

Parthenium

From curse to boon for the farmers

Bal Krishna^{1*}, Rakesh Kumar^{2*} and J S Mishra³

ICAR-Research Complex for Eastern Region, Patna-800 014, Bihar

Parthenium hysterophorus is a noxious weed. This weed has been related to the allergic respiratory problems and contact dermatitis. Due to its allelopathy, crop yield is significantly reduced. However, plant has some positive qualities and confers many health benefit viz. remedy for skin inflammation, rheumatic pain, diarrhoea, urinary tract infection, dysentery, malaria and neuralgia. Removal of heavy metals from soil, eradication of aquatic weeds, additives in cattle manure for biogas production, as bio-pesticide, as Uprooting of plant in early stage, i.e. before flowering from field and burying it in soil produce superior quality organic manure and compost are to name a few of some other potentials. Hence besides burning or destroying parthenium, it is a better way of eradicating it and utilize for better crop production.

Key words: Parthenium, Pit compost, Weed

Parthenium hysterophorus is a noxious weed that has been identified as a Worldwide Invasive Species. Altamisa, carrot grass, Santa Maria, bitter weed, star weed, white top, wild feverfew, gajar ghas, “scourge of India,” and congress grass are some of common names for this herb. Its rapid spread is due to both human activities during globalization and weed plant’s ability to colonise a wide variety of for ecosystems and climatic conditions. *P. hysterophorus* is now considered one of most harmful weeds in India. *P. hysterophorus* is an annual ephemeral herb in *Asteraceae* family. It is a highly biodiverse weed because of its biological characteristics, which include a short life cycle (4-6 week), persistent, copious flowering until senescence, high seed production (15,000-100,000 seed/plant), light seed weight, seed dormancy in harsh environmental condition and good regenerative capability. Machinery, vehicles, cattle, food, feedstock, as well as wind and water are used to spread seeds. Because of its destructive effects on the ecosystem, it

is important to monitor the hazardous weed *parthenium* until it spreads. There are many ways to control *parthenium*, including mechanical, cultural, chemical, and biological management, and managing weed through proper utilization. Chemical/mechanical management strategies that are currently available are neither feasible nor cost-effective. Since, biological methods have certain drawbacks; weed management strategy must be moved to some non-chemical method that is more efficient. To protect/preserve our environment, an environmentally friendly and economically sustainable management of *parthenium* is needed. Composting may be a safe way to transform the biomass from this species into a sustainable stuff that can be used as a soil conditioner. Decline of non-renewable energy sources, increasing fertilizer prices, and environmental issues made it important to revisit alternative strategies focusing on use of accessible renewable sources of plant nutrition for long-term agricultural production. If properly managed, i.e. by

controlling them by utilization as green manure and composting passively, composting significantly reduces viability of weeds and enables for healthy reuse of the nutrients and organic matter found in the weed content. The aim of this article is to explore problem *P. hysterophorus* poses as a weed, as well as to unravel latent beneficial prospects of this weed.

Potential utility

It has been successfully transformed into biochar, which improves the soil quality by increasing basal respiration and microbial biomass carbon, increasing catalase, dehydrogenase activities, and decreasing soil stress and hydrolytic enzyme activities. *Parthenium* was used as an ingredient in cattle manure, resulted in 60–70% CH₄ gas production, implying that *Parthenium* weed could be used as a biogas substrate. When *parthenium* was vermicomposted in specific combination with cow dung, it promotes worm growth and increase in cocoon yield of earthworms suggests weed has potential as a good

substrate for vermicomposting. Application of *parthenium* leaf manure to the rice crop led to increased plant height, grain and straw yields, and no weed emergence in submerged conditions during rice cultivation. According to reports, green manure made from *parthenium* showed a high rate of nitrogen and phosphorus assimilation by maize crops. As a result, this widely accessible weed can be used to improve soil health/ condition with manure instead of chemical fertilizers. Extracts from parts of *parthenium* plant have been found to have an inhibitory activity on common aquatic weeds. Larvae of phytophagous insect, *Bombyx mori*, a silkworm, that feeds on plants, has been found to be tolerant of pure parthenin, which is toxic to many other insects. When these larvae were fed a diet supplemented with *parthenium* root extract, their cocoon yield, thus silk production increased. Lignocellulosic biomass of *parthenium* is abundant (Fig. 1). Lignocellulosic-rich waste produced after extracting plant enzymes or separating useful plant extracts can be used for lignocellulose-related applications. Integrated uses of weed can be an efficient method for managing it, with the added bonus of creating almost zero waste at the end.

