

Grow Your Own

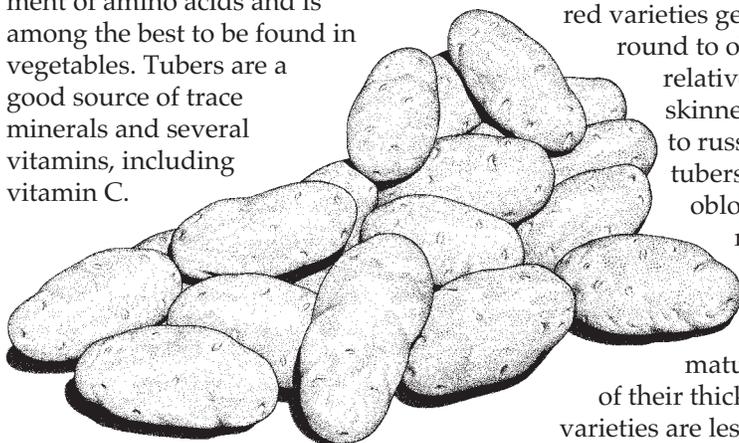
POTATOES

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Potatoes are an excellent choice for the home garden. They emerge quickly and grow rapidly. Potatoes yield well under most soil and growing conditions and can be stored for long periods without canning, drying, or freezing.

Few gardening activities are as rewarding as unearthing a hill of tender, new potatoes for dinner. They can be mouth-watering when prepared by any method, alone or in combination with other foods.

Potatoes are not only delicious but also highly nutritious. They are rich in starch, but an average-sized baked potato contains only 90 to 100 calories—slightly more than an apple and equivalent to one-half cup of cottage cheese. Potato protein has a well-balanced complement of amino acids and is among the best to be found in vegetables. Tubers are a good source of trace minerals and several vitamins, including vitamin C.



While potatoes perform well in most situations when properly cared for, they are susceptible to a number of pests and disorders. Good yields and quality can be achieved in most situations by following the suggestions given here.

Selecting a variety

Selecting the proper variety, or cultivar, is important since varieties differ in yield, cooking characteristics, time of maturity, skin and flesh color, and storage life. Varieties traditionally have been classed as *white*, *red*, or *russet*, based on skin color and texture. Increased interest in new gourmet varieties has added purple, blue, orange, yellow, and other colors to the inventory.

Tubers of standard white and red varieties generally are round to oblong and relatively thin skinned compared to russets. Russet tubers tend to be oblong and relatively dark colored and thick-skinned at maturity. Because of their thick skins, russet varieties are less susceptible

to injury during harvest than reds or whites. The thick russet skins generally also are resistant to common scab.

Gourmet varieties are available in many color combinations and tuber shapes. Home gardeners can enjoy varieties not available in grocery stores. Such varieties are grown more for special features such as color and taste than for high yield and good storage.

Consider the time span from planting to maturity when selecting a variety. Norland, for example, may mature in 80 to 90 days, compared with 120 days or more for Russet Burbank. Early-maturing varieties are a better choice for “new” potatoes, but late-maturing varieties store better because they resist sprouting and shriveling in storage.

Select a variety suited to the method of cooking you prefer.

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While the leading United States variety, Russet Burbank, is excellent for frying and baking, it often is inferior to Kennebec or Red Pontiac for boiling. Some also consider baked Russet Burbank tubers too dry. Many home gardeners prefer to grow an all-purpose variety such as Kennebec, while others grow several varieties for specific uses.

The following varieties are satisfactory for Oregon home gardens. You may want to try more than one.

Early-maturing varieties

Norland, Dark Red Norland—Red-skinned with white flesh. Produces low to medium yields of average-sized tubers. Tuber shape and appearance usually are excellent. The earliest variety currently grown in Oregon. Good for boiling and frying, fair for baking. Somewhat resistant to common scab but less so than russet-skinned varieties. Dark Red Norland, a selection from the original variety, produces darker, more colorful skins than the standard Norland, which is declining in popularity.

Norgold Russet—Yields slightly more than Norland but also matures slightly later. Susceptible to blackleg and hollow-heart of tubers. Once the leading early-maturing variety in Oregon, Norgold has been replaced by Russet Norkotah at the commercial level. Fair to good for baking, french frying, and boiling. Seed may be in short supply and unavailable at most garden centers.

