

Orange

By Salvatore Battaglia



BOTANICAL NAME

Sweet orange

Citrus sinensis L. Osbeck

Bitter orange

Citrus aurantium

FAMILY

Rutaceae

Orange oil is one of the first essential oils I introduce to people who are not familiar with aromatherapy. I have never had a negative response to the delightful, sweet, cheerful aroma of orange oil. It radiates so much positivity, joy and optimism.

BOTANY AND ORIGINS

Sweet orange (*Citrus sinensis*) and bitter orange (*Citrus aurantium*) are considered hybrids of the pummelo with some mandarin.¹

The sweet oranges all belong to the species *Citrus sinensis*, being the main citrus tree grown in most of the citrus producing countries. Four groups exist within this species:

1. **Navel oranges:** The navel orange is named because of its shape; segmented skin looks like a human navel. The navel orange originated as a single mutation in a Brazilian monastery in 1920. Every single navel orange originates from it because they do not produce seeds and propagation is by graft cuttings.²
2. **Common oranges:** Also known as white orange. This includes some of the older varieties such as *Jaffa* from Israel, *Cadenera* and *Valencia* from Spain.³
3. **Blood oranges:** Characterised by the presence of anthocyanin in the fruit; giving an intense red colour to the juice, the pulp or the rind. Cultivars of this group are *Moro*, *Taracco*, *Sanguinelli* and *Doble fina*.³
4. **Acidless oranges:** Also known as sugary oranges because of the low acidity of the juice. Two cultivars are *Sucrena* and *Succari*.³

Bitter oranges belong to the species *C. aurantium*. They are mainly grown for preparation of marmalades. They usually have a high number of seeds and the rind of the fruit has a deeper orange colour than most of the sweeter orange varieties. The following groups exist within this species:³

1. Standard or *Seville* sour orange is the main variety grown for the production of fruit.
2. *Bouquet de Fleurs* is grown as an ornamental plant and for the production of neroli oil.
3. *Granito* or *Abers* is a willow-leaved sour orange, which is used for extraction of essential oil from the leaves.
4. *Chinotto* used as an ornamental, the botanical name is *C. myrtifolia*.
5. Bergamot from *C. bergamia*.

METHOD OF EXTRACTION

Orange essential oil is cold-pressed from the ripe or almost ripe outer peel of the orange fruit. Machine expression usually yields oils with high evaporation residue while the various hand-expression methods lead to oils with low residue. Arcander states the amount of residue in an orange oil has no direct relation to the quality of the oil. It may only affect the tenacity but not the odour or the flavour. The higher content of oxygenated compounds in an orange oil is probably due to the fact that the oil has been expressed from fruits that are not fully ripe.⁴

Orange oil is produced in much larger volumes than any other essential oil. Most of this production is used in foods and beverages.⁵

CHARACTERISTICS

Arctander describes expressed sweet orange oil is a yellow-orange to dark orange-coloured mobile liquid with a sweet, fresh citrus odour, distinctly reminiscent of the odour from a scratched orange peel. Machine-expressed sweet orange oils are generally lighter in colour, whereas hand-pressed oils are generally darker.⁴

Arctander describes bitter orange oil as a mobile liquid of a dark yellow to olive-yellow or pale brownish yellow colour. The odour is fresh with a bitter dry rich and lasting sweet note. There are underlying notes reminiscent of bergamot, grapefruit and sweet orange.⁴

Weiss describes the aroma of bitter orange essential oils as having a distinctive, fresh, biting note with rich sweet floral undertones.⁶

CHEMICAL COMPOSITION

The main constituents of the sweet orange oils are monoterpene hydrocarbon (mostly *d*-limonene) 95%; aldehydes (mostly octanal and decanal) 1.5% and alcohols below 1% (mostly linalool); esters below 0.5% (mostly octyl and neryl acetates) and the non-volatile compounds around 1%.⁶

The chemical composition of sweet orange was reported as follows:

