

Effect, Management and Activities of Parthenium Hysterophorus

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ABSTRACT

Parthenium hysterophorus, a highly invasive annual weed belonging to the Asteraceae family, poses significant threats to biodiversity, agriculture, and human health worldwide. With its prolific seed production and rapid growth, Parthenium has become one of the most devastating weeds globally, impacting ecosystems in Africa, Asia, and Australia. This comprehensive review examines the morphological characteristics, biological activities, and harmful effects of Parthenium on various aspects of the environment and living organisms. The weed's impact on biodiversity, crop production, soil health, animals, and humans underscores the urgent need for effective management strategies. Physical, chemical, and biological control methods are discussed, highlighting their effectiveness in mitigating Parthenium infestations. The abstract encapsulates the multidimensional challenges posed by Parthenium and emphasizes the importance of collaborative efforts to address its widespread proliferation and mitigate its detrimental effects on ecosystems and livelihoods.

KEYWORDS: *Parthenium hysterophorus*, weed, antioxidant, crop

INTRODUCTION

Parthenium hysterophorus (Asteraceae) is an annual weed which is distributed worldwide, Parthenium hysterophorus This dangerous plant is known for its negative impact on biodiversity, agriculture and human beings.[1] The plant is very creative seed producer, with up to 25,000 seeds per plant[2]P. hysterophorus is now considered among the world's top seven most devastating weeds[3]and has attained major weed status in India and Australia.[4] Parthenium hysterophorus L., belonging to the family Asteraceae. It is supposed to have been presented into India and Australia from North America and in the last few years the weed has occurred as the seventh most disturbing weed in Africa, Asia, and Australia. Its biological characteristics such as short-life cycle (4 to 6 weeks), continuous and abundant flowering until senescence [5]Parthenium weed is found in both natural and agroecology. It shows many adverse effects on farming, biodiversity of life, and health of

Morphology of plant

P. hysterophorus L. is fast growing, erect, and abundant branched yearly or transient herb. It shows two separate stages in life: juvenile, rosette, or the asexual stage and adult, developed, or the generative stage. The young phase shows a badge with great, dark green, simple, radicle, and pinnatisect slightly leaves deficient flowering (Figure 1(a)). The large lower leaves are spread on the ground like a mat, without permitting some vegetation

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Scientific classification [8]	
Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots
Clade:	Asterids
Order:	Asterales
Family:	Asteraceae
Genus:	<i>Parthenium</i>
Species:	<i>P. hysterophorus</i>

lower it [9]. The adult stage is erect, much split with deep tap root system that spreads up to 2 m in height (Figure 1(b)). The stem is hairy, octangular, longitudinally fluted and becomes tough and wooded as the plant develops into a robust bush. Leaves are simple, alternate, pinnately or bipinnately divided (Figure 1(a)), 20–30 × 12–25 cm, becoming smaller towards the apex of the branches. The flowers are creamy white, about 4 mm across, rising from the leaf splits. Vast number of pollen grains, 624 millions/plant, are formed which are anemophilous, that is, airstream pollinated. Each flower produces four to five black piece shaped seeds (Figures 1(c) and 1(d)) that are 2 mm long with tinny white scales and difficult to view by the naked eye. It is a very productive seed producer, producing up to 25,000 seeds/plant, leading to large seed bank in the soil [10].