Russet Norkotah—An outstanding early russet. Oblong tubers are extremely attractive with excellent medium russet skins. Tuber physiological disorders such as knobs and hollow centers are very rare even under extremely dry conditions. Susceptible to early dying caused by verticillium wilt but highly resistant to common scab. Fair to good for baking, frying, and boiling.

White Rose—White. Tubers generally are long, thin-skinned, and deep-eyed. Good yields. Will not bake well early but satisfactory for most other uses. Flavor and texture generally not as good as Kennebec. Slightly later maturing than Norgold.

Midseason varieties

Kennebec—White. An excellent all-purpose potato. High yields of large tubers. Susceptible to scab and greening when not hilled properly. Boils, bakes, and fries satisfactorily. Excellent for french frying.

Red LaSoda—Yields more than Norland. Tubers have bright red skins but may be slightly rough in shape with deep eyes. Widely grown in home gardens. Satisfactory to good for most home uses. Susceptible to common scab.

Red Pontiac—Midseason to late. Extremely high yields of large, deep-eyed potatoes. Good cooking quality for most uses. A good red storage potato. Generally too late for early “new” potatoes.

Late-maturing varieties

Russet Burbank—Also known as “Netted Gem,” the “Idaho Baker,” and “Russet.” Leading variety in Oregon and United States. Medium to high yields of large, long, and often knobby, misshapen tubers. Excellent for baking and french frying, fair for boiling, but tends to lose shape and fall apart because of high starch content. Stores extremely well.

Century Russet—Smooth, large, and oblong tubers. Good for baking, boiling, and microwaving. Moister than Russet Burbank when baked because of lower starch content. Satisfactory for frying. Resistant to several diseases. Extremely high yields of attractive tubers.

Ranger Russet—Tubers similar to those of Russet Burbank but sometimes longer, less

susceptible to knobs. Good for all table uses; better internal quality than Russet Burbank. Does not store as well as Russet Burbank.

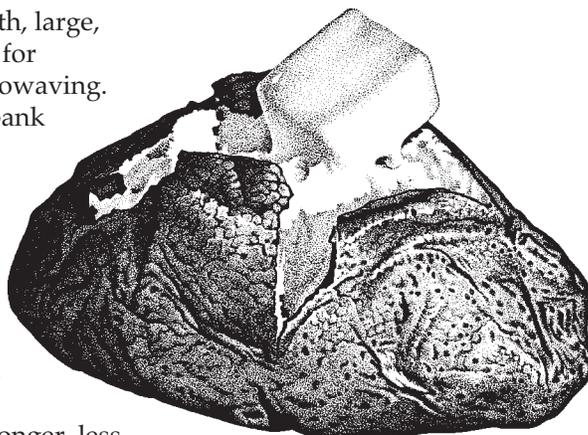
Gourmet and specialty varieties

Many varieties of potatoes are grown for special features including skin and flesh color or unusual flavor. Such “gourmet” varieties often produce low yields compared with standard varieties and may not store as well.

Purple-skinned varieties—All Blue, also called “Purple Marker,” and Blue Cristie are more commonly available to home gardeners than most others in this category. All Blue produces smooth, oblong, late-maturing tubers with dark purple skin and flesh. Blue Cristie tubers are purple skinned with some red-to-pink stripes, prominent eyes, and white flesh. The variety Brigus produces smooth, round, purple-skinned tubers with light yellow flesh.

Yellow skins and flesh—Popular varieties in this category include Yukon Gold, Yellow Finn, and Bintje. Yukon Gold tends to produce smoother tubers and matures earlier than the other two. Yellow Finn stores well.

Red skin, yellow flesh—Desiree is probably the best known and most readily available variety in this group. Others include Saginaw Gold and Iditared.



Soil and fertility requirements

Potatoes do best on fertile, well-drained loamy or sandy soils but can be grown on virtually any soil if high yields and smooth appearance are not essential. Soils with a high pH (alkaline) or extremely high organic matter cause severe scab problems in susceptible varieties, including most round whites and reds.

Tillage

Work the soil to a depth of 6 to 8 inches before planting. The seedbed does not have to be perfectly smooth as is required for small-seeded crops. Excessive tillage actually can cause the soil to seal over after heavy rains, leading to seed piece suffocation and death.

