Potato diagram

The potato is a root vegetable native to the Americas , a starchy tuber of the plant Solanum tuberosum , and the plant itself is a perennial in the nightshade family, Solanaceae. Wild potato species , originating in modern-day Peru , can be found throughout the Americas, from Canada to southern Chile. In the area of present-day southern Peru and extreme northwestern Bolivia , from a species in the Solanum brevicaule complex, potatoes were domesticated approximately 7,–10, years ago. Potatoes were introduced to Europe from the Americas in the second half of the 16th century by the Spanish. Today they are a staple food in many parts of the world and an integral part of much of the world's food supply. As of , potatoes were the world's fourth-largest food crop after maize corn , wheat , and rice. Following millennia of selective breeding , there are now over 5, different types of potatoes. The importance of the potato as a food source and culinary ingredient varies by region and is still changing. It remains an essential crop in Europe, especially Northern and Eastern Europe, where per capita production is still the highest in the world, while the most rapid expansion in production over the past few decades has occurred in southern and eastern Asia , with China and India leading the world in overall production as of

Like the tomato , the potato is a nightshade in the genus Solanum , and the vegetative and fruiting parts of the potato contain the toxin solanine which is dangerous for human consumption. Normal potato tubers that have been grown and stored properly produce glycoalkaloids in amounts small enough to be negligible to human health, but if green sections of the plant namely sprouts and skins are exposed to light, the tuber can accumulate a high enough concentration of glycoalkaloids to affect human health. The English word potato comes from Spanish patata the name used in Spain. The 16th-century English herbalist John Gerard referred to sweet potatoes as common potatoes , and used the terms bastard potatoes and Virginia potatoes for the species we now call potato. The name spud for a 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. It subsequently transferred over to a variety of digging tools. Around , the name transferred to the tuber itself, the first record of this usage being in New Zealand English. Pei writes, "the potato, for its part, was in disrepute some centuries ago. The initials of the main words in this title gave rise to spud. 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. Tubers form in response to decreasing day length, although this tendency has been minimized in commercial varieties. After flowering, potato plants produce small green fruits that resemble green cherry tomatoes , each containing about seeds. Like all parts of the plant except the tubers, the fruit contain the toxic alkaloid solanine and are therefore unsuitable for consumption. All new potato varieties are grown from seeds, also called "true potato seed", "TPS" or "botanical seed" to distinguish it from seed tubers. New varieties grown from seed can be propagated vegetatively by planting tubers, pieces of tubers cut to include at least one or two eyes, or cuttings, a practice used in greenhouses for the production of healthy seed tubers. Plants propagated from tubers are clones of the parent, whereas those propagated from seed produce a range of different varieties. There are about 5, potato varieties worldwide. They belong to eight or nine species, depending on the taxonomic school. Apart from the 5, cultivated varieties, there are about wild species and subspecies, many of which can be cross-bred with cultivated varieties. Cross-breeding 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. 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. There are two triploid species with 36 chromosomes : S. There is one pentaploid cultivated species with 60 chromosomes : S. There are two major subspecies of Solanum tuberosum : andigena , or Andean; and tuberosum , or Chilean. Enriching and preserving the gene bank collection to make potatoes adaptive to diverse environmental conditions is seen as a pressing issue due to climate change. Most modern potatoes grown in North America arrived through European settlement and not independently from the South American sources, although at least one wild potato species, Solanum fendleri , naturally ranges from Peru into Texas, where it is 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. 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 moulds that feed on the stored tubers and quickly turn them

