

Parthenium Invasion in Rampur District of UP–An Unrecognized Threat

Anupam Pratap Singh, Beena Kumari*

Angiosperms Taxonomy Laboratory, Department of Botany, Hindu college, Moradabad (UP)

Abstract

*Partheniumhysterophorus*L. (Family – Asteraceae) commonly known as congress grass, is an annual or short-lived ephemeral herb of neo-tropical origin that now has a pan-tropical distribution. In India, this weed is spreading aggressively in wasteland, degraded areas, rocky crevices, along water channels, roadsides, and railway tracks. It also has been reported in cultivated land. As a result of a lack of information on its spread in Rampur district since its invasion, a phytosociological survey, with special reference to parthenium weed, was carried out in Rampur during 2015 to 2016. Six main sectors of Rampur district were selected for sampling. The phytosociological survey of these sectors of Rampur revealed a total of 27 weed species to be associated with *P. hysterophorus*. The survey also showed a high relative frequency, relative density, and importance value of *P. hysterophorus* in general; however, the percentage relative frequency of the weed in these sectors ranged from 10.6–30.3%. This survey revealed that *P. hysterophorus* had an appreciable degree of sociability with *Senna occidentalis* (L.) Link, *Malvastrum coromandelianum* (L.) Garcke and *Sida acuta* (L.). The population of many common medicinal plants growing in the wastelands of Rampur district might be rapidly declining because of the aggressive colonization by *P. hysterophorus*. The ever-increasing infestation of this weed in urban areas also poses a serious threat to the health of the inhabitants of Rampur.

Article Info

Article history:

Received 02 April 2017

Received in revised form

20 May 2017

Accepted 28 May 2017

Available online 15 June 2017

Keywords: Parthenium, congress grass, weed

1. Introduction

Partheniumhysterophorus L. (Asteraceae), was first reported in 1956 in the western part of peninsular India (Rao, 1956), but now it has become a dominant weed of the Country and is spreading aggressively in wasteland, degraded areas, rocky crevices, along water channels, roadsides, railway tracks and in cultivated land (Oudhia, 1999g, 2001; Mahadevapa et al., 2001). This noxious weed can affect crop production, animal husbandry, human health, and biodiversity (Lonkaret al. 1974; Chippendale & Panetta 1994; McFadyen 1995 and Joshi, 2001). Very little or sometimes no other vegetation can be seen in *P. hysterophorus*-dominated areas. Wherever it invades, it forms a territory of its own by replacing the indigenous natural flora, including medicinal herbs utilized by people as a source of medicine (Oudhia, 1999g; Larson & Anderson, 2001). Its allopathic properties, which cause the inhibition of germination and the suppression of the natural vegetation, pose a strong threat to biodiversity (Raghuvanshi et al., 2005). District Rampur is located between Longitude 79°05' East and Latitude 28°48' North. Spread in area of 2367 Sq. Km falls in Moradabad Division of Uttar Pradesh State. It is home to farms that cover long stretches of land. The height from sea level is 192 Meter in north and 166.4 Meter in South. The district comprises of six tehsils: Bilaspur, Milak, Rampur, Shahabad, Swar and Tanda (Fig 1). Situated on the national highway 24, the state capital is 302 km in East and national capita is 185 km in West. During Summers the temperature is usually from 44.2 °C to 30 °C and during Winters it is from 23 °C to 5 °C. Average low precipitation recorded in November (6.1) mm and average high precipitation recorded in month of July (168.1) mm. Vegetation is highly dependent on rainfall, which is, in most cases, seasonal and erratic. The main objectives of this study were to collect phytosociological data on Parthenium invasion and association with other weeds in Rampur district including wild medicinal plants.

2. Materials and Methods

A phytosociological survey was carried out in the six sectors of Rampur district viz. Bilaspur (S-1), Milak (S-2), Rampur (S-3), Shahabad (S-4), Swar (S-5) and Tanda (S-6) during 2015-2016. During the survey, all wild species growing along different wasteland, degraded areas, rocky crevices, along water channels, roadsides, railway tracks and in cultivated land of these sectors were collected and identified by referring to Maheshwari (1962) and Babu (1977). Weed studies were made following the list count method suggested by Misra (1968), who used 1x1 m quadrats. The importance value (IV) is the sum of the relative density (RD) and relative frequency (RF) of species in a stand. The sampling was conducted randomly in all selected sites of Rampur. The compiled data was analysed for quantitative and qualitative studies using the following equations:

$$RD (\%) = \frac{\text{Absolute density for a given species} \times 100}{\text{Total absolute density for all species}}$$

$$RF (\%) = \frac{\text{Absolute frequency value for a species} \times 100}{\text{Total absolute frequency for all species}}$$

$$\text{Importance Value index} = RD + RF$$

3. Results and Discussion

The survey of six sites of Ramour district revealed a total of 27 weed species belonging to 14 angiosperm plant families that were associated with *Parthenium*. Weeds associated with *Parthenium* in different sectors showed independent association, which reflects the herbaceous flora of the study area.