Fertility

Potato plants require 16 or 17 mineral elements (nitrogen, phosphorus, sulfur, calcium, magnesium, potassium, iron, manganese, molybdenum, copper, boron, zinc, chlorine, sodium, cobalt, vanadium, and silicon) for maximum yields and quality. However, most are needed only in trace amounts and are provided in sufficient quantities by most soils.

Most commercial fertilizers contain only three major elements—nitrogen, phosphorus, and potassium—and sometimes a fourth, sulfur. By law, the fertilizer analysis must be displayed on the container.

Fertilizers typically are identified by three prominent numbers separated by hyphens (10-20-20, 12-12-12, etc.). The first number always refers to nitrogen, the second to phosphorus, and the third to potassium. If a fourth number is present, it typically refers to sulfur.

The fertilizer analysis means the following:

- Nitrogen (N) content always is expressed as the percentage of actual nitrogen.

- Phosphorus (P) content is expressed as the percentage of P_2O_5 . Multiply the number shown on the package by 0.44 to determine the actual P content.

- Potassium (K) is expressed as the percentage of K_2O . Multiply the number shown on the package by 0.83 to get the actual K content.

Thus 10-12-12 fertilizer contains the following:

- 10 percent nitrogen
- 5.28 percent phosphorus (12 percent P_2O_5 \times 0.44 = 5.28 percent P)
- 9.96 percent potassium (12 percent K_2O \times 0.83 = 9.96K)

Fertilizers normally are applied at or shortly before planting either by broadcast or band applications or a combination of the two. Many gardeners hand broadcast the entire amount and work it into the top 3 or 4 inches of soil by rototilling or raking.

A more effective but time-consuming method is to place all or part of the fertilizer in a band 3 inches to the side and 1 inch below the seed pieces. A combination of broadcasting half and banding half of the fertilizer usually is more effective than either method alone.

Never place fertilizer on or directly above the seed pieces; the fertilizer salt will dehydrate and damage or kill the seed pieces and developing roots and shoots.

When the potato plants are about 6 inches tall, some gardeners band or "side-dress" additional fertilizer beside the rows. As a general rule, do not side-dress more than about half the amount that was used at planting. Side-dressed fertilizers always should be covered with soil or watered in shortly after application to prevent excessive loss of nitrogen to the air as ammonia.

Never use "weed and feed" fertilizers on vegetables. They contain herbicides that will kill many crop plants.

Fertilizer requirements for potatoes differ among Oregon geographical regions. Central and

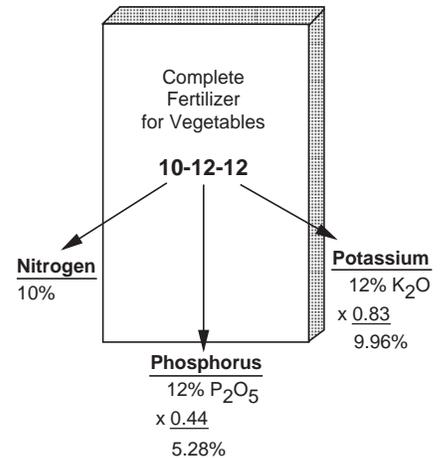


Figure 1. — The three numbers on fertilizer packages represent nitrogen, phosphorus, and potassium.

eastern Oregon soils, for example, normally require less phosphorus than western Oregon soils but may require more sulfur.

Fertilizer and lime rates should be based on soil tests for best results. A soil test is indispensable for precisely determining lime and fertilizer needs. Soil tests are highly recommended for the first cropping season and at least every second or third year thereafter. Information on soil testing is available from county Extension offices.

While not ideal for every situation, the following fertilizer recommendations are satisfactory for most Oregon home gardens.

Complete 1:1:1 (approximately equal percentages of N, P_2O_5 , and K_2O) or 1:2:2 fertilizers generally are preferred unless soil test reports suggest otherwise. Materials such as 10-10-10, 15-15-15, and 10-20-20 satisfy these requirements. They are widely available from most fertilizer dealers and gardening centers.

Apply 10-10-10 at the rate of about 7 pounds per 100 feet of row or 23 pounds per 1,000 square feet. Higher or lower analysis fertilizers should be applied at adjusted rates to supply about the same level of nitrogen.

For example, 15-15-15 applied at the rates of about 4.5 pounds per 100 feet of row or 15 pounds per

Table 1.—Fertilizer application rates.