rotten, whereas crops such as grain can be stored for several years with a low risk of rot. There are close to 4, varieties of potato including common commercial varieties, each of which has specific agricultural or culinary attributes. The distinction may also arise from variation in the comparative ratio of two different potato starch compounds: amylose and amylopectin. Amylose, a long-chain molecule, diffuses from 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, which is a highly branched molecule, help the potato retain its shape after being boiled in water. Anthocyanins mainly responsible for red or blue pigmentation in potato cultivars do not have nutritional significance, but are used for visual variety and consumer appeal. Genetic research has produced several genetically modified varieties. Waxy potato varieties produce two main kinds of potato starch, amylose and amylopectin , the latter of which is most industrially useful. BASF developed the Amflora potato, which was modified to express antisense RNA to inactivate the gene for granule bound starch synthase , an enzyme which catalyzes the formation of amylose. In , the European Commission cleared the way for 'Amflora' to be grown in the European Union for industrial purposes onlyâ€"not for food. 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 , and Sweden and the Netherlands in subsequent years. Simplot Company , which contains genetic modifications that prevent bruising and produce less acrylamide when fried than conventional potatoes; the modifications do not cause new proteins to be made, but rather prevent proteins from being made via RNA interference. The potato was first domesticated in the region of modern-day southern Peru and northwestern Bolivia [5] by pre-Columbian farmers, around Lake Titicaca. The earliest archaeologically verified potato tuber remains have been found at the coastal site of Ancon central Peru , dating to BC. According to conservative estimates, the introduction of the potato was responsible for a quarter of the growth in Old World population and urbanization between and Following the Spanish conquest of the Inca Empire , the Spanish introduced the potato to Europe in the second half of the 16th century, part of the Columbian exchange. The staple was subsequently conveyed by European mariners to territories and ports throughout the world. The potato was slow to be adopted by 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. In , a plant disease known as late blight, caused by the fungus-like oomycete Phytophthora infestans , spread rapidly through the poorer communities of western Ireland as well as parts of the Scottish Highlands , resulting in the crop failures that led to the Great Irish Famine. It remains an essential crop in Europe especially northern and eastern 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. The potato is rarely eaten raw because raw potato starch is poorly digested by humans. Potatoes are often broadly classified as having a high glycemic index GI and so are often excluded from the diets of individuals trying to follow a low-GI diet. The GI of potatoes can vary considerably depending on the cultivar or cultivar category such as "red", russet , "white", or King Edward , growing conditions and storage, preparation methods by cooking method, whether it is eaten hot or cold, whether it is mashed or cubed or consumed whole , and accompanying foods consumed especially the addition of various high-fat or high-protein toppings. In the UK, potatoes are not considered by the National Health Service NHS as counting or contributing towards the recommended daily five portions of fruit and vegetables , the 5-A-Day program. This table shows the nutrient content of potatoes next to other major staple foods, each one measured in its respective raw state, even though staple foods are not commonly eaten raw and are usually sprouted or cooked before eating. In sprouted and cooked form, the relative nutritional and anti-nutritional contents of each of these grains or other foods may be different from the values in this table. Each nutrient every row has the highest number highlighted to show the staple food with the greatest amount in a gram raw portion. Potatoes contain toxic compounds known as glycoalkaloids , of which the most prevalent are solanine and chaconine. Solanine is found in other plants in the same family, Solanaceae , which includes such plants as deadly nightshade Atropa belladonna , henbane Hyoscyamus niger and tobacco Nicotiana spp. These compounds, which protect the potato plant from its predators, are generally concentrated in its leaves, flowers, sprouts, and fruits in contrast to the tubers. The glycoalkaloid content was, in order from highest to lowest: flowers, sprouts, leaves, tuber skin, roots, berries, peel [skin plus outer cortex of tuber flesh], stems, and tuber flesh. Exposure to light, physical damage, and age increase glycoalkaloid content within the tuber. The concentration of glycoalkaloids in wild potatoes is sufficient to produce toxic effects in humans. Glycoalkaloid poisoning may cause headaches, diarrhea , cramps , and, in severe cases, coma and death. However, poisoning from cultivated potato varieties is

very rare. Light exposure causes greening from chlorophyll synthesis, giving a visual clue as to which areas of the tuber may have become more toxic. However, this does not provide a definitive guide, as greening and glycoalkaloid accumulation can occur independently of each other. Different potato varieties contain different levels of glycoalkaloids. The Lenape variety was released in but was withdrawn in as it contained high levels of glycoalkaloids. In normal potatoes, analysis has shown solanine levels may be as little as 3. Potatoes are generally grown from seed potatoes, tubers specifically grown to be free from disease and to provide consistent and healthy plants. To be disease free, the areas where seed potatoes are grown are selected with care. In the US, this restricts production of seed potatoes to only 15 states out of all 50 states where