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Potato

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*"Irish potato" redirects here. For the confectionery, see [Irish potato candy](#).
For other uses, see [Potato \(disambiguation\)](#).*


The **potato** is a [starchy, tuberous crop](#) from the [perennial *Solanum tuberosum*](#) of the [Solanaceae](#) family (also known as the nightshades). The word potato may refer to the plant itself as well as the edible tuber. In the region of the [Andes](#), there are some other closely related cultivated potato species. Potatoes were first introduced outside the Andes region four centuries ago, and have become an integral part of much of the world's cuisine. It is the world's fourth-largest food crop, following [rice](#), [wheat](#) and [maize](#).^[1] Long-term storage of potatoes requires specialised care in cold warehouses.^[2]

Wild potato species occur throughout [the Americas](#), from the United States to [Uruguay](#).^[3] The potato was originally believed to have been domesticated independently in multiple locations,^[4] but later genetic testing of the wide variety of [cultivars](#) and wild species proved a single [origin](#) for potatoes in the area of present-day southern [Peru](#) and extreme northwestern [Bolivia](#) (from a species in the *Solanum brevicaulum* complex), where they were domesticated 7,000–10,000 years ago.^{[5][6][7]} Following centuries of [selective breeding](#), there are now over a thousand different types of potatoes.^[6] Of these [subspecies](#), a variety that at one point grew in the [Chiloé Archipelago](#) (the potato's south-central [Chilean sub-center of origin](#)) left its [germplasm](#) on over 99% of the cultivated potatoes worldwide.^{[8][9]}

Following the [Spanish conquest](#) of the [Inca Empire](#), the Spanish introduced the potato to Europe in the second half of the 16th century. The staple was subsequently conveyed by European mariners to territories and ports throughout the world. The potato was slow to be adopted by distrustful European farmers, but soon enough it became an important food staple and field crop that played a major role in the European 19th century population boom.^[7] However, lack of genetic diversity, due to the very limited number of varieties initially introduced, left the crop vulnerable to disease. In 1845, a plant disease known as late blight, caused by the fungus-like [oomycete *Phytophthora infestans*](#), spread rapidly through the poorer communities of western Ireland, resulting in the crop failures that led to the [Great Irish Famine](#). Thousands of varieties still persist in the Andes however, where over 100 cultivars might be found in a single valley, and a dozen or more might be maintained by a single agricultural household.^[10] Besides the need of ensuring proper genetic diversity of a crop, it also underscores the need of depending on several staple crops, and to preferably choose staple crops that are [endemic](#) and thus adapted to the local environment.

The annual diet of an average global citizen in the first decade of the 21st century included about 33 kg (73 lb) of potato.^[1] However, the local importance of potato is extremely variable and rapidly changing. It remains an essential crop in Europe (especially eastern and central Europe), where per capita production is still the highest in the world, but the most rapid expansion over the past few decades has occurred in southern and eastern Asia. China is now the world's largest potato-producing country, and nearly a third of the world's potatoes are harvested in China and India.^[11]

Potato



Potato [cultivars](#) appear in a huge variety of colors, shapes, and sizes

Scientific classification

| | |
|-------------|-----------------------------|
| Kingdom: | Plantae |
| (unranked): | Angiosperms |
| (unranked): | Eudicots |
| (unranked): | Asterids |
| Order: | Solanales |
| Family: | Solanaceae |
| Genus: | Solanum |
| Species: | <i>S. tuberosum</i> |

Binomial name

Solanum tuberosum
L.

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Etymology

"Spud" redirects here. For other uses, see [Spud \(disambiguation\)](#).

The English word *potato* comes from Spanish *patata* (the name used in Spain). The [Spanish Royal Academy](#) says the Spanish word is a compound of the [Taino](#) *batata* ([sweet potato](#)) and the [Quechua](#) *papa* (potato).^[12] The name potato originally referred to a type of sweet potato rather than the other way around, although there is actually no close relationship between the two plants. The English confused the two plants one for the other. In many of the chronicles detailing agriculture and plants, no distinction is made between the two.^[13] The 16th-century English herbalist [John Gerard](#) used the terms "bastard potatoes" and "Virginia potatoes" for this species, and referred to sweet potatoes as "common potatoes".^[14] Potatoes are occasionally referred to as "Irish potatoes" or "white potatoes" in the United States, to distinguish them from [sweet potatoes](#).^[14]

The name **spud** for a small potato comes from the digging of soil (or a hole) prior to the planting of potatoes. The word has an unknown origin and was originally (c. 1440) used as a term for a short knife or dagger, probably related to Dutch *spyd* and/or the Latin "spad-" root meaning "sword"; cf. Spanish "espada", English "spade" and "spadroon". The word spud traces back to the 16th century. It subsequently transferred over to a variety of digging tools. Around 1845 it transferred over to the tuber itself.^[15] The origin of "spud" has erroneously been attributed to a 19th century activist group dedicated to keeping the potato out of [Britain](#), calling itself The Society for the Prevention of an Unwholesome Diet.^[15] It was [Mario Pei](#)'s 1949 *The Story of Language* that can be blamed for the [false origin](#). Pei writes, "the potato, for its part, was in disrepute some centuries ago. Some Englishmen who did not fancy potatoes formed a Society for the Prevention of Unwholesome Diet. The initials of the main words in this title gave rise to spud." Like most other pre-20th century [acronymic](#) origins, this one is false.^[15]

Characteristics

Potato plants are herbaceous [perennials](#) that grow about 60 cm (24 in) high, depending on variety, the [culms](#) dying back after flowering. They bear white, pink, red, blue, or purple [flowers](#) with yellow [stamens](#). In general, the tubers of varieties with white flowers have white skins, while those of varieties with colored flowers tend to have pinkish skins.^[16] Potatoes are [cross-pollinated](#) mostly by [insects](#), including [bumblebees](#), which carry pollen from other potato plants, but a substantial amount of self-fertilizing occurs as well. Tubers form in response to decreasing day length, although this tendency has been minimized in commercial varieties.^[17]



Flowers of a potato plant



Монгол
 Nāhuatl
 Nederlands
 Nedersaksisch

日本語
 Nnapulitano
 Norsk (bokmål)
 Norsk (nynorsk)
 Occitan
 Pälzisch

Перем Коми
 Picard
 Plattdüütsch
 Polski
 Português
 Qaraqalpaqsha
 Ripoarisch
 Română
 Runa Simi
 Русиньскый
 Русский
 Саха тыла
 Sámegiella
 Gagana Samoa

Sardu
 Scots
 Seeltersk
 Shqip
 Sicilianu
 Simple English
 Slovenčina
 Slovenščina
 Ślůnski

Српски / Srpski
 Srpskohrvatski /
 Српскохрватски
 Basa Sunda
 Suomi
 Svenska
 Tagalog

lea faka-Tonga
 Türkçe
 Tsetsêhestâhese
 Українська

Tiếng Việt
 Walon
 West-Vlams
 Winaray
 吴语

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

Genetics

There are about five thousand potato varieties worldwide. 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. **Genetically modified** varieties have met public resistance in the United States and in the European Union.^{[18][19]}

The major species grown worldwide is *Solanum tuberosum* (a **tetraploid** with 48 **chromosomes**), and modern varieties of this species are the most widely cultivated. There are also four diploid species (with 24 chromosomes): *S. stenotomum*, *S. phureja*, *S. goniocalyx*, and *S. ajanhuiri*. There are two triploid species (with 36 chromosomes): *S. chaucha* and *S. juzepczukii*. There is one pentaploid cultivated species (with 60 chromosomes): *S. curtilobum*. There are two major subspecies of *Solanum tuberosum*: *andigena*, or Andean; and *tuberosum*, or Chilean.^[20] The Andean potato is adapted to the short-day conditions prevalent in the mountainous equatorial and tropical regions where it originated. The Chilean potato, native to the **Chiloé Archipelago**, is adapted to the long-day conditions prevalent in the higher latitude region of southern Chile.^[21]

The **International Potato Center**, based in **Lima, Peru**, holds an **ISO**-accredited collection of potato **germplasm**.^[22] The international Potato Genome Sequencing Consortium announced in 2009 that they had achieved a draft sequence of the potato genome.^[23] The potato genome contains 12 chromosomes and 860 million base pairs making it a medium-sized plant genome.^[24] More than 99 percent of all current **varieties** of potatoes currently grown are direct descendants of a subspecies that once grew in the **lowlands** of south-central **Chile**.^[25] Nonetheless, genetic testing of the wide variety of **cultivars** and wild species affirms that all potato subspecies derive from a single **origin** in the area of present-day southern **Peru** and extreme northwestern **Bolivia** (from a species in the *Solanum brevicaul*e complex).^{[5][6][7]}

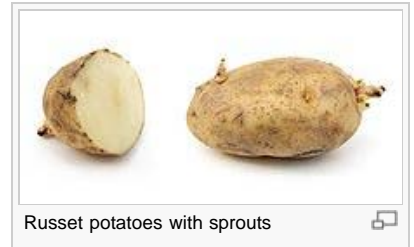
Most modern potatoes grown in North America arrived through European settlement and not independently from the South American sources. However, at least one wild potato species, *Solanum fendleri*, is found as far north as Texas and used in breeding for resistance to a **nematode** species that attacks cultivated potatoes. A secondary center of genetic variability of the potato is Mexico, where important wild species that have been used extensively in modern breeding are found, such as the hexaploid *Solanum demissum*, as a source of resistance to the devastating late blight disease. Another relative native to this region, *Solanum bulbocastanum*, has been used to genetically engineer the potato to resist potato blight.^[26]

Potatoes yield abundantly with little effort, and adapt readily to diverse climates as long as the climate is cool and moist enough for the plants to gather sufficient water from the soil to form the starchy tubers. Potatoes do not keep very well in storage and are vulnerable to molds that feed on the stored tubers, quickly turning them rotten. By contrast, grain can be stored for several years without much risk of rotting.^[27]

History

Domestication

The potato was first domesticated in the region of modern-day southern **Peru** and extreme northwestern **Bolivia**.^[5] This event took place between the years 8000 BC and 5000 BC.^[6]



Russet potatoes with sprouts



Potato plants

粵語
Zazaki
Žemaitėška
中文

South America

In the **Altiplano**, potatoes provided the principal energy source for the **Inca Empire**, its predecessors, and its Spanish successor. In Bolivia and Peru above 10,000 feet altitude, tubers exposed to the cold night air turned into **chuño**;^[28] when kept in permanently frozen underground storehouses, chuño can be stored for years with no loss of nutritional value. The Spanish fed chuño to the silver miners who produced vast wealth in the 16th century for the Spanish government.^[6]

