ESSENTIAL OIL MONOGRAPH:

Pink grapefruit

By Salvatore Battaglia

BOTANICAL NAME

Citrus paradisi Macf.

FAMILY

Rutaceae

METHOD OF EXTRACTION

Grapefruit oil is expressed from the peels of the grapefruit.

CHARACTERISTICS

The oil is a mobile, yellowish to greenish yellow or pale orange-yellow oil with a fresh-citrus and sweet odour.[2] The characteristic grapefruit aroma and flavour is reported to be due to nootkatone.[4]

When you are feeling drained, strung out and depressed, grapefruit provides a new zest for life. With its light, fruity aroma it gives wings to feelings of heaviness, uplifts sagging spirits and radiates optimism.

– Robbie Zeck

Robbie Zeck's description of grapefruit from her book *The Blossoming Heart*, perfectly expresses the delightful refreshing quality of grapefruit on our psyche.

BOTANY AND ORIGINS

Citrus paradisi is a hybrid between *C. maxima* (pomelo) and *C. sinensis* (sweet orange). Grapefruit is the only citrus species native to the New World and probably originated in West Indies from a natural cross between introduced parents sometime in the seventeenth century.[1]

The oil is produced in the USA, the West Indies, Brazil, Israel and Nigeria.[2]

Grapefruit is a large, vigorous tree that grows up to 30 m, with a single trunk, many branches, and has a round to blunt conical shape if left unpruned. The fruit is large, up to 15 cm diameter, generally spherical but often compressed laterally, light yellow to orange. The shape and colour of the fruit are dependent on the cultivar.[1]

The difference between the essential oil from the white- and red-fleshed cultivars is that the former generally has a higher aldehyde content and lower evaporative residue than the latter, which also contains a small percentage of linalool.[1]

The major varieties of grapefruit include Pink, Ruby Red, Star Ruby, Thompson, and White Marsh. Different varieties of grapefruit vary in hue from white to red depending on the presence or absence of lycopene.[3]

CHEMICAL COMPOSITION

The chemical composition of grapefruit essential oil was reported as follows:

α-pinene (0.38%), β-pinene (0.02%), sabinene (0.42%), myrcene (1.37%), *d*-limonene (84.0%), citronellal (0.1%), decanol (0.4%), linalool (0.1%), nootkatone (0.1%).[1]

While the major constituent of grapefruit oil is limonene, it is nootkatone that gives grapefruit its characteristic taste. Over 100 compounds have been detected with monoterpenes accounting for about 95%; including *d*-limonene up to 95%.[1]

The percentage of non-volatiles in grapefruit oil is high compared with sweet orange or mandarin oil. Weiss also states that substantial variation exists in the peel oil from cultivars grown in the same region, and from cultivars grown in different regions.[1]

Like most other citrus oils, grapefruit oil is not very stable and deteriorates easily upon exposure to moisture, air and daylight.[2]

ADULTERATION

Grapefruit oil is rarely adulterated; however, there are different qualities of the oil, and it is important to get freshly produced and carefully stored oil. Cold-pressed grapefruit can be adulterated by addition of lower quality steam-distilled grapefruit, grapefruit terpenes and sweet orange and its terpenes.[1,2]

The presence of δ-3-carene in grapefruit oil is an indication that it has been diluted with sweet orange oil products.[5]

HISTORY AND TRADITIONAL USES

History

Arctander states that grapefruit did not exist 400 years ago and it was still a rarity around the beginning of the twentieth century.[2]

Food, perfumery and flavouring

Grapefruit oil is extensively used as a flavour in soft drinks and as a fragrance component in soaps, detergents and personal care products.[4]

Like many citrus fruits, grapefruit is a high source of vitamin C and many other phytonutrients. Data used for labelling purposes indicate that a serving of pink or red grapefruit corresponds to ½ of medium grapefruit (154 g), provides 100% of the daily value (DV) of vitamin C, 35% of the DV of vitamin A, 8% of the DV for fibre, 5% of the DV for potassium, and less than 5% of the DV for folate, calcium, magnesium, vitamin B6, thiamin, and niacin. Citrus fruits such as grapefruit and orange juice were found to have a more favourable nutrient density score compared to other commonly consumed fruits such as apple, grape, pineapple, bananas and peaches.[6]

Along with a high nutritional value, the secondary metabolites of grapefruit including flavonoids, limonoids, and coumarins. These are known to possess several health benefits such as antioxidative, anti-inflammatory, anticancer and neuroprotective.[3]

