



# manuka

by Salvatore Battaglia

*Leptospermum scoparium* J.R. Forster & G. Forster

## Synonyms

Manex, New Zealand tea tree

## Family

Myrtaceae

## Botany and origins

Manuka is a small tree which is a native of New Zealand. In favourable open conditions, it is a fast growing, conical-shaped bush that reaches about 4m high.<sup>1</sup>

Most manuka is harvested from wild plants as very little commercial cultivation is yet carried out. Re-growth is rapid after harvesting, therefore, there are no risks of damage to the wild plants. However, it has been suggested that in future, plantations may specialise in a particular chemotype.<sup>2</sup>

## Method of extraction

Manuka oil is steam-distilled from the leaves and twigs of *L. scoparium*.

## Characteristics

Manuka oil is a clear yellow liquid with a distinctive spicy, herbaceous and fresh aroma.

## Chemical composition

An analysis of 16 commercial samples of manuka oil revealed 100 constituents, of which 51 were identified and made up about 95% of the content. The typical chemical composition of the oil is triketones (approximately 20%), sesquiterpene hydrocarbons (60 - 70%) and monoterpene hydrocarbons (approximately 5%).<sup>1</sup>

A detailed field study of manuka oil in New Zealand confirmed the presence of three chemotypes:

- Monoterpene rich oil from the Northlands and the West Coast
- Triketones rich oil from the East Cape and Marlborough
- Sesquiterpene rich oil throughout the rest of New Zealand.<sup>1</sup>

*L. scoparium* populations from Australia in Victoria and Tasmania

had different chemical profiles from the New Zealand populations. In particular, the triketones were not present in the Australian oils.<sup>3</sup>

The ratio of chemical components in the three regional types of manuka oil.<sup>1</sup>

Variances in the composition have been noted depending on the age of the plant. For example, the percentage of monoterpenes ( $\alpha$ -pinene,  $\beta$ -pinene and myrcene) increases from less than 1% in young trees to between 17% and 34% in trees that are three years older.<sup>2</sup>

There are also seasonal variations. The pinene levels are highest in spring and summer when the foliage is growing.<sup>2</sup>

The chemical composition of manuka oil obtained from a distinct chemotype found in the East Cape area of the North Island of New

Oil Component	Location		
	North	East Cape	Southern
Monoterpenes	40%	3%	12%
Sesquiterpenes	42%	54%	65%
Triketones	1%	33%	2%

Zealand was reported as follows:

$\alpha$ -thujene (0.03%),  $\alpha$ -pinene (1.31%),  $\beta$ -pinene (0.12%), myrcene (0.24%), p-cymene (0.16%), 1,8-cineole (0.22%), limonene (0.1%), terpinen-4-ol (0.04%),  $\alpha$ -terpineol (0.09%),  $\alpha$ -cubebene (3.95%),  $\alpha$ -copaene (5.86%),  $\beta$ -elemene (0.55%),  $\alpha$ -gurjunene (1.02%),  $\beta$ -caryophyllene (2.63%), aromadendrene (2.09%), cadina-3,5-diene (4.88%),  $\delta$ -amorphene (3.81%),  $\beta$ -selinene (3.67%),  $\alpha$ -selinene + viridiflorene (4.35%), flavesone (4.91%), cadina-1,4-diene (5.94%), isoleptospermone (4.62%), leptospermone (15.54%).<sup>4</sup>

## Adulteration

Lis-Balchin states that the admixing of different trees and shrubs would give the oil variable chemical composition, which may compromise the therapeutic efficacy of the oil.<sup>5</sup>

## History

Maori folklore attributes the kanuka as being the 'male' tree and manuka the 'female'.<sup>2</sup> Other traditional uses include infusions for urinary and intestinal complaints and as a febrifuge, sucking the gum for coughs, vapour inhalations for colds and poultices for back pain and skin conditions, inflamed breasts, burns and scalds.<sup>2</sup>

The leaves of manuka were also used as topical applications for wounds, cuts, sores and skin diseases. Topical use of the various parts of manuka was common among early Maori and settlers.<sup>6</sup>

## Traditional medicine

The therapeutic properties of manuka honey are well established. It is used for slow healing ulcers and wound healing.<sup>7</sup> The antibacterial activity of manuka

honey was shown to be active against *Staphylococcus aureus* and *Helicobacter pylori*.<sup>5</sup>

The antibacterial activity of many honey products are associated with hydrogen peroxide, however, those of manuka honey are derived through other mechanisms. The antibacterial activity of manuka honey is now standardised in terms of phenol concentration equivalent, which is expressed as the unique manuka factor value (UMF).<sup>7</sup>