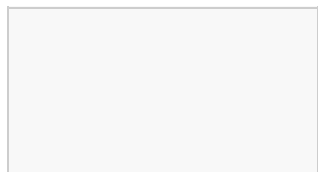
Europe

Sailors returning from the Andes to Spain with silver presumably brought maize and potatoes for their own food on the trip.^[29] Historians speculate that leftover tubers (and maize) were carried ashore and planted: "We think that the potato arrived some years before the end of the 16th century, by two different ports of entry: the first, logically, in Spain around 1570, and the second via the British isles between 1588 and 1593 ... we find traces of the transport of potatoes travelling from the **Canaries** to Antwerp in 1567 ... we can say that the potato was introduced there [the Canary islands] from South America around 1562 ... the first written mention of the potato [is] ... a receipt for delivery dated 28 november 1567 between Las Palmas in the Grand Canaries and Antwerp."^[30] Basque fishermen from Spain used potatoes as ships' stores for their voyages across the Atlantic in the 16th century, and introduced the tuber to western Ireland, where they landed to dry their cod. In 1553, in the book *Crónica del Peru*, **Pedro Cieza de Leon** mentions he saw it in **Quito**, **Popayán**, and **Pasto** in 1538. The English privateer **Sir Francis Drake**, returning from his circumnavigation, or **Sir Walter Raleigh**'s employee **Thomas Harriot**^[31] are commonly credited with introducing potatoes into England. In 1588, botanist Carolus Clusius made a painting of what he called "Papas Peruanorum" from a specimen in the Low Countries; in 1601 he reported that potatoes were in common use in northern Italy for animal fodder and for human consumption.^[32]

The Spanish had an empire across Europe, and brought potatoes for their armies. Peasants along the way adopted the crop, which was less often pillaged by marauding armies than above-ground stores of grain. Across most of northern Europe, where open fields prevailed, potatoes were strictly confined to small garden plots because field agriculture was strictly governed by custom that prescribed seasonal rhythms for plowing, sowing, harvesting and grazing animals on fallow and stubble. This meant that potatoes were barred from large-scale cultivation because the rules allowed only grain to be planted in the open fields.^[33] In France and Germany government officials and noble landowners promoted the rapid conversion of fallow land into potato fields after 1750. The potato thus became an important **staple crop** in northern Europe. Famines in the early 1770s contributed to its acceptance, as did government policies in several European countries and climate change during the **Little Ice Age**, when traditional crops in this region did not produce as reliably as before.^{[34][35]} At times when and where most other crops failed, potatoes could still typically be relied upon to contribute adequately to food supplies during colder years.^[36]

In France, at the end of the 16th century, the potato had been introduced to the Franche-Comté, the Vosges of Lorraine and Alsace. By the end of the 18th century it was written in the 1785 edition of *Bon Jardinier*: "There is no vegetable about which so much has been written and so much enthusiasm has been shown ... The poor should be quite content with this foodstuff."^[37] It had widely replaced the **turnip** and **rutabaga** by the 19th century.^[38]

French physician **Antoine Parmentier** studied the potato intensely and in *Examen chymique des pommes de terres* (Paris, 1774) showed their enormous nutritional value. King **Louis XVI** and his court eagerly promoted the new crop, with Queen **Marie Antoinette** even wearing a headdress of potato flowers at a fancy dress ball. The annual potato crop of France soared to 21 million hectoliters in 1815 and 117 million in 1840, allowing a concomitant growth in population while avoiding the **Malthusian trap**. Although potatoes had become widely familiar in Russia by 1800, they were confined to garden plots until the grain failure in 1838–1839 persuaded peasants and landlords in central and northern Russia to devote their fallow fields to raising potatoes. Potatoes yielded from two to four times more calories per acre than grain did, and eventually came to dominate the food supply in eastern Europe. Boiled or baked potatoes were cheaper than rye bread, just as nutritious, and did not require a gristmill for grinding. On the other hand cash-oriented landlords realized that grain was much easier to ship, store and sell, so both grain and potatoes coexisted.^[39]



Throughout Europe, the most important new food in the 19th century was the potato, which had three major advantages over other foods for the consumer: its lower rate of spoilage, its bulk (which easily satisfied hunger), and its cheapness. The crop slowly spread across Europe, such that, for example, by 1845 it occupied one-third of Irish arable land.^[citation needed] Potatoes comprised about 10% of the caloric intake of



Potato ceramic from the Moche culture, from the Larco Museum Collection.



Antoine Parmentier holding New World plants, François Dumont 1812

Europeans.^[*citation needed*] Along with several other foods that either originated in the Americas or were successfully grown or harvested there, potatoes sustained European populations.^[40]

In Britain, the potato promoted economic development by underpinning the **Industrial Revolution** in the 19th century. It served as a cheap source of calories and nutrients that was easy for urban workers to cultivate on small backyard plots. Potatoes became popular in the north of England, where coal was readily available, so a potato-driven population boom provided ample workers for the new factories. Marxist **Friedrich Engels** even declared that the potato was the equal of iron for its "historically revolutionary role."^[32] The Dutch potato-starch industry grew rapidly in the 19th century, especially under the leadership of entrepreneur Willem Albert Scholten (1819–92).^[41]

In Ireland, the expansion of potato cultivation was due entirely to the landless laborers, renting tiny plots from landowners who were interested only in raising cattle or in producing grain for market. A single acre of potatoes and the milk of a single cow was enough to feed a whole Irish family a monotonous but nutritionally adequate diet for a healthy, vigorous (and desperately poor) rural population. Often even poor families grew enough extra potatoes to feed a pig that they could sell for cash.^[42]

A lack of genetic diversity from the low number of varieties left the crop vulnerable to disease. In 1845, a plant disease known as late blight, caused by the fungus-like *oomycete* *Phytophthora infestans*, spread rapidly through the poorer communities of western Ireland, resulting in the crop failures that led to the **Great Irish Famine**.^[43]

The Lumper potato, widely cultivated in western and southern Ireland before and during the great famine, was bland, wet, and poorly resistant to the potato blight, but yielded large crops and usually provided adequate calories for peasants and laborers. Heavy dependence on this potato led to disaster when the potato blight quickly turned newly harvested potatoes into a putrid mush. The Irish Famine in the western and southern parts of Ireland between 1845–49 was a catastrophic failure in the food supply that led to approximately a million deaths from famine and (especially) diseases that attacked weakened bodies, and to massive emigration to Britain, the U.S., Canada and elsewhere.^[44] During the famine years roughly one million Irish immigrated, this tide was not turned until the 20th century, when Ireland's population stood at less than half of the pre-famine level of 8 million.

Africa

It is generally believed that potatoes entered Africa with colonists, who consumed them as a vegetable rather than as a staple starch.^[45] Shipping records from 1567 show that the first place outside of Central and South America where potatoes were grown were the **Canary Islands**.^[46] As in other continents, despite its advantages as an anti-famine, high-elevation alternative to grain, potatoes were first resisted by local farmers who believed they were poisonous. Colonialists also promoted them as a low cost food and so it was a symbol of domination. In former European colonies of Africa, potatoes were initially consumed only occasionally, but increased production made them a staple in certain areas. Potatoes tended to become more popular in wartime due to them being able to be stored in the ground. In present day Africa they have become a vegetable or co-staple crop.^[45]

In higher regions of Rwanda, potatoes have become a new staple food crop. Prior to the 1994 **Rwandan genocide** consumption was as high as 153 to 200 kg per year — higher than in any Western European country. Recently farmers have developed the potato as a cash crop after introducing several new varieties brought back by migrant laborers from Uganda and other varieties from Kenya.^[45]

Asia

The potato diffused widely after 1600, becoming a major food resource in Europe and East Asia. Following its introduction into China toward the end of the **Ming dynasty**, the potato immediately became a delicacy of the imperial family. After the middle period of the **Qianlong** reign (1735–96), population increases and a subsequent need to increase grain yields coupled with greater peasant geographic mobility led to the rapid spread of potato cultivation throughout China, and it was acclimated to local natural conditions.

Boomgaard (2003) looks at the adoption of various root and tuber crops in Indonesia throughout the colonial period and examines the chronology and reasons for progressive adoption of foreign crops: **sweet potato**, Irish potato, **bengkuang** (**yam beans**), and **cassava**.

The potato was introduced in the Philippines during the late 16th century, and to [Java](#) and China during the 17th century. It was well established as a crop in India by the late 18th century and in Africa by the mid-20th century.^[35]

North America

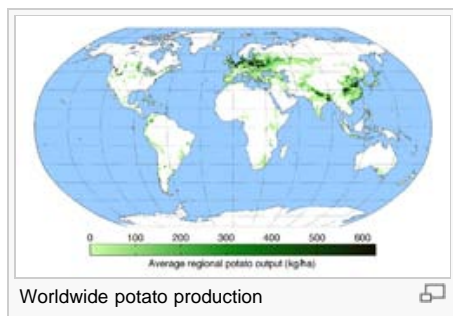
Potatoes were planted in [Idaho](#) as early as 1838; by 1900 the state's production exceeded a million [bushels](#) (about 27,000 [tonnes](#)^[48]). Prior to 1910, the crops were stored in barns or root cellars, but, by the 1920s, potato cellars came into use. U.S. potato production has increased steadily; two-thirds of the crop comes from Idaho, [Washington](#), [Oregon](#), [Colorado](#), and [Maine](#), and potato growers have strengthened their position in both domestic and foreign markets.

By the 1960s, the Canadian Potato Research Centre in [Fredericton, New Brunswick](#), was one of the top six potato research institutes in the world. Established in 1912 as a dominion experimental station, the station began in the 1930s to concentrate on breeding new varieties of disease-resistant potatoes. In the 1950s–1960s, the growth of the french fry industry in New Brunswick led to a focus on developing varieties for the industry. By the 1970s, the station's potato research was broader than ever before, but the station and its research programs had changed, as emphasis was placed on serving industry rather than potato farmers in general. Scientists at the station even began describing their work using engineering language rather than scientific prose.^[49] Potatoes are Canada's most important vegetable crop; they are grown commercially in all its provinces, led by [Prince Edward Island](#).^[50]



Potato harvest in Idaho, circa 1920

Role in world food supply



The United Nations [FAO](#) reports that the world production of potatoes in 2009 was 330 million tonnes.^[51] Just over two thirds of the global production is eaten directly by humans with the rest being fed to animals or used to produce starch. This means that the annual diet of an average global citizen in the first decade of the 21st century included about 33 kg (or 73 lb) of potato.^[1] However, the local

importance of potato is extremely variable and rapidly changing. It remains an essential crop in Europe (especially eastern and central Europe), where per capita production is still the highest in the world, but the most rapid expansion over the past few decades has occurred in southern and eastern Asia. China is now the world's largest potato-producing country, and nearly a third of the world's potatoes are harvested in China and India.^[11] The geographic shift of potato production has been away from wealthier countries toward lower-income areas of the world, although the degree of this trend is ambiguous.^[52]

In 2008, several international organizations highlighted the potato's role in world food production, in the face of developing economic problems. They cited its potential derived from its status as a cheap and plentiful crop that grows in a wide variety of climates and locales.^[53] Due to perishability, only about 5% of the world's potato crop is traded internationally; its minimal presence in world financial markets contributed to its stable pricing during the [2007–2008 world food price crisis](#).^{[54][55]} Thus, the [United Nations](#) officially declared 2008 as the *International Year of the Potato*,^[56] to raise its profile in developing nations, calling the crop a "hidden treasure".^[57] This followed the [International Rice Year](#) in 2004.