potatoes are grown. In the UK, most seed potatoes originate in Scotland , in areas where westerly winds reduce aphid attack and the spread of potato virus pathogens. Potato growth can be 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 above-ground and stolons develop from lower leaf axils on the below-ground stem. In the third phase the tips of the stolons swell forming new tubers and the shoots continue to grow and flowers typically develop soon after. Tuber bulking occurs during the fourth phase, when the plant begins investing the majority of its resources in its newly formed tubers. At this phase, several factors are critical to a good yield: optimal soil moisture and temperature, soil nutrient availability and balance, and resistance to pest attacks. The fifth phase is the maturation of the tubers: the plant canopy dies back, the tuber skins harden, and the sugars in the tubers convert to starches. New tubers may start growing at the surface of the soil. Since exposure to light leads to an undesirable greening of the skins and the development of solanine as a protection from the sun's rays, growers cover surface tubers. Commercial growers cover them by piling additional soil around the base of the plant as it grows called "hilling" up, 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 plastic sheets. 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. 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 historically significant Phytophthora infestans late blight remains an ongoing problem in Europe [30] [73] and the United States. 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 , beet leafhoppers , thrips , and mites. The potato cyst 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. During the crop year , 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 [75] to control potato blight Phytophthora infestans. A total of 36 unique pesticides were detected on potatoes over the 2, samples, though no individual sample contained more than 6 unique pesticide traces, and the average was 1. The average quantity of all pesticide traces found in the 2, samples was 1. While this was a very low value of pesticide residue, it was the highest amongst the 50 vegetables analyzed. At harvest time, gardeners usually dig up potatoes with a long-handled, three-prong "grape" or graip , i. 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 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 "creamer potatoes" and are particularly valued for taste. These are often harvested by the home gardener or farmer by "grabbling", i. A creamer potato is a variety of potato harvested before it matures to keep it small and tender. It is generally either a Yukon

Gold potato or a red potato, called gold creamers [78] or red creamers respectively, and measures approximately 2. Like potatoes in general, they can be prepared by boiling, baking, frying, and roasting. 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. 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. The discovery of acrylamides in starchy foods in has led to international health concerns. They are believed to be probable carcinogens and their occurrence in cooked foods is being studied for potentially influencing health problems. Under optimum conditions in commercial warehouses, potatoes can be stored for up to 10â€"12 months. Mechanical ventilation is used at various points during the process to prevent condensation and the accumulation of carbon dioxide. If potatoes develop green areas or start to sprout, trimming or peeling those green-colored parts is inadequate to remove copresent toxins, and such potatoes are no longer edible. The world dedicated The United States was the most productive country, with a nationwide average yield of New Zealand farmers have demonstrated some of the best commercial yields in the world, ranging between 60 and 80 tonnes per hectare, some reporting yields of 88 tonnes potatoes per hectare. 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 and 44 tonnes per hectare. China and India accounted for over a third of world's production in , and had yields of 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. Global warming is predicted to have significant effects on global potato production. 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. 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 [94] minutes, depending on size and type, to become soft. Peruvian cuisine naturally contains the potato as a primary ingredient in many dishes, as around 3, varieties of this tuber are grown there. French-fried potatoes are a typical ingredient in Peruvian stir-fries, including the classic dish lomo saltado. 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. In the UK , potatoes form part of the traditional staple, fish and chips. Roast potatoes are commonly served as part of a Sunday roast dinner and mashed potatoes form a major component of several other traditional dishes, such as shepherd's pie , bubble and squeak , and bangers and mash. New potatoes may be cooked with mint and are often served with 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. In the UK, game chips are a traditional accompaniment to roast gamebirds such as pheasant , grouse , partridge and quail. These are then mixed with regionally varying ingredients. In Germany, Northern Finland, Latvia and especially Scandinavian countries , Eastern Europe Russia, Belarus and Ukraine and Poland, 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 Belarusian cuisine. Cepelinai is Lithuanian national dish. They are a type of dumpling made from grated raw potatoes boiled in water and usually stuffed with minced meat , although sometimes dry cottage cheese curd or mushrooms are used instead. 