

Development of management plans for control of water hyacinth in South Africa

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Although chemical, biological and mechanical control methods are available for the control of water hyacinth, these are seldom effective when used in isolation. To remedy this, water hyacinth infestations in South Africa are now classified and prioritized for most cost-effective use of the available resources. Management plans incorporate integrated control strategies which are developed from the best available chemical, biological and mechanical control options. The objective is to manage these strategies to enhance implementation of initial, follow-up and maintenance control operations. A systematic, cost-effective reduction in water hyacinth populations can be attained with the use of the resources available to managers of the water systems concerned.

Towards the integration of biological control: the Cooperative Research Centre for Weed Management Systems

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A proposal for a Cooperative Research Centre for Weed Management Systems was approved under the Australian government's CRC Program in December 1994. A major aim is the production of integrated weed management programmes with biological control taking a major role. The Centre will combine expertise in biological control, grazing management, herbicide management and vegetation rehabilitation to tackle weeds in both agricultural systems and natural environments. The unifying research theme is the population dynamics of weeds to improve and integrate all approaches to weed management, while delivery of programmes will involve extensive education and community involvement.

Effect of the fungal pathogen, *Colletotrichum coccodes*, on velvetleaf-soybean competition in the field

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Field experiments were performed from 1990 through 1992 to determine the effect of the foliar pathogen, *Colletotrichum coccodes* (Wallr.) Hughes, on growth and reproduction of velvetleaf (*Abutilon theophrasti* Medik.) and the intensity of intra- and interspecific competition between velvetleaf and soybean. The fungal pathogen was sprayed at a rate of 10^9 conidia m^{-2} across a range of monocultures and 1:1 mixture densities (1-320 plants m^{-2}). In monocultures, *C. coccodes* inoculation had relatively little impact on velvetleaf yield and intensity of

intraspecific competition. In mixtures, however, soybean yields typically increased when plants were grown in the presence of inoculated velvetleaf as opposed to uninoculated velvetleaf. Yield differences between inoculated and uninoculated plots were most evident at the lower planting densities. At these densities, *C. coccodes* inoculation generally resulted in small velvetleaf plants that were unable to overtop soybean and effectively compete for available light. Consequently, velvetleaf yields within inoculated plots were substantially reduced across most of the density range, with the greatest reductions, and the highest concomitant increases in soybean yield, occurring at the lower mixture densities. These findings demonstrate that a non-lethal host-specific disease whilst having only minor effects upon growth parameters of a host plant in pure stands may have a significantly greater impact in a competitive environment.

Integrated control of *Opuntia aurantiaca* in Australia and South Africa, the shift in emphasis from herbicidal to biological control

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Opuntia aurantiaca was the target of biological control campaigns in Australia and South Africa during the 1930s. The most damaging agent proved to be the cochineal insect, *Dactylopius austrinus*. This insect maintains *O. aurantiaca* populations at low levels but its impact has been underrated in the past. During wet summers and autumns, numbers of *O. aurantiaca* plants generally increase more rapidly than do *D. austrinus* populations, and plants are able to live longer while being damaged by this insect. Dry conditions at the same time of year result in a reversal of the situation with numbers of *O. aurantiaca* plants declining as a result of *D. austrinus* damage. Herbicidal control is expensive and in most cases it is only a few years before *O. aurantiaca* populations reach pre-herbicidal treatment levels. In both Australia and South Africa the emphasis is shifting from herbicidal control of this cactus to biological control. Herbicidal control is now largely used where *O. aurantiaca* cannot be tolerated (areas frequented by humans) or where there is only a small part of a property infested. Where numbers of *D. austrinus* in the field are low and numbers of *O. aurantiaca* are high, *D. austrinus* is often re-introduced to the area.

Integration of herbicides with flea beetles, *Aphthona nigriscutis*, for leafy spurge control

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Leafy spurge (*Euphorbia esula* L.) is one of the most difficult perennial weeds to control in North America and currently infests nearly 1 million ha. Herbicides alone have not controlled the weed. Biocontrol insects have been introduced but have been slow to establish and spread. The effect of herbicide treatments on survival and establishment of the flea beetle, *Aphthona nigriscutis*, on leafy spurge, was evaluated. *Aphthona nigriscutis* was established in 1989 and herbicide treatments were initiated in June 1992. The treatments included picloram plus 2,4-D at 0.28 plus 1.1 kg/ha spring-applied, picloram plus 2,4-D at 0.56 plus 1.1 kg/ha fall-applied, and *A. nigriscutis* alone. Stem-density was annually evaluated in the spring, and adult sweep-counts were conducted throughout each summer. Stem-density in the insect-only treatment declined by 95% from May 1992 to May 1995.