

KEYS

TO

PROFITABLE PRODUCTION

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KEYS TO PROFITABLE POTATO PRODUCTION

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The crop value of Irish potatoes in Texas exceeded \$29 million from 17,600 acres in 1974, and \$21 million from 14,100 acres in 1975. In 1974 potatoes ranked highest in dollar value of all vegetable crops in Texas. In 1975 potatoes ranked fourth in value, surpassed by onions, carrots and cantaloupes.

Areas of Production

Potatoes are grown over the entire state; however, commercial acreage is concentrated in four areas: The Northwest Texas High Plains; the Rolling Plains-Munday; the Upper Coast-Winter Garden; and the Rio Grande Valley.

Planting begins in the lower Rio Grande Valley in late December and in the Winter Garden by early January. In the Rolling Plains-Munday area, planting usually begins in mid-February and continues through March. Mid-March through early April is the principal planting time on the High Plains, with scattered plantings for late harvest occurring in July and early August.

Harvesting begins in April in the Rio Grande Valley. Supplies are available from the Winter Garden area in late April and early May, with potatoes available from the San Antonio-Upper Coast region about the middle of May. Digging begins in the Munday and Pecos areas in early June, with peak movement from the High Plains area in July and August. Supplies continue into late fall.

Peak movement of Texas potatoes to market occurs from mid-June through mid-August. About 70 percent of the Texas crop is marketed during this period, with a major portion coming from the High Plains area.

Climatic Requirements

Potatoes produce highest yields and quality when grown under conditions of long days with warm day

temperatures and cool nights. Daytime temperatures of 75 to 90 degrees F followed by cooler night temperatures of 60 to 65 degrees are ideal for maximum yields. These conditions are most critical during the time when the tubers are forming. Continuous high temperatures or insufficient moisture during this period will result in poor yields. Yields are consistently higher in North Texas than in South Texas, primarily because of cooler night temperatures and longer days during the period of tuber enlargement.

Water requirements vary according to soil types and climatic conditions, but from 16 to 30 inches of supplemental irrigation in addition to natural rainfall is necessary for maximum yields.

Soil Types

Potatoes are adapted to most Texas soils that are well drained. Most potato acreage is planted in clay loam and sandy loam soils. In recent years a trend to plant potatoes in the loamy sands of Northwest Texas has developed. Potatoes are adapted to a wide range of soil types, but careful selection of adapted varieties and cultural management are required to assure maximum performance.

Fertilizers

Potato plants require relatively high soil fertility for production of strong tops and premium size tubers of high quality. Nutrient requirements occur early in the growth of the plant, thus all or most of the fertilizer is usually applied at or just before planting. The fertilizer should be banded 2 inches to the side and 1 inch below on both sides of the seed piece. Sidedress nitrogen is sometimes applied to potatoes grown on light sandy soils. For maximum response the extra nitrogen must be applied prior to the onset of tuber formation.

Fertilizer application rates vary with soil types, climatic conditions, varieties and fertility levels of the soil. About 180 to 250 pounds of available nitrogen (expressed as N), 300 to 400 pounds of available phosphorus (expressed as P_2O_5) and 300 to 400 pounds of available potassium (expressed as K_2O) are required for good potato yields in most areas of Texas.

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The fertility levels of the soil greatly influence fertilizer requirements. Soils in most production areas of Texas contain enough potassium to produce good yields, although additional potassium is required in East Texas and on some sandy soils of the Rolling Plains. Actual fertilizer applications are often in the range of 800 to 1200 pounds of 16-20-0 or its equivalent per acre.

Estimates of fertilizer requirements will be more accurate when soil samples are tested yearly in an Extension Service laboratory or a reliable private laboratory. Residual fertility from previous manuring and crop residues will become available to a subsequent potato crop and must be taken into account in estimating the amount of fertilizer to apply.

Varieties

Many potato varieties are grown in Texas. Red La Soda, Viking and Norland are the principal red-skinned varieties. White-skinned varieties include Kennebec, Norchip and several processing company selections. Norgold Russet is the principal russet-skinned variety. Russet Burbank is produced in Gaines and Dallam Counties in Northwest Texas only as a fall crop, but it is not adapted for spring production in Texas. Norgold Russet is widely grown for the fresh market as a baking potato in North Texas.

A considerable portion of Texas potatoes are produced for the chip industry, with Kennebec grown primarily for this purpose.

Varieties worthy of trial in Texas are the white-skinned varieties Superior and Shurchip. The recently introduced Norgold Russet strains, "M" and "19" may offer potential advantages to growers of the original Norgold Russet.

Disease resistance, size, color, uniformity, earliness and yield are of prime importance in variety selection. High specific gravity and low levels of reducing sugar in the tuber at harvest are desirable in varieties for baking and for processing.

The potato blossom is a complete flower and normally is self fertile. Many potato varieties have blooms which, when pollinated, often set fruit. This fruit resembles a small green tomato and is seldom larger than an inch in diameter. This potato fruit is not a cross between potatoes and tomatoes.

