First Field Trials with Fungi Against *Anoplophora glabripennis*

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Abstract

We have been evaluating the use of entomopathogenic fungi against *A. glabripennis*; so far, 20 strains have been isolated belonging to three species, 14 strains have been tested in the laboratory, five strains have been evaluated in caged field trials and two strains have been tested in the open field.

In July 2001, new caged field trials were carried out near Bengbu, Anhui Province, China, with the four best strains from all laboratory bio-assays carried out so far: a North American *Metarhizium anisopliae* strain, a North American *Beauveria bassiana* strain, an indigenous Chinese *B. brongniartii* strain and a commercialized *B. brongniartii* strain from Nitto Denko (Osaka, Japan) being used routinely against *A. chinensis* in Japan. Based on previous caged field trials, we chose the application method developed by Nitto Denko, which markets its strain as non-woven fiber bands impregnated with fungal cultures, hung around the stems of trees, allowing reproduction of the fungus in situ. Forty willow (*Salix* sp.) trees were used for each treatment, with an additional 40 acting as a control group. Five adult beetles were released in a window screening cage around the stem of each tree. We provided the beetles with food and water daily and monitored their mortality. After 10 days, they were removed from the cages and further monitored in the laboratory. Fungus-exposed beetles died faster than controls. The time needed to kill 50% of the population (LT_{50}) was similar for *M. anisopliae*, *B. bassiana* and the Nitto Denko strain (9.4, 10.6 and 11.5 days, respectively) but was higher for the Chinese strain (14.8 days) because this strain produced fewer spores on the bands. The Nitto Denko strain performed better in July 2000 (LT_{50} = 7.8 days) when the maximum daily temperature was never > 33 °C and it rained at least 6 mm on all but one day during the experiment. During 2001, temperatures were routinely > 35 °C during drought conditions. After 15 days, five new beetles were released in the same cages for only 6 days and with only 10 cages per treatment. The LT_{50}s for each of the strains were the same, showing that the bands retain their full virulence in the field for at least 15 days.

Open field trials were carried out in Huayuan, Anhui Province, China, with the indigenous Chinese *B. brongniartii* strain and the commercialized *B. brongniartii* strain. Each of two field sites was divided into three treatments of 100 willow (*Salix* sp.) trees: a control area and two areas treated with a fungal band hung around the stem of each tree. The trees were subsequently monitored for one month. The normalized cumulative reproduction per beetle, measured on the individual tree level, acted as an indirect measurement of the population density. Additionally, beetles were collected in each of the field sites to assess time to death and fungal infection rate. In one of the field sites, reproduction in the fungus-treated trees slowed down, being more pronounced for the Nitto Denko strain than the indigenous Chinese strain, and beetles collected from the fungus-treated trees died faster compared to the control trees. In the other field site, the reproduction did not differ among the treatments and differences in time to death were less pronounced, probably due to other natural enemies already present. When data for the two field sites were combined, infection rates were much higher in the fungus-treated beetles than in the control ones.

Based on these results, we consider that both *B. brongniartii* strains, but especially the commercialized Nitto Denko product, are potentially effective in the field for reducing Asian longhorned beetle population densities and thus would provide a viable and environmentally sound control option to combat this pest in the urban and forest landscape.