



Parthenium weed spread in Andaman & Nicobar and Lakshadweep Islands of India: Lurking invasion needs attention for its eradication

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Article information

DOI: 10.5958/0974-8164.2020.00038.6

Type of article: Weed watch

Received : 18 April 2019

Revised : 28 July 2020

Accepted : 5 August 2020

Key words

Senna tora

Dermatitis

Islands

Parthenium

Zygodotria bicolorata

ABSTRACT

Parthenium (Parthenium hysterophorus L.) has traversed the oceans to reach Andaman & Nicobar and Lakshadweep Islands of India in early 21st century, nearly half a century after its first report in Maharashtra state in 1955. Its entry might be on account of contaminated movement of food grains and other materials with *Parthenium* seeds from mainland through ships and airplanes. The weed has established in wastelands and community lands in some of the islands, hence there is lurking threat of its further invasion in other islands and into croplands. Public were less aware of its harmful effects due its new occurrence in the region. Competitive plant *Senna tora* was noticed in the islands during survey, and was recommended for *Parthenium* management on the road side. Physical removal was done involving people participation and was recommended for its management due to ban on using of chemicals. Bioagent *Zygodotria bicolorata* was not found in Andaman & Nicobar Islands in spite of its introduction in 2005 and 2006 for its biological control.

Parthenium hysterophorus (L.) is an annual herb belonging to the sunflower family of Asteraceae (Compositae). The weed proliferation is so rapid that it has gained the status of world worst weeds by 1997 (Holm *et al.* 1997) and has entered into the group of 100 most invasive species of world (GISD 2018). In India, an attempt was made by Sushilkumar (2005) to trace the history of occurrence of *Parthenium*, which was found about one and half century old (Roxburghi 1914, Maiti 1983). Its presence in India before 1955 got further confirmation from a herbarium record in Forest Research Institute, Dehradun (Uttarakhand) collected by Dr. Brandis (1880), however it became wide spread only after its entry into the country as a contaminant of wheat grains supplied by USA to India as food aid under PL 480 scheme in 1950s. After 1880, this weed was first noticed in the country by Prof. Paranjape, a retired horticulturist, in Pune district, Maharashtra in 1955, and described by Rao (1956). Thereafter, it has rapidly disseminated to every nook and corner of the country infesting about 35 million hectares of land (Sushilkumar and Varshney 2009). First time, its presence in Andaman and Nicobar Islands (ANI) was reported in Diglipur area during floral survey in 2001 (Reddy 2013) and

thereafter, its substantial presence was recorded in Port Blair by Sushilkumar (2005). Severe presence of *Parthenium* was reported in Minicoy Island of Lakshadweep in 2012 (Sushilkumar 2014). The two islands of Union Territories (UTs) of India are physically isolated from mainland by 280-400 (Lakshadweep Islands, of coral origin in Arabian sea) to over 1200 km (Andaman & Nicobar islands, of volcanic origin in Bay of Bengal). In view of harmful effects on men, animals and biodiversity, a study was done on its spread and method of management in Andaman & Nicobar and Lakshadweep Islands of India.

Occasional surveys were made in different parts of two islands (Lakshadweep and Andaman and Nicobar) during 2014 to 2017 for the presence of *Parthenium hysterophorus*, competitive plant *Senna tora* and other species, and bioagent *Zygodotria bicolorata*. Interactions were made with the inhabitants of different parts of the islands and government officials of agriculture, forests and public works departments to know whether people are aware about its harmful effects and control measures to contain it. Attempts were also made to make public aware about the weed by organising

various activities like uprooting of *Parthenium*, display of posters, sowing of competitive plant to replace *Parthenium* *etc.* on the appeal of Directorate of Weed Research, Jabalpur during *Parthenium* Awareness Week.

Parthenium occurrence in the islands

Severe infestation of *Parthenium* was observed in Hut Bay Island, however low presence was also observed around the Port Blair airport boundary in South Andaman district. The weed was also recorded in Sawai tee-top village beach of tribal district of Nicobar in low intensity, which is separated by 10-degree channel from other 2 districts (**Figure 1a** and **1b**). Movement of organic manures and other food materials was suspected to be the causes of its appearance in Nicobar district. The unabated movement of *Parthenium* contaminated materials within the islands from mainland is aiding the threat of its spread to other islands that are free from it till now (Gangaiah *et al.* 2016, Gangaiah 2018).

In Minicoy island of Lakshadweep, severe infestation of *Parthenium* was recorded during survey, however this weed was not found in other islands of Lakshadweep. The mode of entry might be due to transport of *Parthenium* contaminated materials from the state of Kerala. Severe occurrence of *Parthenium* in Minicoy island of Lakshadweep was also reported in 2012 by Sushilkumar (2014), however, he categorised Andaman & Nicobar territory under low infestation category in context to overall spread. The presence of *Parthenium* weed in the Andaman and Nicobar Islands was first time noticed in 2001 (Reddy 2013). Its further spread might be due to transport of aid materials of food, manure, construction materials *etc.* aftermath of 26th December, 2004 massive earthquake followed by tsunami.

