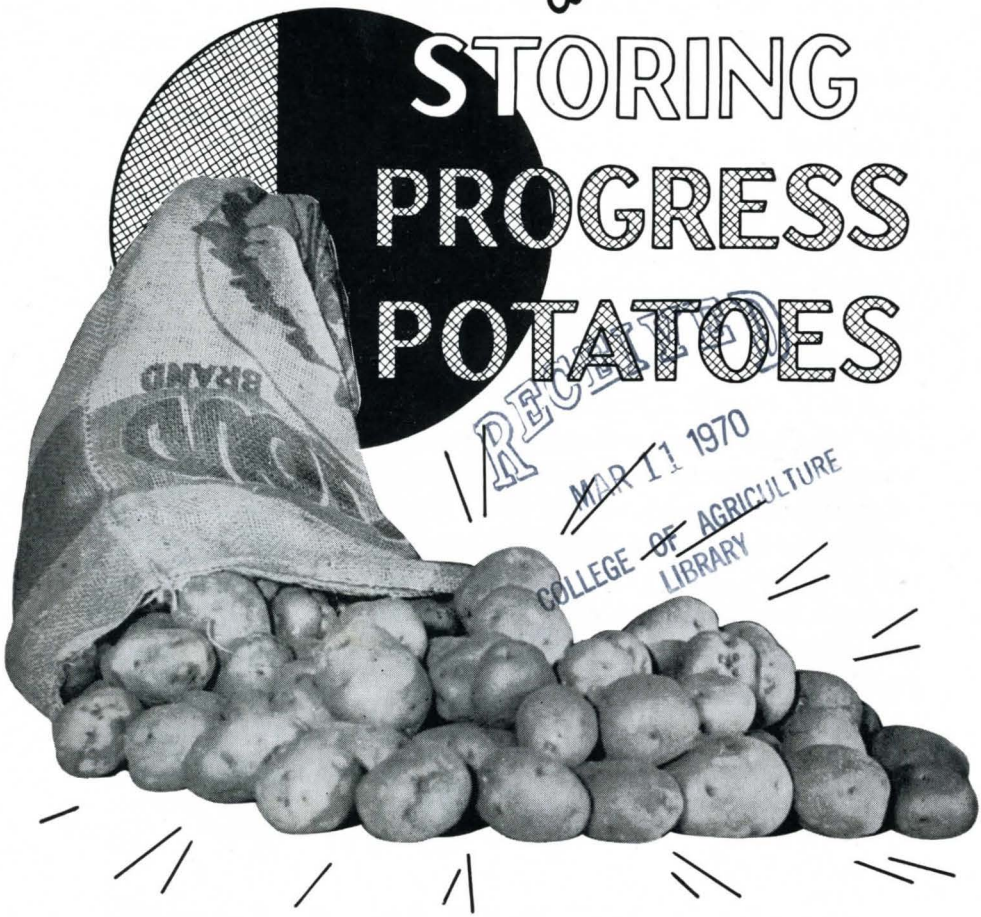
3-1951

EC1272 Growing and Storing Progress Potatoes

H. O. Werner

MARCH 1951 CIRCULAR 1272

GROWING and STORING PROGRESS POTATOES



PUBLISHED IN COOPERATION WITH
THE DIVISION OF POTATO DEVELOPMENT
NEBRASKA DEPARTMENT OF AGRICULTURE AND INSPECTION

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U. S. DEPARTMENT OF AGRICULTURE
COOPERATING
W. V. LAMBERT, DIRECTOR

FOREWORD

Production of No. 1 potatoes in western Nebraska has been limited for many years by scab and harvest cracking. Fifteen years of breeding, selection and testing by the Nebraska Agricultural Experiment Station has produced Progress, a variety less susceptible to scab and harvest cracking than the Triumph variety which has long been grown as a major crop.

To attain most satisfactory results with Progress, more care may be necessary in some operations than farmers are accustomed to using. The methods of growing Progress presented in this circular were developed both from experimental work at the Substations and the outstate plots of the Nebraska Agricultural Experiment Station, and from the experience of western Nebraska growers.

