

## EXECUTIVE SUMMARY

### INTRODUCTION

Water hyacinth is South Africa's most damaging aquatic weed. It is widely distributed throughout the country and mats of the weed impact all aspects of water utilization. Several control options are practiced in South Africa including large scale herbicide control, limited mechanical control and manual removal, biological control and aspects of nutrient control. More recently, attempts have been made to try and integrate a number of the control methods to achieve that highest level of control. The integration of biological and herbicide control is currently the most widely advocated control method. However, this relies on the assumption that these two methods are compatible.

### OBJECTIVES

To test the assumption that the herbicides used in water hyacinth control are not toxic to two arthropod species, the weevil *Neochetina eichhorniae* and the water hyacinth bug *Eccritotarsus catarinensis*, released as biological control agents for the weed in South Africa.

### METHODOLOGY AND RESULTS

Of the two insect species tested, the bug (*E. catarinensis*) was most susceptible to direct herbicide application. Midstream (diquat) and a combination of Midstream and Agral (surfactant), caused high mortality while Muster (glyphosate-trimesium), Roundup Ultra (glyphosate), 2,4-D amine and Touchdown (glyphosate-trimesium) caused some mortality of the mirid bug. The surfactant Agral applied separately also caused mortality at recommended dosages. The weevil, *N.eichhorniae* was less susceptible to herbicide surfactants although Agral, Muster and Roundup Ultra caused some mortality, while Midstream seemed to be less toxic to the weevils. A combination of Midstream and Agral caused higher mortality in weevils than did the same concentration of Agral cause when applied separately. Weevils exposed to herbicides showed decreased feeding in the case of Midstream and Agral combined, but not separately. No other decreases or increases in feeding behaviour were noted.

Weevils fed on Midstream (diquat) treated water hyacinth leaves showed a significant decrease in feeding and significant mortality after 120 hours of feeding. When fed on 2,4-D amine treated leaves, weevils also fed significantly less but little mortality occurred within the 144 hours test period.

Movement studies in small ponds showed that weevils migrated from herbicide treated water hyacinth to untreated plants. The mean number of feeding scars in the unsprayed area was significantly higher than in the sprayed area, indicating that herbicide treated plants become unpalatable to the weevil.

#### IMPLICATIONS FOR INTEGRATED CONTROL

To ensure successful integrated control management of water hyacinth in South Africa each site needs to be investigated thoroughly. A management plan must take into consideration the degree of control required, the type and concentration of herbicide and the biological control agent used.

#### FUTURE RESEARCH NEEDS

Sub-lethal effects of herbicides on natural enemy physiology and on the weed community; spray patterns for herbicide application to allow the highest number of natural enemies to vacate sinking plants; the concepts of leaving refugia for natural enemies; and the re-innoculation of water hyacinth regrowth with large numbers of natural enemies, should be investigated.