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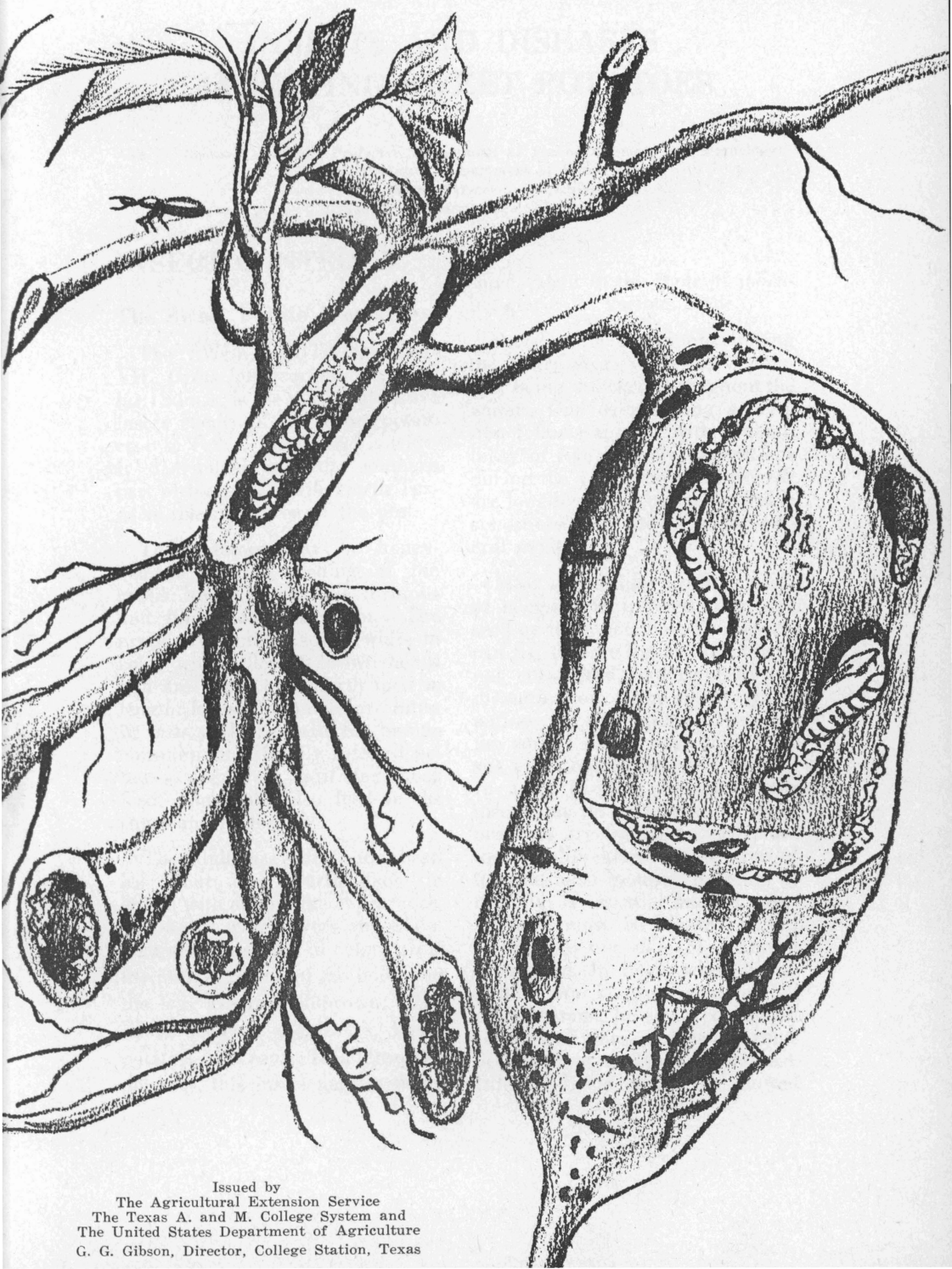

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INSECTS AND DISEASES AFFECTING SWEET POTATOES

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INSECT CONTROL

The Sweet Potato Weevil

The SWEET POTATO WEEVIL, *Cylas formicarious elegantulus* (Sum.), is the most destructive insect enemy of the sweet potato crop in Texas. The insect is widely distributed over the southern part of the state, while North Texas is relatively free of the pest.