If this variety is grown properly, it should be possible to produce more high quality potatoes and thus put the industry in western Nebraska on a sounder basis. No other red variety with the essential characteristics of Progress, plus other better features, is likely to be available to farmers within the next four or five years. The information in this circular is aimed at helping growers handle Progress so as to obtain maximum yields of the best quality potatoes. Additional information about Progress is available in the publications listed on page 15.

W. V. LAMBERT, Director

H. O. Werner is Horticulturist, Agricultural Experiment Station, University of Nebraska College of Agriculture.

A number of people have contributed ideas contained in this circular. Among those who have contributed most are: Lionel Harris, Marx Koehnke, M. W. Felton, R. B. O'Keefe, H. W. Chapman and George Stachwick.

Growing and Storing Progress Potatoes

H. O. WERNER

Agricultural Experiment Station

FOR YEARS the western Nebraska potato industry has been hampered in the production of US No. 1 potatoes because of the high percentage of scab and serious harvest cracking in the Triumph variety. Progress, a new variety, produces high yields of potatoes having relatively little scab—and that of a mild type. It is the only red variety with this characteristic now available to western Nebraska growers, or likely to be available within the next five years. Practically none of the Progress potatoes crack at harvest time. For these reasons, returns to growers are greater and much more certain than with Triumph.

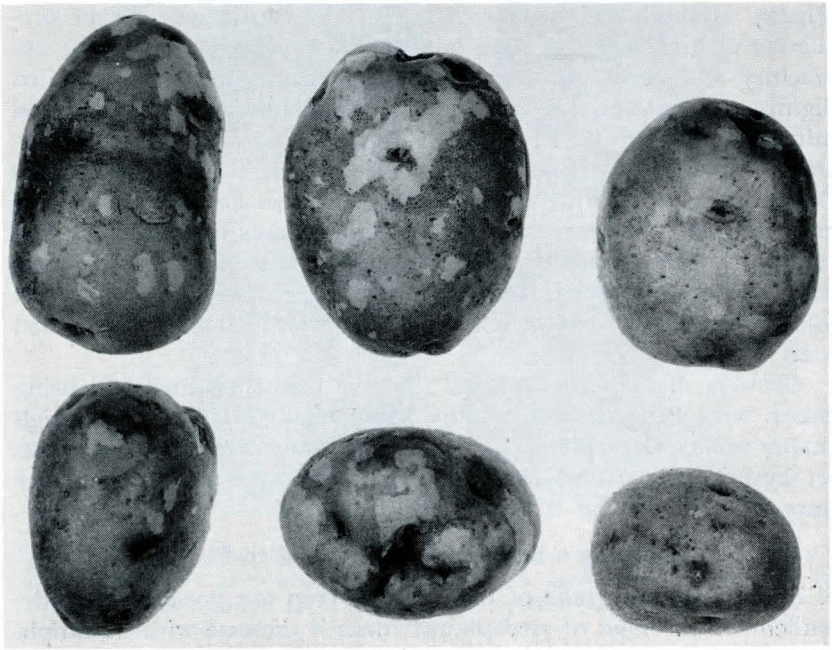


FIGURE 1.—Range of tuber types likely to be found in good commercial lots of Progress potatoes. These tubers were from an irrigated commercial field. Eyes are usually shallow except at the apical end where they are much like those of Triumph potatoes. Lower line: left, side view; middle, apical end; right, basal end. With some of the less mature tubers (upper middle) the outer layer of skin was removed by the high water pressure required in the commercial washer for removing dirt which stuck tenaciously with this lot.

Progress is being well received on the markets. Some buyers have shifted entirely to this variety. Customers like it because of its superior cooking quality, suitability for baking and ease of preparation.