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. Gratin dauphinois , consisting of baked thinly sliced potatoes with cream or milk, and tartiflette , with Reblochon cheese, are also widespread. In the north of Italy, in particular, in the Friuli region of the northeast, potatoes serve to make a type of pasta called gnocchi. 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 omelette and patatas bravas a dish of fried potatoes in a spicy tomato sauce are near-universal constituent of Spanish tapas. In the US, 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 favourite 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 a 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. The Acadian poutine is a ball of grated and mashed potato , salted, sometimes filled with pork in the centre, 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. Poutine , by contrast, is a hearty serving of French fries, fresh cheese curds and hot gravy. Tracing its origins to Quebec in the s, it has become a widespread and popular dish throughout Canada. Potato grading for Idaho potatoes is performed in which No. In South Asia , the potato is a very popular traditional staple. 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 favourite 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 batter 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 favourite dishes are alu tikki and pakoda items. 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. The Aloo gosht , Potato and meat curry , is one of the popular dishes in South Asia , especially in Pakistan. In East Asia, particularly Southeast Asia, rice is by far the predominant starch crop, with potatoes a secondary crop, especially in China and Japan. In the winter, roadside sellers in northern China will also sell roasted potatoes. It is also occasionally seen in Korean and Thai cuisines. The potato has been an essential crop in the Andes since the pre-Columbian Era. The Moche culture from Northern Peru made ceramics from the 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. During the late 19th century, numerous images of potato harvesting appeared in European art, including the works of Willem Witsen and Anton Mauve. Van Gogh 's painting The Potato Eaters portrays a family eating potatoes. Van Gogh said he wanted to depict peasants as they really were. He deliberately chose coarse and ugly models, thinking that they would be natural and unspoiled in his finished work. It presents a theme representative of the peasants' struggle for survival. Millet's technique for this work incorporated paste-like pigments thickly applied over a coarsely textured canvas. Invented in , and marketed and sold commercially by Hasbro in , 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. From Wikipedia, the free encyclopedia. For other uses, see Spud disambiguation , Tater disambiguation , and Potato disambiguation. Plant species producing the tuber used as a staple food. Further information: List of potato cultivars. Main article: Genetically engineered potato. Main article: History of the potato. Main article: List of countries by potato production. Main article: List of potato diseases. This section is an excerpt from Climate change and potatoes [edit]. Potato is one of the world's most important food crops. See also: List of potato dishes. Retrieved 7 September American Journal of Botany. Bibcode : PNAS.. Archived from the original on 26 April Lay summary. Potato Pro. 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Potato cultivars appear in a variety of colors, shapes, and sizes. Solanum tuberosum L. List Battata tuberosa L. Hill Larnax sylvarum subsp. Sawyer Lycopersicon tuberosum L. Parmentiera edulis Raf. Solanum andigenum Juz. Solanum andigenum convar. Solanum andigenum f. Solanum andigenum subsp. Solanum andigenum var. Solanum chaucha Juz. Berthault Solanum chilotanum Hawkes Solanum chilotanum var. Solanum chilotanum f. Solanum chilotanum var. Berthault Solanum diemii E. Brucher Solanum dubium E. Krause Solanum erlansonii Anon. Solanum esculentum Neck. Solanum estradea L. Solanum hygrothermicum Ochoa Solanum kesselbrenneri Juz. Solanum leptostigma Juz. Solanum parvicorollatum Lechn. Solanum phureja Juz. Solanum tuberosum var. Solanum tuberosum f. Kostina Solanum tuberosum var. Solanum utile Klotzsch Solanum yabari Hawkes Solanum yabari var. United States. Protein g. Carbohydrates g. Calcium mg. Iron mg. Magnesium mg. Phosphorus mg. Potassium mg. Sodium mg. Zinc mg. Copper mg. Manganese mg. Thiamin B1 mg. Riboflavin B2 mg. Pantothenic acid B5 mg. Vitamin E , alpha-tocopherol mg. Saturated fatty acids g. Monounsaturated fatty acids g. Polyunsaturated fatty acids g. One of the most widely-grown vegetables in the United States, the potato Solanum tuberosum is a stem tuber. The rhizome, or the root mass, of the potato plant is enlarged and is the part of the vegetable that is eaten. The potato has five primary stages of development during its short life