

Potato



Potato is the term which applies either to the starchy, tuberous root vegetable crop from the various subspecies of the perennial plant *Solanum tuberosum* of the Solanaceae, or nightshade, family, or to the plant itself. In the region of the Andes, the word is also used to refer to other closely-related species of the genus *Solanum*. Potato is the world's most widely grown tuber crop, and the fourth largest food crop in terms of fresh produce — after rice, wheat, and maize (corn).

The potato originated in the area of contemporary Peru and Bolivia, identified more specifically in research published by David Spooner in 2005 as an area of southern Peru, just north of Lake Titicaca. The potato was introduced to Europe around 1700, and subsequently by European mariners to territories and ports throughout the world. Thousands of varieties persist in the Andes, where over 100 varieties might be found in a single valley, and a dozen or more might be maintained by a single agricultural household.

However, today, over 99% of all cultivated potato varieties worldwide are descendants of a subspecies indigenous to Chile.

Once established in Europe, the potato soon became an important food staple and field crop. Lack of genetic diversity, due to the fact that very few varieties were initially introduced, left the crop vulnerable to disease. In 1845, a fungal disease, *Phytophthora infestans*, also known as late blight, spread rapidly through the poorer communities of western Ireland, resulting in the Great Irish Famine. The potato is also strongly associated with Idaho, Maine, Washington, North Dakota, Prince Edward Island, Ireland, Jersey and Russia because of its large role in the agricultural economy and history of these regions. But in recent decades, the greatest expansion of potato has been in Asia, where as of 2007 approximately eighty percent of the world potato crop is grown. Since the dissolution of the Soviet Union, China has become the world's largest potato producer, followed by India.

Description



Flowers of a potato plant.

Potato plants grow high to the ground and bear yellow to silver flowers with yellow stamens.

Potatoes are cross-pollinated mostly by bumblebees that carry pollen from other potato plants, but a substantial amount of self-fertilizing occurs as well. Any potato variety can also be propagated vegetatively by planting tubers, pieces of tubers, cut to include at least one or two eyes, or also by cuttings, a practice used in greenhouses for the production of healthy seed tubers.

Some commercial potato varieties do not produce seeds at all (they bear imperfect flowers) and are propagated only from tuber pieces. Confusingly, these tubers or tuber pieces are called "seed potatoes".

After potato plants flower, some varieties will produce small green fruits that resemble green cherry tomatoes, each containing up to 300 true seeds. By finely chopping the fruit and soaking it in water, the seeds will separate from the flesh by sinking to the bottom after about a day (the remnants of the fruit will float). All new potato varieties are grown from seeds, also called "true seed" or "botanical seed" to distinguish it from seed tubers. Potato fruit contains large amounts of the toxic alkaloid solanine, and is therefore unsuitable for consumption.

Origin and history



Potato plant

There is general agreement among contemporary botanists that the potato originated in the Andes, all the way from Colombia and Venezuela to Chile and northern Argentina, but with a concentration of genetic diversity, both in the form of cultivated and wild species, in the area of modern day Peru. The evidence thus far shows that the potato was first cultivated in Peru some 7,000 years ago.

The potatoes cultivated in the Andes are not all the same species. However, the major species grown worldwide is *Solanum tuberosum* (a tetraploid with 48 chromosomes). Modern varieties of this species are the most widely cultivated worldwide. There are also four diploid species (with 24 chromosomes): *Solanum stenotomum*, *Solanum phureja*, *Solanum goniocalyx* and *Solanum ajanhuiri*. There are two triploid species (with 36 chromosomes): *Solanum chaucha* and *Solanum juzepczukii*. There is one pentaploid cultivated species (with 60 chromosomes): *Solanum curtilobum*.

There are two major subspecies of *Solanum tuberosum*: *andigena*, or Andean; and *tuberosum*, or Chilean. The Andean potato is adapted to the short-day conditions prevalent in the mountainous equatorial and tropical regions where it originated. The Chilean potato is adapted to the long-day conditions prevalent in the higher latitude region of southern Chile, especially on Chiloe Island where it is thought to have originated. The Andean *Solanum tuberosum andigena* was the variety first introduced to Europe by way of the Canary Islands and Spain as early as 1700, and dominated European production until a few decades before the Irish Potato Famine, according to recently-published DNA analysis. The same research shows that in the early 19th century, the Chilean *Solanum tuberosum tuberosum*, adapted to long-day growing conditions, was introduced to Europe. It quickly replaced the Andean short-day variety.

Today, over 99% of all cultivated potato varieties worldwide are descendants of the Chilean subspecies.

Historical and genetic evidence suggests that the potato reached India not very much later than Europe, taken there by either the British or the Portuguese. Genetic studies show that all 32 varieties of potato grown in India derive from the Chilean subspecies. The earliest unequivocal reference to the potato in India is in an 1847 British journal.

There are about five thousand potato varieties world wide. Three thousand of them are found in the Andes alone, mainly in Peru, Bolivia, Ecuador, Chile and Colombia. They belong to eight or nine species, depending on the taxonomic school. Apart from the five thousand cultivated varieties, there are about 200 wild species and subspecies, many of which can be cross-bred with cultivated varieties, which has been done repeatedly to transfer resistances to certain pests and diseases from the gene pool of wild species to the gene pool of cultivated potato species.

Potatoes are occasionally referred to as "Irish" potatoes in the English speaking world because in the earliest years, this signified a distinction from sweet potatoes. Potatoes were widely grown in Ireland after they were introduced, but in 1845, potato blight devastated the crop, precipitating the six-year-long Great Irish Famine.

