



Post-emergence application of herbicide for the control of *Parthenium* in non-cropped area

are of white or light reddish in colour with dark brown longitudinal markings on the elytra, measuring about 6 mm in length. Light yellow eggs are laid generally on ventral side of the leaves and hatch in 4-7 days. The beetle completes its life-cycle in 22-32 days. Insect completes 5-6 generations under field conditions in a year. Both adults and larvae are capable to feed on *Parthenium*. By continuous feeding on *Parthenium*, it gradually kills the weed. Newly-emerged plants after first flush are very vulnerable to the attack of grubs and adults.



Zygogramma bicolorata and its attack on *Parthenium* leaves

6. Management by effective utilization: *Parthenium* can be most effectively be used in compost and vermicomposting making. The compost should only be prepared by pit system. The *Parthenium* biomass should be buried in the pit in layers. On each layer, 5 kg dung slurry and 500 g urea should be used. After filling the pit, it

should be closed by the mixture of soil and dung. The compost prepared by *Parthenium* contains more nutrients than the compost prepared by dung only. Grown-up *Parthenium* plants having more fibrous stems and branched can be used to make particle boards paper and composites.

Community Approach to manage *Parthenium*: How Can a Responsible Citizen Help?

- 1. Identify and Report:** Learn to recognize *Parthenium* in different growth stages. Report infestations to panchayats, agriculture officers, or forest departments.
- 2. Avoid Spreading:** Don't allow it to flower or seed in your surroundings. Clean vehicles, farm tools, and clothes after being in infested areas. Avoid dumping infested soil or plant material on roads or in fields.
- 3. Participate in Community Removal Drives:** Join or organize monthly *Parthenium* removal campaigns in your locality. Involve schoolchildren, SHGs, farmers, and residents. Ensure safe handling: wear gloves and masks while uprooting.
- 4. Promote Safe Disposal:** Bury the uprooted plants in pits or use composting under soil cover. Never burn *Parthenium* (releases harmful fumes). Prevent contact with water bodies to stop its aquatic spread.
- 5. Support Biological Control:** Encourage the use of biocontrol agents like *Zygogramma bicolorata* (Mexican beetle). Report the beetle's performance and infestation control to local authorities.
- 6. Educate Others:** Spread awareness through social media, community meetings, or poster campaigns. Share symptoms of allergies and prevention tips with fellow citizens. Educate school students, farmers, and workers about its harmful effects.
- 7. Follow Local Guidelines:** Cooperate with government and NGO-led programs for weed control. Participate in *Parthenium* Awareness Week and related activities.

What You Can Say as a Responsible Citizen : "This weed is a silent killer—of health, land, and livelihoods. I will act, educate, and protect my environment from *Parthenium*." your small actions can bring big changes. a single responsible citizen can prevent the spread of thousands of seeds. let's unite to build *Parthenium*-free villages, towns, and ecosystems.

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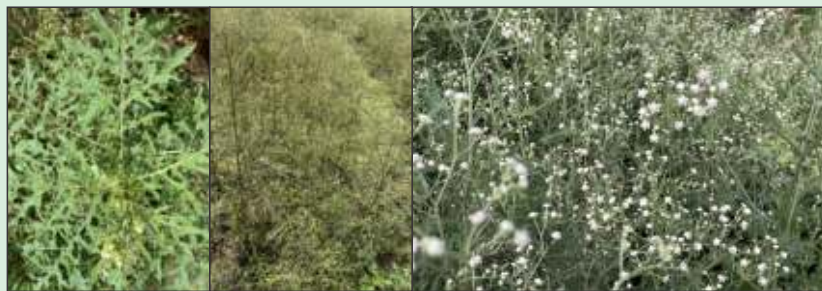
Integrated Management of *Parthenium hysterophorus*



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Parthenium hysterophorus (Family: Asteraceae), is locally known as *Gajar ghas*, *Safed topi*, *Chatak chandni* is native to Central America. It is one of the most problematic alien invasive weeds in the tropical and subtropical world and popularly known as *Gajar ghas* due its appearance like a carrot plant. Its strong allelopathic, potential prolific seed production and phenotypic plasticity in growth form enable this species to invade a wide range of habitats in areas where natural ecosystems are disturbed to varying scales by anthropogenic activities. After the noticeable occurrence of *Parthenium* in Pune (Maharashtra) in 1956, it has spread like a wild fire throughout India. At present, it has invaded about 35 million hectares of land in India. It is a nuisance on road sides and railway tracks, vacant lands, wastelands, industrial areas, on the sides of open drainage systems and irrigation canals besides invading agricultural crops.



Parthenium infestation

How to identify?

