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IMPROVE THE POTATO CROP¹

By A. G. Tolaas, Division of Agricultural Extension; Richard Wellington, Division of Horticulture; and G. R. Bisby, Division of Plant Pathology and Botany

GROW STANDARD VARIETIES

Grow the varieties of potatoes recommended for the various soils and market requirements of Minnesota. Grow only one or two varieties in any one community. Other varieties may eventually either take the place of those recommended or be added to the list, but such changes will and should occur slowly. No new variety or seedling will be recommended unless it proves superior after careful tests, to the varieties now recommended. The eight varieties may be divided roughly into early and late kinds.

Early Ohio is the leading early variety and is grown extensively for table use in the sandy soils north of the Twin Cities and for seed in the loam of the Red River Valley. Triumph and Irish Cobbler are also early and are grown as seed stock for the South. Triumph is subject to tip-burn and consequently is well adapted to the northern part of the state where there is not much danger of drought and hot weather. Irish Cobbler is rapidly gaining in favor in the northern part of the state but is handicapped by its similarity to the late round varieties.

Rural New Yorker stands first among the late varieties. Unfortunately it is often confused with Green Mountain, altho the two varieties are distinct in habit of growth and many other characters. Rural New Yorker is more subject to hollow center, in rich soils, and is more resistant to hot weather, and is therefore well suited to the southern and older sections of the state. Green Mountain, on the other hand, is well adapted to the cool climate and new soils of the northern part of the state. Burbank and Burbank Russet are late potatoes of fine quality and are especially adapted to rich, friable soils well supplied with humus. King, another late potato, is recommended only for sandy and poor soils, since it becomes irregular and develops deep eyes in rich soils.

¹ This bulletin is intended to take the place of Special Bulletins Nos. 5 and 22.

Description of Varieties

Early Ohio. Early Six Weeks, Ohio Junior, Acme, Early Market, and Prize Early Dakota are similar if not identical.

Tubers: Oval with rounded seed and stem ends; eyes numerous, shallow, sometimes protuberant; skin pinkish or flesh-colored, especially around eyes of seed end, usually with conspicuous corky dots or lenticels.

Sprouts: Stems medium in number, rather stout, angular, considerably branched, light green faintly tinged with purple; leaves dark green with leaf stalk tinged with purple; flowers white, borne on stalk situated in axil formed by leaf and stem.

Triumph. Noroton Beauty, Quick Lunch, Red Bliss, Bliss Triumph, and Stray Beauty are similar if not identical.

Tubers: Roundish, blocky, with blunt ends, slightly flattened; seed-end strongly depressed; cavity at stem end deep to very deep, irregular; eyes medium, numerous, rather deep; skin red.

Sprouts: Slightly tinged with red, tips reddish.

Plant: Stems medium numerous, stout, slightly angular, well branched, light green faintly tinged with purple; leaves dark green, petiole of leaves and leaflets tinged with faint purple; flowers light lavender.

Irish Cobbler. Early Eureka, Early Petoskey, Early Victor, and Hamilton Early are similar or identical varieties.

Tubers: Roundish, with blunt ends, slightly flattened; seed end depressed; stem end with large, broad, deep cavity; skin white; blocky shape and recessed ends are characteristic.

Sprouts: Tinged with considerable pink; tips light carmine.

Plants: Somewhat spreading; stems numerous, stout, considerably branched, light green, distinctly purplish at base; leaves dark green; flowers lavender fading to light lavender or whitish at maturity or in intense heat.

Rural New Yorker. Sir Walter Raleigh, Carman No. 3, and Rural New Yorker No. 2 are similar if not identical.

Tubers: Nearly round, considerably flattened, very broad, varying to oblong; eyes fairly numerous, shallow; skin white, slightly flaked at seed end.

Sprouts: Tinged with purple, tips purple.

Plants: Stems at first upright and appear weak, later become stout and spreading, heavily tinged with purple. First leaves appearing above ground purple on lower surface, foliage dark green; flowers few, purplish, usually dropping off, borne on bare stalk usually arising a short distance above the leaf axil.

Green Mountain. Carman No. 1, Empire State, Gold Coin, Green Mountain Jr., Gurney, Norcross, State of Maine, and Uncle Sam are similar if not identical.

Tubers: Oblong, flattened, with blunt ends; eyes medium in number, shallow; skin white, slightly flaked.

Sprouts: White with yellowish tips.

