ABSTRACT

STUDIES ON JAMAICAN NUTMEG OIL

This work

(i) examines relationships between molecular structure and Retention Indices of some volatile congeners found in essential oils,

(ii) demonstrates the use of these quantitative relationships in the prediction of the Gas Chromatographic elution characteristics of some volatile secondary metabolites found in nutmeg oil,

(iii) quantifies some volatile secondary metabolites found in Jamaican nutmeg oil and compares these quantities with those of Indonesian and Grenadian nutmeg oil.

The thesis is presented in three parts - Parts I, II, and III - representing literature reviews, results and discussion, and experimental respectively.

In Part I, two literature reviews are presented. Chapter 1, documents information about *Myristica fragrans* Houttuyn (Nutmeg and mace), and summarises some of the more important pharmacological aspects of the plant. In Chapter 2, an exploration of the Retention Index

System in Gas Chromatography, was undertaken. The relationships between molecular structure and retention index relationships were also examined, with particular emphasis being placed on the study of these relationships by the Retention Index Increment (RII) methodology.

Part II presents all the results of the experiments carried out in this study. In Chapter 3, a rigorous examination of the RII methodology was undertaken for predicting the magnitude of the inter- and intramolecular interactions occurring between solute and stationary phase. Elution characteristics of some volatile congeners - monoterpene hydrocarbons, alcohols, and esters, as well as some aromatic ethers - with respect to the retention index of the compounds on polar and non-polar capillary columns, were studied. This was achieved by determining the specific retention index increments (described as Group Retention Factors or Functionality Constants) associated with particular structural features of the molecules, and resulted in the establishment of a number of new relationships which govern GC elution.

Chapter 4, looks at the application of Group Retention Factors (GRF), Functionality Constants (FC), and GC-MS data, in the identification of some volatile congeners found in Jamaican nutmeg oil (all nutmeg samples for this study were obtained from Glenngoffe,

St. Catherine). It was shown that a combination of these methods improved the process of identification of components in nutmeg oil samples.

In Chapter 5, a quantitative comparison of the essential oil components found in Jamaican nutmeg oil and determined by GC-MS and HPLC methodologies, highlighted the similarities and differences between the local, Grenadian and Indonesian varieties of the oil.