PARTHENIUM WEED RUST, *PUCCINIA ABRUPTA* VAR. *PARTHENIICOLA*

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Summary. Parthenium weed is a serious weed in Queensland which is still spreading, and more biological control agents are needed. The Mexican rust *Puccinia abrupta* var. *partheniicola* was selected as a biological control candidate. The approach to selection of plants for host testing, and the methods of testing used are briefly discussed.

INTRODUCTION

Parthenium weed *Parthenium hysterophorus* is a serious weed of rangeland, particularly in the central highlands of Queensland. It is thought to have been accidentally introduced as a contaminant of pasture seed in 1958. Since being officially recorded in 1962 the weed has continued to spread, with new infestations being found regularly, in spite of a vigorous spraying campaign. While biological control using insects has met with some success following the release of the stem-galling moth *Epiblema strenuana,* a greater degree of control is required. Further research aimed at providing extra biological control agents includes both insects and pathogens. The host testing of one pathogen, *Puccinia abrupta* var. *partheniicola*, has now been completed in the United Kingdom.

SELECTION OF PATHOGENS

Parthenium weed is regarded to be native to the countries around the Gulf of Mexico, the West Indies and possibly central Argentina (2). As the centre of origin of parthenium weed is thought to be Mexico, exploration was initially focussed on this area (Evans, 1983 unpub rept). Six pathogens were identified in a preliminary survey of the diseases of parthenium weed carried out for the Queensland Dept. of Lands in 1983 by the Commonwealth Institute of Biological Control (Evans, 1983 unpub rept).

Of these pathogens 2 rusts were selected for closer study, the remainder being eliminated because of lack of specificity, unresolved taxonomy, or a general lack of information. *P. abrupta* var. *partheniicola* was listed as having only 3 hosts, 2 in North America and 1 in South America, while *P. melampodii* was listed as having 19 (1,4). Preliminary host testing in the laboratory confirmed these listings, and on this basis *P. melampodii* was rejected as a candidate (3). Further work by Evans in the UK supported an earlier belief of Parmelee that P. abrupta var. partheniicola was a long cycled rust having all of the spore stages on the same host (Evans, pers. comm. 1985). Previously, the spermagonial and aecial stages were unknown (1).

TESTING PROCEDURE

The introduction of plant pathogens to control weeds in Australia is supervised by the Australian Quarantine Inspection Service (AQIS) of the Department of Primary Industries and Energy, to which detailed written submissions proposing candidate organisms and relevent testing procedures must be sent. Upon advice to AQIS from the appropriate groups in the states to which copies of the proposal are sent, a consensus on the testing procedure is reached. All testing must be done off-shore, and in this case it was carried out by the Commonwealth Instititute of Biological Control in the United Kingdom.

The basic strategy used to select test plants was that described by Wapshere (5) as the centrifugal phylogenetic method.Test plants were chosen on the basis of their taxonomic affinity with the target weed, with more emphasis being placed on those which were most closely related. They included other weeds, plants of economic importance and Australian native plants. Several unrelated plants which were attacked by other species of *Puccinia* rusts were also included.

Because sunflowers, *Helianthus annuus*, and parthenium weed are closely related, both are in the sub-tribe Ambrosiinae, detailed tests were ordered for this species. Several of the currently planted commercial cultivars were tested as well as other species of *Helianthus* which are potential parent lines in breeding programmes.

Tests were also carried out in which a range of temperatures, humidities and illumination were used in combination with different age cohorts of the sunflower plants. In all the tests, after a set incubation period, inoculated leaves were stained and examined microscopically to determine the extent of development of the pathogen and reaction of the host tissues.

OTHER INVESTIGATIONS

A search of crop protection literature, discussions with associated staff and field inspections in the regions where the rust occurs naturally, did not reveal the rust's presence on plants other than those originally listed by Cummins.

CONCLUSIONS

The results of the tests and other investigations confirm the host range as stated in the literature, and on this basis a proposal to release the pathogen has been submitted to AQIS.

REFERENCES

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