α -pinene (0.54%), myrcene (2.08%), linalool (0.25%), limonene (95.37%), neral (0.06%), citronellal (0.10%), decanal (0.06%), geranial (0.12%).⁶

The major components of bitter orange essential oil are the monoterpene hydrocarbon (mostly *d*-limonene 45-95%, α -pinene 0.4-1.3%, β -pinene 0.3-6%, myrcene 1.8-2.2%); monoterpene alcohols (mostly linalool 12-14%, nerol 0.3-0.6%); esters (mostly linalyl acetate 9-11%), aldehydes (mostly citronellal 1-2%, octanal 1.25-2.5%, nonanal 0.1-0.4%). Weiss explain the wide variation of individual constituents of cold-pressed bitter orange oils from various origins has frequently been noted.⁶

The composition of Perfect Potion's sweet orange essential oil from Brazil is as follows:⁷

α -pinene (0.5%), sabinene (0.2%), β -pinene (0.02%), myrcene (1.85%), *n*-octanal (0.24%), linalool (0.34%), limonene (95.93%), α -terpineol (0.04%), neral (0.05%), citronellal (0.05%), *n*-decanal (0.19%), geranial (0.09%), valencene (0.01%).

The composition of Perfect Potion's blood orange essential oil from Sicily is as follows:⁸

α -pinene (0.6%), sabinene (0.6%), myrcene (1.8%), *n*-octanal (0.2%), *p*-cymene (0.1%), linalool (0.3%), limonene (94.8%), cis-limonene oxide (0.1%), α -terpineol (0.1%), *n*-decanal (0.2%).

The composition of Perfect Potion's bitter orange essential oil from Brazil is as follows:⁹

α -pinene (0.6%), sabinene (0.1%), myrcene (1.6%), *n*-octanal (<0.1%), *p*-cymene (0.1%), linalool (0.1%), limonene (93.3%), cis-limonene oxide (0.8%), α -terpineol (0.3%), *n*-decanal (0.1%).

Adulteration

Expressed sweet orange oil is frequently adulterated with *d*-limonene – isolated or synthetic – or with other citrus oils or with a mixture of monoterpenes or distilled oils from the citrus fruit juice manufacturers.⁴

History

The term *Hesperidium* is the scientific name of the citrus fruit, containing juicy segments and covered by a peel rich in aromatic oil. The term derives from the myth of Heracles, who is obliged to capture the 'golden fruit' from the garden of the Hesperides, the three daughters of Hesperis: Aretusa, Hyperetusa and Aegle. The legend is told in two Greek temples; 'The Treasure of the Athenians' at Delphi, and the Temple of Zeus at Olympia. The story is also recounted in a mosaic at the Roman 'Villa del Casale' in Piazza Armerina (Sicily).¹

When the Crusaders invaded Jerusalem in 1099, a crusader named Jacques de Vitry wrote a book on the history of Jerusalem in Latin. In this book, he describes the citrus species growing in Palestine. He refers to pummelo, lemon and bitter orange. The bitter orange fruit were first referred to as *orenges*.¹

Calabrese explains that sweet oranges were first mentioned in a book by Hugo Falcando, who lived in Sicily from 1154 to 1169. His book on the siege of Palermo states that orange fruits were full of a sweet juice.¹

By the beginning of the fourteenth century, historical documents report that four citrus fruits were known: citron, sour orange, lemon and lime. By the Middle Ages, these four citrus fruits were widely cultivated in Italy and Spain.¹

The diaries of Vasco De Gama recount that the Portuguese knew of the sweet orange in Africa, India and China.¹

Weiss states that the orange tree is native to the region between the Himalayas and southwestern China. The orange tree was introduced to the Americas by Columbus and was primarily grown in the West Indies and Florida. Most of the essential oil produced today comes from Israel, Brazil, North America and Australia.⁶

Traditional medicine

The therapeutic properties of orange were first recognised in ancient China, where the dried peel had been used for centuries to treat coughs, colds and anorexia.¹⁰