Fertilizer	per 100-ft row	per 1000 sq ft
10-10-10	7 lb	23 lb
15-15-15	4.5 lb	15 lb
20-20-20	3.5 lb	12 lb

1,000 square feet would supply approximately the same level of nutrients as 10-10-10 applied at the higher rates. Any complete fertilizer similar to the above, applied at appropriate rates, will perform satisfactorily (Table 1).

Nitrogen usually requires more management than phosphorus and potassium because it is easily leached below the rooting zone by overwatering or heavy rains. Do not apply more water than the soil can hold in the top 15 inches. Prolonged heavy rains prior to late July may call for additional nitrogen applications.

Some western and north central Oregon soils are low in sulfur and may require up to 1 pound per 1,000 square feet each year. Magnesium also may be low in some instances. Soil tests are particularly useful in detecting shortages of these elements. Recommended materials and rates will be recorded on the soil test report.

Soil amendments

Soil amendments, cover crops, manures, and composted organic materials are excellent for increasing organic matter and long-term fertility of the soil. Such materials also tend to improve soil structure.

However, high levels of undecayed organic matter can promote scab on most white- and red-skinned potato varieties. Therefore, the use of uncomposted manure except in the fall is discouraged. If you wish to use sludge or recycled organic matter in or around your garden, you should know the nutrient (NPK, etc.) content of the material. You also should know possible health risks.

Manures tend to be overrated as fertilizer materials but highly underrated as soil builders. A ton of fresh cow manure, for example, contains only about 11 pounds of nitrogen, 3 pounds of phosphoric acid, and 10 pounds of potash. Concentrations of N, P, and K in dried manures may be three to four times higher than in fresh manures.

Poultry and sheep manures tend to be about twice as high in nitrogen and many times higher in phosphoric acid than cattle manures. Potash levels are about the same for all species. Unless fresh manures are applied in excess of about 5 tons per acre, recommended fertilizer levels should not be altered.

A good legume cover crop plowed under just before planting can reduce fertilizer needs by up to 20 percent. Remember, though, that undecomposed organic matter such as fresh manure or cover crop debris can cause severe scab infection in susceptible varieties.

While scab does not affect eating quality or storability, the unsightly skin lesions definitely detract from tuber appearance and may severely reduce market value. If scab is a problem, use resistant russet-skinned varieties.

Heavy liming is not recommended for potatoes in most cases since it increases the soil pH, which causes scabby tubers in most round white and red varieties. The pH should be held between 5.2 and 5.8, slightly acid, if scab has been a problem. Otherwise it should be around 6.5, since other vegetables do best at pH 6.5 to 6.8. Russet-skinned potato varieties, especially Russet Burbank, are highly resistant to the scab organism.

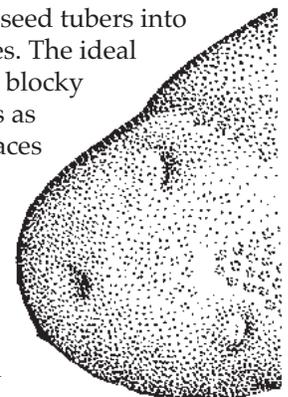
Cutting and handling seed

Whenever possible, plant only *certified seed* potatoes. Such seed has been inspected by professionals and judged to be relatively free of diseases and other problems such as sprout-inhibiting chemicals. Healthy seed tubers produce healthy plants and good yields. Most garden centers stock certified seed of several common varieties, but certified seed may not be readily available for minor varieties except through mail-order companies.

Obviously, non-certified seed will be less productive than certified stock and generally will call for increased disease and insect control during the season. Avoid using home-grown potatoes for planting, since they probably are heavily infected with viruses that can drastically reduce yield and quality of the new crop. Most supermarket potatoes are useless for seed because they have been treated with chemicals that permanently inhibit sprouting.

The use of non-certified seed may be essential in some instances. If non-certified seed must be used, especially seed from grocery stores and other questionable sources, determine whether the tubers will sprout by holding them at room temperature in a dark, humid, well-ventilated area for up to 2 weeks before planting. If sprouts begin to elongate vigorously, the tubers probably will produce plants in the garden.