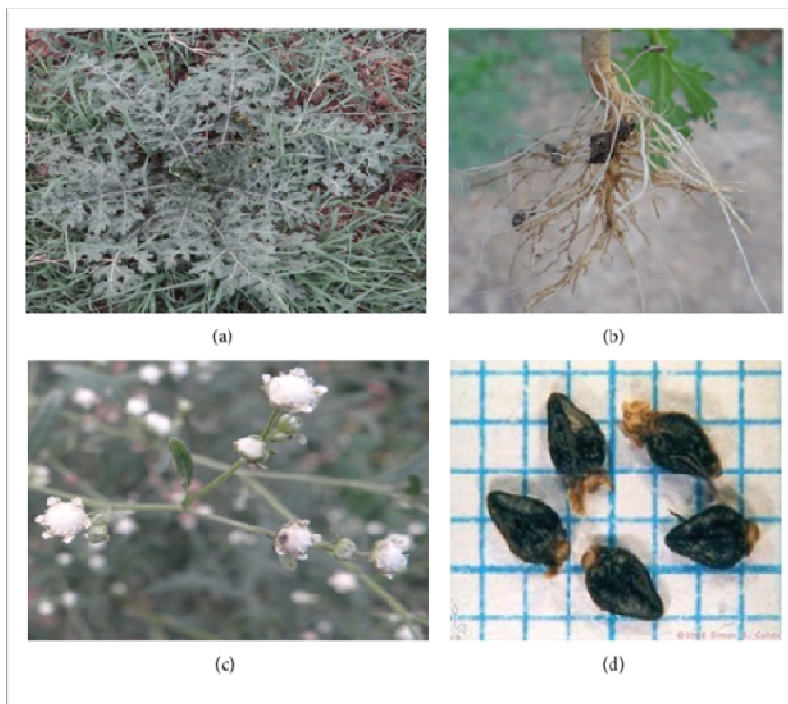


fig: Parthenium weed; (a) rosette stage of parthenium plant; (b) tap root system of parthenium;(c) capitula; and (d) black wedge shaped seeds.

Activities of parthenium hysterophorus

Anti-inflammatory activity

Oral administration 10,20,40 mg/kg of body mass of parthenium hysterophorus extract led to important antinociceptive and anti-inflammatory effects against acetic acid encouraged struggling in mice and carrageenan encouraged paw edema in rats, respectively. 200mg/kg of body heaviness of fresh leaves ethanolic extract exhibited great degree anti-inflammatory in carrageenan encouraged mitt edema rats. 1, 2 mg/kg of body weight parthenolide administration also formed antinociceptive and anti-inflammatory effects. The anti-inflammatory property may be due to an inhibitor of cellular phospholipases, which stops formation of arachidonic acid in retort to suitable physiological stimuli[11]

Antimicrobial activity

Even however P. hysterophorus is known for its poisonousness, in dissimilar parts of the biosphere as Jamaica, Trinidad, Mexico, US Virgin Islands, Alaska and India it is used to formulate traditional drug. Parthenium is used to treat injuries, diabetes, ulcerated wounds, fever, diarrhea, anemi, inflammatory, urinary infections, skin rashes, nervous disorder, and female generative problems. This can be connected to the detail that parthenium produces subordinate plant metabolite chemicals with powerful antimicrobial activity[12,13]

Antioxidant activity

The antioxidant phytochemicals defend the cells from oxidative injury caused by free extremists. DPPH (2, 2-diphenyl-1- picrylhydrazyl radical) searching assay exposed that Methanolic and ethanolic abstract of P. hysterophorus presented antioxidant activity 78.25561% and 66.28858% separately[14]. But next time acetone citation was found to have advanced anti-oxidant activity than methanol and chloroform extracts [15]. 200mg/kg of body mass of fresh leaves ethanolic extract has been displayed significant antioxidant activity in rats [16].

Hypoglycemic activity

Administration of aqueous excerpt of *P. hysterophorus* flower has been shows expressively decreased the serum glucose level in normal and alloxan encouraged diabetic rats [17]. Slightly decreased plasma glucose level was originate in rats after oral administration of fresh leaves extract[18]

Pesticidal activity

Antifeedent bioassay exposed that lactone was originate to be about 2.25 times more energetic than parthenin against sixth-instar larvae of *Spodoptera litura* and pyrazoline adduct was found to be the greatest active as an pesticide against the adults of supply grain pest *Callosobruchus maculatus*[19]

Antiamoebic activity

Antiamoebic activity of parthenin from *P. hysterophorus* has been estimated in vitro alongside axenic and polyxenic philosophies of *Entamoeba histolytica*. Parthenin has been originate to show severe poisonousness to the cultivated organisms. Parthenin has activity similar to that of metronidazol [20]