cycle, lasting between three to four months. Because the potato grows underground, not all of the changes that take place are visible. During the first stage, the eyes from the potato piece develop sprouts which emerge from the ground. These sprouts become the visible, above-ground portion of the potato plant, the stems and leaves. During this stage, the piece of potato is the only source of nutrition for the plant. The temperature of the soil will affect how long this stage takes and sprouting will not happen if the soil temperatures are too close to freezing. This second or vegetative stage of the potato's growth cycle is when the visible portion of the plant emerges and develops. The leaves, stem and root system of the plant grow and photosynthesis begins, providing nourishment for the growing plant. During this stage, warmer temperatures of 77 degrees Fahrenheit or more and long days of 14 to 18 hours of sunlight are preferred. The sprouting and the vegetative states combined can last from 30 to 70 days. The tubers begin forming at the stolon tips of the potato plant, but they are not yet enlarging at this stage. The stolon tips are the underground stems and most of the potato mass lies 18 to 24 inches below the soil surface. The shallow location of the tubers means that sufficient water is very important to healthy potato growth. Along with watering, photosynthesis continues to nourish the plant and nutrients are stored in these early tubers in preparation for the next stage, when they begin to bulk up. This tuber initiation period will last for about 2 weeks. For most potato varieties, this is the period when the plant also begins to flower. The tuber cells expand and grow significantly in the next stage. There is a buildup of carbohydrates, water and other nutrients in the tubers. This stage lasts the longest, taking up to three months to complete, depending on the growing conditions and type of potato plant. During this period, the plant prefers cooler temperatures and shorter days. Photosynthesis now begins to slow down, leading to yellowing vines and fallen leaves. As the potato tubers continue to bulk up during this period, the visible portion of the plant will slowly die. However, if the potato variety has a longer life cycle than the growing season, the maturation stage may not fully finish before harvest needs to take place. As the potato plant progress through this stage, the skin of the potato toughens up, making it more storage friendly. He leads gardening workshops for elementary school children. By Paul Schuster. Related Articles. Cut Potatoes. Sprouting During the first stage, the eyes from the potato piece develop sprouts which emerge from the ground. Vegetative State This second or vegetative stage of the potato's growth cycle is when the visible portion of the plant emerges and develops. Tuber Initiation The tubers begin forming at the stolon tips of the potato plant, but they are not yet enlarging at this stage. Tuber Bulking The tuber cells expand and grow significantly in the next stage. Maturation Photosynthesis now begins to slow down, leading to yellowing vines and fallen leaves. If you want to store the root vegetables in a proper manner, building these bins is the right decision. You can easily adjust the size of the project to suit your needs. Moreover, I truly recommend you to check out the rest of the plans on my site, for even more building ideas. There are many designs and plans you could choose from, so you should take a look on more projects before starting the actual project. Nevertheless, if you are looking for a simple but sturdy design, this project might be the solution to your needs. Make sure you check all the dimensions before making the cuts, otherwise the components might not fit together easily. The first step of the project is to build the sides for the potato bin. Smooth the edges with sandpaper. Drill pilot holes before inserting the screws, to prevent the wood from splitting. Make sure the edges are flush and check if the

corners are square. The next step of the project is to build the door for the top shelf. Add glue to the joints. Staple wire mesh to the frame. Next, you need to build the front frames for the potato bins. Add glue to the joints for a professional result. Mark the cut lines on the plywood sheet and get the job done with a circular saw. Smooth the edges flush. Align the edges flush and leave no gaps between the components. Fit the bins and the top door to the openings. Use hinges and a magnet latch to secure the bins into place, after centering them into the openings. In addition, you need to fit pulls, so you can open and close the bins properly. Last but not least, you need to take care of the finishing touches. Drill the holes with wood putty and smooth the surface with grit sandpaper. Apply a few coats of paint or stain to enhance the look of the potato bin cabinet. This project was about building a wood potato bin. This potato bin is the ideal choice if you want to combine utility with the looks, as the cupboard has a beautiful design. You can use these bins for onions or other vegetables, as well. Get PDF Plans. Side panels. Fitting the cleats. Building the front face. Attaching the back. Fitting the top. Top shelf. Build the top door. Bin front face. Cutting the components for the bins. Assembling the bins. Fitting