Most modern potatoes grown in North America arrived through European settlement and not independently from the South American sources. However, at least one wild potato species, *Solanum fendleri*, is found as far north as Texas and used in breeding for resistance to a nematode species attacking cultivated potatoes. A secondary center of genetic variability of the potato is Mexico, where important wild species are found that have been used extensively in modern breeding, such as the hexaploid *Solanum demissum*, as a source of resistance to the devastating late blight disease. Another plant native to this region, *Solanum bulbocastanum*, a close relative of the potato, has been used to genetically engineer the potato to effectively resist potato blight.

The potato became an important staple crop in northern Europe as the climate changed due to the Little Ice Age, when traditional crops in this region did not produce as reliably as before. At times when and where most other crops would fail, potatoes could still typically be relied upon to contribute adequately to food supplies during the colder years. The potato was not popular in France during this time, and it is believed that some of the infamous famines could have been lessened if French farmers had adopted it. Today, the potato forms an important part of the traditional cuisines of most of Europe. Belarus has the highest consumption of potato per capita with each Belarusian consuming 338 kg in 2005.

Uses



Various potato dishes.

Potatoes are prepared in many ways: skin-on or peeled, whole or cut up, with seasonings or without. The only requirement involves cooking to break down the starch. Most potato dishes are served hot, but some are first cooked then served cold, notably potato salad and potato chips/crisps.

Common dishes are: mashed potatoes, which are first boiled (usually peeled), and then mashed with milk or yogurt and butter; whole baked potatoes; boiled or steamed potatoes; French-fried potatoes or chips; cut into cubes and roasted; scalloped, diced, or sliced and fried (home fries); grated into small thin strips and fried (hash browns); grated and formed into dumplings, Röstli or potato pancakes. Unlike many foods, potatoes can also be easily cooked in a microwave oven and still retain nearly all of their nutritional value, provided that they are covered in ventilated plastic wrap to prevent moisture from escaping—this method produces a meal very similar to a steamed potato while retaining the appearance of a conventionally baked potato. Potato chunks also commonly appear as a stew ingredient.

Potatoes are boiled between 10 and 25^[16] minutes, depending on size and type, to become soft.

Cultivation



PotatoPlanting
Washington



Potatofield
Fort Fairfield, Maine



Potato farmer in India sitting beside the day's harvest

Potatoes are generally grown from the eyes of another potato and not from seed. Home gardeners often plant a piece of potato with two or three eyes in a hill of mounded soil. Commercial growers plant potatoes as a row crop using seed tubers, young plants or microtubers and may mound the entire row.

At harvest time, gardeners generally dig up potatoes with a long-handled, three-prong "grape" (or graip), i.e. a spading fork, or a potato hook which is similar to the graip, except the tines are at a 90 degree angle to the handle as is the blade of a hoe. In larger plots, the plow can serve as the most expeditious implement for unearthing potatoes. Commercial harvesting is typically done with large potato harvesters which scoop up the plant and the surrounding earth. This is transported up an apron chain consisting of steel links several feet wide, which separates some of the dirt. The chain deposits into an area where further separation occurs. Different designs employ different systems at this point. The most complex designs use vine choppers and shakers, along with a blower system or "Flying Willard" to separate the potatoes from the plant. The result is then usually run past workers who continue to sort out plant material, stones, and rotten potatoes before the potatoes are continuously delivered to a wagon or truck. Further inspection and separation occurs when the potatoes are unloaded from the field vehicles and put into storage.

Correct potato husbandry is an arduous task in the best of circumstances. Good ground preparation, harrowing, plowing, and rolling are always needed, along with a little grace from the weather and a good source of water. Three successive plowings, with associated harrowing and rolling, are desirable before planting. Eliminating all root-weeds is desirable in potato cultivation. Potatoes are the most fruitful of the root crops, but much care and consideration is needed to keep them satisfied and fruitful.

It is important to harvest potatoes before heavy frosts begin, since field frost damages potatoes in the ground, and even cold weather makes potatoes more susceptible to bruising and possibly later rotting which can quickly ruin a large stored crop.

Seed potato crops are 'rogued' in some countries to eliminate diseased plants or those of a different variety from the seed crop.

Storage facilities need to be carefully designed to keep the potatoes alive and slow the natural process of decomposition, which involves the breakdown of starch. It is crucial that the storage area is dark, well ventilated and for long-term storage maintained at temperatures near 40°F (4°C). For short-term storage prior to cooking, temperatures of about 45-50°F (7-10°C) are preferred.^[19] Temperatures below 40°F (4°C) convert potatoes' starch into sugar, which alters their taste and cooking qualities and leads to higher acrylamide levels in the cooked product, especially in deep-fried dishes.

Under optimum conditions possible in commercial warehouses, potatoes can be stored for up to six months, but several weeks is the normal shelf life in homes.^[19] If potatoes develop green areas or start to sprout, these areas should be trimmed before using.^[19]

FAO reports that the world production of potatoes in 2005 was 319 million tonnes. The largest producer, China, accounted for one-fourth of the global output followed by Russia and India.

Role in world food supply

In 2008, several international organizations began to give more emphasis to the potato as a key part of world food production, due to several developing economic problems. They cited the potato's potential for a beneficial role in world food production, owing to its status as a cheap and plentiful crop which can be raised in a wide variety of climates and locales.