Cut large seed tubers into several pieces. The ideal seed piece is blocky in shape, has as few cut surfaces as possible, weighs between 1 and 2 ounces (slightly larger than a



golf ball), and has two or more “eyes” or buds. When cut properly, 10 pounds of seed potatoes will produce about 100 seed pieces, enough to plant about 100 feet of row. A 100-foot row should yield between 200 and 400 pounds of usable potatoes if the crop is allowed to mature fully.

The term “eye” originated from the fact that the potato tuber is a modified underground stem and contains rudimentary leaf scars below each bud. These scars tend to be crescent shaped, reminiscent of human eyebrows; hence the associated buds came to be called eyes.

Plant in warm (above 45°F), moist soil immediately after cutting if possible. If planting must be delayed because of cold or wet soil, hold seed pieces at room temperature for 4 or 5 days to promote healing of cut surfaces. During this healing period, the seed pieces should be held at high humidity with adequate ventilation.

A closed, but not sealed, cardboard box with a few ventilation holes provides good conditions for healing. Do not pile cut seed pieces more than about 6 inches deep. Never store seed pieces or tubers in airtight containers. Some sprout growth is normal and desirable for rapid emergence through the soil, but sprouts should not be so long that they break off during planting.

When planting early or under questionable conditions, consider treating seed pieces with a recommended fungicide to reduce decay. A popular method with home gardeners is to place freshly cut seed pieces and a small amount of fungicide dust in a closed plastic bag and shake it vigorously.

Treatment should be done outside or in a well-ventilated area since fungicide dusts can irritate the skin, nose, and throat. Be sure to use rubber gloves, a dust mask, and eye protection. Always read and carefully follow label directions when using any agrichemical.

Planting

Potatoes can be planted from March until mid-June, but most gardeners prefer May. Due to wet weather, western Oregon gardeners normally do not plant before late April or early May.

Planting early and using early varieties will allow early harvest but also may cause some missing plants due to seed piece decay. Consider planting a few hills early for “new” boiling potatoes and more later for fall and winter storage. Late-harvest and late-maturing varieties generally store better than early-harvest and early-maturing varieties.

Space rows about 3 feet apart for easy cultivation and hilling. Space seed pieces 10 to 12 inches apart in furrows and cover with about 4 inches of soil. Deeper covering is permissible on dry or sandy soils in eastern Oregon, but be sure not to cover more than about 4 inches deep on heavy clay soils or in wet situations.

Also, be sure that planted rows are slightly mounded in western Oregon to prevent water standing in the rows and drowning the seed pieces and developing plants.

If you prefer larger tubers, consider widening the within-row spacing to 15 inches or so. Conversely, if tubers have been too large, plant the seed pieces closer together. Seed spacings of 6 inches or less are not uncommon. Tuber size also can be controlled through variety selection.

Cultivation and hilling

Weed control is essential for best yields and quality. The most practical method of controlling weeds in the home garden is by mechanical means—rototilling or hoeing. No chemical herbicide is labeled for all crops normally grown in the home garden. Mechanical cultivation also breaks up soil crusts and increases oxygen availability to the roots. To reduce

clods, avoid cultivating when the soil is wet. Late-season cultivation should be shallow and well away from the rows to avoid damaging potato roots and tubers.

Potato tubers turn green in sunlight. The green color is chlorophyll and is not poisonous. However, solanine, a poisonous alkaloid, increases along with chlorophyll. Green potatoes therefore could be toxic if eaten in quantities far beyond normal consumption. Many other food crops also contain alkaloids or other toxins that also could be harmful with excessive consumption.

To prevent greening, keep the tubers covered by periodically “hilling” up or mounding soil around the base of the plants. Avoid covering the leaves. Since hilling also controls small weeds in the row, most gardeners prefer to form hills gradually by adding a small amount of soil each time the planting is worked.

Stop cultivation and hilling shortly after bloom to avoid root damage. The hills should be about 8 inches high and 10 to 12 inches across by that time.

Watering

Water potatoes in mid-day to allow the foliage to dry before nightfall. Dew and high relative humidity during the night and early morning, especially in western Oregon, may cause the leaves to remain wet and highly susceptible to infection by late blight and other fungal and bacterial diseases.

Potatoes need up to 2 inches of water per week depending on the time of year and weather conditions. Hot, dry conditions and vigorous growth increase water needs. Therefore, moisture requirements are highest during mid-season and generally much lower early and late.

