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Growing garden potatoes

The potato is our most popular vegetable. Rich in carbohydrates, chiefly starch, and a variety of minerals and vitamins, it is a highly nutritious and economical food. The potato is a fair source of protein; a good source of phosphorus, potassium and iron; and an important source of vitamins B and C. It is a common homegrown vegetable because many people like to have early potatoes fresh from their own gardens.

The potato originated in the mountains of South America and is an annual plant botanically related to the tomato, pepper, and eggplant. Although records indicate that the potato was cultivated as early as 200 A.D., it was not known in Europe until introduced from South America by early Spanish explorers in the late 1600's. The potato was first used as food in North America after its introduction from Europe in the 1700's by the early settlers. Before 1860, all varieties grown in North America were of European parentage. Most varieties developed since then have some South American parentage.

Although seldom seen on most common varieties, potato fruits, resembling small green tomatoes, sometimes develop when successful pollination of flowers occurs. The edible part, or tuber, is anatomically an enlarged part of the stem developing underground. Since plants grown from seeds of the potato fruit do not produce true to type, the potato is propagated vegetatively from tubers.

Potatoes grow well in Canada

The potato is highly adapted to most growing regions of Canada because it grows best in a cool climate where average day temperatures seldom exceed 21°C. Higher temperatures suppress tuber formation.

Tubers begin to form about 40-50 days after planting, coinciding approximately with (but quite unrelated to) the onset of flowering. The time and extent of tuber development is largely associated with top growth of the plants. For instance, too much top growth caused by excessive application of fertilizers, particularly nitrogen, delays tuber formation, resulting in low yields and delayed maturity. On the other hand, shortages of fertilizer or water and insect damage to foliage may inhibit top growth and tend to encourage early tuber formation.

It takes 90-140 days from planting date for potatoes to reach maturity (Figure 1), depending on location and variety. In our temperate climate, full maturity of late-season varieties may be limited in some years by late frosts. Except in favorable locations or where experience has demonstrated their adaptability, late varieties should probably be avoided by inexperienced home gardeners.

Start with certified potato stock

In the spring, a gardener must decide which potato variety to grow. Preferences vary acccording to local climate and consumer taste. Although some 50 varieties of potatoes are licensed for sale in Canada, only a few are grown extensively in any one area. Varieties are classified as early, mid-season or late. Most, including the red-skinned types, have white flesh.

The use of good planting stock is essential to obtain a satisfactory crop of potatoes. Always try to obtain potato stocks specially grown for planting, that is, those certified and inspected by Agriculture Canada. These cost a little more, but their use may prevent failures.

Avoid using table potatoes for planting

Instead of using certified stocks, home gardeners often plant table stocks obtained at a supermarket or grocery store. Although potatoes from such sources may grow and yield satisfactorily, this practice is not recommended. Table potatoes may be infected with virus and other diseases that have no effect on consumer quality and may have no visible signs on the tubers, but will result in a smaller or poorer crop if used as planting stocks.

For further advice on varietal selection in your area, consult a seed house or local agricultural representative.

Planting

How to prepare potato stocks for planting

Stock potatoes are usually cut in two, four or six blocky pieces depending on the size of the tuber; each piece should have at least one or two eyes and weigh about 50 g. Small potatoes about the size of an egg and specially grown for stock should be planted whole. Allow stocks taken from cold storage to warm up for several days before cutting or planting. Although stocks may be planted immediately after cutting, curing the potato pieces in a relatively warm, damp place for 1-3 weeks before planting encourages rapid healing of cut surfaces, increases resistance to decay and favors sprouting.

A home gardener may find it advantageous to plant potato stocks with strong, thick sprouts. If care is taken to avoid breaking off the sprouts when planting, these stocks usually emerge earlier and produce more vigorous plants than

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nonsprouted stocks. To induce sprouting, expose to dull light for about 2 weeks.

Plant on well prepared, fertile soil

Most good garden soils are suitable for potato growing. Although potato roots have been known to grow to depths of 1.5 m or more, usually the feeding roots and developing tubers occur in the top 30 cm of soil. Stony soils may produce rough, malformed tubers. Potatoes of the best quality with a high dry-matter content and good texture are usually grown on heavier soils which are predominantly mineral in composition rather than organic.

The fertility of each garden soil is different because of large variations in climate, soil type, amount of added organic matter and quality of culture practiced in the garden. Especially on very heavy or clay soils, a liberal application of well rotted farmyard manure, compost or peat moss helps improve the soil structure, aeration and drainage of a soil and maintains growth of desirable soil microorganisms. Potatoes do not grow well in poorly drained or waterlogged soils.

