

CHIP-STOCK

U.S. POTATO REFERENCE GUIDE





INTRODUCTION

U.S. CHIP-STOCK POTATOES: QUALITY, CONSISTENCY, VARIETY

There's a reason the United States is one of the world's major potato-producing countries, growing more than 20 million metric tons annually.

In fact, there are many reasons—including favorable soil, ideal growing conditions, plentiful water and an industry committed both to advancing research and technology and to sustaining the traditions that made U.S. potato growers so world-renowned in the first place.

The result: U.S. potatoes display a level of quality, consistency and variety that none can match.

BUILDING ON NATURE'S BOUNTY

U.S. potatoes' outstanding quality starts with exceptional seeds, all of which pass the U.S.'s strict seed certification system. Nature plays a role, too, giving major potato-growing regions the long, warm days and cool nights that ensure maximum productivity and consistent, flavorful potatoes with minimal defects. And the cold, hard winters keep pests and diseases at bay.

TECHNOLOGICAL EDGE

U.S. potato growers also follow the data when growing premium potatoes. Soil conditions, water content, weather patterns and the plant's nutritional needs all undergo precise monitoring so that growers can adapt rapidly to changing circumstances. After harvest, U.S. potatoes are stored in carefully designed facilities with just the right temperature, lighting, humidity and ventilation to preserve their quality.

TRUSTED AND VERIFIED

All U.S. potatoes are inspected and sorted for maximum quality and consistency. The pick of the crop is sized and graded using standards of quality established by the United States Department of Agriculture (USDA). The upshot: a high-quality potato that buyers can count on for consistency and value.

PREMIUM CHIPS START WITH PREMIUM POTATOES

The quality of United States chipping potatoes doesn't happen by accident. Only through a fine-tuned mix of soil and climate conditions, advanced plant science, contemporary harvest technology and on-the-ground know-how do U.S. growers produce chipping potatoes of such high quality that their reputation extends worldwide.

Every step that U.S. growers take, from planting to storing to shipping, is designed to maximize the health of the potato and its subsequent chipping performance. U.S. growers grow almost all their chipping potatoes under contract. This means that the processor's (your) requirements and specifications will be considered throughout the process, but only if the contract for the chipping potatoes occurs before planting.

HANDLE WITH CARE

Harvest is a critical time for maintaining potato quality. That's why U.S. growers manage their harvesting and handling equipment to protect against tuber damage. What's more, they store potatoes in facilities that allow for the precise control of temperature, relative humidity, and oxygen and carbon dioxide levels, all to maximize the potatoes' storage life and chip quality.

They also grow varieties specifically designed for longer-term storage. These "cold chippers" can be stored at colder temperatures for longer periods and still produce perfectly white chips as the starches do not convert to sugars as readily.

- Starting in the field, U.S. growers condition the soil using light irrigation to forestall tuber damage.
- In storage, a relative humidity of 90% to 95% reduces shrinkage, pressure bruising and loss of tuber texture.
- Controlled atmospheric (CA) storage holds tubers in dormancy with minimal respiration, keeping oxygen levels low and levels of carbon dioxide—respiration's end product—below 1%.
- Sprout inhibitor applied early in storage prevents the breaking of tuber dormancy.

AVOID STRESS

Darkening in potato chips is a definite defect. It occurs when the six carbon-reducing sugars, glucose and fructose are subjected to frying's high heat. But potatoes only exhibit high levels of these sugars when stressful conditions cause their starch to break down first to sucrose and then to glucose and fructose. So, U.S. growers go out of their way to make sure their potatoes avoid stress.

- A two- to four-week period of suberization at 58°F (14.4°C) preconditions excess sugars out of freshly harvested tubers.
- By dropping the holding temperature 1° to 2°F per day until it reaches between 48° and 52°F (8.9° and 11.1°C), growers maintain a low concentration of free sugars during potato storage.
- Controlled ventilation in storage permits the entry of sufficient oxygen—approximately 18 to 21 cubic feet per minute (cfm)—to avoid potato stress.
- Bimonthly chemical maturity monitoring (CMM) tracks sugar levels and ensures that sucrose and glucose concentrations stay at or below 1 mg/g and 0.35 mg/g, respectively.

