

## **Master data ingredient / monograph**

**Ingredient/plant:** Orange (Citrus sinensis L.; syn. C. aurantium)

Scientific name: Citrus sinensis (syn. Citrus aurantium L. var. dulcis)  
Order: Sapindales  
Family: Rutaceae  
Genus: Citrus  
Species: Citrus sinensis (syn. Citrus aurantium L. var. dulcis)

### **Description:**

**Orange** - specifically, sweet orange - refers to the citrus tree Citrus sinensis (syn. Citrus aurantium L. var. dulcis L., or Citrus aurantium Risso) and its fruit. The orange is a hybrid of ancient cultivated origin, possibly between pomelo (Citrus maxima) and tangerine (Citrus reticulata). It is a small flowering tree growing to about 10 m tall with evergreen leaves, which are arranged alternately, of ovate shape with crenulate margins and 4-10 cm long. The orange fruit is a hesperidium, a type of berry.

The word "orange" ultimately comes from Sanskrit narang or Tamil. The fruit typically has 11 individual pieces inside and in Tamil, the word "Orangu" translates to "6 and 5" implying 11. Oranges originated in southeast Asia, in either India, Vietnam or southern China. The fruit of Citrus sinensis is called sweet orange to distinguish it from Citrus aurantium, the bitter orange. In a number of languages, it is known as a "Chinese apple" (e.g. Dutch Sinaasappel (China's apple)).

All citrus trees are of the single genus Citrus, and remain largely interbreedable; that is, there is only one "superspecies" which includes lemons, limes and oranges. Nevertheless, names have been given to the various members of the citrus family, oranges often being referred to as Citrus sinensis and Citrus aurantium. Fruits of all members of the genus Citrus are considered berries because they have many seeds, are fleshy, soft and derive from a single ovary. An orange seed is sometimes referred to as a pip.

There exist different varieties:

#### *Persian orange*

The **Persian orange**, grown widely in southern Europe after its introduction to Italy in the 11th century, was bitter. Sweet oranges were brought to Europe in the 15th century from India by Portuguese traders, quickly displaced the bitter, and are now the most common variety of orange cultivated. The sweet orange will grow to different sizes and colours according to local conditions, most commonly with ten carpels, or segments, inside.

Portuguese, Spanish, Arab, and Dutch sailors planted citrus trees along trade routes to prevent scurvy. On his second voyage in 1493, Christopher Columbus brought the seeds of oranges, lemons and citrons to Haiti and the Caribbean. They were

introduced in Florida (along with lemons) in 1513 by Spanish explorer Juan Ponce de Leon, and were introduced to Hawaii in 1792.

#### *Navel orange*

A peeled sectioned navel orange. The underdeveloped twin is located on the bottom right. A single mutation in 1820 in an orchard of sweet oranges planted at a monastery in Brazil yielded the navel orange, also known as the Washington, Riverside or Bahie navel. The mutation causes navel oranges to develop a second orange at the base of the original fruit, opposite the stem. The second orange develops as a cojoined twin in a set of smaller segments embedded within the peel of the larger orange. From the outside, the smaller, undeveloped twin left a formation at the bottom of the fruit, looking similar to the human navel.

Because the mutation left the fruit seedless and therefore sterile, the only means available to cultivate more of this new variety is to graft cuttings onto other varieties of citrus tree. Two such cuttings of the original tree were transplanted to Riverside, California in 1870, which eventually led to worldwide popularity.

Today, navel oranges continue to be produced via cutting and grafting. This does not allow for the usual selective breeding methodologies, and so not only do the navel oranges of today have exactly the same genetic makeup as the original tree, they can even be considered to all be the fruit of that single, now centuries-old tree.

On rare occasion, however, further mutations can lead to new varieties.

#### *Valencia or Murcia orange*

The Valencia or Murcia orange is one of the sweet oranges used for juice extraction. It is a late-season fruit, and therefore a popular variety when the navel oranges are out of season. For this reason, the orange was chosen to be the official mascot of the 1982 FIFA World Cup, which was held in Spain. The mascot was called "Naranjito" ("little orange"), and wore the colours of the Spanish soccer team uniform.

#### *Blood orange*

The blood orange has streaks of red in the fruit, and the juice is often a dark burgundy colour. The fruit has found a niche as an interesting ingredient variation on traditional Seville marmalade, with its striking red streaks and distinct flavour. The mandarin orange is similar, but smaller and sweeter, and the scarlet navel is a variety with the same diploid mutation as the navel orange.

