

The Meyer Lemon Story

Botany, components and analysis

Felix Buccellato, Custom Essence

Meyer lemon (*Citrus x meyeri*) is a hybrid citrus fruit native to China^a. It is not immediately clear what Meyer lemon's hybrid pairs were. The literature is vague at best, claiming a lemon/orange hybrid or lemon/mandarin hybrid. The Meyer lemon came into the United States from China in 1908. Therefore, the origin predates that, presumably in China. It is unclear if the plant originated in China as a natural hybrid found by a plant enthusiast or if it resulted from a deliberate cross by a plant breeder. The US version of Meyer remains the same as the original introduction other than the removal of viruses (see History)^b.

History

The tree was brought to the United States from Beijing in 1908 by Frank Meyer, the eponymous plant explorer, for the US Department of Agriculture (USDA)^b. Born Frans Nicolaas Meijer in Amsterdam in 1875, he immigrated to the US in 1901. In 1905 he was hired by the USDA in its Office of Seed and Plant Introduction. His title was Agricultural Explorer, and his job was to send economically useful plants back to the United States. He sent trees and shrubs of ornamental value along with the images he collected on his travels to Harvard's Arnold Arboretum^c. In the early 1900s Meijer/Meyer was traveling near Beijing and came across a dwarf lemon tree. It must have struck him as something new and different enough to be worth shipping back to the United States. Meyer died while on an expedition near Shanghai in 1918; he never enjoyed the success of his namesake.

As has often been the case with imported botanicals, the Meyer lemon tree brought along two companion ailments, *Citrus tristeza* virus and tatter leaf capillovirus. It so happened that the Meyer lemon trees that were being cloned were symptomless carriers of the virus which had killed millions of citrus trees all over the world and rendered other millions useless for production. After this finding, most of the Meyer lemon trees in the United States were destroyed in the 1960s to save other citrus trees (see footnote ^a). A virus-free selection of the plant

^a www.citrusvariety.ucr.edu/citrus/improvedmeyer.html

^b Private communication, Michael Kesinger, chief, Bureau of Citrus Budwood Registration, Division of Plant Industry, 3027 Lake Alfred Road (Hwy 17), Winter Haven, FL 33881

^c <http://arboretum.harvard.edu/library/image-collection/botanical-and-cultural-images-of-eastern-asia/frank-nicholas-meyer/>



Meyer lemon (Citrus x meyeri) is a citrus fruit native to China thought to be a cross between a true lemon and either a mandarin or common orange.



The peel has very distinctive citrus lemon character with the notable inclusion of an oregano spicy character that is evident in both aroma and flavor.



The Meyer lemon flower has a beautiful combination of floralcy and sharp and penetrating citrus character, not unlike orange blossoms.

Meyer lemon peel, juice, leaf and flower components and odor notes

T-1

Material	Peel %	Juice %	Leaf %	Flower %	Odor notes
α -Thujene	0.59	0.88		0.04	
<i>cis</i> -3-Hexenol		0.02			Green leafy
α -Pinene	1.98	2.27		0.12	Pine needle
Camphene	0.03	0.02			Low impact pine
β -Pinene	1.16	1.51	0.08	0.11	Pine, somewhat minty
Myrcene	1.51	2.86		0.23	Citrus
Sabinene			0.04		Citrus
δ -Carene	0.05	0.02			Pine, citrus
d-Limonene	80.58	63.23	3.32	14.04	Citrus, somewhat minty
<i>cis</i> -Ocimene				0.26	Citrus, herbaceous, celery
<i>trans</i> -Ocimene	0.08	0.25		1.56	Citrus, herbaceous, celery
Eucalyptol	?	?	0.17		Medicinal, minty
γ -Terpinene	8.63	9.95		0.58	Citrus, black pepper
Sabinene hydrate	0.01				Citrus
Dehydro p-cymene	0.42	0.83			Citrus
Terpinolene		0.72		0.04	Citrus, lime
Linalool	0.14	0.46	0.49	0.67	Floral, citrus
Citronellal	0.20	0.43	0.18		Lemon, citrus
α -Terpineol	0.12	0.26		0.28	Pine, floral
Carvacrol methyl ether	0.13	0.29			Spice, oregano, thyme
Neral	0.02	0.04	0.06	0.09	Lemon, citrus
Geranial	0.05	0.06	0.07	0.07	Lemon, citrus
<i>trans</i> -2-Decenal		0.03			Green, leafy, citrus
Phenyl acetaldehyde oxime				1.37	Honey, floral, rose, lilac
Indole				0.43	Orange blossom, jasmine
Perilla aldehyde	0.04	0.06			Floral, nutty, fatty
Thymol	0.66	1.60		2.50	Spice, thyme oregano
Undecanal		0.09			Citrus, floral
Methyl anthranilate				2.44	Grape, floral, orange blossom
Copaene α 2 isomers	0.03	0.02			Woody
Benzaldehyde 2 amino				0.16	
Neryl acetate	0.09	0.07			Citrus, fruity
Citronellyl acetate		0.07			Citrus, fruity
Geranyl acetate	0.01	0.02			Citrus, fruity
β -Elemene	0.29	0.82	0.26		Citrus, black pepper
Nerolidol				0.59	Floral, woody
(E)- α -Bergamotene	0.17	0.36			Woody
Caffeine				10.98	No odor
Farnesol				7.44	Floral
β -Caryophyllene		0.19	0.36		Woody
Coumarin 7 methoxy				2.50	Floral, powdery
Germacrene D	0.28				Woody
Bicyclogermacrene	0.03				Woody
β -Bisabolene	0.25	0.58	0.17		Woody, floral
Octacosane	0.13	0.02			No odor
Methyl jasmonate		0.06			Floral, jasmine, orange blossom
Hexamethoxy flavone (tentative identification)	0.14				
Valencene				1.09	No odor
Tetradecanal (tentative identification)		1.26			Fatty, floral
Heptacosane				10.64	No odor
Octacosane				2.94	No odor
γ -Tocopherol				1.47	Low odor
Cholest-5-en-3-ol				1.59	Low odor
Decacosane				66.21	No odor
α -Tocopherol				2.48	Low odor
Bergaptene				2.45	
Tricosane				2.27	No odor
Pentacosane				3.90	No odor
Squalane				3.19	No odor

