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Study of Health Challenges and Management Strategies on *Parthenium hysterophorus* in India

Rajinder Singh

Akal Group of Institutions, Mastuana Sahib, Sangrur-148001, Punjab, India
Phone: +919417261506

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Abstract

Parthenium hysterophorus is a weed of global significance causing great losses in India. Health challenges recorded in humans and animals are serious. Its management requires a collective approach of government and non-government agencies. Present study focuses to measure the prevalence and severity of *Parthenium hysterophorus* and experiments were designed to study its germination, seed dispersal and management strategies.

Key words: *Parthenium hysterophorus*, health challenges, management strategies.

Introduction

Parthenium hysterophorus L. (Asteraceae) is an invasive weed that poses noticeable threats to both agriculture produce and human lives apart from environmental problems in Asia

(Bangladesh, India, Israel, Pakistan, Nepal, southern China, Sri Lanka, Taiwan and Vietnam), Africa (Ethiopia, Kenya, Madagascar, Mozambique, South Africa, Somalia, Swaziland and Zimbabwe), Australia and the Pacific (New Caledonia, Papua New Guinea, Seychelles and Vanuatu) [1,2]. *P. hysterophorus* was first reported in India in 1956 [3] and now occurs throughout the country [4]. It has spread to neighboring countries, including Pakistan [5,6], Sri Lanka [7], Bangladesh [8,9] and Nepal [10]. (Fig-1)

Parthenium hysterophorus being an invasive terrestrial weed tends to colonize every possible vacant space including uncultivated agricultural lands, railway tracks, roadsides, canalsides, uninhabited houses, unused public places etc. Although *Parthenium hysterophorus* is capable of growing in all soil types yet it prefers to grow profusely on alkaline and clay loam to heavy soils in areas where rainfall is greater than 500mm per year and falls predominantly in summers [11].

Keeping in view the hazardous impact of *Parthenium hysterophorus* and its presence all over the area, present study has been planned.

Experimental designs

Field studies were planned to visit different areas in Punjab, Haryana and Himachal Pradesh. In Punjab, survey was carried out in districts of Bathinda, Ludhiana, Mohali, Hoshiarpur, Roop Nagar and Sangrur while locations in Jind, Panipat and Gurgaon area were visited in Haryana. Certain areas around Simla, Una and Dalhausie in Himachal Pradesh were also visited to ascertain the severity and prevalence of *Parthenium hysterophorus*. Data collected was compared with available literature and inference was drawn.

Simultaneously, seed collection was done and plants were raised at Akal Seed Farm, Mastuana Sahib, district Sangrur, Punjab for close study of germination to seed dispersal of *Parthenium hysterophorus*. Plants at different stages were closely monitored and observations were compared with available literature.

Field trials for control and management of *Parthenium hysterophorus* with all available methods were designed and conducted at Akal Seed Farm. The response of plant population to different methods was recorded and evaluated with available literature.

Material and methods

The plants available in nature were collected and set of plants were raised at Akal Seed Farms, Mastuana (Pb.) for conducting experimental studies. Various experiments for studying its germination pattern, flowering time, seed setting, seed dispersal etc. were conducted in experimental area and results were compared with records maintained during field trips in different areas.

Results and discussion

The present study was conducted with the sole objective of investigating the prevalence and severity of *Parthenium hysterophorus*, a weed of social importance.

Growth pattern

This weed is able to germinate, grow, mature and set seed in 28 days. Plants bear pale green, lobed leaves, covered with soft fine hairs. Stem is erect up to 2 m high becoming woody with age, and a deep tap root. Flowers grow on the stem tips, and are small, white and 4 mm across with five distinct corners. Four or five seeds were recorded per flower which disperse easily by moving people, animals, vehicles or even wind (Fig-2). Seeds are capable of germinating any time and can remain dormant for many years posing a situation to control [11]. In northwest India, *Parthenium hysterophorus* germinates mostly in the months of February-March, attaining peak growth after rains in June-July and produces seeds in September-October. It normally completes its lifecycle within 180-240 days.

Harmful effects

Humans and animals were affected by plants at every growth stage. Health problems were observed in people living and working in close proximity to it. Common symptoms

included allergies of various types. Absence of allergy type symptoms should not be assumed to indicate lack of sensitivity since it may take 20 years for symptoms to show [11].