The many growers who will use Progress—many for the first time in 1951—should realize that some of its growth habits are different from those of Triumph. For success with Progress, growing practices should be adjusted to these different characteristics. Failure to do so may leave many growers disappointed. The object of this circular is to give information about production methods that have been used successfully in growing Progress. [1]

The major differences in the growth habits of Progress, as compared with Triumph, are that: (a) attaining good stands may be more difficult; (b) the heavier set of tubers may result in more small potatoes; (c) growth cracking of tubers occurs more readily, but knobby and oversize tubers are much more rare; (d) tubers have a shorter rest period and may lose firmness more rapidly in storage (Fig. 2). Methods that have been found most satisfactory for the production of high yields of high quality Triumph potatoes will be satisfactory with Progress. Some practices will need to be modified slightly, and more care will be necessary with others. Neglect of good culture is likely to give poorer results with Progress than with Triumph. Some of the characteristics of Progress that are sometimes looked upon as liabilities may actually be assets. For example, heavy tuber setting is necessary to get maximum yields of marketable-size potatoes unless excessively large quantities of seed are planted per acre. Then too, growing methods that are necessary to avoid growth cracks will be beneficial in several other ways which will be discussed later.

Growers should bear in mind that the methods which will bring success with Progress will usually bring about high yields of high quality tubers. Costs per acre will perhaps be relatively high, but costs per bushel will be low. Hence, maximum returns per acre and per hour of labor can be realized.

Choosing a Stock of Progress Seed to Plant

Both yield and grade of the Progress crop are possibly more dependent on the kind of seed planted than is the case with Triumph. The most important things to consider in selecting Progress seed are the following:

---

[1] Any grower wishing to be sure that he is not overlooking important details in his methods might review the comprehensive information in Nebraska Agricultural Experiment Station Bulletin 384, "Commercial Potato Production in Nebraska."

1. **Certified seed**—or still better, **foundation seed stock**—is the best general insurance of relatively disease-free seed. If uncertified potatoes must be used, special effort should be made to locate lots as free as possible of spindle tuber.
2. **All grades of certified seed are equally good** in so far as the most vital matters of certification are concerned. The better grades of certified seed potatoes have the best appearance because of freedom from defective tubers (such as rough or sun-green tubers), but with careful handling, tubers of the lower grades may be equally productive.

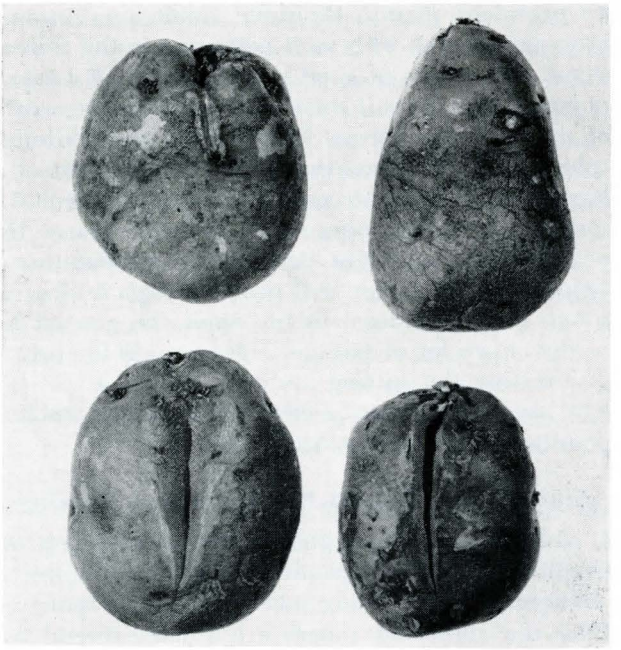


FIGURE 2.—Some undesirable but avoidable Progress tuber types. Growth crack in the lower right tuber occurred rather late in a potato that was still very immature when harvested. If a crack occurs a week or more before tuber growth ceases, the crack tends to become wide and shallow as growth continues (lower left). As a grade defect the crack is then relatively mild. The torn tissues in such cracks heal with red color, sometimes overlaid by a surface russet. Minor cracks near the apical end (upper left) are quite common in some lots, but they usually spread out and become so shallow as not to be a grade defect. At upper right is an immature tuber in which growth was resumed at the apical end late in the season and in which the older part (basal) shriveled after sprouting began in storage.

