

Grapefruit Flower

Origins, composition, use and more.

Felix Buccellato, Custom Essence; additional information provided by Brian M. Lawrence



Felix Buccellato

The grapefruit, *Citrus paradisi* Macfad., which is the fruit of a subtropical tree, appears to have an uncertain history. All species of the genus *Citrus* are thought to be native to Asia and the Malay Archipelago, but the actual origin of grapefruit has been a mystery.



History

According to Kumamoto et al., grapefruit is an apomictically stabilized hybrid between the sweet orange (*Citrus sinensis* [L.] Osbeck and the pomelo, or shaddock, (*C. grandis* (L.) Osbeck [syn. *C. maxima* (Burm.) Merrill]).¹ The main reason for the origin confusion is because it was for a long time thought to be a variety of *C. maxima*, or its known synonym *C. grandis*. Like sweet orange, the shaddock originated in southern China; however, it is grown throughout Southeast Asia.²

Macfadyen first encountered grapefruit in the 1830s in Jamaica where it was being grown and commonly known as ‘Barbados grapefruit.’³ The shaddock was first encountered by Sloane in Barbados 1687, although it had been introduced into the island sometime after the island was settled in 1627.^{1, 4} It is also not clear if Captain Shaddock, or Chaddock, brought the seeds of this maternal parent fruit to Barbados.⁵

It is supposed that the fruit was cultivated and hybridized or mutated into the grapefruit described as “forbidden fruit” by Hughes (1750) from Barbados:^{6, 7}

The Trunk, Leaves, and Flowers of the Tree, very much resemble those of the Orange Tree. The Fruit, when ripe, is something longer and larger than the largest orange; and exceeds, in the Delicacy of its Taste, the Fruit of every Tree in this or any of our neighbouring Islands. It has somewhat of the Taste of a Shaddock; but far exceeds that, as well as the best Orange, in its delicious Taste and Flavour.

Grapefruit, the current name, is a result of the fruit growing in clusters, similar to grapes on the tree.

Florida is one of the centers where grapefruit is grown and it is believed to have been introduced to that state by Count Odet Philippe, a Frenchman living in or near Safety Harbor on Tampa Bay in 1823.⁵ In any event, the commercial grapefruit industry

began in Florida in the late 19th century. Prior to 1880, sales were entirely to tourists, but eventually shipments went to Philadelphia and New York City. California and Arizona developed commercial groves after the introduction of the ‘Marsh’ cultivar in 1890. It was not until a suitable rootstock was obtained for dry western conditions that grapefruit cultivation expanded. By 1947 Texas was producing an amount equal to the Florida production of the ‘Duncan’ cultivar, until frost reduced the acreage. Since then, new and improved cultivars of grapefruit have been developed.⁸ Among them were seedless and pink and deep red cultivars called ‘Star Ruby’ red grapefruit from Texas and the ‘Burgundy’ from Florida.⁹

Grapefruit Fruit and Blossom Oil

Grapefruit oil has always been somewhat problematic for the flavor and fragrance industry. It is not stable, and production qualities and unpredictable supply always cause problems. Like all citrus, color is a moving target depending on age and type. The red grapefruit cultivars can only be used where color stability or change is not an issue.

The introduction of a steam-distilled grapefruit blossom oil, unlike neroli (steam-distilled bitter orange blossom), is a relatively new product. Grapefruit blossom production started in 2007, based on an idea of IFF VP perfumer Yves Cassar. The 2007 production did not exceed 10 kg. This relatively new ingredient does not present the same kind of problems as do peel oils. It is mostly color stable, and it is extremely powerful (and expensive), so the amounts that are likely to be used in any composition are small. As a result, the effect on color and stability is correspondingly small.

Grapefruit Flower Oil From Morocco

The introduction of a new material is not a frequent occurrence. When this happens, perfumers and flavorists feel compelled to examine and evaluate the material for potential use and interest. The most important question that is posed is: Is it unique?

There are essentially three areas of uniqueness to consider: odor, price and performance. The new material will have to fill a roll in at least one of these areas to be included in the

ever-growing palette of materials. Other types of uniqueness can be considered: certified organic; all-natural, especially if there are no COLIPA (Cosmetics Europe—The Personal Care Association; *cosmeticseurope.eu*) items in the natural (this is rare, but possible); or different color characteristics such as being colorless or lightly colored.

The fact that grapefruit flower oil is an important and useful product was self-evident to this author immediately upon receipt of a sample. First, it is valuable because it is related to neroli oil, which is expensive and in short supply. Although it is not exactly like neroli, it is in fact similar; grapefruit flower oil is steam distilled from the blossoms, while neroli oil is steam distilled from bitter orange flower (*Citrus bergamia* Risso et Poit.).

A comparative analysis of two samples of neroli and grapefruit flower oil is listed in T-1. As can be seen, there are many

similarities between neroli and grapefruit flower oil—with a few key differences.

Citrus Components

β -Pinene has a pinelike character, while sabinene provide a distinctive citrus character in some ways similar to γ -terpinene, which is an important citrus character, especially in lemon.

Floralcy

In grapefruit flower oil, linalool and linalyl acetate contribute to a floralcy that is significantly lower than in neroli oil. It is precisely this hybrid area that can transition the character from citrus to floral. Linalool is quite floral with a somewhat citrus character, while linalyl acetate provides a citrus-woody note with less floralcy.

