BUL 1114

Idaho Potatoes

Contents

University of Idaho Extension

In Brief

- Idaho is the top potato producer in the United States, producing approximately 13.8 billion pounds of potatoes per year and contributing 32% of the country's total production.
- Most potatoes in Idaho are grown along the Snake River Plain (Figure 1), which extends from southeastern Idaho across south-central Idaho to the Idaho-Oregon border.
- Long, warm days (85°F–95°F), and short, cool nights (50°F–60°F) are ideal growing conditions for potatoes.
- Irrigation from the Snake River and the Snake River Aquifer allows growers to precisely manage a crop's water needs.

Growing Locations and Yields

- Number of acres harvested annually: 295,000–330,000 acres.
- Average yield across the Snake River Plain: 250–800 hundredweight per acre (cwt/a), depending on the growing location and environmental conditions, with yields increasing from east to west.
- Commercial potato production spans 350 miles across the Snake River Plain, largely planted to russet varieties, but increasingly to reds, yellows, chipping, and specialty cultivars.

Figure 1. Potatoes in Idaho are grown throughout the Snake River Plain.

- Processing factories primarily rely on russet potato varieties for french fries and frozen, formed products.
- Potatoes grown for fresh consumption are sorted into size categories for various uses. Seed potatoes are grown primarily in high-elevation, short-season areas of eastern Idaho with over 100 varieties grown on 30,000–33,000 acres annually. This area is conducive to seed production due to lower temperatures and isolation from commercial fields, both of which reduce pest pressure. The top varieties include Russet Burbank, strains of Russet Norkotah, Ranger Russet, Clearwater Russet, and Alturas.

Planting, Rotation, and Seeding

- Using certified seed potatoes to grow any potato crop is required by certified seed laws in Idaho, with few exceptions. These laws and regulations have been requested by industry to help protect Idaho potato production from the introduction or movement of high-risk pests and pathogens.
- For improved pest and soil structure management, a minimum three-year rotation or longer is encouraged.
- Potatoes are commonly rotated with sugar beets, beans, peas, onions, small grains (primarily wheat and barley), corn, alfalfa, and mustard.
- Planting extends from mid-March to early June, with planting starting earlier in the west and later in the east of the Snake River Plain.
- Potato is vegetatively propagated. Potato seed tubers are typically mechanically cut to produce seed pieces that weigh between 1.5 and 3.0 ounces. Some growers prefer to use whole tubers that have not been cut.
- Seed pieces or whole tubers are usually planted 6”–8” deep and spaced approximately 9”–12” within the row, depending on variety, season length, and desired size profile.
- Row spacing varies, generally from 34 to 36 inches.
- Seed size, seeding rate, and in-row spacing are variety- and end-use dependent.

Growth Stages and Development

Sprout Development

- Potatoes are vegetatively propagated from tubers (potatoes).
- Sprouts grow from the “eyes” of the tuber.
- Roots grow shortly after sprout development, with most roots remaining within the top 12” of soil, although some grow deeper.

Vegetative Growth

Vines (stem and leaf tissue) capture energy from the sun for photosynthesis.

Tuber Initiation and Development

- Stolons (underground stems) grow horizontally and swell to form tubers (potatoes) underground.
- Energy is partitioned between vines and tubers.

Tuber Bulking

- Dry matter accumulates in tubers.
- Russet Burbank tubers add 6–10 cwt/A/day during this stage.

Maturation

Vines die, and tuber skin thickens, which protects against water loss, disease, and handling damage. Properly matured tubers have longer storage life.

Potato Fertility

- Macronutrients: Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and sometimes Sulfur (S). These nutrients are critical and required in larger amounts than micronutrients by the plant.
- Micronutrients: Iron (Fe), Molybdenum (Mo), Boron (B), Manganese (Mn), Zinc (Zn), Chlorine (Cl), and Copper (Cu). These nutrients are needed, but not in large amounts.
- Soil tests are used to determine the nutrient status of the soil and what needs to be added.
- Other soil amendments, including manure and compost, can be used to improve soil fertility and soil structure.

Nitrogen (N)

- Required for healthy plants: 150–400 lb N/acre.
- Ten to fifty percent applied before planting; the remainder applied during the growing season. The preplant rate depends on location, season length, variety, and soil type.
- Nitrogen is typically applied via the irrigation system; however, it can also be applied by airplane.
- Growers use laboratory analysis of plant petioles to determine application rates during the growing season.
- Excess N reduces yields and tuber size.
- Nitrogen is important for chlorophyll production and impacts photosynthesis.

Phosphorus (P)

- Applied as phosphate (P_2O_5): 80–400 lb P_2O_5/acre.
- Incorporated into the soil before planting.
- Depending on soil test results, fields with low P can be amended in season.
- Phosphorus is needed for energy storage and photosynthesis activity.

Potassium (K)

- Applied as potassium sulfate (K_2SO_4) or potassium chloride (KCl): 50–500 lb K/acre.
- Influences potato size, specific gravity, and yield.
- Incorporated into the soil before planting.

Sulfur (S)

- Applied as elemental S or sulfate (SO_4): 30–40 lb/acre.
- May be more needed on sandy fields with low organic matter but is applied when soil tests indicate levels are low.