the boxes. Potato Bin Plans. Potato Bin Building Plans. Cancel reply. Potato , Solanum tuberosum , annual plant in the nightshade family Solanaceae , grown for its starchy edible tubers. Potatoes are frequently served whole or mashed as a cooked vegetable and are also ground into potato flour , used in baking and as a thickener for sauces. The tubers are highly digestible and supply vitamin C , protein, thiamin , and niacin. Potatoes are thought to have been independently domesticated several times and were largely cultivated in South America by the Incas as early as 1, years ago. Encountered by the invading Spaniards, potatoes were introduced into Europe during the second half of the 16th century. By the end of the 17th century the plant was a major crop in Ireland , and by the end of the 18th century it was a major crop in continental Europe, particularly Germany , and in the west of England. It continued to spread, in both Western and Eastern hemispheres, during the first four decades of the 19th century, and the Irish economy itself became dependent upon the potato. However, the disastrous failures of the Irish crops in the midth century especially in and , because of late blight Phytophthora infestans , and the resulting Irish Potato Famine generated a more-cautious attitude toward dependence on the plant. The potato is one of some tuber-bearing species of the genus Solanum a tuber is the swollen end of an underground stem. The compound leaves are spirally arranged; each leaf is 20â€"30 cm about 8â€"12 inches long and consists of a terminal leaflet and two to four pairs of leaflets. The white, lavender, or purple flowers have five fused petals and yellow stamens. The fruit is a small poisonous berry with numerous seeds. The stems extend underground into structures called stolons. The ends of the stolons may enlarge greatly to form a few to more than 20 tubers, of variable shape and size, usually ranging in weight up to grams 10 ounces but occasionally to more than 1. The skin varies in colour from brownish white to deep purple; the starchy flesh normally ranges in colour from white to yellow, but it too may be purple. The tubers bear spirally arranged buds eyes in the axils of aborted leaves, of which scars remain. The buds sprout to form clones of the parent plant, allowing growers to vegetatively propagate desired characteristics. Indeed, vegetative reproduction is always used commercially, though the resulting decrease in genetic diversity has made the popular varieties more vulnerable to pests and diseases. Potato Article Media Additional Info. Article Contents. Print print Print. Table Of Contents. While every effort has been made to follow citation style rules, there may be some discrepancies. Please refer to the appropriate style manual or other sources if you have any questions. Facebook Twitter. Give Feedback External Websites. Let us know if you have suggestions to improve this article requires login. External Websites. The World's Healthiest Foods - Potatoes. Articles from Britannica Encyclopedias for elementary and high school students. The Editors of Encyclopaedia Britannica Encyclopaedia Britannica's editors oversee subject areas in which they have extensive knowledge, whether from years of experience gained by working on that content or via study for an advanced degree See Article History. Harvested potatoes Solanum tuberosum. Britannica Quiz. You may be familiar with french fries and mashed potatoes, but do you know the name of a type of pasta made with potato flour? Step your knowledge up a notch in this study of yams, sweet potatoes, and potatoes. Variety of potatoes Solanum tuberosum. Potato leaf infected with a fungal blight. Freshly harvested potatoes Solanum tuberosum. Get a Britannica Premium subscription and gain access to exclusive content. Subscribe Now. Learn More in these related Britannica articles:. One of the largest and best-known genera of flowering plants is Solanum potato genus , which has some 1, to 1, species. Within Solanum there are about species in the stellate-haired spiny groups, which, though best developed in South America, have rich distributions inâ€¦. The common potato Solanum tuberosum ; Solanaceae forms such tubers. The much-reduced scale leaves and their associated axillary buds form the eyes of the potato. Tubers should not be confused with tuberous roots. Tubers are modified shoots, whereas tuberous roots are

modified roots. The common feature, and henceâ€¦. These could be grown at drier altitudes and in sandy loams too light for rice and other indigenous cereals. Virgin heights in the Yangtze region and northern China were turned into corn and sweet-potato farms. As the population in the mountainâ€¦. History at your fingertips. Sign up here to see what happened On This Day , every day in your inbox! Email address. By signing up, you agree to our Privacy Notice. Be on the lookout for your Britannica newsletter to get trusted stories delivered right to your inbox. In this instructable I'm going to teach you how to build the original hairspray powered potato cannon. Sometims it is also called a potato gun. The finished gun can shoot potatoes over yards!!! Building Materials -5 feet of 1. Drill a hole in the 3" pipe for the metal lead from the ignitor to fit, mount the ignitor using screws provided, you can slop some glue around