The potatoes may be honeycombed by the feeding of the grubs; their tunnels are tortuous and filled with excrement. The grubs are footless, soiled white in color with yellowish-brown heads and are about one fourth inch in length. Infested potatoes are bitter in taste and are unfit for human consumption. Heavily infested potatoes are even unfit for stock feed. The grubs also feed in the stems and roots.

The adults are shiny snout-beetles about one fourth inch in length with an ant-like appearance. The head, wing covers and abdomen are blue-black in color, while the middle region of the body and the legs are reddish-brown. The adults feed on the leaves, vines, potatoes and roots. In addition to potatoes, this insect may breed to some extent in the roots of morning-glories of various kinds.

Breeding is continuous during the entire year, with stored potatoes being attacked throughout the winter. One over-lapping generation follows another with a possibility of five or more generations during the year. The adult weevils are long-lived and under favorable conditions they may live for several months.

Most infestations are the result of bringing in infested slips, and seed or table potatoes. The insects can fly, but are limited and this is not considered important in the dissemination of the insect. Quarantines are maintained to prevent the spread of the pest and to assist in its eradication and control. In areas of light infestation the insect may be eradicated if proper practices are followed. Seed potatoes or slips known to be free of the pest must be used. Rotation of the crop is essential and no sweet potatoes must be planted within one-half to one mile of a known infestation. In fields where infestations are known to occur, all potatoes must be removed and all residues of vines, crowns and roots destroyed at the time of harvest. Infested fields should be plowed

at least twice during the winter. Grazing livestock on the fields is advisable. Infested potatoes should not be stored. All remaining potatoes should be disposed of by February 1 and the storage places thoroughly sprayed with DDT, using either a 3 per cent or 5 per cent oil-base spray or 16 pounds of 50 per cent wettable powder to 50 gallons of water.

In commercial areas where the infestation is general, satisfactory control may be obtained by the use of proper practices. Only weevil-free seed or slips should be used. If seed potatoes are selected locally at the time of harvest they should be thoroughly dusted with ten per cent DDT dust at the rate of one pound to six or eight bushels of potatoes and stored away from food products of both man and animals. After sufficient plants have been produced, the plants and potatoes in these seedbeds should be destroyed. The general cultural practices as recommended for areas of light infestation should be followed also.

In areas attempting to eliminate the sweet potato weevil all seed beds within 1 mile of infested holdings should receive an application of 5 per cent DDT dust every seven days.

Where sweet potatoes are to go into storage in infested areas a 1-ounce application of 10 per cent DDT dust is given to each container. An improvised mechanical duster can be arranged to apply the dust.

Sweet potato plants may be fumigated to eliminate possibility of their being infested with weevils by placing them in a tight chamber and treating with methyl bromide gas. Three pounds of methyl bromide per 1,000 cu. ft. of space with an exposure of five hours is recommended. The plants must be aired out thoroughly after treatment by blowing the fumes out of the chamber with a fan in order to eliminate damage to the plants. Cured potatoes are more satisfactorily fumigated. A temperature of 70 degrees or higher should be maintained during and for several days following fumigation. It is not advisable to hold potatoes for long following fumigation. Plants have been successfully treated in the storage compartment of a large refrigerated truck which was equipped with fans to blow out the fumes. A dosage of one pound per 1000 cubic feet with an exposure of four hours is recommended.

