# SYNTHESIS OF BLACK BEETLE AGGREGATION PHEROMONE

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The rhinoceros beetle, *Oryctes rhinoceros* L., is an important pest of coconut in all coconut growing countries including Sri Lanka. Gas chromatography and gas chromatographic-electroantennographic detection analysis of Porapak Q-trapped volatiles obtained from aeration of male *Oryctes rhinoceros* shows three sex specific compounds[1]. One of these compounds, ethyl 4-methyloctanoate was reported to be an aggregation pheromone. Ethyl 4-methyloctanoate is being promoted by the Coconut Research Institute for mass trapping of the beetle as part of its plant protection strategy for the coconut palm.

The methods available for the synthesis of ethyl 4-methyloctanoate are laborious and expensive. We were interested in developing a synthesis of the pheromone, which could be conveniently carried out using cheap raw materials. Three possible approaches were derived from retrosynthetic analysis, using cane sugar, succinic anhydride and hexanal respectively as starting materials.

The aggregation pheromone was synthesized using cane sugar as the starting material. Cane sugar was treated with conc. hydrochloric acid to give 4-oxopentanoic acid in 20% yield. Fischer esterification of levulinic acid with ethanol and conc. sulfuric acid gave ethyl levulinate in 90% yield. Wittig olefination reaction of ethyl levulinate with triphenylphosphoniumbutylylid gave ethyl 4-methyloct-4-enoate in only 12% yield. Hydrogenation of the alkene using hydrogen with palladised carbon afforded the pheromone in 90% yield. The hydrogenation gives racemic ethyl 4-methyloctanoate but since both R and S compounds are reported to be attractive to the beetle, the racemic product can be used in plant protection without resolution.