The Bilaspur (S-1) area found to be least disturbed and a minimal amount of human perturbation was recorded. The analysis of the data collected from Bilaspur revealed that *P. hysterophorus* L. was accompanied by nine other species of weeds. *Cynodon dactylon* (L.) Pers. was the most dominant plant species, with an Importance Value index of 76.3% and RF and RD values of 28.5% and 47.8%, respectively (Table 1&2). This was followed by and *Tribulusteriestris* L. (17.9%)

*Corresponding Author,

E-mail address: beenakumari.botany@gmail.com

All rights reserved: <http://www.ijari.org>

and *Malvastrum coromandelianum* (L.) Garcke (16.9%) for their relative frequency of occurrence. *Parthenium* had a frequent to occasional level of occurrence in this sector, but was significantly less frequent than the dominant grass species. Milak area (S-2) was inhabited by a high diversity of weeds: a total of 17 species was found in this sector. *Parthenium* was the most dominant weed species with the highest IV (i.e. 63.00%), followed by *Senna occidentalis* (L.) Link. and *Sidaacuta* Burm f. and *M. coromandelianum* (L.) Garcke with IVs of 30.3%, 16.5% and 15.3 % respectively (Table 2).

Rampur city area (S-3) exhibited a total of ten plant species associated with *Parthenium weed*. It was the most dominant weed species of this sector, with *T. tereistris* L., *Senna occidentalis* (L.) Link. and *Sidaacuta* Burm f. as dominant species. *Parthenium* had the highest RF (30.3%), followed by *Tribulsterreistris* L. (15.2%) and *S. occidentalis* (L.) Link. (11.09 %). An interesting feature of this area was that no grass species was found to be associated with *Parthenium weed*.

Parthenium was the most dominant, and *M. coromandelianum* (L.) Grackles was the second most dominant weed species of Shahabad area (S-4) with IVI of 98.81% and 18.78 %, respectively (Table 2). The observations further revealed that most of the roadsides were vegetated with four perennial herbs, such as *Croton bonplandianum* Boil., *Artemisia scoparia* Waldst et Kit, *Convolvulus arvensis* L. and *Tribulsterreistris* L. and two perennial grasses like *C. dactylon* (L.) Pers. and *Heteropogon contortus* (L.) P. Beauv. with six these species having identical values (5.88%) for the relative frequency of occurrence.

The analysis of the data collected from Swar area (S-5) indicated that most of the sampled area in this sector was dominated by perennial grasses, such as *D. bipinnata* and *C. dactylon*. *Desmostachya bipinnata* and *P. hysterothorus* showed equal values for RF (i.e. 21.2%). However, *Parthenium* (68.7%) exhibited a higher IVI than *D. bipinnata* (i.e. 32.34 %) (Table 1 & 2). *Cynodon dactylon* was the third most dominant species after *P. hysterothorus* and *D. bipinnata*, with an IVI of 34.10%. The data for other herbaceous flora, including *Artemisia scoparia* Waldst et Kit, *Barleria cristata* L. and *Trichodesma indicum* (L.) R. Br., which are medicinal herbs, indicated that their population is in decline.

The analysis of the data collected from Tanda area (S-6) showed that *P. hysterothorus* was associated with eleven other weed species. *Parthenium* had the highest IVI (69.9%), RD (45.8%), and RF (24.1%). Being codominant with *Parthenium*, *C. dactylon* showed the second highest IV (45.7%), RD (25.0%), and RF (20.7%) (Table 1 & 2).

Parthenium has become a major weed of various areas of Rampur district in a relatively short time. Both water and air are suspected to be the major vectors of its spread in arable parts of the district. Most of the dispersal of seed is through vehicular and mechanized farming, which leads to long-distance dispersal in India and Australia (Raghuvanshi and Tripathi, 2009; Navie et al. 1996). The phytosociological survey of Rampur showed a high frequency of *Parthenium* in general; however, the RF of the weed in different sites of the district ranged from 10.6–30.3%. A similar pattern of invasion was noticed by Oudhia (1999f) in a phytosociological survey of weeds of the rainy season with special reference to *Parthenium* Raipur (Chhatisgarh). The high relative density and frequency of this weed may be attributed to its aggressiveness and allelopathic effects on the neighboring plants (Kohli et al. 1985; Adkins & Sowerby 1996). It was noticed during the survey that *P. hysterothorus* prefers to invade areas that have

been recently disturbed and where topsoil is removed. This, in turn, minimizes the competition from native species and enhances the chances of survival of the invading plants. It was further observed that *Parthenium* and *S. occidentalis* had a high degree of sociability and these formed large stands under different habitats in Milak (S-2) and Rampur city (S-3). *M. coromandelianum* exhibited a high sociability with *P. hysterothorus* in Bilaspur (S-1) and Shahabad (S-4). The codominance of *M. coromandelianum* was clearly evident in these areas. The data from these areas also revealed that the association of *M. coromandelianum* with *Parthenium* was more prevalent in shady places and wet places.