Plants: Unlike Rural New Yorkers make a strong bushy growth when young; very large, moderately compact, mostly decumbent; stems green, angular; foliage light green; flowers white, very numerous, borne on leaf petiole with one, two or three leaves.

Burbank. Burbank Seedling. Frequently confused with White Chief, White Star, and Pingree which are inferior varieties.

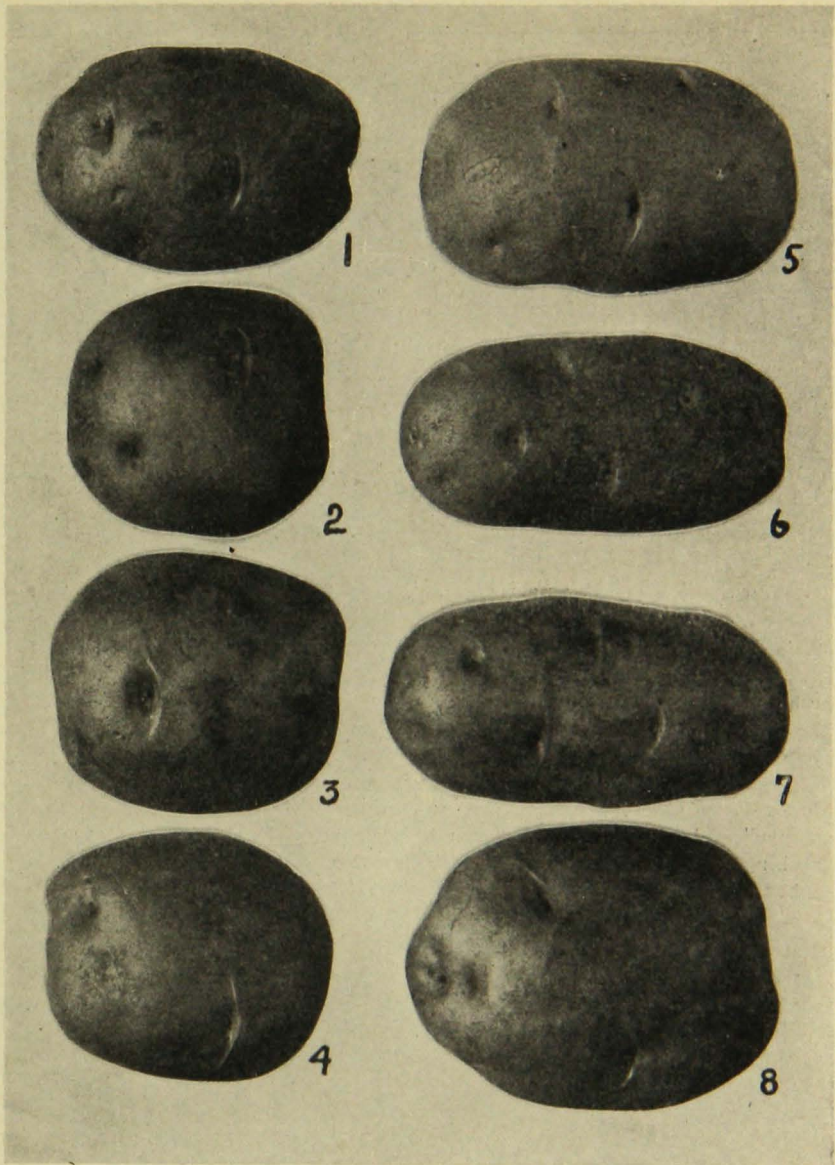


Fig. 1. Eight Standard Varieties for Minnesota

- | | | | |
|-------|------------------|-------|----------------|
| No. 1 | Early Ohio | No. 5 | Green Mountain |
| No. 2 | Bliss Triumph | No. 6 | Burbank Russet |
| No. 3 | Irish Cobbler | No. 7 | Burbank |
| No. 4 | Rural New Yorker | No. 8 | King |

Tubers: Long, cylindrical to slightly flattened with roundish ends; eyes medium in number, very shallow to slightly protuberant; skin white.

Sprouts: Tinged with pink, especially at base; tips very slightly carmine.

Plants: Large, bushy, fairly erect; stems numerous, rather slender, angular, light green faintly tinged with purple; leaves moderately dark green; flowers white with flowering habit similar to that of Green Mountain.

Burbank Russet. Similar to if not identical with California Russet, Cambridge Russet, Netted Gem, and Scabproof.

Similar to Burbank in all characteristics except netted or russet skin.

