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CC181 Growing Potatoes in Nebraska for Processing

Lloyd W. Andersen

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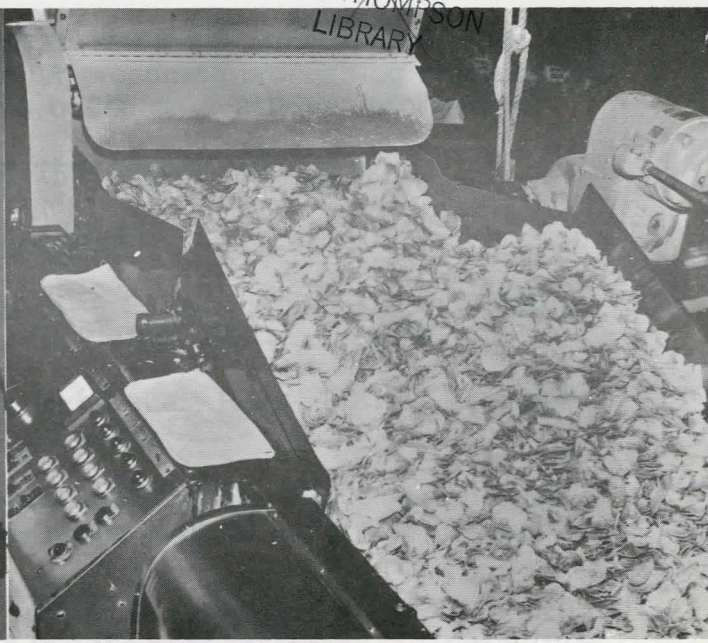

UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE AND HOME ECONOMICS
EXTENSION SERVICE
AND U. S. DEPARTMENT OF AGRICULTURE COOPERATING
E. F. FROLIK, DEAN J. L. ADAMS, DIRECTOR

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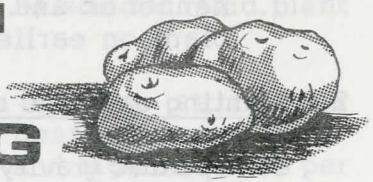

By Lloyd W. Andersen,
R. B. O'Keefe and Wayne C. Whitney[1/]

Potatoes for processing must be of relatively high specific gravity (1.070+), low in reducing sugars and oil and a golden color when processed. Varieties, the place where the potatoes are grown, and cultural practices affect these qualities.

Processing potatoes can be produced in both early and late crop areas in Nebraska but they need proper cultural and storage practices to assure good chipping or french-frying quality.

This report gives Nebraska growers the necessary cultural practices for producing processing potatoes and makes suggestions based on available information.

A TEN-POINT PROGRAM

1. Selection of varieties

   a. In central Nebraska: Haig, Irish Cobbler, Kennebec, Hi Plains, Platte, Pioneer.

   b. In western Nebraska: Haig, Platte, Kennebec, Hi Plains, Pioneer.

   c. Irish Cobbler and Pioneer should be planted in sandy soils where scab is not a severe problem.

1/ Lloyd W. Andersen is Extension Potato Specialist; R. B. O'Keefe is Associate Professor of Horticulture, Nebraska Agricultural Experiment Station; Wayne C. Whitney is Extension Horticulturist, University of Nebraska Agricultural Extension Service.

d. Kennebec and Platte are long season varieties; plant on earliest date indicated for areas.

2. Planting date and rate with irrigation

a. Specific gravity increases as tuber size and maturity increase. Control these factors by proper combination of planting date and seed piece spacing.

b. Planting guide by areas (Use 1.5 - 1.7 oz. seed pieces):

	Central City Gibbon Red Cloud	McCook Hershey	Western Nebraska
Date of planting	Mar 25 - Apr 7	Apr 1 - 14	May 15 - June 10
Spacing between rows	36 - 38 inches	36 - 38 inches	36 inches
Spacing in rows	12 - 15 inches	12 - 15 inches	12 - 15 inches
Rate (cwt/acre)	15 - 18	15 - 18	15 - 18
Possible harvest	July 9 - Aug 7	July 15 - Aug 7	Aug 15 - Oct 10

c. The 15-inch, in-row spacing with Haig will produce the highest percentage of large tubers (2 1/4 to 4 inch) and may be beneficial with the earliest planting and anticipated harvest dates. Use 9 inch spacing with Kennebec and Pioneer for a late harvest.

d. Plant in moist, warm (45°F.+) soil for rapid plant emergence.

e. Plant Nebraska Certified Seed or still better Nebraska X Free Seed for best insurance of relatively disease-free seed and higher returns per acre. Diseased tubers generally produce chips of poor color. Treat cut seed according to recommendations given under "Insect and Disease Control."

