Unlocking the Potential of Manuka (Leptospermum scoparium)

The word manuka tends to be linked to honey, but in this research paper, Helena Barber, MFHT, BSc, and Sharon Fairhurst, BSc, look at the potential benefits of the plant’s essential oil, Leptospermum scoparium.

Abstract

While it may be argued that the manuka plant has a long history of use for its health benefits by the indigenous people of New Zealand, there appears to be growing scientific evidence of its potential for aroma-therapeutic and medicinal use. In recent years there has been particular interest in the antimicrobial effects of the essential oils and subsequent research has demonstrated efficacy against a range of bacteria, fungi and viruses (Carson et al, 2006).

Manuka: Leptospermum scoparium essential oil is perhaps lesser known and, it may be argued, one of the least used oils within an aroma-therapeutic context that exhibit antimicrobial activity, particularly when compared to tea tree. Research highlights its antimicrobial potential, however further research is required to ensure safe practice guidelines for all users in all applications.
Historical background

Historically it may be argued that the manuka plant was used in a variety of medicinal applications by the Maori people in New Zealand. Leaves, for example, may have been used as an aromatic diffusion while the crushed seed pods may have treated wounds (New Zealand Institute for Crop and Food Research Ltd, 2000). A type of beverage made using the leaves was thought to aid well-being and consumed by early settlers from Europe (Crest New Zealand, 2001). Recent developments include a recommendation for manuka essential oil to be used in Class 1 medicine (Interim Joint Expert Advisory Committee on Complementary Medicines, 2006). It may, however, be argued the lack of potential for patenting individual essential oils limits opportunities for research into their properties (Halcón and Milkus, 2004). Another by-product of manuka trialled within healthcare settings is honey derived from the floral nectar of the plant. Visavadia et al (2008) provided an example where this product may have successfully treated wounds when antibiotics appeared to fail. Lis-Balchin (2006, p.53) however, argued that research studies concerning manuka honey as an antibacterial agent ‘have not provided scientific evidence of activity’.

Habitat and characteristics of the manuka plant

The manuka plant is an elegant evergreen shrub with deep green fragrant leaves that bears small flowers of white to pink in colour (Coombes, 2002). The blossom is produced from September to February and most profusely in the later months. Manuka trees can reach heights of up to eight metres especially when found within dense woodland. Essential oil is usually liberated from oil capsules found in the gleaming leaves or from small branches by steam distillation. Yield may differ according to the season from 0.2% to 1% (New Zealand Institute for Crop and Food Research Ltd, 2000) or up to 2% (Worwood and Worwood, 2003). The essential oil produced can vary in colour from ‘yellow’ (Battaglia, 2003, p.227) to ‘colourless’ (Davis, 2005, p.190). Descriptions of aroma also seem to differ; from ‘rich, spicy and herbaceous’ (Harding, 2008, p.190) to ‘unpleasant’ (Lis-Balchin, 2006, p.243). The manuka plant can be found in Australia although it is indigenous to New Zealand where it can generally be found throughout the country (Worwood and Worwood, 2003). Habitats appear diverse; from marshland to dry mountain slopes and the shrub seems to acclimatises well to varied terrain (Crest New Zealand, 2001).

Focus on commercial development of manuka essential oil within New Zealand appears to have originated during the past decade (Porter and Wilkins, 1999). Research suggests that the majority of distillation is conducted using uncultivated vegetation, as little farming of manuka plants is currently undertaken (Battaglia, 2003). Promising opportunities may exist for the development of future cultivation providing essential oil as outlined in a recent report (Porter and Reid, 2008). One example of commercial venture is a patented product known as Lema® Oil; a blend of manuka essential oil combined with tea tree oil. It is marketed as an effective antibacterial measure and suggested as suitable for use in hospitals (Coast Biologicals Limited, no date).
Manuka essential oil: a summarised profile

**Latin name:** *Leptospermum scoparium* J.R. et. G. Forst

**Family name:** Myrtaceae

**Chemotypes:** Several chemotypes have been identified in New Zealand including: oil from the East Cape thought to have a high triketone content; another from the coast with relatively high levels of sesquiterpenes (>60%) and low levels of monoterpenes (<3%); an α-pinene type; and another with linalool and eudesmol. Another found only in the southern area of the North Island contains geranyl acetate.

**Synonyms:** New Zealand tea tree, kahikatoa, red manuka, manex.

**Extraction:** Steam distillation from the leaves and branches.

**Botanical description:** Graceful evergreen shrub or small tree with deep red wood of vigorous growth. Height can be from two to eight metres tall depending on habitat. It produces small (2 cm) pink or white flowers from September to February. The greatest profusion of flowers is during November through to January. Leaves are small, dark, pointed, concave and shiny.