Conditions Governing Movement

Restricted material includes: Sweet potato roots or tubers, plants, vines or parts thereof; any vines or roots of other plants belonging to the genus Ipomoea (related to sweet potatoes), or such other plants as may be found to be hosts of the sweet potato weevil *shall not* be moved from any regulated area *into*, *within*, or from the state of Texas unless a valid sweet potato inspection certificate issued by a duly authorized inspector (representing the State Department of Agriculture) is securely attached to the outside of each container thereof.

Information concerning the sweet potato weevil quarantine, areas affected and restrictions of

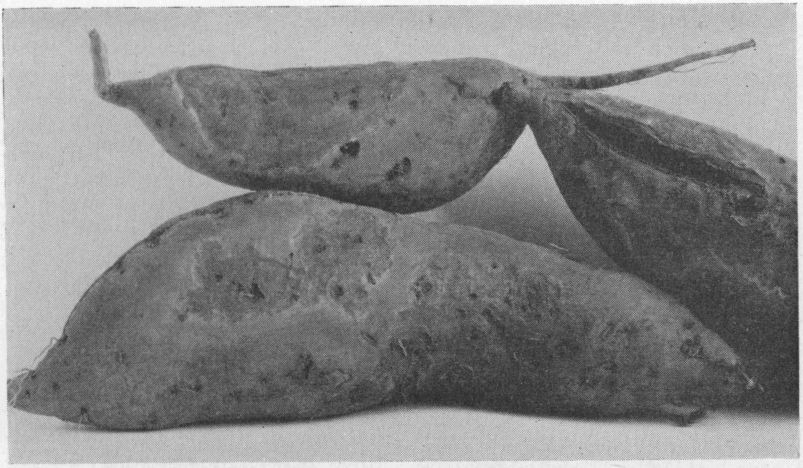


Figure 1. These sweet potatoes are infected with black rot.

the quarantine regulations can be obtained by writing the Division of Plant Quarantine, Texas Department of Agriculture, Austin, Texas.

Minor Pests

SWEET POTATO OR TORTOISE BEETLES. The foliage of sweet potatoes is often fed upon by these insects. The leaves may be cut full of holes or completely destroyed by the feeding of these pests. The adult beetles are of a golden color and are often marked with dark spots or stripes. The larvae are spiny and dirt-laden, and they are found on the underside of the leaves. Dusting with lead arsenate or cryolite will control this pest. DDT dusts or sprays should also give satisfactory control.

SWEET POTATO FLEA BEETLE. This insect is a small, chunky, black beetle about one sixteenth of an inch in length that jumps when disturbed. It eats long narrow grooves on the upper surface of the leaves along the veins. In addition to the sweet potato it feeds on a wide variety of other plants. The larvae feed on the roots of bind weeds. This insect may be controlled as the tortoise beetles.

The GARDEN WEBWORM is known to feed on the foliage of sweet potatoes when the fields are infested with such weeds as careless weeds and lamb's-quarter. This caterpillar is light green with black dots over the body. This pest tends to construct webs over the leaves. Control measures are the same as for the tortoise beetles.

CUTWORMS are reported as minor pests of the sweet potato. Poison baits, DDT or toxaphene dusts are recommended for their control.

DISEASE CONTROL

Sweet potatoes are affected by diseases in the seed-bed, field and

storage. Some of the causal fungi (molds) such as the black rot organism cause destructive disease in the field, and seed-beds as well as in storage. Field diseases result in reduced yields, poor color, roughness and poor shape of the sweet potatoes which affect market quality. The important field diseases which affect the sweet potato crop in Texas are: black rot, stem rot (or wilt), soil rot, (or pox), internal cork, and root knot. Application of fungicides for the control of field diseases is of no value, since the causal fungi are primarily soil-borne. However, soil fumigants for the control of root knot nematodes are available on the commercial market. Destructive diseases of sweet potato in storage are: soft rot, black rot, surface rot, internal cork and charcoal rot. Increased yield and quality of sweet potatoes depends directly upon successful control of field and storage diseases. The above mentioned diseases can, with the exception of root knot, be controlled best by the following measures: Selection of disease-free seed stock, disinfection of seed stock before bedding, clean seed-bed (use new soil, sand or sawdust each season), crop rotation and disinfection of seed potatoes before placing in storage or bedding.

