



Deutscher Tropentag, October 9-11, 2002, Witzenhausen
“Challenges to Organic Farming and Sustainable Land Use
in the Tropics and Subtropics”

Importance of *Parthenium* (*Parthenium hysterophorus* L.) and the Role of Pathogens as Biological Control in Ethiopia

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Abstract

Parthenium is an exotic invasive weed that originated in tropical America, now occurs widely in India, Australia, and Africa. In Ethiopia, it is also known to affect crop, animal and human health. *Parthenium* was observed growing in different habitats from hot, arid and semiarid low altitude (900 m) to humid high mid altitude (2500 m) in the survey area. It grows on any type of soil: sand, loam or clay and in different habitats: roadsides, wastelands, rangelands, villages and gardens, and in crop fields. Experiments on diagnosis, incidence and distribution of pathogens associated with *Parthenium*, and further evaluation of the potential pathogens as biological control agents were carried out during 1998–2002. Several fungal isolates of the genus *Helminthosporium*, *Phoma*, *Curvularia*, *Chaetomium*, *Alternaria*, and *Eurotium* were obtained from seed and other plant parts of *Parthenium*. However, most of the isolates tested were non pathogenic except *Helminthosporium* isolate which resulted in a leaf blight symptom similar to the infected plants in the field. Its virulence was very limited and required high humidity for infection. Therefore, it was concluded that these non-obligate fungal pathogens showed insignificant potential for biological control of *Parthenium*. The two most important diseases associated with *Parthenium* were the rust, caused by *Puccinia abrupta* var. *partheniicola* and the phyllody, caused by phytoplasma of fababean phyllody group (FBP). The rust, being accidentally and possibly introduced together with *Parthenium*, was commonly found in high mid altitude (1400–2500 m) while phyllody was observed in low to mid altitude regions (900–2300 m.a.s.l.) of Ethiopia, each with a disease incidence up to 75 % in some locations. Phyllody diseased plants were characterised by excessive branching, reduced plant height and leaf size, and alteration of floral structures into small leaf-like structures that lead the plant to sterility.

Study of the individual effects of the rust and phyllody disease on *parthenium* in different locations under field conditions showed that weed morphological parameters were significantly affected. Seed production capacity of *parthenium* was reduced by 42 and 85 % due to rust and phyllody, respectively. Virulence of *parthenium* rust collected from different locations showed that Ambo and Debre Zeit isolates were comparatively most virulent based on mean number of leaves infected per plant and mean number of pustules per leaf. From the distribution and effects on *Parthenium*, it can be concluded that Phyllody and rust diseases of *Parthenium* showed significant potential for use as a classical biological control of *Parthenium* weed in areas where the diseases are not present after the assessment of potential risk of specificity of Phyllody disease and identification of insect vector(s) that transmit phyllody disease.

Keywords: Biological control, Ethiopia, *Parthenium hysterophorus* L., pathogens