the hole to make sure there wont be a gap where the flames will shoot out and burn your arm In order to create the arc spark to ignite the gas, there needs to be a metal contact between the lead from the ignitor and the metal chasis of the ignitor. Both methods will work. Let the cement cure for a couple hours. Firing: -Unscrew the end cap -Force a potato into the barrel this is easier if you sharpen the end of the barrel with a file -Pack it down with a broom, make sure its still inside the barrel, and not the combustion chamber -Spray some hair spray into the 3" pipe for seconds -Quickly screw the end cap back on -Point it at a 45 degree angle to maximize range and push the ignitor. Question 7 weeks ago on Introduction. I built my potato gun after watching your video it worked great once I cannot remove the rear cap after firing I cut off the existing one and pvc'd a new fitting and a new screw cap on fire it again and the end cap won't come off. Reply 11 months ago. Reply 2 years ago. Reply 3 years ago. Reply 5 years ago. Drill some holes through the sides of the cap and the end of the combustion chamber so you can stick some nails through. Or just use a ton of epoxy to seal the cap and mount a bottle cap somewhere on the combustion chamber with another ton of epoxy for fast and easy loading, like I did. Reply 4 years ago. Question 1 year ago. Answer 11 months ago. Reply 1 year ago. Quick question, what's the best way to make a pressure valve so that if I accidentally use too much combustables it won't explode on me. Drill small holes 3mm or so in the combustion chamber but be careful not to keep your hand near those holes while shooting it. Or you can get a proper pressure valve but it would need a lot of maths to find the right pressure. Or drill a bigger hole, about 7 mm in the chamber and seal it up with epoxy. If the pressure is too high, the epoxy will break and the pressure will come out the hole. Introduction: The Original Potato Cannon. By matt Follow. More by the author:. About: I liked designing and building things long before I became an engineer, now I get paid to do it! Did you make this project? Share it with us! I Made It! How to Make a Trout Net by trailogy in Fishing. Charleshall2 Question 7 weeks ago on Introduction. Answer Upvote. Reply Upvote. Teh32Chicken 1liular Reply 11 months ago. FlorinJ 1liular Reply 3 years ago. Certified Nerd 1liular Reply 5 years ago. RaduR6 harry Reply 2 years ago. Does it matter where I put my igniter? Does the spark nee to be towards the back of the chamber? RaduR6 geg13 Reply 2 years ago. Did you know that you can power a lightbulb with just a potato or two? The chemical energy between the two metals is converted to electrical energy and creates a circuit with the help of the potato! This creates a small electrical charge that can be used to turn on a light. This tutorial is a great example of how energy comes in many forms and how products use that energy in order to do work. The potato battery converts energy from chemical to electrical in order to allow the light bulb to work benchmarks C and D. Follow Faith Davis, Cheyenne Balzer, and Spencer White through this tutorial in order to make a battery out of a potato, and hopefully learn something about the use of energy and the technologies that use it! Each slit should be able to fit a penny, but it doesn't need to be exact because it can always be adjusted later! The wire-wrapped-penny should fit snuggly into the slit you made earlier. This may take some adjusting and a little force to get the penny in right. On the side that the penny is not attached to, trim the wire to the length you want between the other potato plus an inch or two. You want to leave enough of the screw out for the other end of the copper wire to wrap around, but still have the screw snug in the potato. Be sure that the screw doesn't go all the way through your potato! This step will take some force, and it's easier if you twist it in instead of trying to jam the screw in there. Cut a new slit for a penny into the second potato that already has a screw and fit the new wire wrapped penny into that potato. Tip: we cut all our wires to be around the same length overall to make things easier later on. In the end, this is what the connections should look like. Look carefully at the sides of the potatoes. Each potato in the battery should have one zinc side screw and one copper side penny with wires attached. Leave out two wires, one going to a penny and one to a screw. These wires will connect to the lightbulb or the voltmeter. Tip: If you wanted to add more potatoes for more power, make sure to follow this pattern! Each potato should have one screw and one penny! Tip: For only two potatoes, we found that it didn't produce enough power for a lightbulb. We ended up adding more potatoes after we discovered this. A potato battery is a type of battery