Do not irrigate before plant emergence unless absolutely necessary. Wet soils can aggravate seed piece decay. Begin irrigating

shortly after plants emerge and keep the soil damp, but not flooded. Water only when and as much as the crop needs. An even, adequate soil moisture supply favors maximum yields and quality. Reduce irrigation late in the season. Cease watering when the vines begin to die or a week or two before final harvest for winter storage.

Soil texture does not alter crop water needs but does strongly affect the amount of water that can be applied in a single irrigation. Many sandy soils, for example, hold less than 1 inch of available water per foot of soil, while heavier silt loam soils may hold 2 inches or more.

Potato roots normally do not penetrate more than about 18 inches into the soil, and 90 percent or more of the roots usually are restricted to the top foot. Therefore, if the crop requires 2 inches of water in a given week, you often can meet crop needs with a single weekly application of 2 or 3 inches on silt loams. However, you will need two or three 1-inch applications, spaced 2 or 3 days apart, on sands.

When irrigating, try to apply only as much moisture as the soil will hold in the top 15 inches. Higher application rates not only waste water but also leach much of the nitrogen and other nutrients below the root zone—and eventually into streams and rivers, with adverse environmental impacts.

Conversely, avoid frequent, light applications that may wet the soil surface but leave most of the roots dry. When sprinklers are used, monitor application rates by placing open-topped tin cans throughout the planting. Turn off the sprinklers when the proper depth has collected in the cans, or when shoveled holes show good moisture down to at least 12 inches.

The irrigation methods described above generally are satisfactory for all home garden vegetables.

Harvesting and storing

Tubers can be harvested for immediate use as soon as they are large enough. Norland or Russet Norkotah, for example, will produce small immature or “new” potatoes for cooking with peas or beans within 50 days after planting. Don’t miss the opportunity to harvest and enjoy new potatoes at about the time plants are blooming.

Do not attempt to store immature potatoes for more than a few days. Potatoes for storage should not be dug until 2 weeks after vines have died from frost or old age, or have been cut and removed. This allows the tuber skin to toughen and resist cutting and bruising during harvest. Harvest for storage normally does not begin before early October in most areas. Western Oregon gardeners should harvest before the fall rains set in.

To prevent excess mud and soil on the tubers, dig only when the soil is relatively dry. Do not wash potatoes before storage, since wet potatoes decay easily. Never store potatoes with decay or bad cuts.

Potatoes should be stored in a *cool, dark, well-ventilated* area where there is no danger of freezing. Temperatures around 40°F are best for long-term storage. A root cellar or similar location generally supplies a very satisfactory storage environment for potatoes. Do not use plastic bags or airtight containers, which might cause the tubers to suffocate. Remember, light in storage causes tubers to form chlorophyll and turn green.

Potatoes stored below 40°F may become sweet-tasting as tuber starch is changed to sugars, primarily glucose and sucrose. Sweet tubers produce dark-colored fries and off-flavors. Warming the potatoes to room temperature for several days before use usually cures the problem.

Shriveling and sprouting increase at storage temperatures above 50°F. To reduce shriveling, store potatoes in a humid but not

wet area. Breaking off sprouts from time to time also reduces water loss and shriveling.

Controlling pests and diseases

Although chemicals used in the home garden are relatively safe to humans, all pesticides are potentially dangerous, especially if misused. Always use them with caution, strictly according to label directions, and only when needed. Apply and store chemicals away from children. Read and precisely follow the instructions printed on the manufacturer’s labels. Do not apply pesticides closer to harvest than recommended by the label.

Many materials recommended by reputable suppliers will effectively control potato insects and diseases. Most insecticides, for example, are multi-purpose, controlling several species.

Since pesticide registrations change frequently, affecting the availability of pesticides and changing permissible practices, this publication does not make specific pesticide recommendations.

For current recommendations, refer to the *Pacific Northwest Plant Disease Control Handbook* and *Insect Control Handbook*, published and revised annually by the Extension Services of Oregon State University, Washington State University, and the University of Idaho. In addition, instructions for pesticide use are provided on pesticide container labels and in other literature provided by manufacturers.

Insecticidal soaps are becoming more popular for small plantings. Soaps are relatively safe to work with and effective for most insects if used regularly as recommended. Insects must be contacted directly by the soap solution to be affected.

Disease control

Control of insects such as aphids, wireworms, and flea beetle larvae will reduce disease problems.

