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## Potato

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**Potato** (alu) edible tuber of the cultivated plant *Solanum tuberosum* of the family Solanaceae. It was the major crop for the original Americans. It is now one of the staple foods in Bangladesh. Its history is difficult to trace, partly because the name potato was also used by early writers for the sweet potato (*Ipomoea batatas*) and for other unrelated plants. Spanish explorers are believed to have brought it in the 16th century from Peru to Spain, whence it spread north and west throughout Europe. European settlers brought it to North America probably around 1600 AD; thus, like the closely related tomato, it was a food plant reintroduced to the New World. Potato was first accepted as a large-scale crop in the British Isles.

It became the major food in Ireland during the 18th century and is hence often called Irish potato to distinguish it from the sweet potato. Potato was also important for 20th century Europe, especially for Germany, where it kept the country alive during two world wars. With its high carbohydrate content, potato is today a primary food of Western peoples, as well as a source of starch, flour, alcohol, dextrin, and fodder (chiefly in Europe, where more is used for this purpose than for human consumption). It grows best in a cool, moist climate; the greatest potato producing counties are the United States (mostly in Maine and Idaho), Germany, Russia, Holland, and Poland.

It is not known exactly when potato was introduced in this subcontinent. It is assumed that at the beginning of the 17th century the Portuguese navigators first brought potato to India. The first record about the cultivation of potato in India is seen in an 1847 issue of *The Gardening Monthly*, a magazine published from London. Initially, potato was cultivated in areas around Calcutta, from there its cultivation spread to Cherapunjee. When Warren Hastings was the governor (1772-1785), potato cultivation spread to many provinces of India, including Bombay, through his initiatives.

The potato plant is a herbaceous annual, normally propagated by planting pieces of tubers that bear two or three eyes. Nutritionally, the tuber is rich in carbohydrates or starch and is a good source of protein, vitamin C and the B vitamins, potassium, phosphorus, and iron. Most of the minerals and protein are concentrated in a thin layer beneath the skin, and the skin itself is a source of food fibre.

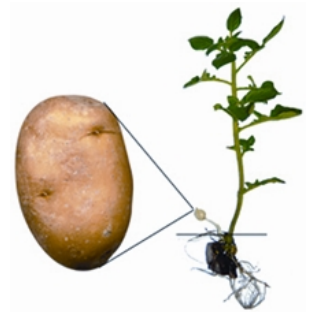
**Varieties** Several hundred varieties of potatoes are grown in the world. These differ in appearance, tuber structure, size and colour, time of maturity, cooking and marketing qualities, yield, and resistance to pests and diseases. A variety that grows well in one area may do poorly in another. Potato varieties that are cultivated in Bangladesh are broadly categorised into two groups, local and high yielding. The so-called local varieties are in fact, not strictly native. In the distant past those were brought to this part of the subcontinent but in the absence of varietal improvement efforts, gradually degenerated, showing poor yield performance. In spite of poor yields, some of the local varieties are still being cultivated because of their taste and cooking qualities.

There are about 27 local varieties of potatoes cultivated in different parts of the country. They have familiar local names. It is estimated that local varieties were cultivated in about 1,83,446 acres of land, producing 5,99,518 m tons of tubers during 2004-05. The familiar local varieties are (a) Sheel Bilatee- mostly cultivated in Rangpur. The tuber is oblong, reddish. Each tuber weighs about 30 g. (b) Lal Sheel- primarily cultivated in Bogra with tubers rounded, reddish, each having a weight of about 55 g. This variety is also known as Lal Madda and Bograi. (c) Lal Pakri - cultivated widely in Dinajpur, Bogra and Sirajganj districts with tubers reddish and round, each weighing about 30 g. (d) Du Hajari - mostly cultivated in the Chittagong area. Tubers appear round and pale, each weighing about 25 g. Among other indigenous varieties Jhau Bilatee and Suryamukhi are notable.

In the last few decades, several dozens of high yielding varieties (HYV) of potato were brought to Bangladesh and tried experimentally under local conditions before being recommended for general cultivation. During the 1970s, about 16 varieties were initially selected, but subsequently 10 were dropped. Through constant evaluation of the traits, varietal performance, and considerations of other characteristics, about 10 HYV have been released for cultivation in the country. However, huge amount of potato seeds are imported every year by the Bangladesh Agricultural Development Corporation (BADC) for distribution among farmers. Bangladesh Agricultural Research Institute (BARI) has also established a farm at Debiganj in Panchagar district for production of HYV seed potatoes. Among the high yielding popular varieties the following are notable: (a) Cardinal- probably most popular among the foreign varieties with oblong, reddish tubers, shallow eyes, and smooth skin. The variety has been introduced from Holland and has yield potential of 20-25 m tons per ha. (b) Diamant - another Holland variety with oval to oblong, pale yellow tubers, skin smooth, and eyes shallow. It is quite disease resistant. Per hectare yield ranges from 18-24 m tons. (c) Kufri Shindhury - tubers reddish, round, and eyes deep with rough skin. This variety was introduced from India and is comparatively less susceptible to pests and diseases. It has a yield potential of 18 to 22 m tons per ha. Other notable exotic varieties are Patronis, Alpha, Archa, Multa, Ukama, Hira, Maurin, Origo, Alisa, etc.