Harmful effects of parthenium

A. Impact on Biodiversity

This weed has the possible to disrupt the natural ecology, as it can produce throughout the year in nearly all radical conditions overpowering natural vegetation. Due the absence of actual natural opponents, its allelopathic effect as well as photo thoughtlessness and thermoinsensitivity, it is a danger for natural variety. Rapid spread of *Parthenium* can distract natural ecosystem because it has very fast invasion capacity and allelopathic latent and which have the capacity to disrupt any type of natural ecosystem. Species richness, consistency an local biodiversity regularly decrease where this plant is present, this condition clearly shows the native biodiversity loss of weeds and other crop plants due to *Parthenium* invasion. Its infestation is joined with its allelopathic potential the nonappearance of its natural inhibitors such as pathogen, pests and their grubs, these are the some important factor which are the reason of its comfortable growth and spread[21]

B. Impact on Crop production

The *P. hysterophorus* weed has infested in a large area of india [22] Given the unhelpful nature and imaginable impacts of parthenium weed, there is suffering that weather change, exactly increasing [CO₂] and temperature, may change its demography, its modest capacity, and its organization (Fig.), For example, biological controller agents can be negatively artificial by increased temperature(23,24)

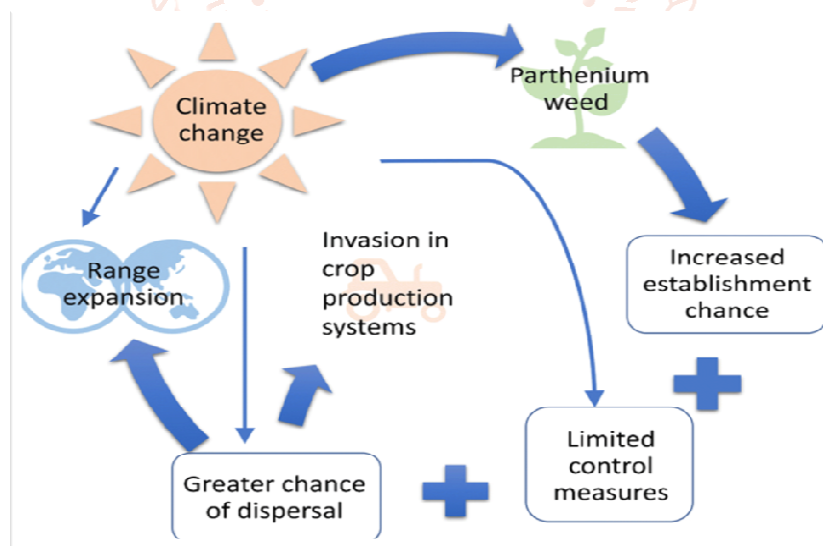


Fig: An overview of the effect of weather change on parthenium weed. Weather change fundamentals rise formation chances of parthenium weed, limit its organization and enable seed dispersion. These result in range development and attack in crop production systems.

C. Impact on Soil

Parthenium is known to its inhibitory result on development and activity possible of dissimilar bacterial species related to Nitrogen integration such as *Rhizobium* and *Azotobacter* and nitrifying bacteria like *Nitrosomonas*. Aqueous excerpt of *Parthenium* has harmful effects on the development of *Rhizobium*, *Nitrosomonas* and *Azotobacter*. It reduced the Leghea-moglobin contented of root nodes by which *Rhizobium*-legumes symbiosis is affected. Leaf and root leachates and their chemical component prevent nitrate creation (25).



Fig: impact on soil[26]

D. Impact on Animals

Parthenium weed is poisonous to animals producing dermatitis with definite skin scratches on various animals including horses and cattles. If troubled, it is responsible for mouth ulcers with extreme salivation. Important volume (10–50%) of this weed in the diet can destroy cattle [27]. In addition, it causes anorexia, pruritus, diarrhea, and eye irritation in dogs. It also causes acute disease, when bittermilk and stained meat from buffaloes, cows and goats, are fed on grass mixed with parthenium [28]. The parthenium extract results in important reduction of rat white blood cell count which signifies its immune system flagging ability [29].