3. The **smaller tubers** (from certified seed or better) **are best** because the total area of cut surface per bushel of seed is much less when cut from small potatoes than when cut from large tubers. The risk of seed piece rot decreases as the amount of cut surface decreases. Small potatoes, that can be handled whole, are satisfactory if they are from stocks practically free of virus diseases, such as foundation seed stock or certified seed with very little spindle tuber. The quality of small potatoes from uncertified fields is too uncertain. They should not be planted.
4. **Seed potatoes should be firm** and not weakened or spongy because of excessive sprouting.
5. **In seed potatoes that are not certified, virus diseases may be more prevalent than is desirable.** Some precautions that the growers might take with such potatoes are the following:
   a. Plant only tubers of good type. Sort out all long or pointed potatoes, especially if their color is distinctly paler than that of the good-type tubers. Many of the long, pointed, normal-colored Progress potatoes may be healthy, but on the other hand they may be infected with spindle tuber and should be sorted out (Fig. 2, upper right). If seed is scarce, the best appearing of these might be planted in separate rows in the field. If healthy, they will produce a good crop; if not, the tubers they produce will not spoil the general appearance of the entire lot of potatoes. (See page 8 for instructions on disinfecting the cutting knife.)
   b. The use of "one-drop" seed is not advisable when using seed potatoes that have not been certified.

Storing Progress Seed Potatoes Before Planting

Storage of Progress seed potatoes is even more of a problem than with Triumph because they sprout earlier. These sprouts dissipate moisture and plant food, causing tubers to become spongy. The heat generated by the sprouting tubers accentuates several undesirable conditions. The necessary removal of the sprouts, a tedious chore in itself, may increase tuber rotting because of the infection of the open wounds where the sprouts are broken off. After the removal of much sprout growth, more but weaker sprouts develop and later this brings about more but weaker stems per hill, and eventually a greater set of tubers than is desired. The cut surfaces of seed pieces from tubers that are spongy will not heal as well or as quickly as surfaces cut from crisp tubers. For these reasons, heavy sprouting of seed potatoes may lead to much seed piece decay, weak sprout growth and poor stands.

This sprout situation should be dealt with by one or more of the following methods:

1. **Retard sprout growth by:**
   a. Holding seed potatoes at low temperatures, provided either by careful cellar management or by artificially refrigerated cold storage. (When the latter is used, warm up the seed potatoes at least one week before planting.)
   b. Providing air to the seed potatoes by storing them either in sacks in well ventilated piles or in shallow bulk piles (not over 24 inches deep). Turn these piles over every week.
2. **Induce the development of short, stubby sprouts** that will survive planting operations by stacking sacks of seed potatoes outdoors on racks in a wind-sheltered, shady place. Provide for air circulation around each sack. With this method bear in mind that there is a risk of freezing potatoes in some seasons. Progress tubers are likely to lose more water than Triumph tubers when exposed in this way. If they lose enough to become spongy, the cut surfaces of the seed pieces may heal poorly. Obviously, more care must be used with large potatoes that are to be cut than with small tubers that are to be planted whole.
3. **If sprouts must be removed, do it with care.** Hand removal may prove best. Sprout removal by machines has resulted in much rotting of seed potatoes. The numerous slight abrasions caused by the machine provide entrance places for the rot organisms and the wet pulp from crushed sprouts provides an excellent medium for spreading the rot-causing organisms. There is also a possibility that spindle tuber may be spread by such equipment.
4. **Do not treat Progress seed potatoes with hot formaldehyde to kill sprouts.** Tuber rotting organisms entering the potatoes through the unprotected tissues in the bases of the killed decaying sprouts may cause serious losses. This treatment is intended only for the control of scab—a disease that at present is of minor importance with Progress. Furthermore, the greatest source of scab infection is the soil.

Cutting and Handling Progress Seed Potatoes

Many growers do not realize the importance of handling cut seed potatoes very carefully, nor do they appreciate the importance of minor details of procedure. Great damage can result from failure to use proper care. Proper cutting and proper handling of cut seed are extremely important because of the direct influence on the stand of plants. The stand in turn has a great influence on total yield, and

size and type of tubers of the ensuing crop. Each year many poor stands occur because of mistakes in handling cut seed potatoes.