Nutrition

The potato contains [vitamins](#) and [minerals](#), as well as an assortment of [phytochemicals](#), such as [carotenoids](#) and natural phenols. [Chlorogenic acid](#) constitutes up to 90% of the potato tuber natural phenols. Others found in potatoes are [4-O-caffeoylquinic acid](#) (crypto-chlorogenic acid), [5-O-caffeoylquinic](#) (neo-chlorogenic acid), [3,4-dicaffeoylquinic](#) and [3,5-dicaffeoylquinic acids](#).^[58] A medium-size 150 g (5.3 oz) potato with the skin

| Top Potato Producers in 2009 | |
|---|------------|
| (million metric tons) | |
| People's Republic of China | 73 |
| India | 34 |
| Russia | 31 |
| Ukraine | 20 |
| United States | 20 |
| Germany | 12 |
| Poland | 10 |
| France | 7 |
| Netherlands | 7 |
| Belarus | 7 |
| World Total | 330 |
| Source: <i>UN Food & Agriculture Organisation (FAO)</i> ^[6] | |

Potato, raw, with skin

| Nutritional value per 100 g (3.5 oz) | |
|--------------------------------------|------------------|
| Energy | 321 kJ (77 kcal) |
| Carbohydrates | 19 g |
| - Starch | 15 g |
| - Dietary fiber | 2.2 g |

provides 27 mg of **vitamin C** (45% of the Daily Value (DV)), 620 mg of **potassium** (18% of DV), 0.2 mg **vitamin B₆** (10% of DV) and trace amounts of **thiamin**, **riboflavin**, **folate**, **niacin**, **magnesium**, **phosphorus**, **iron**, and **zinc**. The fiber content of a potato with skin (2 g) is equivalent to that of many whole grain **breads**, **pastas**, and **cereals**.

In terms of nutrition, the potato is best known for its **carbohydrate** content (approximately 26 grams in a medium potato). The predominant form of this carbohydrate is **starch**. A small but significant portion of this starch is resistant to digestion by **enzymes** in the **stomach** and **small intestine**, and so reaches the **large intestine** essentially intact. This **resistant starch** is considered to have similar physiological effects and health benefits as **fiber**: It provides bulk, offers protection against **colon cancer**, improves **glucose** tolerance and insulin sensitivity, lowers plasma cholesterol and **triglyceride** concentrations, increases satiety, and possibly even reduces fat storage.^{[59][60][61]} The amount of resistant starch in potatoes depends much on preparation methods. Cooking and then cooling potatoes significantly increases resistant starch. For example, cooked **potato starch** contains about 7% resistant starch, which increases to about 13% upon cooling.^[62]

The cooking method used can significantly impact the nutrient availability of the potato.

Potatoes are often broadly classified as high on the **glycemic index** (GI) and so are often excluded from the diets of individuals trying to follow a **low-GI diet**. In fact, the GI of potatoes can vary considerably depending on type (such as red, russet, white, or Prince Edward), origin (where it was grown), preparation methods (i.e., cooking method, whether it is eaten hot or cold, whether it is mashed or cubed or consumed whole, etc.), and with what it is consumed (i.e., the addition of various high-fat or high-protein toppings).^[63]

Potatoes are not considered by the **NHS** as counting towards the **five portions of fruit and vegetables** diet.^[64]

Comparison to other major staple foods

The following table shows the nutrient content of potato and other major staple foods, each in respective raw form. Raw staples, however, aren't edible and can not be digested. These must be sprouted, or prepared and cooked for human consumption. In sprouted and cooked form, the relative nutritional and anti-nutritional contents of each of these grains is remarkably different from that of raw form of these grains reported in this table. The nutritional value of potato and each cooked staple depends on the pre-processing and the method of cooking: boiling, frying, roasting, baking, etc.

 Nutrient content of major staple foods^[65]

| STAPLE: | Maize / Corn ^[A] | Rice ^[B] | Wheat ^[C] | Potato ^[D] | Cassava ^[E] | Soybean ^[F] | Sweet potato ^[G] | Sorghum ^[H] | Yam ^[Y] | Plantain ^[Z] |
|------------------------------|-----------------------------|---------------------|----------------------|-----------------------|------------------------|------------------------|-----------------------------|------------------------|--------------------|-------------------------|
| Component (per 100g portion) | Amount | Amount | Amount | Amount | Amount | Amount | Amount | Amount | Amount | Amount |
| Water (g) | 76 | 12 | 11 | 79 | 60 | 68 | 77 | 9 | 70 | 65 |
| Energy (kJ) | 360 | 1528 | 1419 | 322 | 670 | 615 | 360 | 1419 | 494 | 511 |
| Protein (g) | 3.2 | 7.1 | 13.7 | 2.0 | 1.4 | 13.0 | 1.6 | 11.3 | 1.5 | 1.3 |
| Fat (g) | 1.18 | 0.66 | 2.47 | 0.09 | 0.28 | 6.8 | 0.05 | 3.3 | 0.17 | 0.37 |
| Carbohydrates (g) | 19 | 80 | 71 | 17 | 38 | 11 | 20 | 75 | 28 | 32 |
| Fiber (g) | 2.7 | 1.3 | 10.7 | 2.2 | 1.8 | 4.2 | 3 | 6.3 | 4.1 | 2.3 |
| Sugar (g) | 3.22 | 0.12 | 0 | 0.78 | 1.7 | 0 | 4.18 | 0 | 0.5 | 15 |
| Calcium (mg) | 2 | 28 | 34 | 12 | 16 | 197 | 30 | 28 | 17 | 3 |
| Iron (mg) | 0.52 | 4.31 | 3.52 | 0.78 | 0.27 | 3.55 | 0.61 | 4.4 | 0.54 | 0.6 |
| Magnesium (mg) | 37 | 25 | 144 | 23 | 21 | 65 | 25 | 0 | 21 | 37 |
| Phosphorus (mg) | 89 | 115 | 508 | 57 | 27 | 194 | 47 | 287 | 55 | 34 |
| Potassium (mg) | 270 | 115 | 431 | 421 | 271 | 620 | 337 | 350 | 816 | 499 |
| Sodium (mg) | 15 | 5 | 2 | 6 | 14 | 15 | 55 | 6 | 9 | 4 |

| | |
|-----------------------------------|----------------|
| Fat | 0.1 g |
| Protein | 2 g |
| Water | 75 g |
| Vitamin A equiv. | 0 μg (0%) |
| Thiamine (vit. B ₁) | 0.08 mg (7%) |
| Riboflavin (vit. B ₂) | 0.03 mg (3%) |
| Niacin (vit. B ₃) | 1.05 mg (7%) |
| Vitamin B ₆ | 0.295 mg (23%) |
| Folate (vit. B ₉) | 16 μg (4%) |
| Vitamin C | 19.7 mg (24%) |
| Vitamin E | 0.01 mg (0%) |
| Vitamin K | 1.9 μg (2%) |
| Calcium | 12 mg (1%) |
| Iron | 0.78 mg (6%) |
| Magnesium | 23 mg (6%) |
| Phosphorus | 57 mg (8%) |
| Potassium | 421 mg (9%) |
| Sodium | 6 mg (0%) |
| Zinc | 0.29 mg (3%) |

Percentages are relative to **US recommendations** for adults.
Source: *USDA Nutrient Database*

| | | | | | | | | | | |
|----------------------------------|------------|-------------|-------------|------|------|-------------|--------------|------|-------------|------|
| Zinc (mg) | 0.45 | 1.09 | 4.16 | 0.29 | 0.34 | 0.99 | 0.3 | 0 | 0.24 | 0.14 |
| Copper (mg) | 0.05 | 0.22 | 0.55 | 0.11 | 0.10 | 0.13 | 0.15 | - | 0.18 | 0.08 |
| Manganese (mg) | 0.16 | 1.09 | 3.01 | 0.15 | 0.38 | 0.55 | 0.26 | - | 0.40 | - |
| Selenium (mcg) | 0.6 | 15.1 | 89.4 | 0.3 | 0.7 | 1.5 | 0.6 | 0 | 0.7 | 1.5 |
| Vitamin C (mg) | 6.8 | 0 | 0 | 19.7 | 20.6 | 29 | 2.4 | 0 | 17.1 | 18.4 |
| Thiamin (mg) | 0.20 | 0.58 | 0.42 | 0.08 | 0.09 | 0.44 | 0.08 | 0.24 | 0.11 | 0.05 |
| Riboflavin (mg) | 0.06 | 0.05 | 0.12 | 0.03 | 0.05 | 0.18 | 0.06 | 0.14 | 0.03 | 0.05 |
| Niacin (mg) | 1.70 | 4.19 | 6.74 | 1.05 | 0.85 | 1.65 | 0.56 | 2.93 | 0.55 | 0.69 |
| Pantothenic acid (mg) | 0.76 | 1.01 | 0.94 | 0.30 | 0.11 | 0.15 | 0.80 | - | 0.31 | 0.26 |
| Vitamin B6 (mg) | 0.06 | 0.16 | 0.42 | 0.30 | 0.09 | 0.07 | 0.21 | - | 0.29 | 0.30 |
| Folate Total (mcg) | 46 | 231 | 43 | 16 | 27 | 165 | 11 | 0 | 23 | 22 |
| Vitamin A (IU) | 208 | 0 | 0 | 2 | 13 | 180 | 14187 | 0 | 138 | 1127 |
| Vitamin E, alpha-tocopherol (mg) | 0.07 | 0.11 | 0 | 0.01 | 0.19 | 0 | 0.26 | 0 | 0.39 | 0.14 |
| Vitamin K (mcg) | 0.3 | 0.1 | 0 | 1.9 | 1.9 | 0 | 1.8 | 0 | 2.6 | 0.7 |
| Beta-carotene (mcg) | 52 | 0 | 0 | 1 | 8 | 0 | 8509 | 0 | 83 | 457 |
| Lutein+zeaxanthin (mcg) | 764 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 30 |
| Saturated fatty acids (g) | 0.18 | 0.18 | 0.45 | 0.03 | 0.07 | 0.79 | 0.02 | 0.46 | 0.04 | 0.14 |
| Monounsaturated fatty acids (g) | 0.35 | 0.21 | 0.34 | 0.00 | 0.08 | 1.28 | 0.00 | 0.99 | 0.01 | 0.03 |
| Polyunsaturated fatty acids (g) | 0.56 | 0.18 | 0.98 | 0.04 | 0.05 | 3.20 | 0.01 | 1.37 | 0.08 | 0.07 |

A corn, sweet, yellow, raw

C wheat, durum

E cassava, raw

G sweetpotato, raw, unprepared

Y yam, raw

B rice, white, long-grain, regular, raw

D potato, flesh and skin, raw

F soybeans, green, raw

H sorghum, raw

Z plantains, raw

Toxicity

Potatoes contain toxic compounds known as **glycoalkaloids**, of which the most prevalent are **solanine** and **chaconine**. Solanine is also found in other plants in the family **Solanaceae**, which includes such plants as the deadly nightshade (*Atropa belladonna*), henbane (*Hyoscyamus niger*) and tobacco (*Nicotiana*) as well as the potato, eggplant, and **tomato**. This toxin affects the nervous system, causing weakness and confusion.