Food, perfumery and flavouring

The orange oils are extensively used in food flavouring.¹⁰ *d*-Limonene serves as an important starting material for the synthesis of *l*-carvone, an important source of synthetic spearmint flavour. The price of *l*-carvone from sweet orange oil is usually two-thirds the cost of spearmint.⁶

Other uses

A number of other products are derived from sweet orange oil. For example, the carotenoids which are extracted from the orange oil processing waste are used to create natural colours for use in food and drinks.⁶

The orange wax, another by-product of orange oil processing, is used in perfumery. *d*-Limonene which is redistilled from orange oil is used in the plastics industry, pressure sensitive adhesives and quick drying inks. Weiss states orange oil is so important to the plastics industry that a very large portion of the mid-season orange oil from the USA is solely produced for the production of *d*-limonene.⁶

PHARMACOLOGY AND CLINICAL STUDIES

Alzheimer's disease

The role of essential oils for the management of Alzheimer's disease (AD) has been extensively researched. One study used a range of psychometric tools to measure the cognitive function and concentration of AD patients exposed to a blend of lavender, sweet orange, lemon and rosemary. Sweet orange and lavender oils activate the parasympathetic nervous system, while rosemary and lemon are known to relieve depression and improve concentration. The study concluded that aromatherapy can improve cognitive function in AD patients.¹¹

Another study found that aromatherapy does not reduce combative, resistive behaviours in individuals with dementia. However, it was stated that research with a larger sample in future studies may provide other results.¹²

Antidepressant activity

Twenty depressed male inpatients receiving antidepressant medication were divided into two groups. One group were given antidepressants alone and the other group were exposed to the fragrance of a blend of lemon, sweet orange and bergamot essential oils, while continuously having their medication reduced weekly until their depression remitted, usually within 4 to 11 weeks. The Hamilton Rating Scale for Depression and Self-Rating Depression Scale were used to evaluate psychiatric states. The researchers confirmed that both scores improved in both groups.¹³

By the end of 11 weeks, 9 of the 12 patients in the aromatherapy group had reduced their antidepressant drug intake to zero, whilst the other three had reduced their dosage by 50-75%. On the other hand, all subjects in the antidepressant group still needed their usual doses of antidepressant at remission.¹³

Urinary cortisol and dopamine levels were significantly high in both groups before treatment and both were reduced by treatment. However, the levels were significantly lower in the aromatherapy group when compared to the antidepressant group after treatment. The aromatherapy group also had higher values of natural killer cell activity return to almost the normal range. It was suggested that the results support the concept that depression may be based on homeostatic dysregulation and that the citrus blend may improve the homeostatic balance

more effectively than treatment with antidepressants. However, the researchers stated that caution was recommended in interpreting the results due to the small size of the study.¹³

Antifungal activity

The antifungal activity of sweet orange oil was evaluated using the agar dilution method. The results of the in vitro study confirmed that sweet orange oil and other citrus oils had significant antifungal activity.¹⁴

Another in vitro study confirmed that citrus oils – sweet orange, mandarin and grapefruit – displayed strong antifungal activity against a range of moulds commonly associated with food spoilage. Sweet orange oil was the most effective against *Aspergillus niger*. Mandarin oil was most effective at reducing the growth of *Aspergillus flavus* and grapefruit was the best inhibitor of the moulds *Penicillium chrysogenum* and *P. verrucosum*.¹⁵

Antimicrobial activity

Sweet orange oil has been reported to exhibit excellent antimicrobial properties.^{16,17,18}

Essential oil vapours of orange and bergamot, blended 1:1 ratio, were found to be effective at removing methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus sp.* (VRE) from a stainless-steel bench surface and reducing the formation of biofilm. It was suggested that citrus vapours have the potential for application in a clinical environment as a secondary disinfectant to reduce surface contamination by VRE and MRSA.¹⁹

The antimicrobial activity of bitter orange essential oil was reported by inhibiting the growth of *Listeria innocua*, *Salmonella enterica*, *Escherichia coli*, *Pseudomonas fluorescens* and *Aeromonas hydrophilia*. It was also reported to be effective in controlling multi-species biofilms.²⁰

Anxiolytic activity

A plethora of clinical studies were found to highlight the benefits of orange oil for persons in patients suffering from anxiety.