DECISIONS, DECISIONS: U.S. CHIP-STOCK POTATOES GIVE YOU OPTIONS

U.S. growers harvest potatoes all four seasons of the year, with the larger portion of the crop harvested in the fall from September through November. Potatoes not sent to market immediately are put in storage and kept throughout the remainder of the marketing season.

Because U.S. growers plant and harvest chipping potatoes throughout the country and year-round, there are potatoes available for export all year. The different potato varieties that U.S. growers produce represent a breadth of storage, shipping and chipping characteristics, so based on your operational needs, you'll find the U.S. potato that best meets them. The introductions on the following pages should get you started.



ANDOVER

STRENGTHS AND WEAKNESSES

Andover is an early season table-stock and chipping variety. This variety has medium-dry matter content and good storability quality, and is excellent for chipping. Tubers are spherical with slightly textured skin. It has good cooking qualities and medium specific gravity. Andover has an excellent chip color from 45°F (7.2°C) storage. Andover is relatively free from internal defects. It is resistant to golden nematode and powdery scab, moderately resistant to common scab and susceptible to early dying and early blight.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** Medium **MATURITY:** Early to midseason **STORABILITY:** Medium dormancy
AVAILABILITY: ME, NY, WI



ATLANTIC

STRENGTHS AND WEAKNESSES

Atlantic is a midseason cultivar used for chipping and processing markets. With high yield potential, high specific gravity and uniform tuber size and shape, Atlantic is the standard variety for chipping from the field or from very short-term storage. It is noted for its light chipping color and its consistently high specific gravity equal to 1.090. The cultivar is tolerant to scab and verticillium wilt, resistant to pink eye and highly resistant to Race A of golden nematode, virus X and tuber net necrosis. Tubers are susceptible to hollow heart, blackspot and shatter bruise. Hollow heart in larger diameter tubers (>0.83mm) can be serious in some growing areas.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Midseason **STORABILITY:** Medium dormancy
AVAILABILITY: CA, CO, ID, ME, MI, MN, ND, NE, NY, OR, WA, WI



CHIPETA

STRENGTHS AND WEAKNESSES

Chipeta is a medium to late maturing variety used for chipping and processing markets. Tubers have moderately high specific gravity and accumulate less sugars in storage than most standard chipping varieties. It is noted for its excellent chip color after long-term storage. Chipeta is resistant to most internal and external defects, including second growth, growth cracks, hollow heart, heat necrosis, blackspot bruise, leafroll-induced net necrosis, verticillium wilt, and both foliar and tuber phases of early blight. Chipeta is susceptible to fusarium dry rot.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Mid to late season **STORABILITY:** Medium dormancy
AVAILABILITY: CA, CO, ID



DAKOTA CRISP

STRENGTHS AND WEAKNESSES

Tubers are round, uniformly sized and smooth, with an eggshell skin color, white flesh and shallow eyes. The variety is medium in maturity and specific gravity. Dakota Crisp stores well, has low sugar accumulation in storage and processes consistently from 45°F (7.2°C) storage. It is suitable for chip processing and table-stock. It produces typical symptoms of bacterial ring rot and PVY0. It is susceptible to common scab, pink eye, silver scurf and/or black dot and late blight.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** Medium to high **MATURITY:** Midseason **STORABILITY:** Medium dormancy
AVAILABILITY: ID, ND, OR, WA, WI