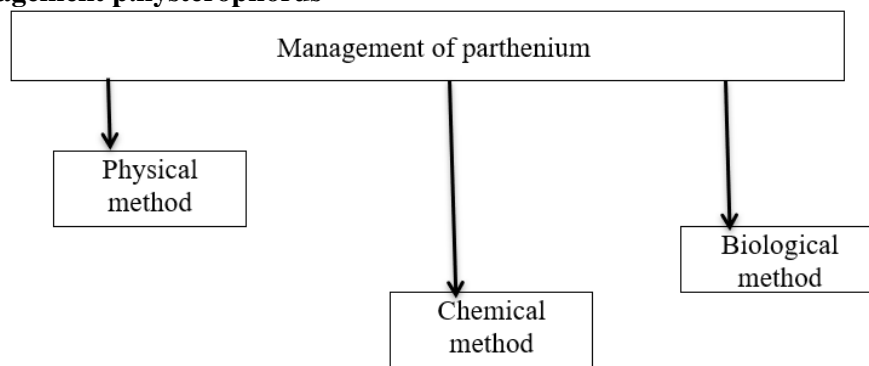
E. Effects on Human Beings

The pollen particles, airborne dried plant parts, and roots of parthenium cause several allergies like contact dermatitis, hay fever, asthma, and bronchitis in human beings. The common allergens originate in this weed are parthenin, coronopilin, tetraneris, and ambrosin. Pollens of parthenium cause asthma (allergic bronchitis), particularly in children playing outdoors and in adults and old-age persons. Interaction of plant with the body roots dermatitis and the feast of the problem all over the body (shown in figure) causes great suffering.(30)



Fig: prurigo-like lesions over dorsa of hands.

Methods of management p.hysterophorus



A. physical control

Physical uprooting of parthenium already flowering and seed set is the maximum effective method. Uprooting the weed after seed situation will increase the area of invasion. Some landowners have attained success in cultivating the parthenium weed in the decoration stage before it seeds, but this necessity be followed up by propagating a crop or direct seeding the recurrent grassland. Physical control contains hand preparing, a time consuming and unpleasant job, completed inferior by the health risks involved with handling parthenium weed. Burning, extra plan employed to achieve weed, is not a useful regulator strategy for parthenium. However, research suggests that scorching for other purposes (e.g., forested weed control) will not product in an increased disease of parthenium as long as the grassland is allowed to improve before standard is introduced. This too has shown to be insufficient due to two reasons; it requires large quantity of fuel and burning destroys all other carefully important plants increasing in its vicinity[31,32]

B. chemical control

Chemical control is a real method to regulator parthenium in the areas where its natural enemies are absent. Use of chemical herbicides, such as chlorimuron ethyl, glyphosate, atrazine, bromoxynil, and metsulfuron, are known to be very active in monitoring this weed. Time of parthenium weed for herbicidal control is significant and the weed was successfully controlled at decoration stage in wilderness, noncropped areas, along railway tracks, water channels, and roadsides. The maximum effective treatments for parthenium weed control were glyphosate and metribuzin, having advanced humanity at 4 weeks after treatment at both decoration and fastened phases than 2, 4-D, triasulfuron + terbutryn, atrazine, s-metolachlor. Pendimethalin was the smallest active treatment for both development stages. Overall, the effectiveness of herbicides was talented on decoration parthenium plants than fastened plants.[33]

C. Biological control

Biological control is an ecologically complete and active means of reducing or justifying pests and pest properties through the use of natural opponents. In the last three to four times, a great agreement of importance has been agreed to control parthenium complete various biocontrol agents like microbial pathogens, insects, and botanicals [34,35]. the various biocontrol plans, biological control of weeds by plant pathogens has increased receiving as a practical, safe, and ecologically useful method applicable to agro-ecosystem [36].



Fig: *Zygogramma bicolorata* feeding on parthenium weed.

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