Seventy-two patients took part in a study to investigate the efficacy of the ambient odour of sweet orange oil in a dental office to reduce anxiety. Twice a day, morning and noon, 0.25ml of sweet orange oil was added to a hidden electrical diffuser in a dental waiting room. No orange oil was diffused for the control group. The results of the study demonstrated that the exposure to ambient odours of sweet orange oil had a relaxation effect when compared to the non-odour control group. It was also found that women who were exposed to the sweet orange odour had a lower level of anxiety and a more positive mood and a higher level of calmness compared to the men in the test group. It was reported that the effect of the odour played a minor role for men, possibly due to their lesser olfactory sensitivity, however, it was stated that the experimental design did not take into account the different baseline anxieties for different dental procedures and more females may have entered the room when the odour was at its maximum.²¹

Forty healthy male volunteers were submitted to an anxiogenic situation. Psychologic parameters such as state-anxiety, subjective tension, sedation, and physiologic parameters such as heart rate and gastrocnemius electromyogram were evaluated

before inhalation of sweet orange, during inhalation and after the anxiogenic situation. The results of the study confirmed an anxiolytic activity of sweet orange oil.²²

A clinical trial involving 200 patients between the ages of 18 and 77 years (half men, half women) revealed that compared to the control group, both ambient odours of sweet orange and lavender reduced anxiety and improved mood in patients waiting for dental treatment. It was reported that odours are capable of altering emotional states and may be helpful in reducing anxiety in dental patients.²³

Autonomic nervous system activity

Inhalation of sweet orange oil increased the activity of the parasympathetic nervous system by 12% and decreased sympathetic nervous system activity by 16%. The study concluded that changes in mood caused by inhalation of essential oils could be detected using the light reflex of the pupil.²⁴

Carcinogenesis activity

Oral doses of sweet orange oil and lemon oil inhibited tumour formation and growth in a study involving chemically induced tumours in mice. The researchers stated that the two citrus oils inhibited the tumour formation due to their high *d*-limonene content.²⁵

The results of an in vitro study provided conclusive evidence of the apoptotic and anti-angiogenesis potential of sweet orange oil in colon cancer cells.²⁶

A phase I clinical trial assessed the toxicity and pharmacokinetics of limonene in patients with advanced cancer. It was concluded that *d*-limonene is well tolerated in cancer patients at doses that may have clinical activity.²⁷

Relaxant activity

A blind, randomised clinical trial involving 120 children undergoing dental extraction under sevoflurane anaesthesia investigated the effects of sweet orange oil on induction and in recovery. It was found that the children exposed to sweet orange oil were more relaxed and cooperative during induction.²⁸

A study examined the anxiolytic, sedative and depressant effects of *Citrus aurantium* and *Citrus sinensis* essential oil inhalation on mice. Behavioural tests confirmed that inhalation of both orange essential oils presented an anxiolytic-like and sedative effect.²⁹

Thirty-nine healthy volunteers participated in a study to investigate the effect of sweet orange oil on human autonomic parameters and emotional responses in healthy subjects after transdermal absorption. In order to exclude olfactory stimulation, the inhalation of the scent of the oils was prevented by breathing masks. Four autonomic parameters – blood pressure, breathing rate, pulse rate and skin temperature were recorded. Emotional responses were assessed by means of rates scales. Compared with the placebo, the results found that sweet orange oil caused significant decrease in breathing rate and pulse rate, which indicated a decrease of autonomic arousal. At an emotional level, the sweet orange group rated themselves more cheerful and more vigorous than subjects in the control group.³⁰

ACTIONS

Antidepressant, antiseptic, antispasmodic, carminative, cholagogue, digestive, lymphatic stimulant, sedative, stomachic.^{31,32,33}