It is important that the cut seed pieces are of the proper shape and that they remain in sound condition until the plants are well established. To assure this seed piece preservation the cut surfaces must be protected against infection by rot producing organisms that are always present in the environment to which they are exposed. If handled properly, a protective cork layer will develop at the cut surfaces by a week to 10 days after cutting. This layer develops very well on Progress seed pieces if they are held under the proper conditions, but if any of the conditions are not favorable, cut surfaces frequently do not heal as rapidly or completely as with pieces of Triumph. With proper care growers have been getting almost perfect stands with Progress.

On the basis of present knowledge, the best recommendations that can be made for cutting and handling Progress seed pieces to preserve them and get good stands of strong plants are the following:

1. **Cut blocky-shaped seed pieces.** They have the least cut surface for a given weight of seed piece, they will work through the planter better and are likely to produce stronger sprouts more promptly than pieces of other shapes (Fig. 3). The smaller the area of the cut surface, the less opportunity there is for rot producing organisms to get into the seed piece.

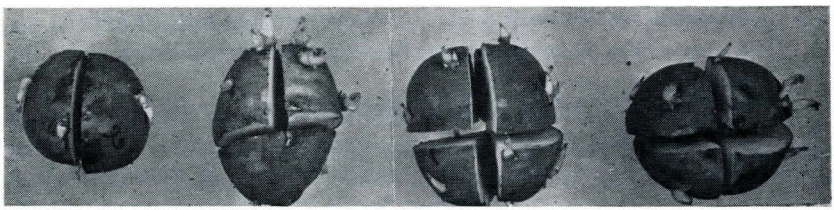


FIGURE 3.—Proper shapes into which seed potatoes of various sizes should be cut so as to get the desired blocky pieces.

2. **Disinfect the cutting knife between tubers** if the potatoes are to be grown for certification or if spindle tuber is likely to be present in the seed stock. Any of a number of chlorine-containing disinfectants for domestic or dairy use should be satisfactory. The solution should have a minimum strength of one part of disinfectant per one thousand parts of water and should be mixed fresh every half day, or as frequently as it becomes clouded with dirt, potato particles, etc.

3. **Planting into moist soil as soon as possible after cutting is the best practice for most growers.** Cutting seed days or weeks in advance of planting has some advantages, but **it must be done properly.** It is not recommended as a practice for most growers because if not done right, it may be disastrous. (Full instructions about this method are given on pages 48-51 of Nebraska Agricultural Experiment Station Bulletin 384.) The methods to use when cut seed must be held for short periods of time during practical operations are described in the following sections of this circular.
4. **Protect the cut seed at all times against exposure to high temperature, dry air or direct sunshine.** Exposure of as little as 10 to 15 minutes has been known to do serious damage. Do not do the seed cutting out of doors or in a dry, windy place.
5. **When holding the cut seed pieces, provide high humidity and ample aeration.** Avoid deep piling of cut seed, and turn piles each day. If cut pieces are held in sacks, fill the sacks only half way, then tie them at the top of the bag and lay them out flat. Never stack these sacks in deep solid piles. If necessary to hold them more than a few hours, turn them end over end once a day, and shake the seed pieces around inside the bag. If space is limited the sacks may be stacked several layers deep by placing strips of wood between layers of sacks and allowing air space between the sacks of each layer. Sprinkling sacks occasionally with water will help to maintain the desired high humidity around the seed pieces.
6. **Handle cut seed very cautiously after it is taken out of the cellar.** Provide circulating air space between sacks of seed pieces on the truck. Shade the load on the truck with several layers of burlap sacks or a tarpaulin placed so as to permit reasonable ventilation beneath it. On sunny or windy days, cover the potatoes in the hopper of the planter because the 10 to 20 minutes they are exposed will damage many of them seriously. Take only small loads of cut seed to the field at one time, thus avoiding the overheating or asphyxiating of some of the seed potatoes that occurs when large loads of cut seed are held in the field for a half day or more during hot weather. Many of these difficulties may be avoided and results of the planting operation may be greatly improved by avoiding planting in mid-day on hot windy days (about 10:00 A.M. to 4:00 P.M.), or by planting at night.
7. **Plant seed pieces so they will be in contact with moist soil.** This requires attention to depth of planting and covering. If