3. Proper fertilizer use

a. Potato plants require nutrients to insure rapid, steady growth and proper tuber development. Meet fertility requirements at the beginning of growth. Broadcast and plow down the fertilizer or apply part of the fertilizer at planting time and the rest when the plants are four to six inches high.

b. Apply fertilizers according to recommendations derived from soil tests and cropping history. (Consult your County Extension Agent for sampling boxes and sampling procedure).

c. General recommendation:

1. 80 to 100 pounds available phosphorus per acre following alfalfa or sweet clover: 40 to 80 pounds available phosphorus after corn, beets, etc.

2. A good legume crop preceding potatoes generally supplies nitrogen needs; too much nitrogen results in immature potatoes. Apply 0 to 40 pounds of nitrogen after a legume crop; 80 to 100 pounds after corn, beets, etc.

3. Generally, soils in Nebraska contain enough potassium for potatoes.

d. Nitrogen can be applied in the irrigation water. This practice is important when the potato crop

has had hail damage. Apply 8 to 10 pounds of nitrogen immediately after hail to start regrowth.

e. Too much nitrogen can reduce the specific gravity and dry matter of the tubers because plants remain green longer and tubers do not mature. Take care in nitrogen applications when growing processing potatoes.

4. Irrigation practices

a. Irrigate before plant emergence if soil becomes dry. Soil moisture is essential for plant emergence.

b. Irrigate early (soon after emergence) and frequently to keep top two feet of soil moist, but not wet, until the plants reach their growth peak (lower leaves begin to turn yellow). Three or four inches of water are enough.

c. Irrigate late in the season according to conditions. Tubers produced at low to medium soil moisture levels are of higher specific gravity than tubers produced at a high soil moisture level. Avoiding heavy, late irrigations hastens vine and tuber maturity.

d. Frequency and rate of irrigation:

Temperature Since Last Irrigation	Water Used By Plants
70° - 80° F.	.15 - .20 in/day
80° - 90° F.	.20 - .30 in/day
90° - 100° F.	.30 - .40 in/day

APPROXIMATE DAYS
BETWEEN IRRIGATIONS

Sandy Soil: $\frac{.75 \times 3 \times .40}{.25}$ = 3 to 4 days

Sandy Loam: $\frac{1 \times 3 \times .40}{.25}$ = 5 days

Medium Texture: $\frac{2 \times 3 \times .40}{.25}$ = 10 days

Clay Soil: $\frac{2.5 \times 3 \times .40}{.25}$ = 12 days

EXAMPLE: $\frac{\overset{(1)}{.75} \times \overset{(2)}{3} \times \overset{(3)}{.40}}{\underset{(4)}{.25}}$ = 3 to 4 days

(1) Amount of water a foot of soil will hold.

(2) Depth in feet you wish water to penetrate.

(3) Amount of moisture used at irrigation.

(4) Inches of water a plant uses per day under normal conditions.

5. Insect and Disease Control

Insect control recommendations:

a. Eastern and central Nebraska:

1. Control Colorado beetles and potato psyllids early in the season. Later in the season potato leafhoppers, thrips, grasshoppers, and blister beetles may appear, with leafhoppers presenting the major threat to the crop.

