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**CHEMICAL INVESTIGATION AND BIOACTIVITY STUDIES OF
SOME SRI LANKAN FERNS**

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A THESIS SUBMITTED BY

RANJALA RATNAYAKE

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ABSTRACT

This thesis consists of two parts.

The first part deals with the Chemical investigation of three fern species and consists of four Chapters. **Chapter 1** is a general introduction to ferns, which highlights their morphological features, their usefulness in the traditional medicines, with a brief Introduction to the numerous classes of compounds that are commonly encountered in this group of plants together with their chemotaxonomic and therapeutic significance.

Chapter 2 deals with the Chemical investigation of *Marattia fraxinea* Sm. (Marattiaceae). The methanol extract of the rhizomes of *M. fraxinea* yielded a novel γ -lactone glucoside, which was named as marattioside together with angiopteroside, maltol glucoside, methyl- α -D-galactoside and 6-deoxy-D-glucose. The structure of marattioside together with the stereochemistry was established by synthesis from angiopteroside.

The co-occurrence of both marattioside and angiopteroside suggested a possible biogenetic relationship between these two compounds. Maltol glucoside is reported for the first time from the family, while methyl- α -D-galactoside is reported for the first time from ferns. 6-deoxy-D-glucose which is extremely rare as a free sugar has been previously reported only from a single Rubiaceae species. Both 6-deoxy-D-glucose and methyl- α -D-galactoside were suggested to be stable intermediates in

the biosynthesis of marattioside, angiopteroside and maltol glucoside. A possible biosynthetic pathway from glucose leading to these compounds has been postulated

The third chapter describes the chemical investigation of *Pteris ensiformis* Burm. A comprehensive review of the compounds isolated from *Pteris* species is given in this section. Investigation of the rhizome of *P. ensiformis*, a plant with certain applications in the indigenous system of medicine yielded several sugars and sugar derivatives. The α and β anomers of methyl-3,6-anhydro-2-deoxy-glucopyranoside are reported for the first time. The bicyclic structures of these compounds and their anomeric configurations have been established by extensive usage of spectroscopic evidence. The co-occurrence of the two disaccharides 3-*O*- β -D-glucopyranosyl-1,5-anhydro-2-deoxyhex-1-enitol and 3-*O*- β -D-glucopyranosyl-2-deoxy-D-glucose were of considerable significance in the biogenesis of these sugars from glucose. It was postulated that conversion of glucose to 2-deoxy glucose occurs *via* glucal and glucosylation of these compounds gives rise to the two disaccharides, which have been isolated. This constitutes the first report of the natural occurrence of both these compounds.

Methylation analysis coupled with GCMS studies on 3-*O*- β -D-glucopyranosyl-1,5-anhydro-2-deoxyhex-1-enitol indicated fragmentation pattern of 2-deoxy derivative suggesting conversion of 1,5-anhydro-2-deoxyhex-1-enitol to 2-deoxy hexose during the hydrolysis process. A possible biogenesis to these compounds and hydroxy maltol glucoside from glucose has been postulated.

The chemical investigation of *Davallia repens* Kuhn is discussed in **Chapter 4**. The triterpenoid constituents occurring in family Davalliaceae have been reviewed herein. The rhizomes of *D. repens* yielded two hopane triterpenoids and esters and ketones of cycloartane type triterpenes. The occurrence of these 9,19 cyclolanostanol derivatives has been considered to be of considerable chemotaxonomic significance. The structure elucidation of these compounds was exclusively based on their mass and NMR spectral characteristics.

The second part of the thesis constituting **Chapter 5** deals with preliminary bioactivity studies on fern species collected from different parts of the country. Numerous biological activities displayed by several ferns with special reference to antibiotic activity have been discussed in this chapter. Larvicidal, antibacterial and antifungal studies were carried out on *M. fraxinea*, *P. ensiformis*, *D. repens* and several other fern species. Antibacterial and antifungal activities displayed by *P. ensiformis* were established as due to the water-soluble polar compounds, while the larvicidal activity of the same species was suggested to be due to comparatively less polar active principles present in the hexane/chloroform soluble fraction of the plant extract.