

## The Solanaceae as Food: A Natural History of the Potato Family

**Editor's Introduction** | Potatoes, tomatoes and a host of other important fruit crops all belong to the Solanaceae plant family. But so do mandrakes, daturas and other poisonous and important medicinal plants. Sandra Knapp, of the department of botany at The Natural History Museum, explores the incredible diversity of this amazing plant family, focusing in part one on their use for food, and then for drugs and medicine in part two. Her study demonstrates the considerable contribution these species have made to humankind, in both positive and negative ways.

Botanists arrange and classify plants in families, and place much importance on shared derived characters, or plant attributes, for doing this. The Solanaceae is one such important family, whose members share the characteristics of internal phloem--where the phloem (the sugar-conducting tissue in the plant) is inside the water conducting tissue called the xylem. It is the other way around in most other plant families. In addition, the ovary in Solanaceae is set at an angle in the flowers. Members of the Solanaceae are advanced angiosperms, and have flowers with fused petals, making them closely related to daisies and morning glories. There is much floral diversity in the family and the form of the flowers is extraordinary: the largest genus *Solanum* has mostly star-shaped flowers with yellow anthers. The Solanaceae are interesting because they are used by people for both food and medicine all around the world, unlike most other plant groups.

Most important on a world-wide scale is the common potato. These are found hidden beneath the green plant, with its pretty white or purple flowers and tiny fruits. Potatoes are actually swollen underground stolons or stems--storage organs for the plant to survive through the winter, but also to vegetatively reproduce. Potato cultivation originated high in the Andes, in the altiplano of Peru and Bolivia where an enormous variety of cultivated types exists. They have many different uses, and also a variety of common names, for example "the potato that makes the young bride weep", so-named because they are knobbly-shaped, and as a young bride in Peru you are required to peel potatoes well!



The Natural History Museum  
Machu Picchu terracing.

Potatoes were brought to Spain from the New World after Francisco Pizarro conquered Peru in the 1530s, and they soon became established as a popular and cheap food crop in Europe. Potatoes were one of the mainstays of the Inca civilisation, and were grown on terraces cut into the steep mountainsides. To this day they remain the main staple diet of high Andean cultures. The Incas were also among the first to freeze-dry food, making a product known locally as chuño, which is the result of a complex freeze-drying process. Despite the fact that potatoes are grown on a commercial scale all over the world, the Andean people still grow them in the traditional manner, sometimes employing this method of preservation.

Chile peppers are also exclusively New World, most probably brought by early Portuguese traders on their travels from South America to India, where they then became established. The flowers are white and the fruits come in a wide variety of shapes, colours, flavours, and degrees of hotness. The hot taste of the chile pepper is derived from a chemical compound called capsaicin, which being fat soluble, binds itself to other fats within body cells. Milk and yoghurt is often eaten alongside dishes which are hot with chile peppers, as the hot compound binds to the fat in the milk, thus softening the blow. There are actually only a few species of commonly cultivated peppers, and

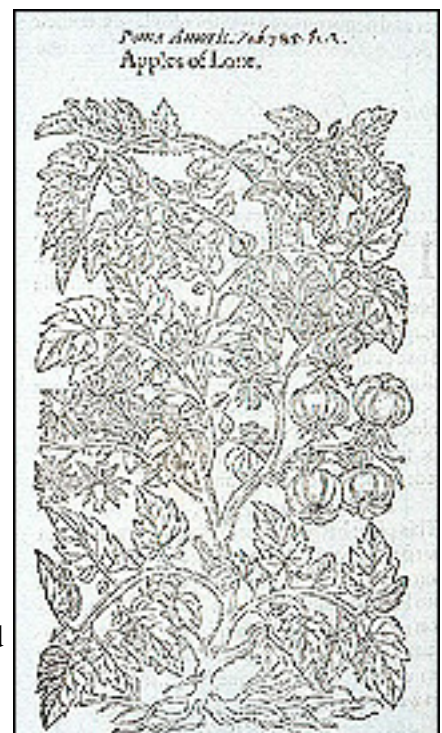
the variety results from selection by humans to introduce variety of shape, colour and flavour. Another species of peppers found in the Andes has black seeds and is called *Capsicum pubescens* or rocoto. The fruits, although very hot, are delicious.

Another member of the Solanaceae family, but this time native to the Old World, is the eggplant or aubergine, *Solanum melongena*. These plants also come in many varieties and are what's known as andromonecious; that is, each inflorescence has one very large flower, which is hermaphrodite, as well as several other smaller flowers which don't have fertile ovaries, and can only contribute pollen. The single hermaphrodite flower develops a big fruit, known in many parts of the world as eggplants because the fruits of some of the original cultivars seen in Europe were about the size of an egg and were creamy white in colour. Many related species are to be found today in North Africa and are still used extensively by local people.

Most of the other fruit crops from the Solanaceae family originate from the New World. The cocona has big fleshy leaves and the cultivated varieties are not spiny, while the wild populations have fierce spines. Narajilla, or *Solanum quitoense*, has a purple pubescence and is native to the Andes. It is commonly grown in Ecuador and in many other mountain areas in South and Central America. The fruit has the appearance of a small orange, but when cut open has a delicious green flesh.

Tree tomatoes (or tamarillos) are increasingly popular and are predicted to become as popular as kiwi fruit. The beautiful flowers are pollinated by oil-collecting bees, who collect oil from special areas on the backs of the anthers. True tomatoes are native to Peru, although the origins of cultivated tomatoes, that form such a huge industry world-wide, are difficult to trace. There are around twelve or thirteen native species, although only two are cultivated and used by humans, which provide a wide variety of colours and shapes.

The tomato was originally classified by Linnaeus as a species of *Solanum*, but a year later, in 1754, Philip Miller of the Chelsea Physic Garden described it as a new genus called *Lycopersicon*, or the wolf peach. However, DNA sequences and other morphological characteristics have subsequently confirmed its very close relationship to the potato ( *Solanum tuberosum*). Tomatoes are often referred to as "apples of love", a phrase derived from a corruption of the Italian *pomma di mori* (the apple of the Moors), having originally been brought back from the New World by the Spanish conquerors. People were initially suspicious of the fruits when they were first introduced to Europe, possibly due to their strong smell. Most European Solanaceae are highly toxic--but smell like tomato leaves--perhaps thus creating great suspicion and hindering the tomato's spread into European diets. Belief still persists that the tomato actually originated from Mexico because the word tomato is from Nahuatl, the ancient Aztec language. However, wild species of tomatoes are only found in South America, and the tomato probably reached Mexico due to the extensive trading networks that existed prior to the Spanish conquest.



John Gerard Herbal of 1583

Gerard's Herbal plate of tomatoes "Apples of Love".

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