A New Biocontrol Agent, the Stem Feeder Beetle

*Thamnurgus euphorbiae* Küster (Coleoptera: Scolytidae)

from Italy to Control Leafy Spurge in the U.S.

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*Thamnurgus euphorbiae* Küster (Coleoptera: Scolytidae), a univoltine stem feeder recorded from *Euphorbia characias* L. in Italy, was selected as a candidate for biological control of leafy spurge (*Euphorbia esula*) in North America. Its potential host range was studied at the USDA-ARS-EBCL Rome laboratory from 1992 to 1998. Of 40 plant species or varieties in 13 families tested, the beetle oviposited on and completed its life cycle only on plants in the subgenus *Esula* of the genus *Euphorbia*. Six North American *Euphorbia* species, including *E. incisa* and *E. robusta*, trees in the families Pinaceae and Ulmaceae were also tested against *T. euphorbiae* and none of them received damage or eggs. The restricted host range suggests use of this beetle as a biological control agent against leafy spurge in North America and therefore, release in the field is proposed. A petition of introduction was prepared and submitted to the Technical Advisory Group to introduce and release this beetle in the U.S.

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**Biological Control of Hypericum androsaemum with Melampsora hypericorum**

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The rust fungus, *Melampsora hypericorum*, is a biological control agent for the weed tutsan (*Hypericum androsaemum*). Rust infection occurs readily on some tutsan populations but there is no or negligible infection on other tutsan populations. Several possible reasons for this occurring were investigated.

In this study, light, scanning and electron microscopy techniques were used to examine the life cycle of *M. hypericorum*. Urediniospores were the only spore type found and these had distinct, compact ornamentation on the spore surface that was echinulate, where a conical projection was supported by a broader warty base.

To determine the genetic variation between rust isolates obtained, RAPD-PCR was the
only technique that amplified products in repeatable reactions. The OPM-01, -02, and -06 primers amplified the greatest numbers of polymorphic bands. Four rust isolates from Victoria were analysed, with all being genetically different.

To determine genetic variation between tutsan populations, RAPD-PCR and RAMS were used. RAPD-PCR using primers OPA-02, -07, -08, and 10 produced the greatest numbers of polymorphic bands and showed that all tutsan populations tested (two from New South Wales and four from Victoria) were genetically different.

A cross-inoculation trial was undertaken in controlled glasshouse conditions with all four rust isolates and five tutsan provenances. Myrtleford tutsan plants were most highly susceptible to infection and the Nursery rust isolate the most highly virulent. Infection of plants only occurred when the temperature was at 20°C, not 15 - 25°C.

A viability test and germination trial was undertaken on tutsan seeds. All seeds tested were viable but there were differences in germ resistance.

It was concluded that the lack of infection in some tutsan populations was probably due to variations in rust virulence and tutsan susceptibility, with these probably being genetically determined.

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**Liquid Fermentation, Delivery System, and Efficacy Testing of the Mycoherbicide *Fusarium oxysporum* M12-4A Against *Striga hermonthica***

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*Striga hermonthica* (Del.) Benth., a hemiparasite of sorghum and other cereal crops, causes severe losses in grain yield and is a threat to food production in many areas of Africa. *Fusarium oxysporum* Schlt. emend. Synd. & Hans strain M12-4A isolated in Mali from diseased *S. hermonthica* tissue significantly reduced *Striga* emergence under laboratory and field conditions. Optimal conditions for a liquid fermentation process to stimulate *F. oxysporum* M12-4A chlamydospore production were investigated. Fermentors with 1% sorghum straw powder, as substrate, exposed to a temperature of 21°C under black light for 21 days yielded the highest colony forming units (CFU). Fermentor-harvested inoculum can be directly applied into the planting furrow or coated on sorghum and other cereal crop seeds with arabic gum prior to planting. Under laboratory conditions, arabic gum solutions (10, 20 and 40% w/v) used in the sorghum seed pelleting process were found to enhance chlamydospore germination, mycelial growth, and increase inoculum potential by stimulating production of secondary chlamydospores. In a pot trial experiment, under natural conditions, fermentor-harvested *Fusarium* inoculum, applied directly to the soil or on sorghum seeds, was found to control *Striga* emergence. The delivery system proposed is a simple step application procedure: seeding.