Field Diseases

Black rot, caused by the fungus *Ceratostomella fimbriata*, probably the most destructive disease of sweet potatoes, is a serious disease in the seed-bed, field and in storage. Infection occurs through the roots resulting in the development of firm, shallow, circular brown spots. (See Figure 1.) As the spots enlarge, they become greenish black to black in color and small black bristles (fruiting bodies) may be seen in their centers. Black rot infected potatoes have a disagreeable bitter taste and practically no market value.

Stem rot (or wilt) is caused by either one of two species of Fusarium, *Fusarium oxysporum and Fusarium bulbigenum var. batates*, which can survive for several years in the soil on decayed plant refuse. Infection occurs through the roots of sweet potato plants in the hot bed or in the field after setting, from contaminated soil or diseased seed stock. After invading the roots, the fungus grows rapidly into the vascular (water carrying) tissues of the stem. First symptom of stem rot in the field is the appearance of a dull green color and yellowing between the veins of the younger leaves. Wilting of the vines soon occurs, followed by death and blackening of the entire plant. When a stem rot infected sweet potato is cut in cross sections, a blackened ring (vascular system) is visible.

The "Goldrush" and "All Gold" varieties have been reported to be resistant to stem rot.

Soil rot, also known as pox, is caused by Streptomyces ipomoea a soil inhabiting organism which persists in the soil from one season to the next. Infection occurs in infested fields, from infested soil in the hot beds or from infected seed potatoes or slips. Soil rot diseased plants are usually dwarfed with small pale green leaves and produce few vines. Decayed spots (lesions) occur on the enlarging sweet potato and small

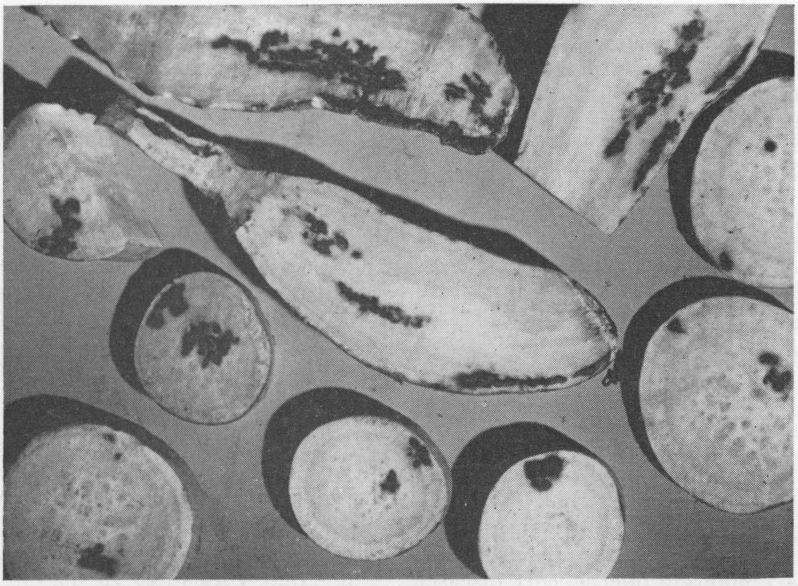


Figure 2. Internal cork is shown here.

roots. Diseased potatoes at harvest are misshapen, with conspicuous pits of varying size. There is no effective control for soil rot. Crop rotation and broadcast application of 500 to 1,000 pounds of sulphur per acre may be beneficial. Sulphur should be worked into the soil one month before setting plants. Guard against introducing the soil rot organism into disease-free fields by infested livestock and contaminated farm implements.

The root knot nematode *Heterodera marioni* (a small round worm) causes small knots or swellings on the roots of infected sweet potato plants and surface of infected potatoes. Infection occurs through infested soil or diseased seed stock. In fields heavily infested with nematodes sweet potato plants may be severely stunted and their yield seriously reduced.

