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ABSOLUTE CONFIGURATION OF ELDANOLIDE, THE WING GLAND PHEROMONE OF THE MALE AFRICAN SUGAR CANE BORER, ELDANA SACCHARINA (WLK.) SYNTHESES OF ITS (+) AND (-) ENANTIOMERS.

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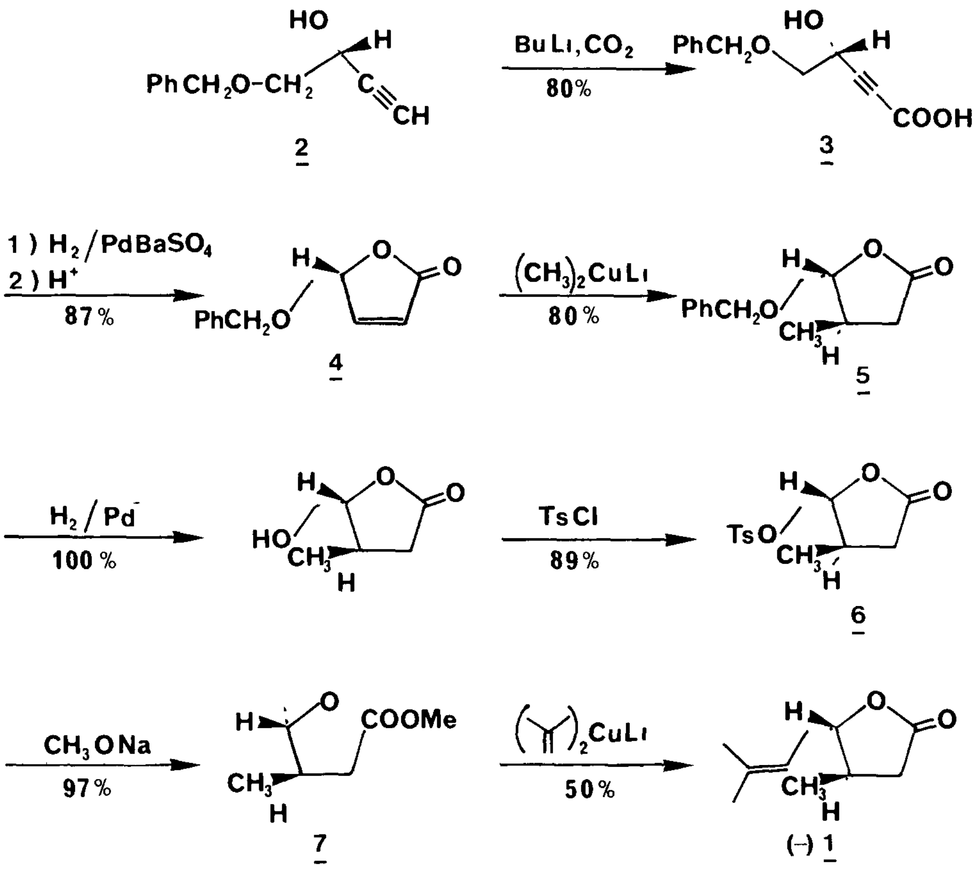
Abstract Eldanolide 1, a novel terpenoid lactone pheromone, was shown to have (3S,4R) configuration by synthesis of both enantiomers and comparison of their CD with the natural pheromone

Recently, we reported the isolation and structure determination of the wing gland pheromone (1,2) and the aphrodisiac secretion of the abdominal hair pencils (3) of the African sugar cane borer, *Eldana saccharina* (Wlk)

In order to complete our preliminary biological studies with synthetic racemic material (1) and because even small amounts of antipodes may totally inhibit the biological activity of pheromones we set out to synthesise both enantiomers of the title compound for which we propose the name eldanolide 1. The main criteria in selecting the pathways depicted below were availability of starting material, good yields and high stereospecifity

Scheme I describes the synthesis of (3R,4S) eldanolide 1 Optically pure 2 $[\alpha]_D^{21}$ - 4.8° (c = 2.9, dioxane) was obtained by resolution of its acide phtalate using (-)(S) α-methylbenzylamine 2 is then transformed into acid 3, which after partial hydrogenation gives the butenolide 4 $[\alpha]_D^{21}$ + 101 3° (c = 2.15, EtOH) (4) Since its antipode had previously been prepared from L-glutamic acid (5) and D-ribonolactone (6), the absolute configuration of 4 as (4R) was thus firmly established

