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EC1276 Recommended Potato Production Practices

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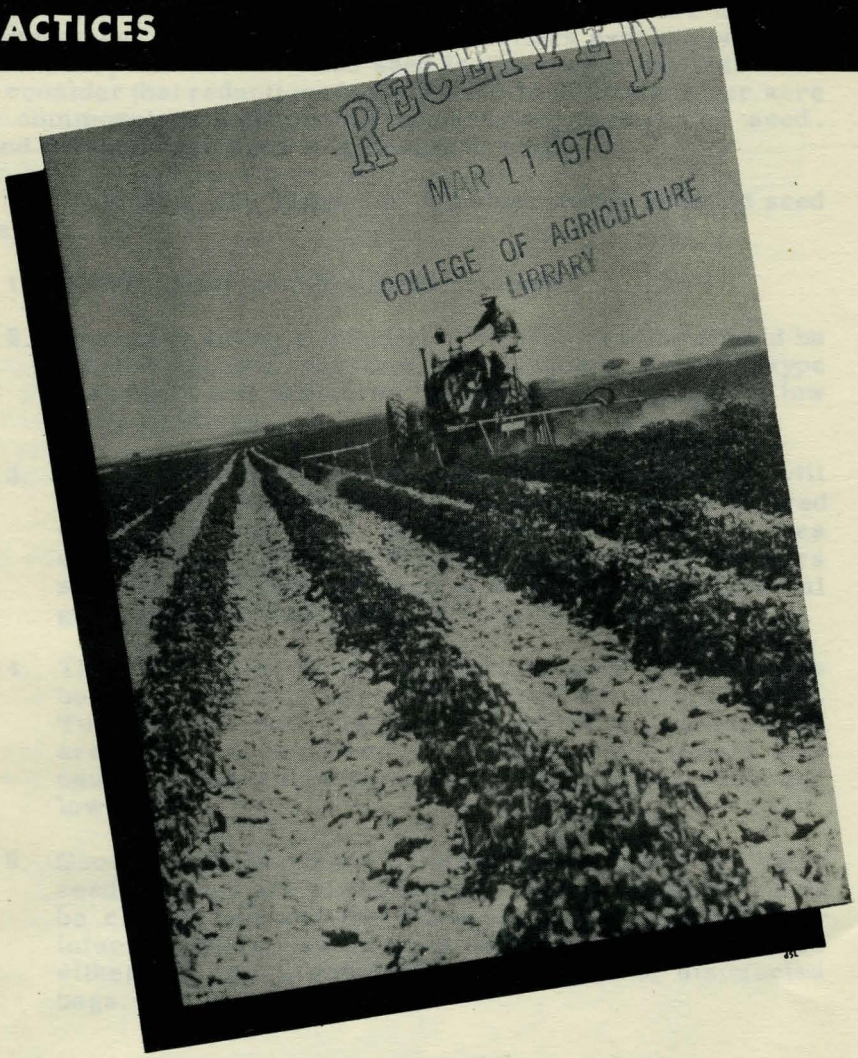
RECOMMENDED POTATO PRODUCTION PRACTICES



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Recommened Potato Production Practices

G. T. Stachwick 1/

The Proper Seed Practices

Seed Selection

A successful potato venture is the result of employing correct production procedure coupled with favorable climatic and environmental conditions. A very important practice is the selection of good seed potatoes. Good seed potatoes insure maximum returns from other production practices. Producers who are not willing to pay a premium for good seed are not good businessmen. The additional 20 to 25 dollars expense per acre required to purchase certified seed is returned many-fold when you consider that reductions in yield of 50 to 60 bushels per acre are commonplace when using noncertified commercial seed. Sound disease-free seed is economical seed.

The following are important considerations in sound seed selection:

1. Always plant certified seed potatoes.

2. Seed stock rating a foundation disease reading should be planted whenever possible. Small tubers from this type of seed are safe to plant as "single drops" because of low virus readings.

