Potatoes
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POTATOES are a widely adapted and important crop in Michigan. A substantial initial investment and a potential market outlet are the first requirements for successful commercial potato production in Michigan.

Soil and Climate

The most desirable soils for producing quality potatoes are sandy loams or loamy sands which are well-drained, well-aerated and well-supplied with organic matter and plant food. Such soils are easily tilled and warm quickly in the spring permitting early planting and good tuber development. Peat and muck soils are also adapted to potato production if well-drained, adequately fertilized and frost-free during the growing season.

Potatoes require adequate soil moisture throughout the growing season. Wet periods followed by periods of drought result in erratic growth and can cause second growth, knobs, growth cracks and hollow heart in many varieties. The ideal conditions for maximum quality are warm days (65-80°F) and cool nights (55-65°F). Planting should not begin until the soil temperature at the 6-inch depth is 45°F or above.

Tuber formation (tuberization) at the tip of the stolons (lateral growing underground stems) usually starts when plants are 6-8 inches tall (approximately 35-50 days after planting). Tuberization is affected by many environmental factors but depends largely upon the production of starch in excess of that needed for growth and metabolism. Contrary to common belief, tuberization is not dependent upon flowering. Tubers will form without flowers ever appearing.

Variety and Seed Selection

The variety selected must be adapted to the soil and cultural conditions under which it will be grown. It must also be acceptable for the chosen market. Different varieties require different management practices for planting, growing, harvesting and storage. Results of potato variety trials are published each year. Extension Bulletin E-935, "Selecting Potato Varieties in Michigan," provides a guide to some of the common varietal characteristics.

Use only certified seed obtained each year from a reliable source. Attempts to save seed from a commercial crop without certification often result in seed with reduced productivity and performance.

Land Preparation

Most commercial potato producers in Michigan utilize a minimum tillage practice of plow-plant. Winter rye is often used as a cover crop. The field may be chiseled or disked before plowing in the spring (depending on vegetative cover). Planting is done immediately after plowing.

Soil Testing and Fertilizer Needs

The best fertilizer program starts with a soil test. The desired pH range is from 6.0 to 6.5. Nitrogen (N) requirements for most full-season varieties with a 400 cwt/A yield goal will be 160 to 190 pounds N per acre. The required phosphorous and potash is determined by the soil test level. If lime is needed, it should be applied at least one year before potatoes are planted to allow proper mixing with the soil and to reduce the incidence of scab disease. Lime applications should not exceed one ton per acre per application.

A complete fertilizer banded at planting is suggested. Total banded fertilizer should not exceed 800 lbs/A and it should be placed 2 inches to the side and slightly below the seed piece. Phosphorous is best utilized when banded at planting. If additional nitrogen is needed, it can be applied as a sidedress after the potatoes emerge and no later than 60 days after emergence (about August 1). If additional potash is needed, it is best applied broadcast before plowing. Fertilizer recommendations are based on the soil type, previous crop, yield goal and soil test.

Planting Practices

When: Soil temperature at the seed piece level should be at least 45°F. Most plantings in Michigan are during May.

Depth: Seed pieces should be planted 3-4 inches below the soil surface and covered with approximately 4 inches of soil.

Seed Size: The ideal tuber for planting should be firm, have a sprout of no more than ¼ inch and a pulp temperature above 45°F. Planted seed may be whole (tubers 1 to 2 inches in diameter) or it may be blocky seed pieces cut from larger tubers. Cut seed pieces should weigh 1½ to 2 ounces. It is best to cut and plant seed the same day. If held longer, environmental conditions must favor suberization (the healing over of the cut surface). Conditions necessary for suberization are a temperature of 55-65°F, high relative humidity (80-90%), and adequate ventilation. If seed treatment material is needed, follow the label directions.

Amount of Seed: The amount of seed used will depend upon the variety, seed piece size, and the row and plant spacing (Table 1, page 2).

Weed Control

Identification of the major weed problems is helpful in selecting the method of control. Quackgrass, a perennial, can be a serious problem and must be controlled before

establishing the potato crop. Tillage and/or chemical methods can be utilized. for annual weed problems, there are several alternatives identified in Extension Bulletin E-434 "Weed Control Guide for Field Crops." When using chemicals for weed control, be sure to follow label directions.

