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SWEETPOTATO GROWING

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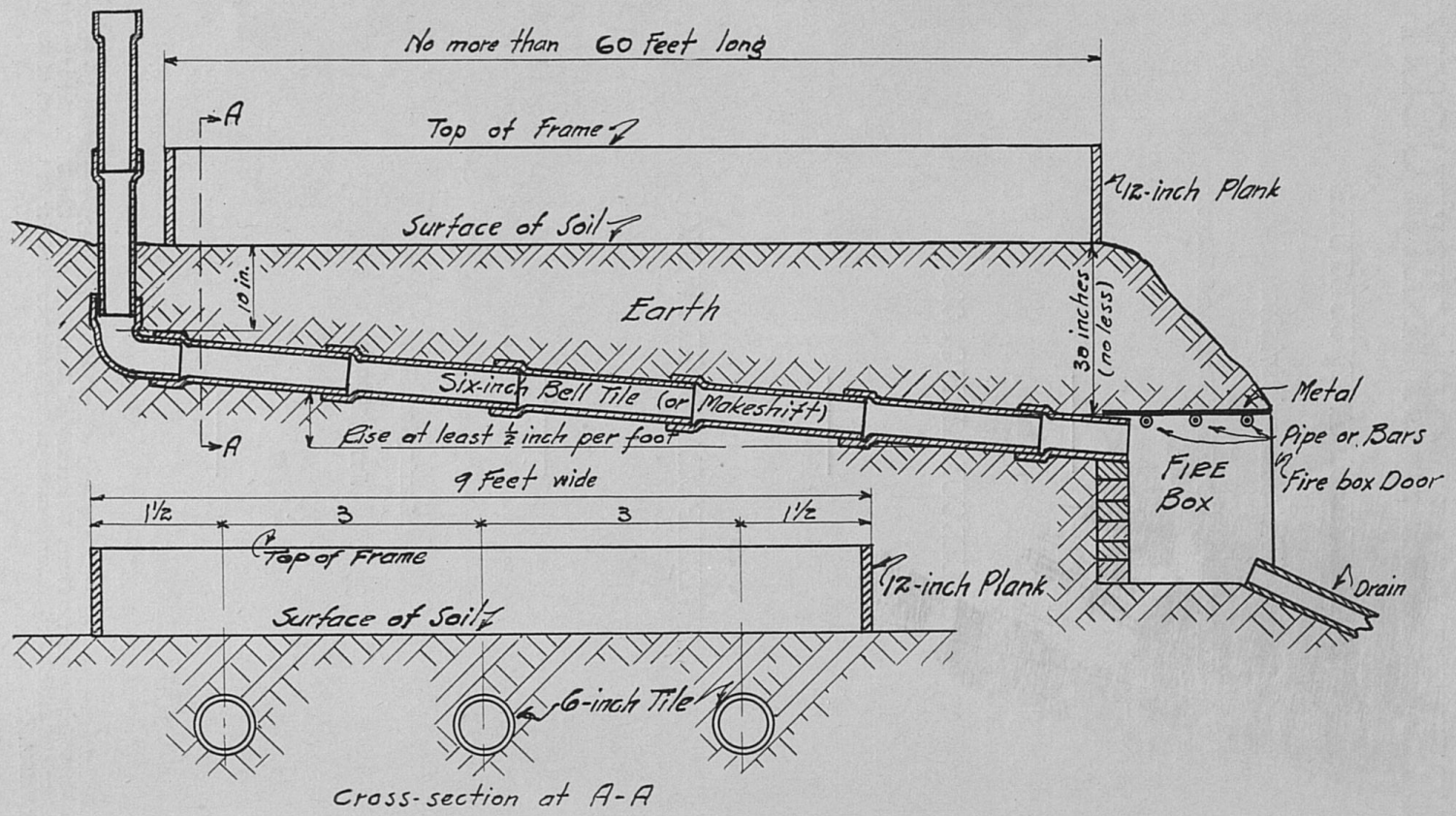

FIGURE 1. A flue-heated hotbed.

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SWEETPOTATO GROWING

By JOHN S. GARDNER

Sweetpotatoes rank fifth in value of Kentucky crops, the value of the crop as reported in the census of 1935 being $1,375,590. The climate of the whole state is well adapted to the crop, making it possible for any home gardener to grow sweetpotatoes, but the commercial industry is located in the Jackson Purchase Region and along the Tennessee border.