3. The use of "sized" tubers where seed is to be cut will facilitate the cutting operation and help to insure desired uniformity and size of seed piece. Cut seed pieces should weigh 1 1/4 to 2 1/4 ounces. However, growers should see to it that this seed is not sized on commercial graders which have not been completely disinfected.

4. The cellar conditions under which seed potatoes have been stored are as important as freedom from disease. Tubers which have just begun to sprout at planting time are the most desirable seed. Badly sprouted tubers may cause trouble at planting time and result in poor stand and low yields.

5. Good sanitation should be practiced in the cellar where seed potatoes are to be stored. Rotten potatoes should be cleaned out and the storage should be entirely dis-infected before new seed is brought in. Seed potatoes either whole or cut should be handled in new or disinfected bags.

1/ Assistant Extension Horticulturist

Storage and Management Prior to Planting

Proper management of seed potatoes is a necessary part of correct production procedure. Firm seed potatoes are a product of proper seed management. The practice of planting potatoes after June 10 in the late-crop potato area has created a serious problem in seed management. After about two months of storage, potatoes generally begin to sprout. The most important factor in keeping potatoes dormant is temperature. Sprouting is retarded by holding the temperature under which the potatoes are stored at or below 40° F.

How to store seed potatoes so that they will remain firm in late spring is a problem that the potato grower must solve. Commercial refrigeration offers the best solution but is expensive and in many areas is unavailable, so other measures must be taken. The following practices are a part of sound seed management:

1. Seed potatoes should be stored at 36° to 40° F.

2. Growers should utilize cool air at night to keep cellar temperatures down. Opening of vents in the evening and early morning when the outside temperatures are lower than the cellar temperatures and shutting cellars tight throughout the day when outside temperatures rise above cellar temperatures can help immensely in keeping the cellar cool.

3. Starting cellar cooling before sprouting begins is important in storing seed.

4. If sprouting commences in spring before planting time, spreading potatoes in thin layers (1 1/2 to 2 feet deep) and subsequent weekly turning will help retard this sprouting. (Growers must be careful to hold down injury to tubers as spindle tuber can be transmitted in this way.) If seed potatoes are stored in sacks, sprouting can be retarded by piling the sacks so that there is good circulation of air around individual bags. The sacks should be turned frequently.

5. If unsized seed is purchased, running seed that is sprouting over a grader will not only retard sprouting but will also facilitate cutting operations by sizing the seed potatoes. Under no circumstances should this operation be performed unless the grader has been thoroughly disinfected.

6. Dipping the seed in hot formaldehyde about the time seed potatoes start sprouting is a practice frequently employed in western Nebraska. This destroys scab organisms on the surface of the potatoes and also inhibits sprouting.

7. Because potato scab is not a severe problem with Progress, treating Progress seed with hot formaldehyde is not recommended. Treatment for Bliss Triumph is as follows:

   (a) 40% formaldehyde solution. (One quart formalin in 30 gallons water.)

   (b) Water heated to 124° to 126° F.

   (c) Immersion time is three to four minutes.

   (d) Whole potatoes should be treated. Treating is easier if the potatoes are sacked.

   (e) Sacks should be stacked in a pile and covered with a tarp to increase penetration by formaldehyde fumes.

   (f) Fumigation should last one hour and then the sacked potatoes should be spread for rapid cooling and drying.

   (g) Treating of potatoes should be carried on out of doors or in a shed to keep from heating the cellar and bringing discomfort to workers.

8. Growers should never let sprouts grow over one inch in length. Removing short sprouts lessens the danger of rots, since less injury occurs when you remove these sprouts.

9. A good way to condition seed where facilities are not available to retard sprouting is to pile sacked seed in the open for the last two or three weeks before planting. The sacks should be staggered or separated by wood piling to insure good ventilation, and shade should be provided. This develops short stubby sprouts capable of producing vigorous plants. There is danger of freezing seed when this practice is employed and growers should be continually alert for this hazard.

10. If seed potatoes are stored in cold storage or cool farm storage a "warm up" period of 7 to 10 days is necessary before planting.