Root knot nematodes are not easily eradicated from infested soils. Crop rotation, planting to nematode-resistant crops such as peanuts, corn, sorghum, grasses and crotalaria and soil fumigation are the only feasible methods of control. Infested soils may be treated with a soil fumigant such as D-D, Dowfume, Iscobrome, Soilfume, Larvicide or Chloropicrin (follow the manufacturers directions). Large acreages may be treated with one of the above soil fumigants at a cost of approximately $35 to $40 per acre. Sanitation should be exercised to prevent introduction of nematodes into nematode-free fields through livestock, infested plants or plant debris. All root knot infected plants should be burned. Seed potatoes should be examined for the

presence of nematodes by slicing several of the lot to be bedded. Do not bed infested potatoes.

Internal cork of sweet potatoes is a virus disease which first appeared in the southeastern states about six years ago. Internal cork disease was found in the Texas sweet potato crop for the first time in 1948.

When internal cork diseased sweet potatoes are cut in cross section, hard dark brown to black, corky areas are seen in the flesh. (Figure 2.) Although cork symptoms, as such, are confined to the fleshy tissues of sweet potato roots, certain external leaf symptoms indicate the presence of the disease in affected plants. Leaf symptoms of internal cork diseased potatoes appear first as mottled and chlorotic areas along the veins. Later, these areas develop purplish colored margins (rings), which gradually fade, the entire leaf becoming bronzed and dead. Leaf symptoms in affected plants can usually be found about two months after planting.

Internal cork is becoming a serious disease of sweet potatoes which, if allowed to become established, will affect seriously the Texas sweet potato industry.

To prevent establishment and spread of internal cork disease in Texas the following precautions should be observed:

1. Plant only certified sweet potato slips or those grown from healthy Texas grown bedding stock. Do not bed market sweet potatoes for slip production.
2. Cut into thin slices 25 sweet potatoes for each lot to be bedded for slip production. Discard the entire lot if internal cork symptoms are found.
3. Discard all sweet potato slips which have white or red margined leaf spots.

Control of Field Diseases

1. Select healthy seed stock sweet potatoes in the fall at harvest time when still attached to vines. Discard all potatoes from hills showing discoloration of vine interior.
2. Select clean potatoes uniform in size (one and one-half inches or more in diameter), shape and good internal color.
3. Store sweet potatoes selected for seed in baskets or crates isolated from other sweet potatoes in the storage house.
4. In the spring, before bedding, disinfect seed potatoes by immersing in a corrosive sublimate solution (one ounce in eight gallons of water) for ten minutes. Use wooden containers. Add one-half ounce of corrosive sublimate dissolved in hot water to each twenty-four gallons of solution after each ten bushels of potatoes treated. After treating thirty bushels, renew solution entirely. Semesan Bel or Wettable Spergon treatment may be substituted for corrosive sublimate solution. Follow the manufacturers directions.
5. Immediately after treating, plant the seed stock in new soil or sand. (Thoroughly soak frame work of seed-bed and surrounding soil with formalde-

hyde solution, one pound in thirty gallons of water, before seed-bed is prepared).

6. Select only healthy slips for planting in field. Discard all slips that appear stunted or have black spots on stems. Plant in a field which has not been planted to sweet potatoes for three or four years.

7. Rotted sweet potatoes in the seed-bed usually produce slips with yellow leaves. Discard all slips with yellow leaves and remove and burn rotted potatoes.

Storage Diseases

Soft rot, a serious and destructive disease of sweet potatoes in storage, is caused by the fungus *Rhizopus nigricans*. Infection occurs through wounds or bruises. Decay progresses rapidly, usually beginning at one end and may completely destroy the potato within a few days if conditions are favorable. At first, diseased potatoes are soft and watery. If the skin covering the infected area is broken, the potato becomes covered with "whiskers" of fungus growth. After loss of moisture the potatoes are shriveled, hard and brittle. Spores of the soft rot fungus are readily disseminated to other potatoes in the storage house by flies, air currents and handling of crates.