In recent years, the Tuber Crops Research Centre of BARI has collected many new varieties of potato from the International Potato Research Centre, Peru, and from other sources. These are being tested under Bangladesh field conditions, to determine whether they can be recommended for cultivation in the country. The Centre has already made good contribution towards the development of some high yielding potato varieties. In 2004-05, a total of 42,55,863 m tons of high yielding potatoes were produced on 6,22,828 acres of land.

**Cultivation** Potato is widely cultivated in all the districts of Bangladesh during winter. Of the total 3,36,740 acres (1,36,332 ha) of land used for potato cultivation during 1997-98, 1,13,540, 2,18,445, and 4,755 acres were for local, high yielding, and Indian varieties respectively. Well-fertilized, sunny land with sufficient moisture in soil is appropriate for potato plantation. The first fortnight of November is the right time. In certain northwestern areas, farmers even plant potato in October to harvest the crop early. Virtually all potatoes in this country are planted manually. On the basis of the soil quality and potato variety farmers determine the spacing in between the seed tubers and the adjacent rows. Row spacing is usually from 45 to 60 cm. Optimum depth of planting depends on temperature and moisture of the soil, probable weather following planting, and mode of conducting field operations later. If planting is shallow and only about 5 cm deep, the soil must be gradually ridged over the row incidental to cultivation. This ensures that the developing tubers are well covered with soil to protect them from light and pests. Mulching is frequently done over the rows with waterhyacinth, straw etc to preserve the soil moisture and to prevent the growth of weeds.



Potato and potato plant

**Production** As the potato plants become mature and the tubers are fully formed, the leaves become gradually yellowish and then brownish, and finally the plants die. It is always better to harvest the crop after these signs are evident in the field. Most varieties are harvested in this country during February-March. Collection of the tubers is usually done in Bangladesh manually using a spade or other devices.

In volume of fresh product, the potato ranks first among the world's most important food crops. It is grown in almost all countries of the world. In many countries, including those of Europe, America, and Canada, potato is the staple food. Nearly 90% of the potato crop of the world is grown in Europe. In the last 2-3 decades, production of potato in Bangladesh has increased with the cultivation of high yielding varieties. Although the growing conditions are excellent, because of lack of desirable market, farmers do not like to grow more potatoes. Only a negligible portion of the total production is exported, while a substantial amount of seed potatoes are still imported.

In 2005-06, about 4.66 million m tons of potato were produced in the country. This has increased to 8.2 million m tons in 2007-08. Most small farmers preserve potatoes, particularly local varieties, at home indigenously. Consequently, loss due to dehydration, pest attack and infection by disease organisms is substantial. There are 193 cold storages in the country with installed capacity of about 22,00,000 m tons. Rest of the potatoes are kept by farmers in an indigenous method.

**Production of seed potato** In Bangladesh potato is grown in an area of about 8,06,294 acres. For this purpose about 3,50,000 m tons of seed potatoes are necessary. Most of the seeds used are not of high quality. The farmers generally use the tubers they keep for their own consumption as seeds. This results in poor yield in the following season.

Usually, two types of potato seeds are imported by the government, one known as foundation or basic seeds, and the other certified seeds. Bangladesh Agricultural Development Corporation (BADC) distributes certified seeds to the growers produced locally from the imported foundation seeds in their own farms or in lands of farmers on contract basis. Directly imported seeds are also sold to growers through local BADC offices. BARI has now started producing seed potatoes in its own farms at the Debiganj Breeders Potato Seed Production Centre to make seeds available to growers at a reasonable price. Available quality seeds, however, are not sufficient to meet the demand. During 1997-98, the country imported 3,96,331 kg fresh or chilled potato seeds.

**Uses** In Bangladesh, potato is primarily used as a vegetable, although in many countries of the world it constitutes the staple food and contributes more than 90% of the carbohydrate food source. Millions of tons of potatoes are processed annually in Europe into starch, alcohol, potato meal, flour, dextrose and other products. Some are processed into potato chips, dehydrated mashed potatoes, French fries and canned potatoes. Large quantities of potatoes in the Netherlands, Ireland, Germany and other countries of Europe are grown specifically for manufacture of alcohol, starch, potato meal or flour, and for livestock feeding. Europeans consume much larger quantities of potato than the North Americans. Asian countries consume more rice than potato for carbohydrate foods.

In Bangladesh, although the principal use of potatoes is to make potato curry along with fish, meat, and eggs, there exists a great diversity in the consumption of potatoes. Notable among potato-based food items are the boiled potato, fried potato, mashed potato, baked potato, potato chop, potato vegetable mix, potato singara, potato chips, French fry etc. In recent years, bakeries and fast food shops have started preparing a wide variety of potato-based food delicacies.