These compounds, which protect the plant from its predators, are, in general, concentrated in its leaves, stems, sprouts, and fruits.^[66] Exposure to light, physical damage, and age increase glycoalkaloid content within the tuber;^[67] the highest concentrations occur just underneath the skin. Cooking at high temperatures (over 170 °C or 340 °F) partly destroys these. The concentration of glycoalkaloid in wild potatoes suffices to produce toxic effects in humans.

Glycoalkaloids may cause **headaches**, **diarrhea**, **cramps**, and in severe cases **coma** and death; however, poisoning from potatoes occurs very rarely. Light exposure causes greening from **chlorophyll** synthesis, thus giving a visual clue as to areas of the tuber that may have become more toxic; however, this does not provide a definitive guide, as greening and glycoalkaloid accumulation can occur independently of each other. Some varieties of potato contain greater glycoalkaloid concentrations than others; breeders developing new varieties test for this, and sometimes have to discard an otherwise promising **cultivar**.



Early Rose variety seed tuber with sprouts

Breeders try to keep solanine levels below 200 mg/kg (200 ppmw). However, when these commercial varieties turn green, even they can approach concentrations of solanine of 1000 mg/kg (1000 ppmw). In normal potatoes, analysis has shown solanine levels may be as little as 3.5% of the breeders' maximum, with 7–187 mg/kg being found.^[68] While a normal potato has 12–20 mg/kg of glycoalkaloid content, a green tuber contains 250–280 mg/kg, and green skin 1500–2200 mg/kg.^[69]

The U.S. National Toxicology Program suggests that the average American consume at most 12.5 mg/day of solanine from potatoes (the toxic dose is actually several times this, depending on body weight). Douglas L. Holt, the State Extension Specialist for Food Safety at the [University of Missouri](#), notes that no reported cases of potato-source solanine poisoning have occurred in the U.S. in the last 50 years, and most cases involved eating green potatoes or drinking potato-leaf tea.^[citation needed]

Growth and cultivation

Potatoes are generally grown from seed potatoes - these are tubers specifically grown to be disease free and provide consistent and healthy plants. To be disease free, the areas where seed potatoes are grown are selected with care. In the USA this restricts production of seed potatoes to only 15 states out of the 50 states that grow potatoes.^[70] These locations are selected for their cold hard winters that kill pests and long sunshine hours in the summer for optimum growth. In the UK, most seed potatoes originate in [Scotland](#) in areas where westerly winds prevent aphid attack and thus prevent spread of potato [virus pathogens](#).^[71] Potato growth has been divided into five phases. During the first phase, sprouts emerge from the seed potatoes and root growth begins. During the second, [photosynthesis](#) begins as the plant develops leaves and branches. In the third phase [stolons](#) develop from lower leaf [axils](#) on the stem and grow downwards into the ground and on these stolons new tubers develop as swellings of the stolon. This phase is often (but not always) associated with flowering. Tuber formation halts when soil temperatures reach 80 °F (26.7 °C); hence potatoes are considered a cool-season crop.^[72] Tuber bulking occurs during the fourth phase, when the plant begins investing the majority of its resources in its newly formed tubers. At this stage, several factors are critical to yield: optimal soil moisture and temperature, soil nutrient availability and balance, and resistance to pest attacks. The final phase is maturation: The plant canopy dies back, the tuber skins harden, and their sugars convert to starches.^[73]

New tubers may arise at the soil surface. Since exposure to light leads to greening of the skins and the development of solanine, growers are interested in covering such tubers. Commercial growers usually address this problem by piling additional soil around the base of the plant as it grows ("hilling", or in British English "earthing up"). An alternative method used by home gardeners and smaller-scale growers involves covering the growing area with organic [mulches](#) such as straw or with plastic sheets.^[73]

Correct potato husbandry can be an arduous task in some 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. In general, the potatoes themselves are 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. Seed potato crops are 'rogued' in some countries to eliminate diseased plants or those of a different variety from the seed crop.

Potatoes are sensitive to heavy [frosts](#), which damage them in the ground. Even cold weather makes potatoes more susceptible to bruising and possibly later rotting, which can quickly ruin a large stored crop.



The [toxic](#) fruits produced by mature potato plants



Potato planting in [Washington](#)



Potato field in [Fort Fairfield, Maine](#)



Potatoes grown in a tall bag are common in gardens as they increase potato yield and minimize the amount of digging required at harvest

At harvest time, gardeners usually 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 but with tines at a 90 degree angle to the handle. In larger plots, the plow is the fastest implement for unearthing potatoes. Commercial harvesting is typically done with large potato harvesters, which scoop up the plant and 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 use 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.

Immature potatoes may be sold as "new potatoes" and are particularly valued for taste. These are often harvested by the home gardener or farmer by "grabbling", i.e. pulling out the young tubers by hand while leaving the plant in place.

Potatoes are usually cured after harvest to improve skin-set. Skin-set is the process by which the skin of the potato becomes resistant to skinning damage. Potato tubers may be susceptible to skinning at harvest and suffer skinning damage during harvest and handling operations. Curing allows the skin to fully set and any wounds to heal. Wound-healing prevents infection and water-loss from the tubers during storage. Curing is normally done at relatively warm temperatures 50 °C (122 °F) to 60 °C (140 °F) with high humidity and good gas-exchange if at all possible.^[74]

Storage

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 4 °C (39 °F). For short-term storage before cooking, temperatures of about 7 °C (45 °F) to 10 °C (50 °F) are preferred.^{[2][75]}

On the other hand, temperatures below 4 °C (39 °F) 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 — the discovery of acrylamides in starchy foods in 2002 has led to many international health concerns as they are believed to be possible carcinogens and their occurrence in cooked foods are currently under study as possible influences in potential health problems.^{[76][77]}

Under optimum conditions possible in commercial warehouses, potatoes can be stored for up to ten to twelve months.^[2] When stored in homes, the shelf life is usually only a few weeks.^[75] If potatoes develop green areas or start to sprout, these areas should be trimmed before using.^[75] Trimming or peeling green areas are inadequate to remove copresent toxins, and such potatoes are no longer suitable as animal food.^{[78][79]}

Commercial storage of potatoes involves several phases: drying of surface moisture; a wound healing phase at 85% to 95% [relative humidity](#) and temperatures below 25 °C (77 °F); a staged cooling phase; a holding phase; and a reconditioning phase, during which the tubers are slowly warmed. Mechanical ventilation is used at various points during the process to prevent condensation and accumulation of [carbon dioxide](#).^[2]

When stored in the home, mature potatoes are optimally kept at room temperature, where they last 1 to 2 weeks in a paper bag, in a dry, cool, dark, well ventilated location.^[80] If mature potatoes are refrigerated, dark spots can occur and conversion of starch into sugar can give rise to an unpleasant sweet flavour when cooked.^[80] Only new potatoes can be refrigerated, and should be kept so, where they have a shelf life of 1 week.^[80] If kept in too warm a temperature, both mature and new potatoes will sprout and shrivel.^[80] Exposure to light causes them to turn green. Also, potatoes absorb odours produced by [pears](#).^[80]

Yields

The world dedicated 18.6 million hectares in 2010 for potato cultivation. The average world farm yield for potato was 17.4 tonnes per hectare, in 2010.

Potato farms in the [United States](#) were the most productive in 2010, with a nationwide average of 44.3 tonnes per hectare.^[81] [United Kingdom](#) was a close second.

[New Zealand](#) farmers have demonstrated some of the best commercial yields in the world, ranging between 60 to 80 tonnes per hectare, some reporting yields of 88 tonnes potatoes per hectare.^{[82][83][84]}

There is a big gap among various countries between high and low yields, even with the same variety of potato. Average potato yields in developed economies ranges between 38-44 tonnes per hectare. The two largest producers of potato, [China](#) and [India](#) which accounted for over a third of world's production in 2010, had yields of 14.7 and 19.9 tonnes per hectare respectively.^[81] The yield gap between farms in developing economies and developed economies represents an opportunity loss of over 400 million tonnes of potato, or an amount greater than 2010 world potato production. Potato crop yields are determined by factors such as the crop breed, seed age and quality, crop management practices and the plant

environment. Improvements in one or more of these yield determinants, and a closure of the yield gap, can be a major boost to food supply and farmer incomes in the developing world.^{[85][86]}

Indian farmer from Bihar have created World record by harvesting 72.9 tonnes/hectare of potato.^[87]

Varieties

While there are close to 4000 different varieties of potato,^[88] it has been bred into many standard or well-known varieties, each of which has particular agricultural or culinary attributes. In general, varieties are categorized into a few main groups, such as russets, reds, whites, yellows (also called Yukons) and purples—based on common characteristics. Around 80 varieties are commercially available in the UK.^[89] For culinary purposes, varieties are often described in terms of their waxiness. Floury, or mealy (baking) potatoes have more starch (20–22%) than waxy (boiling) potatoes (16–18%). The distinction may also arise from variation in the comparative ratio of two potato starch compounds: **amylose** and **amylopectin**. Amylose, a long-chain molecule, diffuses out of the starch granule when cooked in water, and lends itself to dishes where the potato is mashed. Varieties that contain a slightly higher amylopectin content, a highly branched molecule, help the potato retain its shape when boiled.^[90]

The **European Cultivated Potato Database** (ECPD) is an online collaborative database of potato variety descriptions, updated and maintained by the Scottish Agricultural Science Agency within the framework of the European Cooperative Programme for Crop Genetic Resources Networks (ECP/GR)—which is organised by the International Plant Genetic Resources Institute (IPGRI).^[91]

Popular varieties (**cultivars**) include:

