1911 to control outbreak populations of gypsy moth, Lymantria dispar. By 1912, E. maimaiga was reported as not established and this fungus was not reported again in North America until 1989, after which time it spread across the gypsy moth distribution. Results from molecular studies suggest that the fungus found in 1989 and after in North America is probably a more recent accidental introduction. Extensive non-target studies have demonstrated that this fungus is highly host specific in the field. Use of this fungus for augmentation has been limited due to lack of mass production although we can now produce resting spores in vitro and can avoid resting spore dormancy. This fungus will persist, spread and increase in gypsy moth populations on its own, given amenable conditions. We are presently working on the ability to predict epizootics, which would be helpful to land managers who could then avoid ground and aerial applications of chemical pesticides.

Symposium. Thursday, 9:00. (167)

Potential uses of Beauveria bassiana GHA for management of the emerald ash borer, Agrilus planipennis Fairmaire (Coleoptera: Buprestidae)

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In 2002, emerald ash borer (EAB), a woodborer native to northeastern Asia, was identified as the cause of ash tree (Fraxinus spp.) mortality in Michigan and Ontario. EAB is now known to have spread to Ohio, Indiana, Illinois, Maryland, and Virginia through the inadvertent transport of infested ash nursery stock, logs, firewood, and natural dispersal. We began studying the potential use of entomopathogenic fungi for management of EAB due to their prevalence as natural enemies in Michigan field populations. After comparing the virulence of fungal species and strains, we found B. bassiana GHA most virulent. Initially, we studied this strain, formulated as BotaniGard® ES, in laboratory, greenhouse, and small field trials to determine the best methods, timing, rate, etc. In 2004, we evaluated the efficacy of B. bassiana GHA applications, sprayed to drip four times during the summer, on trunks and crowns of 20-year-old green ash trees infested with EAB. That fall, we found 46% fewer EAB larvae in sprayed vs. control trees. The following spring, the sprayed trees showed 42% less crown dieback and had 63% fewer emergent EAB adults. In collaboration with scientists at USDA ARS, we initiated an expanded field trial in Michigan during 2006.

Symposium. Thursday, 9:20. (168)

Thelohania solenopsae as a factor of fire ant populations

David Oi

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The inadvertent introduction of fire ants into the United States over 70 years ago initially resulted in large-scale efforts to eradicate the invasive pest. Large populations, mobility, and ability to occupy diverse habitats make fire ants a dominant arthropod in infested regions and very difficult to eradicate. Current control strategies in the U.S. now focus on reducing populations to tolerable levels at specific sites, typically with insecticides. The fire ant pathogen Thelohania solenopsae was discovered in the 1970's in South America, but not until the 1990's were reductions in the field formally documented with this pathogen. Introductions of T. solenopsae into red imported fire ant populations in the U.S. spread and are self-sustaining, primarily in the fire ant social form that contains several queens per colony. T. solenopsae infected sites had population reduction of over 60% and infections in colony founding queens. Perhaps the most compelling effect of T. solenopsae is the delay in re-infestation in areas cleared of fire ants by insecticides. The use of T. solenopsae and other biological control agents provide a potential opportunity for the regional suppression or at least impediment to the geographic expansion of fire ants.

Symposium. Thursday, 9:40. (169)

Tritrophic interaction in the control of Sirex woodwasp by nematodes

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The mutual reliance of the woodwasp, Sirex noctilio, and the nematode, Beddingia siricidicola, on the symbiotic fungus of the woodwasp is a key element in the successful control by the nematode of this highly invasive pest of Pinus. S. noctilio was initially identified as a significant threat to Pinus plantations in Australasia and has since emerged as a significant pest in South America, South Africa, and North America. B. siricidicola was initially employed in Australia during the 1970s in an augmented biological control program with great success. However, the success of this control measure when S. noctilio is in an invasive phase is highly dependent on a thorough appreciation of the biology of the pest, its symbiotic fungus and the nematode, especially as each interacts with the tree. This presentation will address recent discoveries that are crucial to the continuing success of control programs as S. noctilio expands its range as a pest.

CONTRIBUTED PAPERS, Thursday 8:00 - 10:00

MICROBIAL CONTROL 3

Contributed Paper. Thursday, 8:00. (170)

Use and formulation of Baculovirus insecticides in Australian broadacre crops.

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Nucleopolyhedrovirus (NPVs) insecticides are established tools in pest control and insecticide resistance management in Australian cotton and grains. Research and development by the Queensland Department of Primary Industries has led to the manufacture and registration of three commercial NPV insecticides against Helicoverpa armigera, a serious pest of crops in Australia.

A range of commercial additives and reducing sugars, including mannitol, were tested for improvement in NPV efficacy in cotton. While many additives enhanced performance to some degree, there was a significant increase in efficacy with increased relative sweetness. Mannitol was found to have an antifeedant effect and lower relative enhancement of activity compared to a significant increase in efficacy with high sweetness additives.

Increased sugar concentration and combination with emulsified spray oils significantly increased NPV efficacy, as did ULV application of NPV in oil compared to conventional application in water. Results demonstrate the efficacy of practical, low-cost additives to enhance NPV field efficacy.

The successful adoption of biopesticides in Australian broadacre cropping provides a model system for the introduction of biopesticides in conventional farming systems and has resulted in industry demand for biopesticides for sucking pest management in genetically modified crops.

Contributed Paper. Thursday, 8:15. (170,1)

Suppressing plum curculio (Coleoptera : Curculionidae) with biopesticides

Renee Pereault, Mark Whalon, Department of Entomology, B11 Center for Integrated Plant Systems, Michigan State University, East Lansing, MI 48824

Eastern US tree fruit growers, facing limitations on pesticide inputs largely brought on by the passage of the Food Quality Protection