Sweetpotatoes thrive in a variety of soils, but light sandy loams, "freestone" soils, are best, because they offer least resistance to formation of shapely tubers.* In such soil the tubers develop bright color unlike the dull or russet color of those grown in limestone clays. The soil should not be too "rich," for a soil that carries too much nitrogen and humus produces long, twisted "strings" instead of the short, plump ones the market demands. In such soil marketable tubers may be covered with ridges or "veins," and they move at a discount in all markets for they are coarse and fibrous in texture. In terms of corn-producing ability, "25-bushel corn land" is about right.

FIGURE 1. A flue-heated hotbed.

VARIETIES

Altho there should be no difficulty in growing all varieties of sweetpotato in Kentucky it is wise to choose the one that best fits the purpose for which the crop is to be produced. The list of varieties that follows includes those long and successfully grown in the state and offers wide enough choice to suit all conditions.

Nancy Hall. This is the most widely used variety, a selection from Florida Yam. Its golden flesh and bright skin color have made it a favorite in the markets in which Kentucky sweetpotatoes move It is of moderate top growth and acceptable average tuber size and uniformity, when properly fertilized and when certified "seed" is used.

Porto Rico. Quite vigorous in top growth and prone to make tubers too large, when grown in good land. The red skin and deep

* To the botanist, sweetpotatoes are fleshy roots, not tubers. The word is used in the popular sense, in this circular, for the sake of brevity.

orange flesh of this variety make it increasingly a favorite, in markets where Nancy Halls now freely move. Porto Rico's proneness to make oversized tubers may be overcome by close setting or by using land too thin to make good Nancy Halls.

Vineless Porto Rico. A relatively new variety in Kentucky, offspring of Porto Rico, it removes much of the difficulty of over-sized tubers, and may displace the original, on good land. Skin color and flesh are the same as in the original Porto Rico.

Red and White Bermuda. Grown in a limited way by commercial gardeners who serve early-potato markets. The quality is excellent, but they do not keep well under average storage conditions.

Southern Queen. A white-fleshed, dry sweetpotato, easy to keep without "curing." For this reason it is excellent for the home winter supply but its movement as a commercial variety is limited. The tubers are symmetrical and smooth, and few "jumbos" occur where care is taken to fertilize properly and to set close.

Poplar Root. White fleshed with high starch content. Because of its dry flesh it may be stored without "curing." Objection to it is its long, crooked tubers but it is a home favorite in the Mountain section where it moves also in local markets, in a limited way.

Big-Stem Jersey. Jerseys are of two kinds as to color of skin, red and yellow. The flesh is pale yellow. A dry sweetpotato, it is easy to keep and is a market favorite, particularly in the East and in centers where Kentucky sweetpotatoes are marketed. Of relatively sparse top growth, a necessary part of its culture is to lift the vines to break loose the roots that form at the stem nodes.

PLANT OR "SLIP" PRODUCTION

Sweetpotatoes are grown from plants or "slips" that arise from bedded tubers. These are sweetpotatoes that are under marketable size but preferably not less than one inch in diameter. "Strings," or underdeveloped tubers, may be used for "seed" but, bushel for bushel, fewer plants will result than when standard bedding tubers are used. The same is true where large tubers are bedded. There is little difference in the final crop whether the plants have been produced from "strings," from large tubers or from sweetpotatoes usually accepted as being of "seed" size, if the stock is disease-free. Those who grow their own "seed" may produce disease-free stock by

setting vine cuttings in clean land. Usually such vines do not set large tubers, but an acceptable proportion of them may be large enough to use for seed. Sweetpotatoes to be used in producing plants should be free of all diseases and damage of any kind.

"SEED" TREATMENT

Always, no matter how clear of disease the tubers appear, they should be treated, to make sure they are safe to use. The treatment is as follows:

In a wooden or crockery container, put 2 quarts of *boiling* water and into it stir 1 ounce of corrosive sublimate until it is completely dissolved. Add this solution to 7 gallons of water of ordinary temperature in a wooden barrel or tub, and stir thoroly. This is the "treating solution."

