Identification of the Sex Pheromone of Eggplant Borer *Leucinodes orbonalis* Guenèe (Lepidoptera: Pyralidae)

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(*E*)11-Hexadecenyl acetate was identified from sex pheromone gland extract of female eggplant borer. The acetate synthesized in the laboratory showed high attractant activity in the field.

The eggplant borer, *Leucinodes orbonalis* Guenèe (Lepidoptera: Pyralidae), is a serious pest of eggplant in various regions of China [1]. The control of this pest is troubled with the fact that the chemical insecticides do not penetrate into the fruit where the pests stay. The female sex pheromone identified and synthesized as follows might be a prospective candidate for population monitoring or direct control.

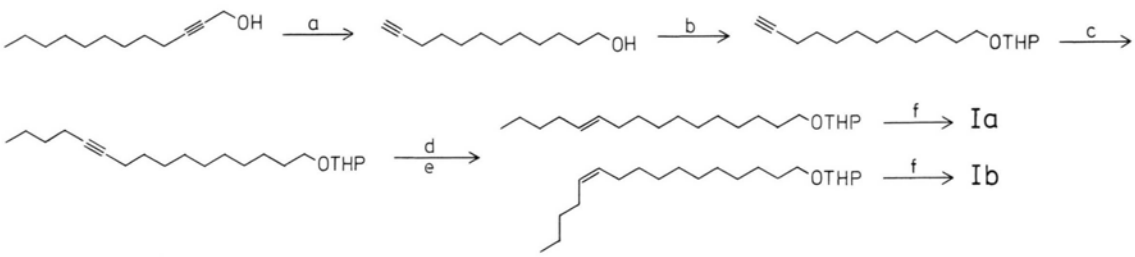
The abdominal tips of virgin female moths were immersed in *n*-heptane for 6 h. This crude extract was fractionated by preparative TLC on a silica gel plate and developed with *n*-hexane-ethyl ether (4:1). The *absorbate* was cut into five fractions and washed with treated acetone. In the field test, high bioactivity was shown by the fraction of R_f 0.6–0.8 corresponding to a long chain acetate, and no notable activity by the remaining fractions.

GC-MS(EI) analysis of the active fraction from TLC separation on SE-54 capillary column recorded a major peak at 17′49″ which possessed the following fragment ions, *m/e* 222 (M^+-CH_3COOH), 194 ($C_{14}H_{26}^+$), 180 ($C_{13}H_{24}^+$), 166 ($C_{12}H_{22}^+$), 152 ($C_{11}H_{20}^+$), 138 ($C_{10}H_{18}^+$), 124 ($C_9H_{16}^+$), 110 ($C_8H_{14}^+$), 96 ($C_7H_{12}^+$), 82 ($C_6H_{10}^+$) and 61 ($CH_3COOH_2^+$). These data indicated that the natural pheromone is a *n*-hexadecenyl acetate [2].

To determine the location of the double bond, microozonolysis [3, 4] was carried out. GC-MS (methane CI) of the ozonolysis product on a PEG-20M capillary column showed a major peak at 6′36″ with parent ion at *m/e* 229 (MH^+), and less ion at *m/e* 169 ($MH-CH_3COOH$) and 151 ($MH-CH_3COOH-H_2O$). These data indicated that the ozonolysis product of pheromone was 11-acetoxyundecanal, and thus showed that the double bond of the pheromone is located at 11-position.

The configuration of the double bond was examined by comparing the GC retention time (R_t) of the natural pheromone to that of synthetic (*E*)- and (*Z*)-11-hexadecenyl acetate ($\mathbf{I_a}$ and $\mathbf{I_b}$). R_t of the synthetic $\mathbf{I_a}$ and $\mathbf{I_b}$ on a DEGS capillary column were 16′40″ and 17′20″ respectively, while that of natural pheromone was 16′40″. Thus, *Z* configuration was defined.

Synthesis of $\mathbf{I_a}$ and $\mathbf{I_b}$ was carried out as follows:



where **a**----NaH/1,2-EDA, **b**----DHP, H_3O^+, **c**----*n*-BuLi/BuBr, **d**----Na/Liq NH_3, **e**----H_2, P–2Ni, **f**----AcOH–AcCl.

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In the electroantennagram (EAG) "puff" test at 10 μg level, the males responded much stronger to synthetic $\mathbf{I}_a$ than to $\mathbf{I}_b$. In field trapping, $\mathbf{I}_a$ was found to be very attractive to male moths, and more males were captured by traps baited with 300 to 500 μg $\mathbf{I}_a$ than by six alive females. This result proved that $\mathbf{I}_a$ is the main component of the eggplant borer sex pheromone.

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