Grapefruit, particularly the red and pink varieties, provide several phytonutrients such as carotenoids β-carotene and lycopene. Grapefruits also provide naringin, a flavonoid that has been identified as having cardiovascular benefits. In animal studies, naringin has been reported to have neuroinflammatory properties and improve blood lipid profile and bone mineral content.[6]

This same report also stated that individuals who consumed grapefruit generally had a significantly better diet quality compared to non-consumers. The cross-sectional study also reported that grapefruit fruit consumption was associated with lower body weight, waist circumference, BMI, and a higher HDL cholesterol. However, it was noted that grapefruit consumption was not associated with reduced risk of being overweight or obese.[6]

Another study involving mice found that a bioactive compound in grapefruit juice, naringin, reduced blood glucose and improved insulin tolerance, but did not ameliorate weight gain. It was concluded that more studies be conducted to examine the potential use of grapefruit in the management of lifestyle induced diseases as a result of the Western diet.[7]

PHARMACOLOGY AND CLINICAL STUDIES

Antimicrobial activity

An in vitro study demonstrated that that grapefruit essential oil had antifungal activity against a wide range of moulds commonly associated with food spoilage such as *Aspergillus niger*, *Aspergillus flavus*, *Penicillium chrysogenum* and *Penicillium verrucosum*.[8]

Studies indicate that grapefruit oil has considerable antimicrobial activity when tested against *Candida albicans*, *A. niger* and the generally difficult to inhibit *Pseudomonas aeruginosa*.[1]

Grapefruit oil was tested on methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-sensitive *S. aureus* (MSSA) from hospital patients using the disk diffusion method. Grapefruit oil showed higher effectiveness inhibiting MRSA and MSSA growth than vancomycin, which is the currently used standard antibiotic for treatment. The authors concluded that essential oils such as grapefruit could be beneficial towards treating hospital patients with MRSA and MSSA infections in areas where antibiotics are not readily available.[9]

Sympathetic nervous system activity

The olfactory stimulation resulting from the scent of various essential oils has on the sympathetic nervous system dysfunctions associated with lifestyle diseases such as hypertension was investigated. The researchers found that grapefruit oil caused increases in adrenaline and noradrenaline levels, but that the changes were not statistically significant.[10]

Role of furanocoumarins

Although the phytochemicals found in grapefruit are reported to exhibit many bioactive activities, furanocoumarins and flavanones found in grapefruit have been shown to interact with numerous medications causing adverse effects known as the 'grapefruit juice effect.'[3]

Furanocoumarins present in grapefruit can interact with medications by interfering with hepatic and intestinal enzyme cytochrome P450. However, although furanocoumarins can have undesirable effects because of the interactions with certain medications, recent studies suggest that furanocoumarins possess antioxidative, anti-inflammatory and bone health promoting activities.[3]

The furanocoumarins in grapefruit all originate from psoralen. The major grapefruit furanocoumarins include bergaptol, bergapten, bergamottin, epoxybergamottin, and 6',7'-dihydroxybergamottin. An investigation found that 6',7'-dihydroxybergamottin and bergamottin were found in the peel and the flesh of the grapefruit, whereas epoxybergamottin is only found in the grapefruit peel. A study examining a range of citrus oils such as lemon, lime, bergamot, grapefruit, mandarin and bitter orange reported that grapefruit oil had the highest percentage of epoxybergamottin.[3]

It was also reported that the formation of furanocoumarin in grapefruit can be affected by environmental conditions. Higher temperature and age were both identified as factors leading to decreased levels of furanocoumarins in the fruit. However, storage at 9˚C retained more furanocoumarins than those stored at 24˚C.[3]

When it comes to consuming juice, hand squeezed grapefruit juice resulted in higher concentrations of furanocoumarins than commercially processed grapefruit juice.[3]

Anticancer activity

In vitro and in vivo studies have demonstrated that the flavonoids and furanocoumarins found in grapefruit exhibited chemopreventive and antigenotoxic activities. One in vitro study reported that bergamottin significantly suppressed breast cancer proliferation through inhibition of signal transducers and activator of transcription 3 (STAT3) expression.[3]

Another study found that bergamottin not only inhibited cancer cell growth, but also suppressed metastasis – the spread of cancer cells from one tissue to another away from the primary site of malignancy. It was concluded that while grapefruit furanocoumarins exhibit anticancer activities against the growth of different types of cancer cells including skin cancer, breast cancer, leukemia and neuroblastoma cells, the in vivo studies are still limited and the authors concluded that more comprehensive research of the health benefits of furanocoumarins and molecular interactions should be undertaken.[3]