Recommendations For Potato Insect Control
Spray Application

Insect	Insecticide and formulation	Amount per acre	Actual Insecticide per acre
Leafhoppers and plant bugs	DDT, 2 lbs/gal.	2 quarts	1 pound
	Thiodan, 2 lbs/gal.	2 quarts	1 pound
	Sevin, 50 WP	2 pounds	1 pound
Colorado potato beetles and flea beetle adults	Sevin, 50 WP	2 pounds	1 pound
	DDT, 2 lbs/gal.	2 quarts	1 pound
	Dieldrin, 1.5 lbs/ gal.	1/3 gallon	0.5 pound
	Endrin, 1.6 lbs./ gal.[a]	1 pint	0.3 pound
	Thiodan, 2 lbs/gal.	2 quarts	1 pound
Grass-hoppers	Dieldrin, 1.5 lbs/ gal.	2/3 pint	2 ounces
	Endrin, 1.6 lbs/gal.[a]	1 pint	0.3 ounce
	Toxaphene, 6 lbs/gal.	2 pints	1.5 pound

Insect	Insecticide and formulation	Amount per acre	Actual Insecticide per acre
Blister beetles	DDT, 2 lbs/ gal.	4 quarts	2 pounds
	Thiodan, 2 lbs/gal.	2 quarts	1 pound
Potato psyllids	DDT, 2 lbs/ gal.	2 quarts	1 pound
	Endrin, 1.6 lbs/gal.a/	1 pint	0.3 pound
	Thiodan, 2 lbs/gal.	2 quarts	1 pound
Thrips	Malathion, 5 lb/gal.	2 pints	1.3 pounds

b. Western Nebraska:

1. Early season insects are the flea beetle, Colorado potato beetle, and the potato psyllid. Late season insects are the flea beetle, potato psyllid, aphids, grasshoppers, and leafhoppers.

BHC NOT RECOMMENDED FOR POTATO INSECT CONTROL OR FOR SOIL TREATMENT WHERE POTATOES MAY BE PLANTED IN THE FUTURE

BHC (Benzene hexachloride) is absorbed by potatoes and imparts a musty flavor. It has been used as a soil treatment for corn rootworms, and in several cases pota-

a/ Endrin is a high toxic chemical. It should be used only by trained operators.

toes planted in the same ground have not been usable. BHC should not be used as a soil treatment if potatoes are to be planted later in the same ground. Manure from cattle sprayed with BHC should not be used on potato ground.

Because of residues of aldrin and dieldrin in and on tubers during 1962 and the actions taken by the Food and Drug Administration, aldrin and dieldrin are not recommended in Nebraska as soil insecticides for control of the tuber flea beetle and wireworms. Control materials suggested are all registered for use on potatoes.

Recommendations For Potato Insect Control
Soil Applications

Insect	Insecticide and formulation	Method of application	Amount per acre	Actual Insecticide per acre
Tuber Flea Beetle and wireworms	Diazinon 10G	Broadcast	20 lbs.	2
	14G	Broadcast	14 lbs.	2
	10G	Band	10 lbs.	1
	14G	Band	7 lbs.	1
	Thimet 10G[a]	Band	25 lbs.	2.5
	Di-Syston 10G[a]	Band	25 lbs.	2.5

a/ Thimet or Di-Syston can be applied over the seed pieces.

Disease control recommendations

Ring-rot and Virus Disease Control

Disease	Chemical	Suggested Rate
Disinfection of storage cellars, bins, crates, graders, etc., for ring rot control	Preferred compounds: Hyamine 2389 Selco Ocean 101 Satisfactory compounds: Copper sulfate Copper A Compound Cuprocide Tribasic Copper Sulfate	Use at rate suggested by manufacturer. 6 lbs/100 gallons water 3 lbs/100 gallons water 2 lbs/100 gallons water 3 lbs/100 gallons water
Disinfection of cutting knife to prevent ring rot spread.	Mercuric chloride for Ring Rot	1 ounce to 5 gallons water
	Semesan Bel	Follow manufacturer's directions.
Disinfection of cutting knife to prevent virus spread.	Formaldehyde	1 tsp. per quart of water
Scab	Formaldehyde	Four to six weeks before planting dip uncut potatoes for 3 to 4 minutes into a

		solution of 1 pint of formaldehyde in 15 gallons of water kept at 121 degrees F. Drain and dry. This treatment is effective when scabby tubers are to be planted in relatively scab-free soil.

