some animals and especially for dogs it is used as flea repellent in the country like Jamaica.
- It have 60% to 70% of methane content as a gas. So, it used in India for the production of biogas through anaerobic digestion.
- Use it as a compost result into alternative useful material which work as a soil conditioner.
- Reducing viability of weed by effectively composting and reuses of content present in weed like its nutrients and organic matters used as a green manure and compost indirectly.

Insecticidal Properties

The extracts of shade dried *Parthenium hysterophorus* L. leaves have used on Brassica juncea which is mainly for the control of mustard aphid and other plant like Kaltenbach. Due to the presence of phenols it help in reducing the number of *L. erysimi* which is pest of *B. juncea*.

Industrial Uses: It is usually used in batch reactor in the form of aqueous solution for removing methylene blue. This

absorbents contain sulphuric acid which treated with the parthenium and phosphoric acid treated with parthenium.

- The other species of parthenium like *Parthenium argenatum* for yield rubber which used in the place of Hevea rubber.
- It is used for preparation of some antibiotics, paper and card boards
- It is mostly used as some of Herbicides or insecticides, etc.

Harmful Effects

- It have an alleopathic effect on the crops or other cultivated plants as it contains some of chemicals such as parthenin hysterin, ambrosin and hymenin.
- The compound which is active in this weed plant is called parthenin.
- It causes greatest loss to the yield of useful crops such as sunflower, maize, pigeon pea as it grows in field crops by their own in different growing conditions. In India, this weed plant is one of the reason of decline at least of 40% of grown or agricultural crops. It is spreading throughout a larger area. So, it is considered as an exotic weed species.
- Animals do not like to eat *Parthenium hysterophorus* L. because of it is bitter in taste. It is also harmful for biodiversity and humans.
- It causes dermatitis with skin lesion on animals like horse and cattle's, sometimes it is responsible for mouth ulcer with excessive saliva, diarrhoea due to irritation of gastro intestine, reduction in milk yield, tainting of milk and severe cases haemorrhage, and rupture of internal tissues may kill animals.
- In both plants dicot and monocots it act as an inhibitor of germination and radical growth.
- In some plants like tomato, maize, etc. the pollen of parthenium settle on the stigma of flower and inhibit the fruit setting.
- In humans it cause allergies like dermatitis when body comes in contact of this plant and cause discomfort all over body, asthma mostly in children, also hay fever and bronchitis, it is all due the pollen grains and dust from this plant, other parts of parthenium.
- The allergens which is commonly found in parthenium weed parthenin, coronopilin, ambrosin and tetranurins.

Control of *Parthenium hysterophorus*

- Singh (1997) use of bio control agents and exploitations of competitive plants, the most economic and practical way of managing parthenium. But weeds has not managed below the threshold level and is threatening biodiversity and posing ill problems for the human and animals.
- Various methods, for example physical, chemical, bio herbicidal and integrated are being practiced to manage this weed.
- It is most effectively controlled by physical methods like manual uprooting before the flowering start and setting of seeds.
- Sometimes burning is also useful method of controlling parthenium plant growth. The method is use of different types of herbicides like glyphosate, ametryn, etc.

- This types of weed is effectively controlled at their vegetative stage of life where it is normally found and crops are not grown in that area.
- Controlling of this weed by the use of *Zygogramma* (Mexican beetles) when the numbers of these beetles increases, they are collected and then it was released in the area where parthenium are large in numbers or spread over large area.

Bio-Pesticidal properties of *Parthenium hysterophorus* L.

The extract from the parthenium can blocked the process of cleavage in eggs. This ovicidal activity of *P. hysterophorus* L. leaf and inflorescence. Petroleum ester extract of *Bougainvillea spectabilis* wild, *P. hysterophorus* and *A. indica* at 0.5 % gave protection to brinjal leaves against third instar of halda beetle after 24 hrs of treatment. *P. hysterophorus* L. have allelopathic effect against the pathogens of species of fungus. Parthenium have inhibiting effect on growth of fungus when it used in lower conc. And if it is used in high conc. as aqueous extract about 60% and 70% stimulated the production of biomass of fungal species.

Composting of *Parthenium hysterophorus* L. and utility of the compost in agriculture

The green leaf manure of this weed highly effect on the ratoon crops, parthenium manure have ability to increase the height of ratoon crops than its normally growth pattern but it shows less effect on the main crops like rice as comparing to the plants such as lantana and sun hemp manure reported by Sudhakar, (1984) [13].

Apurva *et al.* (2000) [2] prepared mili-compost by using *Harphaphe haydeniana* for composition of Parthenium and compared it with ordinary Parthenium compost (OPC). Application of OPC exerted harmful effects on the early growth and development of *Triticum aestivum*, whereas, mili-compost exerted more beneficial effects due to its higher nutrient contents and least amount of allelopathic chemicals present in it *P. hysterophorus* L. has high concentration of N, P, K, Zn, Ca, Mg, Fe and Chlorophyll content that makes it suitable for composting.

Allelopathic effect

P. hysterophorus L. produce allelochemicals and large numbers of seeds about 10,000-25,000 per plant. Small

seeds are diameter of 1-2mm and light in weight and travelled for long distance mainly water and wind. *Parthenium hysterophorus* L. is comes under the dangerous weeds because it have harmful effects on both human and to biodiversity. This plant have presence of chemicals such as parthenin, hysterin, ambrosin and hymenin. Because it have these chemicals it exerts highly allelopathic effect on different crops. Sometimes these allelochemicals from the exudates of roots may leads to change the ph of the soil which is from acidic or neutral conditions.



