

Contents of Fatty Acids, Selected Lipids and Physicochemical Properties of Western Australian Sandalwood Seed Oil

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Abstract The study was designed to characterise two extracts of Western Australian sandalwood (*Santalum spicatum*) seed oils for their physicochemical and lipid characteristics. Sandalwood plantation's surplus seeds could be used for their oil content, to improve the commercial viability of this industry. The seed oils were obtained by solvent extraction and supercritical carbon dioxide extraction respectively. Important physicochemical parameters were compared with other oils commonly used in pharmaceutical and cosmetic products. Acid values were found to be higher (6.0–7.5 mg KOH/1 g oil) while peroxide values (6.7–9.0 mequiv/Kg) were lower than reported for other oils. Tocopherols were found to be lower than those usually reported for nut oils (α -tocopherol 1–3 mg/100 g; δ -tocopherol 2.2–5.7 mg/100 g), squalenes and phytosterols were found in considerable quantities. The fatty acid content consisted largely of ximenynic acid (35 %) and oleic acid (52 %). No oxidative derivatives of fatty acids were observed. Although there were statistically significant differences in some properties, the magnitude of these were insufficient to conclude there were any notable differences in the two oil extracts.

Keywords Fatty acids · New seed oil · Sandalwood Seeds · *Santalum spicatum* · Ximenynic acid

Introduction

Global demand for the scented wood of Western Australian sandalwood (*Santalum spicatum* R. Br.) is increasing and encouraging many private sector organisations and farmers to develop sandalwood plantations [1]. Currently, there are more than 12,000 hectares of *S. spicatum* plantations in the Wheatbelt region of Western Australia. These trees are harvested for their valuable timber after 15 to 20 years [2]. During this period, the seeds are a potential source of secondary income. *S. spicatum* annually bears a drupe with a hard shelled seed and each tree can produce 1–2 kg of seeds from 3 years of age. The current plantations could produce up to 700 tonnes of seeds annually. *S. spicatum* has several advantages as an oil seed crop compared with other sandalwood species around the world. The fruit pericarp is removed easily upon drying; large seeds are easy to collect and the hard shell keeps the seed intact once fallen to the ground [3, 4].

The seed is rich in oil (50–60 %), which is characterised by containing a high percentage of an unusual acetylenic fatty acid, the major one being *trans*-ximenynic acid (XYA, 30–35 %), which occurs only in Santalaceae and Oleaceae families [5–7]. It has also been reported that XYA forms a triximenynic glyceride [8]. Mice fed with a sandalwood seed oil enriched diet gained less fat when compared to other groups. There was no pathological damage to vital organs observed in mice. However increased aspartate amino transferase enzyme plasma levels suggested an increased hepatic activity. Increased n-3 and n-9 fatty acids and decreased arachidonic acid (n-6)

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