in his review that the degree of stereo-selectivity was rarely higher than 95–96% by semihydrogenation of a triple bond, even in the presence of the Lindlar catalyst which appeared to be the most stereo-selective. Horiike et al. (1978) synthesized (Z)-alkenyl acetate with a stereo-selectivity higher than 90% by the Wittig reaction. The sex pheromone synthesized by these methods was considered to be useful for the effective field-trapping of A. segetum males without any geometrical purifications.

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Studies on Summer Diapause in Pupae of Antheraea yamamai
(Lepidoptera : Saturniidae)1

III. Influence of Photoperiod in the Larval Stage

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Antheraea yamamai, a univoltine saturniid silkmoth in Japan, overwinters at the embryonic stage, and enters summer diapause at the pupal stage. The moth emerges from the end of July to October with a peak in September. The termination of pupal summer diapause in this species is accelerated by short photoperiods such as 8L–16D to 12L–12D (Kato et al, 1979; Sakate et al., unpublished). However, the factors inducing the pupal summer diapause are not known.

In two other univoltine species of saturniid, Antheraea polyphemus and Hyalophora cecropia hibernating as diapause pupae, an ‘obligatory’ diapause is induced or averted by the photoperiod in the larval stage (Mansingh and Smallman, 1966, 1967). We examined such an effect on A. yamamai in 1979.

Eggs of A. yamamai used in this study were laid by the moths reared in the laboratory. After hatching, the larvae were kept in a short (12L–12D) or a long (16L–8D) photoperiod. Leaves of Quercus acutissima were given as food. When they pupated, each group was divided into two sub-groups, which were exposed to photoperiods of 12L–12D and 16L–8D, respectively, till emergence. The temperature was 25°C throughout the experiments.

The duration from hatching to pupation was a little shorter in 12L–12D than in 16L–8D (Table 1). Fig. 1 shows the distribution of the pupal duration under various photoperiodic conditions. The pupal duration was shorter when the larvae were kept in 12L–12D than in 16L–8D. This effect was much larger when the pupae were exposed to 16L–8D. Obviously the larvae of A. yamamai responds to photoperiod: the photo-

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Fig. 1. The pupal duration till emergence under four photoperiodic conditions at 25°C. (A) 12L–12D at the larval and pupal stages; (B) 16L–8D at the larval stage and 12L–12D at the pupal stage; (C) 12L–12D at the larval stage and 16L–8D at the pupal stage; (D) 16L–8D at the larval and pupal stages. Figures in parentheses indicate the number of pupae. *Mean ± S.D.

<table>
<thead>
<tr>
<th>Photoperiod</th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td>12L–12D</td>
<td>37.5 ± 2.2 (19)*</td>
<td>38.9 ± 2.3 (23)</td>
</tr>
<tr>
<td>16L–8D</td>
<td>40.0 ± 1.5 (36)</td>
<td>41.3 ± 2.2 (26)</td>
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</table>

* Mean ± S.D. (Number of larvae)

period at the larval stage influences the larval development and incidence of pupal diapause. When the larvae were kept in a short photoperiod, the moths emerged in a very short time irrespective of the photoperiod in the pupal stage. Under such conditions, the pupae avert the summer diapause.

Summer diapause in *A. yamamai* is thus regulated by the photoperiods not only in the pupal stage, but also in the larval stage.

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