

(1/2 PDA) produced the largest numbers of conidia. Conidia were also generated from autoclaved seeds of various agricultural products such as sorghum, wheat, barley and oats. To assess virulence, 16-19 cm plants were sprayed at a rate of 1×10^4 conidia ml^{-1} to 1×10^5 conidia ml^{-1} in 0.01% Triton X-100. Plants were incubated in a dew chamber at 24°C for 8 h following inoculation. Conidia generated on 1/2 PDA and sorghum seeds gave 100% kill 2 WAA. Studies of the environmental requirements of *Alternaria* sp. will be used to develop an on-farm cottage industry protocol for the low-cost generation of conidia for small-scale rice farmers in Southeast Asia.

Biological control of Brazilian pepper tree, *Schinus terebinthifolius*, in Florida

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Brazilian peppertree, *Schinus terebinthifolius* Raddi (Anacardiaceae), is an aggressive weed that is threatening the biodiversity in Florida. It is a perennial tree native to Brazil, Argentina and Paraguay. Introduced into the United States of America in the late 1800s as an ornamental plant, it has displaced the native vegetation in parks and wildlife areas. Explorations in Brazil, beginning in 1987, revealed many potential candidates for *S. terebinthifolius* biocontrol including *Heteroperryia hubrichi* (Hymenoptera: Pergidae), *Liothrips ichini* (Thysanoptera: Phlaeothripidae), and *Lithraeus aronotatus* (Coleoptera: Bruchidae). Host-plant specificity studies which started in February 1995 indicate that both *L. ichini* and *H. hubrichi* probably can be safely released in Florida.

Potential of *Fusarium tumidum* as a bioherbicide to control gorse and broom in New Zealand

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Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) are perennial weeds that are particularly troublesome in New Zealand forests and conservation areas. Intensive weed management is an important component of plantation forestry and is currently achieved by chemical and mechanical methods. Development of alternative or complimentary control measures such as inundative biological control is strongly supported by the government, industry and the general public. The pathogenic fungus *Fusarium tumidum*, which occurs naturally on gorse and broom in New Zealand, is being developed as a potential bioherbicide. The high pathogenicity of some isolates of *F. tumidum* towards these weeds makes this fungus a good bioherbicide candidate. The biology of the pathogen was extensively studied on gorse. *Fusarium tumidum* caused severe disease symptoms on seedlings of various ages, regrowth and mature plants. In controlled conditions, the pathogen-infected seedlings under a wide range of temperatures (12-27°C) but, like most other fungal pathogens, required available water to infect plants (optimum period 18-24 h). An active research programme on formulation has been initiated to address this environmental

constraint. Large quantities of spores, the active ingredients of this potential bioherbicide, were produced on solid substrate in this study. However, spore production in liquid culture has been successful in pilot experiments and research to develop a cost-effective mass-production system is continuing. Issues relating to the safe use of this fungus are currently being considered by testing for the presence of mammalian mycotoxins in the system and determining the host range of the pathogen.

Habitat analyses of *Euphorbia* species and associated flea beetles in the *Aphthona* complex from Europe: can we learn something about habitat associations of natural enemies prior to release?

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Habitat associations were characterized for four different spurge species and their associated flea-beetle species in the *Aphthona* complex from dry, moist and wet habitats from 18 field-sites in Europe. Micro- and macro-nutrient analyses were conducted on soil and spurge foliage and roots, physical properties of the soil were measured and plant productivity was estimated at each of the 18 sites during spring, early-summer and mid-summer. The spurge species included *Euphorbia cyparissias*, *E. lucida*, *E. seguieriana* and *E. virgata*. Flea-beetle species included *Aphthona cyparissiae*, *A. czwaline*, *A. lacertosa*, *A. nigriscutis*, *A. pygmaea*, *A. venustula* and *A. violacea*. The results of ordination analyses and other multivariate approaches revealed that the spurge species and various flea-beetle species were each associated with particular chemical and, or, physical properties of the soil, chemical properties of the spurge roots and foliage (*Aphthona* spp. only), and levels of plant productivity. Flea-beetle species such as *A. lacertosa* and *A. czwaline* were found to be associated with higher levels of clay and organic matter, higher moisture levels, higher levels of plant productivity and higher levels of potassium in the spurge foliage. In contrast, *A. pygmaea*, *A. cyparissiae*, *A. nigriscutis* and *A. venustula* were associated with higher levels of sand, lower moisture levels, lower levels of plant productivity and higher levels of calcium in the spurge roots and, or, foliage. *Aphthona violacea* appeared to be associated with increased levels of clay and organic matter, higher moisture levels, higher levels of plant productivity, higher levels of phosphorous, copper, potassium, manganese and nitrogen in the spurge roots, and higher levels of nitrogen and manganese in the spurge foliage. This information will be helpful in guiding the release of flea-beetle species in the appropriate types of habitats in the future, and hopefully improve their chances for establishment on leafy spurge in North America.