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ABSOLUTE CONFIGURATIONS OF (-)-14-METHYL-*cis*-8-HEXADECEN-1-OL AND METHYL (-)-14-METHYL-*cis*-8-HEXADECENOATE, THE SEX ATTRACTANT OF FEMALE DERMESTID BEETLE, *TROGODERMA INCLUSUM* LE CONTE

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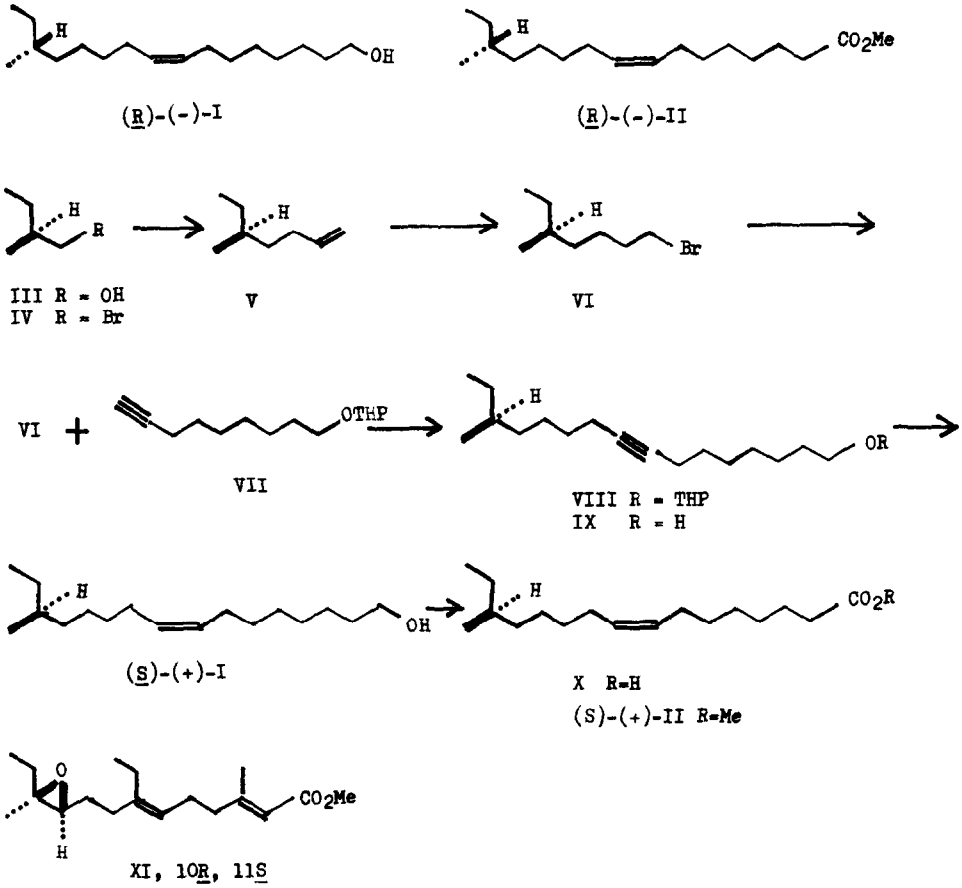
(-)-14-Methyl-*cis*-8-hexadecen-1-ol (I) and methyl (-)-14-methyl-*cis*-8-hexadecenoate (II) were isolated from a female dermestid beetle, *Trogoderma inclusum* Le Conte, as the components of the sex attractant (1). A non-stereoselective synthesis of their racemates was also reported (1) employing the Wittig reaction in the key step. Their absolute configurations, however, remained unknown. Herein we report an unambiguous solution to this problem by accomplishing a stereoselective synthesis of (+)-I and (+)-II, the enantiomers of the natural pheromones, starting from the levorotatory primary amyl alcohol of fusel oil (III)(2).

(*S*)-(-)-2-Methylbutan-1-ol (III), $[\alpha]_D^{23}$ - 4.54° (neat), was converted to the corresponding bromide (IV), $[\alpha]_D^{23}$ + 3.92° (neat) (3), with phosphorus tribromide. The Grignard reagent derived from IV was coupled with allyl bromide to give an olefin (V) in 71% yield, bp 110-115°; n_D^{24} 1.4070; $[\alpha]_D^{23}$ + 6.42° (neat)(4). Anti-Markownikoff hydrobromination of the terminal olefin *via* hydroboration-bromination (5) yielded a bromide (VI) in 46% yield, bp 112°/60 mm; n_D^{29} 1.4481; $[\alpha]_D^{23.5}$ + 7.97° (c=3.73, $CHCl_3$). This in HMPA was added to a THF-ether solution of the lithium salt of 9-tetrahydropyranyloxy-1-nonyne (VII) to give an acetylenic tetrahydropyranyl (THP) ether (VIII) (cf. 6). The tetrahydropyranyl protective group was removed by treatment with *p*-toluenesulfonic acid in methanol to give an acetylenic alcohol (IX) in 32% yield from



VI, bp 148°/0.2mm; n_D^{24} 1.4601; $[\alpha]_D^{23.5}$ + 5.23° (c=2.79, $CHCl_3$).