Since the potato is a fairly heavy feeder, nutrients from organic matter alone are usually not sufficient to meet its needs. To avoid mineral deficiency, supplement the soil with a complete fertilizer, that is, one containing nitrogen, phosphorus, and potash (such as 5-10-10, 6-12-12 or 5-20-20).

Potatoes are extremely tolerant of acid soils and when grown in such soils develop a natural resistance to scab. Unless indicated by a soil test, do not add lime to a garden in which potatoes are to be grown, as this promotes development of the scab organism, if present. Fresh manure, which is high in ammonia, produces a similar effect to lime.

When and how to plant

The potato is a cool-season, semihardy crop that tolerates a light frost. Usually, it is planted during May, about 2 weeks before the last killing frost is expected. Under favorable conditions, potato stocks begin to grow as soon as they are planted. Do not plant in soil that is too cold (less than 7°C), as this delays emergence and may cause stock pieces to rot.

At planting time, make holes or furrows about 13 cm deep with a trowel or hoe. For most garden soils, apply $1^1/_2$ tablespoons (27 mL) of complete fertilizer at the bottom of each hole; or 900 g/15 m of row in a band along the bottom of the furrow. Cover with 2.5 cm of soil, put in the stock pieces, and top with soil to ground level. Alternatively, the fertilizer may be broadcast over the garden plot at 7-9 kg/100 m^2 and thoroughly worked into the upper 15 cm of soil. Do not allow stock pieces to come in direct contact with the concentrated fertilizer.

Spacing to a large extent influences size and yield of tubers. Close spacing gives a higher yield per unit area of garden space, but tubers tend to be smaller. Plant stock pieces 25-30 cm apart, in rows about 80 cm apart. About 2.25 kg of potatoes cut in 42 g pieces are sufficient for a row about 12 m long.

Potatoes usually take 2-3 weeks to emerge from the soil at the usual planting depth of 7-10 cm. At this depth, the soil covering is sufficient to prevent late frost damage of stock pieces or young shoots beneath the soil. Planting should be slightly shallower in heavy soil. Too deep a planting may delay emergence of young shoots.

Cultivation and care

Weeding and hilling are essential

Weeds compete with potato plants for soil nutrients, water and light and also reduce yield and quality of tubers. Furthermore, weeds are potential hosts for diseases and insect pests that damage potatoes. Do not allow weeds to build up. Start hoeing early when weeds are just germinating; one good hoeing before potato plants emerge is worth several afterwards. Discontinue hoeing when the foliage covers most of the soil surface or about when plants come into bloom. Besides controlling weeds, hoeing also aerates the soil, loosens the surface, and allows better absorption and retention of soil moisture.

When hoeing, mound a little hill of soil around the base of each plant. This extra soil cover stifles small weeds, prevents greening or sunburning of any tubers that may develop near the soil surface and protects tubers against damage from frosts occuring in the fall. Begin hilling by starting far enough from the plant to avoid cutting roots or developing tubers. Preferably, the hill formed should be broad and flat. It is generally recommended not to hill after the time of last hoeing (Figure 1) unless tubers happen to become exposed.

The use of chemical weed killers is not usually recommended in small garden plots. If it should become necessary to use chemical weed killers in your potato garden, particularly in larger plantings, seek advice and recommendations from your nearest agricultural representative or provincial specialist. Weed killers are most effective when weeds are small. Types such as 2,4-D, used mostly on lawns, may cause deformation of potato plant foliage and reduce yields.

Water during dry spells

Lack of moisture is said to be the main cause of reduced potato yield in Canada. Cycles of hot dry weather, followed by heavy rains prompting sudden short periods of rapid growth, are the main causes of rough, knobby, malformed or cracked tubers. On the other hand, high humidity and excessive rainfall may provide ideal conditions for the development of diseases such as late blight.

Studies have shown that growth of potatoes is greatly retarded by periods of drought longer than 1 week. On the average, potatoes require about 2.5 cm of water per week. Therefore, supplement low rainfall periods with thorough watering from a garden hose. Adequate watering, especially during the period of tuber enlargement, is essential for good tuber growth. A moist soil helps to keep tubers cool during excessively hot weather and to offset conditions suitable for the development of certain types of diseases and disorders.

