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LETTER TO THE EDITOR

Oil Content and Fatty Acid Profiles of Seed Oil from the Genus *Lavandula*

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Sir

The genus *Lavandula* is comprised of 39 species and several hybrids of woody perennial plants some of which have long been grown for their essential oil, which is extracted by steam distillation from floral tissue. The major cultivated lavenders are varieties of *Lavandula angustifolia* Mill. (true lavender) and hybrids between *L. angustifolia* and *L. latifolia* Medik., (spike lavender), called *L.* × *intermedia* Emeric ex Loisel. and commonly known as lavandins. Several species within the genus are popular gardens plants and are also grown for cut and dried flowers, including the above species and additionally *L. dentata* L., *L. stoechas* L. and *L. pedunculata* Mill.

Research on this genus has focused largely on taxonomy, essential oil composition and yield, together with research on the biological activity of essential oils; for reviews see [1–3], respectively. Little work has focussed on seed oils of this genus although seed oils from several genera within the family Lamiaceae have been analysed [4]. We are interested in the possibility of extending the range of products from lavenders and therefore examined the oil content and fatty acid profiles of oils extracted from lavender seed (nutlets) of five commonly grown species.

Prior to extraction of oil approximately 10 g of seed was dried overnight at 80 °C and ground in a coffee grinder. The oil was extracted for 16 h using a Goldfische extraction apparatus and 100 ml of petroleum ether (b.p. 40–60 °C). The mass of the oil was determined gravimetrically after removal of solvent. Results are expressed as a percentage of the seed weight. Oil content is reported as a percentage of the dry weight of the seed. To determine the fatty acid profile 100 mg of oil was mixed with 3 ml of petroleum spirit (b.p. 40–60 °C) followed by 0.5 mL of sodium methoxide solution (1.15% w/v sodium in methanol). The sample was mixed for 15 s and allowed stand for 10 min. Bromothymol blue (0.1 ml) of a 0.1% w/v solution in methanol was added followed by 0.4 mL of 1 M hydrochloric acid. Sodium carbonate (0.6 mL) of a 1.5% solution was added and the solution was mixed thoroughly. Distilled water was added to bring the solvent layer to the top and following phase separation the solvent layer was transferred to GC vials. The fatty acid profile was determined by gas chromatography using a SGE BPX70 capillary column (30 m, 0.22 mm, 0.25 μm film) and a flame ionisation detector. The column temperature was programmed at 185 °C for 8 min then increased at 10 °C/min to a final temperature of 220 °C which was held for 3 min. Total run time was 13.5 min. The injector (split mode) temperature was set at 250 °C with a split ratio of 1:50. Detector temperature was 260 °C. Data was analysed using Star® Workstation Chromatography software (Version 6.20).

Oil was extracted and analyzed from seed of three varieties of *L. angustifolia.* These were "Hidcote blue" (Kings Seeds, Bundaberg, Australia), "True lavender" and "Munstead" (Highsun Express Seeds, Ormiston, Australia). We also extracted and analyzed seed from three sources of *L. latifolia.* One was purchased from Highsun Express seeds and two came from *L. latifolia* accessions growing in the lavender germplasm collection at Charles

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Table 1 Oil content and fatty acid profiles of *Lavandula* species

Species	Variety	Total oil (%)	Relative content (%)								U/S	18:3/18:2
			C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1		
L. angustifolia	Hidcote blue	27.4	5.3	0.2	1.2	10.4	9.5	73.0	0.1	0.2	14.1	7.7
L. angustifolia	True lavender	28.7	4.3	0.2	1.3	10.4	12.9	70.4	0.1	0.3	16.5	5.4
L. angustifolia	Munstead	24.4	5.0	0.3	1.4	10.5	14.3	68.1	0.1	0.3	14.3	4.8
L. latifolia	–	27.2	4.7	0.2	1.4	14.2	11.6	67.4	0.1	0.4	15.1	5.8
L. latifolia	CSU 1	18.3	4.8	0.1	1.5	13.6	12.3	67.1	0.1	0.4	14.6	5.4
L. latifolia	CSU 2	18.8	5.4	0.2	1.3	12.8	12.8	67.2	0.1	0.3	13.6	5.3
L. stoechas	–	20.3	4.7	0.3	1.4	8.6	15.3	69.3	0.1	0.2	15.1	4.5
L. multifida	–	26.6	5.4	0.4	1.6	10.8	16.5	64.9	0.2	0.2	12.8	3.9
L. dentata	–	31.5	4.6	0.2	1.4	8.9	11.3	73.0	0.2	0.3	15.1	6.4

Sturt University, Wagga Wagga, Australia. We also analysed one seed batch of each of the following species *L. multifida* "Spanish Eyes", (Highsun Express Seeds, Ormiston, Australia), *L. dentata*, (Kings Herb Seeds, Penrith, Australia) and *L. stoechas* (Royston Petri Seeds, Mudgee, Australia).

The results are presented in Table 1 and quantitatively oil content varied between 18.3 and 31.5% with *L dentata* having the highest. The greatest variability within species was within *L. latifolia* (18.3–27.2%). Qualitatively fatty acid profiles were similar between all species of lavender analyzed with the major fatty acid in all species being α-linolenic acid, constituting 64.9–73.0%. Approximately similar quantities of linoleic and oleic acids were present in all oils, oleic ranging between (8.6–14.2%) and linoleic between (9.5–16.5%). In addition all oils contained 4–6% palmitic and 1–2% stearic acids. Interestingly, the fern leaf species *L. multifida* from section *Pterostoechas* Ging. had the highest U/S index and lowest 18:3/18:2 ratio of all species. Our results are in general agreement with those in [4] for *L. angustifolia*, *L. latifolia* and *L. stoechas*. We have extended their study by including three different varieties of *L. angustifolia* and *L. latifolia* and assessing two new species. Because of similarity, fatty acid composition is unlikely to be of use in taxonomy of this genus.

Lavender seed oils closely approximate that of Flax, (*Linum usitatissimum* L.) [5]. Flax oil is used in paints and flax seed and seed oil are used in animal and human foods. An increasing body of literature on health benefits of flax oil including improvement of reproductive efficiency [6], anti-tumorigenic [7] and anti-atherogenic [8, 9] activities is accumulating. This seems largely due to its high α-linolenic acid content and in this respect lavender seed oils might also have similar effects. One species of *Lavandula* which might be particularly amenable to seed or seed oil production is *L. stoechas*. It is drought tolerant, produces large quantities of seed, and will grow in relatively poor soils. *L. angustifolia* is a species traditionally grown for its essential oil and colchicine induced tetraploids with approximately twice the seed weight of diploid varieties have recently been obtained [10]. It would therefore seem that commercial production of seeds or seed oils from *Lavandula* species may have some merit and give growers new products.

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