Demonstrating the potential for classical biological control of a weed prior to release of agents

JOE BALCIUNAS[1] and DAMIEN BURROWS[2]

1 *U.S. Department of Agriculture - Australian Biological Control Laboratory, Australian Centre for Tropical Freshwater Research, James Cook University, Qld. 4811, Australia*

2 *Australian Centre for Tropical Freshwater Research, USDA - Australian Biological Control Laboratory, James Cook University, Qld. 4811, Australia*

When releasing a potential biological control agent, it's success cannot be guaranteed. However, studies in the native range of the target pest, which exclude herbivorous insects, may indicate the effect of herbivores, as well as help select potential agents. The broad-leaved paperbark tree, *Melaleuca quinquenervia*, native to coastal swamps and wetlands of eastern Australia, has become a serious pest in southern Florida, and to a lesser extent in Hawaii. In a series of experiments spanning four years, we grew *M. quinquenervia* saplings or seedlings outside of the main laboratory in Townsville, Australia and the substation in Brisbane. To determine the direct effects on growth by the insecticides used, the experiments were also replicated inside a shadehouse. Half of the trees were regularly treated with systemic insecticides to reduce attacks by naturally-occurring herbivores. After a few months, differences in height became significant in all of our outside experiments. After three years, the sprayed trees in the longest-running experiment were significantly taller, but the differences between the unsprayed trees remained relatively constant over the last few years. Likewise, the trees not protected from herbivores, flowered later and produced fewer flowers. The richness of the herbivore species varied between the two locations, as did those species causing the most impact on growth. We discuss the utility of this technique for biological control of weeds programmes.

Prospects for biological control of a large tree, *Melaleuca quinquenervia*

DAMIEN BURROWS[1] and JOE BALCIUNAS[2]

1 *Australian Centre for Tropical Freshwater Research, USDA-Australian Biological Control Laboratory, James Cook University, Qld. 4811, Australia*

2 *U.S. Department of Agriculture, Australian Biological Control Laboratory, Australian Centre for Tropical Freshwater Research, James Cook University, Qld. 4811, Australia*

Melaleuca quinquenervia is an Australian native that has become a serious pest in the United States of America. We believe that this is the largest plant species (up to 29 m tall) to have been targeted by a classical biological control programme. Controlling a large tree species will require many insects that will both reduce the growth rate of *M. quinquenervia*, and limit its spread. Favourable conditions in Florida allow *M. quinquenervia* to grow at rates that are unattainable in its native habitat, and to outcompete local vegetation. Experiments conducted in Australia indicate that insects, even at ambient levels, suppress the growth of *M. quinquenervia* saplings, thus reducing their competitiveness. If insects released through a biological control programme can decrease sapling growth-rate, they

should be rendered more susceptible to competition with local plants and to abiotic factors such as fire. We have collected over 400 herbivorous insect species on *M. quinquenervia* in Australia. Two insects capable of reducing growth of *M. quinquenervia*, a foliage-feeding weevil, and defoliating-sawfly, have already been exported to quarantine in Florida. Other insects being considered for use in this programme will be discussed, along with an examination of their biocontrol prospects and possible impacts. The potential for providing biological control of large tree species through the combined approaches of impacting directly upon growth and reproduction, and indirectly upon competitive abilities and survivorship, will be assessed.

Eriophyoid mites (Acari: Eriophyoidea) as possible control agents of introduced plants in South Africa

CHARNIE CRAEMER and STEFAN NESER

Plant Protection Research Institute, Private Bag X134, Pretoria 0001, South Africa

Members of the Eriophyoidea, commonly known as gall-, bud-, blister- and rust-mites, are wormlike, four-legged, phytophagous arthropods, practically invisible to the naked eye. Eriophyoid species are probably present on most higher plants and generally show a high degree of host specificity. A few are sufficiently damaging to be considered for the use in the control of, or to aid in suppressing, unwanted plants. Recent interest in eriophyoids for weed control resulted in the use of five eriophyoid species that were generally successful in weed control programmes elsewhere. Seventeen species causing appreciable damage, which may be of value in the biological control of 12 alien, invasive plants in South Africa, are listed. Selected species on *Acacia saligna* (Port Jackson), *Chromolaena odorata* (triffid weed), *Convolvulus arvensis* (field bindweed), *Cuscuta epithymum* (dodder), *Lantana camara* (lantana), *Melia azedarach* (syringa), *Solanum elaeagnifolium* (silverleaf nightshade), and *Spartium junceum* (Spanish broom) are discussed and warrant special investigation as possible control agents of these weeds in South Africa. Some of these mites have been subjected to preliminary studies, and *Aceria malherbae* which causes galling and stunting, and suppresses flowering, is being released on field bindweed in South Africa.

Little-known pathogens on well-known weeds: the results of recent surveys for potential biological control agents

CAROL A. ELLISON and HARRY C. EVANS

IIBC, Silwood Park, Ascot, Berks., SL5 7TA, UK

This paper is a report on the results of recent surveys for fungal pathogens of some well-known target weeds. The surveys covered a geographically diverse range of ecosystems in the purported centres of origin of the weed hosts, based on previous entomological surveys and Herb. Kew records. Amongst the weed targets (countries) surveyed were: *Carthamus lanatus* (Greece), *Xanthium spinosum* (Argentina), *Nassella trichotoma* (Argentina), *Parthenium hysterophorus* (Argentina) and *Dichrostachys cinerea* (India). The pathogens collected are briefly described and their biological control potential is assessed. Amongst the pathogens of particular interest, both from a taxonomic and a biological control viewpoint, are: *Puccinia sommieriana* (on *C. lanatus*), *Ceratobasidium* sp. (on *N. trichotoma*), *Ravenelia* sp. (on *D. cinerea*), *Phaeoramularia* sp. (on *X. spinosum*) and *Entyloma* sp. (on *P. hysterophorus*).