Seed Preparation

The practice of cutting seed potatoes and the subsequent handling of the stock prior to planting is one of the most crucial steps in proper seed management. Poor stands are the result of improper seed practices. Good stands are obtained by proper preparation and conditioning of the seedbed, and by planting firm disease-free seed of the proper size. Using cut seed increases the necessity of obtaining adequate seed piece size and treating this seed before planting. Cutting the seed makes the tubers more subject to drying out and to the invasion of rot-producing organisms. For these reasons, greater care must be exercised to see that the seed is in the best physical condition. This will insure a good stand even if planting conditions are not ideal.

The growing of new potato varieties has increased the severity of this problem. This is especially true with Progress since this variety may be unable to heal wound surfaces if conditions are not ideal. Growers must recognize this factor and manage their seed preparation so that difficulty will not be experienced during this operation.

1. If conditions at seed preparation time and subsequent planting time are ideal, then planting immediately after cutting is recommended. Conditions are rarely ideal in western Nebraska.

2. If growers plant immediately after cutting, disinfecting the cut pieces has been found desirable in Nebraska. 1/

   Dithane Dip - 1 part in 200 parts water.
   5-minute immersion.

   Dithane Dust - 1 part in 10 parts sulfur. Use 1 cup to 30 pounds of cut potatoes.

3. Holding seed one to three days after cutting can be very beneficial, especially if planting conditions are not ideal. The seed should be held under sanitary conditions in half sacks that are placed so the air can circulate around the sacks. High humidity with a temperature of 60-65° F. is essential. High humidity can be obtained by wetting the cellar floor and moistening the sacks containing the potatoes. The humidity is necessary to prevent drying of the seed potatoes.

1/ Phygon, Spergon, Arasan, and Orthocide 406 have been reported suitable for this work by other states. However, tests are still lacking in Nebraska on these materials.

4. Seed cutting is done best by hand. Uniform blocky seed pieces are desirable. Sizing of seed prior to cutting makes it easier to cut this type of seed piece. A seed potato 2 1/2 inches in diameter can be cut into four pieces giving the desirable weight of approximately 2 ounces.

5. Because of the diseases present in all varieties, a disinfected cutting knife should always be used. A rotary hand-operated knife revolving through a bath of disinfectant is ideal. As the potato is pushed against the rotary blade it turns through the bath. Thus the cutting edge is always disinfected.

The Potato Insects

Insect Control - A Good Crop Insurance

The potato farmer in western Nebraska is faced with many difficult problems. One of the most important is the control of destructive insects. Growers have exhibited some resistance toward accepting and following a good insect control program. The following are reasons for this attitude: increased costs of production incurred by regularly applied sprays or dusts, need for timely as well as regular applications, and the difficulty of applying material during the middle and latter part of the growing season. Potato growers should look upon insect control as a necessary operation and a cheap form of crop insurance.

Certain areas in western Nebraska are harder hit by insect problems than other areas. The Gering and Mitchell Valley sections of Scotts Bluff County are especially unfortunate with respect to the flea beetle problem. Growers in these areas must plan on a regular and timely insect program throughout the season if high quality potatoes are to be produced. All the irrigated sections of western Nebraska have difficulty with this insect to a varying degree, but as a general rule dryland sections will not need to worry about serious flea beetle infestations.

The potato psyllid is another important insect in western Nebraska. In some years psyllids cause serious damage to the late potato crop and all sections are apparently subject to serious infestation. Climatic conditions seem to exercise a great deal of influence on the potato psyllid population. The severe psyllid outbreak in western Nebraska in 1938 was correlated with a peculiar sequence of weather conditions occurring that season. The wet, cool July followed by two months of extremely hot weather was ideal for the development and increase of the psyllid. The psyllid must have cool weather during July to become established on the small potato plants. Later when vine growth is dense enough to shade the lower portions of the plants and soil surface, relatively high temperatures become essential. Plant symptoms expressing psyllid injury are readily recognized by most potato producers. The potato vine exhibits characteristic symptoms for identification and there is little

or no excuse for growers to suffer a major loss through damage from potato psyllids.