**Habitat:** Grows wild in New Zealand and not generally cultivated for commerce.

**Distribution area:** Native to New Zealand but also grows in Australia.

**Yield:** 0.2 – 2%.

**Oil appearance:** Clear or yellow liquid.

**Odour:** Gentle, fresh and delicate with a distinctive spicy, sweet, herbaceous aroma although some may find it unpleasant.

**Odour intensity:** Not known

**Evaporation rate:** Top note (Lunny, 1997).

**Principle constituents:**

**Alcohols**
- Monoterpenols: terpinen-4-ol (trace), α-terpineol (trace).
- Sesquiterpenols (4%): nerolidol, viridiflorol, ledol, spathulenol (0.4-0.63%), cubenol (0.86-1.12%).
**Oxides**
Monoterpenoid 1,8-cineole (0.2%).
Sesquiterpenoid β-caryophyllene oxide (0.23-0.26%).

**Esters** (0.55-50%) mainly C10, MWt 168-172.

**Ketones**
Triketones flavesone (4.65-8%), iso-leptospermone (4.47-8%), leptospermone (15-29.4%).

**Hydrocarbons**

- **Monoterpenes**
  - α-pinene (1.1-1.5%), β-pinene (0.1%),
  - β-myrcene (0.2-0.3%), limonene (<0.4%),
  - γ-terpinene (0.1-0.2%), α-thujene (trace),
  - γ-terpinene (trace), α-terpinolene (trace), linalool (0.1%).

- **Sesquiterpenes** (12-17%) α-cubebune (3.9-4%), α-ylangene (0.3%),
  - α-copaene (5.6-6%), β-elemene (0.6%),
  - α-gurjunene (0.9-1.1%), β-caryophyllene (2.4-2.6%),
  - aromadendene (1.9-2.3%), α-humulene (0.3-0.4%),
  - allo-aromadendene (0.8%), β-selinene (3.6-3.8%),
  - α-farnesene (0.6-1.0%), calamenene (11.8-17%),
  - α-cadinene (5.9-6.1%), cadin-1.4-diene (4.7-5.4%),
  - cadina-3.5-diene (4.8%). selinene, arnorphene, muurolene and cadinene isomers.

- Aromatic p-cymene (0.15%)

(Price and Price, 2007)

**Therapeutic properties:** Analgesic, antibacterial, antibiotic, antifungal, antihistamine, anti-inflammatory, anti-infectious, antimicrobial, antiseptic, astringent, deodorant, digestive, expectorant, immune stimulant, insecticide, sedative, vulnerary.

**Uses in aromatherapy**

**Mind:** Relief from stress, anxiety and depression.

**Body:** Pain relief from muscular tension, sprains and stiffness in joints or aches and rheumatism. Also all types of respiratory tract infections including coughs, cold, flu and acts as a decongestant. Skin complaints such as dermatitis, acne, eczema, boils, ulcers, oily skin, dandruff, rashes, sunburn and ringworm may also be treated. Other uses may include against dyspepsia and as an antihistamine for asthma or hayfever.

**Spirit:** May promote inner strength and courage to take actions. It may also protect against negative external influences.
Safety:
No known contraindications. It is thought to be non-sensitising, non-toxic, and non-irritant although research may be inconclusive concerning toxicity and irritation. It may therefore be advisable to carry out a skin patch test prior to usage or use in low dilutions of less than 2%.

Other information:
There may be many variations in micro bacterial potential due to the variety in chemotypes. Applications may include use in massage, compresses, bathing, within ointments or vaporisation.

Chemotypes of manuka
Initially four manuka chemotypes were highlighted in New Zealand including a triketone-rich type found in the East Cape area; later distinguished under the trade name manex. Another, which originated in Otaio, Woodstock and Canterbury, identified traces of α-pinene while a further chemotype discovered in Kaiteriteri and Nelson included linalool and eudesmol. All of these chemical constituents were lacking in the final variety which emanated from both New Zealand Islands (Porter and Wilkins, 1999). The study by Douglas et al (2004, p.1255) found there to be significant geographical variations affecting the chemical composition of manuka and they have subsequently proposed there to be 11 chemotypes of this plant including a ‘sesquiterpene-rich with high myrcene’ and another with ‘elevated caryophyllene and humulene’. The research also identified a new variety containing substantial levels of geranyl acetate only found in the southern area of the North Island. A more recent study indicated that certain individual components still remained unrecognised with others such as humulene relatively new to the practitioner. Differing levels of chemical components may also potentially influence the selection process by the practitioner when selecting manuka oils (Maddocks-Jennings et al, 2005). Research indicates leptospermone, a triketone, for example, may be as high as 29.4%, suggesting greater antimicrobial potential (Douglas et al, 2004) or as low as 15% (Lis-Balchin, 2006). A further example of this type of selection may be β-triketone manuka chemotype which ‘is used commercially as an anti-infective agent in New Zealand’ (Reichling et al, 2005, p.1124).