the soil is not moist, irrigate it before planting. Irrigation after planting will be satisfactory if done properly and without delay —that is, usually the day of planting. If the surface soil is dry, never permit dry soil (especially if warm) to roll into the furrow around the cut seed pieces while planting. If the soil is loose or has slightly less than optimum moisture and irrigation is not possible, much can be accomplished by packing a shallow layer of soil immediately over the seed pieces, or by packing the ridge left by the planter. A good procedure is to equip the planter with two pairs of covering disks, the front pair being the smaller and throwing a small amount of moist soil directly over the seed pieces from the sides of the furrows with large rear disks doing most of the covering. An even better method is to use a concave press wheel instead of the front covering disks.

Time to Plant Progress

Progress potatoes should be planted at about the same time as Triumph, generally between June 15 and 22. Because Progress has less scab, some growers have planted it much earlier than Triumph so as to be able to harvest the crop earlier or to give it more time to mature. This was found to be unwise because the tubers produced were generally of inferior type and color, yields were lower and scab did occur to a more serious extent. It seems better to plant later and force the development of the crop with irrigation or sometimes with supplemental fertilizer.

Planting Distance and Seed Piece Size

The general size of the tubers raised may be increased by planting less seed per acre than is common practice with Triumph. If too little seed is used, most of the tubers will be large, but some may have serious growth cracks and a very few will be oversize. The planting rate for any field must be governed by the fertility of the soil and irrigation schedule contemplated. If soil fertility is high, and if irrigation will be adequate—both in time of application and amount of water—it may be advisable to plant fairly large quantities of seed. When reducing the quantity of seed planted, the use of moderate-sized pieces (1½ to 2 oz.) planted 12 to 14 inches apart is more desirable than larger pieces (2 to 4 oz.) far apart.

Soil Fertility and the Progress Variety

Total yields of Progress and Triumph are about the same on average soils, but with high fertility it is possible to obtain higher

yields of US No. 1 potatoes with Progress than with Triumph. Crop rotations that have been most effective in the production of Triumph potatoes should be satisfactory for Progress. These rotations should be 4 to 6 years in length and include either alfalfa or sweetclover as green manure crops to be plowed under for potatoes. Farm manure, when applied several years prior to potatoes, increases yields but usually increases the amount of scab of most varieties. With Progress it can be used with more safety. At the Scotts Bluff Substation when manure was applied just prior to potatoes, Progress tubers had much less scab—and that of a milder type—than did the Triumph tubers produced in alternate rows across the field (Fig. 4). Although Progress does not do well on soils of low fertility, good crops can be grown even

