INHIBITORY ACTION OF (4S,6S,7R)-ISOMER TO PHEROMONAL ACTIVITY OF SERRICORNIN, (4S,6S,7S)-7-HYDROXY-4,6-DIMETHYL-3-NONANONE

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Abstract—By adding the effects of a series of the stereoisomers to the pheromonal activity of serricomin, (4S,6S,7S)-7-hydroxy-4,6-dimethyl-3-nonanone, the sex pheromone of the cigarette beetle Lasioderma serricorne (F.) was investigated. The experiments using synthetic enantiomeric mixtures and optically active stereoisomers showed that the (4S,6S,7R)-isomer inhibited significantly the pheromonal activity of serricomin.

Key Words—Sex pheromone, cigarette beetle, Lasioderma serricorne (F.), Coleoptera, Anobiidae, serricomin, 7-hydroxy-4,6-dimethyl-3-nonanone, inhibitory action of diastereoisomer.

INTRODUCTION

Serricomin, (4S,6S,7S)-7-hydroxy-4,6-dimethyl-3-nonanone, is the sex pheromone of the cigarette beetle Lasioderma serricorne (F.), which is a worldwide pest for cured tobacco leaves and various dried foodstuffs (Coffelt and Burkholder, 1972). As the serricomin molecule has three chiral centers at C-4, C-6, and C-7, there are eight possible stereoisomers shown in Figure 1, in which the isomers in the upper row, such as (4S,6S,7S), and the corresponding ones in the lower row, such as (4R,6R,7R), are enantiomerically paired, respectively.

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Up to now six of them have been synthesized as such or as the O-acetyl derivatives (Chuman et al., 1981; Mori et al., 1982a,b; Mori and Watanabe, 1985).

Our serial studies on the relationship between the stereochemistry of the serricornin molecule and biological activity revealed that the $(4S,6S,7S)$-stereoisomer, which is the natural form of the sex pheromone (Mori et al., 1982a,b), is at least $10^3$ times more active than any of the other diastereoisomers (Chuman et al., 1982a,b; Mochizuki et al., 1984). In this paper we report the additive effect of these stereoisomers in enantiomeric mixtures and of the optically active stereoisomers on the pheromonal activity of serricornin.

The enantiomeric mixtures used are designated herein as SSS, SSR, SRS, and SRR which mean mixtures of $(4S,6S,7S)$ and $(4R,6R,7R)$ isomers, $(4S,6S,7R)$ and $(4R,6R,7S)$ isomers, $(4S,6R,7S)$ and $(4R,6S,7R)$ isomers, and $(4S,6R,7R)$ and $(4R,6S,7S)$ isomers, respectively.

**METHODS AND MATERIALS**

*Rearing the Insects.* The beetles were reared on corn flour supplemented with 8% dried brewer’s yeast (EBIOS®, Asahi Breweries Ltd., Tokyo) at 28°C and 60% relative humidity. For the following pheromonal bioassay, virgin males were sexed during the pupal stage by their external characteristics and reared separately from the atmosphere of female adults under the same condition.

*Pheromonal Bioassay.* The method of pheromonal bioassay is essentially the same as described previously by Chuman et al. (1982a) and Mochizuki et al. (1984). At 9–10 AM of the day for bioassay, ten healthy virgin males 7–10 days after adult emergence were put on an arena of filter paper tightly fitted on the floor of a Petri dish (60-mm ID, 15-mm height). Meanwhile almost all of these insects came to rest on the arena. At 2–3 PM of the same day, the cover was opened and a small screen made of rectangular filter paper (5-mm height, 25-mm length, folded in W-letter shape), which was previously impregnated with the test substance, was put on the center of the arena, the dish was covered again immediately (Figure 2). Impregnation of the test substance on the screen was performed just before the bioassay by adding 2 μl of n-hexane solution, pipetted from an appropriately diluted solution prepared from stock solution (5