Control diseases and pests

The potato is susceptible to numerous diseases, among which potato scab and late blight are probably most troublesome and persistent across Canada. Scab frequently causes severe blemishes on tubers but usually does not destroy their usefulness.

Many insects, including the Colorado potato beetle, potato flea beetle, potato leaf hopper and aphids, attack the foliage of potatoes. Others such as wireworms and whitegrubs generally feed below ground and damage the tubers and roots. Slugs and snails may cause some damage in wet parts of a garden plot or during wet seasons. Besides damaging plants

and tubers, insects such as leafhoppers and aphids transmit disease. Virus diseases do not affect the eating quality of table potatoes appreciably, though they reduce vigor and yield of plants and size of tubers. Any plant that appears dwarfed or has yellowed, mottled, wrinkled, rolling or distorted leaves is probably infected with virus and should be pulled from the garden and destroyed.

Growing potatoes year after year in the same part of the garden encourages a buildup of diseases and insect pests, which can best be handled by rotating your potato plantings to other areas in the garden. Grow potatoes and related plants such as tomatoes, peppers and petunias in the same garden spot no oftener than once every 3 years. If potato diseases persist, gather and discard (preferably by burning) all crop residue and culled potatoes after each harvest, since these are prime breeding sites of disease organisms. Good control of diseases and pests of potatoes can be obtained in the garden by specially prepared home garden spray or dust mixtures. Various formulations are available under brand names with directions for use.

For further information, consult your nearest agricultural representative or provincial specialist.

Harvesting and storage

Harvest before first killing frost

Potatoes reach full maturity when the tops of plants become withered. Although tubers of acceptable size may be harvested at any time for immediate use, if you plan to store them for prolonged periods it is best to defer digging until the crop matures. Well-matured tubers have firm, hardened skin, are less susceptible to injuries, and store better than immature tubers.

It is generally preferable to harvest potatoes before the first killing frost. Where the growing season is too short to mature late varieties, tops can be prematurely killed simply by cutting them off when tubers have reached acceptable size. The skin will harden sufficiently if tubers are then allowed to remain 10-14 days in the soil before harvesting. Alternatively, tops may be allowed to be killed naturally by frost, but a severe frost may damage tubers or reduce their quality.

When hot dry weather prevails during late August and September, late varieties may mature and the tops die down naturally in areas marginal for late varieties. Since partial or complete loss of tops due to insect infestation occurring close to harvest helps hasten maturity, it is not advisable to spray against insects late in the season. As previously stated, cultural practices such as overfertilization tend to prolong top growth and delay maturity.

How to dig and handle tubers

A 15 m row of potatoes should yield about 18-30 kg of tubers.

Dig with a fork and handle tubers carefully at all times to avoid bruising, skinning or cutting, which may not always be noticeable at the time of harvest. Injured tubers generally do not store well. To avoid bruising and skinning do not allow potatoes to drop from heights greater than 20 cm, and carry tubers indoors in a padded box or cardboard container.

Do not expose tubers unnecessarily to sunlight. After digging, allow them to dry in a shaded area in the open (but for no more than a few hours) or in your basement. Drying helps harden the skin. Avoid digging on a wet day since wet soil tends to stick to tubers and is a good reservoir for rotting organisms. Do not leave potatoes that have been dug outdoors overnight, especially if there is a risk of frost; frostbitten tubers store poorly and rot easily. Discard all sunburnt or diseased tubers.

Store in a cool, dark place

The potato tuber is a living plant mass that continues to age until cooked. The aim of storage is to slow ageing and maintain tubers in a wholesome state.

A mature tuber at harvest has a natural rest period of 2-3½ months, depending on variety, during which time its sprouts are dormant and will not grow under normal conditions (Figure 1). With proper storage, the rest period of the

