

## Plant Introduction in Environmental Pollution Control and Waste Land Development

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The pernicious weed *Parthenium hysterophorus* L., commonly known as congress grass, carrot weed, white cap etc, growing naturally since centuries in Latin America and many other countries, has become one of the seven most dreaded weeds of the world (Singia, 1992). In India, it is noticed only from mid-fifties and is presumed to have been accidentally introduced in Maharashtra. However, its spread throughout the country has been very rapid with abnormal density. Abandoned and wastelands, vacant sites, road sides, railway tracks, grave yards, back yards, cultivated lands etc, are the targets for the invasion by this dreaded weed. The consequences of the rapid and gregarious growth of parthenium, especially the ill effects on human, livestock and plants, have been well published to create public awareness. All the parts of the plant, particularly its pollen have allergic effects on other organisms. The weed can germinate, flower and set seeds within four weeks. A single plant can produce up to fourteen thousand seeds. Once established, it can survive severe droughts and frosts. Further, factors such as (i) the absence of natural agents that restrict the spread of this plant as in its original home, (ii) high fecundity, (iii) efficient seed dispersal mechanisms, (iv) monopolistic allelopathic impact on most other plant species, (v) unsuitability for grazing because of the presence of anti-feedants in the plant system and (vi) wide adaptability to varying soil and agroclimatic conditions have enabled this plant to invade a variety of growing environments particularly in situations associated with human activities.

Parthenium has been regarded as a beneficial plant too. It is used as a folk remedy against various afflictions such as ulcerated sores, certain skin diseases, facial neuralgia, for cleaning the blood and also as insecticide. It is reported that "parthenin", the principal ingredient of this plant possesses anticancer properties. Parthenium plants have been commonly used as centering material in the construction of buildings and bridges. Possibility that parthenium plants can be ensilaged after mixing it in certain proportion with conventionally used feeds, is also reported. The ensilaged parthenium is reported

to be devoid of the contact allergen/toxin parthenium and was palatable to live stock. The fibrous nature of the parthenium stem is a point that needs the attention of industrial researchers to see if it has potential in manufacturing paper and such other materials as helmet, molded furniture, door etc. In the years of drought when most plant species fail to grow, parthenium, by virtue of tolerance to drought, grows and brings down CO<sub>2</sub> level in the atmosphere. It is reported that 20 per cent parthenium leaf water extract when sprinkled on mulberry leaves improved the quality as well as quantity of cocoon due to steroids present in the parthenium plant. As felt at present, its harmful effects both from medical as well animal health and agricultural production point of view are serious matters for consideration.

The management of this weed has posed a serious challenge to the scientists, administrators and the public. Manual, chemical and biological approaches have long been attempted. The weed has defied all human efforts to control it. But positive results are seen through integrated management suggested from 1988 onwards in which plant introduction has played major role. The Integrated Parthenium Weed Management Technology (IPWMT) being adopted successfully in containing this weed includes botanical agents such as *Cassia sericea*, *C.tora*, *Tephrosia purpurea*, *Heptis spp.*, *Sida spp.*, *Mirabilis jalapa*, *Croton sparciflorus*, *Stylosanthes hamata*, *Tagetes erecta*, *Amaranthus spinosa* etc, beside releasing Mexican beetle (*Zygogramma bicolorata*), hand pulling and herbicide application. Proven botanical agents need to be introduced depending on their suitability to the ecological situations wherein parthenium has invaded in a menacing scale.

The Integrated Parthenium Weed Management Technology (IPWMT) involving the various methods suggested in the past could be effective in controlling parthenium. If a concerted effort is made to adopt IPWM, the results will be visible in the second year and by the third year the parthenium will come down to a negligible level. The newly suggested IPWMT envisages five steps viz., (i) Maintenance of natural biodiversity

i.e., not to disturb the existing flora to the extent possible, (ii) In places where cleaning and exposing of soil is unavoidable, planting of *C. sericea* or such proven botanical agents (BAs) at the start of rainy season. The growth of such plants can insulate opened up soils against invasion by parthenium. In already infested areas, planting of botanical agents may be taken up at the start of rainy season and parthenium plants which may grow along with BAs are to be removed in the initial one or two years, so that the antagonistic plant establishes well. Afterwards, the BAs will shed seed and perpetuate on their own. (iii) To watch for the commencement of rains and build up of Mexican beetles and when the beetles become available in large numbers, they have to be collected and released in parthenium-invaded areas. (iv) In situations where none of the above methods can be adopted as in case of gardens, flowers beds, lawns intensively cultivated agricultural fields, manual removal has to be taken up. In the manual method, it should be noted that the persons chosen for uprooting the weed should not be allergic to parthenium. (v) In situations where none of the above methods can be adopted like vast stretches of already parthenium invaded plots and where immediate relief is needed, it may have to be controlled through chemical sprays with the knowledge that it gives only temporary suppression and

does not ensure permanent control. Adoption of this technology in Karnataka has clearly demonstrated the success of this method in suppressing the growth of parthenium up to 90 per cent in some parts of north Karnataka and to an extent of fifty per cent in pockets of southern Karnataka, including in and around Bangalore city. Success is also seen in the neighboring states of Andhra Pradesh and Tamil Nadu.

The proven botanical agents are: *Cassia sericea* (Syn: *Cassia uniflora*), *C. tora*, *C. auriculata*, *C. occidentale* *Croton bonplandiamum*, *Amaranthus spinosus*, *Tephrosia purpurea*, *Hyptis suaveolens*, *Sida spinosa*, and *Mirabilis jalapa*, *Stylosanthus hamata* and *Tagetes erecta*, the strongest being the first one. Thus, the introduction of identified botanical agents where the super weed has invaded and established in a dangerous proportion has a key role to play in checking the growth of this weed and wasteland development. The contribution of plant introduction can be enormous not only in crop production but also in maintaining biodiversity, weed control, pollution control and wasteland development. The biomass efficient plants among them, like *Cassia sericea*, *C. tora* also find several other uses like green manure, gum from seeds, and fodder from *Stylosanthus* etc, and can even be potential source of biofuel.