

**Research Article**

## **A SCIENTIFIC APPROACH OF CONVERSION OF ECO-HAZARDOUS PARTHENIUM WEED INTO ECO-FRIENDLY BY COMPOST MAKING**

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### **ABSTRACT**

A field study was done with the *Parthenium* compost and it is found that it aids in moisture conservation which is utilized for better root penetration and crop growth. This enhancement attributed to the higher water holding capacity of the soil due to the influence of organic waste application. The moisture in soil due to application of *Parthenium* compost was 14.5 and 16.5% at 0-15 and 15-30 cm. depths as compared to 10.7 and 11.6% at 0-15 and 15-30 cm. depths of soil due to application of NPK alone. It was also found that if *Parthenium* compost was prepared by scientific means then it avoid germination of non-dormant seed. It has higher percentage of micronutrient and macronutrient in respect to the other manure. Another major objective is it minimizes the utilization of chemical fertilizers which has bad impact on soil texture and pollutes our whole biosphere. It also reduces the weed growth upto 40% in the maize due to allelopathic effect so, minimizes excessive use of pesticides. Examination of *Parthenium* compost was done and found that it has bacteria PSB, *Azotobactor*, Actinomycetes that also improves soil- texture and fertility without affecting soil health.

**Key Words:** *Actinomycetes, Farm Yard Manure, Herbaceous, Soil-Texture, Vermicompost*

### **INTRODUCTION**

*Parthenium hysterophorus* L., commonly called as Congress grass, White top, Carrot weed in India, while it popularly called as Gajar ghas due to its carrot plant like appearance. It is herbaceous and annual plant, belonging to the family compositae. The origin place of *Parthenium* is thought to be Mexico, America and Argentina but its first occurrence in India was identified in 1955 in Maharashtra, Pune. It is estimated that *Parthenium* has occupied around 35-40 million hectares of land in India and most visible on road sides, railway tracks, wastelands, sides of irrigation canal also invading agricultural, forest, orchard area. *Parthenium* seed is very small and light weighted and single plant can produce about 5000-25000 seeds. *Parthenium hysterophorus* L. is spreading very fastly in grass land and has become an obnoxious. It is common in vertisols than an alfisols. It can tolerate drought condition also to the certain extend under favorable condition. *Parthenium hysterophorus* L. completes about three generations in the year. It is also reported that congress grass has remarkable power of generation. The weed left as such in the same area acts as seed bank because of its seed production capacity and extended dormancy period. Huge amount of available *Parthenium* can be utilized as a source of organic matter to prepare its compost. Compost of *Parthenium* is recommended as the deprive their viability due to higher temperature during composting of *Parthenium* is not practiced by farmers. The decomposition of *Parthenium* plant is done by the composting and the composted product becomes enriched with mineralizable plant nutrients. Some tree has negative effect on the seed germination and thus these trees can contribute to the pesticides industry if explored fully. The inhibitory effect of *Parthenium* species on germination of many crops has been reported with the increasing concentration of *Parthenium* extract the seed germination and growth of *Eragrostis* decreased significantly. Instead of eradication of *Parthenium* constituents can be made use of for our purpose, seed germination of *Lepidium pinnatifidum* was more prone to higher concentration of *Parthenium* extract where there was no germination at *Parthenium* concentration of 30gm/l. It is concluded that *Parthenium* sp. Can be used as a bio herbicide but still need extensive study. Explore its potential against different summer and winter weed. The weed population in the rice field was found to be influenced by the incorporation of composted organic waste. Among the treatment the compost coir pith

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and *Parthenium* recorded lower weed population. The application of organic waste compost reduces the weed count from 30%-40%. This could be attributed to the role of allelopathic compound such as phenol present even after composting. Among the different compost *Parthenium* compost recorded lower weed population in maize. The beneficial effect of organic waste in reducing the incident of pest such as stem borer, and leaf roller was observed due to the application of organic waste compost.

#### **Harmful Effect of *Parthenium***

*Parthenium* has serious threaten effect on human beings and livestock. It is considered as greatest cause of dermatitis, asthma, nasal-dermal, nasal-bronchial disease. In general it is poisonous, allergic weed which reduces the aesthetic value of gardens and parks. Pollen of *Parthenium* spread through air causes greater loss in the cattle yield and gives bitter taste to the milk of cattle.