Impacts of parthenium on agriculture and health in the islands

No serious estimate on extent of *Parthenium* invasion into forests (occupying >85 of Andaman's geographical area), wastelands and community lands has been assessed yet. There are no forests in Lakshadweep islands. *Parthenium* infestation in agricultural lands has not reached the level of economic threshold level to reduce the yield. The impact of *Parthenium* on health of domestic animals was also not reported. However, from *Parthenium* weed infested areas, local people complained about the irritation on skin, an indication of allergenic eczematous contact dermatitis (AECD), which may be caused by *Parthenium* pollens and trichomes. Seema Das and Mitesh Behari (2017) reported rise in eye allergy cases in people of Andaman including Hut

Bay Island, which might be due to the severe presence of *Parthenium* weed, however it needs to be affirmed yet. No asthma related cases were reported due to this weed in the islands. This allergic reaction of weed was ascribed to sesquiterpene lactones (SQLs) present in hairs and pollen (Towers and Mitchell 1983). The uncontrolled *Parthenium* in islands may enhance these health disorders in future.

Parthenium management options in islands

Preventive management: In context to Andaman & Nicobar and Lakshadweep territories, prevention of entry from one island to another island may play significant role to contain further spread of *Parthenium* weed. There are 572 islands in Andaman & Nicobar and 38 in Lakshadweep territory. So far, from Lakshadweep territory, *Parthenium* has been reported only from Minicoy Island. The main movement of materials is from mainland (Kochi, Mangalore only). There is a possibility of *Parthenium* entry from Bengaluru, which is connected with Agatti island via Kochi. In ANI, materials are transported from Chennai, Visakhapatnam and Kolkata to Port Blair by ships, therefore there is a need of proper quarantine of this weed from these ports. Recently, air connectivity has been extended from Delhi, Bengaluru, Hyderabad and Mumbai to Port Blair. The movement of men and materials from these places may further aid its spread in Port Blair. Therefore, opting of strict quarantine measures will certainly help to contain its further spread from the main land.

Physical removal: It is one of the easiest methods for reducing the intensity of *Parthenium* in infested islands of Andaman & Nicobar and Lakshadweep. Attempts have been made to uproot the weed from Minicoy Island and Harmider Bay during *Parthenium* Awareness Week since 2014, however, this single approach has not reduced the intensity of weed in this area at appreciable level. Nevertheless, manual method of uprooting by involving different stakeholders at regular interval before flowering of weed appears the most promising management option keeping in view of limited penetration of the weed in different isolated islands of Andaman & Nicobar and Lakshadweep.

Chemical control: There is no option to use herbicide to manage *Parthenium* in the islands because of banning of use of chemicals after 2018 to make the islands organic. There is option to use 15-20% saline water prepared from common salt (Singh *et al.* 1996) for controlling *Parthenium* in the islands. This may not be economical because of high prize of salt in absence of salt production factories owing to tropical monsoonal humid climate.

Biological control: In Harmider Bay Island (Little Andaman, South Andaman district), *Senna* species



Figure 1a. Severe Parthenium infestation in Hut Bay, South Andaman district



Figure 1b. Parthenium infestation at Sawai tee-top village of Nicobar district



Figure 2. Luxuriantly growing *Senna tora* in Hut Bay replacing Parthenium



Figure 3a. Parthenium awareness week organized at Hut Bay during 21-22 August, 2017



Figure 3b. Uprooting of Parthenium in residential areas

were found dominated on the road side (Figure 2). *Senna tora* has been recommended to replace Parthenium in main land of India due to its useful attributes (Sushilkumar 2009) in spite of about 23 listed competitive plants against Parthenium (Gautam *et al.* 2005). About 8 species of *Senna* have been documented from Adaman & Nicobar Islands (Reddy 2013). *Mimosa pudica* has also been found in ANI which leaf extracts (20%) application has been reported to completely (100%) inhibit the germination of Parthenium germination (Nganthoi Devi *et al.* 2013), however, this plant species cannot be recommended for replacement of Parthenium due to its invasive nature.

Biological control by host specific insect *Zygogramma bicolorata* has been considered one of the most suitable approaches for the management of Parthenium (Sushilkumar 2009 and 2014). Efforts were made in 2005 and 2006 to introduce this bioagent by sending beetle consignment to Krishi Vigyan Kendra in Port Blair from Directorate of Weed Research (Sushilkumar, personal observations) but so far there is no report of bioagent presence in the area. It is expected that if bioagent get establish in such island situations, it may help to reduce the intensity of the weed. A fresh attempt is required to introduce the bioagent in the area consulting the prediction model developed by Gharde *et al.* (2019).

Awareness and utilization approach: Local people especially tribal were not aware of the weed and its harmful effects. Awareness campaigns were conducted by organising training programmes to make people aware about the menace and management of Parthenium during Parthenium Awareness Week (16-22 August) every year since 2014 in Hut Bay, a tribal village severely infested with Parthenium. (**Figure 3a** and **3b**). The techniques of compost making by pit method was demonstrated for the utilization of uprooted weed biomass as per methods suggested by Sushilkumar *et al.* (2005). A Doordarshan programme on Parthenium weed management in Andaman & Nicobar Islands was given for the benefit of all stakeholders during 2016.

Conclusion

At present, Parthenium problem is not alarming in the Islands in comparison to main land of India, therefore, it will be easy to manage and even eradicate the weed completely. The movement of this weed in South Andaman and North and Middle Andaman districts will be easy by road and boat, therefore, more attention needs to be given by administration to check this weed in these areas. There are meagre chances of spread of Parthenium among the 16 isolated islands of Nicobar district, but immediate attention of local administration is required to contain the weed from Sawai tee-top village under Nicobar Island. Likewise, in Lakshadweep territory, severe infestation of Parthenium has been reported in Minicoy island only. Utmost attention should be given to contain the weed from this island to check further entry into other nearby islands. It is opined that eradication of Parthenium is possible from ANI because of low spread yet. Therefore, Government of ANI should come forward for its eradication programme before this invasive and obnoxious weed reach beyond the approach of such intervention.

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