Parthenium leaves look alike carrot leaves and attains height of 1.5-2.0 meter. It is heavily branched specially when reaches to the flowering stage. Stem and leaves covered with fine hairs whereas flowers are white in colour.

How does Parthenium spread?

It mainly spreads through seeds. A single plant can produce about 25,000-50,000 seeds. The seeds are very light in weight and easily carried or transported by wind, water or through various human activities. *Parthenium* has the capacity to re-grow from the cut or broken parts. Its allelopathic effects coupled with the absence of efficient natural enemies are two important factors responsible for its rapid spread in India.

Harmful effects of Parthenium

In general, *Parthenium* is a poisonous, pernicious, problematic aggressive weed posing a serious threat to biodiversity, human beings and livestock. Contact with *Parthenium* can cause severe allergic reactions like dermatitis, rashes, eczema, and skin inflammation (*Parthenium dermatitis*). Airborne pollen and volatile compounds can induce allergic rhinitis, asthma, and bronchitis in sensitive individuals. Some studies suggest the sesquiterpene lactones, especially parthenin, may have mutagenic properties. Continuous exposure may lead to conjunctivitis and other ocular complications.

Besides ill-effects, it also causes several other problems like blockage of common pathways and reduces the aesthetic value of parks, gardens and residential colonies. *Parthenium* also infests field crops, orchards, plantations and forest. It severely reduces the crop productivity besides loss to biodiversity and environment. It causes severe skin and respiratory allergies in humans, Toxicity in animals and reduced milk quality, crop yield losses due to its allelopathic chemical, soil degradation and destruction of biodiversity..



Harmful impact of Parthenium on human health and livestock

Integrated management of Parthenium

Ever since the weed became a menace in India and other countries, efforts have been made to manage the weed by different methods. But so far, no single method has proved satisfactory as each method suffers from one or more limitations such as impracticability, temporary control, environmental safety, high cost, etc. Therefore, there is an urgent need to adopt an integrated *Parthenium* management approach by amalgamating all the methods together as and when applicable

1. Mechanical and manual methods: Uproot the *Parthenium* before flowering during monsoon when soil is wet. Gloves and masks should be wear while uprooting as it causes allergy to sensitive person. People may be sensitise on community basis for uprooting.

2. Cultural management: Farmers should adopt fast growing crops like sorghum, berseem and *dhaincha/sesbania* to suppress the growth of *Parthenium* in their field. *Parthenium* can also be managed by competitive plants like *Senna tora*, *Senna sericea*, *Tephrosia purpurea*, *Achyranthes aspera* etc. But among these *S. tora* or *S. sericea* are widely used to replace *Parthenium*. Its strong allelopathic effects does not allows *Parthenium* to grow in its surroundings The seeds of *Senna* can be collected during October-November and

should be broadcasted in March-April before monsoon on the pre-identified areas to be replaced

3. Legal and extension management: The management of *Parthenium* was also tried in India through the legal act, first in Karnataka state. This act can be complemented at municipality or stated to prevent the spread of *Parthenium*.

4. Use of chemicals: *Parthenium* in non-cropped areas can be controlled by use of glyphosate (1.0-1.5%) for total vegetation contro but if grasses are to be saved, metribuzin (0.3-0.5%) or 2,4-D (1.0-2.0%) can be used. In different crops, the use of herbicides should be done only after consulting weed scientists as different herbicides are recommended to crops. Alachlor (2.0 kg/ha) can be used as pre-emergence to control *Parthenium* in soybean, rajma, and tomato. Metribuzin (0.50 to 0.75 kg/ha) can be used as pre-emergence just after sowing to control *Parthenium* in potato, tom and soybean. In crops like sugarcane sorghum, mail, pearl millet etc. 2, 4-D (0.5 kg/ha) can be applied as post emergence.

5. Use of biological control agent: Among several components of integrated management, biological control has been considered the most important approach due to its cost-effectiveness, environmental

safety, and sustainability in controlling *Parthenium*. Biological control is the intentional manipulation of natural enemies by man for the purpose of controlling harmful weeds. *Parthenium* can be managed by its natural enemies like insects and fungi. Biological control is inexpensive and poses no threat to non-target organisms, environment and biodiversity. It is self-perpetuating and can spread on its own while other control measures require inputs periodically. It is easy to integrate with other control measures. Under the biological control programme, host-specific bioagents from the native home of the weed are imported into other countries, where the weed had entered and became invasive.



Use of Cassia tora as a management option for Parthenium

Based on well documented success by Mexican beetle, *Zygogramma bicolorata* in other countries where they were introduced, beetle was imported in 1982 from Mexico to India. Detailed host-specificity tests under quarantine conditions confirmed the safety of *Z. bicolorata* to cultivated crops in the country. This beetle has been found effective to control *Parthenium* in different parts of the country. Beetles