King. Similar to if not identical with Maggie Murphy.

Tubers: Broad oblong, flattened, blocky, with blunt ends; eyes rather numerous, medium to deep, pinkish; skin reddish, with deepest color at seed end.

Sprouts: Tinged slightly with pink, tips carmine.

Plants: Very large, bushy, mostly erect, giving row broad flat appearance; stems very numerous, stout, angular, light green tinged with purple; leaves medium dark green; upper side of leaf and leaflet petioles tinged purple; flowers white and nearly always drop before opening.

SELECT THE RIGHT KIND OF SEED

Select potatoes that show vigor, health, and high yielding qualities. This can best be done at digging time. Superior strains have been developed in some varieties as a result of careful selection, and show uniformity, vigor, and health. It does not pay to attempt to build up a poor strain by selection.

If the strain grown is unsatisfactory, get a better one. The past performance of a strain is a good indication as to what it will do in the future.

Do not introduce disease into the soil with the seed. Exclude disease when selecting potatoes. Select only healthy potatoes and treat the seed.

Discard tubers showing rots or brown discolorations either within the tuber or at the stem end. Such tubers, as well as knobby, irregular, "off shape," and very small ones, can be eliminated in the process of sorting, racking, and cutting. It may not be practicable to select individual choice tubers for the general field, but this should be done for the seed plot.



Fig. 2. Rural New Yorker Variety:

- Front Row, Tubers With Black Scurf; Back Row, Clean Tubers
1. Crop from seed treated with corrosive sublimate, 1 sq. rod.
 2. Crop from seed treated with copper sulphate, 1 sq. rod.
 3. Crop from seed treated with formaldehyde solution.
 4. Crop from untreated seed.

Treat the Seed

Tubers showing scab or black scurf on the surface should be treated with corrosive sublimate. This treatment is valuable because it cleans the seed. Formaldehyde has been recommended but is not so effective as corrosive sublimate especially for black scurf and blackleg.

Results in 1918 thus gave clear cut evidence of the value of corrosive sublimate as a disinfectant for potatoes showing black scurf. The four years' results show also that copper sulphate is of value under University Farm conditions. It is worthy of trial in other parts of the state. Formaldehyde solution, while of some value, is not recommended; results secured in seed plot work throughout the state have shown that it is unsatisfactory. Soaking for half an hour did not give, in 1918, as good results as treatment for two hours. We feel justified in recommending treatment of seed for from one hour to two hours.

Table I indicates the value of different seed treatments for black scurf.

TABLE I. VALUE OF DIFFERENT SEED TREATMENTS FOR BLACK SCURF

Kind of Tubers	Treatment	Strength	Time	Percentage of crop free from black scurf	
				Av. 3 plots, 1918	Av. for 4 years
Affected with black scurf Clean	Corrosive sublimate..	4 ounces to 30 gallons water	Hours 2	73.5	57.4
	Copper sulphate.....	3 pounds to 50 gallons water	2	60.1	58.5
	Formaldehyde solution	1 pint to 30 gallons water...	2	47.3	46.2
	Check, no treatment.....	16.9	23.0
	Check.....	92.8

As the lower line in the table indicates, planting perfectly clean tubers (even without treatment) gives the best results. It must be remembered, too, that treatment does not "cure" diseases borne in the seed, or help build up "run out," "off type," or poor strains of potatoes. Seed treatment must be combined with sorting, seed selection, and removal of undesirable hills during the growing season, crop rotation, and other good farm practices.²

Barrels may conveniently be used for treating potatoes. Make holes near the bottom to draw off the solution when through treating.

Make corrosive sublimate solution by mixing four ounces of the sublimate with 30 gallons of water. Dissolve first in a small quantity of hot water, then add it to the remainder of the water. Keep treated potatoes away from livestock, as corrosive sublimate is a deadly poison.

Do not allow metals to come in contact with the corrosive sublimate solution, for it injures them. Soak the seed for about an hour and a half. Use the solution three or four times.

Dry the potatoes after treatment. Seed potatoes are sometimes injured by being allowed to remain wet after treating. The seed may be cut at once and then allowed to dry, or the seed may be cut first, then treated, then allowed to dry, or planted at once.