Seed-borne diseases—The most serious diseases of potatoes are carried in the seed tubers. Many of these, particularly viruses, can be prevented or reduced by using certified seed.

Do not plant seed potatoes showing any decay. Decaying seed pieces contain fungi and/or bacteria that can rapidly destroy the seed pieces and developing plants. Decaying seed pieces also can introduce harmful diseases such as late blight and bacterial ring rot, which can harm the entire planting. If soil conditions are not suitable for rapid healing and plant emergence (above 45°F, moist but not wet), allow cut seed pieces to heal for several days before planting.

Early and late blight—Both early blight and late blight occur in Oregon. Both diseases cause dark, dead spots on the leaves. Early blight spots often look like a bulls-eye target when examined closely, and the disease often is referred to as “target spot.” Late blight lesions, by contrast, often show a white, moldy growth around the edges, particularly on the undersides of leaves and in early morning or during wet weather.

While early blight primarily is a leaf problem, late blight can cause severe tuber decay in storage. Late blight was responsible for the Irish famine of the mid-1840s, in which more than a million people perished. Do not store late blight-infected tubers and never use them for seed.

Since late blight prefers cool, humid situations, it normally is most severe in western Oregon, especially in the Willamette Valley in wet, cool weather in late August and September.

Both early and late blight can be controlled by weekly spraying or dusting with any of several recommended fungicides. Follow label instructions for best results.

Some materials should not be applied within 14 days of harvest. Additional spray information is

available at county Extension offices and garden centers.

Soil-borne diseases—Avoid growing potatoes in the same section of the garden year after year, since this causes a buildup of soil-borne diseases including verticillium wilt and scab. Tomatoes, strawberries, and eggplant also are susceptible to wilt and should not precede or follow potatoes in the cropping sequence.

Leaves of verticillium-infected plants wilt from the bottom of the plant upward beginning about flowering time. The wilted foliage turns yellow and then brown, and severely infected plants quickly die.

Common potato scab first is expressed as minute reddish-brown spots around breathing pores (lenticels) in small tubers. The lesions become larger and darker to form circular scabbed areas that may be isolated or coalesced to form large corky masses. While scab does not affect food quality, severely affected tubers are unmarketable. Most russet varieties are resistant to scab.

Viruses—Viruses can be controlled by using certified seed, which is relatively free of viruses, and by controlling aphids. Aphids, particularly the green peach aphid, spread several viruses (e.g., potato virus Y, potato leafroll virus) from plant to plant during feeding.

A single feeding on a potato leafroll-infected plant can cause the green peach aphid to be a carrier for the rest of its life and to be able to infect every plant it feeds on. Therefore, good aphid control is essential for controlling many potato viruses. Some viruses (for example, PVX and potato spindle tuber viroid) are sap transmitted and can be spread from plant to plant by clothing or equipment.

Unlike fungal and bacterial diseases, which usually cause obvious lesions and decay, external symptoms of viruses usually are limited to plant stunting and distortion and yield and quality

loss. Potato leafroll virus (PLRV), for example, causes the leaves to roll up and the plants to become stunted and sometimes yellow. Mosaic viruses such as potato virus Y (PVY) and potato virus X (PVX) cause characteristic light and dark patterns in leaves. Certain combinations of mosaic viruses (PVX plus PVY) cause the plants to become extremely distorted, lose leaves, and sometimes eventually die.

Because viruses are spread easily throughout the patch, you should remove and discard suspect plants as early as possible.

Insect control

Insects other than the common ones listed below may attack potatoes. Ask your county Extension agent or other expert for additional information on insects and their control.

Many insecticides are extremely toxic to honeybees. Try to spray early or late in the day when bees are less active.

The discerning gardener will notice that one or two insecticides used as needed will control most of the insects listed.

Insecticidal soaps are effective against most insects when used properly. Some gardeners also have used household soaps successfully



Use pesticides safely!

- **Wear** protective clothing and safety devices as recommended on the label. **Bathe or shower** after each use.
- **Read** the pesticide label—even if you’ve used the pesticide before. **Follow closely** the instructions on the label (and any other directions you have).
- **Be cautious** when you apply pesticides. **Know your legal responsibility** as a pesticide applicator. You may be liable for injury or damage resulting from pesticide use.

for insect control. Results have been mixed, however. Soap solutions must come into direct contact with insects in order to be effective.