Most growers do not realize how much damage is done by the potato leafhopper. In the early production area of central Nebraska, significant decreases in yield can be traced directly to this insect. The wonderful responses plants have exhibited when treated with DDT may often have been the result of controlling the leafhopper with this material.

The aphid or plant louse is a tiny green or pinkish insect which damages potato plants by sucking juices from the under surface of leaflets and by transmitting certain virus diseases. Many growers are not too familiar with this insect because of its small size. The aphid population in western Nebraska was extremely light in 1950. The task of maintaining clean seed stocks is made considerably more difficult when these insect vectors of plant disease are in evidence. Commercial growers who plant seed the second year from certification must be especially diligent in seeing that the spread of virus diseases is held to a minimum by controlling insect vectors.

The wireworm problem has been increasing in severity in recent years. The 1950 and 1951 crops had perhaps the largest amount of wireworm damage yet observed in western Nebraska. However, at the present time injury from this insect can not be classified as a serious problem.

Important points in the control of insects are as follows:

1. Plant as late as is feasible for the successful production of potatoes in western Nebraska.

2. Destroy all cull potato piles in early spring before growth starts.

3. Apply enough insecticide at frequent intervals to effectively control insects.

   Irrigated sections - A regular program of from 3 to 5 dustings or sprayings advised. Dates and frequencies dependent on circumstances. Suggested schedule for late planted fields July 15 and 30, August 10, 20, and 30. Watch fields and if beetles are present early, start treatments earlier. Important to begin early and also important to make applications late in August. However, it is of questionable value to spray or dust after September 1. There is no need to use insecticides right up until frost or harvest time.

Dryland sections - Fields should receive one or two treatments during the growing season, especially those grown for seed.

Materials and Methods of Insect Control

(a) Insecticide - DDT recommended.

(b) Dust - 5% DDT in a sulfur pyrophyllite mixture. Apply at rate of 30-35 pounds of the mixed dust per acre.

(c) High pressure, high volume spray - 50% wettable powder used at rate of 2 pounds in 100 gallons of water per acre.

(d) Low pressure, low volume spray - Use emulsion concentrates. Spray concentrations and rates of application should be adjusted so that approximately 1 pound of technical DDT is applied per acre.

(e) Aerial applications of dust have given good control of flea beetles but are not recommended if psyllids are abundant.

(f) The use of sprays or dusts is up to the individual growers. Use whichever method is preferred. Ground equipment is generally more reliable than aerial equipment. Vine lifters are necessary for late ground applications.

The Potato Blights

Blight Control - Additional Crop Insurance

Potatoes are a cool weather crop. Studies have shown that potato yields are greatest in those regions where the mean annual temperature is between 40° and 50° F., and where the mean temperature of July is not over 70° F. The cool summers enjoyed by Nebraska potato producers the past several years have not, however, been without problems. In 1951 there was an excessive amount of rainfall and continuous damp weather. This combination of cool, moist weather favored high tuber production but also created an excellent environment for certain potato diseases, especially early blight and late blight. Early blight of potatoes is a fungus disease which attacks both the potato vine and tuber. Generally, the extent of injury to tubers from this disease is slight and doesn't warrant attention. The economic loss from this early blight disease is in the form of reduced yields, since it causes premature death of the vines. Early blight can be identified by brown circular spots which show a series of concentric rings giving the appearance of a target board on the leaves. The crop loss from early blight has never been fully appreciated by western potato growers.

Late blight can also attack both the potato foliage and tubers. When it attacks the foliage it causes a dying of all or parts of the potato vine. Dead areas appear at the tips or margins of the leaves and spread downward, killing the entire leaf. These dead areas on the leaves are wet, dark green, depressed and of irregular shape or size. In the early stages of infection the areas are surrounded by a light, yellow band. Infection is possible from spores (infectious bodies) which are produced within the infected areas of the leaves. These spores are produced in great numbers and are spread about by wind and water. Tuber infection results when these spores fall onto the soil and are carried down to the tubers by rain or irrigation water. Infection of the tubers will cause a rot. Thus a significant reduction in tuber quality as well as yield may result from late blight.