- **Adirondack Blue**
- **Adirondack Red**
- **Agata**
- **Almond**
- **Apline**
- **Alturas**
- **Amandine**
- **Annabelle**
- **Anya**
- **Arran Victory**
- **Atlantic**
- **Avalanche**
- **Bamberg**
- **Bannock Russet**
- **Belle de Fontenay**
- **BF-15**
- **Bildtstar**
- **Bintje**
- **Blazer Russet**
- **Blue Congo**
- **Bonnotte**
- **British Queens**
- **Cabritas**
- **Camota**
- **Canela Russet**
- **Cara**
- **Carola**
- **Chelina**
- **Chiloé**^[92]
- **Cielo**
- **Clavela Blanca**
- **Désirée**
- **Estima**
- **Fianna**
- **Fingerling**
- **Flava**
- **German Butterball**
- **Golden Wonder**
- **Goldrush**
- **Home Guard**
- **Innovator**
- **Irish Cobbler**
- **Jersey Royal**
- **Kennebec**
- **Kerr's Pink**
- **Kestrel**
- **Keuka Gold**
- **King Edward**
- **Kipfler**
- **Lady Balfour**
- **Langlade**
- **Linda**
- **Marcy**
- **Marfona**
- **Maris Piper**
- **Marquis**
- **Megachip**
- **Monalisa**
- **Nicola**
- **Pachacoña**
- **Pike**
- **Pink Eye**
- **Pink Fir Apple**
- **Primura**
- **Ranger Russet**
- **Ratte**
- **Record**
- **Red LaSoda**
- **Red Norland**
- **Red Pontiac**
- **Rooster**
- **Russet Burbank**
- **Russet Norkotah**
- **Selma**
- **Shepody**
- **Sieglinde**
- **Silverton Russet**
- **Sirco**
- **Snowden**
- **Spunta**
- **Up to date**
- **Stobrawa**
- **Superior**
- **Vivaldi**
- **Vitelotte**
- **Yellow Finn**
- **Yukon Gold**



Bamberg potatoes



Organically grown Russet Burbanks

Blue varieties

The **blue potato** (or **purple potato**) originated in South America. It has purple skin and flesh, which becomes blue once cooked. It has a slight whitish scab that seems to be present in all samples. The variety, called "Cream of the Crop", has been introduced into Ireland and has proved popular.^[93]

A mutation in the varieties' **P locus** causes production of the **antioxidant anthocyanin**.^[94]

Genetically-modified varieties

Genetic research has produced several **genetically modified** varieties. 'New Leaf', owned by **Monsanto Company**, incorporates genes from *Bacillus thuringiensis*, which confers resistance to the **Colorado potato beetle**; 'New Leaf Plus' and 'New Leaf Y', approved by US regulatory agencies during the 1990s, also include resistance to viruses. **McDonald's**, **Burger King**, **Frito-Lay**, and **Procter & Gamble** announced they would not use genetically modified potatoes, and Monsanto published its intent to discontinue the line in March 2001.^[95] The starch content of 'Amflora', a **waxy potato variety** from the German chemical company **BASF**, has been modified to contain only **amylopectin**, making it inedible but more useful for industrial purposes. In 2010, the European Commission cleared the way for 'Amflora' to be grown in the European Union. Nevertheless, under EU rules, individual countries have the right to decide whether they will allow this potato to be grown on their territory. Commercial planting of 'Amflora' was expected in the Czech Republic and Germany in the spring of 2010, and Sweden and the Netherlands in subsequent years.^[96] Another GM potato variety developed by BASF is '**Fortuna**' which is resistant to **late blight**.^[97] In 2010, a team of Indian scientists announced they had developed a genetically modified potato with 35 to 60% more protein than non-modified potatoes. Protein content was boosted by adding the gene AmA1 from the grain **amaranth**. They also found 15 to 25% greater crop yields with these potatoes.^[98] The researchers expected that a key market for the GM potato would be the developing world, where more than a billion people are chronically undernourished.^[99]

New non-GM varieties

Other new potato cultivars are conventionally bred. For example, on 22 September 2007, **Benguet State University** (BSU) announced that four potato varieties—'Igorota', 'Solibao', 'Ganza' and one not yet officially named—possess more than 18% **dry matter** content required by **fast-food** chains to make crispy and sturdy **French fries**.^[100] Since 2005, a natural 100% amylopectin waxy potato variety called 'Eliane' is being cultivated by the starch company **AVEBE**.

Some horticulturists sell **chimeras**, made by grafting a tomato plant onto a potato plant, producing both edible tomatoes and potatoes. This practice is not very widespread.

Pests

Main article: [List of potato diseases](#)

The historically significant *Phytophthora infestans* (late blight) remains an ongoing problem in Europe^[101] and the United States.^[102] Other potato diseases include *Rhizoctonia*, *Sclerotinia*, **black leg**, **powdery mildew**, **powdery scab**, **leafroll virus**, and **purple top**.

Insects that commonly transmit potato diseases or damage the plants include the **Colorado potato beetle**, the **potato tuber moth**, the green peach aphid (*Myzus persicae*), the potato aphid, beetlehoppers, **thrips**, and **mites**. The **potato root nematode** is a microscopic worm that thrives on the roots, thus causing the potato plants to wilt. Since its eggs can survive in the soil for several years, **crop rotation** is recommended.

Pesticides

During the crop year 2008, many of the **certified organic** potatoes produced in the United Kingdom and certified by the **Soil Association** as organic were sprayed with a **copper pesticide**^[103] to control potato blight (*Phytophthora infestans*).^[104] According to the Soil Association, the total copper that can be applied to organic land is 6 kg/ha/year.^[105]

According to an **Environmental Working Group** analysis^[106] of USDA and FDA pesticide residue tests performed from 2000 through 2008, 84% of the 2,216 tested potato samples contained detectable traces of at least one pesticide. A total of 36 unique pesticides were detected on potatoes over the 2,216 samples, though no individual sample contained more than 6 unique pesticide traces, and the average was 1.29 detectable unique pesticide traces per sample. The average quantity of all pesticide traces found in the 2,216 samples was 1.602 **ppm**. While this is a very low value of pesticide



Potato variety "Blue Swede"



A potato ruined by late blight

residue, it is the highest amongst the 50 vegetables analyzed.

Health

Due to carbohydrate content, potatoes are considered to make a person obese if used in excess i.e. more than **RDA** of carbohydrates and fats. However, research by the University of California, Davis and the National Center for Food Safety and Technology, Illinois Institute of Technology demonstrates that people can include potatoes in their diet and still lose weight.^[107]

Uses

- Potatoes are used to brew alcoholic beverages such as **vodka**, **potcheen**, or **akvavit**.
- They are also used as food for domestic animals.
- **Potato starch** is used in the food industry as, for example, thickeners and binders of soups and sauces, in the textile industry, as adhesives, and for the manufacturing of papers and boards.^{[108][109]}
- **Maine** companies are exploring the possibilities of using waste potatoes to obtain **polylactic acid** for use in plastic products; other research projects seek ways to use the starch as a base for **biodegradable** packaging.^{[109][110]}
- Potato skins, along with honey, are a folk remedy for burns in India. Burn centers in India have experimented with the use of the thin outer skin layer to protect burns while healing.^{[111][112]}

Culinary uses

Potatoes are prepared in many ways: skin-on or peeled, whole or cut up, with seasonings or without. The only requirement involves cooking to swell the starch granules. 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**; **scaloped**, diced, or sliced and fried (home fries); grated into small thin strips and fried (hash browns); grated and formed into dumplings, **Rösti** 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 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^[113] minutes, depending on size and type, to become soft.

Latin America

Peruvian cuisine naturally contains the potato as a primary ingredient in many dishes, as around 3,000 varieties of this tuber are grown there.^[114] Some of the more notable dishes include boiled potato as a base for several dishes or with **ají**-based sauces like in **papa a la huancaína** or *ocopa*, diced potato for its use in soups like in *cau cau*, or in **Carapulca** with dried potato (*papa seca*). Smashed conditioned potato is used in *causa Limeña* and **papa rellena**. French-fried potatoes are a typical ingredient in Peruvian stir-fries, including the classic dish **lomo saltado**.

Chuño is a **freeze-dried** potato product traditionally made by **Quechua** and **Aymara** communities of **Peru** and **Bolivia**,^[115] and is known in various countries of South America, including **Peru**, **Bolivia**, **Argentina**, and **Chile**. In Chile's **Chiloé Archipelago**, potatoes are the main ingredient of many dishes, including *milcaos*, *chapaleles*, **curanto** and *chochoca*. In **Ecuador**, the potato, as well as being a staple with most dishes, is featured in the hearty *locro de papas*, a thick soup of potato, squash, and cheese.

European cuisine

In the UK, potatoes form part of the traditional staple **fish and chips**. Roast potatoes are commonly served with a **Sunday roast**, and mashed potatoes form a major component of several other traditional dishes such as **shepherd's pie**,



Various potato dishes



Papa rellena

[bubble and squeak](#), and [bangers and mash](#). New potatoes are often cooked with [mint](#) and served with a little melted butter.

The [Tattie scone](#) is a popular Scottish dish containing potatoes. [Colcannon](#) is a traditional Irish food made with mashed potato, shredded [kale](#) or cabbage, and onion; [champ](#) is a similar dish. [Boxty](#) pancakes are eaten throughout Ireland, although associated especially with the north, and in Irish diaspora communities; they are traditionally made with grated potatoes, soaked to loosen the starch and mixed with flour, buttermilk and baking powder. A variant eaten and sold in [Lancashire](#), especially [Liverpool](#), is made with cooked and mashed potatoes.

[Bryndzové halušky](#) is the [Slovakian](#) national dish, made of a batter of flour and finely grated potatoes that is boiled to form dumplings. These are then mixed with regionally varying ingredients.^[116]

In [Northern](#) and [Eastern Europe](#), especially in [Scandinavian countries](#), Poland, Russia, [Belarus](#) and [Ukraine](#), newly harvested, early ripening varieties are considered a special delicacy. Boiled whole and served un-peeled with [dill](#), these "new potatoes" are traditionally consumed with [Baltic herring](#). Puddings made from grated potatoes ([kugel](#), [kugelis](#), and [potato babka](#)) are popular items of [Ashkenazi](#), [Lithuanian](#), and [Belarussian](#) cuisine.^[117]

In [Western Europe](#), especially in Belgium, sliced potatoes are fried to create [friteten](#), the original [French fried potatoes](#). [Stamppot](#), a traditional [Dutch](#) meal, is based on mashed potatoes mixed with vegetables.

In France, the most notable potato dish is the [Hachis Parmentier](#), named after [Antoine-Augustin Parmentier](#), a French pharmacist, nutritionist, and agronomist who, in the late 18th century, was instrumental in the acceptance of the potato as an edible crop in the country. The [pâté aux pommes de terre](#) is a regional potato dish from the central [Allier](#) and [Limousin](#) regions.