A comprehensive survey of *in vitro* and *in vivo* studies examining the pharmacological activity of both *C. aurantium* and *C. sinensis* reported the following pharmacological actions: gastrointestinal stimulant and general tonic; treatment of central nervous system disorders such as anxiety, insomnia and hysteria; relieve stomach cramps and constipation; anti-inflammatory; sedative; anxiolytic and antidiabetic properties.³⁴

AROMATHERAPY USES

Review of traditional uses and clinical data also support the role of sweet orange oil for its gastroprotective activity and as an effective antimicrobial agent. Many studies also confirm that citrus aromas are uplifting and can be helpful to alleviate stress, anxiety and depression. While most aromatherapy books refer to sweet orange, the properties of bitter orange and blood orange essential oils are similar to that of sweet orange.

Digestive system

Sweet orange oil helps to settle the digestive system; it prevents and eases spasms and relieves cramps. It is excellent for treating constipation, flatulence and irritable bowel.^{31,33} It appears to have a normalising effect on the peristaltic action of the intestines and is recommended for constipation or diarrhoea.³⁵

Sweet orange oil is known as a hepatic and cholagogue and may be used to improve the flow of bile and improve the metabolism of fats.³³

Lymphatic system

Sweet orange oil is known to stimulate lymph fluids, which assists in treating swollen tissue.^{31,32,36} This makes it useful in blends for the treatment of cellulite.

Nervous system

Davis states that the properties of sweet orange oil overlap with those of neroli. It is considered to have a mildly sedative and antidepressant effect.³⁵

Bitter orange essential oil can be used as a mild sedative and hypnotic, and for its calming and soothing effects. It has been used to enhance sleeping time and promote a sense of wellbeing. It has demonstrated anxiolytic activity by regulating serotonin receptors in rats and its antidepressant effects through the monoaminergic system in mice.²⁰

An overview of clinical trials conducted with *Citrus aurantium* or *Citrus sinensis* on people with anxiety showed that inhalation or oral administration of the essential oils can exert beneficial effects on anxiety.³⁷

It is recommended in the treatment of anxiety, nervousness and insomnia and may be used with similarly relaxing oils such as bergamot, geranium, lavender, neroli and sandalwood.

Psychological

Fischer-Rizzi describes the influence of sweet orange on the mood as positive and joyful. Orange oil harmonises feelings and awakens creativity. The oil is ideal to use whenever we are taking everything too seriously and have forgotten how to laugh, or whenever we feel tense, nervous or withdrawn. It helps to reduce our fears of the unknown and helps us greet new adventures.²⁸

Skin care

Sweet orange oil is beneficial for soothing dry, irritated or acne-prone skin. It is considered to have regenerative properties and can be used for treating aging skin and rough or calloused skin.²⁸

ENERGETICS

According to the principles of traditional Chinese medicine (TCM), sweet orange oil helps to circulate stagnant *Qi*, especially when it accumulates in the *Liver* and *Stomach*.³³

In TCM, the main organ responsible for ensuring the smooth flow of *Qi* throughout the body is the *Liver*. Whenever our *Qi* stagnates, we experience tension, frustration moodiness and irritability. The sweet, vibrant, warm aroma of sweet orange helps to alleviate these conditions.³³

According to the principles of the Five Elements, sweet orange oil helps to balance the Wood Element. From an energetic perspective sweet orange assists the *Liver*, the *Yin* organ associated with the Wood Element to ensure the smooth flow of *Qi*. The internal condition associated with the Wood Element is anger. Sweet orange also helps us to be more relaxed whenever we feel frustration, irritability and anger.