The UMF rating is set by the Active Manuka Honey Association (AMHA). Maggie Tisserand explains that the manuka honey is challenged with *Staphylococcus aureus* and the results are compared with the same test using phenol, a carbolic acid once used as a disinfectant. The number that follows the trademark UMF is equal to the concentration of phenol used. Therefore, a manuka honey with a UMF 10 rating is equal to a 10% dilution of phenol, whereas a UMF 20 rating is equivalent to a 20% dilution of phenol, making it twice as strong. She states that the high potency manuka honeys are often used for the treatment of MRSA- infected wounds. Honey that has a UMF 5 is not considered effective enough to treat MRSA.<sup>7</sup>

## Pharmacology and clinical studies

Many pharmacological studies involving manuka essential oil

have been published. A systemic review of these studies will not be attempted. Rather, I have chosen a selection of studies that support the traditional and clinical uses.

## Antimicrobial activity

The comparative antimicrobial activity showed greater differences between different samples of manuka and kanuka than that of tea tree. The antifungal activity of kanuka was inversely proportional to its strong antibacterial activity, whilst manuka displayed a stronger antifungal effect, though not as potent as tea tree.<sup>8</sup>

The antimicrobial activity of standard tea tree compared with manuka obtained from the East Cape region of New Zealand is reported in the table below.<sup>8</sup>

A comparative study examining the antibacterial activity of tea tree, kanuka, manuka and eucalyptus oils reported that tea tree oil had the highest antibacterial activity with minimum inhibitory concentration (MIC) values of 0.25%. However, it was reported that manuka oil exhibited a higher activity than tea tree oil against gram-positive bacteria with MIC values of 0.12%. Both tea tree oil and manuka oil demonstrated a very good antimicrobial efficacy against various antibiotic-resistant *Staphylococcus* species. *Pseudomonas aeruginosa* was resistant to all the essential oils tested, even at high concentrations of 4%.<sup>9</sup>

Oil Sample	Zone of inhibition (mm)	
	<i>Candida albicans</i>	<i>Staphylococcus aureus</i>
Tea Tree	9.0	8.5
Aust. Lavender	8.0	7.0
NZ Manuka	2.0	8.0
Lemongrass	30.0	38.0
Eucalyptus	2.0	2.5

Comparative antimicrobial activity for some essential oils

An in vitro study confirmed that kanuka and manuka oils significantly inhibited a range of fungi and bacteria. The fungicidal properties of the oil were confirmed with a MIC ranging from 0.78% to 3.13%. The oils also displayed excellent bactericidal activity with 100% inhibition of the examined bacteria.<sup>10</sup>

A comparative study examined the use of a range of essential oils against plaque-causing bacteria and the production of plaque. Manuka oil was found to be the most effective inhibiting all the bacteria with MICs of 0.25% and 0.13% for *Streptococci* and 0.03% for the gram-negative bacteria.<sup>11</sup>

The adhesive ability of the bacteria is a significant pathogenic factor in the formation of plaque. The study confirmed the inhibitory effect of the tea tree and manuka essential oils on the adhesion of *Porphyromonas gingivalis* and *Streptococcus mutans*. It was concluded that manuka and tea tree oils exhibit growth-inhibiting and bactericidal effects on periodontopathic and cariogenic bacteria and also anti-adhesion effects on some species. The authors state that the oils are promising antibacterial agents for oral care at concentrations of 0.25 or lower.<sup>11</sup>

Lis-Balchin suggests that higher levels of flavescene and leptospermone give the oil a higher level of antimicrobial activity, particularly against gram-positive organisms such as *Staphylococcus* and *Streptococcus*.<sup>5</sup>

### **Antiphotaging activity**

An in vivo study investigated manuka oil for its effects against photaging in UV-B irradiated hairless mice. The study found

that an application of 10% manuka oil significantly reduced the average length and depth of wrinkles. This was correlated with the inhibition of loss of collagen fiber content and epidermal hyperplasia. It was also reported that manuka oil could suppress UV-B induced skin inflammation by inhibiting the production of inflammatory cytokines. It was suggested that this study provides evidence that manuka oil possess antiphotaging activity that is associated with its inhibitory activity against skin inflammation induced by UV irradiation.<sup>12</sup>

### **Antispasmodic activity**

Studies using field-stimulated guinea pig ileum have confirmed that both manuka and kanuka oils induced a spasmolytic effect, however, kanuka produced an initial contraction. It was reported that there was some evidence that manuka oil acts through cAMP, whereas the mode of action of kanuka was not yet determined.<sup>13</sup>