One batch of solution suffices to treat 4 lots of sweetpotatoes, dipping them as follows:

1st lot, 8 minutes
2nd lot, 10 minutes
3rd lot, 12 minutes
4th lot. 15 minutes

The tubers may be placed in the bed while wet. If they must be held over, the crates or sacks in which they are kept should be thoroly wet with the treating solution, to cleanse them of any disease germs they may carry.

The sweetpotatoes may be dipped loose, or in hampers or crates, but the more closely the hamper fits the treating vat the less solution is needed. Ideal equipment consists of a 15-gallon tub made by cutting in two a 30-gallon barrel. The sack filled with tubers is hung in the tub containing 7½ gallons of solution, which just fills the tub. At the end of the treating time, the sack is withdrawn. The tubers may be spread in a clean place to dry or put into the bed at once.

PLANT BEDS

The simplest form of sweetpotato plant bed is merely a 4-inch layer of sawdust or light soil or sand spread over the seed tubers laid on the ground, one deep. The sawdust is enclosed by a frame of lumber. Such a bed must depend for warmth on heat absorbed from the sun. Accordingly, its efficiency and dependability are low,

even when started April 1. If such a bed is covered with canvas or with muslin, its effectiveness is somewhat better, but it is still too much at the mercy of the weather. Covered with glass sash to keep out cold rains, the behavior of the bed is improved to the extent that home gardeners who use relatively few plants and who are not particularly concerned with setting their sweetpotatoes early, may find it adequate. Growers of sweetpotatoes on larger acreages cannot rely on beds of this type but must use more dependable means for producing their plants.

Manure-heated Beds. The most obvious way to warm a sweetpotato bed is with fermenting horse manure. A pit should be dug 15 inches deep, to accommodate 12 inches of tramped manure, the remaining 3 inches, earth. If glass sash is to cover the bed the width and length of the pit should be made to accommodate it. A box frame of 10-inch lumber should be made to fit. It should have enough pitch to carry off rains if the cover is glass.

If the bed cover is to be muslin, the width of the pit (and the frame) may be 6 or 9 feet, and the length as determined by the quantity of sweetpotatoes to be bedded. Muslin is not waterproof but it gives fair protection if it can be supported by means of a wire stretched the length of the bed, forming a ridge, which allows much of the rain to run off. Soaking, cold rains delay both the sprouting of the bedded tubers and the development of the sprouts that have formed.

Horse manure is not always to be had in sufficient amount and in such condition that it will ferment, as it must, to give off heat. Beds may be heated with wood, coal, crude oil or natural gas. The heat from these fuels may be applied to the bed indirectly as steam or hot water led thru pipes buried in the soil, or directly, by passing the smoke and hot gases under the bed soil, thru flues. Sometimes waste steam from a building or factory can be utilized as a source of heat.

Flue-heated Beds. "Flue beds" are well within the ability of any farmer to construct. The site should be on a slope, the firebox end downhill. See the diagram, figure 1, page 2. Usually such beds are 9 feet wide, with 3 flues, spaced as in the diagram. Altho it is better to use bell tile as the diagram shows, the "flues" may be merely ditches covered with sheet metal or stone; the upper half (toward

the stacks) may be covered with saw-mill slabs. The ditches may be lined or not, depending on the nature of the soil. At the firebox end, the flues should be covered with 30 inches of earth and at the upper end, 10 inches. It is important that the flues have a rise of at least 5 inches in 10 feet.