Suggested properties
The oil is thought to be non-sensitising, non-toxic and non-irritant (Battaglia, 2003) but may irritate some skin types when applied neat (Sibley, 2004). A low dilution: less than 2% or combined with a rich oil such as jojoba may therefore be advised (Davis, 2005). An alternative method may be to carry out a skin patch test to gauge sensitivity prior to usage (Buckle, 2002). Currently most safety tests appear to be carried out using animals so this may have limited efficacy for humans (Price and Price, 2007). Even taking these limitations into account, research into manuka toxicology as yet seems inconclusive, suggesting caution should be exercised when using it (Lis-Balchin, 1999). One recommendation for example suggests it is not suitable to use in ‘pregnancy, parturition or during lactation’ (Lis-Balchin, 2006, p.242). Low toxicity from ingesting preparations of manuka extracts may additionally
be implicated (Price and Price, 2007). In the United Kingdom, however essential oils are not usually taken internally and may be considered dangerous to do so (Pitman, 2004).

Manuka is part of the myrtaceae family group whose members generally demonstrate antiseptic, tonic and stimulant tendencies (Price, 2000). It may also possess antiviral properties as suggested in a report considering the oil for treatment of the herpes simplex virus. It additionally argued that it could provide an effective antiviral measure particularly when the infection re-occurs in an individual (Reichling et al, 2005). The antimicrobial effectiveness of manuka has also been favourably reviewed as a bacterial barrier to periodontal disease (Allaker and Douglas, 2008). This antibacterial property may in addition benefit urinary tract infections, with the oil applied topically or used in a sitz bath (Stefflitsch and Steflitsch, 2008). A report claimed that manuka may also be able to treat ‘chronic inflammatory conditions such as polymyalgia rheumatica, fibromyalgia and rheumatoid arthritis’ (Maddocks-Jennings et al, 2005, p.145). It indicated that the presence of sesquiterpenes influences the potential for anti-inflammatory and antispasmodic properties. Muscular tension, joint stiffness and sprains may therefore be treated as well as dyspepsia (Price and Price, 2007). Where ketones or 1,8 cineole are present in manuka, the oil may possess decongestant and expectorant properties (Gould, 2003). This may in turn benefit conditions such as ‘respiratory tract infections: colds, catarrh, sinusitis and bronchitis’ (Davis, 2005, p. 190). Where there is a high triketone content, manuka essential oil must be used with care. Clarke (2008, p68) advised that essential oils with a high ketone content should be diluted up to a maximum of 2%. A variety of skin complaints may also profit from topical application including ‘sunburn, itching scalp, dandruff, oily skin and rashes’ (Lis-Balchin, 2006, p.240). Other conditions such as eczema, ulcers, boils, dermatitis and fungal skin infections, such as ringworm, for example, may also be treated (Bio-Extracts Limited, no date). Further research suggested that manuka may also be an antihistamine, useful for asthma and hayfever (Davis, 2005) and as a deodorant (Battaglia, 2003).

In addition to the physiological properties, it may also be effective on a psychological level, with the ability to calm and soothe the nervous system. Other possible features may include the potential to increase self-confidence, treat susceptible individuals and shield them from negative energies (Harding, 2008). Evidence suggested that the uplifting qualities of manuka oil may facilitate treatment of anxiety, depression or stress (Price and Price, 2007). It may be argued, however that ‘much scientific research is flawed’ and should therefore be carefully evaluated by the reader prior to implementing any course of action (Pitman, 2004, p.323). Within aromatherapy it may also be argued that the properties and functions will vary according to the chemotype reviewed (Martin, 2007).

**Blending and method of application**

The aroma of manuka oil suggests that it may blend well with ‘wood oils such as sandalwood or cedarwood‘ or mellowed with ‘lavender, lemon or lemon myrtle’ (Maddocks-Jennings et al., 2005). The gentle aroma of the oil, moreover suggests that it blends sympathetically with almost any other essential oil (Davis, 2005). It may be argued that client preference ought to be considered as previous
unfavourable experience of an aroma may limit therapeutic benefits (Dunning, 2006).