Insects and Diseases

Extension Bulletin 312, "Control of Insects, Diseases and Nematodes on Commercial Vegetables," contains a listing of alternative control programs. The systemic insecticides, which can be applied in a band at planting, provide early season control of several insects. If systemic insecticides are not used, foliar sprays may be necessary soon after emergence.

Subsequent insect control sprays will be necessary as problems arise so frequent observations are necessary. The principle insects to look for are: flea beetles, Colorado potato beetle, leafhoppers, aphids and cutworms.

Disease control programs are designed to prevent diseases. Therefore, regular foliar spray schedules are necessary to protect new foliage. Foliar spray applications need to be initiated in early July. The principal foliar diseases are early and late blight.

The effectiveness of foliar-applied materials depends upon the selection of the proper material and the thoroughness of plant coverage. The foliar materials must come in contact with the insect or disease to be controlled or the foliage to be protected. Follow label directions for all applied pesticides.

Cultivation

Cultivation is usually not necessary if weeds are properly controlled. The crop should be hilled when the plants are well-developed (8-12 inches tall), and certainly before the plants come together between the rows. Hilling prevents greening of tubers and facilitates tuber development and harvest. Cultivation and/or hilling performed too late results in severe root pruning and foliage damage. Hilling can be done in one operation. The result should be a wide and flattened hill around the plant rather than a narrow and sharp ridge.

Table 1. Potato seed required for different row widths, plant spacings and seed size.

Row spacing and spacings within the row	*Seed required per acre when seed pieces weigh an average of:*			*Plants per acre*
	1½ ounces	1¾ ounces	2 ounces	
	Cwt/acre			
32 inch rows				
8 inch	22.9	26.8	30.6	24,502
10 inch	18.4	21.4	24.5	19,602
12 inch	15.4	17.9	20.5	16,335
14 inch	13.1	15.2	17.5	14,001
34 inch rows				
8 inch	21.6	25.2	28.8	23,061
10 inch	17.3	20.2	23.0	18,448
12 inch	14.4	16.8	19.2	15,374
14 inch	12.4	14.4	16.5	13,177
36 inch rows				
8 inch	20.4	23.8	27.2	21,780
10 inch	16.3	19.0	21.8	17,424
12 inch	13.5	15.8	18.1	14,520
14 inch	11.6	13.6	15.5	12,445

If irrigation is used, water sufficiently to keep the soil profile throughout the root zone moist but not overly wet. Generally, a one-inch application per irrigation is adequate. The frequency between applications will depend on the variety, evaporation demand, rainfall and the soil moisture holding capacity. See Bulletin E-1110 for a proper schedule of irrigation water for potatoes.

Harvesting and Storage

Success in storing the crop depends largely on the condition of the crop at harvest. Potatoes for storage should not be dug until the vines are dead. This reduces the incidence of skinning and bruising. Potatoes harvested with green vines will skin and "feather" more easily, and are more vulnerable to bruising and subsequent breakdown. The later maturing varieties often require the aid of a mechanical vine beater or a chemical vine killer. These facilitate earlier harvest, promote firmer skin set and control tuber size. If late blight is present in the foliage, harvest must be delayed until the vines are completely dead to reduce the risk of spreading the disease from the foliage to the tubers. Late blight on the tubers can cause severe breakdown in storage.

Potato harvest should be completed before the soil and/or pulp temperature drops below 45°F. Potatoes to be used for processing, particularly for chips, should be harvested before the soil and/or pulp temperature drops below 50°F. The harvest and handling operation should be designed to minimize dropping of tubers and to eliminate rough handling. Avoid sharp edges and pad all areas on which potatoes will be dropped.

The storage environment should be managed to preserve crop quality. The storage should be properly constructed so that temperature, humidity and air movement can be properly controlled. Growers should contact their Cooperative Extension Service office for assistance in planning, designing and constructing a storage area.

The first two-three weeks after harvest is commonly referred to as the curing period. The storage temperature during this period should be 55-60°F and the relative humidity should be 90-95% to accelerate the healing of bruised and damaged areas. Following this period the temperature should be lowered to the desired storage temperature.

Potatoes for fresh pack or tablestock are generally stored at 40°F whereas those to be held in chipping condition are generally stored at 50-52°F. Potatoes being stored for frozen processing or those to be reconditioned for chipping are generally stored at 45°F and seed potatoes are stored at 37-40°F. Extended storage for fresh market and processing, particularly at the higher temperatures, will require the use of a sprout inhibitor.

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