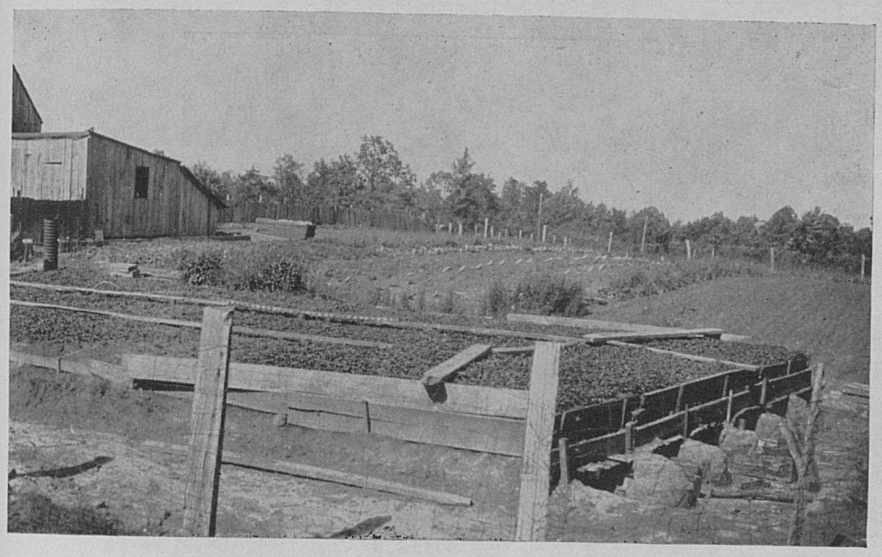

FIGURE 2. Large sweetpotato plant bed; note multiple fireboxes.

The flues lead off from a firebox made of masonry, roofed over with sheet metal supported on pipe or iron bars. A drain should be provided to prevent water from collecting. If wood is to be the fuel, the firebox should be made large enough to accommodate quite large chunks. A few rough stones should cover the bottom of the firebox, to serve as a grate. If it is designed to burn coal, the firebox may be smaller, and a grate of iron bars should be built in. A metal oil drum can be transformed into a coal-burning firebox, with little labor. The front of the firebox may be closed with a discarded furnace door or sheet metal, propped against it.

At the upper end of the bed, each flue is joined to a stack. The height of the stacks should be 5 feet, but provision should be made to add to each if it develops that more draft is needed. Generally it is found that, in order to distribute the heat evenly thru the bed, the outer stacks should be taller than the one in the middle.

Usually, 12-inch planks are used in the construction of the box frame to give height sufficient for the plants to develop good tops. Splices in the sides and the ends of the frames should be tight, and the corners, as well. Cross-pieces should be placed every 10 feet to keep the sides in line. Further, the lower edges of the frame should be mounded with tamped earth or rotted straw, to seal all openings.

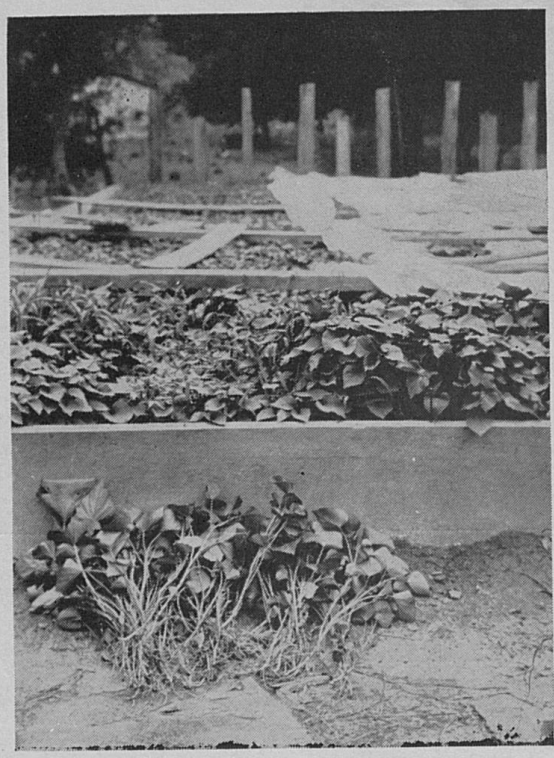

FIGURE 3. Sweetpotato plant bed in full production. Note "canvas" rolled back, support while plants are being drawn, and specimens of good plants in the foreground.

The seed tubers should be laid by hand, closely, but with space between them. If standard "seed" is used, a bushel will occupy an area 3 feet by 6 feet or, in a 9-foot bed, one bushel for each 2 feet of bed length. Growers usually estimate that for one acre 10,000 plants should be grown and that they should be ready by June 15.

In a flue bed started April 1 or before and managed properly, 4 bushels of seed tubers should be allowed for plants for one acre. A manure-heated bed, being somewhat less dependable because of the uncertainty of the weather, produces plants somewhat more slowly, and at least a bushel extra should be allowed. For a bed

without heat perhaps 8 bushels of seed tubers should be used, to get enough plants for setting an acre at the proper time.