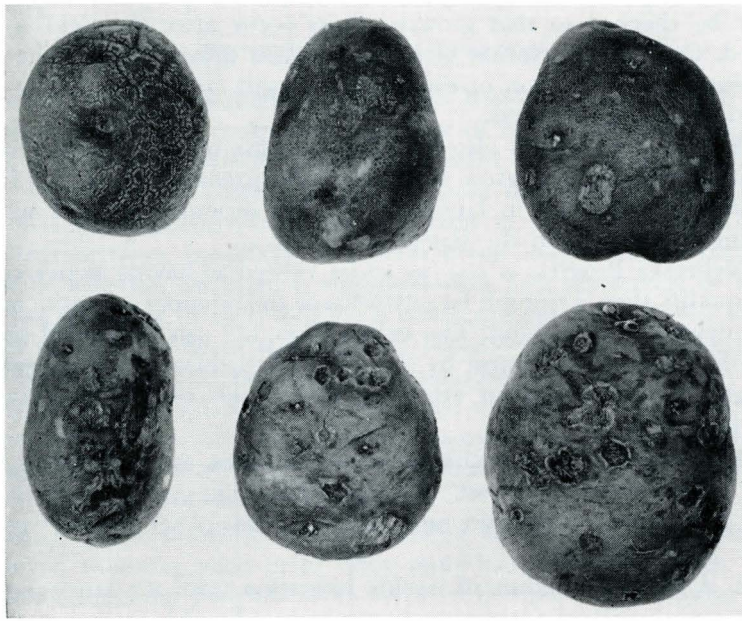


FIGURE 4.—Types and severity of scab occurring on Progress in comparison with that on Triumph tubers (two potatoes in lower right). All tubers were grown in a field that had very few scab-free Triumph potatoes. The scab on the two Triumphs is typical of that on most of the tubers of that variety, whereas the scab shown on the Progress tubers (all upper row and lower left) was the most severe that could be found on potatoes of that variety in that field. Upper center shows spots where scab infection occurred but growth of lesion was checked and shallow, corky scab tissue was spread out as the tuber enlarged. Upper left shows a tuber with a network of shallow growth cracks which healed with a corky growth commonly considered to be scab, but much of which might merely be a heavy growth of wound cork. On lower left tuber, tracks made by flea beetles apparently became infected with scab.

on light sandy soils without the preceding legumes if commercial fertilizer containing 80 to 120 pounds of nitrogen and 30 to 50 pounds of phosphorus per acre is applied at planting time.

Irrigation of Progress Potatoes

Good irrigation of Progress fields (timely, frequent irrigation in adequate amounts), is probably the most effective means of assuring maximum yields of tubers of desirable size and type and free of growth cracks. Several seemingly minor growth characteristics of Progress can best be dealt with by proper irrigation. For instance, Progress plants do not show external signs of moisture deficiency, such as drooping leaves, as quickly as Triumph plants. If irrigation is delayed until the plants droop, as is often done with Triumph, the growth of the tubers may be checked so that growth cracks occur after the field is irrigated. Careful observation of many Progress tubers leads to the conclusion that prevention of even small growth cracks may aid in preventing scab on Progress.

Proper irrigation is also necessary because of the tendency in irrigated fields for Progress vines to ripen prematurely if the fields become partially dry in late summer. The seriousness of the partial drying depends upon the temperature.

Nebraska Progress is coming to be viewed as having better culinary quality than Triumph largely because the potatoes are quite mealy and desirable for baking. The culinary quality can be altered significantly for better or worse by the extent and duration of irrigation. Irrigation suggestions for attaining high yields of high quality are the following:

1. **Keep the top 18 inches moist at all times,** especially after Progress tubers have "set" and started to enlarge. However, if the soil becomes dry, do **not** wait until tubers set before starting the irrigation.
2. **A regular schedule of weekly irrigation** from the latter part of July to about September 10 might be advisable in most seasons. During very hot, dry or windy weather in late August or early September, when plants are large and tubers are growing rapidly, Progress fields should be irrigated twice a week.
3. At each irrigation apply water so that 2 to 3 inches of it will get **into** the soil. More will be wasteful of water and fertility. Efficiency of distribution may be increased by cutting the length of rows (sets) for irrigation to 500 or 600 feet.
4. Build high, wide ridges to prevent sun-greening of new tubers and to keep them out of saturated soil.

Disease and Insect Control

Disease and insect control should generally be the same as with Triumph. Although scab is not a serious problem with Progress and fusarium wilt is less prevalent than with Triumph, it will be well to observe the ordinary precautions of crop rotation and avoid early planting.

Various opinions are heard about increased susceptibility of Progress to spindle tuber, wireworm damage and psyllids. Up to now, the evidence on this is of dubious validity or inconclusive; however, because the more spreading, less erect vine growth of Progress may interfere with adequate covering of the lower leaves when dusting or spraying, it will be advisable to be sure that insecticides are properly applied.

Harvesting Progress Potatoes

Some of the physiological differences between Progress and Triumph vines and the comparative absence of harvest cracking of Progress potatoes may call for some adjustment of harvesting practices with Progress. The mere mention of these differences will suggest common sense measures that can be taken to avoid the difficulties.

