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INTEGRATED PARTHENIUM MANAGEMENT

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In India, *Parthenium hysterophorus L*. (Asteraceae), a noxious weed, commonly known as carrot weed, white top, or congress grass. It is a herbaceous, erect, and annual plant. The origin of parthenium is considered to be from Mexico, the USA, Trinidad to and Argentina. The general notion of belief is that when the USA exported grain to Indian under its US PL 480 (also known as "Food for Peace") scheme, which was basically a food assistance program; the seeds of parthenium also came with it and established itself as a naturalized weed within no time.

Presently it has been spread about 35 million hectares of land in India. Ever since weeds became a global threat, including in India, efforts have been made to control weeds using various methods such as mechanical, competitive (allelopathy), chemical, and biological control methods. Weeds, however, have resisted all efforts to control it for one reason or another. Biological control, deliberately exploiting natural enemies, insects, bioherbicides, nematodes, snails, and competing plants to control harmful weeds, thrives more effectively and co-friendly than conventional weed control methods.

Habitat and dispersal of Parthenium

Parthenium thrives in desert areas, grasslands, fields, forests, floodplains, agricultural areas, urban areas, overgrazing, industrial areas, playgrounds, roads, railways, and residential areas. Drought and reduced veld coverage that followed created favourable conditions for parthenium weeds to settle. Although parthenium weeds can grow in many soil types, they are particularly dominant in alkaline, hard clay soils. The leaf of parthenium looks like a carrot leaf that can reach a height of 1 to 1.5 meters. It has branches. The stems and leaves have hairs on the surface. The flowers are white. It is spread mainly by seeds. Weeds can produce up to 154,000 / m2 seeds, and a single plant can produce about 15000 - 25,000 seeds. Seeds are very light in weight and are easily carried or transported by air, water, or various human activities. Seeds do not require dormancy and can germinate whenever moisture is present. Seeds germinate with the commencement of rains; flowering begins a month later

Volume 3 – Issue 12
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and continues for another three months. In northwestern India, parthenium germinates mainly during the months of February-March, experiencing high post-rainfall growth in June-July and producing seed in September-October. It usually completes its life cycle between 180-240 days. Due to the bitter cold, its growth is slow and stagnant from November to January. Parthenium has the ability to regenerate from the cut or broken parts. Its allelopathic effects associated with the absence of natural enemies such as pests and diseases are two key factors contributing to its rapid spread in India.

Harmful Effect

In general, parthenium is a toxic, harmful, problematic, allergic, and aggressive weed that poses a severe threat to humans and livestock. This weed has been considered a major source of dermatitis, asthma, nasal-dermal and nasal-bronchial infections in India and Australia. In addition to the side effects, it also causes a few other problems, such as the closure of familiar roads and reduces the value of parks, gardens, and residential areas. Furthermore, it dramatically reduces crop production without losing biodiversity.

Fig 1: Parthenium

Integrated Management of Parthenium

Since weeds became a threat to India and other countries, efforts have been made to control weeds in multiple ways. But so far, no single method has been proven satisfactorily as each method has one or more limitations such as the possibility of temporary relief, high environmental safety costs, etc. Therefore, there is an urgent need to adopt an integrated approach to parthenium control methods together and if applicable.

Physical Method

Physical control involves hand weeding, time-consuming and unpleasant workmanship, exacerbated by the health risks involved in particle weed control. Proper removal of parthenium before flowering and seed set is the most effective method. Weeding after seeding will increase the area of invasion. Burning, another method used to control

Volume 3 – Issue 12
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www.agriallis.com

weeds, is not a helpful particle control strategy. However, research shows that the burning of some targets (e.g., weed control with wood) will not cause the growth of parthenium as long as the veld is allowed to thrive before the stock is formed. This too seemed insufficient for two reasons; it requires a large amount of fuel and burns destroy all the other critical economic crops that grow in its area.

Chemical control

Chemical control is an effective way to control the parthenium in areas where its natural enemies are absent. The use of herbicides, such as chlorimuron ethyl, glyphosate, atrazine, amethyst, bromoxynil, and metsulfuron, is known to be very effective in controlling weeds. The most effective treatment for parthenium growth was glyphosate and metribuzin, with higher mortality 4 weeks after treatment (WAT) in both rosette and bolted phases than 2, 4-D, triasulfuron + terbutryn, bromoxynil + MCPA, and atrazine + s-metolachlor. Pendimethalin was a slow-acting treatment in both stages of development. Overall, the efficacy of herbicides was more promising for rosette parthenium plants than for binding plants. In no crop areas, uncultivated areas, and along railways and sidewalks, spraying `of standard salt solution (Sodium chloride) at concentrations of 15-20% has been observed. Found to be effective.