In the north of Italy, in particular, in the [Friuli](#) region of the northeast, potatoes serve to make a type of pasta called [gnocchi](#).^[118] Similarly, cooked and mashed potatoes or [potato flour](#) can be used in the [Knödel](#) or [dumpling](#) eaten with or added to meat dishes all over central and Eastern Europe, but especially in [Bavaria](#) and [Luxembourg](#). Potatoes form one of the main ingredients in many soups such as the [vichyssoise](#) and Albanian potato and cabbage soup. In western Norway, [komle](#) is popular.

A traditional [Canary Islands](#) dish is [Canarian wrinkly potatoes](#) or [papas arrugadas](#). [Tortilla de patatas](#) (potato omelete) and [patatas bravas](#) (a dish of fried potatoes in a spicy tomato sauce) are near-universal constituent of Spanish [tapas](#).

North America

In the United States, potatoes have become one of the most widely consumed crops and thus have a variety of preparation methods and condiments. [French fries](#) and often [hash browns](#) are commonly found in typical American fast-food burger joints and cafeterias. One popular favorite involves a baked potato with cheddar cheese (or sour cream and chives) on top, and in [New England](#) "smashed potatoes" (a chunkier variation on mashed potatoes, retaining the peel) have great popularity. Potato flakes are popular as an instant variety of mashed potatoes, which reconstitute into mashed potatoes by adding water, with butter or oil and salt to taste. A regional dish of [Central New York](#), [salt potatoes](#) are bite-size new potatoes boiled in water saturated with salt then served with melted butter. At more formal dinners, a common practice includes taking small red potatoes, slicing them, and roasting them in an iron skillet. Among [American Jews](#), the practice of eating [latkes](#) (fried potato pancakes) is common during the festival of [Hanukkah](#).

A traditional [Acadian](#) dish from [New Brunswick](#) is known as *poutine râpée*. The Acadian poutine is a ball of grated and [mashed potato](#), salted, sometimes filled with [pork](#) in the center, and boiled. The result is a moist ball about the size of a [baseball](#). It is commonly eaten with salt and pepper or [brown sugar](#). It is believed to have originated from the German [Klöße](#), prepared by early German settlers who lived among the Acadians.



Fish and chips



A baked potato served with butter



French fries served with a hamburger



Poutine, by contrast, is a hearty serving of French fries, fresh [cheese curds](#) and hot gravy. Tracing its origins to [Quebec](#) in the 1950s, it has become a widespread and popular dish throughout Canada.

Poutine: Fried potatoes, cheese curds, and gravy

Indian Subcontinent

In India, the most popular potato dishes are *aloo ki sabzi*, [batata vada](#), and [samosa](#), which is spicy mashed potato mixed with a small amount of vegetable stuffed in conical dough, and deep fried. Potatoes are also a major ingredient as fast food items, such as aloo chaat, where they are deep fried and served with chutney. In Northern India, alu dum and alu paratha are a favorite part of the diet; the first is a spicy curry of boiled potato, the second is a type of stuffed chapati.

A dish called masala dosa from South India is very notable all over India. It is a thin pancake of rice and pulse paste rolled over spicy smashed potato and eaten with sambhar and chutney. Poori in south India in particular in Tamil Nadu is almost always taken with smashed potato masal. Other favorite dishes are alu tikki and pakoda items.



Potato Bhaaji (Spicy Indian potatoes)

[Vada pav](#) is a popular vegetarian fast food dish in Mumbai and other regions in the Maharashtra in India.

Aloo posto (a curry with potatoes and poppy seeds) is immensely popular in East India, especially Bengal. Although potatoes are not native to India, it has become a vital part of food all over the country especially North Indian food preparations. In Tamil Nadu this tuber acquired a name based on its appearance 'urulai-k-kizhangu' () meaning cylindrical tuber.

East Asia

In [East Asia](#), particularly [Southeast Asia](#), rice is by far the predominant starch crop, with potatoes a secondary crop, especially in China and Japan. However, it is used in northern China where rice is not easily grown, with a popular dish being [青椒土豆丝](#) (qīng jiāo t dòu sī), made with green pepper, vinegar and a thin slices of potato. In the winter, roadside sellers in northern China will also sell roasted potatoes. It is also occasionally seen in Korean and Thai cuisines.^[119]

Art

The potato has been an essential crop in the [Andes](#) since the [pre-Columbian Era](#). The [Moche](#) culture from Northern [Peru](#) made ceramics from earth, water, and fire. This pottery was a sacred substance, formed in significant shapes and used to represent important themes. Potatoes are represented anthropomorphically as well as naturally.^[120]

During the late 19th century, numerous images of potato harvesting appeared in European art, including the works of [Willem Witsen](#) and [Anton Mauve](#).^[121] [Van Gogh](#)'s 1885 painting "[The Potato Eaters](#)" portrays a family eating potatoes.^[122]

Invented in 1949 and marketed and sold commercially by [Hasbro](#) in 1952, [Mr. Potato Head](#) is an American toy that consists of a plastic potato and attachable plastic parts such as ears and eyes to make a face. It was the first toy ever advertised on television.^[123]






































See also

- List of potato museums
- New World crops
- Potato battery
- Potatoes of Chiloé
- Loy, a form of early spade used in [Ireland](#) for the cultivation of potatoes.

Notes

- ↑ ^{***a b c***} "International Year of the Potato 2008 - The potato" . United Nations Food and Agricultural Organisation. 2009. Retrieved 2011-10-26.
- ↑ ^{***a b c d***} Potato storage, value Preservation: Kohli, Pawanexh (2009). "[Potato storage and value Preservation: The Basics](#)" . Crosstree Techno-visors.
- ↑ Hijmans, RJ; DM Spooner (2001). "[Geographic](#) *J. Nutr.* **75** (5): 733–47. doi:10.1079/BJN19960177 . PMID 8695600 .
- ↑ Hylla S, Gostner A, Dusel G, *et al.* (January 1998). "Effects of resistant starch on the colon in healthy volunteers: possible implications for cancer prevention". *Am. J. Clin. Nutr.* **67** (1): 136–42. PMID 9440388 .
- ↑ Raben A, Tagliabue A, Christensen NJ, Madsen J, Holst

- distribution of wild potato species" [↗](#). *American Journal of Botany* (Botanical Society of America) **88** (11): 2101–12. doi:10.2307/3558435 [↗](#). JSTOR 3558435 [↗](#).
4. [^] [University of Wisconsin-Madison](#), *Finding rewrites the evolutionary history of the origin of potatoes* (2005) [1] [↗](#)
 5. [^] [a b c](#) Spooner, DM; et al. (2005). "A single domestication for potato based on multilocus amplified fragment length polymorphism genotyping" [↗](#). *PNAS* **102** (41): 14694–99. doi:10.1073/pnas.0507400102 [↗](#). PMC 1253605 [↗](#). PMID 16203994 [↗](#).
 6. [^] [a b c d e](#) Office of International Affairs, *Lost Crops of the Incas: Little-Known Plants of the Andes with Promise for Worldwide Cultivation* (1989) [online](#) [↗](#)
 7. [^] [a b c](#) John Michael Francis (2005). *Iberia and the Americas* [↗](#). ABC-CLIO. ISBN 1851094261.
 8. [^] Solis, JS; et al. (2007). = "Molecular description and similarity relationships among native germplasm potatoes (*Solanum tuberosum* ssp. *tuberosum* L.) using morphological data and AFLP markers" [↗](#). *Electronic Journal of Biotechnology* **10** (3): 0. doi:10.2225/vol10-issue3-fulltext-14 [↗](#).
 9. [^] Miller, N (29 January 2008). "Using DNA, scientists hunt for the roots of the modern potato" [↗](#). American Association for the Advancement of Science. Retrieved 10 September 2008.
 10. [^] Theisen, K (1 January 2007). "History and overview" [↗](#). *World Potato Atlas: Peru*. International Potato Center. Archived from the original [↗](#) on 14 January 2008. Retrieved 10 September 2008.
 11. [^] [a b](#) Hijmans, Robert (2001). "Global distribution of the potato crop" [↗](#). [*American Journal of Potato Research*] **78** (6): 403–12. doi:10.1007/BF02896371 [↗](#).
 12. [^] "Real Academia Española. Diccionario Usual" [↗](#) (in Spanish). Buscon.rae.es. Retrieved 2010-07-16.
 13. [^] Weatherford, J. McIver (1988). *Indian givers: how the Indians of the Americas transformed the world*. New York: Fawcett Columbine. p. 69. ISBN 0-449-90496-2.
 14. [^] [a b](#) J. Simpson, E. Weiner (eds), ed. (1989). "potato, n". *Oxford English Dictionary* (2nd ed.). Oxford: Clarendon Press. ISBN 0-19-861186-2.
 15. [^] [a b c](#) David Wilton, Ivan Brunetti; p94 *Word myths: debunking linguistic urban legends*; Oxford University Press US; 2004; ISBN 0195172841
 16. [^] Tony Winch (2006). *Growing Food: A Guide to Food Production* [↗](#). Springer Science+Business Media. ISBN 1402066244.
 17. [^] Virginia Amador, Jordi Bou, Jaime Martínez-García, Elena Monte, Mariana Rodríguez-Falcon, Esther Russo and Salomé Prat (2001). "Regulation of potato tuberization by daylength and gibberellins" [↗](#) (PDF). *International Journal of Developmental Biology* (45): S37–S38. Retrieved 8 January 2009.
 18. [^] "Consumer acceptance of genetically modified potatoes" [↗](#). American Journal of Potato Research cited through Bnet. 2002. Retrieved 19 February 2012.
 19. [^] Rosenthal, Elisabeth (24 July 2007). "A Genetically Modified Potato, Not for Eating, Is Stirring Some Opposition in Europe" [↗](#). New York Times. Retrieved 15 November 2008.
 20. [^] "Chilean Tetraploid Cultivated Potato, "*Solanum tuberosum*" is Distinct from the Andean Populations: Microsatellite Data, Celeste M. Raker and David M. Spooner, Univewrsity of Wisconsin, published in "Crop
 - JJ, Astrup A (October 1994). "Resistant starch: the effect on postprandial glycemia, hormonal response, and satiety". *Am. J. Clin. Nutr.* **60** (4): 544–51. PMID 8092089 [↗](#).
 62. [^] Englyst HN, Kingman SM, Cummings JH (1992). "Classification and measurement of nutritionally important starch fractions". *Eur J Clin Nutr.* **46**: S33–S50. PMID 1330528 [↗](#).
 63. [^] Fernandes G, Velangi A, Wolever TMS (2005). "Glycemic index of potatoes commonly consumed in North America". *Journal of the American Dietetic Association* **105** (4): 557–62. doi:10.1016/j.jada.2005.01.003 [↗](#). PMID 15800557 [↗](#).
 64. [^] List of what counts towards 5 A DAY portions of fruit and vegetables [↗](#) NHS 18 December 2009 retrieved 29 March 2010
 65. [^] "Nutrient data laboratory" [↗](#). United States Department of Agriculture.
 66. [^] "Tomato-like Fruit on Potato Plants" [↗](#). Iowa State University. Retrieved 8 January 2009.
 67. [^] "Greening of potatoes" [↗](#). Food Science Australia. 2005. Retrieved 15 November 2008.
 68. [^] *Glycoalkaloid and calystegine contents of eight potato cultivars* J-Agric-Food-Chem. 2003 May 7; 51(10): 2964–73 [↗](#)
 69. [^] Shaw, Ian (2005). *Is it Safe to Eat?: Enjoy Eating and Minimize Food Risks* [↗](#). Berlin: Springer. p. 129. ISBN 3-540-21286-8. Retrieved 19 September 2011.
 70. [^] United States Potato Board -Seed Potatoes [↗](#)
 71. [^] Scottish Government -Seed and Ware Potatoes [↗](#)
 72. [^] "Potato" [↗](#). University of Illinois Extension Service. Retrieved 2010-06-27.
 73. [^] [a b](#) "Growing Potatoes in the Home Garden" [↗](#). Cornell University Extension Service. Retrieved 2010-06-27.
 74. [^] Kleinkopf G.E. and N. Olsen. 2003. Storage Management, in: Potato Production Systems, J.C. Stark and S.L. Love (eds), University of Idaho Agricultural Communications, 363–381.
 75. [^] [a b c](#) "Potato Storage and Care" [↗](#) (PDF). Retrieved 19 September 2011.
 76. [^] See text: [acrylamides](#), esp introduction; acrylamide was accidentally discovered in foods in April 2002 by scientists in Sweden when they found the chemical in [starchy](#) foods, such as [potato chips](#), [French fries](#), and bread that had been heated (production of acrylamide in the heating process was shown to be temperature-dependent)
 77. [^] Tareke E, Rydberg P. et al. (2002). "Analysis of acrylamide, a carcinogen formed in heated foodstuffs". *J. Agric. Food. Chem.* **50** (17): 4998–5006. doi:10.1021/jf020302f [↗](#). PMID 12166997 [↗](#).
 78. [^] Carol Deppe (2010). *The Resilient Gardener: Food Production and Self-Reliance in Uncertain Times* [↗](#). White River Junction, VT: Chelsea Green Publishing. p. 157. ISBN 1-60358-031-X. Retrieved September 17, 2011.
 79. [^] Small, Ernest (2009). *Top 100 food plants* [↗](#). Ottawa: NRC Research Press. p. 421. ISBN 0-660-19858-4. Retrieved 19 September 2011. "Green-colored potatoes should be discarded."
 80. [^] [a b c d e](#) Canadian Produce Marketing Association > Home Storage Guide for Fresh Fruits & Vegetables [↗](#). Retrieved August 2010.
 81. [^] [a b](#) "FAOSTAT: Production-Crops, 2010 data" [↗](#). Food and Agriculture Organization of the United Nations. 2011.
 82. [^] Sarah Sinton (2011). "There's yet more gold in them thar

