TUBER ROT

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Rots And Their Causes

Many names such as soft rot, leak, and water rot, are used to describe various tuber decays and breakdowns. These names usually are quite descriptive of the decay. The causes of such disorder are often very difficult to identify. The primary cause of decay may be a fungus or a bacterial organism, however the decay may have been initiated by some agency which injures the tuber and allows the decay organism to enter the tuber. Common agencies which initiate decay are freezing, sunscald or the bruising of tubers during the harvest or sorting operations.

Development of Tuber Rot

Fungus and bacterial organisms which cause decay come from the soil. Some of the fungi can grow directly into tubers (e.g. some Pythium and Phytophthora spp.) and cause rot. Other fungi (e.g. Fusarium spp.) and bacteria (e.g. Erwinia spp.) are commonly present in field soils and readily contaminate the surface of tubers. Any break in the skin allows these organisms to gain entrance into the flesh of the tuber where they can cause decay. Sometimes bacteria and fungi enter the enlarged lenticles (pores) on the outside of the tuber and cause breakdown.

Soft Rot

When we mention the tuber "soft rot" disease we generally consider the causal organism to be bacterial (Erwinia spp.). Soft rot most frequently follows bruises which provide entryways for these very small bacteria. Upon entry, the bacteria may multiply very rapidly in bruised (killed) thissue and the adjacent non-bruised tuber flesh. These bruises do not have to be visible to the eye from the outside for rot to occur. Once decay has been inititated, the excess water from dead tuber tissue makes the environment even more favorable, and rot spreads from tuber to tuber. At this stage wet spots may develop on sacks and within the piles of stored tubers. In the presence of moisture on the surface of the tuber, soft rot increases as the temperature of the tubers is increased from 38° F. to 75° F (approximately room temperature). The water remaining on the tubers after washing is quite sufficient to initiate the multiplications of the soft rot bacteria and cause decay.

Water Rot

A special disease situation worthy of discussion is "water rot" which occurred in Washington in 1964. Water rot is initially caused by a fungus which penetrates and multiplies within the tuber. Factors which increase this tuber rot are excessive field irrigation towards the last of the season and poor drainage. Many water rot tubers are detected and removed during sorting; however, many others escape detection because the rot is not visible from the outside of

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the tuber. These infected tubers remain mixed with sound healthy tubers. As water rot develops secondary soft rot bacteria may enter the decayed areas of the tuber. The amount of rot that develops is dependent upon the temperature, the amount of moisture, and the time before detection. The severe rot is often not detected until the car is opened at the shipping destination.

Probable Causes of Rots, Their Descriptions and Predisposing Factors

1. Soft rot - caused by bacteria (Erwinia spp.). The bacteria multiply rapidly under high moisture (90 - 100% relative humidity) and high temperature (70-80°F.) Wounds, bruises, sunscald or freezing injury are subject to soft rot. Soft rot bacteria are a primary cause, but generally they gain entry only after a weakness in tuber tissue has occurred. Rot is watery, soft and creamy in color with a very foul odor.

2. Water rot - caused by fungi (exact species of fungi involved in controversial). Rot occurs in soil which has been watered to heavily at the end of the season, or is poorly drained. Rot is watery; the outside tissue may be sunken and dark brown, while the inside tissue is light gray.

3. Slimy soft rot - exact cause not certain. This term is given to the severe rot which usually is seen only at the point of destination. This rot may be a very severe soft rot or a combination of water rot and secondary bacterial soft rot. Rot is watery, tissue is slimy, and yellow or brown.

4. Leak rot - caused by a fungus (Pythium spp.). This rot may be confused with slimy soft rot at the shipping point. Rot is watery, brown, soft, margins of rot clearly defined and the interior of the tuber tissue in the center may be decayed, leaving a shell. Infection occurs through wounds at harvest. The disease is severe during hot weather.

5. Tuber bruising - caused by harvesting and sorting equipment. Tissue underneath bruise may turn gray or black. No rot is formed unless bacteria penetrate the wound.

6. Fusarium soft rot - caused by a fungus (Fusarium spp.). Rot usually occurs beneath an injury such as a cut, bruise or where a knob has been broken off. Secondary soft rot bacteria may also be involved. Rot varies in color, but generally is brown or black; tissue is moist and firm and from the outside may look sunken.

7. Jelly end rot - cause not known. Stem end of tuber becomes a light brown, jelly-like mass about one-half to one inch in depth. Under dry conditions this mass may dry and shrivel or in wet conditions it may retain its shape.

Tuber Rots In 1964 Shipments

This year at the close of the 1964 Fall shipping season, the occurrence of the various tuber breakdowns was determined from reinspection records (Table 1). According to these records, soft rot, slimy soft rot and leak rot were very much more important than tuber bruising.

Table 1. Tuber defects reported in Washington potato shipments rejected at terminal markets in 1964. 1/

PER CENT 2/					
Soft rot	Slimy soft rot	Leak rot	Tuber bruising	Fusarium soft rot	Jelly end rot
43	74	27	13	2	2

1/ Based on records provided by Mr. W. J. Irey, Supervisor, Fresh Products Inspection, Federal-State Inspection Service.

2/ Based on the number of times each type of tuber defect appeared in the rejection reports.

Control Considerations

1. Avoid bruising of tubers during harvesting and sorting operations by padding equipment, avoiding tuber drops and slowing down harvesting equipment.

2. Avoid sunscalding by exposure of tubers to sun during digging. Cover loads with canvas and move from the field to cover of unloading sheds as quickly as possible.

3. Remove excess moisture from the outside of the tubers after the washing and sorting operation with sponge rollers.

4. Place the sorted tubers to be shipped under ice or refrigeration conditions (38° - 40° F) as soon as possible after sorting.