Bone health promoting activity

Studies have reported that bergapten was found to delay osteoporosis activity in both in vitro and in vivo experiments. In vivo animal studies using mice found that oral administration of bergapten for 3 months effectively improved bone mineral density.[3]

PROPERTIES

Antidepressant, antiseptic, depurative, disinfectant, diuretic, hepatoprotective, stimulant[11,12,13]

AROMATHERAPY USES

Detoxification

The actions of grapefruit oil have been described as being similar to that of lemon oil. The *d*-limonene content of grapefruit indicates that grapefruit oil has hepatoprotective properties similar to lemon oil.

Lymphatic system

Grapefruit oil is a lymphatic stimulant and is indicated for cellulite, obesity and water retention.[13,14,15,16]

Psychological

Grapefruit oil has an uplifting and reviving effect, which makes it valuable for treating stress, depression and nervous exhaustion. It is recommended for people who are depressed and lethargic, particularly in winter.[16]

Skin care

Grapefruit oil is beneficial for treating oily skin and acne, and has a tonic effect on the skin and scalp.[16]

ENERGETICS, PSYCHE AND SUBTLE USES

Energetics

Grapefruit oil is *cooling*, cleansing and decongesting. It is beneficial for both an overheated *Liver* and sluggish lymphatic system. Symptoms associated with an overheated *Liver* includes abdominal distension, constipation, nausea and a feeling of general irritability.[14]

Mojay states that grapefruit oil, like all citrus oils, has the ability to smooth the flow of stagnant *Qi* which is associated the Wood Element. This helps to alleviate feelings of frustration, irritability, stress and tension.[14]

According to the principles of Five Elements, grapefruit oil also helps to reduce excess *damp* associated with the Earth Element. *Damp* conditions are often associated with chronic indigestion, abdominal bloating, lethargy, heaviness of the body and water retention.

According to the principles of Ayurveda, grapefruit oil would strengthen *Vata* and *Pitta* and help to reduce *Kapha*. [17]

Personality

The grapefruit personality is described as a warm, happy person who is bursting with energy, loves life and people. They can be great motivators and have so much 'get up and go' without being overbearing. Worwood also describes grapefruit personalities as clear thinkers. They make wonderful healers because of their infectious enthusiast personality because they are naturally attuned to their spiritual selves.[18]

The oil is most suited to people who are tense. Under pressure, they tend to resort to 'comfort eating' as a means of dealing with difficult situations. Mojay explains that such people often have high expectations of everything, however, whenever reality fails to meet their goals and desires, they tend to react with anger, blame and self-criticism. Grapefruit helps to clear psychological heat that results from deep-seated frustration and self-blame.[14]

According to Myers-Briggs personality types, the grapefruit personality is likely to be an ENTP. ENTPs are energetic, enthusiast and confident. Many are nonconformists. They are innovative and have excellent analytical ability and are resourceful in solving problems. They like variety and change. Because they have so many interests, they feel that life is too short. They feel relaxed when they do new things. They enjoy travelling to exotic places. They can be inspirational and rise to leadership positions because of their quick mind. They work best when interacting with many people. They are optimistic, charming and quick-witted. They value their freedom and independence. They seek growth, excitement, and continuous improvement in their relationship. They enjoy debating and they like to have the last say. They may deny emotional pain and keep busy to avoid dealing with their feelings. They can be arrogant, argumentative and insensitive.

Subtle

Worwood states that grapefruit oil awakens the human spirit from a slumber – it is energising and enlivening. She explains that it can reconnect the mind, body and soul.[19]

Zeck recommends using grapefruit oil whenever you are feeling drained, strung out and depressed. She explains that the light fruity aroma of grapefruit lifts the spirits and radiates optimism. Grapefruit helps us focus our thoughts on the positive aspects of our life.[20]

Keim Loughran & Bull state that the scent of grapefruit oil dissolves emotional energy blocks associated with feelings of frustration and self-blame. It also promotes confidence and increases mental clarity and intuition.[21]

BLENDING TIPS

Aromatherapy

- For the relief of stress, anxiety and nervous tension, consider blending grapefruit oil with bergamot, geranium, lavender, lemon, neroli, sweet orange or sandalwood.
- To alleviate fatigue and feelings of apathy consider blending grapefruit oil with basil, black pepper, cardamom, coriander seed, ginger, lemon, lime, sweet orange or rosemary.
- To create a liver detoxification blend, consider blending grapefruit oil with essential oils such as everlasting, sweet fennel, lemon, sweet orange or rosemary.
- For the relief of indigestion consider blending grapefruit oil with essential oils such as black pepper, cardamom, ginger or peppermint.
- To create a lymphatic detoxification blend, consider blending grapefruit oil with essential oils such as cypress, juniper berry or peppermint.