was found in the 1950s by Don Dillon of the California company Four Winds Growers, and was later certified and released in 1975 by the University of California as the “improved Meyer lemon.”¹ Somewhat surprisingly, the fruit was never commercialized on a large scale until about 2005, when Martha Stewart and other media personalities started promoting them in recipes. It seems the soft, thin skin that makes Meyer lemons so difficult to ship long distances is one of their more appealing qualities in these applications. The white pith is bitter and thick in Lisbon- and Eureka-type lemons, but thin in Meyer lemons, allowing the latter to be eaten peel and all.

Currently, when a legitimate nursery or citrus farm propagates Meyer lemon trees through grafting techniques, it uses budwood that originated in the California Virus-free Budwood Program. Horticulturally, this improved Meyer is the same as the original introduction, other than being virus-free, and does not represent another hybrid of the original. Florida’s Meyer lemon usually does not have “improved” in front of the name, though the use of the name is common in the California citrus industry. Virus-free budwood of Meyer lemon is available from the Florida Division of Plant Industry’s greenhouses for commercial citrus nurseries to propagate^d.

Olfactory Properties

The lack of concrete evidence regarding origins of the Meyer lemon did not interfere with the study or analysis of its odorous properties. As luck might have it, Tina Martorano, project manager at Custom Essence, has an ornamental plant of significant size in her home. She was kind enough to bring samples of a lemon, leaves and blossoms to the author. The author has always enjoyed doing a firsthand analysis and examination of botanicals that have not been commercially processed and is the same as the original plant—other than being virus-free.

The flower has a beautiful combination of floralcy and sharp and penetrating citrus character not unlike orange blossoms. This is due to methyl anthranilate and indole floralcy combined with the green celery/citrus notes of *cis* and *trans* ocimenes. While there is a significant amount of phenylacetaldehyde oxime, which has a distinctive but soft honey character, this does not play a major role in the character of the flower.

The peel has a distinguishing citrus lemon character with the notable inclusion of an oregano spicy character which is both evident in aroma and flavor, especially when one knows to look for it. The longer the peel sits, the more it smells like oregano or pizza. This is not surprising considering that the citrus components are much more fleeting and volatile and the thymol and carvacrol molecules are much more substantive due to a higher molecular weight and more polar chemical properties.

The juice, while similar to the peel in its character, has much more body mainly due to the reduction of limonene, thereby enhancing all the flavor characteristics of

the peel. It is spicy due to thymol and carvacrol methyl ether blended with typical citrus notes of γ -terpinene. Limonene itself is a very low impact material and often acts more like a carrier or diluent for all citrus products—this is no exception. Components and odor notes of Meyer lemon peel, juice, leaf and flower are listed in **T-1**.


It is the author’s best guess, based on the analysis that *Citrus limon* (lemon) was hybridized with some type of mandarin due to the presence of thymol, linalool, methyl anthranilate and dimethyl anthranilate in Meyer lemon. These materials are quite common to mandarin but do not exist in sweet orange. In a series of private communications with Mike Kesinger and a few of his colleagues it seems the task of an identification of hybrid pairs is not very easy since mandarins are quite diverse and have some specific problems with allele amplification from citron^e.

^ePrivate communication, Michael Kesinger, chief, Bureau of Citrus Budwood Registration, Division of Plant Industry

Address correspondence to Felix Buccellato, Custom Essence, 53 Veronica Ave., Somerset, NJ 08873.

References

1. W Reuther, LD Batchelor, E Clair Calavan, H John Webber, GE Carman and RG Platt, *Crop Protection*. In: *Citrus Industry*. p 195, ANR Publications, Richmond, California (1989)

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

^d Private communication, Richard Gaskalla, division director, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Post Office Box 147100, Gainesville, FL 32614-7100