### **Antiviral activity**

An in vitro study found that *Herpes simplex virus type 1* (HSV-1) and *Herpes simplex virus type 2* (HSV-2) were significantly inhibited when the viruses were pretreated with manuka oil, 1 hour prior to cell infection. After virus penetration into the host cells only replication of HSV-1 particle was significantly inhibited to about 41% by manuka oil. Flavescene and leptospermone, two  $\beta$ -triketones found in manuka oil, inhibited the virulence of HSV-1 in the same manner as the essential oil itself.<sup>14</sup>

Kanuka and manuka were more cytotoxic with a maximum noncytotoxic concentration of 0.001% compared with a maximum noncytotoxic concentration of 0.006% for

cajeput and clove oils. Manuka oil also reported the highest virucidal activity against HSV-1 and drug-resistant HSV-1 isolates.<sup>15</sup>

### **Mucositis activity**

A study examined the effects of an essential oil mouthwash on radiation-induced mucositis of the oropharyngeal area during treatment for head and neck cancers. Patients participated in the randomised, placebo-controlled study, involving the use of a gargle containing 2 drops of a 1:1 mix of manuka and kanuka in water reported delayed onset of mucositis and reduced pain and oral symptoms relative to the placebo (gargling with water). The study confirmed that manuka and kanuka oils used in a gargle can provide relief on the development of radiation-induced mucositis.<sup>16</sup>

### **Properties**

Analgesic, antibacterial, antifungal, anti-inflammatory, deodorant, expectorant, immune stimulant, insecticide, sedative<sup>5,6,17</sup>

### **Aromatherapy Uses**

Given the presence of several chemotypes, it would appear that the manuka oils with a higher sesquiterpene and  $\beta$ -triketone content would be most suitable for use in aromatherapy.

### **Integumentary system**

It has been suggested that the sesquiterpenes found in manuka oil are responsible for manuka's ability to reduce skin irritation and promote wound healing.<sup>17</sup> Manuka oil is recommended for treating ringworm, insect bites, athlete's foot, acne, skin eruptions, stubborn ulcers and wounds, cuts and abrasions.<sup>18</sup>

### **Musculoskeletal system**

Manuka oil has a good analgesic

effect and is recommended for the relief of muscular aches and pain.<sup>18</sup>

### Respiratory system

Manuka oil is beneficial for all types of respiratory tract infections and can be used to relieve coughs, cold and flu.<sup>7</sup>

### Energetics

Manuka oil is recommended for dispersing *wind cold* conditions. *Wind cold* is characterised as the onset of respiratory tract infections with aches and pains, chills and a dislike for cold. Manuka oil tonifies the *Qi* and strengthens the *Shen*. Whenever we experience *Qi* deficiency and our *Shen* is weak, we experience fatigue, lethargy, poor focus and depression.

### Subtle

Von Braunschweig states that manuka oil is a protective oil similar to myrrh and cedarwood. She says that old psychic scars get smoothed and that the sesquiterpenes stabilise and protect the nervous system and balances the sympathetic and parasympathetic nerves. Manuka's vitalising scent is well suited to gentle souls that express themselves through sensitive skin or frequent digestive upsets.<sup>17</sup>

## Blending

### Aromatherapy

For the relief of pain and inflammation in conditions such as rheumatoid arthritis, consider blending manuka oil with essential oils such as German chamomile, everlasting, fragonia, kunzea or lavender.

For the relief of muscular aches and pains consider blending manuka oil with essential oils such as black pepper, cajeput, ginger, kunzea, spike lavender, rosemary or pine.

For treating fungal skin infections consider blending manuka oil with patchouli or tea tree oil.

For the relief of the symptoms associated with colds and flu, consider blending manuka oil with essential oils such as cajeput, 1,8-cineole-rich eucalypts, fragonia, ginger, lemon, lemon myrtle, pine, tea tree or thyme.

For the relief of stress, nervous tension and anxiety, consider blending manuka oil with essential oils such as bergamot, Atlas cedarwood, geranium, lavender, mandarin, neroli, sweet orange or sandalwood.

## Perfumery

Manuka oil is not commonly used in perfumery, however, it would blend well with essential oils such as bay laurel, bergamot, black pepper, Atlas cedarwood, cinnamon bark, clove bud, elemi, ginger, lavender, nutmeg, sandalwood, vetiver and ylang ylang.

### How to use

#### Bath

Full body bath, foot bath

#### Topical

Compress, massage, ointment, skin care

#### Inhalation

Direct inhalation, diffuser, oil vaporiser

### Safety

All the studies to date indicate that manuka oil is non-toxic, non-irritating and non-sensitising.

### Contraindications

No contraindications known.

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