Heavy infestation of *Parthenium* which also has been proved to be an allergy-causing plant, poses a serious threat to the inhabitants of the Rampur district. Sriramarao et al. (1991) conducted aero-pollen sampling in Bangalore (southern India) over a 6-year period and revealed that 40–60% of the total pollen counts were from *Parthenium*. Subsequent studies by Suresh et al. (1994) from northern India showed that a significant proportion of patients with bronchial asthma were sensitive to the pollen of *Parthenium*. Kohli and Rani (1994) from Punjab also reported adverse effect of pollen grains on human health. The studies of McFadyen (1995) in Australia are in line with the findings of these Indian authors. *Abutilon indicum*, *Artemisia scoparia*, *Barleria cristata*, *Boerhavia diffusa*, *Sidaacuta* and *Tribulsterreistris* are common wild medicinal species which are under serious threat due to competitive ability of *Parthenium*. The wastelands are a potential source of naturally growing herbs, but if the increasing population of *parthenium weed* is not checked, it is most likely that the latter will replace these medicinal plants.

References

- [1.] SW Adkins, MS Sowerby. Allelopathic potential of *Parthenium hysterothorus* L. in Australia. *Plant Prot.*, Q. 1, 1996, 20–23.
- [2.] CR Babu. Herbaceous Flora of Dehradun. CSIR, New Delhi, 1977.
- [3.] JF Chippendale, FD Panetta. The cost of *Parthenium weed* to the Queensland cattle industry. *Plant Prot. Q.* 9, 1994, 73–76.
- [4.] D Joshi D. Alien invasive species: a global threat to biodiversity. *The Katmandu Post* 2001.
- [5.] RK Kohli, A Kumari, DB Saxena. Auto and teleotoxicity of *Parthenium hysterothorus* L. *Acta Univ. Agric. Brno (Czechoslovakia)* 33, 1985, 253–263.
- [6.] RK Kohli, D Rani. *Parthenium hysterothorus*, a review. *Research Bulletin of Punjab University (Science)* 44, 1994, 105-149.
- [7.] DL Larson, PJ Anderson. Alien plant invasion in mixed-grass prairie: Effects of vegetation type and anthropogenic disturbance. *Ecological Application*, s 11(1), 2001, 128-141.
- [8.] A Lonkar, JC Mitchell, CB Calnan. Contact dermatitis from *Parthenium hysterothorus*. *Trans. St John's Dermatol. Soc.* 60, 1974, 43–53.
- [9.] JK Maheshwari. *The Flora of Delhi*. CSRI, New Delhi, 1963.
- [10.] RE McFadyen. *Parthenium weed* and human health in Queensland. *Aust. Fam. Physician*, 24, 1995, 1455–1459.
- [11.] M Mahadevapa, TK Das, A Kumar. *Parthenium*: A curse for natural herbs. In: National Research Seminar on Herbal Conservation, Cultivation, Marketing and Utilization with Special Emphasis on Chhatisgarh, "The Herbal State". (Raipur, India, 3–14 December 2001.)
- [12.] R Misra. *Ecology Work Book*. Oxford & IBH. New Delhi, 1968.

- [13.] SC Navie, RE McFadyen, FD Panetta, SW Adkins. The biology of Australian weeds 27, *Parthenium hysterophorus*L. *Plant Prot.Q.* 11, 1996, 76–88.
- [14.] P Oudhia. Medicinal weeds in rice fields of Chhattisgarh (India). *International Rice Res. Notes, (IRRI)*. 24 (1), 1999, 40.
- [15.] P Oudhia. Phyto-sociological studies of rainy season wasteland weeds with special reference to *Parthenium hysterophorus* L. in Raipur (India) district, 1999.
- [16.] P Oudhia. Phytosociological Survey of Rainy Season Weeds of Wastelands with Special Reference to *Partheniumhysterophorus* in Raipur District. *Asian J. Microbiol. Biotech and Environ. Sci.*, 24(3), 2001, 42-48.
- [17.] AS Raghuvanshi, LC Rai, JP Gaur, JS Singh. Invasive Alien species and biodiversity in India. *Curr.Sci.*, 88(4), 2005, 539-540.
- [18.] AS Raghuvanshi, A Tripathi. Effect of disturbance, habitat fragmentation and alien invasive plants on floral diversity in dry tropical forests of Vindhyan highland: a review. *Tropical Ecology*, 50(1), 1999, 57-69.
- [19.] P Sriramarao, S Nagpal., BS Rao, O Prakash, PV Rao. Immediate hypersensitivity to *Partheniumhysterophorus*. II. Clinical studies on the prevalence of parthenium rhinitis. *Clin. Exp. Allerg*, y 21, 1991, 55–62.
- [20.] PV Suresh., D Gupta, D Behera, SK Jindal. Bronchial provocation with *Parthenium*pollen extract in bronchial asthma. *Ind. J. Chest Dis. Allied Sci.*, 36, 1994, 104.
- [21.] RS Rao. *Partheniumhysterophorus* L. a new record for India. *J. Bombay Nat. Hist. Soc.*, 54, 1956, 218–220.