
Biological Control of Indigenous Weeds with Indigenous Insects: *Cirsium arvense* as a Model

S. BACHER

Zoologisches Institut, Universität Bern, Baltzerstr. 3, CH - 3012 Bern, Switzerland

Using indigenous agents as biocontrol agents requires augmentation of their population densities, which are currently insufficient to suppress the weed. It can be assumed that most, if not all, herbivorous insects possess the ability to control their host plant, if they occur in sufficiently high densities. Two keystone questions for the use of native agents need to be addressed: (1) How many agents are needed to sufficiently damage the weed? and (2) What are the factors limiting agent densities? We investigated the effect of density of the shield beetle *Cassida rubiginosa* Muell. (Coleoptera, Chrysomelidae) and two different plant communities on the performance of creeping thistle, *Cirsium arvense* (L.) Scop., plants in an open field experiment. Beetle density had a negative effect on above-ground plant performance while plant community mainly affected below-ground performance. At high densities of *C. rubiginosa* (≈ 20 larvae/plant) we observed 50% weed mortality in the competitively superior plant community. However, such beetle densities rarely occur in the field. Predation was found as a major factor lowering *C. rubiginosa* populations in the field. The probability of a larva being eaten by a predator lies in the order of magnitude of 10% per day. We recently developed a monoclonal antibody to identify the predator complex of *C. rubiginosa* by serological gut contents analysis of field collected predators. These studies will be complemented by continuous long-term video surveillance of *C. rubiginosa* individuals in the field to analyze predation events. Knowledge of the most important predator species of *C. rubiginosa* may provide us with clues on strategies to lower their impact on agent populations and thus achieve a better weed control status.

Prospects of *Septoria cirsii* as a Biocontrol Agent Against *Cirsium arvense*

A. O. BERESTETSKY

Laboratory of Mycology and Phytopathology,
All-Russian Research Institute of Plant Protection,
Podbelsky sh., 3, Pushkin, St-Petersburg, 189620, Russia

Potential of a mycoherbicide candidate is the sum of such biological properties as good inoculum production on cheap media, narrow host range, aggressiveness, and ability to attack a target weed in early stages of its ontogenesis under different natural conditions. A number of experiments were carried out in order to assess the mycoherbicide potential of the fungus, *Septoria cirsii*, against the weed, *Cirsium arvense*. Seedlings of

the weed were inoculated with conidial suspension (5×10^5 conidia ml⁻¹) of the fungus in controlled conditions: at 22°C with varied dew period (0, 12, 24, 36, 48 h), at 24 h dew period with varied temperatures (16, 20, 24, 28°C), and at 36 h dew period, 22°C on different growth stages of *C. arvensis* (3-4, 5-6, 7-8 true leaves). The host range of *S. cirsii* was studied on 37 plant species belonging to 13 families. Seedlings of the plants were inoculated with the pathogen at 24°C, 48 h dew period. Disease rating (0-4) was estimated every seventh day after inoculation. The highest levels of the disease were obtained at 36-48 h dew period, 24-28°C during dew period, on plants in the stage of five to six true leaves. During all experiments low older leaves were more susceptible than young leaves. Using staining techniques, it was detected that the pathogen penetrates leaves through stomata of low surface of leaves only. The optimal conditions for natural infection are possible in June when the weed is in the rosette stage. The host range of *S. cirsii* is restricted within the genus *Cirsium*. Requirements of prolonged dew period and specialization on older leaves decrease chances of *S. cirsii* to become a mycoherbicide. However, *S. cirsii* has narrow host range and high reproductive ability on different media. Hence, future investigations should be directed on developing suitable formulation for the fungus to shorten its dew period requirement.

Evaluating the Efficiency of Agent Prioritisation Tools

S. BÖTTCHER¹ and W. M. LONSDALE²

¹CSIRO Entomology, European Laboratory, Campus International de Baillarguet,
34980 Montferrier-sur-Lez, France

²CSIRO Entomology, GPO Box 1700, Canberra, ACT 2601, Australia

In order to optimise research efforts and increase success rates of agent introductions for biological control of weeds, several protocols suggest ways of prioritising promising candidates (Harris 1973; Goeden 1983; Wapshere 1985). Based on data available prior to release, these screening protocols aim to pinpoint future unsuccessful agents at an early stage of exploration to allow for their exclusion from further ecological investigations. At this time, such screening devices have found little application, which may be partly due to the fact that their efficiency is largely unknown, as it has never been addressed for a statistically relevant number of cases. Using data from literature, this contribution assesses the predictive potential of three agent prioritisation tools in a retrospective way. It draws attention to general statistical particularities of screening devices and discusses shortcomings of current agent prioritisation in relation to the conception of future agent selection tools.