Some soaps can cause plant injury when used in high concentrations and/or left on the leaves too long. Because soaps are effective only when in solution, dry residues can be washed off to reduce plant injury if necessary. Mesh row covers also can prevent insect injury but they are expensive and inconvenient to use, especially during hilling and cultivating.

Flea beetles—Two species of flea beetles, the potato flea beetle and the tuber flea beetle, attack potatoes in Oregon. Adult flea beetles are shiny, dark beetles about $\frac{1}{16}$ inch long. They rest on tops of leaves and jump like a flea when disturbed. Damage caused by the adults is minor, consisting of small round holes slightly larger than a pencil lead in the leaves.

In the Willamette Valley, considerable damage can be caused by larvae of the tuber flea beetle feeding on tubers. Injured tubers show pimple-like swellings on the skin and brown feeding tunnels about $\frac{1}{32}$ inch in diameter up to $\frac{1}{2}$ inch deep in the flesh. Larvae can be controlled best by killing adults with recommended sprays before they can lay eggs at the base of the plants. Tuber flea beetles normally are of little importance in central or eastern Oregon.

Flea beetles can be controlled by spraying or dusting with various insecticides. Begin treatment when two-thirds of the plants have emerged and continue through the season whenever new leaf damage is observed. Be aware that insecticides that control flea beetles but do not kill aphids actually can increase aphid populations by destroying

beneficial insects such as lady beetles, which feed on aphids.

Aphids—Aphids are small, soft-bodied insects about $\frac{1}{16}$ inch long. They come in many colors and may or may not have wings. Aphids feed much like mosquitoes, by inserting stylets into the plant and sucking sap. They usually feed and cluster on the undersides of leaves and shoot tips. Vines may become covered with thick, sticky “honey dew” excreted by the aphids. Aphids damage plants by spreading viruses and, when present in large numbers, directly weakening or killing plants through sap removal.

Many insecticides control aphids. More than one application during the season is necessary. Insecticidal soaps also control aphids when used regularly.

Wireworms—Wireworms are slick, brownish, slender, hard-bodied worms up to $1\frac{1}{2}$ inches long. They live in the soil. The body is segmented, with three pairs of legs situated near the front. Wireworms bore into seed pieces in the spring and later tunnel into tubers or eat out deep, funnel-shaped holes. Decay organisms (fungi and bacteria) often enter the wounds. Wireworms can be severe in some gardens and almost nonexistent in others.

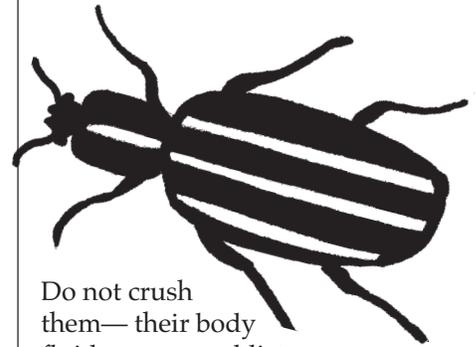
Labeled granular insecticides incorporated into the soil according to label directions generally will control wireworms and other insects such as symphylans. Rotating crops or moving the whole garden can be helpful in controlling soil insects.

Colorado potato beetles—This beetle sometimes is troublesome in central and eastern Oregon but not in the Willamette Valley or Klamath Basin. The adults are about $\frac{1}{2}$ inch

long, whitish yellow with black stripes, and hard bodied. The soft-bodied larvae usually are copper colored. Both adults and larvae chew on leaves.

Potato beetles can be controlled with various insecticides as directed on the labels. Hand picking the adult beetles and egg masses from the plants is effective but not very practical in large gardens. Insecticidal soaps or mesh row covers probably would work fairly well. A regular spray program for flea beetles and Colorado potato beetles usually will reduce the incidence of spotted cucumber beetles, which can be troublesome in some areas of western Oregon.

Blister beetles—These are black, shiny beetles about $\frac{1}{2}$ inch long. They feed on leaves but only occasionally are a serious problem.



Do not crush them—their body fluids can cause blisters.

Mites—Mites are tiny spider-like creatures that are difficult to see but detectable by their feeding, which causes the plants to yellow and die. Fine webbing may be evident.

Mites can be controlled with labeled pesticides; however, they may be resistant in some areas. Spraying plants with water and using sprinkler irrigation are somewhat effective in washing mites off plants. Good miticides are available should mites become a problem.

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