- Science", Vol.42, 2002"  (PDF). Retrieved 2010-07-16.
21. ↑ "Molecular description and similarity relationships among native germplasm potatoes (*Solanum tuberosum* ssp. *tuberosum* L.) using morphological data and AFLP markers" . *Electronic Journal of Biotechnology*. Retrieved 6 December 2009.
 22. ↑ "ISO accreditation a world-first for CIP genebank" . *International Potato Center*. 2008. Retrieved 19 November 2008.
 23. ↑ "Potato Draft Sequence Available"  Genoweb Daily News, 24 September 2009, Retrieved 1 May 2011
 24. ↑ Visser, R. G. F.; Bachem, C. W. B.; Boer, J. M.; Bryan, G. J.; Chakrabati, S. K.; Feingold, S.; Gromadka, R.; Ham, R. C. H. J. et al (2009). "Sequencing the Potato Genome: Outline and First Results to Come from the Elucidation of the Sequence of the World's Third Most Important Food Crop". *American Journal of Potato Research* **86** (6): 417–429. doi:10.1007/s12230-009-9097-8 . edit
 25. ↑ Story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Wisconsin-Madison (February 4, 2008). "Using DNA, Scientists Hunt For The Roots Of The Modern Potato" . ScienceDaily (with information from a report originally appearing in the *American Journal of Botany*). Retrieved August 27, 2011.
 26. ↑ "Gene RB cloned from *Solanum bulbocastanum* confers broad spectrum resistance to potato late blight, Junqi Song et al., PNAS 2003" . Pnas.org. Retrieved 2010-07-16.
 27. ↑ The yield of Calories per acre (about 9.2 million) is higher than that of **maize** (7.5 million), **rice** (7.4 million), **wheat** (3 million), or **soybean** (2.8 million). Audrey Ensminger; M. E. Ensminger, James E. Konlande (1994). *Foods & Nutrition Encyclopedia* . CTC Press. ISBN 084938981X.
 28. ↑ Global Facilitation Unit for Underutilized Species. *Andean Native Potatoes (*Solanum tuberosum* subsp. *andigena*)* . p. 5. Retrieved 28 february 2012.
 29. ↑ Ames, Mercedes; Spooner, David (2008). "DNA from herbarium specimens settles a controversy about origins of the European potato" . *American Journal of Botany* **95** (2): 252–257. doi:10.3732/ajb.95.2.252 . Retrieved 28 february 2012.
 30. ↑ "Histoires de légumes" by M. Pitrat and C. Foury, Institut National de la recherche agronomique, 2003, p164
 31. ↑ **Sir Walter Raleigh - American colonies** 
 32. ↑ **a b** John Reader, John. *Propitious Esculent: The Potato in World History* (2008)
 33. ↑ McNeill William H (1999). "How the Potato Changed the World's History". *Social Research* **66** (1): 67–83.
 34. ↑ Wilhelm Abel (1986). *Agricultural Fluctuations in Europe: From the Thirteenth to the Twentieth Centuries* . Taylor and Francis. ISBN 0312014651.
 35. ↑ **a b** "Columbus's Contribution to World Population and Urbanization: A Natural Experiment Examining the Introduction of Potatoes"  (PDF). Harvard University. Retrieved 8 January 2009.
 36. ↑ John Reader, *Propitious Esculent: The Potato in World History* (2008)
 37. ↑ "Histoires de légumes" by M. Pitrat and C. Foury, Institut National de la recherche agronomique, 2003, p167
 38. ↑ von Bremzen, p. 322
 39. ↑ William L. Langer, "American Foods and Europe's Population Growth 1750–1850", *Journal of Social History*,
 - "hills"! . Grower Magazine, The Government of New Zealand.
 83. ↑ "Phosphate and potatoes" . Ballance. 2009.
 84. ↑ "International Year of the Potato: 2008, Asia and Oceania" . Potato World. 2008.
 85. ↑ *WORKSHOP TO COMMEMORATE THE INTERNATIONAL YEAR OF THE POTATO - 2008* . The Food and Agriculture Organization of the United Nations. 2008.
 86. ↑ Foley, Ramankutty et al. (12 October 2011). "Solutions for a cultivated planet" . *Nature* **478** (7369): 337–342. doi:10.1038/nature10452 .
 87. ↑ http://www.patnadaily.com/index.php/news/7060-world-record-in-potato-production-for-bihar-farmer.html 
 88. ↑ John Roach (10 June 2002). "Saving the Potato in its Andean Birthplace" . National Geographic. Retrieved 11 September 2009.
 89. ↑ Potato Council Ltd.. "Potato Varieties" . *Potato Council website*. Agriculture & Horticulture Development Board. Retrieved 13 September 2009.
 90. ↑ "Potato Primer"  (PDF). Cooks Illustrated. Retrieved 8 December 2008.
 91. ↑ "Europotato.org" . Europotato.org. Retrieved 2010-07-16.
 92. ↑ "Descripción de tuberculos" . Papas Nativas de Chiloé. Retrieved 6 December 2009.
 93. ↑ McCann, Nuala (March 4, 2008). "Eat your blues!" . BBC News.
 94. ↑ Jung CS, Griffiths HM, De Jong DM, Cheng S, Bodis M, De Jong WS (January 2005). "The potato P locus codes for flavonoid 3',5'-hydroxylase". *TAG* **110** (2): 269–75. doi:10.1007/s00122-004-1829-z . PMID 15565378 .
 95. ↑ "Genetically Engineered Organisms Public Issues Education Project/Am I eating GE potatoes?" . Cornell University. Retrieved 16 December 2008.
 96. ↑ **GM potatoes: BASF at work**  GMO Compass March 5, 2010. Retrieved October 19, 2011.
 97. ↑ Burger, Ludwig (31 October 2011) **BASF applies for EU approval for Fortuna GM potato**  Reuters, Frankfurt, Retrieved 29 December 2011
 98. ↑ Chakrabortya, Subhra; Chakrabortya, Niranjana; Agrawala, Lalit; Ghosha, Sudip; Narulaa, Kanika; Shekhara, Shubhendu; Naikb, Prakash S.; Pandec, P. C. et al (September 20, 2010). "Next-generation protein-rich potato expressing the seed protein gene AmA1 is a result of proteome rebalancing in transgenic tuber"  (PDF). *Proceedings of the National Academy of Sciences* **107** (41): 17533–8. doi:10.1073/pnas.1006265107 . PMC 2955143 . PMID 20855595 . Retrieved October 19, 2011.
 99. ↑ Scientists invent genetically-modified 'superspud' that could help fight hunger in the Third World  The Daily Mail, September 20, 2010. Retrieved September 24, 2010.
 100. ↑ "Inquirer.net, RP's new potato varieties good for French fries" . Newsinfo.inquirer.net. Retrieved 2010-07-16.
 101. ↑ "NJF seminar No. 388 Integrated Control of Potato Late Blight in the Nordic and Baltic Countries. Copenhagen, Denmark, 29 November –1 December 2006"  (PDF). Nordic Association of Agricultural Scientists. Retrieved 14 November 2008.
 102. ↑ "Organic Management of Late Blight of Potato and Tomato (*Phytophthora infestans*)" . Michigan State University.
 103. ↑ Section 4.11.11, page 103 *Soil Association Organic*