Seeding Rates, Spacing, Size and Treatment

The amount of seed required to plant an acre varies with plant spacing and size of the seed piece. Usually, 1,500 to 2,000 pounds of seed pieces are required to plant an acre. Potatoes usually are planted in rows 36 to 40 inches apart with an in-the-row spacing of 7 to 10 inches. The closer spacing in fertile soil of the High Plains has proved to be more profitable. Seed should be cut to weigh 1½ to 2 ounces each.¹

B-size potatoes often are used as seed-pieces to eliminate the cost of cutting larger potatoes, and to lessen the chance of spreading infectious diseases dur-

ing the cutting operation. Usually, a better stand results from using whole potatoes.

Use only certified, disease-free seed potatoes. See the section on Disease Control for seed piece treatments for disease control.

Land Preparation and Planting

The land is deep plowed in the fall or winter and disced just before planting in most cases. Proper leveling of land is essential before final preparation. A clod buster or spike toothed harrow can be used to break clods down to a granular structure.

Plant early potatoes only when the soil temperature at the 4- to 6-inch depth has risen to 50 degrees F. This soil temperature usually occurs 3 to 4 weeks before the frost-free date. Plant to a depth of 2 to 3 inches, measured from the top of the seed piece to the bed level. Increased yields and higher prices warrant the risk of frost damage by early planting. However, planting too early or too deeply may cause increased seed piece decay and Blackleg.

Irrigation

The most common method of watering potato soils in Texas is by furrow irrigation. Center pivot sprinkler systems are being used successfully on the High Plains. Adequate soil moisture at planting time is preferred. Avoid watering-up the crop if possible. Seed piece decay and Blackleg are usually more troublesome when the soil around the seed piece is flooded prior to shoot emergence.

Four to ten irrigations may be needed during the growing season, depending on rainfall and the variety planted. Growers usually examine the plants and the soil in the root zone (3 to 6 inches below the seed piece) to estimate need for irrigation. Abnormally dark bluish-green leaves, wilted growing points, and soil from the root zone that fails to form a tight ball when compressed by hand are indicators of moisture stress. Growers of high yielding potato crops irrigate before plants or soil show moisture stress.

Some leading growers use soil moisture tensiometers to schedule irrigation and prevent moisture stress. The tensiometer is an instrument which accurately senses the tension in the water film as moisture is pulled into the roots from the soil. Tensiometer management must be adjusted to individual soil and crop conditions and cultural practices. Soil around the seedling root system must not be allowed to dry out. The first post-emergence irrigation should be applied when the soil moisture tension (SMT) at the 12-inch depth reaches 20 centibars in the morning of a bright day. Subsequent irrigations are scheduled to prevent the SMT at the 12-inch depth from reaching as high as 30 centibars. Again, this usually means irrigating whenever the SMT is 20 centibars or higher in the morning of a clear day. Moisture stress (SMT readings above 30 centibars at the 12-inch depth) during tuber enlargement will result in lower yield of premium

size tubers. Secondary growth on tubers (knobs and necks) results from moisture stress followed by irrigation or heavy rainfall. Excessive soil moisture favors Blackleg, *Rhizoctonia* disease and enlarged lenticels. Furrow watering every other bed prevents excessive soil moisture conditions in clay loam soils.

Cultivation and Hilling

Cultivation is necessary only for incorporating herbicides, forming a hill 6 to 8 inches high over the seed piece and 12 inches wide on the top, or breaking up a crusted condition of the bed surface. The first bedding is best done when the plant tops are at least 4 to 6 inches above the soil surface. Hilling can be delayed until plants are taller, but earlier hilling will assure cooler soil (65 to 70 degrees F) in the zone where stolons and tubers form, and this is beneficial to their development.

By the time the plants bloom fully and begin to form tubers, hilling should be completed and cultivation should cease.

Weed Control

Weeds emerging after the last cultivation often are a serious problem because they reduce the efficiency of mechanical harvesting. Most annual weeds and grasses can be controlled by applying recommended herbicides before planting or during the early growth stages. Treflan, applied at the rate of 1 to 2 pints per acre, incorporated 1½ to 2 inches deep, gives satisfactory control of most annual weeds and grasses. Pre-emergence application of Dacthal W-75 at the rate of 6 to 14 pounds per acre results in satisfactory control of many annual weeds, but weed control is erratic on some soils. Where nutgrass is a problem, Eptam applied preplant or post-emergence at 3 to 6 pounds of active chemical per acre is suggested. Eptam must be incorporated mechanically immediately after being sprayed on the soil surface. Dacthal, Treflan and Eptam can be applied at layby or during the last cultivation. Two herbigation applications of 3 pounds of Eptam per acre, the first in the initial postemergence irrigation and the second just after the last hilling, has given good weed control in sandy loam soil.

Limited commercial experience with Sencor demonstrated that good weed control was obtained with 1 to 2 pounds of Sencor 50-WP per acre applied prior to crop emergence. The 1 pound rate was used on sandy soil, and it does not control nutgrass at that rate.

Diseases

Potatoes are exposed to many disease organisms during the growing season. Most disease losses can be prevented by careful culture and timely applications of protective fungicides.