Perfumery

Grapefruit oil is typically not used in perfumery; however, it would add a fresh, uplifting top note to any perfume.

HOW TO USE

Bath

Full body bath, foot bath

Topical

Compress, massage, ointment, skin care

Inhalation

Direct inhalation, diffuser, oil vaporiser

SAFETY

Grapefruit oil is reported to be non-toxic, non-irritating and non-sensitising.[4,11] Old and oxidised grapefruit oil should be avoided.[22]

Tisserand & Young report that IFRA recommends that for application to the skin exposed to the sun, expressed grapefruit oil be limited to a maximum of 4% in products for the skin.[22]

Grapefruit juice has been found to be an inhibitor of intestinal cytochrome P450 3A4 system, which is responsible for the metabolism of many drugs. Grapefruit juice leads to the elevated serum levels of calcium channel antagonist and the statin group of drugs. Increased serum concentration of these drugs is associated with increased frequency of dose dependent adverse effects.[23]

The FDA lists some of drugs that can be problematic with grapefruit juice:[24]

- Some statin drugs to lower cholesterol, such as Zocor (simvastatin) and Lipitor (atorvastatin).
- Procardia and Adalat CC (both nifedipine) used to treat hypertension.
- Sandimmune and Neoral (both cyclosporine), organ-transplant rejection drugs.
- Some corticosteroids such as Entocort EC and Uceris (both budesonide) that are used to treat Crohn's disease and ulcerative colitis.
- Some anti-anxiety drugs, such as buspirone.
- Pacerone and Nexterone (both amiodarone), used to treat abnormal heart rhythms.
- Some antihistamines such as Allegra (fexofenadine).

However, the website also states that grapefruit juice does not affect all the drugs in the above categories and that the severity of the interaction can be different depending on the individual, the drug and the amount of grapefruit juice that is drunk.[24]

Grapefruit juice was reported to reduce the levels of CYP 3A4 in the cells by as much as 47% within four hours of ingestion with the resultant bioavailability being maintained for as long as 24 hours, by which time 30% of its effect is still detectable.[23]

The adverse effects of statins can range from mild discomfort (myalgia) to the more serious rhabdomyolysis which requires hospitalisation and in extremely rare cases causes death. Statins can also increase the risk of hyperglycemia; however, the cardiovascular benefits of statins out weight this small increased risk.[25]

Studies reveal that bergamottin and 6',7'-dihydroxybergamottin, which are highly concentrated in fresh grapefruit juice are the main agents responsible for inhibiting the activity of CYP3A4 in the intestines which in turn inhibits pre-systemic degradation of statins and hence increases the statins systemic bioavailability. Lovastatin, simvastatin, and atorvastatin are all metabolised by CYP3A4, while statins such as Fluvastatin and rosuvastatin are metabolised by CYP2C9 and pravastatin is metabolised enzymatically in the liver.[25]

Lee et al. explain that this is why grapefruit interacts with atorvastatin, simvastatin, and lovastatin, but not with fluvastatin, rosuvastatin, or pravastatin. They explain the perception that grapefruit juice is contraindicated when taking a statin is misleading and is based on pharmacokinetic studies that use unusually large amounts of grapefruit juice. They state that grapefruit juice is being used to enhance the therapeutic benefit of drugs is already recognised in some cancer treatments. They conclude that the interaction between grapefruit juice and certain statins leads to the effective dose of a statin being increased, resulting in reduced LDL cholesterol. They claim that the risk of rhabdomyolysis is low and suggest that there should be no need to advise people on statins to avoid drinking grapefruit juice.[25]

If you wish to drink grapefruit juice, my advice is to always talk to your doctor or health care provided and read any information provided with your prescription to find out if the medication you are taking will be affected and how much grapefruit juice you can have, if any. My advice would also be to ditch the juice in favour of eating the whole fruit. You will obtain many more of the important phytonutrients in the fresh fruit.

While grapefruit juice inhibits the metabolism of some medications, Tisserand & Young state the percentage of furanocoumarins present in grapefruit essential oil is not likely to cause drug interactions.[22]

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