After the tubers have been placed, it is of decided advantage to spread over them small-mesh chicken wire, to keep them from being pulled up when the plants are drawn. Then, the tubers should be covered with 4 to 6 inches of sawdust or with soil light enough to provide minimum resistance to the plants to push up thru it. The sawdust or other covering material should not have been used for this purpose before, lest disease be carried over.

The bed may be covered with muslin or tobacco cotton, but glass or glass substitute is better, to provide run-off for cold spring rains. Altho this is more important for beds without heat and those warmed with manure, it is advantageous even for the flue beds, in that heat is saved. Before the bed cover is placed, the sawdust should be thoroly moistened and it should be watered from time to time to keep it moist. This serves, not to start sprouts, but to aid the plant food in the mother tuber in making plants attain proper length to set.

Bed Management. Beds without heat and those warmed with manure require no management; they perform automatically, whether well or ill. A flue bed, on the other hand, behaves just in the manner it is managed.

The desired minimum bed temperature is about 60 degrees. To hold it there, well diffused, may require individual study of each bed. It is well to make a preliminary firing before the bed is put into operation, as it may be found that some of the stacks may need additional height; that a windbreak should be set about the fire-box opening; and perhaps other details arranged because of peculiarities in the location of each bed. Experimenting should be done to determine the times of firing and banking for the night, at certain outside temperatures and with wind prevailing in certain quarters. This preliminary firing serves, too, to warm the bed preparatory to placing the seed tubers, causing them to start without delay.

No matter how well designed the bed and no matter how faithfully fired, the tubers in the firebox half of the bed will start first, and quite likely this half will have furnished two-thirds of the plants produced by May 15. After that, with outside temperature higher, plants will be produced uniformly over the entire surface.

FIELD PREPARATION

Land for sweetpotatoes should be broken deep and thoroly harrowed so there is plenty of loose soil from which to make the ridges and some besides, to absorb and hold moisture, for sweet-potatoes need moisture to make large yields. Ten inches is not too deep to plow, and tho some subsoil may be brought to the top, soil dilution is taken care of by the fertilizer that is used.

After the field has been dragged level, it should be marked off in rows 3 feet apart, and along these marks the fertilizer should be sown. Sweetpotatoes use all three plant foods that occur in complete fertilizer, but because they need less nitrogen and more potash than do crops in general, sweetpotato fertilizer is 2-8-8 or 2-10-8. Suggested rate for sowing is 1 pound to 30 feet of row, making 500 pounds per acre, tho good results may be had when it is used at a rate as low as 300 pounds per acre, or 1 pound to 50 feet.

Over this "ribbon" of fertilizer, the ridges are made. The matter of whether to use ridges or level culture is a moot one. As a matter of fact, more tubers can be made in level culture, but the difficulty of digging them whole arises, also that of putting the fertilizer under the row, where it should be, to feed the crop properly. When ridges are used, perhaps the crop is smaller, but the net amount of marketable tubers is greater.

The plants are set between May 1 and June 15, depending on the latitude, and on the purpose for which the crop is grown. Gardeners who wish to benefit from the price early sweetpotatoes command, set theirs early, whereas growers who raise them to be sold from winter storage, and home gardeners who produce them as winter supply, wait until later in May. Generally, the crops set after June 1 are designed for seed, tho in the extreme southern part of the state, these tubers sometimes reach marketable size.

Most plant setting is done by hand with dibbles, sometimes with water and sometimes without, tho several growers have setting machines, built after the manner of tobacco setters. Depth of setting depends on the length of the plants and the height of the ridge, but generally the roots are covered 3 inches deep. The usual spacing is 18 inches, but if fertilizer is used with varieties that make large potatoes, 15 inches is better, because fewer unsalable "jumbos" are produced.

CULTIVATION

As with other crops, cultivation is needed to keep down weeds. This is done by scraping the ridges shallowly, afterwards repairing any damage that may have been done them. There is virtue in pulling loose the roots that may have taken hold at the nodes of the stems but this is not often done except in the case of the smaller-topped Jerseys. Rather, the vines are let grow to fill the middles, thus ending weed trouble for the season.

