

## The Origin of Oranges

Generating over \$9 billion per year and employing over 70,000 workers, the orange industry has long been a pivotal part of our state's history. The first orange tree was planted in the mid-1500s in St. Augustine, possibly by the Spanish explorer Ponce de León. Presently, over 70% of oranges grown in the United States come from Floridian groves, and Florida is second only to Brazil in orange production-the latter growing a third of all the oranges in the world.

Orange trees dot the Floridian countryside, and their fragrant white flowers became the state symbol in 1909. A little over a decade ago, the orange was officially designated as the state fruit.

Although many have come to associate the tangy, sweet fruit with Florida, the humble orange actually traces its origins all the way to Southeast Asia, where it was first engineered by farmers thousands of years ago. The oldest known reference to citrus fruits can be found in Chinese documents that were written around 2200 BCE.

The word "citrus" refers to any flowering tree or shrub that belongs to the genus *Citrus*. The fruits produced by these plants typically all have a tough, waxy rind and are filled with juicy, edible flesh, which can range from tasting sweet to tangy. The sweet varieties of citrus include mandarins, tangerines, sweet oranges, and grapefruit. The tangy varieties include kumquats, lemons, limes, and bitter oranges.

Genome analyses have shown that a single common ancestor of citrus fruits first appeared around 7 million years ago. The same study also found that citrus fruits are highly prone to genetic mutation and that they have a propensity to hybridize.

These two traits have allowed for farmers and scientists to create a wide variety of citrus hybrids. In fact, some of the most well-known species are hybrids:

- Grapefruit: cross between sweet orange and pomelo
- Lemon: cross between bitter orange and citron
- Lime: cross between citron, mandarin, and pomelo
- Orange: cross between pomelo and mandarin

The word "citrus" comes from the Greek *kedar* meaning "cedar". Cedar trees and citrus trees give off a similar smell, and this might explain how the two words came to be related.

The inhabitants of the region where oranges were first bred (most likely the area that forms the present day border between India and China) spoke Sanskrit, and their word for "orange tree" was *nāraṅga*. Trade brought Middle Eastern peoples into contact with oranges for the first time, the Persians calling the fruit *nārang*, which later became *nāranj* in Arabic. In the 12th century,

Arab traders in North Africa brought oranges across the Mediterranean sea and into Sicily. Locals there called the fruit *narancia*, which later became *arancia*. Oranges finally arrived in Britain several decades later, and the English word “orange” comes from the Old French *orange*, from the phrase *pomme d’orange*.

It wasn’t until the 1500s—several centuries after oranges had been first brought to Europe—that the word “orange” came to be used to describe the color one produces when mixing red and yellow together.

Like any other fruit, oranges are covered in multiple layers of skin. The outermost skin is called the endocarp, but it is commonly referred to as the rind. This tough outer shell is leathery and waxy, and right below its surface lies another layer called the flavedo, which contains oil-producing glands. The white, spongy film that covers the flesh of a peeled orange is known as the albedo. Triangular segments, separated by a membrane called the septum, spiral around the center of the fruit. Each segment bursts with innumerable juice-filled sacs, woven together like a web. This juice contains all the acids, oils, and sugars that combine together to give oranges their signature taste.

If you were to visit a tropical country where oranges are grown, you might be surprised to see oranges with lime green-colored rinds for sale at the marketplace (the inner, edible flesh is still orange, though). These oranges are not some sort of special variety, they are the same sweet oranges grown in Florida. Neither were these fruits picked before they ripened—in fact, ripe oranges are naturally green when grown in tropical climates. So why do some oranges never turn orange? Special molecules in plants called pigments are responsible for this discrepancy.

Members of the kingdom Plantae produce these pigments in order to absorb photons (light particles) from the sun and ultimately convert them into chemical energy in the form of sugar molecules. The color of a pigment depends on which types of light waves are absorbed and which ones are reflected. Chlorophyll, carotenoids, and anthocyanins are examples of pigments. Because chlorophyll absorbs red and blue light and reflects green light, plants that are rich in this pigment appear green. When temperatures drop and the days grow shorter in the winter time, plants stop producing chlorophyll molecules, allowing the red and orange carotenoids to shine through. This is why leaves change color in the fall, and it is also why oranges from tropical parts of the world never turn orange: if it is hot and sunny all year round, the fruit will hold onto its chlorophyll and remain green.