Pernicious effects

Animals, humans, plants, and ecological biodiversity are all adversely impacted by *parthenium* weed. Pollens cause airborne contact dermatitis and allergic rhinitis, which can lead to severe respiratory problem including asthma/bronchitis, when inhaled. Secondary metabolites, i.e. parthenin toxin, found in various parts of the plant, cause negative effects. Immunity loss, excessive water loss, weakness, and allergic reactions such as hay fever, peeling skin, puffy eyes, swelling and itching of mouth and nose, persistent cough, rhinorrhea, and eczema are all signs of weed exposure. Odour, taste, and appearance of trichomes make *parthenium* unappealing to animals. Cattle exposed to weed develop rashes and skin inflammation, especially around the mouth and

udder. *Parthenium* directly competes with crop plants for space, nutrients, water, and sunlight in agricultural ecosystems. Allelochemicals, phenolics, and sesquiterpene lactones are examples of its influential indirect effects (mainly parthenin). These chemicals, which are found in *parthenium* weed's roots, stems, leaves, fruits, and pollens, are released into surrounding soil through exudates or rotting process. They have a growth and germination inhibitory impact on a wide range of agriculturally important plants, including both food and fodder crops. According to studies, allelochemicals from *parthenium* have anti-microbial effects on nitrogen fixing and nitrifying bacteria, resulting in decline in nodulation in leguminous plant. *Parthenium* poses a danger to natural biodiversity because it is incursive. Weed has a detrimental effect on biodiversity because it competes for resources with native species and because it is allelopathic. Invasions have ability to change ecosystem hydrology, nutrient accumulation and cycling, and C-sequestration. Natural ecosystems are undergoing biodiversity loss as natural vegetation is replaced and

natural succession is disturbed. Farmers' main concern about using *Parthenium* as a source of bio-compost is that compost made from *parthenium* biomass could proceed to further weed germination in their fields. As per a study conducted by the ICAR-Directorate of Weed Research at Jabalpur, unscientific *parthenium* compost creates more trouble in farmer's sectors. From 300 g of NADEP compost or open pit process, 350 to 500 *parthenium* seeds will germinate. Compost produced in a scientific manner, on other hand, is healthy and does not comprise any viable seeds, making it beneficial to soil health and crop production.

Methods of composting from *parthenium*

- Make a 3' × 3' × 10' pit in an area where water would not stagnate. Size of pit may be gone up or down, but the depth of the pit cannot be changed.
- Cover pit surface and sidewalls with stone chips if necessary. It will prevent soil surface from absorbing vital nutrients from compost (Fig. 2).
- If stone cheep are not usable, compact the soil surface.
- Place 100 kg of dung, 10 kg of