When the tubers are large enough to market, digging may begin. A mechanical digger may be employed, if set deep enough not to cut off tubers. More commonly a turning plow is used to plow a furrow away from one side of the ridge and the clumps of sweetpotatoes are pushed over; or the ridge itself is pushed over by plowing under it so as to upend the clumps of sweetpotatoes, after which they are shaken clean of earth.

In digging sweetpotatoes in whatever manner, care should be taken not to bruise them or cut them or even to rub off earth, for tubers that are injured in any way keep poorly in storage and are unsightly even tho the wounds heal over. They should be gathered in rigid crates, not in sacks where they may jostle one another and become abraded. They should not be dumped from one container to another; rather, they should be handled with utmost gentleness thruout.

CURING

Freshly dug sweetpotatoes contain an excess of moisture which must be removed before they can be expected to keep in storage. This is accomplished by heating the house to about 85 degrees and ventilating to prevent excess humidity. Usually about three weeks are required for the curing process, but the time may vary with the condition of the tubers and the weather. Curing ends when sprouting begins on the tubers in the top layers. Then the tubers should be stored at once. Usually the storage house is utilized for the curing process after which the temperature is reduced.

STORAGE

Sweetpotatoes require special storage. The atmosphere must be dry and the temperature must be kept constantly at about 50 degrees, after the curing period is over. Accordingly, sweetpotato

storage houses are built to conserve heat and provision is made to heat them when necessary. Ventilators are provided; outlets at the highest point in the ceiling, thru which foul, moist air may escape and inlets at the floor, thru which fresh, dry air may be admitted. A necessary piece of equipment is a thermometer, which should be consulted daily. Heat should be used or the ventilators opened, as necessary to hold the temperature constant. From time to time

FIGURE 4. An 800-bushel sweetpotato storage house, with lean-to garage.

moisture given off by the sweetpotatoes may gather on the ceiling or on the tubers. This should be removed by opening all the ventilators and supplying heat if necessary to maintain the house at about 50 degrees.

For plans of sweetpotato houses, write to the Agricultural Engineering Department of the College of Agriculture, Lexington, from whom blueprint plans for houses of any capacity are obtainable at small cost.

Figure 4 shows an 800-bushel sweetpotato storage house with lean-to garage. It is not necessary, however, to build anew; sometimes existing buildings may be remodeled satisfactorily at small cost, and sometimes it is possible to combine a sweetpotato storage house with some other necessary farm building.

Often sweetpotatoes are put into storage in the boxes or crates

in which they have been gathered, sometimes in lots of five bushels or so in slatted bins built in the house, but most growers sort their sweetpotatoes as they are dug, directly into the hampers in which they are finally to be sold, replenishing any that are under weight as a result of shrinkage that takes place during the "curing." The "jumbos" and the "seed" sweets are generally stored in bulk. The reason for storing sweetpotatoes in containers or in small lots is to keep down the diseases which may spread from tuber to tuber by contact, but rarely spread beyond the hamper or the partitions between bins.

DISEASES AND INSECT PESTS

Of the diseases that affect sweetpotatoes, the most serious are black rot, soil stain and stem rot or wilt.

Black Rot. In the field, the sign is unthrifty growth and perhaps death of the plants. (This symptom is shared with stem rot, described below.) Plants that survive are found to have tubers with blackened flesh at the stem end, this condition sometimes extending thru the whole. Even apparently unaffected flesh is found to have a bad flavor, and always a characteristic odor is given off. Affected tubers should be sorted out and not put into storage, for the disease may spread.

The disease can be prevented by (1) using only CLEAN seed; (2) treating the seed sweets, even when certified seed is used; (3) swabbing all lumber and glass sash with the same solution used in seed treatment or, if muslin or tobacco canvas is to be used to cover the bed, only NEW materials should be used; (4) always using NEW sawdust and soil; (5) letting at least a year or, better, two years, elapse before sweetpotatoes are planted in the same field again.

In drawing slips, "blank spots" in the bed should be examined, and if the failure to produce plants arises from black rot on the seed, plants that are drawn from surrounding areas should be carefully examined for the tell-tale black streak on the stem. Sometimes seed tubers fail to make slips because they rot from other causes but black rot decay is characteristic. (Best, if possible, is not to use slips at all from a bed that is for any reason backward or "spotted.")

