
Control of St. John's Wort and Round-Leaved Mallow in Non-Cultivated Habitats with *Colletotrichum gloeosporioides*

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The use of *Colletotrichum* spp. as biocontrol agents has largely focused on their potential use as commercial mycoherbicides. In addition, some may have potential in classical biological control where, after release, they establish and persist to provide long-term weed control. Two such successful examples on introduced weeds have been studied in Nova Scotia. The first, *C. gloeosporioides* f. sp. *hypericum* (*Cg-h*) on the perennial St. John's wort (*Hypericum perforatum*) caused 40 to 96% mortality of mature plants in several non-arable habitats. Seedling mortality approached 100% and infected seedlings did not survive winter. The pathogen may have originated from the local *Hypericum* flora and all St. John's wort biotypes collected across North America appeared equally susceptible. *Cg-h* occurs ubiquitously in Nova Scotia and may be selectively transmitted by *Chrysolina hyperici*. *Chrysolina* adults contaminated with the pathogen were an effective means of disseminating the disease. The second example involves round-leaved mallow (*Malva pusilla*), an annual weed increasingly imported into Nova Scotia in western feed grains along with its pathogen, *C. gloeosporioides* f. sp. *malvae*. When applied as a mycoherbicide to micro-plots of mallow in habitats subjected to mowing or cattle trampling, e.g. orchards, pastures, or barnyards, the pathogen was widely disseminated over several hectares within one season and has provided effective control since 1996. These examples demonstrate that these pathogens, and others, can provide long-term control in stable habitats and profoundly affect the weediness of some species.

Successful Biological Control of Water Hyacinth (*Eichhornia crassipes*) in Papua New Guinea by the Weevils *Neochetina bruchi* and *Neochetina eichhorniae* (Coleoptera: Curculionidae)

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Water hyacinth invaded Papua New Guinea (PNG) prior to 1962. Attempts to eradicate the weed failed and it spread throughout the country. In 1986 the biological control agent *Neochetina eichhorniae* was released and became established. A project began in 1993 to locate and control the weed using manual control of small isolated infestations and biological control of all other infestations. Manual removal, recommended at over 90

locations, was successful at 54 locations where no regrowth occurred. Biological control was instigated at 132 locations. The agents released were the weevils, *N. eichhorniae* and *N. bruchi*, and the moths, *Niphograptia albiguttalis* and *Xubida infusella*. *N. albiguttalis* failed to establish while *X. infusella* established at one site. The two *Neochetina* weevils became widely established, and where populations remained undisturbed on water hyacinth growing on large water bodies, successful control resulted. On Sepik River lagoons, weevil damage reduced flowering and decreased the production of offshoot ramets which caused large mats of the weed to break up and then sink or to be flushed away in smaller sections. Damage caused by the weevils increased over three to six years culminating in mats collapsing over a 12 month period in 1994/95. The weed cover on Sepik lagoons decreased dramatically despite continued spread. The improvement to village life was equally dramatic with the return to better levels of nutrition, health and activity. In another region, in a pond where *N. eichhorniae* was released during 1986, control of the weed has been maintained since 1991. Elsewhere, in a lake with elevated nutrient levels, water hyacinth cover was reduced from 70% to less than 30% in two and a half years by both *Neochetina* species. This study presents unambiguous examples of the value of *Neochetina* species as control agents for water hyacinth.

The Development of Mycoherbicides for the Management of Parasitic Weeds of the Genus *Striga* and *Orobanche* - a Review and Recent Results

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Parasitic weeds of the genus *Striga* and *Orobanche* are causing considerable yield losses in cropping systems south of the Sahara and in the WANA-region. Their management is unsatisfactory since present control methods are still not efficient enough to control the underground development stages of the parasites. Hence, most of the control methods do not lead to a yield increase in the first years of application. Fungal antagonists of the genus *Fusarium*, especially *F. oxysporum*, which have been isolated from diseased plants of *Striga hermonthica* and *Orobanche cumana*, have been proven to be highly pathogenic to all developmental stages of the parasites including seeds. In addition, they are highly host specific and non-pathogenic to a wide range of crops tested, thus meeting two important criteria to be used as mycoherbicides. Applied as solid medium in field trials, these fungi were shown to be highly effective, but the inoculum amount has to be reduced to a practicable level. Therefore, different formulations (alginate with nutrient amendments; wheatflour-kaolin granules - 'Pesta') with fungal propagules have been investigated. Compared to the untreated control, 'Pesta' applied in dosages of 0.4 and 1 g per pot (2 kg of soil) reduced the emergence of *Striga* and *Orobanche* shoots by 80% and 71%, respectively. Formulations on the basis of alginates have been advantageous to