T-1. Comparative percentage composition of two samples each of neroli oil and grapefruit flower oil, and the odor characteristics of the components

Component	Neroli 1	Neroli 2	Grapefruit1	Grapefruit2	Odor
α -thujene	0.02	0.03	0.33	0.33	Citrus
α -pinene	0.40	0.72	1.57	1.61	Pine
camphene	0.03	0.04	0.04	0.05	Woody
sabinene	—	—	21.19	17.38	Citrus
β-pinene	4.76	11.87	2.26	2.35	Pine
myrcene	1.70	1.24	2.84	3.09	Citrus
α -phellandrene	—	—	0.14	0.17	Citrus
α -terpinene	0.11	0.09	1.84	1.91	Citrus
p-cymene	—	0.15	0.22	—	Citrus
limonene	9.81	16.91	30.06	33.07	Citrus
1,8-cineole	—	—	—	—	—
<i>cis</i> - β -ocimene	0.86	0.43	0.32	0.47	Citrus
phenylacetaldehyde	—	—	0.03	0.06	Rose, floral
<i>trans</i> - β -ocimene	4.83	5.03	6.56	9.79	Citrus
γ-terpinene	0.28	—	2.68	2.72	Citrus, pepper
<i>cis</i> -sabinene hydrate	—	—	0.09	0.07	Citrus
<i>cis</i> -linalool oxide (f)	0.32	0.11	0.06	0.07	Earthy
terpinolene	0.68	0.42	0.70	0.75	Citrus, lime
linalool	38.56	35.71	6.56	6.40	Floral, citrus
benzyl cyanide	—	—	0.26	0.29	Green, hyacinth
citronellal	—	—	0.08	0.11	Lemon
terpinen-4-ol	—	0.50	2.67	2.97	Pine, earthy
α -terpineol	7.17	5.45	0.32	0.35	Floral
nerol	1.49	0.93	0.28	0.30	Floral, citrus
neral	—	—	0.05	0.08	Lemon
linalyl acetate	11.03	2.40	—	—	Woody, citrus
geraniol	2.98	2.62	0.26	0.28	Floral
geranial	0.08	—	0.26	0.12	Lemon
indole	0.13	0.12	0.13	0.10	Floral
methyl anthranilate	0.23	0.23	0.20	0.24	Floral, grape
α -terpinyl acetate	—	—	0.05	0.04	Woody, citrus
neryl acetate	2.13	1.58	0.02	—	Citrus
geranyl acetate	3.97	3.25	0.04	—	Citrus, fruity
dimethyl anthranilate	1.29	—	—	—	Floral, grape
β -caryophyllene	0.94	1.09	1.05	1.07	Woody
nerolidol*	1.19	2.98	9.43	5.19	Floral
farnesol*	1.63	2.27	3.09	2.97	Floral

* correct isomer not identified
f = furanoid form

Fruity

The fruity area perhaps adds the greatest dimension to these products. Geranyl acetate, along with the isomer neryl acetate, add the fruity body to neroli oil, which is nearly completely absent in the grapefruit blossom oil.

Overlap

Interestingly, there are a few key common components that really make the two oils more alike than meets the analytical eye. It is where the components meet the nose that is of particular interest.

Those components are indole and methyl anthranilate. They are probably the two most important and powerful odor contributors and characterizers for the oils of the citrus blossom family.

Examination of the data on the table reveals that the amounts in each are nearly identical, which can explain why their characters are similar. As any perfumer knows, concentration of key items can retain and/or mimic the character quite easily, while components like limonene or linalool play a secondary role in terms of character or performance.

Uniqueness

Each of these oils has its own odor uniqueness, which is one of the requirements for adding anything new to the perfumer's or flavorist's palette. In neroli, these materials are α -terpineol and dimethyl anthranilate—floralcy and a mandarin-citrus character. In grapefruit blossom, these are phenylacetaldehyde and benzyl cyanide, adding honey and honeysuckle characters.

It is always interesting to evaluate a new material, especially a natural product. They are always more complex with many facets that require many years of study and use. Nature has always been, and continues to be, one of the best teachers in the universe. Grapefruit blossom will find a home in the libraries of perfumers and flavorists all around the world.

Address correspondence to Felix Buccellato; fbuccellato@customessence.com.

References

1. J Kumamoto, RW Scora, HW Lawton and WA Clerx, Mystery of the forbidden fruit: historical epilogue on the origin of the grapefruit *Citrus paradisi* (Rutaceae), *Econ Bot*, 41, 97–107 (1987)
2. MS Ladanaya, *Citrus Fruit. Biology, Technology and Evaluation*, 558pp, Academic Press, London, UK (2008)
3. J Macfadyen, Some remarks on the species of the genus *Citrus* which are cultivated in Jamaica. *Bot Misc*, 1, 295-304 (1830); cited in Kumaoto et al (1987)
4. H Sloane, *A voyage to the islands of Madeira, Barbados, Nieves, St. Christophers, and Jamaica*. Printed by the British Museum, London (1707); cited in Kumamoto et al (1987)

5. W Reuther, HJ Webber and LB Baxter, *The Citrus Industry*. Vol 1, 611pp 611, Univ California Publication, Riverside, CA (1967)
6. G Hughes, *The Natural History of Barbados in Ten Books by the Reverend Griffith Hughes*. 400pp, (a reprint of the original 1850 books), BiblioLife, Charleston SC (2010)
7. D Arthur and D Reeve, Grapefruit the “Forbidden Fruit,” *Perfum Flavor*, 29(1), 26–30 (2004)
8. J Saunt, *An Illustrated Guide. Citrus Varieties of the World*, 128 pp, Sinclair International Ltd, Norwich UK (1990)
9. RA Seelig, *Fruit and Vegetable Facts and Pointers*, United Fruit and Vegetable Assoc, July, Washington, DC (1996)

To purchase a copy of this article or others, visit www.PerfumerFlavorist.com/magazine. 