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" ANALYSIS OF EXTRACTABLES
FROM TEN FICUS SPECIES
IN KENYA AND HPLC ANALYSIS
OF SOME COMMON FATTY ACIDS
AS THEIR p-PHENYLPHENACYL
ESTERS "

A Thesis Submitted in Partial Fulfillment for the
M.Sc. Degree in Chemistry by

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University of Nairobi

(1984)

DECLARATION

I hereby declare that this research has been carried out and the thesis composed by myself, and that this thesis has not been submitted for a degree in any other University or other Institution.

The research was carried out in the Department of Chemistry at the University of Nairobi under the direction of Dr. A. Ng'eny-Mengech.



S.N. KIHUMBA

I certify that Simon N. Kihumba has undertaken full-time research in the Department of Chemistry at the University of Nairobi under my supervision since August, 1981 and is qualified to submit this Thesis for the degree of Master of Science.

A. Ng'eny-Mengech

A. NG'ENY - MENGECH, PhD.

ABSTRACT

A screening procedure utilizing successive extractions with acetone, cyclohexane and methanol was applied to 10 Ficus species in order to quantify their solvent extractables. The species include Ficus benjamina, F. capensis, F. elastica, F. glumosa, F. ingene, F. ovata, F. sansibarica, F. thonningii and F. volgelii, all of which are found in Kenya at different altitudes and climatic regions. A combined solvent extraction-partitioning scheme was used to divide the dried, ground leaves and stems into oil, polyphenolic, hydrocarbon and sugar-containing fractions, which might be of use as sources of chemical raw materials and renewable, biomass-derived fuels. The fractions were examined by IR, UV and NMR spectroscopy, while the residues were analysed for protein and crude fibre content. Bomb calorimetric study was done to determine the heat of combustion of each fraction. The iodine and saponification numbers, and saponifiable and unsaponifiable matter of the oil fractions were estimated by standard titrimetric methods.

The results showed that the amount of extractable oils varied from one species to the other, being highest in F. benjamina (5.43%) during the dry season and lowest in F. capensis (0.58%) during the wet season. The oils have a heat value varying from 39.56MJ/Kg to 43.74MJ/Kg.

The oils also showed reasonably high iodine and saponification numbers of over 90 and 110 respectively. The oils also showed reasonably high content of unsaponifiable matter ranging between 23.81% in F. sansibarica and 37.50% in F. benjamina.

The quantity of the hydrocarbon fraction extracted varied from 0.21% in F. sycomorus to 3.54% in F. benjamina during the dry season, and between 0.22% and 1.31% in F. ingene and F. volgelii respectively during the wet season. The heat of combustion of the hydrocarbon fractions were the highest compared to the other fractions, ranging from 39.26MJ/Kg in F. sycomorus to 51.68^{Kg} in F. ingene.

The species were found to have considerably high amounts of polyphenols compared to other fractions. The amounts were as high as 9.26% in F. volgelii.

A rating scheme applied to the ten species showed that F. benjamina, F. glumosa and F. volgelii are candidates for further investigation as potential multipurpose crops.

The p-phenylphenacyl esters of the saturated fatty acids series C₁₂ - C₂₂ (lauric, myristic, palmitic, stearic, arachidic and behenic) were prepared by

reaction of their potassium salts with p-phenylphenacyl bromide. The esters were identified by their m.p., IR and NMR spectra. High performance liquid chromatography of the esters on a reverse phase column, with methanol solvent, gave a straight line when the log of the retention time was plotted against molecular weights. This analytical method when applied to p-phenylphenacyl esters made from coconut oil gave peaks which corresponded to lauric, palmitic, and stearic acids. When the method was applied to the F. volgelii oil fraction, several peaks were observed which did not appear to correspond to any of the saturated acid peaks.