that is known as an electrochemical cell. This chemical energy is converted to electric energy by a spontaneous electron transfer. The potato acts as a buffer and an electrolyte for the two metals. This means that it separates the zinc and copper, forcing the electrons trying to get from one metal to the other to travel through the potato and form a circuit. The electrons are able to flow through the potato because it acts as an electrolyte. The two metals would still react if they just touched each other without the potato, but without the barrier and electrolyte, the energy released from the reaction wouldn't form a circuit, which is what gets the power to the light bulb. Problems we solved: Since we found that two batteries couldn't power our lightbulb, we were disappointed at the prospect of only showing the potato's energy through the voltmeter. To solve this, we decided to add more potatoes. When that didn't work we found an LED light bulb instead of the regular, incandescent one we initially were using. Finally, the light turned on with four potatoes and an efficient LED bulb, which is why we added the option to attach more potatoes to the instructions and why our materials say to use an LED bulb, even though our picture includes the incandescent. Other ideas: We played around with a few ideas before deciding to make a potato-powered light bulb and explaining how and why it worked. We thought about making a small wind turbine or water turbine to produce electricity, and talk specifically about benchmark M or I but decided against it mainly because Spencer had some prior knowledge on how to make the potato battery work. Additionally, we wanted to try to use the potato to charge our phones but found that it would take far too many potatoes than we could afford. In the end, we were all happy with explaining energy in relation to benchmark C and D through the example of a potato battery. Tip 5 weeks ago on Introduction. Israeli researchers found that boiling the potatoes 8 minutes increases their output. I'd be interested to know if one boiled potato would power a LED. Reply 2 years ago. First let me say thank you for this post. Although this has been done a few times with potatoes and a multitude of other food items, it is always great to see it again. This will pike the interest in some new students to try and make this and that is the beginning of more electronic students. So you never know, you could have started a whole new class full of new technicians Bravo sir, Bravo. By DramaticIron Follow. More by the author:. You need to make sure that you are stripping enough wire to wrap securely around the penny. Connect the two potatoes together with the wire going from the penny to the screw. Insert a screw to the potato that only has a penny, and attach a new wire to the screw. How it works: A potato battery is a type of battery that is known as an electrochemical cell. When the two wires are attached to the bulb it completes this circuit, turning the light on! Did you make this project? Share it with us! I Made It! Easy Zoom Quit Button by randofo in Arduino. Light Up Clock 2. Mars Clock by prdassonville in Clocks. Reply Upvote. A battery is something that causes chemical energy to be converted into electricity. Batteries have a positive side terminal and the negative side terminal. The negative side is the source of the electrons that gives the energy to a wire that is connected to an electronic device. Batteries power electronic devices when connected with a conductive material, such as wires. The potato battery is a type of electrochemical battery, or cell. Certain metals zinc in the demonstration below experience a chemical reaction with the acids inside of the potato. This chemical reaction creates the electrical energy that can power a small device like an LED light or clock. Incredible, huh? There are a few different ways to create batteries. Different batteries can be made from different electrolytes acidic fruits, vegetables and liquids and different electrodes metals. The science behind a topic is called its scientific principles or concepts. To do your background research, you can ask an expert, look in books or search the internet. Below are some scientific principles and concepts of potato battery experiments that would be helpful for you to understand in order to plan your project. Scientists make observations, ask a lot of questions, then try to find ways to answer those questions. They use their understanding of scientific concepts to explore their questions. Here are a few questions for you to try to ponder now that you have learned some scientific concepts:. In your own words, describe the scientific concepts that you learned about and some of the things you observed or discovered. The purpose of

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an inquiry is to demonstrate what you learned, observed and discovered. Demonstrations are not the same as experiments but can involve you having fun collecting data. When you do an experiment, you choose one thing to change and try to understand the results of that change. This is called Cause and Effect. Want a little more help taking charge of your project? Want to take the stress and guess-work out of Science Fair projects? Skip to content. Contact us. Facebook page opens in new window Linkedin page opens in new window. Potato Power! Mar

23 Explore the science behind the popular potato battery Science Fair project! It might simply look like a couple of potatoes with clips, wires and pennies sticking out of them in all directions. But when you connect the wires and pennies â€" WOW! It creates energy! Learn More. Related posts. How to create volunteer and registration signups for your Fair December 13, The Heart of Effective Mentors March 16, Join us at CO Impact Days l February 22,