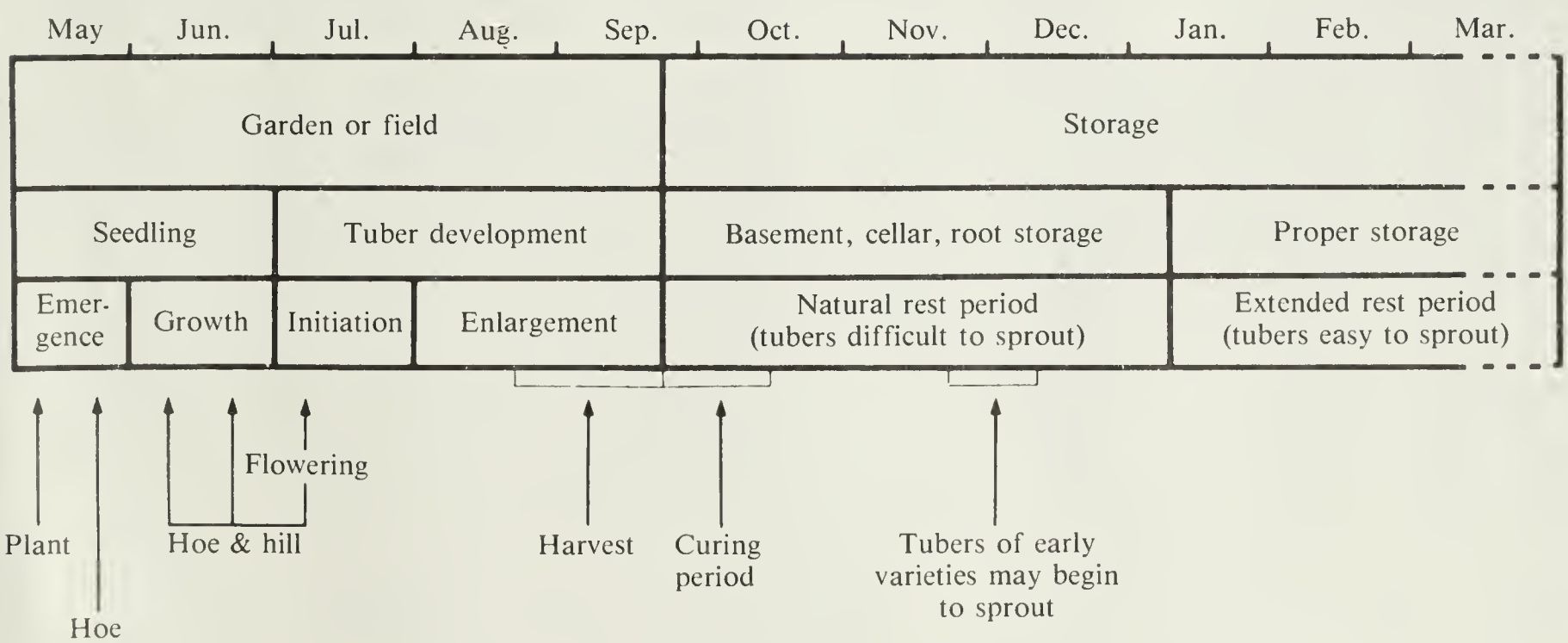

Figure 1 Major events during growth and storage of potatoes

tuber can be extended well beyond 6 months. Because late varieties have a longer rest period, they usually store much better than early varieties.

Potatoes for table use require different storage temperatures from those kept for processing or for planting out. Ideally, table potatoes store best at 4-7°C. This temperature is low enough to prevent sprouting and shrinkage, but not too low to cause excessive sweetening; certain sugars tend to accumulate in tubers kept at low temperatures. It is recommended that, if possible, tubers be kept under relatively warm and humid conditions during the first 2-3 weeks of storage, as this promotes healing of wounds and cuts and increases storageability of the tubers.

In the past, an underground cellar or hole dug in the ground covered with straw or soil kept tubers in good condition until spring. Basements of modern homes, however, are not ideal for potato stroage and potatoes stored there keep satisfactorily for only 3-4 months. Losses due to shrivelling, rotting and increased sprouting, accompanied by general deterioration of internal quality and significant losses in starch and vitamin C contents, can be high.

To avoid this, store only sound potatoes that are dry and reasonably free from dirt. Keep them in a dark location, preferably well ventilated, and away from hot pipes and radiators. If potatoes must be stored in a lighted area, place them in nontransparent bags. Examine the potatoes at intervals and discard diseased ones when you see them.

Green or sunburned potatoes can cause digestive upsets or may be toxic if eaten in large quantities. Potato greening is associated with the presence of toxic glycoalkaloid (TGA) compounds, which accumulate largely as a result of cumulative exposures of tubers to sunlight during growth and handling operations or to artificial light during storage. The presence of small amounts of glycoalkaloids in potatoes is considered normal and is believed to be partly responsible for the characteristic taste of the tubers. There should be no danger from potato poisoning since the green areas are usually removed before cooking.

The storage requirements of potatoes and the planning, designing, and construction of storage facilities are described in Agriculture Canada Publications 1478, *Home Storage Room for Fruits and Vegetables.*

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