Fig 5: Parthenium plant

Effect of *Parthenium hysterophorus* L. compost on Banana plant

The compost was mixed with the soil in which banana plant has shown its growth. After the completing two months compared it with another banana plant which does not have any compost or external macro or micronutrient like compost of *Parthenium hysterophorus* L. It will observe that the growth in height or increase in height is much more than the controlled banana plant. The compost of this weed increase the content of nitrogen, potassium, phosphorous in the soil which is observe by the plants. The compost of parthenium normally reduced the height of plants and increase the width but in the ratoon plants, it shows the increase in the height and the banana plant is one of the ratoon plant.



Fig 2: Banana plant growth with using parthenium as a compost parthenium as a compost.

Conclusion

Parthenium hysterophorus L. is a plant species which belongs to the tribe Heliantheae of the Asteraceae family. The common name used for this weed are congress grass, santa maria, carrot grass, famine weed, bitterweed, etc. this plant is native of tropics of America. It is an invasive type of plant species. It is an ephemeral herb. It can grow on any type of soil but favours to alkaline soils. It is normally 2- 4 feet tall. The stem is hairy, leaves are simple and alternate pinnately. It produces the white creamy flowers at five distinct corners. The fruit produced by it is an achene which is ovoid black in colour. *P. hysterophorus L.* have phytochemicals like carbohydrates, alkaloids, sterols, saponins, flavonoids, tannins, proteins, phenolic compounds, triperenoids, resins and starch. It also has the antioxidant property due to the presence of peroxidase and catalase. It has both chlorophyll A and B. Carbohydrates are present more than protein. *P. hysterophorus L.* has many health benefits as it is used as a remedy for skin inflammation, diarrhoea, dysentery (mainly root extract), malaria, rheumatic pain, urinary tract infection and it is also used as a prospect of nano medicine. It is also used for larger production of crops and better yield. The leaves of this invasive weed are used as a manure in the field and also as bio-pesticides which is helpful to the plant which is infected by the pest. Some animals and especially for dogs it is used as a flea repellent. This weed has mainly a harmful effect on their surroundings. It has an alleopathic effect on the crops or other cultivated plants. It causes the greatest loss to the yield of useful crops such as sunflower, maize, pigeon pea as it grows in field crops by their own in different growing conditions. Animals do not like to eat *Parthenium hysterophorus L.* because of its bitter taste. It is also harmful to biodiversity and humans. In both plants dicot and monocots it acts as an inhibitor of germination and radical growth. In humans it causes allergies like dermatitis when the body comes in contact with this plant and causes discomfort all over the body, asthma mostly in children, also hay fever and bronchitis, it is all due to the pollen grains, other parts of *parthenium*.

Reference:

1. Akter A, Zuberi MI. Invasive alien species in Northern Bangladesh: identification, inventory and impacts. *Int J Biodivers Conserv.* 2009;15:129-134.
2. Apurva P, Sinhya SK, Thakur PC. Composting an obnoxious weed, *Parthenium hysterophorus* with the help of a millipede, *Harpaghe haydeniana*. *Asian Journal of Experimental Biological Science.* 2010;1(1):7-14.
3. Basu BD. Resource utilization and beneficial aspects of alien weeds. *The Wealth of India.* 2003;4:282-284.
4. Bhojar MG. Possible uses of *Parthenium* in organic farming. *Kheti.* 2013;1:136-141.
5. Gunaseelan VN. Impact of anaerobic digestion of inhibition potential of *Parthenium* soids. *Biomass Bioenergy.* 1998;14:179185.
6. Kareem AA, Progress in the use of neem and other plant species in pest control in India, in *Research Planning Works on Botanical Pest control Project*, IRRI, Los Banos, Phillipines, 6-10 Aug, 1984, p15(1984).
7. Khan FI, Abbasi SA. *Techniques and methodologies for risk analysis in chemical process industries*, Discovery Publishing House, New Delhi. 1998.
8. Kumar D, Jamwal A, Madaan R, Kumar S. Estimation of total phenols and flavonoids in selected Indian traditional plants. *JPTRM.* 2014;2:329-338.
9. Narasimhan TR, Murthy BS, Rao PV. Nutritional evaluation of silage made from toxic weed *Parthenium hysterophorus* in animal. *Food Chem Toxicol.* 1993;31(7):509-515.
10. Nigatu L, Hassen A, Sharma J, Adkins SW. Impact of *Parthenium hysterophorus* on grazing land communities in Northern- Eastern Ethiopia. *Weed Bio Manag.* 2010;10:143-152.
11. *Parthenium hysterophory*, Germplasm Resource Information Network (GRIN), Agricultural Research Service (ARS), United States Department of Agriculture (USDA), Retrieved 2010-10-29.
12. Singh K, Shashi AK, Pal S and Balyan SS, Phytoalleopathic influence of *Parthenium hysterophorus L.* in Alleopathy in Agro-ecosystem, *Agricultural and Forestry*, ed by Tauro P and Narwal SS, CCS Haryana Agriculture University, Hisar, India, 1997 February 12-14, 61-63.
13. Sudhakar P. Substitute of fertilizer nitrogen through green manure in lowland rice. M.sc Thesis, Tamil Nadu Agricultural University, Coimbatore; c1984.
14. Wiesner M, Tessema T, Hoffmann A, Wilfried P, Buettner C, Mewis I. Impact of the pan-tropical weed *Parthenium hysterophorus L.* on human health in Ethiopia. *Institute of Horticultural Science, Urban Horticultural.* 2007.
15. Wakjira M, Berecha G, Tulu S. Alleopathic effects of an invasive alien weed *Parthenium hysterophorus L.* compost on lettuce germination and growth. *Afr. J. Agric Res.* 2009;4(11):1325-1330.