This was dissolved in methanol and hydrogenated over palladium-barium sulfate in the presence of quinoline (7) to give (S)-14-methyl-cis-8-hexadecen-1-ol (I) in 85% yield after chromatography over silicic acid impregnated with silver nitrate, bp 150-151°/0.1mm; n_D^{25} 1.4568 ; ν_{max} (film) 3350 (s), 3050 (m), 2940 (vs), 1660 (w), 1470 (s), 1380 (m), 1060 (m), 970 (vw), 730 (w) cm^{-1}; δ (CCl_4, 100 MHz) 0.88 (3H, t, J=6Hz), 0.88 (3H, d, J=6Hz), 1.34 (19H, br), 2.00 (4H, br. d), 2.67 (1H, s), 3.52 (2H, t, J=6Hz), 5.28 (2H, m, seemingly t, J=5Hz); MS: m/e 254 (M^+), 236 ($M-H_2O$), 225, 208, 194, 180, 166, 151; GLC (5% LAC 2R-446 on Diasolid, 1.5m x 3 mm i.d. at 200°, Carrier gas

N_2, 1.0kg kg/cm^2): R_t 11.6 min, 99% purity. Jones chromic acid oxidized this alcohol (I) to a carboxylic acid (X) which was treated with diazomethane to give the methyl ester (II) with 14S configuration, bp 125-127°/0.1 mm; n_D^{25} 1.4483; ν_{max} (film) 3020 (m), 2930 (s), 2860 (s), 1750 (s) 1470 (m), 1440 (m), 1380 (m), 1250 (m), 1200 (m), 1175 (m), 1130 (m), 1085 (w), 1030 (w), 970 (w), 880 (w) cm^{-1}; δ (CCl_4, 100 MHz) 0.88 (3H, t, J=6Hz), 0.88 (3H, d, J=6Hz), ~1.34 (17H, br. m), 2.00 (4H, br. d), 2.22 (2H, t, J=7Hz), 3.62 (3H, s), 5.28 (2H, m, seemingly t, J=5Hz); MS : m/e 282 (M^+), 253, 251, 250, 213, 85, 74, 70; GLC (5% LAC 2R-446 on Diasolid, 1.5m x 3mm i.d. at 180°; Carrier gas N_2, 1.0kg/cm^2): R_t 16.5 min.

These two products were dextrorotatory : $[\alpha]_D^{25}$ + 5.31° (c=4.575, $CHCl_3$) for (S)-I and $[\alpha]_D^{25}$ + 3.75° (c=1.975, $CHCl_3$) for (S)-II. Therefore the 14 R stereochemistry was assigned to the natural and levorotatory (magnitude unspecified) pheromones.

The comparison of this 14 R stereochemistry with the 11S configuration of the Cecropia juvenile hormone (XI)(8) seems to suggest the participation of a similar stereochemical process in the biosynthesis of this part of these molecules of insect origin. It should be recalled that the common amino acid L-isoleucine possesses the 3 S stereochemistry and not 3 R.

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2. a) The purest sample of $[\alpha]_D^{20}$ - 5.90° is recorded. Hence our material was of 77% optical purity. Our synthetic products were therefore presumed to be in the same order of optical purity. This caused no trouble in the present work, for

not the magnitude but the sign of the optical rotation was the important factor.

b) The absolute configuration of the active primary amyl alcohol (III) was related to that of L-(+)-isoleucine [see J.H. Brewster, "Elucidation of Organic Structures by Physical and Chemical methods" Second Ed., K.W. Bentley and G.W. Kirby (eds.), Vol IV pp 134-136, Wiley-Interscience, New York, 1972]. The absolute configuration of D-(-)-isoleucine was determined by X-ray diffraction analysis as 3R [J. Trommel and J.M. Bijvoet, Acta Cryst., 7, 703 (1954)]. Therefore (-)-2-methylbutan-1-ol is 2S.

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