Black rot, caused by the fungus *Ceratostomella fimbriata* is a destructive disease of sweet potatoes in storage. Although black rot lesions may not be visible on sweet potatoes when placed in storage, potatoes infected in the field readily develop black rot lesions in storage in the presence of high temperature and humidity. Spore-producing black bristles (fruiting bodies of the fungus) develop in the centers of these lesions. The spores are readily spread to other potatoes in a storage house by insects and handling of crates.

Surface rot is caused by the fungus *Fusarium oxysporum f. batatas*. Infection occurs when sweet potatoes are being dug, or early in the storage period. Surface rot symptoms first appear as shallow, circular spots. As moisture is lost from the potato, the margin of the spots become sunken, and later the entire potato becomes shrunken, dry and hard. Frequently, sweet potatoes infected with surface rot become so shrunken that they have no market value. Although there are no immune varieties, the dark-yellow skinned strains of the New Jersey types are not as subject to surface rot as the light-skinned types.

Charcoal rot, caused by the fungus *Sclerotium bataticola* (*Macrophomina phaseoli*), is characterized by the production of tiny, black spherical bodies (sclerotia) throughout the interior of the sweet potato. These black bodies are visible in the inner tissues of an infected sweet potato when cut in cross section. After a period in storage, infected sweet potatoes become shrunken, hard, dry mummies, having a charcoal like appearance.

It has been observed that internal cork infected sweet potatoes may increase during the storage period. Occasionally sweet potatoes in which internal cork symptoms are undetectable before place-

ment in storage will develop symptoms during the storage period. It is obvious, therefore, that each lot of sweet potatoes to be bedded for slip production must be carefully examined to prevent the possibility of planting diseased stock.

See precautions for control under field diseases.

Control of Storage Rots

Since fungi which cause field diseases may also cause decay of sweet potatoes in storage, the availability of disease free sweet potatoes for storage, therefore, depends first upon the effective control of field diseases. (See directions given for control of field diseases). Careful handling during harvesting and crating is important since most storage rot organisms cannot invade a healthy sweet potato except through wounds or bruises.

1. Before sweet potatoes are stored, sweep storage house free of all debris. Decay organisms may survive for many months in soil and other refuse from the previous year's crop; therefore, it is important that the storage house be thoroughly cleaned.

2. Disinfect the interior of the storage house, crates, and baskets, using one of the following disinfectant materials: (1) Formaldehyde solution—one pint commercial formaldehyde in fifteen gallons of water. Apply as a spray or with a broom. If a large container is available, crates and baskets may be dipped. (2) Bichloride of mercury solution—one fourth ounce in eight gallons of water. Apply as recommended for formaldehyde solution above. (3) Potassium permanganate - formaldehyde fumigant, twenty-three ounces potassium permanganate and three pints commercial formaldehyde for each one thousand cubic feet of storage space. Keep storage house closed for twenty-four hours. *VENTILATE THOROUGHLY BEFORE ENTERING STORAGE HOUSE AFTER FUMIGATING.*

3. Harvest only in dry weather and allow sweet potatoes to dry in the fields a few hours.

4. Discard all diseased and weevil infested sweet potatoes.

5. Cure for seven to ten days at 80° to 85° F. with high relative humidity to accelerate healing of wounds and broken ends.

6. Sweet potatoes store better in crates than in bins or piles. Do not disturb sweet potatoes stored in piles or crates to remove decayed potatoes unless all are to be marketed.