Soil Stain, or Scurf. This disease causes the tubers to be blotched

with dark areas which affect their salability. In storage the flesh under the blotches shrinks and the tubers become pitted, which makes them all the more unsalable. Soil stain is usually worse in heavy soil to which an excess of manure or other organic matter has been added, and in wet seasons. Seed treatment as for black rot is of some effect but plant treatment should be given, too, as follows:

Put a handful of fine dusting sulfur into a 20-lb. paper sack. In bundles of 25 or 50 put the plants into the sack, roots down. Then, holding the mouth of the sack close about the tops of the plants, shake until the stems and the roots are well covered. The plants should be set immediately. Another way to treat plants for soil stain is to dip them in *Semesan Bel* and water, 1 to 10.

Stem Rot or Wilt. The first sign of stem rot in the field is yellowing of the foliage and general unthriftiness. The stems of affected plants are found to be discolored with yellow or brown, just at the ground line and, later, thruout. In severe cases the stems split and become shredded and the plants die.

The disease is sometimes present in seed tubers and may spread from them to the slips but this is not the usual method of infection of plants in the field. The disease usually enters the broken end of the slip from the soil soon after setting. The slips may be protected from infection that may occur after setting, by dipping the lower half in 20-20-50 Bordeaux or in *Semesan Bel* and water, 1 part to 10, or dusting with monohydrated copper sulfate mixed with hydrated lime, 1 part to 3. These treatments are to be given just before the plants are set. Treated plants do best when not allowed to wilt and when set in moist soil.

Growers who raise their own plants should use none but certified seed sweetpotatoes, and always new soil and new sawdust. If it is the practice to save one's own seed the grower should select them from parts of the field where the stand is perfect.

The Black Fleabeetle. This small, black, hopping insect sometimes comes in swarms just after the plants are set and sometimes punctures the leaves so severely as to make resetting necessary, but always to cause damage. Its control is to spray with Bordeaux mixture as soon as any beetles are seen. Usually one spraying is sufficient, tho sometimes a second should follow, 10 days later.

Wireworms. These general pests sometimes attack sweetpotato

tubers, boring holes into them that mar appearance and affect quality. Usually wireworms are found in land that has been in sod for a long time. The control could be to let 2 or 3 years of some other cultivated crop intervene before sweetpotatoes. Actually there is little control for wireworms but, fortunately, wireworm injury to sweetpotatoes is comparatively rare.

Tortoise Beetle. This beetle, golden in color with transparent "shell," may be found on sweetpotato plants almost any time, chewing out roundish holes in the leaves. In seasons when growth proceeds at normal rate, its injury is negligible. In cool, wet seasons, when leaf growth is slow, it is sometimes necessary to check this insect by spraying with lead arsenate, 2 tablespoons in one gallon of water (2 pounds to 50 gallons) or the arsenate may be stirred at this rate into the Bordeaux mixture being applied for the control of the black fleabeetle.

BORDEAUX MIXTURE*

In a wooden tub dissolve 4 lbs. of bluestone in 4 gallons of water; into another tub put 10 quarts of water and into this stir 6 pounds of screened hydrated lime. Into the 50-gallon tank of the sprayer put 30 gallons of water and the 4 gallons of dissolved bluestone and the 10 quarts of lime mixture. Stir thoroly and add water to fill the 50-gallon tank. This is 50 gallons of 4-4-50 Bordeaux mixture.

If 20-20-50 Bordeaux is needed for plant treatment, it can be made by dissolving 2 lbs. of bluestone in 2½ gallons of water and 3 pounds of the screened lime in 2½ gallons of water. Pour these two mixtures into a 5-gallon tub and stir vigorously.

Bordeaux for Dust Application. Bordeaux mixture for dusting may be made by mixing monohydrated copper sulfate and hydrated lime in the proportion of 15 pounds of the copper sulfate to 85 pounds of screened hydrated lime (300-mesh). Applied at the rate of 20 to 25 pounds per acre, its effectiveness is approximately that of 100 gallons of liquid Bordeaux, depending on the manner in which the duster operates. Bordeaux for dusting is sold under the name copper-lime dust.

* Methods of making and using Bordeaux mixture, in detail, can be found in Kentucky Experiment Station Bulletin No. 393, Fruit Pests and Their Control; Extension Circular No. 309, The Vegetable Garden; and Extension Circular No. 307, Potato Growing.