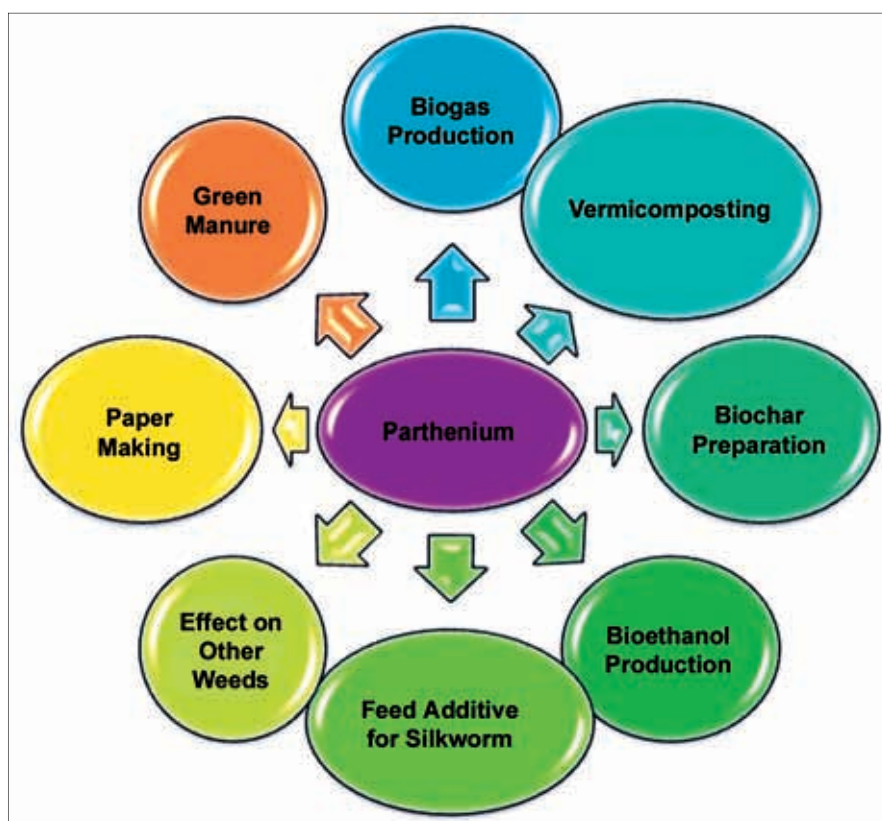


Fig. 1. Potential utility of of *Parthenium*



Fig. 21. Pit composting from *Parthenium*

Table 1. Comparison of nutrient composition of *Parthenium* compost with other compost

Type of biofertilizer	Nutrient (%)					
	N	P	K	Ca	Mg	Organic carbon
Parthenium compost	1.05	0.84	1.11	0.90	0.55	2.88
Vermicompost	1.61	0.68	1.31	0.65	0.43	2.49
Farm yard manure	0.45	0.30	0.54	0.59	0.28	1.17

Parthenium compost has double nutrient content of ordinary compost and at par to vermicompost. Application is recommended @ 2.5 to 3.0 t/ha as basal dressing for field crops and for vegetable 4.0 to 5.0 t/ha.

- urea/rock phosphate, 1-2 q of soil and one water drum near the pit.
- Gather all of *parthenium* plants in your field and the surrounding area.
- ~ 50 kg of *parthenium* should be placed on the pit's surface.
- Sprinkle 500 gm urea or 3 kg rock phosphate over the layer of *parthenium*.
- If necessary, add 50 gm of *T. viride* or *T. harzianum* (a form of fungi cultured powder) per layer.
- All of the above components will be combined to form a single sheet.
- Make multiple layers similar to first before pit is filled to 1 ft height from surface of the ground.
- Fill the pit with water in a dome shape.
- Apply foot pressure to compress weed biomass when creating

layers.

- If there isn't any soil with *parthenium* roots, cover each layer with 10 -12 kg of loamy soil.
- When pit is filled with layers, cover it with a mixture of cow dung, soil, and husk.
- We can now get well decomposed compost after 4-5 months.
- From 37-42 quintals of *parthenium* biomass, we can get 37-45 percent compost.

Benefits of *parthenium* composting

- Cost-effective and environmentally sustainable solution for farmers, crops, and animals.
- Humans, crops, and ecosystem are unaffected by well-decomposed or well rotten compost.
- Nutrient-balanced manure with more primary nutrient (NPK) than FYM. It comprises

micronutrients and trace elements that are necessary for the quality and growth of the plant.

- Reduces the use of chemical fertilizers and protect soil from contamination.
- Increases crop production and decreases water use due to its high water holding capacity.

CONCLUSION

Parthenium is regarded as worst weeds currently identified and a worldwide weed that causes serious human/animal health problems, as well as agricultural damage and significant threat to biodiversity. Plant, on other hand, has some advantage. Composted *parthenium* has a higher nutritional value than FYM. As a result, composting *Parthenium* appears to be an effective way of using enormous agricultural weeds.

¹Ph.D. Research Scholar, Department of Plant Breeding & Genetics, BAU Sabour 813 210.

²Scientist, Division of Crop Research, ICAR-Research Complex for Eastern Region, Patna 800 14, Bihar. Director, Directorate of Weed Research, Jabalpur 482 004, Madhya Pradesh. *Corresponding author email: rakeshbhu08@gmail.com