#### **Advantage of Weed *Parthenium* as a Eco-Friendly**

By application of *parthenium* as a compost it becomes eco-friendly for human beings as well as for standing crop and grazing animals. Another major objective is it minimizes the utilization of chemical fertilizers which has bad impact on soil texture and pollute our whole biosphere. It increases the agricultural productive yield in comparison to other chemical fertilizer and minimizes the water requirement to the crop due to enormous power of water holding capacity. The *parthenium* compost two times more nitrogen, phosphorous and Potassium than FYM (Farm yard manure) compost is one of the fastest and effective ways to recycle these organic material in which the organic waste can be compostabilized into compost. Compost is the rich source of macro and micro nutrients, vitamins, enzymes, antibiotics, growth hormones and immobilized micro-flora. Allelochemicals and plant derived chemicals offers a great potential for the pesticides because they are comparatively safer for the environment. In the past two decades, much more work has been done on plant derived compound as environmentally safe alternative in the herbicides for the weed control. These chemicals should be used for weed management directly or their chemistry could be used develop new herbicides.

## **MATERIALS AND METHODS**

### **Material**

I have collected *Parthenium* weed from two adopted village named as Affaur and Darihara at saran district of Bihar (India) under a national project of ICAR as NICRA (National Initiative on Climate resilient Agriculture). Fresh *Parthenium* weed, stone chips, Urea/RocK phosphate, *Trichoderma viridi* (powder), loamy soil, cow- dung, husk, Ammonium sulphate, water suspension of nitrogen fixer and phosphorous solubilization bacteria.

### **Utilization of *Parthenium* to Make Compost**

Due to continuous and large scale use of chemical fertilizer, fertility of land decreases gradually, so bio-fertilizer is a boon of soil health. We can make bio-fertilizer from abundant biomass of *parthenium*. The use of weed in compost making has three lines of benefit –at one hand we increase productivity of crop land by weeding out of this weed and also maintaining ecological balance by reducing the use of chemical fertilizers, weedicides while on the other hand we can earn money by making compost from waste weed material.

**Method to Make Compost from *Parthenium*:** Make a pit of 3×6×10 feet (depth× width× length) at a place where water does not stagnant. Pit size can be altered but depth cannot be altered. Pit site is very important while preparing the compost from *Parthenium* weed that is it should be elevated place so that runoff water should not pours in the pit. Cover the side wall and surface of pit with stone chips to stop the leaching of essential nutrients of compost to the soil surface. If stone chips are not available make soil surface compact to reduce pore size of soil surface of pit surface. All the Collected *Parthenium* weed from such field was spreaded around 50 kg on the bed of pit. Temperature rise is very important in the compost process, which is supplied by respiration of microorganism as they break down the organic material. During the whole process temperature rises above 60-70°C due to which a seed of *parthenium* is killed. The high temperature favours two things, one is rate of decomposition of material by

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microorganism increases rapidly and another advantage is seed of parthenium weed was completely killed which may germinate and may contaminate the whole compost and also causes great threat to dispersal of parthenium weed in agricultural field. To maintain the heat nitrogen content must be high and it should be corrected by adding the substance rich in nitrogen content such as ammonium sulphate or chicken manure or may diluted urine to some extent.



**Figure 1: Flowering Stage of Parthenium Weed**

If C/N less than 30:1 the organic matter decomposes very rapidly but there is loss of nitrogen which may be detected by odour of  $\text{NH}_3$  near the compost pit which may be counteracted by addition of sow duct that is rich in carbon but poor in nitrogen. It was observed that rate of decomposition of parthenium weed is more rapidly in summer month while rate was declined during the spring and autumn season and no measurable activity occurs during the typical winter season. To keep aerobic bacteria population high nitrogen fertilizer was added in the compost pit. The proportionate amount on nitrogen fertilizer such as urea should be added 0.12 kg of fertilizer per  $0.0283\text{m}^3$  of dry matter and four to five holes should be punctured around the compost pit. If possible add 50 gm *Trichoderma viridi* (fungi cultured powder) a cellulose decomposing fungus to decompose the cellulose content of weed for releasing nutrient content which is locked in the weed biomass. To increase the fungus activity the fungus was mixed with the leaves of leguminous plant called as *Leucaena leucocephala* which is termed as compost-fungus activator (CFA). For making the good quality of compost involves mixing of lime in the ratio of 1000 kg of waste material. Lime can be applied in the powder form or mixing with sufficient amount of water. Treatment with lime enhances the process of decomposition as well as humification process in the plant residues by enhancing the population and activity. It also improves the humus quality by changing the ratio of humic to fulvic acid. The main advantage of addition of lime decreases the amount of bitumen which interferes with the decomposition process. Instead of lime powdered phosphate rock can be used in the ratio of 20 kg/1000 kg of organic waste. Phosphate rock contains lots of lime. The phosphate and micronutrients contained in the phosphate rock make compost rich in the plant nutrient. All the above mixture constitute one layer like first layer make several layers till the pit is filled up to 1 feet height from ground surface. If there is no soil with *Parthenium* root than add 10 kg of loamy soil on each layer. Water was sprinkled as necessary to maintain a moisture level of 50-60 %, the process is repeated as level rises to 1 meter height. Filling of the pit was done in dome shape, during making the layers apply pressure by feet to make weed biomass compact. If pit is fully filled with described layers then plaster it by the mixture of cow dung, soil, and husk. Covering minimizes the water evaporation and volatilization of  $\text{NH}_3$ . After 4 to 5 month well decomposed *parthenium* compost will be obtained and according to the rough estimate around 40% of compost will be obtained from 40 quintals of *parthenium* biomass.

