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THESIS

ENTITLED

THE CHEMISTRY OF POLYHYDROXYFLAVONOID AND POLYPHENOLIC COMPONENTS ISOLATED FROM SOME LOCAL PLANTS

Submitted to

Faculty of Science

Ain Shams University

For

The Degree of

DOCTOR OF PHILOSOPHY

OF SCIENCE

Chemistry

By

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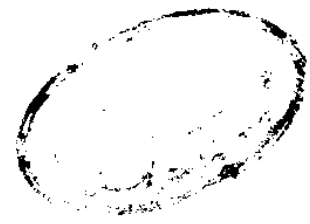
(M. Sc.)



National Research Centre

Cairo

1990

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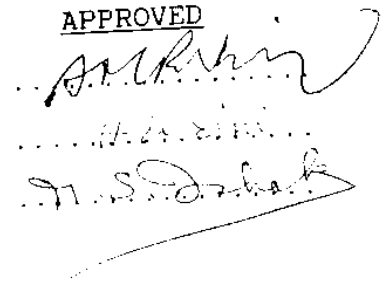

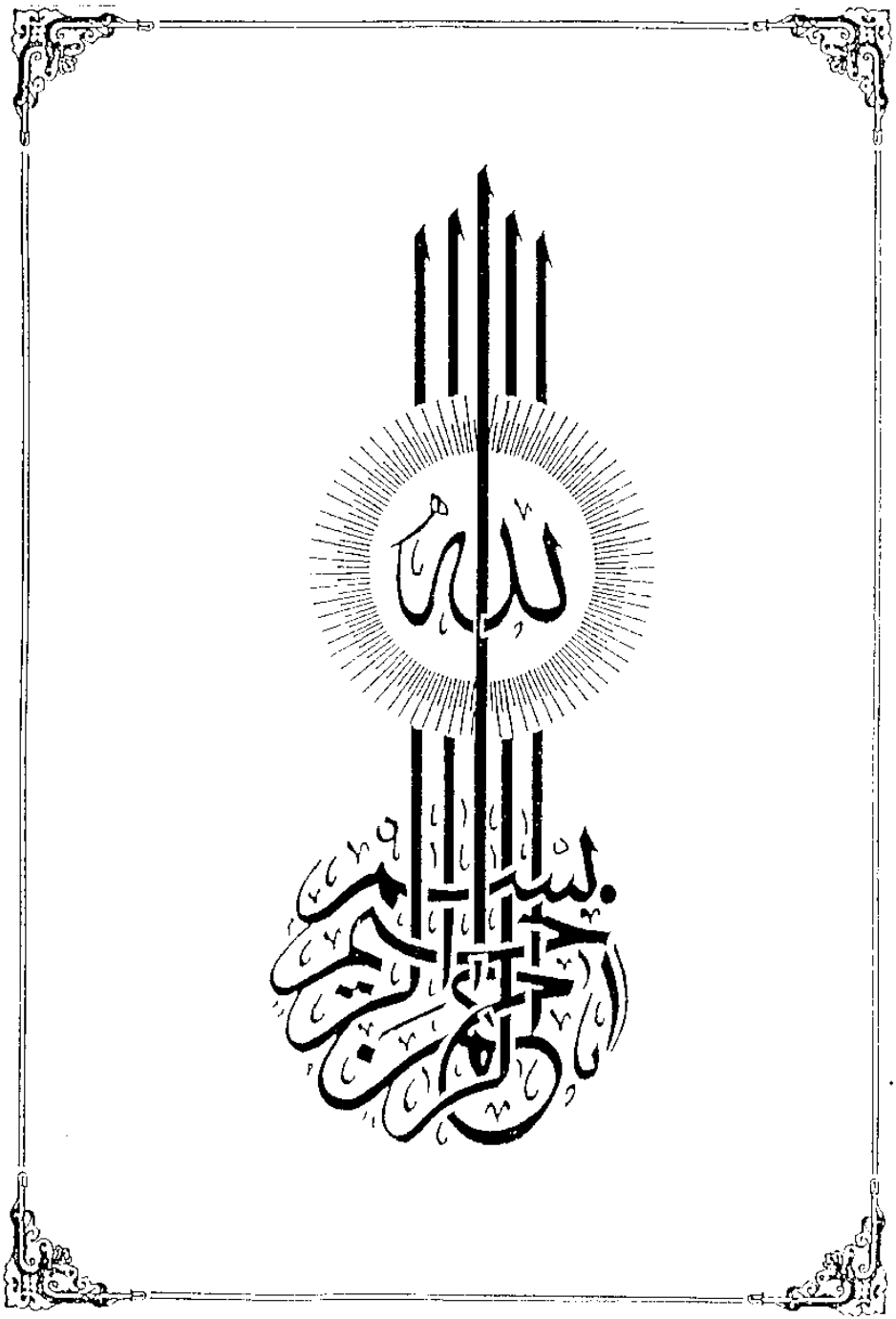

ACKNOWLEDGEMENT

A C K N O W L E D G E M E N T

The author wishes to express her thanks to Prof. Dr. A.M.Rabie, Professor of Organic Chemistry, Faculty of Science, Ain Shams University, for his interest, invaluable support and encouragement.

The author would like to record her gratitude to Prof. Dr. H.I.El Sissi, Former President of the N.R.C., for his kind help sound advice and encouragement during the revision of the thesis.