Allelopathic Control

Parthenium can be controlled by planting *Cassia sericea, C. tora, C. auriculata, Croton bonplandianum, Amaranthus spinosus, Tephrosia purpurea, Hyptissuaveolens, Sida spinosa, and Mirabilis jalapa*. In India, crop rotation using Marigold (Tagetes spp.) During the rainy season, instead of the common crop, it effectively reduces parthenium invasion in cultivated areas. Both root and shoot extracts of three allelopathic grasses, namely *Dicanthiumannulatum, Cenchrus pennisetiformis*, and *Sorghum halepense*, reduce germination and suppress plant growth at the beginning of the rare P weed. hysterophorus. Watery leafy plants of *Azadirachta indica*, *Aegle marmelos*, and *Eucalyptus tereticornis* completely inhibit the germination of parthenium seeds.

Biological Control

Biological control is a natural and effective way to reduce or minimize pests and the effects of pests by using natural enemies. Biological control of parthenium involves using

Volume 3 – Issue 12
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www.agriallis.com

various biocontrol agents such as microbial pathogens, insects, and botanicals. In various biocontrol control techniques, plant pathogens can be effective, safe, and beneficial to the environment. There are two basic strategies for using weed control biology: the introduction of exotic pathogens, called "old-fashioned way," and "propagation method" or "bioherbicidal," in which pathogens already exist (native or introduced) and population. They increase in size. Of the various insects, the leaf-feeding beetle (*Zygogrammabicolorata*) and the stem galling moth (*Epiblemastrenuana*), both imported from Mexico, have revealed excellent prospective to control this weed. Both adults and larvae of *Z. bicolorata* feed on leaves. The fully-grown larvae enter the soil and pupate. One adult per plant is effective in skeletonizing leaves within 4–8 weeks, but little success has been achieved as the weed has very high generative potential; moreover, the insect is not species-specific and is found to attack sunflower in India. The most promising fungus to treat parthenium is *Puccinia abrupta var. partheniicola* (Jackson) Parmelee, *Puccinia xanthii* var. *Parthenia-hysterophorae* (formerly known as *P. melampodii Diet*. and How.) (Uredinales), *Entylomacompositarum* De Bary (Ustilaginales), and *Plasmoparahalstedii* (Farlow) Berl. and *De Toni* (Peronosporales). In this case, *Puccinia abrupta var. partheniicola* and *Puccinia xanthii var. parthenii hysterophorae* originated in Mexico and has been fully explored and released in Australia; they are the most potent biocontrol fungal bacteria of this weed in Australia

Conclusion

The *P.hysterophorus* grows in a wide range of areas and causes changes in surface plants and underground nutrients. As a result, it can compete with native and exotic flavor plants important for livestock. In addition, changes in vegetation and soil structure can lead to the final transformation of some trophic levels and alter the function of the ecosystem. Therefore, proper ways to manage *P. hysterophorus* are needed to avoid potential threats to biodiversity and economic losses. Biological controls using allelopathy, insects, and fungal bacteria are a practical and environmentally friendly alternative to other time-consuming, expensive, toxic, physical, and chemical methods. Nine insects and two rust species have been released in Australia to test this weed. Of these, two insects are *Z. bicolorata* and *E. stenuana* and two rusty fungi, *Puccinia abrupta* var. *partheniicola* and *Puccinia xanthii* var. *parthenii hysterophorae*, has shown strength and is used to control this weed. However, weeds have not been fully explored and are still causing trouble in Australia and India, and

Volume 3 – Issue 12
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much remains to be done by scientists, farmers, and governments to work together to control these weeds.

References

A. K. Pandey, S. Farkya, and R. C. Rajak, "A preliminary evaluation of *Fusarium* spp. for biological control of *Parthenium*," *Journal of Indian Botanical Society*, vol. 71, pp. 103–105, 1992.

A. L. Siddaramaiah, T. Narendrappa, and M. V. Shivalingaradhya, "A new collar rot disease of *Parthenium* from India," *Plant Pathology Newsletter*, vol. 2, no. 2, p. 11, 1984.

P. S. Kumar and S. P. Singh, "First report of *Lasiodiplodiatheobromae* as a foliar pathogen of *Parthenium hysterophorus*," *Plant Disease*, vol. 84, no. 12, p. 1343, 2000.