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### Enrichment of Compost

When we obtained decomposed compost from pit then we find several stem that gives impression of un decomposed Parthenium plant but they are completely decomposed. Allow to dry compost in shady and dry places during such process wet compost become dry and crumpled. If parthenium stems are present then beat them with stick to convert them into tiny pieces. Sieve that compost with 2× 2 mesh size. Generally weed compost is poor in phosphorous content (0.4-0.8) addition of phosphate makes the compost more balanced and other aspect is that it supplies nutrients to the microorganism for their multiplication so makes faster decomposition of organic waste and reduces the nitrogen loss of compost. Addition of PSB, nitrogen fixer (IARI, 1983). Quality of compost is further improved by the secondary inoculants of the Azotobactor, Azospirillum, Lipoferum, Pseudomonas species in the form of water suspension or in the form of culture broth of bio-fertilizers product can be sprinkled when weed is completely decomposed. For commercialization make packets for kitchen garden and agricultural purpose.

## RESULTS

By application of *parthenium* as a compost it becomes eco-friendly for human beings as well as for crop and animals. It minimizes the utilization of chemical fertilizers which pollute our whole biosphere. It increases the agricultural productive yield in comparison to other chemical fertilizer and minimizes the water requirement to the crop due to enormous power of water holding capacity. The parthenium compost two times more nitrogen, phosphorous and Potassium than FYM (Farm yard manure). Compost is one of the fastest and effective ways to recycle these organic materials. Compost is the rich source of macro and micro nutrients. The inhibitory effect of Parthenium species on germination of many crops has been reported with the increasing concentration of Parthenium extract. Among the different compost Parthenium compost recorded lower weed population in maize. The beneficial effect of organic waste in reducing the incident of pest such as stem borer, and leaf roller was observed due to the application of organic waste compost. It is concluded that Parthenium sp. Can be used as a bio herbicide but still need extensive study, chemical herbicide is major cause of biosphere because most of chemical pesticides are persisting in nature due to its non-degradation. The application of organic waste compost reduces the weed count from 30%-40%.

**Table1: Showing nutrient composition of different bio-fertilizer**

| Type of bio-fertilizer | N%   | P%   | K%   | Ca%  | Mg%  |
|------------------------|------|------|------|------|------|
| Parthenium compost     | 1.05 | 0.84 | 1.12 | 1    | 0.55 |
| Vermi compost          | 1.61 | 0.69 | 1.31 | 0.64 | 0.43 |
| FarmYard Manure        | 0.45 | 0.30 | 0.54 | 0.6  | 0.29 |

**Table 2: Showing bio chemical Characterization of parthenium compost**

|  |                                    |
|--|------------------------------------|
| <b>Micronutrients(ppm)</b>                           | Fe= 7829, Mn= 3.4, Zn= 116, Cu= 66 |
| <b>Biological component(Gm compost<sup>-1</sup>)</b> | Fungi $9.67 \times 10^4$           |
|  | Azotobactor $2.33 \times 10^6$     |
|  | Actinomycetes $7.67 \times 10^5$   |
|  | PSB $2.67 \times 10^6$             |

### Comparative analysis of nutrients composition of different bio-fertilizer

In general, incorporation of organic wastes enhanced the moisture content of the soil to the tune of 45.5 to 77.4% as compared to application of NPK alone to maize crop (Son, 1995). The moisture in soil due to application of Parthenium compost was 14.5 and 16.5% at 0-15 and 15-30 cm depths as compared to 10.7 and 11.6% at 0-15 and 15-30 cm depths of soil due to application of NPK alone.

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During basal dressing of the field compost is required 2.5-3.0 t/h while during plantation of vegetable crop 5-5 t/h.

### **Conclusion**

If you find germination of parthenium weed near the pit then destroy them unless they will contaminate your compost after flowering. If there is dryness in the pit then make holes to pour water and close them. It is eco-friendly bio-fertilizer which can be made on low cost. It is balanced bio-fertilizer which has more NPK than other manure and micronutrient is also available. Parthenium weed compost increases the soil fertility and improves soil texture. Increases the soil water holding capacity. Parthenium weed compost has no harmful effect on human being and any other crops.

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