**Pests and diseases** The potato plant is attacked by several dozens insect, mite, and nematode pests and under ecological conditions favourable to them, these may inflict heavy damage to the growing crop. The following, however, probably cause most of the damage: cutworm, crickets, leafhoppers, potato tuberworm, aphids, flea beetles, root knot nematode, and golden nematode.

The cutworm, *Agrotis ypsilon* (Noctuidae, Lepidoptera) cuts the young potato plants at the ground level and feed on tender leaves and shoots during the night. The C-shaped caterpillar remains hidden under the soil during daytime. Adult moths often can be seen flying in the field.

The field cricket, *Brachytrypes portentosus* (Gryllidae, Orthoptera) inflicts a feeding damage like the cutworms. This pest also cuts the young plants at the base or the underground root system. They do more damage through cutting of the growing plants rather than feeding of the plant parts. Several species of leafhoppers infest the potato plant. Of these, the most serious is *Empoasca devastans* (Cicadellidae, Homoptera). Both adults and nymphs constantly suck the sap of leaves, causing the foliage to curl and dry up. Severe infestations may result in 'hopper-burn'. These insects also transmit virus diseases.

The aphids *Myzus persicae* and *Apis gossypii* (Aphididae, Homoptera) are probably the most serious pests of potato. Both adults and their young suck the sap from the potato foliage, causing leaves to curl downward. Under favourable environmental conditions their population may increase enormously. In addition to the feeding damage they cause, aphids are known to transmit the potato mosaic virus disease, which may seriously affect production.

The potato tuberworm, *Phthorimaea operculella* (Gelechiidae, Lepidoptera), is another serious pest of potato. The caterpillars mine leaves and stems, and later infest tubers. The damage reaches to the climax in storage, if tubers are left unprotected. Initially, they burrow just under the skin and then tunnel into the flesh of tubers. Local varieties, particularly the Lal Pakhari, is very susceptible to their attacks. There are instances of 80% damage in the farmer's homostored potatoes in some locations. Among nematodes, the root knot nematode (*Meloidogyne* species) and the golden or cyst nematodes (*Heterodera* species) cause damage to roots and tubers. Several insecticides, including diazinon, dimethion and malathion are recommended for field application to control potato pests. For control of potato tuberworm in the storage, fumigation with methyl bromide is recommended.

**Diseases** Potatoes suffer from various diseases which are classified according to their causal agents, such as virus, bacteria, fungus, and nematodes. Some nonparasitic diseases or physiological diseases caused by environmental factors or physiological deficiencies are also noticeable. Among the viral diseases, the Mild Mosaic, Rugose Mosaic, and Latent Mosaic diseases are important. Symptoms of mosaic diseases include mottling of leaves with different shades and spots, necrosis and curling. Often, the disease does not exhibit any appreciable symptom. The milder strains of the latent mosaic produce no visible symptoms.

The notable bacterial diseases of potato of this country are the Blackleg, Brown Rot, Bacterial Wilt, and Ring Rot. The Blackleg is caused by *Erwinia atroseptica*, affects growing plants, and tubers in storage; it is so named because the base of the stem becomes shrivelled and blackened.

Brown rot is caused by *Pseudomonas solanacearum*. This disease causes the leaves to wilt, shrivel, and finally death of the plant. The disease is also seen in many other tropical countries, and besides potato, tomato, brinjal, chilli, tobacco etc are also affected. Ring rot is the result of infection with *Corenibacterium sepedonicum*. The symptoms of the affected plant are similar to those of brown rot. The first symptom is pale yellow chlorosis between the veins of the leaves.

Important fungal diseases of potatoes are the Late Blight, Early Blight, Black Scurf and Stem Rot. Late Blight is the most serious and widespread of all potato diseases. The causal organism is *Phytophthora infestans*, a parasitic fungus. The first signs of the disease are brownish to black lesions on any portions of the plant tops, principally on the leaves. On the underside of the leaf white mildew appears. Tubers may be subjected to infection while in the field, during harvest, or in storage. Infected tubers are the principal source for over wintering of this disease pathogen and of primary infection.

Early blight, caused by *Alternaria solani*, is also a serious disease of potato in Bangladesh. It appears first as dark brown to black spots on the leaves. The spots are usually irregular. Often several spots coalesce to form large patches, resulting in the leaf blight. When the spots are numerous leaves die. Usually lower leaves are affected first, drying up as the disease progresses towards the top. In some cases tubers are affected. The Black Scurf disease although not usually very serious, may cause occasionally appreciable damage. It is caused by *Pellicularia filamentosa* and is most conspicuous on the surface of the tubers as brown to black spots. The infection usually does not get into the tissues of the tuber. Infected stems show characteristic lesions.

The best way to prevent or reduce the incidence of potato diseases is the use of disease-free seeds. Seed materials must be examined carefully prior to planting, and if required, seeds should be treated by dipping in recommended chemicals. It is always advisable to use certified disease-free seed potatoes and disinfected seed cutting knives. [Gour Pada Das and Abul Khair]

- This page was last edited on 18 June 2021, at 01:28.