



Contents lists available at ScienceDirect

Journal of Food Composition and Analysis

journal homepage: www.elsevier.com/locate/jfca

Characterization of *Schinziophyton rautanenii* (Manketti) nut oil from Namibia rich in conjugated fatty acids and tocopherol

Natascha Cheikhyoussef^{a,b,*}, Martha Kandawa-Schulz^b, Ronnie Böck^c, Charles de Koning^d, Ahmad Cheikhyoussef^e, Ahmed A. Hussein^f

^a Ministry of Higher Education, Training and Innovation, Windhoek, Namibia

^b Department of Chemistry and Biochemistry, University of Namibia, Windhoek, Namibia

^c Department of Biological Sciences, University of Namibia, Windhoek, Namibia

^d School of Chemistry, University of the Witwatersrand, Johannesburg, South Africa

^e Science and Technology Division, Multidisciplinary Research Centre, University of Namibia, Windhoek, Namibia

^f Department of Chemistry, Cape Peninsula University of Technology, Bellville Campus, Cape Town, South Africa

ARTICLE INFO

Chemical compounds studied in this article:

Alpha-Eleostearic acid (PubChem CID5281115)

Linoleic acid (PubChem CID 5280450)

Gamma-tocopherol (PubChem CID92729)

Keywords:

Namibia

Manketti nut oil

Physicochemical characterization

Conjugated fatty acids

Tocopherol

α -Eleostearic

Linoleic acid

ABSTRACT

The *Schinziophyton rautanenii* tree is an important food source for many communities of the African continent. Oil extracted from the Manketti nut is of great economic value, due to its unique composition and properties. In this study, the physical and chemical characteristics of the oil obtained from three extraction methods – cold pressed, traditional and Soxhlet extraction – were investigated and compared. Oil yield of the nut was found to be $42.6 \pm 0.84\%$. Good quality characteristics, including saponification values (184–189 mg KOH/g), iodine values (120–131 g/100 g), acid values (0.959–2.44 mg KOH/g) and peroxide values (1.80–3.98 meqO₂/kg) were found for the Manketti nut oil. The total tocopherol content was in the range of 144–206 mg/100 g of oil, with γ -tocopherol as the dominant tocopherol. The oil was rich in conjugated fatty acids, α -eleostearic (9Z,11E,13E-octadecatrienoic acid) (24–36%) and linoleic acid (9Z,12Z-octadeca-9,12-dienoic acid) (31–32%), making it a potential candidate in the nutraceutical and cosmetics industry.

1. Introduction

Schinziophyton rautanenii (Schinz), formerly known as *Ricinodendron rautanenii* Schinz (Vermaak et al., 2011), belonging to family Euphorbiaceae, is a large spreading dioecious tree of 15 to 20 m in height (Fig. 1a & b), which commonly grows wild on plains, among dunes, wooded hills and the floodplain islands of the eastern Zambezi (Palgrave, 1983; Curtis and Mannheimer, 2005). The *S. rautanenii* (Schinz) tree is commonly found in the north-eastern part of Namibia (Fig. 1c) and is an important food source to the local communities (European Commission, 1998; Graz, 2002). Other countries where the tree grows are Angola, South Africa, Botswana and Zambia (Atabani et al., 2014). In Namibia, the *S. rautanenii* tree is locally known as Omunkete (Oshiwambo), Omungete (Otjiherero), Ngongo (Kavango) and Mungongo (Zambezi) (Curtis and Mannheimer, 2005). The yellow flowers, about 10 mm in diameter and 12 cm in length (Palgrave, 1983), appear from November to February (Curtis and Mannheimer,

2005). Egg-shaped, light grey-green fruits appear from February (Palgrave, 1983) and between April to May, the fruit fall to the ground, at which time the ripening process starts, softening the fruit flesh (Vermaak et al., 2011). The different fruit parts have various uses, but the inner nut of the Manketti seed kernel is of most value (European Commission, 1998), as it is highly nutritious and contains high amounts of a bright yellow edible oil (Palgrave, 1983). Traditionally, the inner edible nut is used for oil extraction after removal from the fruit with an axe (European Commission, 1998), or it may be crushed between two rocks (Vermaak et al., 2011), opening the hard Manketti shell (Fig. 1d) to reveal the inner edible nut (Fig. 1e). The inner nut is eaten raw or roasted (Curtis and Mannheimer, 2005) and is commonly pounded and cooked to be eaten with Mahangu porridge, whilst the oil (Fig. 2a–c) is eaten with vegetables (Namibia Tourism Board, 2014), chicken and spinach. In Namibia, Manketti nut oil is made traditionally in households and a very limited number of small enterprises produce the cold pressed Manketti nut oil. Apart from being used in food preparations