Use clean bins, sacks, baskets, or other containers to avoid contamination after the potatoes are treated or cut. The bin should be scrubbed out

² See "Selection and treatment of seed potatoes to avoid disease." B.P.I., C., T., & F.C.D. Cir. 3, and "Growing high-grade potato seed stock," C., T., & F.C.D. Cir. 5, for further information. They may be obtained free of charge from the Division of Publications, U.S. Dept. of Agr., Washington, D. C. Circular 3 may also be obtained from the Division of Plant Pathology and Botany, University Farm, St. Paul, Minn.

with a disinfectant (1 pint formaldehyde to from 10 to 15 gallons of water; or 1 pound copper sulphate to 10 gallons of water).

For small plots, that is, plots that may be planted by hand, sun-sprouted seed may be used. Seed potatoes are put where the sun or bright daylight will strike them until short, tough, green sprouts are formed. These come through the ground sooner than those planted before they sprout. Discard tubers that do not show vigorous sprouts.

Cut the Seed Carefully

Cut the seed by hand. Discard diseased and undesirable tubers when cutting. Rots may spread from diseased tubers to clean ones with which they come in contact.

Sulphur dusted over cut seed aids in drying the pieces and is of some value as a disinfectant. Put cut seed only in a clean bin, allow it to dry off soon, shovel it over, spread it thin. With careful handling, seed may be kept from one to three weeks after cutting.

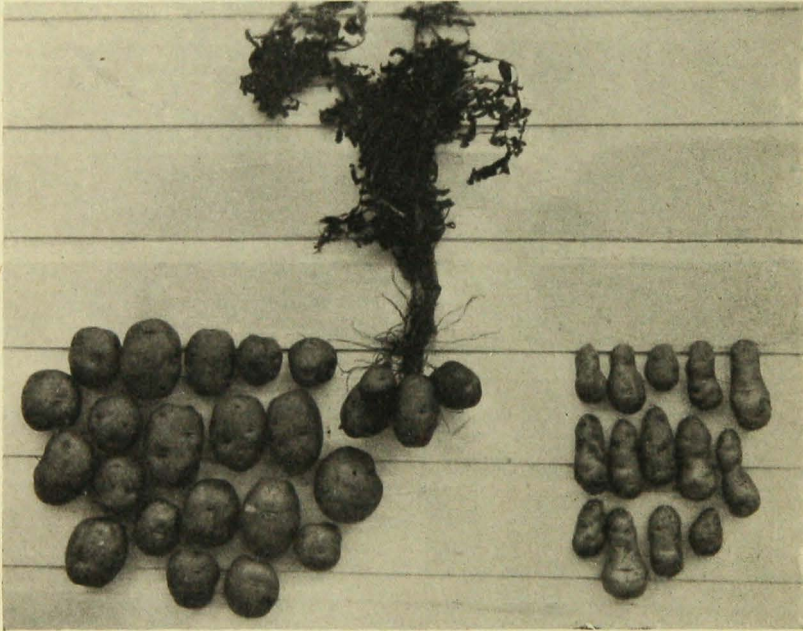


Fig. 3. The Value of Careful Selection

Potatoes at left represent actual yield from four hills of Green Mountain potatoes. Note trueness to type. The hills at right represent the yield from four hills of the same variety taken from another field. Most of the field from which the latter were taken produced such tubers.

ROTATE CROPS

Do not grow potatoes on the same soil year after year. A five- or six-year rotation arranged so that potatoes will follow clover or alfalfa sod, is ideal. By the use of such a rotation the accumulation of diseases is prevented, humus is added, and the soil is given an opportunity to replenish elements removed by the tubers. Rotation of crops will increase the yield of potatoes and improve the fertility of the soil. The figures below show results obtained on rotation plots at University Farm:

Character of rotation	Average percentage of black scurf
Potatoes continuously (4th year)	35.4
3-year rotation	1.7

Clean seed was planted and the black scurf present on the crop must have come from the soil. Continuous cropping to potatoes allows the accumulation of disease organisms in the soil.

PRACTICE PROPER CULTURAL METHODS

Plow deep for potatoes. The plants can not grow vigorously without plenty of loose soil. Do not, however, add more than an inch to the depth of plowing each year.

Do not plant too early. Cold wet soil may cause the seed to rot.

Practice clean cultivation, more vigorous plants result. The absence of weeds means better air circulation and less danger from blights.

MAINTAIN A SEED PLOT

Demonstrations carried on in Minnesota show the value of establishing and maintaining a seed plot. Table II shows what can be done by a little attention to seed selection and disease control.