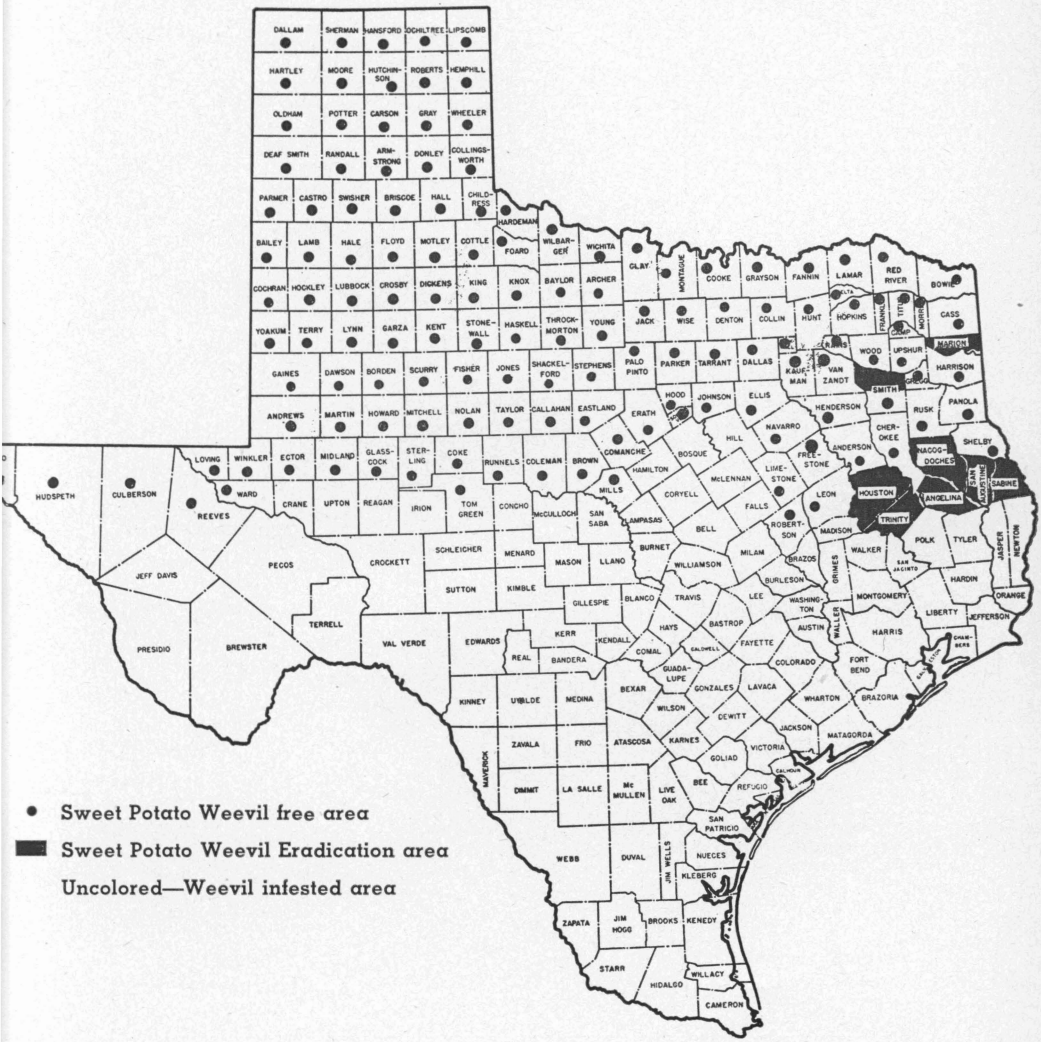
7. Rats and mice should be controlled. Their feeding wounds provide avenues of entrance for decay-producing organisms.