### **Properties:**

Depending on weight and quality one orange contains about 30 mg Vitamin C. The recommended daily intake of vitamin C amounts about 100 mg.

Paring of an orange is often treated with waxes, not seldom containing preservatives, like Thiabendazole (E 233), Orthophenylphenol (E 231), sodium orthophenylphenol (E 232), Biphenyl (E 230) or Imazalil.

Oranges can be processed to extract oils and essences.

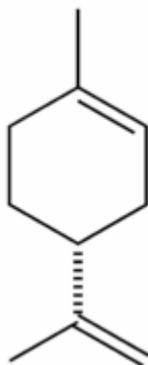


Fig. 1: D-limonene

### ***Pharmacological properties:***

#### ***Active ingredients***

Fruits of Citrus sinensis contain:

- essential oil about 1,5 %: main components are: D-limonene (amount: 90 %), citral, citronellal, nootkaton, sinesal, n-nonanal, n-decanal, n-dodecanal, linalyl acetate, geranyl acetate, citronelyl acetate, anthranil acid methyl ester
- in pressed oils: lipophilic flavonoids, furanocumarines
- flavonoids

There is some evidence that active ingredients of oranges stimulate the secretion of gastric juice, due to an reflectory action. A detailed scientific proof of these thesis, however, is still outstanding. Nevertheless the german commission E recommends in their monograph, dated 1990 the use of orange oil in cases of dyspepsia and anorexia.

d-Limonene serves as a natural insect repellent for citrus fruits. Direct contact with d-Limonene can act as an organic insecticide. Experiments with fruit flies have shown that they by-pass this problem by laying eggs between the oil-producing glands. Also effective on Drywood termites.

Limonene is also flammable. If you squeeze an orange peel in front of a flame, the glands will burst with an aerosol that will ignite on contact with the flame.

Despite being non-toxic to humans, limonene has been observed to cause cancer in male rats, by reacting with  $\alpha$ 2U-globulin, which is not produced by female rats. In humans, however, the substance is not a carcinogen or a mutagen.

### ***Topical and cosmetic properties:***

In case of cosmetic preparations the pleasant odour of oranges is the main reason for its wide use, especially in baths, soaps and fragrances.

### ***Possible interactions:***

If used, as intended, essential orange oil in special preparations for topical use do not exert any harmful effects.

## Use:

As already described for lemon fruits also orange fruits are regularly served as lemonade or limeade, its equivalent, or as a garnish for drinks such as iced tea or a soft drink, with a slice either inside or on the rim of the glass. Only lemons, however, are used in the Italian liqueur Limoncello. A wedge of lemon is also often used to add flavor to water. The average lemon contains approximately 3 tablespoons of juice. Lemons warmed to room temperature before squeezing (in a microwave or by leaving on a counter) increases the amount of juice that can be extracted. Storing lemons at room temperature for long periods makes them more vulnerable to mold. Lemon juice is typically squeezed onto fish dishes; the acidic juice neutralizes the taste of amines in fish by converting them to nonvolatile ammonium salts.

## Limits of administration:

Due to a possible sensitisation effect orange oil should not be administered undiluted. Furthermore citrus oil should not be applied on the skin prior to sun baths. Although it is relatively safe to handle, the limonene in the oil is a mild hand irritant, by virtue of dissolving the protective oils in the skin. It is wise to wear solvent-resistant gloves when handling limonene solutions.

## Assessment/safety factors and toxicity:

Essential oil of orange is generally considered as safe and devoid of adverse side effects when administered in recommended doses. The potential capacity of causing sensitisation effects is very weak (Jänicke C. et al. 2003).

## Further remarks and characteristics:

None

## References:

Hausen B.:  
"Allergiepflanzen, Pflanzenallergene",  
ecomed Verlagsgesell. MbH, Landsberg, 1998

Ihrig M.:  
„Qualitätskontrolle von süßem Orangenschalenöl“,  
Pharmazeutische Zeitung 140, 2350-2353, 1995

Jänicke C., Grünwald J., Brendler Th.:  
"Handbuch Phytotherapie – Indikationen-Anwendungen-Wirksamkeit-Präparate",  
Wiss. Verlagsgesell. Stuttgart 2003

Rimpler H.:  
"Biogene Arzneistoffe",  
Dtsch. Apothekerverlag 1999