Abbreviations: AV, acid value; AMW, average molecular weight; meq, milliequivalents; mg/kg, milligram per kilogram; mg/100 g, milligram per hundred gram; MUFA, mono-unsaturated fatty acids; PUFA, polyunsaturated fatty acids; O₂/kg, oxygen per kilogram; SV, saponification value

* Corresponding author at: Ministry of Higher Education, Training and Innovation, Windhoek, Namibia.

E-mail addresses: Natascha.Cheikhyoussef@mheti.gov.na, natapogori@gmail.com (N. Cheikhyoussef).

<https://doi.org/10.1016/j.jfca.2017.12.015>

Received 3 May 2017; Received in revised form 25 October 2017; Accepted 7 December 2017

0889-1575/© 2017 Elsevier Inc. All rights reserved.

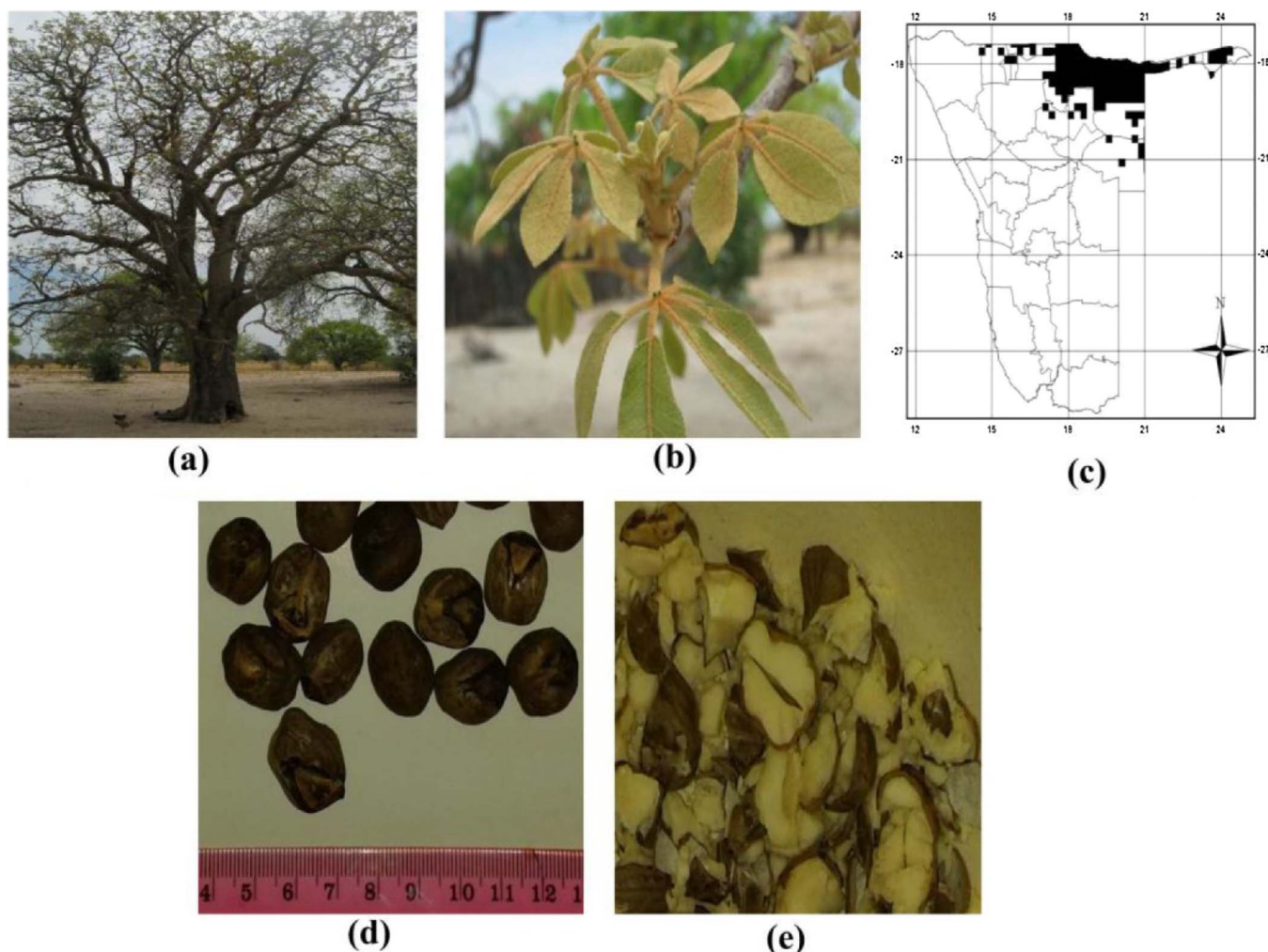


Fig. 1. (a-e). Tree (a) and leaves (b), wild tree distribution of *S. rautanenii* throughout Namibia (Adopted from [Graz, 2002](#)) (c), dried kernels (d) and crushed nuts (e).

and cooking, the Manketti nut oil can also be used in skincare formulations for cleansing and moisturizing ([Kivevele and Huan, 2015](#)), since the oil is easily absorbed into the skin ([Zimba et al., 2005](#)).

The seed kernel of *S. rautanenii* generally contains between 41 and 53% oil ([Chisholm and Hopkins, 1966](#); [Chivandi et al., 2008](#); [Mitei et al., 2008](#); [Gwatidzo et al., 2017a](#)), allowing this oil to be exploited commercially ([Chivandi et al., 2008](#)). The Manketti nut oil is reported to be highly stable to oxidation, with a long shelf life ([Zimba et al., 2005](#)). Interestingly, [Peters \(1987\)](#) reported that dried kernels stored under proper conditions for about 6 years can still be edible and palatable. This provides a continuous food source for rural communities throughout the year, especially during food scarcity periods ([Curtis and Mannheimer, 2005](#)), such as droughts and during winter periods. The aim of the study was to analyze the physical and chemical properties, fatty acid profile, tocopherol composition of the Manketti nut oil currently produced locally in Namibia in its cold pressed and