8. Store at 55° F. and relative humidity of 80 per cent.

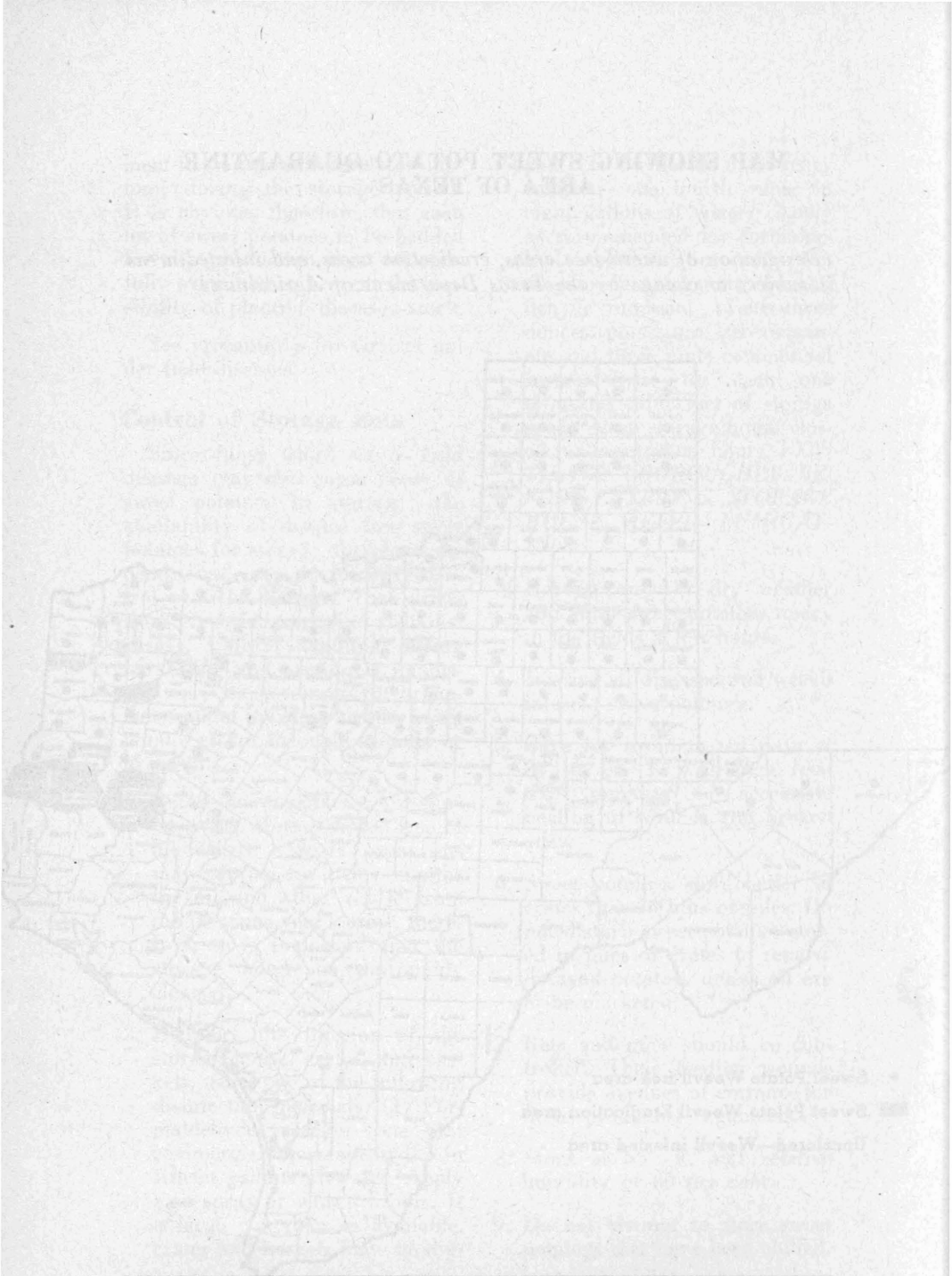
9. Do not attempt to store sweet potatoes that have been chilled.

MAP SHOWING SWEET POTATO QUARANTINE AREA OF TEXAS

(Designation of weevil-free areas, eradication areas, and infested areas is subject to change by the Texas Department of Agriculture)



- Sweet Potato Weevil free area
- Sweet Potato Weevil Eradication area
- Uncolored—Weevil infested area



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