

Riding the Citrus Trail: When is a Mandarin a Tangerine?

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In the second installment of articles looking at the origins and development of fruits and their flavoring derivatives, Daemmon Reeve and David Arthur investigate mandarins and tangerines.

Today, there are literally hundreds of commercially recognized varieties of mandarin and tangerine in existence worldwide. There is much confusion surrounding the difference between these products, and often the names are used interchangeably. Here, we outline the key types and discuss some of the many essential oils derived from mandarins and tangerines.

Back to Basics

Mandarins: The mandarin, *Citrus reticulata*, *Rutaceae*, is the largest and most varied group of edible citrus. Worldwide mandarin production is currently estimated to be in the range of 10-13 million tons. The most popular varieties for the Western market are the seedless and easy-to-peel types.

Mandarins are believed to have originated in China many centuries ago and evidence suggests that they were named after the colorful gowns worn by the well-respected Mandarins of the official court. The mandarin fruit spread from China into Japan, India, Arabia and North Africa before reaching Europe. From there, they were taken across the Atlantic Ocean to the New World courtesy of the travelers and traders of the late 19th century.

Tangerines: The name “Tangerine” comes from Tangiers, the capital of Morocco, where the first shipment of tangerines was allegedly sent to mainland Europe in the mid 1840s. “Tanger” literally means pertaining to Tangiers. Originally known as a tangerine orange, in botanical terms the tangerine is also a type of mandarin orange — and this

is one element responsible for the confusion between tangerine and mandarin. However, in the flavor and fragrance industry, critical differences exist between the varieties both in terms of juice and essential oil.

Terminology

The situation is further confused by the conflicting terminology, which makes it even harder to come to grips with the differences between fruit varieties. And this is an

international issue. The Ponkan mandarin, for example, is the most common mandarin in Brazil, although it is often known as Cravo tangerine there. In China, the word “kan” is used to describe the larger, sweeter mandarins, while “chiü” is used for smaller mandarins — both sweet and sour varieties. To overcome this problem in the United States, many people have begun to refer to mandarins and tangerines by their commonly known commercial name, such as “honey” for honey tangerine. Moreover, the same botanical variety can also be

known by different names depending on geographical location. A classic and widely used example is the Ortanique, originally a Jamaican mandarin, but successfully transplanted around the world. In Cyprus, the fruit is known as Mandora, and in Australia the Australique.

Climatic Adaptability

The mandarin group of fruits’ adaptability to a range of climates — from desert, semi-tropical to sub-tropical Mediterranean conditions — has enabled them to be grown in a wide variety of places. Mandarin trees themselves are widely recognized as being capable of withstanding cold



Mandarin processing in Uruguay (Source: Treatt plc).

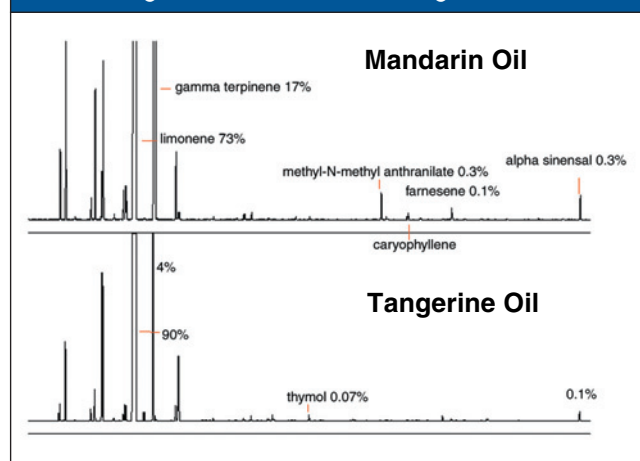
conditions in comparison to other citrus varieties. Even in New Zealand — despite a wet, generally cloudy climate — it is now possible to harvest mandarin-type fruit for 12 months of the year, due to careful selection of rootstock and cultivar selection. Conversely, the fruit itself is quite susceptible to damage when compared with oranges, for example.

Essential Oils: Types

Applications of mandarin and tangerine oil are many and varied. Typical uses are extensive in both the flavor and fragrance industry. Here, some of the many types of mandarin oils are examined. Robert Kryger presents information on tangerine oils in the January/February 2002 issue of *Perfumer & Flavorist* magazine.

