STRUCTURE-ACTIVITY STUDIES OF ARYL ALKENES

AND

SYNTHESIS AND USE OF CHIRAL INDUCTORS IN IRIDOID SYNTHESIS

A THESIS PRESENTED

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ABSTRACT

This thesis consists of two parts.

Part one of the thesis describes the synthesis of insecticidal active aryl alkenes. Previous study of *Zingiber purpureum* had shown the presence of an aryl alkene, (E)-1-(3',4'-dimethoxyphenyl)butadiene which was active against *Aedes aegypti* with LC_{50} of 6.5 ppm and against the bruchid, *Callosobruchus maculatus* with LC_{50} of 2 mg. The compound also showed oviposition deterrent and ovicidal effects against the bruchid.

The aryl alkene was however unstable when exposed to light and air. Structurally related compounds, were therefore synthesized in order to study the structure-activity relationship to obtain stable aryl alkenes with the same or enhanced activity.

Arylalkenes were synthesized using the Wittig reaction. Aromatic aldehydes substituted with hydroxy and methoxy groups at different positions on the aromatic ring were reacted with ylides of different length (1 to 4 carbons).

Para methoxy substituted aryl alkenes were generally found to have strong insecticidal activity against *Callosobruchus maculatus* in the residual film bioassay. In the seed treatment bioassay, these compounds showed oviposition deterrent and ovicidal effects against the bruchid.

However the result against *Aedes aegypti* did not show any consistent pattern in relationship between structure and activity.

Part two describes the synthesis of Gastrolactole, which is a key intermediate in the synthesis of sex pheromones, Nepetalactoles and some Iridoidal compounds. Some Nepetalactones, Nepetalactoles and other terpenoids with iridoidal skeleton are chemical messengers among aphids.

The key step in our synthesis is an intramolecular [4+2]-cycloaddition of an enamine derivative of 8-oxocitral, wherein the enamine moiety acts as the chiral inductor.

2-Methyl-, *tert*-Butyl-, Phenyl-indoline were used as chiral inductors in the cycloaddition step and three different cycloaddition products were obtained in different diastereomerical ratios. 2-Phenylindoline was the best chiral inductor for the cycloaddition step judging by the yield of the reactions and the diastereomerical ratios of the products.

Racemic 2-phenylindoline was resolved into its enantiomers separated by first converting them to urea derivatives using (*R*)-(+)-α-methylbenzylisocyanate. The diastereomers of the urea derivative were then separated by medium pressure column chromatography and finally they were released as separate samples of (*R*)- and (*S*)-2-phenylindoline after reaction with diborane in refluxing THF. The enantiomeric purity of the two enantiomers were checked by chiral gas chromatography.