It is widely accepted as the most dangerous terrestrial weed which is responsible to cause dermatitis in animals with pronounced skin lesions especially in horses and cattle. Consumption of this weed in large proportion as in fodder led to mouth ulcers in cattle in addition to anorexia, pruritus, alopecia, diarrhea, and eye irritation in dogs. Milk of affected cattle became bitter and meat was recorded to be tainted. The parthenium extract resulted in significant reduction of rat WBC count which signifies its immune system weakening ability [11,12].

Humans affected by *Parthenium hysterophorus* complained of contact dermatitis, hay fever, asthma, and bronchitis. Pollens of parthenium cause asthma (allergic bronchitis), especially in children playing outdoors and in adults and old-age persons.

Control methods

During the study, it was greatly concluded that control of *Parthenium hysterophorus* is must but it cannot be done with single method and sporadic activity. People in both rural and urban areas should be exhaustively made aware of its harmful effect.

Cultural methods involving uprooting of this weed in vegetative stage and leaving minimum chances of its emergence can prove to be the best and least cost effective. Both government and social organizations should come forward.

Allelopathic control, as suggested by various scientists, can be achieved by planting plants like *Cassia sericea*, *C. tora*, *C. auriculata*, *Croton bonplandianum*, *Amaranthus spinosus*, *Tephrosia purpurea*, *Hyptis suaveolens*, *Sida spinosa*, and *Mirabilis jalapa* which are capable of effectively suppressing this weed in its natural habitats. In India, crop rotation using Marigold (*Tagetes* spp.) during the rainy season, instead of the usual crop, has been found effective in

reducing its infestation in cultivated areas.

Chemical control is an effective method of control in the areas where its natural enemies are absent. Use of chemical herbicides, such as chlorimuron ethyl, glyphosate, atrazine, ametryn, bromoxynil, and metsulfuron, are known to be very effective in controlling this weed. There are several disadvantages of using the chemical herbicides, such as the environmental hazards and the development of resistance against many herbicides, like atrazine 2, 4-D, metribuzin, paraquat (Gramoxone), trifluralin, diphenamid, and glyphosate. Various reports indicate Glyphosate as one of the most toxic herbicides, with many species of wild plants being damaged or killed by applications of less than 10 micrograms per plant. Atrazine has been found to be highly persistent in soil and has been classified as a restricted use pesticide (RUP) in the USA due to its potential for groundwater contamination. Chemicals used for control of *Parthenium hysterophorus* have records of serious side effects in different studies including infertility and other sexual disorders in human beings.

Biological control through the use of natural enemies of *Parthenium hysterophorus* proved to be effective and environment friendly. Various biocontrol agents like microbial pathogens, insects, and botanicals have been used and recommended by different workers. The most promising fungal pathogens include two rust fungi, *Puccinia abrupta* var. *partheniicola* and *Puccinia xanthii* var. *parthenii-hysterophorae*, which have shown potential and are being used to control this weed [11].

Among the insects available as biological control method, the leaf-feeding beetle (*Zygogramma bicolorata*) and the stem galling moth (*Epiblema strenuana*), both imported from Mexico, have shown good potential to control this weed. Both the adults and larvae of this insect feed on leaves which lead to suppress the population of *Parthenium hysterophorus* [12].

It is highly recommended that integrated management approach would be the most suitable for the management of *Parthenium hysterophorus*.