Green, yellow and red mandarin oils are three distinct commercial products derived from the same fruit. Green mandarin oil, produced in Europe and South America, is much coveted by the perfumery industry. The fruit are picked when immature (around the size of a walnut) to allow the remaining fruit to grow to maturity. Yellow mandarin oil, the next stage of maturity after green, is used commonly in both flavor and fragrance applications and is generally regarded as a Sicilian product. The acidic juice breaking down the green chlorophyll during the production process en-

Figure 1. Mandarin oil vs. tangerine oil



Tangerines have a distinctive, slightly tart flavor (Source: Treatt plc).

hances the yellow color of the oil. Finally, the mature red mandarin fruit provides the commonly known cold-pressed red mandarin oil, which is more frequently used in the flavor rather than the fragrance industry.

Another type of mandarin oil, which is produced in Sicily, is distilled mandarin oil. This material is derived from the production of cold-pressed mandarin peel oil, and consists of recovering oil from the water streams used in the process. Because the oil has been in contact with the acidic juice and produced by distilling the oil away from the water streams, it is a product that shows a significant difference in composition from the peel oil.

Petitgrain mandarin oil is a Sicilian product of commercial importance produced in the months of March and April (after the crop has finished maturing). It is manufactured from the steam distillation of the leaves and prunings, and yields around 2 kg of oil per ton of leaves. The principle component of the essential oil is dimethyl anthranilate, and it is understood that there is no commercial equivalent for tangerine.

Composition of Essential Oils

The two GLC traces (Figure 1) show the composition of a typical Sicilian red mandarin oil and Chinese tangerine oil.

It can be seen that there are some key compositional differences in the levels of limonene and γ -terpinene. Limonene is typically present in Chinese tangerine at ~90 percent, whereas a level of ~73 percent is more typical of Sicilian red mandarin oil. γ -Terpinene is typically present at ~4 percent in Chinese tangerine oil; a level of ~17 percent is more typical for a Sicilian mandarin oil. Methyl-n-methyl anthranilate and caryophyllene are also characteristic of Sicilian mandarin oil, but present at no more than trace levels in Chinese tangerine oil. Also evident from the GLC traces, both α -sinensal and farnesene tend to be present at higher levels in Sicilian mandarin compared with Chinese tangerine oil.

Inconsistency

One of the problems involving essential oils from the many varieties of mandarin is that processors do not maintain varietal isolation of the oil, which leads to inconsistent quality. As a result, the user may need to adjust formulations to achieve the desired consistency. Consistency of quality and supply are vital for the essential oil market — both significantly impact overall oil prices. For example, if a batch of mandarin oil contains 50 percent Sicilian-type mandarin oil and 50 percent mixed varieties of lower grade mandarin, the achievable price for the producer is likely to be significantly less than 50 percent of the market price for the Sicilian type. This is because the cheaper oil drives the value down. If the processor has taken the necessary steps to keep the variety discrete, the potential for greater profits is clearly increased.

This is a common situation in parts of the citrus belt in Uruguay where farmers focus on obtaining money for fruit that is deemed unsuitable for the fresh fruit market. Small processors produce the juice and oil from a mixture of varieties in a single run, which is commonly sold on the local market. It is usually uneconomical and often impossible for these producers to isolate the varieties of fruit.

Seasonal Variations

Another issue facing the industry is determining what constitutes seasonal variation and what may constitute adulteration. Certain tangerine and mandarin oils may have different properties in different years, or variations may occur if the fruit is picked or processed at different times during the season. However, in general terms, seasonal variation is often responsible for fluctuation in levels with detection down to ppm or less. Adulteration can be spotted by the presence of components not usually found in an essential oil at any stage of the season. Cold-pressed sweet orange oil is a by-product of the huge orange juice industry, which dwarfs mandarin and tangerine oil production. On occasion, it is possible to tell whether a percentage of mandarins or tangerines have found their way into the juice process via the detection of enhanced levels of γ -terpinene and thymol in the orange oil.

Conclusion

The awareness of the health benefits associated with the consumption of fresh fruit has led to an increase in demand for citrus fruits — in particular, mandarins and tangerines, which possess their own distinct flavors and aromas. This increased demand has impacted the availability of fruit production by-products — namely by boosting the production of essential oils. Popular throughout the world and highly revered, the tangerine is a symbol of luck in China and regarded as a remedy for indigestion in France — there's a lot more to these citrus fruits than flesh, pith and peel. And for these reasons, the future widespread use of mandarin and tangerine oils is assured.

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