Growers should insist that seed potatoes be treated before winter storage. Use Mertec-F at the rate of 42 fluid ounces in 100 gallons of water and

apply to 2,000 pounds of tubers. Cut seed should be thoroughly coated with a fungicide dust when seed are cut. Use Manzate-200, Dithane M-45 or Captan at the rate of 1 pound per 100 pounds of seed, or Polyram dust at the rate of 1 to 1½ pounds per 100 pounds of seed. Polyram has slightly better activity against the bacterial disease Blackleg. Blackleg is more prevalent in plants grown from seed infected with Fusarium, so the grower should not accept seed infected with dry rot.

Early blight and late blight can be prevented by spraying Manzate 200 or Dithane M-45 at 7- to 10-day intervals when the first infection is seen. Bravo and Difolitan are also effective in preventing both diseases. Apply fungicides in strict compliance with label directions.

Crop rotation and sanitation will help to prevent scab, *Rhizoctonia* disease and southern blight. For more detailed control recommendations, see MP-902, *Texas Guide For Reducing Vegetable Losses* (Texas Agricultural Extension Service).

Insects

Potatoes can be damaged by a number of different insect pests. Careful inspection of the crop during the growing season is necessary to minimize or prevent crop damage. Proper selection of insecticides and timing of applications are necessary to achieve satisfactory control. Wireworms can be controlled with an application of 40 pounds of 10 percent granular Dyfonate per acre at the time of planting. DiSyston, applied at the rate of 2 to 3 pounds of active material per acre banded at planting, or 3 to 4 pounds broadcast per acre and incorporated into the soil prior to planting, will provide early season control of leafhoppers, psyllids, aphids, flea beetles and Colorado potato beetles. Temik can also be used at the rate of 2 to 3 pounds active ingredient per acre, banded at planting, for control of the above insects. Blister beetles, hornworms and Colorado potato beetles are controlled with a foliar application of 1.0 pound of active Sevin per acre. In season control of aphids, psyllids, cucumber beetles and flea beetles can be obtained with Parathion at 0.25 to 0.50 pounds active ingredient per acre. Refer to MP-675, *Texas Guide for Controlling Insects on Commercial Vegetable Crops* (Texas Agricultural Extension Service) for additional information on the latest recommended control measures. *Follow label directions concerning rates, time of application and safety precautions.*

The chemicals and procedures stated herein for the control of weeds, diseases and insects comply with Environmental Protection Agency label registrations in force on the date that this publication was printed. However, subsequent changes in EPA regulations may cause any of these chemical usages to be in error. Be sure to adhere strictly to usage restrictions on the current label for the chemical you intend to use.

Harvesting

Although harvest time depends primarily on maturity of the crop, other factors such as weather conditions, market prospects and the labor situation influence harvest decisions of Texas growers. Optimum maturity is reached when most of the tubers are between 6 and 12 ounces and the skin is set.

To assure good skin-set, the plants should mature and die before harvest. It is usually necessary to kill the plants prior to harvest of the summer crop. Vine beaters are often used to cut the vines just above the soil surface. One to 2 gallons of Sinox plus 3 to 5 gallons of diesel oil in 50 gallons of water per acre applied 12 to 15 days before harvest may be used. Do not spray in wind to avoid injuring adjacent crops. Use only EPA approved vine killers.

In Texas, most potatoes are harvested with potato combines. Some growers still pick up and bag the tubers by hand to avoid skinning an early-harvested crop. The tubers are washed, sized and graded, then placed in 100-pound bags or 50-pound cartons for shipment. Graded sizes are U. S. #1 unsized, U. S. #1 Size A, U. S. #1 6 to 14 oz., and U. S. #1 70 to 110 count size. The U. S. #1 70 to 110 count sizes are packed in 50-pound cartons.

Costs and Returns

The costs and returns for potatoes change from year to year as the cost of inputs and market prices fluctuate. The total cost of producing and marketing Texas potatoes has risen sharply from more than \$500.00 per acre in 1970 to more than \$800.00 in 1974 and more than \$1,000.00 per acre in 1976 for a high yielding crop.

Harvesting and marketing costs per acre vary with yield. With higher yield, the production cost per sack decreases while harvesting and marketing costs per sack remain the same.

For more information on vegetable production in Texas, refer to the following publications available from your county Extension office:

- MP-1244 *Budgets for Major Rio Grande Valley Vegetables*
- MP-675 *Texas Guide for Controlling Insects on Commercial Vegetable Crops*
- MP-1061 (Part III) *Suggestions for Weed Control with Chemicals in Horticultural Crops*
- MP-902 *Texas Guide for Reducing Vegetable Disease Losses*

Lipe, W. M., J. C. Miller, and J. M. Krejci. "Effect of Row Spacing on Yield and Grade Distribution of Norgold Russet and Other Potato Varieties Grown on the Texas High Plains." Texas Agricultural Experiment Station, MP-1212.

The authors acknowledge contributions to this publication by Robert W. Berry and Jose Amador, Extension area plant pathologists, James F. Leser, area Extension entomologist; and Jack D. Price, Extension project leader in pesticide chemicals and agricultural chemist.

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