

## Evaluation of a fungal pathogen for control of Canada thistle

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The perennial weed known as Canada thistle (*Cirsium arvense* (L.) Scop.) is a major pest of cereal, oilseed, forage, and pulse crops grown in western Canada. Losses in field crops range from 15% to 60% depending on weed density. In 1992, a fungal pathogen was isolated from Canada thistle and it was shown to kill Canada thistle plants rapidly under controlled conditions. Host-range tests indicated that the fungus is host specific and does not affect other weeds or field crops. Thermogradient plate studies determined the optimum temperature required for growth. Greenhouse and field trials were conducted to determine the optimum inoculation rate with formulation and the effects of rainfall after inoculation on disease development. The greenhouse studies used a whole-leaf clearing and staining technique to count the number of spores attached to, or that had penetrated, the leaf surface. Irrigated-field studies were conducted on small plots inoculated in Canada thistle weed nurseries. Data were collected on weed density, and the incidence of plants infected and killed.

## The first use of insect biological control agents to manage a submersed aquatic plant (*Hydrilla verticillata*)

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Hydrilla, an exotic submersed plant, clogs waterways and impedes navigation in the United States of America. It was introduced into Florida via the aquarium trade in the late 1950s. It has now spread throughout the southern states, along the east coast as far north as Delaware, and occurs in California. Research that commenced in 1980 has produced several candidate insect biological control agents. To date, four of these have been approved for release while three others are still under evaluation. The weevil *Bagous affinis* and the ephydrid fly *Hydrellia pakistanae*, both from India and Pakistan, were first released in Florida during 1987. The fly was established in Florida by 1990 and has now been released in six other states. Two Australian insects, a similar ephydrid fly, *H. balciunasi*, and another bagoine weevil, *B. hydrillae*, were released in 1989 and 1991, respectively. Although some difficulties with the establishment of three of these bioagents have been experienced, *H. pakistanae* is now widespread throughout the southern USA, and preliminary field data indicates that it is affecting hydrilla populations. Hydrilla declines of 60-80% have been observed at experimental sites in Florida, Alabama, and California. This represents the first use of insects as classical control agents to manage submersed vegetation. However, this one agent acting alone is unlikely to produce satisfactory control of hydrilla over a broad geographical range, so others should be sought.