TABLE II. RESULTS OF SEED SELECTION AND DISEASE CONTROL

County	Date	Number of plots	Average yield in seed plots per acre	Average yield of fields per acre	Average increase in yield per acre
			Bushels	Bushels	Bushels
Hennepin.....	1915	9	192	162.5	29.5
Otter Tail.....	1916	9	118	95.0	23.0
Clay.....	1917	6	101	72.0	29.0
Clay.....	1918	7	132	95.0	37.0
Kittson.....	1918	7	138	121.0	17.0

Altho some of the individual differences were small, the tubers produced on the seed plots were always of much better quality and more nearly true to type and were freer from disease.

Similar results can be obtained by establishing and maintaining a potato seed plot. Select a piece of ground in which potatoes have not been grown before. Select the seed to be used in this plot carefully with regard to type and freedom from disease.

By careful selection, control of diseases, and good cultural practices, and by growing varieties best suited to local conditions, an increase in yield of from twenty-five to fifty per cent and a great improvement in quality may reasonably be expected.

Keep up the practice of growing a seed plot every year. Select seed for next year's seed plot at digging time, when the yield from each hill can be easily determined. This is best done by hand, only tubers from productive vines, uniform, true to type, free from bruises and diseases, and weighing 7 or 8 ounces, being kept for the seed plot. After sufficient seed has been selected for next year's seed plot, the rest of the tubers should be kept for general planting. Avoid the use of misshapen and rough potatoes for seed. Handle seed stock carefully to avoid bruising or injuring, as bruised potatoes are more likely to rot than sound ones.

Avoid using any tubers that show a tendency to "run out." It is a good policy to discard all such stock and to obtain seed from some grower who has a good, heavily producing strain of the desired variety. Treat the

selected tubers in a solution of corrosive sublimate as described under "Treatment."

Rogue the seed plot carefully at blossoming time. This means remove all undesirable plants, such as varietal mixtures, weak and diseased plants. **Spray the seed plot thoroly.**

SPRAY FOR INSURANCE

Write to the state entomologist, University Farm, St. Paul, for Circular 47, Some Insects Injurious to the Potato, by S. A. Graham.

Spray with paris green, 1 or 2 pounds to 50 gallons of water; or with lead arsenate, $1\frac{1}{2}$ pounds of powdered or 3 pounds of paste to 50 gallons of water, for beetles ("bugs").

Spray with bordeaux mixture to avoid blight and to increase yields. The tests in 1918 completed ten years' work in spraying with bordeaux mixture at University Farm. Spraying with 5-5-50 bordeaux mixture has, as the average for the ten-year period, increased the yield at the rate of 53 bushels per acre over the yield from the unsprayed check plots. The experiments have shown that to increase yield it is only necessary to keep some of the bordeaux mixture present on the leaves with about three thoro sprayings, beginning when the plants are about a foot high. The 5-5-50 bordeaux mixture has been found to be better than weaker strengths or the commercial preparations tried. Increased yield resulted whether late blight was present or absent, altho of course bordeaux mixture is particularly valuable in protecting potato plants against late blight.

In soil in which potatoes grow better than they do at University Farm, such striking increases in yield from spraying may not occur. This was indicated in tests carried out in Hennepin County in 1918. It is realized, too, that the use of bordeaux mixture requires some extra labor, which is an important factor at the present time. However, by preventing or lessening blights (late and early) and tipburn, and by keeping the leaves green and vigorous longer in the fall, its use pays. On certain types of soil not so well adapted to potatoes, as at University Farm, its use may result in a large increase in yield. Spraying with bordeaux mixture is important in growing better potatoes.

Make bordeaux mixture from 5 pounds of copper sulphate, 5 pounds of lime, and 50 gallons of water. Dissolve the copper sulphate by hanging it over night, in a sack, near the top of 25 gallons of water; slake the lime in a little water, and add enough to make 25 gallons; stir the two solutions, pour together, and use the same day. On a larger scale, use stock solutions.

Spray with bordeaux mixture two to four times, depending on weather conditions, beginning late in July or early in August. Use any sprayer that gives a high pressure and a fine spray.

Paris green or lead arsenate may be combined with bordeaux mixture if potato beetles are still prevalent.

STORE POTATOES PROPERLY

Provide a cool, dry, well-ventilated cellar or storage house for potatoes. A warm, damp cellar furnishes good conditions for the development of rots. Keep the seed tubers for next year in separate bins. Keep the temperature as close to 35 or 40 degrees, Fahrenheit, as possible. A temperature above 40 degrees will cause the tubers to sprout too early and cause considerable injury to the seed through the loss of sprouts when handled.