8#2 (1975), pp. 51–66

40. ↑ John Komlos, "The New World's Contribution to Food Consumption During the Industrial Revolution." *Journal of European Economic History* 1998 27(1): 67–82. Issn: 0391-5115
41. ↑ Dorien Knaap, The W.A. Scholtenscompany: the first Dutch industrial multinational, Summary of dissertation, University of Groningen, 2004 [2] ↗
42. ↑ McNeill William H (1948). "The Introduction of the Potato into Ireland". *Journal of Modern History* **21** (3): 218–21. [JSTOR 1876068](#) ↗.
43. ↑ Cormac Ó Gráda, *Black '47 and Beyond: The Great Irish Famine in History, Economy, and Memory*. (1999).
44. ↑ Cormac Ó Gráda, et al. *When the Potato Failed: Causes and Effects of the Last European Subsistence Crisis, 1845–1850*. (2007)
45. ↑ "The Cambridge World History of Food- Potatoes (White)" ↗. Cambridge.org. 1994-06-10. Retrieved 2010-12-19.
46. ↑ by Sarah C. P. Williams (2007-05-15). "The Secret History of the Potato - ScienceNOW" ↗. News.sciencemag.org. Retrieved 2010-12-19.
47. ↑ Kemble, Joseph (February 1997). "Containers and Weights of Commercial Fruits, Nuts, and Vegetables" ↗. The Alabama Cooperative Extension System. Retrieved 11 March 2010.
48. ↑ Using 60 pounds per bushel, as given by the Alabama Cooperative Extension System^[47]
49. ↑ Steven Turner, and Heather Molyneaux, "Agricultural Science, Potato Breeding and the Fredericton Experimental Station, 1912–66." *Acadiensis* 2004 33(2): 44–67. Issn: 0044-5851
50. ↑ "Potatoes in Canada". ↗ Agriculture and Agri-Food Canada. Retrieved 29 June 2010.
51. ↑ "FAOSTAT" ↗. faostat.fao.org. Retrieved 19 October 2011.
52. ↑ "World-wide potato production statistics" ↗. Potato World. Retrieved 10 September 2008.
53. ↑ "As other staples soar, potatoes break new ground" ↗ By Terry Wade, Reuters, 15 April 2008.
54. ↑ "Getting Out of the food crisis" ↗. Global Policy Forum. Retrieved 14 November 2008.
55. ↑ Rosenthal, Elisabeth. "Potatoes called savior in global food crisis" ↗. *San Francisco Chronicle*. Retrieved 14 November 2008.
56. ↑ http://www.khaleejtimes.com/DisplayArticleNew.asp?xfile=data/theworld/2007/October/theworld_October534.xml
57. ↑ 'Humble' Potato Emerging as World's next Food Source, p. 20
58. ↑ Chemistry, Biochemistry, and Dietary Role of Potato Polyphenols. A Review. Mendel Friedman, J. Agric. Food Chem., 1997, 45 (5), pp 1523–1540, doi:10.1021/jf960900s ↗
59. ↑ Cummings JH, Beatty ER, Kingman SM, Bingham SA, Englyst HN (May 1996). "Digestion and physiological properties of resistant starch in the human large bowel". *Br Standards for Producer*, Verion 16, January, 2009 ↗
104. ↑ "Thousands of tons of organic food produced using toxic chemicals" ↗ article by David Derbyshire in *The Daily Mail* 1 January 2008
105. ↑ "Links to forms permitting application of copper fungicide on the website of the Soil Association" ↗. Soilassociation.org. Retrieved 2010-07-16.
106. ↑ "Metrics Used in EWG's Shopper's Guide to Pesticides Compiled from USDA and FDA Data" ↗. Environmental Working Group. Retrieved 2010-09-01.
107. ↑ "Lose the Weight, NOT the Potatoes" ↗. University of California, Davis and the National Center for Food Safety and Technology, Illinois Institute of Technology. October 2010. Retrieved September 7, 2011.
108. ↑ Grant M. Campbell, Colin Webb, Stephen L. McKee (1997). *Cereals: Novel Uses and Processes* ↗. Springer. ISBN 0306455838.
109. ↑ Jai Gopal, S. M. Paul Khurana (2006). *Handbook of Potato Production, Improvement, and Postharvest* ↗. Haworth Press. ISBN 978156022729.
110. ↑ "Potatoes to Plastics" ↗ (PDF). University of Maine. Retrieved 8 January 2009.
111. ↑ [3] ↗
112. ↑ [4] ↗
113. ↑ [5] ↗
114. ↑ Hayes, Monte (24 June 2007). ""Peru Celebrates Potato Diversity"" ↗. Washingtonpost.com. Retrieved 2010-07-16.
115. ↑ Timothy Johns: With bitter Herbs They Shall Eat it : Chemical ecology and the origins of human diet and medicine, The University of Arizona Press, Tucson 1990, ISBN 0-8165-1023-7, p. 82-84
116. ↑ Sinkovec, Magdalena (2004). "Bryndzové Halušky / Potato Dumplings with 'Bryndza' Sheep Cheese and Bacon" ↗. *Culinary Cosmic Top Secrets A Nato Cookbook*. Lulu. pp. 115–116. ISBN 9781411608375. Retrieved 1 March 2009.
117. ↑ von Bremzen, Anya; Welchman, John (1990). *Please to the Table: The Russian Cookbook*. New York: Workman Publishing. pp. 319–20. ISBN 0-89480-845-1.
118. ↑ Roden, Claudia (1990). *The Food of Italy*. London: Arrow Books. p. 72. ISBN 0-09-976220-X.
119. ↑ Solomon, Charmaine (1996). *Charmaine Solomon's Encyclopedia of Asian Food*. Melbourne: William Heinemann Australia. p. 293. ISBN 0-85561-688-1.
120. ↑ Berrin, Katherine & Larco Museum. The Spirit of Ancient Peru: Treasures from the Museo Arqueológico Rafael Larco Herrera. New York:Thames and Hudson, 1997.
121. ↑ Steven Adams, Anna Gruetzner Robins (2000). *Gendering Landscape Art* ↗. University of Manchester. ISBN 0719056284.
122. ↑ van Tilborgh, Louis (2009). "The Potato Eaters by Vincent van Gogh" ↗. *The Vincent van Gogh Gallery*. Retrieved 11 September 2009.
123. ↑ "Mr Potato Head" ↗. *Museum of Childhood website*. V&A Museum of Childhood. Retrieved 11 September 2009.

References

- *Economist*. "Llamas and mash", *The Economist* 28 Feb 2008 online ↗
- *Economist*. "The potato: Spud we like", (leader) *The Economist* 28 Feb 2008 online ↗
- Ó Gráda, Cormac. *Black '47 and Beyond: The Great Irish Famine in History, Economy, and Memory*. (1999). 272 pp.
 1. Ó Gráda, Cormac, Richard Paping, and Eric Vanhaute, [JSTOR 1876068](#) ↗.

- Boomgaard, Peter. "In the Shadow of Rice: Roots and Tubers in Indonesian History, 1500–1950." *Agricultural History* 2003 77(4): 582–610. Issn: 0002-1482 Fulltext: [Ebsco](#)
- Hawkes, J.G. (1990). *The Potato: Evolution, Biodiversity & Genetic Resources*, Smithsonian Institution Press, Washington, D.C.
- Lang, James (2001). *Notes of a Potato Watcher*, Texas A&M University, College Station, Texas.
- Langer, William L. "American Foods and Europe's Population Growth 1750–1850", *Journal of Social History*, Vol. 8, No. 2 (Winter, 1975), pp. 51–66 in [JSTOR](#)
- McNeill, William H. "How the Potato Changed the World's History." *Social Research* 1999 66(1): 67–83. Issn: 0037-783x Fulltext: [Ebsco](#), by a leading historian
- McNeill William H (1948). "The Introduction of the Potato into Ireland". *Journal of Modern History* **21** (3): 218–21.

eds. *When the Potato Failed: Causes and Effects of the Last European Subsistence Crisis, 1845–1850*. (2007). 342 pp. ISBN 978-2-503-51985-2. 15 essays by scholars looking at Ireland and all of Europe

- Reader, John. *Propitious Esculent: The Potato in World History* (2008), 315pp a standard scholarly history
- Salaman, Redcliffe N. (1989). *The History and Social Influence of the Potato*, Cambridge University Press (originally published in 1949; reprinted 1985 with new introduction and corrections by J.G. Hawkes).
- Stevenson, W.R., Loria, R., Franc, G.D., and Weingartner, D.P. (2001) *Compendium of Potato Diseases*, 2nd ed, Amer. Phytopathological Society, St. Paul, Minnesota.
- Zuckerman, Larry. *The Potato: How the Humble Spud Rescued the Western World*. (1998). 304 pp. Douglas & McIntyre. ISBN 0-86547-578-4.

Further reading


- "'Humble' Potato Emerging as World's Next Food Source". *column (Asahi Shimbun)*: p. 20. 11 May 2008.
- Spooner, David; et al. (October 2005). "A single domestication for potato based on multilocus amplified fragment length polymorphism genotyping" . *Proc. Natl. Acad. Sci. USA* **102** (41): 14694–14699. doi:10.1073/pnas.0507400102 . PMC 1253605 . PMID 16203994 .
- The World Potato Atlas at [Cgiar.org](#) , released by the International Potato Center in 2006 and regularly updated. Includes current chapters of 15 countries:
 - South America: (English and Spanish): Bolivia, Colombia, Ecuador, Peru
 - Africa: Cameroon, Ethiopia, Kenya
 - Eurasia: Armenia, Bangladesh, China, India, Myanmar, Nepal, Pakistan, Tajikistan
 - 38 others as brief "archive" chapters
 - Further information links at [Cgiar.org](#) .
- World Geography of the Potato at [UGA.edu](#) , released in 1993.
- Reference for potato history: *The Vegetable Ingredients Cookbook* by Christine Ingram, Lorenz Books, 1996 ISBN 1-85967-264-7
- *The History and Social Influence of the Potato* by Redcliffe N. Salaman ISBN 0-521-31623-5
- Hamilton, Andy & Dave, (2004), [Potatoes: Solanum tuberosums](#) retrieved on 4 May 2005
- Gauldie, Enid (1981). The Scottish Miller 1700–1900. Pub. John Donald. ISBN 0-85976-067-7.


External links


- [GLKS Potato Database](#)
- [Centro Internacional de la Papa](#) : CIP (International Potato Center)
- [World Potato Congress](#)
- [British Potato Council](#)
- [Online Potato Pedigree Database for cultivated varieties](#)
- [Potato Information & Exchange](#)
- [GMO Safety: Genetic engineering on potatoes](#) Biological safety research projects and results
- [International Year of the Potato 2008](#)
- [Solanum tuberosum \(potato, papas\): life cycle, tuber anatomy at GeoChemBio](#)
- [Potato Genome Sequencing Consortium](#)
- [Potato storage and value Preservation](#) : Pawanexh Kohli, CrossTree techno-visors.
- [Potato](#), in *Cyclopedia of American Agriculture*

 Wikibooks [Cookbook](#) has a recipe/module on [Potato](#)

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