Irrigation

- Consistent irrigation prevents defects and ensures high yields and good quality.
- Potatoes may need as much as 25” of water per season.
- Irrigation methods in sprinkler (center pivots, wheel lines, solid set pipe) and (less common) drip.
- Irrigation frequency: Every 2–7 days depending on variety, growth stage, soil type, and weather.
- Soil moisture can be evaluated by growers using the “hand feel” method and increasingly by using soil moisture probes placed in different locations throughout the field to help inform when irrigation is needed. Soil moisture is ideally maintained at 70%–85% soil-holding capacity during the growing season.

Abiotic Stress

- Environmental stresses: heat/cold and drought/excessive water.
- Results in decreased yield, specific gravity, and increased tuber defects.
- Heat stress can cause second growth, growth cracks, and sugar accumulation, which may lead to sugar ends.
- Frost events can significantly reduce yields, depending on the plant growth stage and severity.

Harvest

- Potato tubers are mechanically harvested 100–150 days after planting, depending on variety, location, and end use.
- Harvesting at potato pulp temperatures between 45ºF and 65ºF minimizes storability issues.
- Maturation and properly adjusted equipment help minimize tuber bruising.

Storage

- Properly stored potatoes can maintain quality for 9–12 months. Storage is typically positively ventilated, computer-controlled environments that hold over 10 million pounds of potatoes.
- Different end users determine the appropriate temperature at which to store tubers.
  - Seed: 36ºF–38ºF
  - Fresh: 44ºF–48ºF
  - Process: 45ºF–50ºF

- Ideal storage conditions are dark and well ventilated, with consistent temperature and high humidity (>98%).
- Proper storage conditions prevent defects like blackheart and sprouting.
- High humidity minimizes water loss and tuber shrinkage.
- Sprout suppressants are commonly used to control sprouting.

Potatoes may be affected by various pests, including disease-causing pathogens, insects, and weeds. To mitigate damage from pests, use Integrated Pest Management, which incorporates cultural, biological, and chemical controls into a comprehensive strategy that optimizes environmental and economic outcomes.

Diseases

- Black dot (*Colletotrichum coccodes*)
- Blackleg, bacterial soft rot, and aerial stem rot (various pectolytic bacteria)
- Brown spot (*Alternaria* spp.)
- Common scab (*Streptomyces* spp.)
- Early blight (*Alternaria solani*)
- Fusarium dry rot (*Fusarium* spp.)
- Grey mold (*Botrytis cinerea*)
- Lesion nematodes (*Pratylenchus penetrans*); also part of the early die disease complex
- Less common diseases: zebra chip ("*Candidatus Liberibacter solanacearum*"), rubbery rot (*Geotrichum candidum*), late blight (*Phytophthora infestans*)
- Pink rot (*Phytophthora erythroseptica*)
- Powdery scab (*Spongospora subterranea* f. sp. *subterranea*)
- Pythium leak (*Pythium ultimum*)
- Rhizoctonia canker and black scurf (*Rhizoctonia solani*)
- Root-knot nematodes (*Meloidogyne chitwoodi* and *M. hapla*)
- Silver scurf (*Helminthosporium solani*)
- Verticillium wilt (*Verticillium dahliae*); also part of the early die disease complex
- Virus diseases, such as *Potato virus Y*, *Potato mop-top virus*, *Potato leaf roll virus*, *Tobacco rattle virus*
- White mold (*Sclerotinia sclerotiorum*)

Insect Pests

- Aphids (green peach aphid, *Myzus persicae*; potato aphid, *Macrosiphum euphorbiae*; others)
- Colorado potato beetle (*Leptinotarsa decemlineata*)
- Cutworms and armyworms (many species)
- Flea beetles (*Epitrix* spp., others)
- Leafhoppers (beet leafhopper, *Circulifer tenellus*; others)
- Loopers (alfalfa looper, *Autographa californica*; cabbage looper, *Trichoplusia ni*)
- Lygus (*Lygus* spp.)
- Other sporadic, infrequent pests of potatoes include leatherjacket (crane fly), blister beetles, grasshoppers, whiteflies, and white grubs.
- Potato psyllid (*Bactericera cockerelli*)
- Potato tuberworm (*Phthorimaea operculella*)
- Thrips (western flower thrips, *Frankliniella occidentalis*; onion thrips, *Thrips tabaci*)
- Two-spotted spider mite (*Tetranychus urticae*)
- Wireworms (*Limonius* spp., others)

Weeds

- Barnyard grass (*Echinochloa crus-galli*)
- Common lamb's-quarter (*Chenopodium album*)
- Crabgrass (*Digitaria* spp.)
- Field bindweed (*Convolvulus arvensis*)
- Foxtails (*Setaria viridis*, *Setaria pumila*)
- Hairy nightshade (*Solanum physalifolium*)
- Kochia (*Bassia scoparia*)
- Palmer amaranth (*Amaranthus palmeri*)
- Quack grass (*Elymus repens*)

- Redroot pigweed (*Amaranthus retroflexus*)
- Russian thistle (*Salsola tragus*)
- Sandbur spp. (*Cenchrus* spp.)
- Sow thistle (*Sonchus arvensis*)
- Wild buckwheat (*Polygonum convolvulus*)
- Wild oat (*Avena fatua*)

Defects

- Brown center
- Bruise (blackspot, shatter, pressure)
- Freezing injury
- Greening
- Growth cracks
- Hollow heart
- Misshapen tubers
- Periderm disorder syndrome (pink eye)
- Skinning
- Sunburn
- Vascular discoloration

Further Reading

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