WOZNIAK*, CHRIS A, USDA, Agricultural Research Service, Molecular Plant Pathology Laboratory, Beltsville, MD, 20705. **A novel fungus pathogenic to the sugarbeet root maggot.**

ABSTRACT

The sugarbeet root maggot, *Tetanops myopaeformis* Röder, is the most destructive insect pest of sugarbeets in North America. Although organophosphate and carbamate insecticides have offered good control of this soil dwelling pest in many instances, seasonal variability in efficacy, public interest in pesticide toxicity issues, and concerns over the possible loss of these compounds from a regulatory perspective have prompted the search for biological alternatives. As part of the biocontrol effort established at the Sugarbeet and Potato Research Unit at Fargo (USDA-ARS), a search of sugarbeet root maggot (SBRM) populations was undertaken to discover native pathogens and parasites for use as biopesticides. From this search a new fungal species, *Syngliocladium tetanopsis* Hodge, Humber et Wozniak, was discovered in the Red River Valley following a natural epizootic on third instar SBRM in 1994. Larvae were selected from field plots based upon discoloration (yellow to brown) and sclerotization of the cuticle. The fungus was isolated following incubation of SBRM cadavers in a moist chamber and subsequent production of synnemata. Plating of hyphal fragments and conidiospores upon modified oatmeal and potato dextrose agars yielded a pure isolate. Synnemata were produced after approximately three weeks at 24 °C under fluorescent lighting. Koch's postulates were demonstrated by inoculation of first and third instar larvae with conidiospores of *S. tetanopsis*, observation of disease etiology, and reisolation of the fungus in pure culture. Conidia were produced upon short, unbranched conidiophores borne directly upon prostrate hyphae or upon the surfaces of aerial synnemata. Spores (ameroconidia) were bacilliform (6.8 x 2 µm), non-ornamented and often produced in copious slime. Morphology, culture conditions and taxonomy are detailed in a recent paper (K. Hodge, R. Humber, C. Wozniak, Mycologia 90:743-753, 1998).

Pathogenicity was examined in an *in vitro* bioassay by placing 10 third instars per 9 cm Petri plate containing autoclaved coarse sand and 300,000 viable conidia, as determined by staining with fluoroscein diacetate (FDA), in normal saline. After 7 d the larvae were removed from sand, washed in sterile water and placed on filter paper. Mortality at 30 d after inoculation ranged from 68 to 92% (n = 80 to 118) depending on the isolate of the fungus evaluated. Control treatments (saline) resulted in 4 to 9% mortality over the same time period. A higher infection rate and shorter time to mortality were recorded for first instar SBRM as compared to third instars with sporulation occurring on the cadavers in as little as 8 days versus 21 to 28 days for third instars. Analysis of disease progression by scanning electron microscopy indicated that infection is by cuticular penetration and not by ingestion of spores. No sexual state is currently known for this imperfect fungus, however, the asexual state is consistent with the teleomorphic genus *Cordyceps*. At least three other species of *Syngliocladium* have been documented as associated with insects and other arthropods. Evaluation of ladybird beetles, green lacewing larvae and adults, gray sunflower seed weevil larvae, sunflower leaf beetle larvae, and tobacco hornworm larvae indicated no disease etiology following inoculation with conidiospores of *S. tetanopsis*. Conversely, treatment of SBRM larvae with the same spore preparations yielded typical disease symptoms and ultimately sporulation of the fungus upon the insect cuticle.

This species represents the first known pathogen of the SBRM, *Tetanops myopaeformis*, from a natural epizootic. Type cultures (holotype and lectotype) have been deposited in the ARS

Entomopathogenic Fungal collection (ARSEF, Ithaca, NY) and the Northern Regional Research Laboratory collection (NRRL, Peoria, IL). Dried specimens have also been deposited in the Cornell University Plant Pathology Herbarium (CUP, Ithaca, NY).