DAKOTA PEARL

STRENGTHS AND WEAKNESSES

Dakota Pearl is a midseason cultivar that produces white, uniformly round tubers. This variety has medium to high specific gravity generally in the low to mid 80s and is capable of delivering exceptional chip quality after long-term storage of tubers at 42°F (5.5°C). Dakota Pearl has a low percentage of external defects and is resistant to cold sweetening.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** Medium to high **MATURITY:** Midseason **STORABILITY:** Long dormancy
AVAILABILITY: ID, ME, MN, ND, NE, OR, WA, WI



IVORY CRISP

STRENGTHS AND WEAKNESSES

Ivory Crisp is a midseason variety with specific gravity ranging from 1.090 to 1.095. Tubers are round, white and medium in size. Ivory Crisp is a dependable chipper from long-term storage. This cultivar chips directly from cold temperatures without reconditioning. A desirable feature of Ivory Crisp is that it has very consistent chipping quality from year to year. This variety has very few internal defects. Ivory Crisp is susceptible to PVX and is extremely susceptible to shatter bruise.

CHARACTERISTICS

YIELD: Medium **SPECIFIC GRAVITY:** High **MATURITY:** Midseason **STORABILITY:** Medium dormancy
AVAILABILITY: ID, ND, NE, NY, OR, WA, WI



LA CHIPPER

STRENGTHS AND WEAKNESSES

La Chipper is a midseason chip-stock variety. It has medium to high yield, medium specific gravity and white tubers. This variety is well suited for processing into potato chips. This variety has some resistance to late blight and is susceptible to air pollution damage and moderately susceptible to common scab.

CHARACTERISTICS

YIELD: Medium to high **SPECIFIC GRAVITY:** Medium **MATURITY:** Midseason **STORABILITY:** Short dormancy
AVAILABILITY: ME, ND, NY



LAMOKA

STRENGTHS AND WEAKNESSES

Lamoka is a chipping variety that produces attractive, round tubers with slightly to moderately textured skin. Tubers exhibit few external defects, but have shown internal necrosis in a few trials. Small areas of translucent tissue have also been observed inside tubers in a few trials. Specific gravity has averaged about 0.004 less than Atlantic in 33 trials. Chip color out of cold storage has been excellent, comparable to or better than Snowden in most trials.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Late season **STORABILITY:** Medium to long dormancy
AVAILABILITY: CA, CO, ID, ME, MI, MN, ND, NE, NY, OR, WA, WI



MANISTEE

STRENGTHS AND WEAKNESSES

Manistee is a white chip-processing variety with mid to early season maturity and the ability to store long term. The tubers have above-average yield potential and high gravity. Manistee has an attractive round appearance and shallow eyes. It has creamy, white flesh with low incidence of internal defects and a better tolerance to blackspot bruise than Snowden.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Early to midseason **STORABILITY:** Medium dormancy
AVAILABILITY: CA, FL, MN, MO, NC, ND, NY, OR, TX, WI



MEGACHIP

STRENGTHS AND WEAKNESSES

Megachip is a white potato that matures in 90–100 days, or mid to late season. This potato is a medium to short storage chipper and makes a good table and chipping potato. Megachip produces good quality tubers of an acceptable size in a relatively short season. This variety has good yielding capacity. It is fairly resistant to early blight and early dying and is less sensitive to blackspot bruise than Snowden. Megachip is resistant to common scab, but susceptible to pressure bruise.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** Medium to high **MATURITY:** Mid to late season **STORABILITY:** Long dormancy
AVAILABILITY: CA, WI



NORWIS

STRENGTHS AND WEAKNESSES

Norwis is a medium to late season chip-stock and table-stock variety. Its yield is high and specific gravity is medium. Chip color is good at harvest and when stored at 50°F (10°C) or warmer. Norwis is not well-suited to long-term cold storage for chip processing. The tubers are blocky, oval and relatively smooth. Norwis is resistant to PVX, PVY, leafroll and southern bacterial wilt. It is susceptible to verticillium wilt, pink eye, external brown spot and common scab.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** Medium **MATURITY:** Midseason **STORABILITY:** Short dormancy
AVAILABILITY: ME, MI



