

# First Report of Phyllody Disease in *Parthenium hysterophorus* L. from Hyderabad, Telangana, India

## Research Article

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### Abstract

During July-October, 2023 symptoms of phyllody on *Parthenium hysterophorus* L. (Asteraceae) were observed in the college campus at Hyderabad. The phyllody infected plants were characterized by excessive branching, reduced plant height, leaf size, and transformation of floral structures into leaf-like structures that lead to sterility. Phyllody in *Parthenium hysterophorus* is reported from different parts of India specifically in parts of Tamil Nadu, Karnataka. Recently, it is also reported from Tirupati and Annamayya districts of Andhra Pradesh but no reports are found from the state of Telangana and this is the first report.

**Keywords:** *Parthenium hysterophorus*; Phyllody; Phytoplasma; Hyderabad, Telangana.

### Introduction

*Parthenium hysterophorus* L. commonly called as 'Congress grass' in India is an invasive weed known to be originated in America, and widely prevalent in India, Australia and East Africa. It is an annual procumbent, leafy herb, 0.5-2 m tall, bearing alternate, pinnatifid leaves, belonging to the family Asteraceae. In many places, it is considered as threatening weed due to its competitive and allelopathic effect on different crops [1]. It poses health hazard to man [2] and animals also [3]. In India, a reduction of yield in agricultural crops to an extent of 40% [4] and 90% reduction in production of forage (Nath, 1988) [5] are reported. While there are a number of ways to manage *Parthenium hysterophorus*, each has drawbacks of its own. For example, mowing or slashing causes new shoots to grow back, necessitating more operations. Due to the significant amount of labor and time needed, as well as the workers' susceptibility to the several

types of allergies, manual and mechanical uprooting also proves to be ineffective [2]. Chemical management is although effective, needs repeated applications and harmful to the environment. Hence, the use of biocontrol agents including insects, pathogens and other plants are recommended for the integrated *Parthenium* weed management (PAG 2000) [6].

Phyllody, a disease affecting *Parthenium hysterophorus*, was first recorded in India in 1974 [7]. It is caused by Phytoplasma, specialized bacterial pathogens that live within the phloem of plants. The disease is characterized by the transformation of floral parts into leafy structures, witches' broom, stunted growth and sterility.

Phyllody in *Parthenium hysterophorus* was first reported in South India during the 1980s, specifically in parts of Tamil Nadu and Karnataka. Recently, it is also reported from Tirupati and Annamayya

districts of Andhra Pradesh [8] but no reports were found from the state of Telangana and this is the first report.

## Materials and Methods

In July-October 2023, Phytoplasma suspected symptoms of phyllody were observed in *Parthenium hysterophorus* weed growing in the college campus showing witches' broom symptoms. Literature was surveyed [9-13] and the symptoms were confirmed.

## Results And Discussions

### Symptoms

Phyllody infected plants of *Parthenium hysterophorus* are characterized by excessive branching, reduced plant height, leaf size, and transformation of floral parts into many small green leaf-like structures that lead to sterility of plants. The infected plants also formed rosette-like structures through the production of stunted axillary shoots from the crown or nodes of the stem (Figure 1a). Some infected plants were dwarfed and bushy whilst others were healthy-looking with abnormal leafy inflorescence that did not set seeds (Figure 1b). The disease is observed even from a distance in *Parthenium* infected areas.

### About the pathogen

Phytoplasmas are plant prokaryotic mollicutes which are phloem-limited bacterial pathogens that cause many serious diseases of woody and herbaceous plants worldwide [14]. These are obligatory pathogens which need host for their survival [15]. In India [16] explained in detail the phyllody disease on *Parthenium hysterophorus*. Aster yellow disease caused by Phytoplasma in *Parthenium hysterophorus* was demonstrated by [10] by direct and nested polymerase chain reaction using universal primers specific to 16SrRNA gene of Phytoplasma.

### Distribution

In Bangalore in 1988, *Parthenium hysterophorus* phyllody was observed in epidemic form varied from 20 to 75% (Mathur and Muniyappa 1993) [17] which declined seed production drastically. In Jabalpur and some other parts of Madhya Pradesh, large numbers of *Parthenium hysterophorus* patches were found infected with phyllody. [18] observed phyllody disease in low to mid altitude areas of Ethiopia with incidence up to 75%.

### Host diversity and Vectors

*Parthenium* phyllody attacks a wide variety of crops. Besides many economic crop species, several weeds are reservoirs of important Phytoplasmas and play an important role as natural alternative/collateral hosts [19]. More than 30 weed species are reported to be the hosts of Phytoplasmas belonging to four different groups (16SrI, 16SrII, 16SrVI and 16SrXIV) throughout India and most of them belonged to 16SrI and 16SrXIV groups of Phytoplasma [10,11,20]

Janke et al., (2007) [9] detected DNA fragments specific to Phytoplasmas in *Parthenium hysterophorus* as well as in important crops in Ethiopia, e.g. groundnut, sesame and grass pea. [17] carried out host range studies in India with 16 plant species belonging to Asteraceae, Fabaceae, Malvaceae, Pedaliaceae and Solanaceae by inoculating the plants using leafhopper, *Orosius albicinctus*, as a vector. They reported that *Parthenium* phyllody was transmitted to *Parthenium*, sunn hemp, aster, blackgram, cowpea, field bean, greengram, lupin, horsegram, pigeonpea, sesame and soybean by the agents. Phytoplasmas belong to the Peanut witches' broom (16SrII) group found to be transmitted by the leafhoppers *Orosius cellulosus* native to Ethiopia. Moreover, it could be shown that nymphs as well as adult plant hoppers of the genus *Hilda* collected from phyllody diseased *Parthenium*, can acquire these Phytoplasmas.



**Figure 1:** a: Floral parts modified into leaf like structures b: Healthy and infected inflorescence

## Conclusion

Pathogens associated with *Parthenium hysterophorus* like Phytoplasma are under study in India and efforts are in progress towards the development of indigenous pathogens as bioherbicides (Kumar, 1998). Native natural enemies are more effective than introduced because of more adaptability and no necessity of quarantine measures. Since very little efforts are put in this direction, this approach can be explored to manage *Parthenium*. Hence, the search for pathogens causing diseases to *Parthenium* at various levels is an essential step for future implementation of biological control in an integrated *Parthenium* management system.

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