She also feels very grateful to Prof. Dr. Moheb S. Ishak, Head of Chemistry of Tanning Materials and Proteins Department N.R.C., for the suggestion of the topic of this work , continuous guidance, constant support, criticism and sound advice generously given throughout the course of the present study and during the writing of this thesis.

She would like to acknowledge with thanks the kind help of Dr. M.A.El Ansari and Dr. A.A. Ahmed for achieving some of the spectral analysis.

Thanks are expressed to the National Research Centre, Dokki, Cairo, for the facilities provided for such an accomplishment.

C O N T E N T S

SUMMARY AND CONCLUSION

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The present thesis affords comprehensive studies on the chemical structure of the polyphenolic and flavonoid constituents and their glycosides found in the aerial parts of two local plants, namely Asteriscus graveolens and Asteriscus pygmaeus (Family Compositae) and the whole plant of Plantago lagopus (Family Plantaginaceae). These local plants have been selected to be the subject of this thesis due to their economic importance and the very few reports concerning their polyphenolic and flavonoid constituents in the literature.

The identification and the elucidation of the structure of the isolated and purified components were confirmed through U.V. spectral measurements, ^{1}H and ^{13}C-NMR spectroscopy, mass spectra, R_f-values in different solvents in addition to the chemical methods of investigation (acid and enzymic hydrolyses, hydrogen peroxide oxidation, demethylation, alkali fusion and the preparation of some derivatives... etc.).

The aerial parts of A. graveolens ans A. pygmaeus as well as the whole plant of P. lagopus were air-dried, ground and extracted with aqueous ethanol. The ethanol extract of each of the two species of Asteriscus i.e. graveolens and pygmaeus was applied on a polyamide column, whereby seven fractions were obtained from the former and six fractions from the latter, while the extract of P. lagopus was subjected to the elution technique on Whatman 3MM paper (preparative paper chromatography) whereby nine components were obtained.

The first fraction of A. graveolens showed to contain mainly sugars, which were isolated and identified as glucose, galactose, rhamnose and xylose.

From the second fraction, a new natural flavonol glycoside was isolated, purified and identified for the first time as 5, 7,3'-trihydroxy-4'-methoxyflavonol-3-O- α-L-rhamnosyl (1$\rightarrow$6) β-D-galactoside (Tamarixetin-3-O-robinobioside). Acid hydrolysis led to the identification of the aglycone tamarixetin and the sugars rhamnose and galactose, while enzymic and controlled acid hydrolyses failed to give any intermediate.

Investigation of the third fraction led to the identification of two methoxylated flavonol glycosides: 3,5,3',4'-tetrahydroxy-6-methoxyflavone-7-O-β-D-glucoside (Patuletrin) and 3,5,4'-trihydroxy-6-methoxyflavone-7-O-β-D-glucoside, together with two other components of glycosidic flavonoid nature, namely 5,7,4'-trihydroxyflavonol-3-O-β-D-glucoside (Astragalin) and 5,7,4'-trihydroxyflavonol-3-O-β-D-galactoside (Trifolin).

The fourth fraction desorbed from the column proved to contain the three glycosidic flavonoid components 3,5,3',4'-tetrahydroxyflavone-7-O-β-D-glucoside (Quercimeritrin); 5,3',4'-trihydroxyflavone-7-O-β-D-glucoside (Glucoluteolin) and 3,5,4'-trihydroxyflavone-7-O-β-D-glucoside, in addition to the methoxylated aglycone, jaceidin (5,7,4'-trihydroxy-3,6,3'-trimethoxyflavone).

Another new natural flavonol glycoside was separated from fraction five which was identified for the first time as 3,5,

3',4'-tetrahydroxyflavone-7-O-(6''-acetate)-β-D-glucoside, in addition to the three flavonol glycosides 5,7,3',4'-tetrahydroxyflavonol-3-O-β-D-glucosyl (1⟶2)-β-D-galactoside; 5,7,3',4'-tetrahydroxyflavonol-3-O-β-D-glucoside (Isoquercitrin) and 5,7,3',4'-tetrahydroxyflavonol-3-O-β-D-galactoside (Hyperin).

The two major components isolated from fraction six were purified and identified as the two methoxylated aglycones 5,7,3'-trihydroxy-6,4'-dimethoxyflavone (Desmethoxycentaureidin) and 5,7,3'-trihydroxy-3,4'-dimethoxyflavone (3,4'-dimethoxyquercetin).

Detailed studies of the last fraction (seven) led to the isolation and identification of the two methoxylated aglycones 3,5,7,3',4'-pentahydroxy-6-methoxyflavone (Patuletin) and 5,7,4'-trihydroxy-3'-methoxyflavone (Chrysoeriol).

The investigation of the ethanolic fractions eluted from the polyamide column of A. pygmaeus extract led to the identification of the sugars glucose, galactose and rhamnose from the first fraction.

The second fraction proved to contain two polyphenolic components identified as 3-caffeoyl quinic acid (Chlorogenic acid) and 3,4-dihydroxy cinnamic acid (Caffeic acid).

The two glycosidic flavonoids isolated from the third fraction were identified as 5,7,3',4'-tetrahydroxyflavonol-3-O-β-D-glucosyl (1⟶6)-β-D-glucoside (Quercetin-3-O-gentiobioside) and 5,7,3',4'-tetrahydroxyflavonol-3-O-α-L-rhamnosyl (1⟶6)-β-D-glucoside (Rutin).