Bull. Chem. Soc. Ethiop. **1996**, 10(2), 161-164.
Printed in Ethiopia
ISSN 1011-3294

SHORT COMMUNICATION

A COMPARATIVE STUDY OF SEED OILS OF *CHROZOPHORA BROCHIANA* AND *GUIZOTIA ABYSSINICA*

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(Recieved May 17, 1996; revised November 5, 1996)

ABSTRACT. A comparative study on the fatty acid composition of the seed oils of *Chrozophora brochiana* and *Guizotia abyssinica*, showed both oils to contain nearly the same type of C_{16} and C_{18} type fatty acids. Linoleic acid (18:2) was the major component in both oils. The other predominant fatty acids were palmitic (16:0), oleic (18:1) and stearic (18:0) acids.

INTRODUCTION

Guizotia abyssinica (L.f.) Cass. (Compositae) known in Ethiopia as 'Nug' and commercially as niger, is an important oil crop in Ethiopia, India, Tanzania, Uganda and the Sudan. It is cultivated in many parts of Ethiopia at altitudes between 500 - 2600 m where there is enough rain [1]. Niger seed provides 50 - 60 % of Ethiopia's but only 2% of India's edible oil consumption. *G. abyssinica* has also been successfully introduced in the Sudan, particularly in the southern Blue Nile area. The fatty acid composition of niger seed oil was found to be similar to that of safflower and sunflower and contains a high percentage of the essential fatty acid, linoleic acid reaching up to 85% [2].

Chrozophora brochiana Vis., known in the Sudan as 'Argessi' is widely scattered in the dry areas of North West and Eastern Sudan as weed or as range crop. Preliminary studies [3] at the National Oilseed Processing Research Institute (NOPRI), University of Gezira, Sudan, showed that the seeds of this plant give by expression good yields of edible oil. All indications point out that it may be a new promising source of edible oil. However to date there is no report in the literature on the chemical composition of the seed oil of *C. brochiana*.

The objective of this study was to undertake a comparative study of the fatty acid composition of the seed oils of *C. brochiana* and *G. abyssinica* so that the result may shed light on whether the former oil crop could also be promoted for large scale human consumption.

RESULTS AND DISCUSSION

The relative percentage compositions of the major fatty acids, as determined by capillary GC and GC-MS, are presented in Table 1 and Figure 1 shows the chromatograms of their methyl esters.

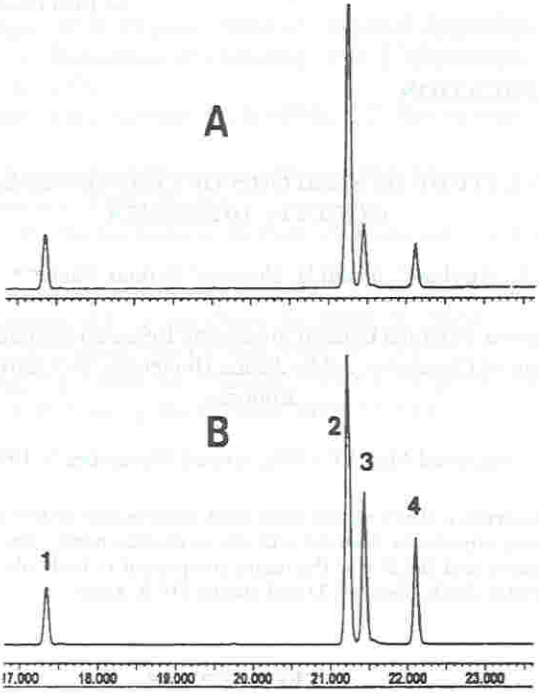

Figure 1. GC chromatograms of methyl esters of the fatty acids obtained by hydrolysis and methylation of seed oils of (**A**) *G. abyssinica* and (**B**) *C. brochiana*: Palmitic acid (**1**), linoleic acid (**2**), oleic acid (**3**) and stearic acid (**4**). Print numbers at baseline indicate retention times in minutes from injection.

Table 1. Relative percentage composition of the four fatty acids in *C. brochiana* and *G. abyssinica* seed oils analyzed by capillary GC and GC-MS.

Methyl ester of	RT(min)	Relative area, percentage *C. brochiana*	*G. abyssinica*	Identification method
Palmitic acid	17.35	9.6	11.8	GC-MS
Linoleic acid	21.22	48.0	67.0	GC-MS
Oleic acid	21.44	24.6	11.5	GC-MS, PE*
Stearic acid	22.10	17.8	9.6	GC-MS, PE

*PE = peak enhancement.

methyl esters. The identity of each fatty acid was determined from their ms fragmentation pattern and further confirmed by co-injecting with authentic samples.

When the fatty acid ester mixture was hydrogenated using PtO_2 catalyst, it was shown by GC-MS analysis that the unsaturated fatty acids, methyl oleate (18:1) and methyl linoleate (18:2)

were converted to methyl stearate (18:0), leaving methyl palmitate (16:0) unchanged.

The above results show the composition of linoleic acid found in this study for *G. abyssinica* is in good agreement with a previous report [2] and is also slightly higher than that in *C. brochiana* . These results also indicate that in so far as composition of fatty acids is concerned, *C. brochiana* may have potential for use as an oil crop.

EXPERIMENTAL

Plant materials. G. abyssinica seeds originating from Ethiopia were grown in the University farm in Nishishiba (Medani-Sudan). *C. brochiana* seeds were collected from Western Sudan where it is a range crop, and from Gezira State near Gitena City 'White Nile'.

Instrumentation. A Varian Model 3700 Gas Chromatograph (FID detector, 270° C) with a fused silica HP-1 capillary column (30 m x 0.25 mm i.d.) Using N_2 as carrier gas was employed for GC analysis of the methyl esters. The oven was programmed from 60 to 220° at a rate of 4°/min, with a final hold time of 3 min. Inlet temp was 220°. GC-MS analysis was carried out using Fison GC Model 8000 series Chromatograph coupled to MD 800 mass selective detector with helium as carrier gas using HP-1 fused silica capillary column. The same GC parameters as above were employed and mass spectra were acquired at 70 eV ionization at a rate of 2/s. The methyl esters were identified by matching their mass spectra with NIST and Wiley databases.

Extraction of oil. Oil from the seeds was obtained by mechanical pressing and also by extraction with hexane using Soxhlet apparatus. The average yield for both types of oils was 40% based on whole seed weight.

Preparation of fatty acids. To the oil (2 g) was added MeOH (20 mL) and 1 N KOH (0.5 mL), and the mixture was refluxed for 10 min or till a clear solution developed. This was cooled and washed with hexane. The aqueous layer was then acidified with 2 N HCl and extracted with hexane. The hexane extract was dried with anhydrous Na_2SO_4. Evaporation of the hexane yielded fatty acids, which were analyzed by TLC.

Methylation of the fatty acids. The fatty acid mixtures were methylated using diazo methane kept in ether at 0°.

Hydrogenation of methyl esters. The methyl ester mixture of each oil was subjected to catalytic hydrogenation at atmospheric pressure overnight using PtO_2 as catalyst.

ACKNOWLEDGMENTS

M.E.S.M. is grateful to IPICS-NAPRECA for a short term fellowship to Addis Ababa University. E.D. is thankful to SAREC-Sweden for research grant and T.B. is thankful to IPICS-NAPRECA for Home-University-based Training Fellowship. Beniam Kebede is thanked for GC-MS measurements. We are grateful to Dr S.O. Yeboah of Botswana University for providing authentic samples of fatty acids.

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