In 1951, late blight caused a significant reduction in both yield and quality. Conservative estimates place the crop loss due to this disease at 50 per cent for the irrigated potato sections of western Nebraska. Quality of the 1951 crop was reduced an average of 10 per cent by late blight tuber rot.

Contrary to popular opinion, 1951 was not the first year that late blight was in evidence in the western potato area of Nebraska. Many blight infected potato stocks were observed in storage in 1945. The disease, however, had never been identified in potato fields of western Nebraska prior to 1951. Two factors were mainly responsible for the blight epidemic in 1951. One, a considerable amount of blight-infected seed was planted in all of the potato sections and, two, weather conditions were extremely favorable for late blight development. The severity of the epidemic varied a great deal, with the potato sections that received the greatest amount of rainfall generally being the hardest hit. The irrigated sections of Box Butte and Sheridan Counties received between 6 and 9 inches of rain during late August and early September, and many growers lost their entire crop because of blight-infected tubers.

The high per acre cost of producing potatoes makes it advisable for growers to include blight control in their production schedules. It is not good business to gamble with this disease. The loss of one potato crop will more than pay for any additional equipment needed for initiation of a positive blight control program. Blight control is a form of crop insurance and growers should include it in their prospective potato cost.

The following are important points in the control of late blight:

1. Complete vine coverage with a fungicide is necessary to obtain proper blight control.

2. Blight control is best obtained by preventing the disease from becoming established in a field.

3. Most methods of applying a fungicide will give some control of this disease but certain methods are considerably more effective than others.

   (a) Spraying with high pressure equipment (300 lbs.) offers the only reliable late blight control.

   (b) Dusting with ground dusters is a means of blight control but is not assurance against a total crop loss.

   (c) Airplane dusting should be employed only as a late resort. After extremely wet periods when it is impossible to get into a field with ground equipment, aerial applications should be immediately employed to be followed as soon as feasible with high pressure spraying.

4. The organization of a spray ring by neighboring growers enables small operators to employ a high pressure sprayer at a reasonable cost. Eastern areas have long used this means for obtaining adequate blight control.

5. Time of application will vary a great deal depending upon the season. The first application of a fungicide should be made when the weather turns cool and moist.

6. When weather conditions are favorable for blight, fungicide applications should be made weekly. Additional applications are needed after heavy rains.

7. Vine lifters are necessary for late applications of fungicide when ground equipment is employed.

8. Destroy all potato cull piles. These piles may be a source of infectious material for the coming year. Volunteer potatoes in fields infected with late blight must be eliminated.

9. Irrigating potatoes after late blight has become general throughout the field is not recommended.

10. Removal of green infected vines is necessary before harvesting. If vine beaters or pullers are not available,

spraying infected vines and potato ridges with a 5% copper sulphate solution will possibly keep down tuber infections.

11. The following fungicides are recommended for blight control in Nebraska.

Material	Form in which material is applied			
	Spray	Amount	Dust	Amount
Bordeaux mixture	8-8-100 Gal	100 gal/acre		
Parzate	$1\frac{1}{2}$-2 lbs. in	100 gal/acre	10-20% mix.	50 lbs/acre
Zerlate Dithane Z-78	$1\frac{1}{2}$-2 lbs. in H_2O make 100 $1\frac{1}{2}$ lbs. in H_2O to make 100 gal.	100 gal/acre	10-20% mix.	50 lbs/acre
Dithane D-14 plus Zinc Sulfate	2 Qts.+1-lb. of Zn So_4 to make 100 gal.	100 gal/acre		

(a) Bordeaux mixture is the most effective material for the control of all phases of late blight infection.

(b) The materials listed in the table above are compatible with DDT with the exception of Bordeaux mixture and can be included in a regular insecticide application.

(c) A regular blight control program should start with Parzate or Dithane. If severe blight infection is in evidence late in the season after insect problems are past, growers should switch to Bordeaux mixture. 1/

(d) Zerlate is specifically for early blight control.

1/ The effectiveness of DDT is considerably less when included with Bordeaux mixture.