traditionally extracted form and to compare data inclusive of a Soxhlet extraction. The characterization data is intended to assist rural communities and small upcoming enterprises to produce value-added products from their indigenous seed oil resources, in order to uplift livelihoods of rural communities and assist in the economic improvement of a developing country such as Namibia.

2. Experimental

2.1. Sources of manketti kernels and oil

The mature kernels of *S. rautanenii* (Manketti) were purchased from the village of Oshikulufitu in the Omusati region of Namibia. The cold pressed Manketti nut oil was purchased from Mungongo Trading Enterprise, Zambezi region of Namibia. The traditionally extracted Manketti nut oil was prepared in a rural homestead near Outapi, Namibia. The traditionally extracted Manketti nut oil ([Fig. 3a–g](#)) was produced by first roasting the Manketti nuts using hot coals with the aims of improving the flavor of the oil and oil extraction from Manketti nuts ([Fig. 3a](#)). The roasted Manketti nuts were then pounded, producing a sticky nut paste ([Fig. 3b & c](#)), which was then mixed with some water ([Fig. 3d](#)) and boiled for a time, eventually expressing the oil ([Fig. 3e & f](#)). Oil extracted was scooped off ([Fig. 3g](#)) using a spoon-shaped calabash and then stored in 200-mL glass bottles.

2.2. Solvent extraction of oil from manketti nuts

The oil-containing nuts of *S. rautanenii* (Manketti) kernels were manually removed from their shells and crushed to a fine powder using a mortar and pestle. The crushed nuts were extracted with *n*-hexane (Merck, Darmstadt, Germany) in a Soxhlet apparatus for 6 h. The solvent was then removed under vacuum at 40 °C using a vacuum rotary evaporator (Heidolph, Schwabach, Germany). The oil yield was determined and samples were stored in the dark at 4 °C for further

Download English Version:

<https://daneshyari.com/en/article/7619924>

Download Persian Version:

<https://daneshyari.com/article/7619924>

[Daneshyari.com](https://daneshyari.com)