PIKE

STRENGTHS AND WEAKNESSES

The major strength of Pike is its good chip-processing characteristics. Tubers of this variety can be stored at 45°F (7.2°C) and produce light color chips. Tuber yield and specific gravity of Pike are about equal to Atlantic. Pike has excellent common scab resistance and is resistant to golden nematode and hollow heart. It is susceptible to net necrosis.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Midseason **STORABILITY:** Medium dormancy
AVAILABILITY: ID, ME, MI, NE, NY, OR, WA, WI



REBA

STRENGTHS AND WEAKNESSES

Reba is a mid to late season chip and table-stock variety. It has high yields with specific gravity averaging 1.074. This variety stores well with few problems and chips well from 45°F (7.2°C) storage. Tubers are large with white skin and white flesh. This variety is resistant to golden nematode, common scab, verticillium and early blight. It is susceptible to late blight.

CHARACTERISTICS

YIELD: Medium to high **SPECIFIC GRAVITY:** Medium **MATURITY:** Mid to late season **STORABILITY:** Long dormancy
AVAILABILITY: ME, MI, NY, WI



SNOWDEN

STRENGTHS AND WEAKNESSES

Snowden is a late maturing chip-stock variety with high specific gravity and above-average yields. This variety has excellent chipping quality from the field and from storage. It will produce an acceptable chip color from storage temperatures above 45°F (7.2°C). This variety is resistant to scab and susceptible to bruising.

CHARACTERISTICS

YIELD: High **SPECIFIC GRAVITY:** High **MATURITY:** Late **STORABILITY:** Short dormancy
AVAILABILITY: CA, CO, ME, MI, MN, ND, NE, NY, WA, WI

Stable Supply: the Contracting Advantage

The majority of chipping potatoes grown in the U.S. are grown under contract. The only way to ensure that you receive the right chipping potatoes for your operation—and receive them when you need them—is to contract with U.S. growers and shippers before planting. The advantages are clear:

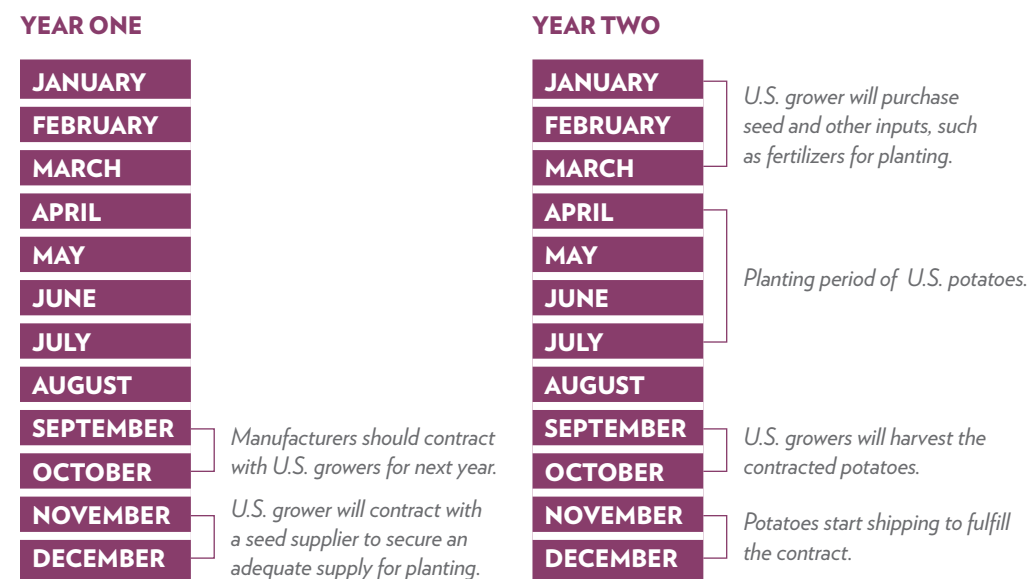
- Contracting lets you and your seller agree in advance on critical conditions, such as the variety of potato grown, the volume grown and price conditions.
- Open-market prices and variety availability can change with the season and market conditions, and the longer into the year you wait, the higher the prices tend to rise.
- Though a supply of non-contracted processing potatoes is sometimes available, you can't be sure of its stability or suitability for your purposes.
- Many importing countries have phytosanitary requirements that require testing and monitoring throughout the production cycle. These requirements cannot be met unless the potatoes have been contracted and the grower knows what needs to be done.

