

ABSTRACT

This thesis is concerned with the isolation, identification and synthesis of insect pheromones particularly those of the pine looper moth, *Bupalus piniaria* L. (Lepidoptera:Geometridae) and the coffee white stemborer, *Xylotrechus quadripes* Chevrolat (Coleoptera:Cerambycidae). The different types of semiochemicals are described along with methods used for studying them and their use in insect pest management. Pheromone components found in Geometrid moths are reviewed. In collaboration with the Forest Research Agency, pheromone was collected from virgin female *B. piniaria* by gland extraction and air entrainment methods. Identification was performed using gas chromatography (GC) linked to electroantennography (EAG) and GC linked to mass spectrometry (MS). GC-EAG and GC-MS analyses of the natural pheromone and synthetic standards indicated that the pheromone component might be an unsaturated epoxide with 19 carbon atoms. It was difficult to confirm the structure of the pheromone component as the amount in the extract was very small (<0.001 ng/female). Microhydrogenation of the pheromone component and the synthetic standards suggested that the pheromone component might be a 9,10-epoxy-nonadecadiene. The position of double bonds was investigated by syntheses of likely structures of Geometrid pheromones. The GC retention times of (6Z,12Z)-*cis*-9,10-epoxy-6,12-nonadecadiene exactly coincided with those of the natural pheromone component. To confirm the structure, optically active (6Z,12Z,9S,10R)-*cis*-9,10-epoxy-6,12-nonadecadiene and (9Z,12Z,6S,7R)-*cis*-6,7-epoxy-9,12-nonadecadiene were synthesised. The former had identical retention times to those of the natural pheromone but the mass spectrum was slightly different. While this work was in progress it was learnt that German scientists had proposed four components as pheromone components for *B. piniaria*. The major pheromone component, (6Z,9Z,4S,5S)-*trans*-4,5-epoxy-6,9-nonadecadiene, had identical retention times and mass spectrum with those of the natural pheromone studied here. In collaboration with German scientists trapping experiments were carried out with the *B. piniaria* pheromone components in Scotland and the optimum blend was established. A new and economically viable route to (2S)-2-hydroxy-3-decanone the major pheromone component of the male produced sex pheromone of *X. quadripes* was developed.