ABSTRACT

This thesis is in two parts. The first part (Chapter 1 to 7) deals with the gas chromatographic studies of the volatile constituents of some spices and aromatic plants grown in Sri Lanka. This work has been carried out in the laboratory of the Natural Products Section of CISIR.

In the second part, (Chapter 8 – 11) the phytochemical studies on Strychnos chrysophylla carried out in the Department of Pharmacognosy in University of Uppsala, Sweden are described.

PART I

The spice trade is one of the oldest occupations of the people of Sri Lanka. Recently a great deal of interest has been shown in the cultivation and processing of spices on account of their foreign exchange earning capability. It is hoped that the studies carried out here will help to improve the existing knowledge, technology and the quality control of the spices in many ways.

In the first Chapter some of the common methods used to isolate the essential oils from plants are described.

The second Chapter attempts to give a brief description of the technique of gas liquid chromatography along with the different methods used to identify the components separated using this technique. The method of peak trapping and peak area calculations used in this technique have also been described.

In the third Chapter the important aspects of the biosynthesis of the constituents of essential oils have been reviewed. The tracer studies employed in the study of the biosynthetic pathways, the influence of the environment on the composition of the essential oils and the biological significance of the terpenes have been surveyed. Some of the recent hypotheses put forward to explain the formation of phenyl propanoids have also been discussed.

Chapter four deals with the studies on the volatile constituents of the essential oil of fennel grown in Sri Lanka. Anethole is observed to be the major constituent while fenchone and estragole are also present to an considerable extent. The two sets of fennel seeds analysed showed wide variations in the percentage of oil and anethole content which indicate that the period of harvesting

and climate have a great influence on the composition of the essential oil of fennel. Some of the work carried out by Kaneko on the biosynthesis of anethole is described. An attempt has also been made to postulate a mechanism to explain his observations and also to speculate on the possibilities of formation of estragole and anisaldehyde from anethole.

Chapter five describes the analysis of the essential oils of leaf and root of cinnamon grown in Sri Lanka. Several methods of pretreatment of the leaf oil have been adopted to facilitate the isolation of some minor components. The presence of α-ylangene, ethyl and methyl cinnamte is reported for the first time in cinnamon leaf oil of Sri Lanka. The probable structure of another previously unidentified component (peak No. 41) is also discussed here. The highest percentage of this component is found in the leaves and then in the bark. The possible reason for its occurrence in this manner has also been discussed. Some of the drawbacks of the FFAP column used in this study are also indicated. The root bark oil of Sri Lanka cinnamon has been analysed by g.l.c. for the first time and sabinene, Δ^3 carene, linalool, 4-terpinen-1-ol α- humulene, piperitone, geraniol, ethyl cinnamate, acetyl eugenol and benzyl benzoate are reported for the first time in this oil.

In Chapter six the gas chromatographic studies on the volatile oil of wild cardamom are described. The oil obtained by steam distillation is separated into a number of fractions by column chromatography in order to facilitate the collection of some components which elute very close to each other. The presence of α- thujene and cis-p-2-menthen-1-ol in wild cardamom oil has been reported for the first time. A possible structure based on spectral data is proposed for one of the components while the spectral data are given for another component which remains unidentified. The reason for the presence of a high percentage of p-cymene in steam distilled oil compared to cold pressed oil is also discussed.

Chapter seven describes an attempt made to upgrade the hydrocarbon fraction of the citronella oil by photosensitized oxygenation to commercially more important compounds. Though various sources of light have been used for the photosensitized oxygenation of the oil the most successful results were obtained using a 500 w photoflood bulb as the source of light. The oil after oxygenation was reduced with sodium borohydride, and its gas chromatogram when compared with that of the unoxidised reduced oil fraction showed the presence of a large number of components in the terpene alcohol region.

PART II

In Chapter eight a brief description of the three geographically separated groups of Strychnos species is given. Very few studi es have been carried out on the structure activity relationships of strychnos alkaloids and this work is mentioned in Chapter nine.

Chapter ten attempts to cover some aspects of the biosynthesis of indole alkaloids that have been reported so far.

In Chapter eleven the studies carried out on Strychnos chrysophylla are described. The alkaloid was extracted from the bark and separated into dichloromethane and aqueous phases. As the dichloromethane phase showed muscle relaxing effects it was fractionated using column chromatography. Making use of preparative thin layer chromatography and preparative gas chromatography the isolation of alkaloids was attempted from the fractions. The presence of an alkaloid (A) having a molecular peak at m/e 390 and a mixture of 2 alkaloids having molecular peaks at m/e 224 and 222 are reported. Due to the small quantities of the material present, further purification was not possible.

A mixture of two more alkaloids (D) and (E) having molecular ions at m/e 214 and 216 was isolated. The alkaloid (F) was obtained in a pure form. Its u.v., i.r., n.m.r., and mass spectra were obtained and based on these data a partial structure is suggested for the compound.