

Identification of Female-produced Sex Pheromone of the Honey Locust Gall Midge, *Dasineura gleditchiae*

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Abstract The honey locust gall midge, *Dasineura gleditchiae* Osten Sacken 1866 (Diptera: Cecidomyiidae) is the main pest of ornamental varieties of the honey locust tree, *Gleditsia triacanthos* L., in North America, and is now becoming a pest of concern in Europe. Female midges were observed to emerge in the early morning with their ovipositor extended until they mated. Volatiles were collected from virgin females in a closed-loop stripping apparatus and analyzed by gas chromatography (GC) coupled to electro-antennographic (EAG) recording from the antenna of a male midge. A single EAG response was observed, which was assumed to be to the major component of the female sex pheromone. This was identified as (*Z*)-2-acetoxy-8-heptadecene by comparison of its mass spectrum and GC retention times on different columns with those of synthetic standards and by micro-analytical reactions. This compound was synthesized, and the individual enantiomers were produced by kinetic resolution with lipase from *Candida antarctica*. Analysis of the naturally-produced compound on a cyclodextrin GC column indicated it was the (*R*)-enantiomer. In EAG dose-response measurements, the (*R*)-enantiomer alone or in the racemic mixture evoked significant responses from the antennae of male *D. gleditchiae*, whereas the (*S*)-enantiomer did not. In field trapping

tests, the (*R*)-enantiomer attracted male *D. gleditchiae*. The racemic compound was equally attractive, but the (*S*)-enantiomer was not attractive. Both the pure (*R*)-enantiomer or racemic (*Z*)-2-acetoxy-8-heptadecene, applied to red rubber septa in a dose range of 3–30 µg, constitute a strongly attractive bait in sticky traps for monitoring the flight of *D. gleditchiae*.

Keywords Honey locust gall midge · *Dasineura gleditchiae* · Cecidomyiidae · Chiral sex pheromone · Enantiomers · (*Z*)-2-acetoxy-8-heptadecene · (2*R*,8*Z*)-2-acetoxy-8-heptadecene · *Gleditsia triacanthos* · Ornamental tree · Diptera

Introduction

The honey locust gall midge, *Dasineura gleditchiae* Osten, Sacken 1866 (Diptera: Cecidomyiidae), already known as the most important pest of honey locust tree, *Gleditsia triacanthos* L., in North America (Thompson et al. 1998), has now appeared in several European countries, e.g., the Netherlands (Nijveldt 1980), Italy (Bolchi and Volonte 1985), Great Britain (Halstead 1992), Switzerland (Fischer and Pivot 1992), Serbia (Simova-Tossic and Skuhrová 1995), and Hungary (Ripka 1996). Soon after its appearance in Hungary, it severely damaged the aesthetic value of thornless, *inermis* cultivars of *G. triacanthos*, which are favoured ornamental trees in urban green areas, and public concern prompted the search for control methods. The developing larvae are hidden and protected inside the galls. Moreover, only a few pesticides are registered for application in urban areas, and their use is restricted, such that often only a single treatment is permitted. These constraints underline the importance of the exact timing of application

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