A variety of methods of application may be suitable including by means of steam inhalation or using a vaporiser. Other considered approaches may include massage, bathing, within ointments or compresses. (Battaglia, 2003). These recommendations appear to contrast, however with advice by Lis-Balchin (2006, p.243) who suggests that it ‘cannot be recommended for aromatherapy massage.’ A summary of some suggested methods of applications and suitable blends using manuka is provided in table one.

Table one: suggested applications for manuka essential oil.

<table>
<thead>
<tr>
<th>Type of application</th>
<th>Symptoms</th>
<th>Suggested blend / level of application</th>
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<tbody>
<tr>
<td>Baths</td>
<td>Relieve colds, influenza and other viral infections (for evening use) Relieve muscle stiffness</td>
<td>Lavender (3 drops), manuka (2 drops) and ravensara (1 drop) manuka (4 drops), vetiver (2 drops)</td>
</tr>
<tr>
<td>Massage</td>
<td>To restore energy following a virus condition To help relieve extreme nervous tension</td>
<td>Manuka (4 drops), clove bud (2 drops), cardomon (4 drops, carrier oil (20ml) Manuka (2 drops), (rose geranium (4 drops), bergamot (4 drops), carrier oil (20ml)</td>
</tr>
<tr>
<td>Skincare</td>
<td>To treat very oily skin conditions and acne; use daily as a skin toner</td>
<td>orange flower water (200mls), witch hazel (100mls), grapefruit oil (3 drops), geranium oil (3 drops), manuka oil (2 drops)</td>
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</table>

(Davis, 2005, Harding, 2008)

Research

Available facts on manuka oil seem sparse within published literature with information more readily available from aromatherapy suppliers’ internet sites (Lis-Balchin, 2006). Careful evaluation of online data should be applied as currently there appears to be little censorship of material (Cottrell, 2003). Chemical constituents of manuka oil seem to vary according to the area of origin with several chemotypes identified; each with their respective properties. Practitioners should, therefore be aware of all variations and consider properties other than the
antimicrobial potential (Maddocks-Jennings et al., 2005). It may be advisable, therefore to identify this information prior to selecting oil from a supplier to ensure that the appropriate choice is made (Martin, 2007). Chemical composition of essential oils alone however may not fully reflect their potential benefits (Bowles, 2003). It may be the synergistic combination of these components which dictate the final properties of an oil (Clarke, 2002). Therapeutic value and efficacy of oils may also change with age and degradation although some may actually improve (Bowles, 2003). It is vital, therefore that safe practice procedures are followed such as satisfying legal requirements of the Control of Substances Hazardous to Health Act (Beckmann & Le Quense, 2005).

Manuka oil may also present an effective microbial alternative with a subtle fragrance which the client may prefer to other myrtaceae members (Davis, 2005). Past association with aroma however provokes positive or negative responses and may potentially limit efficacy of any oil. The practitioner may therefore be advised to seek client approval of the odour before use. A further deliberation may be whether it is actually ethically acceptable to use oil with an aroma of which the client does not approve (Buckle, 2007). Another consideration may be that as evidence into the toxicology of manuka appears inconclusive, caution may be recommended when using this oil. Precautions such as reviewing dilution ratios, for example, or carrying out a patch test before use may be appropriate (Clarke, 2008). There also appears to be supporting research that suggests that it may not be suitable as a ‘general aromatherapy oil’ (Lis-Balchin (2006, p.240).

Conclusion

To conclude it may be suggested that the properties of manuka oil may vary depending on the chemotype selected. Oil which contains high levels of triketones and found in the East Cape area of North Island in New Zealand appears to possess the greatest antimicrobial potential. Other chemotypes however are thought to reveal anti-inflammatory and analgesic tendencies. It may be argued, therefore, that it is important for the practitioner to be aware of these various chemotypes when selecting oil. Manuka may also be considered as an analgesic, expectorant and suitable to treat psychological concerns such as depression. The subtle aroma may also prove versatile for blending with other oils using a variety of applications. Some clients however may not approve of the odour so it may be advisable for the practitioner to seek endorsement prior to use. It could be argued that it is generally considered non-irritant, non-sensitising and non-toxic. Some concern regarding the possibility of toxicology and potential for skin irritation may be suggested so a low dilution or conducting a skin patch test before use may be advisable. As yet, commercial development of manuka oil is relatively underdeveloped in New Zealand with the majority of distillation from uncultivated plants. It may be argued that this oil may provide opportunities for further development within the field of aromatherapy however the need for additional research is apparent.

References


**Pictures: ISTOCKPHOTO**