How far ahead should you negotiate? The following example should give you an idea of how to determine the most prudent timeline. And remember: know before they grow!



Growing Under Contract: an Example

It is best to negotiate and sign contracts prior to planting. For example, potatoes purchased from the fall harvest season should be discussed in the fall of the preceding year. Early contracting allows the grower to initiate a contract with a seed supplier in the winter (November or December) to secure an adequate supply for planting the required acreage in the spring. Growers will then harvest the potatoes in the fall (September or October) of the contracted year and will be ready for shipping in October or November to fulfill the contract.



Note: This example is for fall-harvested potatoes. The same lead time is required for winter, spring and summer harvests.

SPEAKING THE SAME LANGUAGE

A Glossary of Potato Terms

AGTRON: an instrument that objectively measures relative color characteristics.

AGTRON VALUES: chip color values measured by Agtron instruments.

APICAL: used to describe the top or apex of something.

BLACKSPOT: dark semispherical spot in the flesh beneath the hard tuber surface.

CFM (CUBIC FEET PER MINUTE): the volume of the air that is compressed each minute.

CULINARY: relating to food or cooking.

CWT (HUNDRED WEIGHT): a unit of weight used in the U.S. equal to 100 pounds.

DRY MATTER: solid content of a tuber; made up of carbohydrates, protein and mineral or ash.

FOLIAR: relating to the leaves of a plant.

HOLLOW HEART: associated with excessively rapid tuber enlargement; incidence is associated with large tubers.

OBLONG: having a shape that is considerably longer than it is wide.

PRESSURE BRUISING: a type of bruise that occurs in storage where tubers develop softened, flattened or indented areas as a result of continuous pressure; they may discolor the flesh of the tuber, which shows up after processing as gray areas.

RELATIVE HUMIDITY: the ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.

RUSSETTED TUBERS: tubers with brown rough skin.

SHATTER BRUISE: cracks or splits on the tuber surface that penetrate the flesh.

SLOUGHING: discarding or shedding.

SPECIFIC GRAVITY: a measure of total solids content of a product.

SUBERIZE: to deposit a fatty substance called suberin in plant cell walls during their conversion to cork tissue; aids wound healing and thickening of the skin.

SWEETENING: a process of starch breaking down to sucrose and, in turn, to glucose and fructose after a given resting period.

YSI (YELLOW SPRINGS INSTRUMENT): instrument used to evaluate the sugars in potatoes by measuring the constituent glucose and sucrose.



Potatoes USA: Your Resource for U.S. Potatoes

Potatoes USA is the marketing organization representing the 2,500 commercial potato growers operating in the United States. In addition to fresh chipping potatoes, Potatoes USA promotes four other categories of potatoes and potato products: fresh table-stock potatoes, frozen potato products, dehydrated potato products and seed potatoes.

Whether you're seeking ideas, information, tools or inspiration, Potatoes USA can provide support to enhance your sales:

- Educational and training materials
- On-site and technical training
- Point-of-sale materials
- Individualized seminars
- Promotional support
- Product samples

Contact your local Potatoes USA representative office to find out about services available in your market. We're also happy to put you in touch with exporters of U.S. potatoes and potato products. And to answer your potato questions and fuel your imagination, visit PotatoesUSA.com.



For more information about chip-stock exporters and suppliers, visit:

<http://potatoesusa.com/contact/us-potato-exporters-suppliers/chip-stock-exporters-and-suppliers>





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