Recommended Fungicidal Chemicals For Potatoes

Disease	Chemical	Suggested Rate
	Semesan Bel S	Mix at rate of 1 lb. to each 7 1/2 gallons of water in treating vat. Immerse whole or cut seed pieces, remove, drain and promptly dry if not planted immediately. 1 lb. will treat 60-80 bushels or 36 to 48 cwt.
Early and late blight.	Maneb	1 1/2 lbs. of 80% material/ 100 gal. of water (100-150 gals/A)

	Zineb	2 lbs. of 65% material/100 gals. of water (100-150 gals/A)
	Nabam + Zinc Sulfate	2 quarts of 19% Nabam + 1 lb. zinc sulfate to 100 gal. water
	Bordeaux mixture	8 lbs. copper sulfate + 8 lbs. hydrated lime to 100 gals. water
	Fixed copper	Follow manufacturers directions.
	Polyram 80 WP	1 1/2 to 2 lbs/100 gallons/acre. Start when plants are 6" to 8" high. Apply at 5 to 10-day intervals.
Treatment of cut seed potatoes for seed piece rot	Captan	1 1/2 lbs. of 7.5% dust per 100 lbs.
	Zineb	1 1/2 lbs. of 5% dust per 100 lbs.

POTATO LATE BLIGHT FORECASTING

Phytophrthora infestans, the causal fungus of late blight, is extremely dependent upon weather conditions for survival and spread. Cool, moist weather is necessary for spore development and germination. Periods when night temperatures average 50-55 degrees F., and day temperatures are in the 60's and 70's are favorable for

growth. If these temperatures are coupled with drifting fog or mist, frequent rains, or heavy dews that keep the foliage wet for 12 hours or longer, the stage is set for spore development and disease progression.

To determine more accurately climatic conditions for late blight forecasts, place a hygrothermograph instrument, which simultaneously records the humidity and temperature, in a potato field. If the instrument is several feet above the soil surface, the data obtained are not exactly those obtained if the instrument were among the potato vines.

Irrigation water, particularly at the lower ends of the fields where the water might stand, may cause the microclimate about the foliage to be different from atmospheric conditions several feet above the foliage. For practical purposes, however, placing the instrument at the edge of the field is satisfactory. The data taken from the hygrothermograph are analysed and a report made on disease conditions at weekly intervals.

Varieties vary in their disease potential. Those of high potential should have a full season spray program with applications at 2 week intervals. Spray those of moderate potential when notified through public warning service. Spray those of low potential if blight can be found in the field.

6. Weed Control

a. Use chemical controls where weeds are difficult to control by cultivations.

b. Pre-emergence - Eptam, Dacthal, Dymid;
Post-emergence - Eptam.

c. Weed burning, using shields and vine lifters, controls grassy and broadleaf weeds; this procedure is effective for severe grassy weed problems late in the season.

7. Vine Killing

a. Natural, slow maturation of vines results in the

movement of carbohydrates from vines to the tubers and consequent high specific gravity. Conversely, rapid vine killing by chemicals may result in tubers of low specific gravity. Some chemical vine killers cause internal tuber discoloration. Sodium arsenite may be used in central and eastern Nebraska as a vine dessicant.

b. Vine beating should not be practiced more than three days before harvest. Studies in other states indicate that vine beating is followed by a rapid decrease in tuber chipping quality.

8. Harvesting

a. Exposure of tubers to low temperatures (below 40°F.) and high temperatures (above 80°F.) before or during harvest impairs their processing quality.

b. In central Nebraska harvest potatoes only during the early morning and late afternoon when temperatures do not exceed 80°F.

c. In western Nebraska harvest potatoes before the danger of exposure of tubers to temperatures below 40° F. occurs. If late September or early October harvesting is necessary, ridging the potato rows with soil late in the season may avoid field chilling of the tubers.

d. Use all recommended precautions to avoid harvest injury to tubers.

9. Storage

a. Reducing sugars build up in tubers at storage temperatures below 50° F.

b. Chemicals to retard sprout growth and permit storage of potatoes at 50° F are 1. Maleic hydrazide (MH 30) applied to the vines at the rate of one gallon per acre, four to six weeks prior to harvest, 2. Chloro-IPC applied as a vapor to potatoes in storage (one gram/cwt. of potatoes), 3. Fusarex applied as a dust at grading time.

c. Tubers of some varieties will reconstitute after cold storage at 40° F. and may be processed. Reconstitution should occur with storage at 70° F. for 10 days to 3 weeks. However, Haig is unreliable with regard to reconstitution following cold storage.

d. Control of storage temperature and ventilation is important; store potatoes in bins with center air ducts and taper lower part of bin side walls to center of the bin floor to form side ducts.