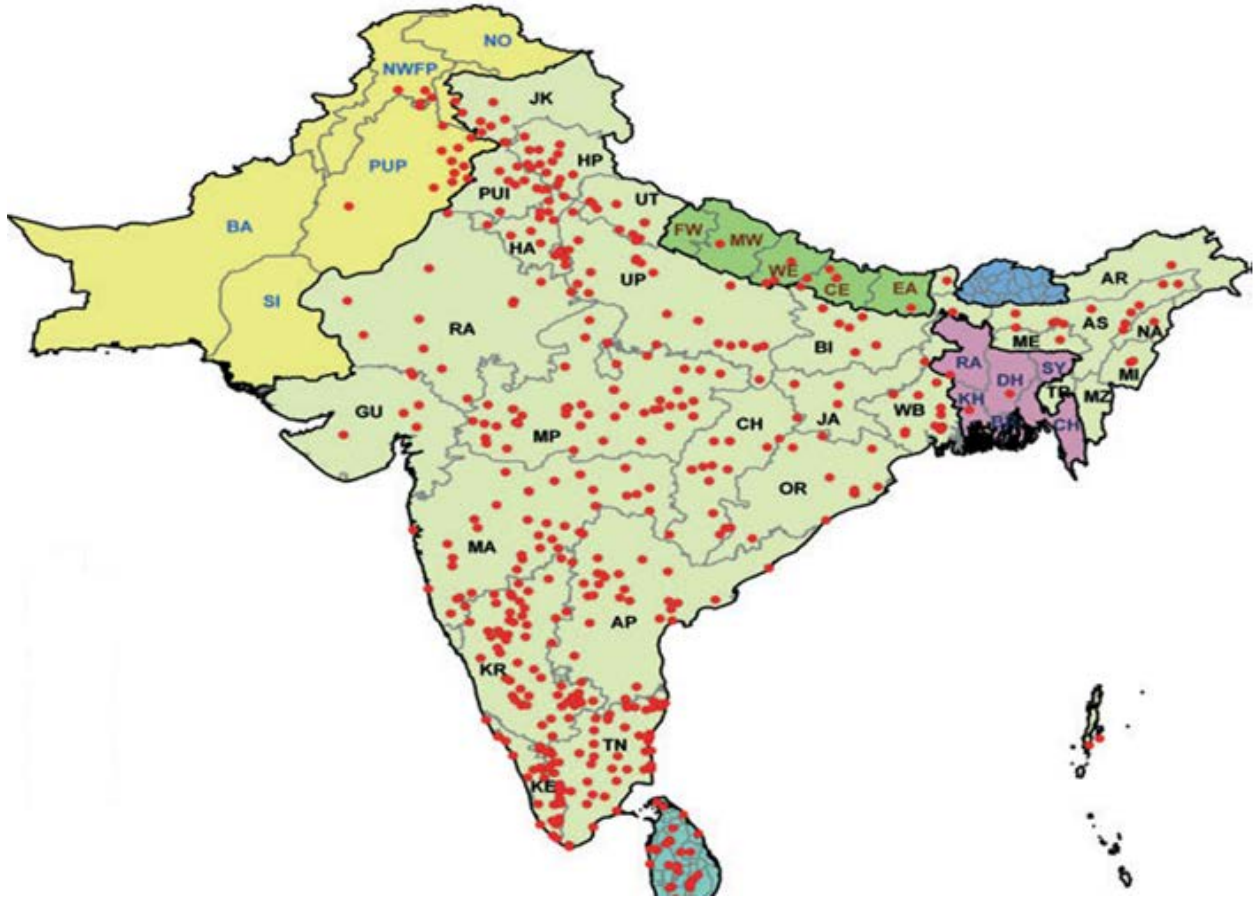


Fig-1: Geographical distribution of *Parthenium hysterophorus* in India and surrounding areas. (Courtesy: Dhilepan, K.)



Leaves



Flowers



Seeds

Fig 2: Plant parts of *Parthenium hysterophorus*

Conclusion

Parthenium hysterophorus occurs in almost all the continents causing serious challenges to ecosystem and human lives. Appropriate methods for the management of *P. hysterophorus* are required to avoid potential threats to biodiversity and economic losses. The best methods used for its management should be integrated involving environment-friendly alternatives to other time-consuming, costly and toxic methods. Biological control through allelopathy, insects and fungal pathogens can be used successfully along with cultural methods as chemical control leads to serious health challenges. Lot of work needs to be done by scientists, agriculturists, and government jointly for managing this troublesome weed.

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Authors Column



Dr. Rajinder Singh is passionate to contribute in community welfare projects with all his resources. He initiated his research pursuits during his masters program from Punjab Agriculture University, Ludhiana in 1995 followed by Ph.D. in Faculty of Life Sciences in 2011 from Punjabi University, Patiala. His research papers and reports have been presented and published in conferences and journals of international repute. Benefitting research scholars and organizations with his research guidance and extension activities always remained the area of thrust.