PERSONALITY

The refreshing, cheerful and sensual nature of sweet orange gives warmth and joy to all who are around it, both adults and children alike.³⁶

Worwood states that orange personalities are cheerful and optimistic, openhearted, witty, honest and they embrace ideas and suggestions as easily as they embrace people. They have a carefree, friendly smile and joy in their eyes, with faith and understanding which seems to exude from every pore in their body. This is why it is common for people to love being around an orange personality.³⁸

Mojay recommends sweet orange for the person who is hard working, high achiever and is always striving for perfection. He explains that they may find it difficult to delegate and they can become tense and irritable because they 'try too hard'. He says that sweet orange oil will help us to take a more relaxed approach instilling a more positive attitude and encouraging one to be more adaptable and adapt a more easy-going approach to life.³³

According to Myers-Briggs personality types, the orange personality is likely to be an ENFP.

ENFPs are outgoing, lively and spontaneous. They are very enthusiastic and their joy for life can be contagious. They have a rich imagination and active mind. Their thoughts are always

wandering and their mood constantly changing. They can be inspiring and charismatic leaders. They are always involved or in love, with someone or something new. They know how to establish instant rapport and make people feel comfortable. They love emotional intensity and enjoy expressing their feelings. They can be charming and flirtatious. They relate with warmth to many people and can appear overly enthusiastic, positive and optimistic.

SUBTLE

Worwood explains that the scent of sweet orange is bursting with vitality, bringing happiness to the heavy-hearted and to those who seem lost. She explains that the scent of orange is so adaptable, at times it seems so gentle and at other times to gives us the determination required to invigorate our sense of being.³⁹

Keim Loughran & Bull have personified the qualities of sweet orange perfectly:

*People who meet the Dalai Lama often comment on the extraordinary joy that he radiates. His eyes are surrounded by fine laugh lines, his giggle is infectious, and even though he has experienced incredible suffering, his strength, compassion, serenity and faith inspire all who have met him.*⁴⁰

*Sweet orange oil will nourish our soul, helping us to become more confident and loving.*⁴⁰

Zeck recommends using sweet orange oil when you are feeling gloomy and unable to see the light at the end of the tunnel. Sweet orange will help you access a bubbling light-heartedness and radiant inner warmth that will help you loosen up and find your sense of humour. She also recommends using orange if you are taking life too seriously and you need to lighten up.⁴¹

BLENDING TIPS

Aromatherapy

Sweet orange oil is referred to as a blend equaliser. It helps your blend to flow harmoniously and control the intensity of the most active ingredients in your blend.³²

Fischer-Rizzi states blending with orange oil is virtually foolproof as it blends so easily with so many essential oils. She also explains that lemon and orange oil work in harmony together. Lemon represents the masculine or *Yang* energy, providing energy and energising the spirit, while sweet orange oil represents the feminine or *Yin* energy which strengthens the heart and soul, making us feel as though we want to hug the world - such a beautiful and simple combination.³⁶

For the relief of anxiety, irritability, stress and nervous tension, consider blending any of the orange oils with essential oils such as bergamot, frankincense, geranium, lavender, neroli, patchouli, sandalwood or ylang ylang.

To alleviate the symptoms of depression, consider blending any of the orange oils with essential oils such as bergamot, geranium, jasmine absolute, lavender, lemon, neroli, rose absolute or otto, sandalwood or ylang ylang.

To alleviate insomnia, consider blending any of the orange oils with essential oils such as clary sage, lavender, neroli, petitgrain, sandalwood or vetiver.

To alleviate the symptoms of indigestion, consider blending any of the orange oils with essential oils such as black pepper, cardamom, coriander seed, sweet fennel, ginger, spearmint or peppermint.

Perfumery

In perfumery, the orange essential oils are used in eau de colognes, fougère, chypre, aldehydic and fruity based perfumes.⁴

HOW TO USE

Bath

Full body bath, foot bath

Topical

Compress, massage, ointment, skin care

Inhalation

Direct inhalation, diffuser, oil vaporiser

SAFETY

General safety

Sweet orange oil is non-toxic, non-irritating and non-sensitising. The oil is not considered to be phototoxic. However, IFRA recommends that essential oils rich in limonene should only be used when the levels of peroxides are kept to the lowest practical level. This can be achieved by the addition of antioxidants.⁵

Contraindications

No contraindications known.

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