1. Ventilate bins by forced air distributed to and through air ducts.

2. Use thermostatically controlled heaters.

3. Consult the Extension Entomologist or the Department of Horticulture and Forestry for further information.

10. Marketing

a. Test potato samples for specific gravity before and during harvest or storage. The specific gravity of processing tubers must be above 1.070. The higher the value, the better the quality; 1.080+ desirable.

b. Use a "potato hydrometer" to measure specific gravity. This instrument can be obtained from the Potato Chip Institute International, 946 Hanna Building, Cleveland 15, Ohio.

c. Test potato samples for reducing sugars with "chip color tester" tape which can be obtained from the Potato Chip Institute International. Low reducing sugar content is associated with light chip color and is an essential quality of chipping potatoes.

d. Potatoes which will not process well at harvest time will not improve with storage. Find another use for them.

e. Do not over-ice shipments of potatoes during warm months. Chilling of tubers in transit may destroy their chipping quality; this also applies to winter shipments.

Note: For detailed information regarding processing potatoes, refer to:

1. "Potato Handbook 1960"

   Potato Association of America, New Brunswick, New Jersey

2. "The Production of Good Chipping Potatoes," C. W. Frutchery, H. W. Chapman and A. M. Binkley, Colorado State University, Extension Service, Fort Collins, Colorado.

TOXICITY OF INSECTICIDES

Consider all insecticides poisons and capable of causing illness and even death to humans. THE BEST SOURCE OF INFORMATION FOR EACH INSECTICIDE IS ON THE LABEL. Always read labels thoroughly before opening containers. Laws require that labels contain several important facts. All labels will list the contents, what crops to use them on, residue information, amounts to use and time to elapse before harvest. Each container will list precautions for use and highly toxic insecticides will provide first aid information and instructions for physicians.

Most toxicity ratings are based on an oral dose administered to test animals. Ratings can be placed in these three general categories:

HIGH TOXICITY: (requires protective clothing and respirator for safe handling. They should be applied only by trained operators)...Demeton (systox), Endrin, EPN, Guthion, Metacide, methyl parathion, parathion, phosdrin, schradan, TEPP, Thimet, Di-Syston, and Trithion.

MODERATE TOXICITY: (Requires very careful handling. Undue exposure must be avoided) Aldrin, BHC, chlordane,

Chlorthion, Co-Ral, DDT, DDVP, Delnav, Diazinon, Dibrom, Dieldrin, Dylox, Ethion, heptachlor, lindane, Strobane, Thiodan, Toxaphene.

SLIGHTLY TOXIC: (Exercise careful handling) Chlorobenside, Kelthane, ronnel (Korlan), malathion, methoxychlor, ovex, Perthane, rotenone, Sevin, TDE (DDD), Tedion, and Thanite.

WHAT TO DO FOR POISONING

1. Get the patient to a hospital or physician as soon as possible. Take a label for the doctor's information. Give artificial respiration if breathing has stopped.
2. If the chemical has been swallowed and vomiting has not resulted, induce vomiting by giving a strong soap solution or a tablespoon of salt in one-half glass warm water.
3. If insecticide is spilled on the skin, remove clothing and bathe with large amounts of soap and water, rinsing thoroughly.
4. If insecticide gets into eyes, wash at once with flowing water and continue for several minutes.

POISON CONTROL CENTERS

In emergencies, poison control centers can be called day or night. Physicians can call these centers for any type of poisoning:

Omaha, Nebraska	533-5400 . . .	Childrens Memorial Hospital
Denver, Colorado . . .	CH 4-6969 . . .	Dep't. of Health & Hospitals

Manhattan, Kansas . . .	JE 9-2244 . . .	Riley County Hospital
Cheyenne, Wyoming. . . .	4-4431 . . .	Memorial Hospital

Furnish all information possible to poison control center.