Progress vines are likely to remain green longer than Triumph vines because the life span is slightly longer and vines seem to have less susceptibility to early blight. If vines are green at harvest time, much tuber skinning or scuffing may occur because of the immaturity of the tubers and because when potatoes do not crack they are likely to be handled more roughly. Such damage is serious because it spoils the appearance of the tubers, permits more water loss from them, and leads to development of sunken scald spots or facilitates infection by rot-producing organisms.

Much tuber skinning can be avoided by advance root cutting. However, this may need to be done more cautiously than with Triumph because the Progress vines seem to be able to pull water out of the tubers more rapidly. Consequently, if roots are cut too far in advance in bright and windy weather, the tubers may become and remain spongy. This may also occur if Progress potatoes are left on top of the ground too long on drying days. Vine destruction shortly before harvest may result in a better "set" of the skin and is not likely —except in very unusual weather—to bring on more tuber cracking, as it usually does with Triumph. Some potatoes may be closer to the surface of the ground with Progress than with Triumph; therefore, vine beaters should be used more cautiously or they may bruise many potatoes.

Storage of Progress Potatoes

Progress potatoes require somewhat better storage facilities and management than Triumph. They seem to lose turgidity more readily than Triumph tubers and they have a shorter rest period and sprout earlier. They do not turn sweet as quickly or extensively as Triumph potatoes when subjected to low temperatures. In view of these characteristics, the following practices are recommended:

1. **Avoid taking dirt into the bins** as much as possible. It interferes with proper air circulation in the bin. With a little care, men can avoid dumping much of the loose dirt remaining in the bottoms of the sacks into the bin. Bin-filling conveyers will sift out much dirt.
2. **Construct bins so as to provide for ventilation** at the rear, through the center and preferably beneath large bins. These may be false walls or flues and floor ducts—any means of circulating air to carry off heat. (For detailed information see pages 139 to 151 of Nebraska Agricultural Experiment Station Bulletin 384.)
3. **Maintain high humidity** (80 per cent or more) **and temperatures as high as possible up to 70°F. during the first 10 to 14 days after harvest** to insure proper wound healing and to retain firmness of tubers. This can be accomplished by frequent "wetting down" of the cellar driveway.
4. **Cool the potatoes as rapidly as possible immediately after the initial warm healing period** and then keep them cool. Aisle temperatures of 34° to 38°F. are advised because the tuber temperatures in the bins—even with the best of management—will be several degrees higher.
5. If seed potatoes are stored late into June, it will be well to sort and size them during the latter part of the winter and then store them either in sacks properly piled for ventilation or in bulk piles not more than 2 or 3 feet deep. Artificially refrigerated cold storage is satisfactory, if available (see section on seed management in the spring, pages 7–9).

Other Information About Progress

Additional publications of the Nebraska Agricultural Experiment Station containing information on the growing of Progress potatoes in western Nebraska are the following:

HORTICULTURE
PROGRESS REPORT

No. 11 The Progress Potato Variety: General report of experience with the variety in western Nebraska and special methods suggested for growing it. H. O. Werner

No. 12 The Progress Potato: Reports from western Nebraska potato growers in 1949. H. O. Werner

No. 13 Western Nebraska Dryland Tests of Progress and Several Other Promising Potato Varieties. H. O. Werner, H. W. Chapman and R. F. Sandsted

No. 14 Western Nebraska Irrigation Tests of Progress and Several Other Promising Potato Varieties. H. O. Werner and R. F. Sandsted

No. 15 Results with the Progress Variety Planted in Western Nebraska on Four Dates in Comparison with Triumph. H. O. Werner, R. F. Sandsted and H. W. Chapman

No. 16 Yield and Quality of Progress Potatoes on Dryland as Influenced by Seed Piece Size and Planting Distance. H. O. Werner and H. W. Chapman

These reports may be procured from County Agricultural Extension Agents, the office of the Division of Potato Development of the Nebraska Department of Agriculture and Inspection at Scottsbluff, or the Department of Horticulture, College of Agriculture, Lincoln, Nebraska.