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## A New Approach to the Stereospecific Total Synthesis of Racemic Cecropia Juvenile Hormone<sup>†</sup>

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Summary 4-Methyl-5,6-dihydro-2*H*-thiopyran and its dimer (4) are used as structural units for the synthesis of  $C_{18}$ -juvenile hormone.

WE describe herein a new and economically feasible method for the stereospecific synthesis<sup>1</sup> of a racemic *Cecropia* 

juvenile hormone ( $C_{18}$ -J.H.), based on condensation of dihydrothiopyrans. The structure of  $C_{18}$ -J.H. can be

divided into three structural units (A)-(C). The con-

figuration of two ethyl groups in units (A) and (B) might be

retained if they were blocked with two sulphur atoms [see

(A') and (B')]. These blocking atoms could easily be removed by reductive desulphurization.

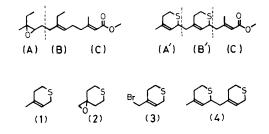
A key intermediate, the thiopyran (4), was synthesised by two methods. Condensation of tetrahydrothiopyran-4one<sup>2</sup> with dimethyloxosulphonium methylide afforded the epoxide (2)<sup>‡</sup> (65%), m.p. 52°. The carbanion prepared from the thiopyran (1)<sup>3</sup> and Bu<sup>n</sup>Li in the presence of 2,3-diazabicyclo[2,2,2]octane (DABCO) was treated with the epoxide (2) in THF at  $-20^{\circ}$  and the resulting adduct was further dehydrated with SOCl<sub>2</sub>-pyridine to give the desired dimeric dihydrothiopyran (4) [73% based on (2)],

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<sup>‡</sup> All new compounds gave satisfactory elemental analyses and i.r. and n.m.r. spectra consistent with the assigned structures.

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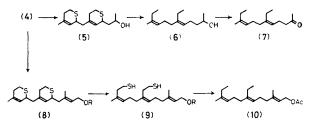
b.p. 85° at 0.2 mmHg. The other method was based on the condensation of (1) with (3), which was prepared from tetrahydrothiopyran-4-one by treatment with HCN, followed by solvolysis with EtOH, dehydration, reduction, and bromination with PBr<sub>1</sub>.



Attachment of the final unit (C) and the removal of the blocking sulphur atoms were carried out by the following routes.

Route A: The dimer (4) was converted into a carbanion by treatment with BunLi-DABCO and was then treated with propylene oxide to afford the alcohol (5) (84%). Reductive desulphurization of (5) by treatment with metallic Li in ethylamine<sup>4</sup> at  $-20^{\circ}$  produced the dodecadienol (6) (60%), b.p. 97-98° at 0.45 mmHg. Oxidation of the alcohol (6) with Jones reagent yielded the ketone (7) (85%), b.p.  $98-99^{\circ}$  at 1.5 mmHg, which was further transformed into deoxy C<sub>18</sub>-J.H. by condensation with diethyl methoxycarbonylmethylphosphonate.5 Epoxidation<sup>6</sup> of the ester gave racemic J.H., which was identical spectroscopically with natural J.H.<sup>7</sup>

Route B: The carbanion of dimer (4) was condensed with trans-4-chloro-3-methylbut-2-enyl tetrahydropyranyl ether, prepared from isoprene,<sup>8</sup> to yield the triene (8; R = THP) (60%). The trienol (8; R = H) was treated with Li in ethylamine at  $-70^{\circ}$  and the resulting dithio-alcohol (9; R = H) was converted into the corresponding acetate (9; R = Ac) (80%). Final desulphurization of (9; R = Ac) was achieved by treatment with excess of deactivated Raney nickel (W-2/acetone) to give the acetate (10) as a colourless oil (55%), b.p. 115° at 0.15 mmHg. Deoxy- $C_{18}$ -J.H. obtained from (10) by the method of Corey et al.<sup>9</sup> was identical spectroscopically with that prepared from the ketone (7).



 $C_{18}$ -J.H. can thus be obtained with 100% stereospecificity at C-6 and C-10 and 95% or more at C-210 by route A, and with complete stereospecificity by route B.

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