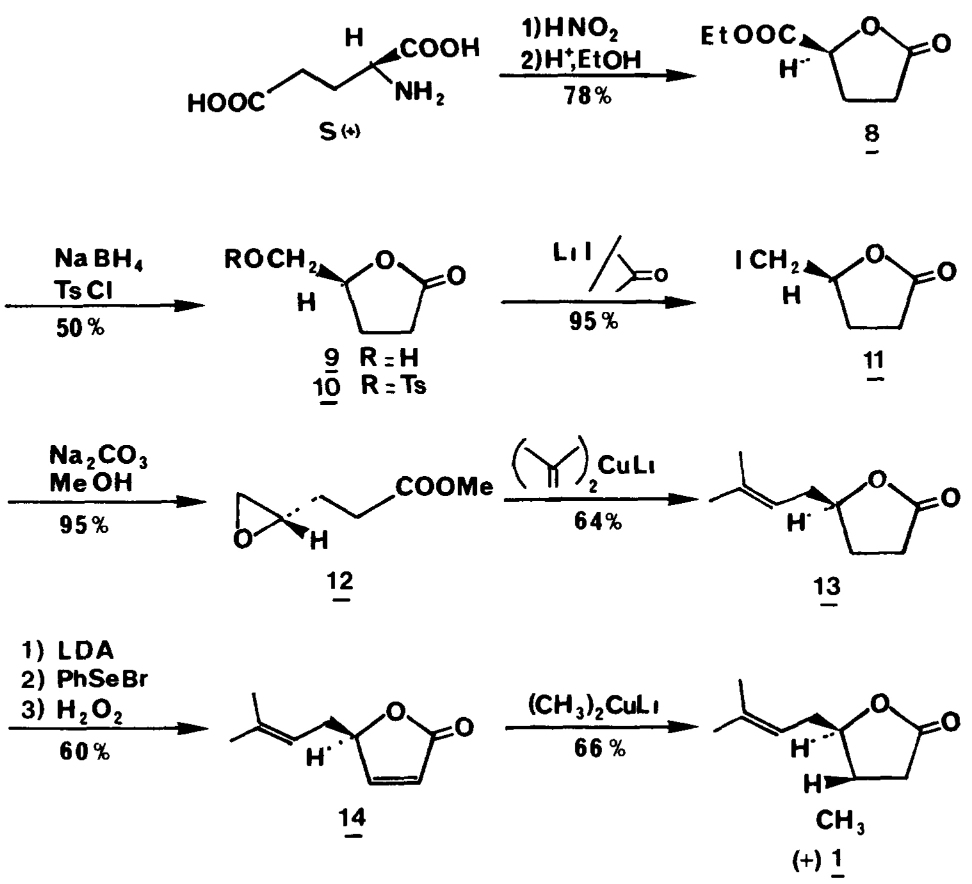
SCHEME I



Stereospecific 1,4-addition of Me_2CuLi (7) to 4 furnished the trans lactone 5 $[\alpha]_D^{21}$ - 36° (c = 2.17, dioxane) of absolute configuration (3R,4R) Hydrogenolysis of 5 followed by tosylation of the resulting alcohol gave compound 6 $[\alpha]_D^{21}$ - 60.9° (c = 1.25, dioxane) which was transformed into the epoxide 7 $[\alpha]_D^{21}$+ 1.94° (c = 1.55, dioxane) by treatment with sodium methoxide

Finally, the reaction of 7 with lithium diisopropylidene cuprate led to the isolation of (3R, 4S) eldanolide 1 $[\alpha]_D^{21}$- 52.4° (c = 1.51, EtOH) whose spectral date were identical to the natural pheromone

SCHEME II



The (3S,4R) isomer was synthesised according to scheme II using S(+) glutamic acid as starting material. Treatment with HNO_2 followed by esterification gave lactone-ester 8 which was reduced to alcohol 9 $[\alpha]_D^{22}$ + 31° (c = 2 66, EtOH) (8) with sodium borohydride. The corresponding tosylate 10 was further transformed into the iodide 11 by refluxing in acetone in the presence of LiI $[\alpha]_D^{20}$ + 2.3° (c = 2.4, CH_2Cl_2) (9).

Epoxide 12 $[\alpha]_D^{20}$ - 10 0° (c = 1 7, CH_2Cl_2) resulted from treatment of 11 with Na_2CO_3 in methanol (10) In analogy to the previous scheme, condensation with lithium diisopropylidene cuprate at -30° gave lactone 13 $[\alpha]^{0}$+20.0° (c = 1.1, MeOH). The introduction of the methyl group in position 3 was achieved in the following manner the anion of 13 was treated with phenylselenenyl bromide followed by oxidation with H_2O_2. The spontaneous elimination of phenylselenenic acid provided the butenolide 14 $[\alpha]_D^{21}$ - 130° (c = 0.80, MeOH) (11). Finally, the stereospecific 1,4- addition of Me_2CuLi yielded the (3S,4R) isomer of eldanolide 1 $[\alpha]_D^{20}$ + 51.5° (c = 1.15, MeOH).

Both synthetic isomers showed significant circular dichroism While the (3R, 4S)(-)isomer gave a $\Delta\varepsilon$ = + 0.4 at 210 nm, the (3S,4R)(+) isomer showed a $\Delta\varepsilon$ = -0.35 at the same wavelength (solvent hexane).

A GC fraction resulting from the extraction of approximately 1000 wing glands provided a CD curve whose shape was identical to that obtained with the synthetic (+) isomer. Therefore, the absolute configuration of the natural pheromone is (3S,4R).

The biological activity of both synthetic enantiomers is currently investigated and will be reported elsewhere.

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