STORAGE MANAGEMENT TO PREVENT AND CONTROL ROT DEVELOPMENT

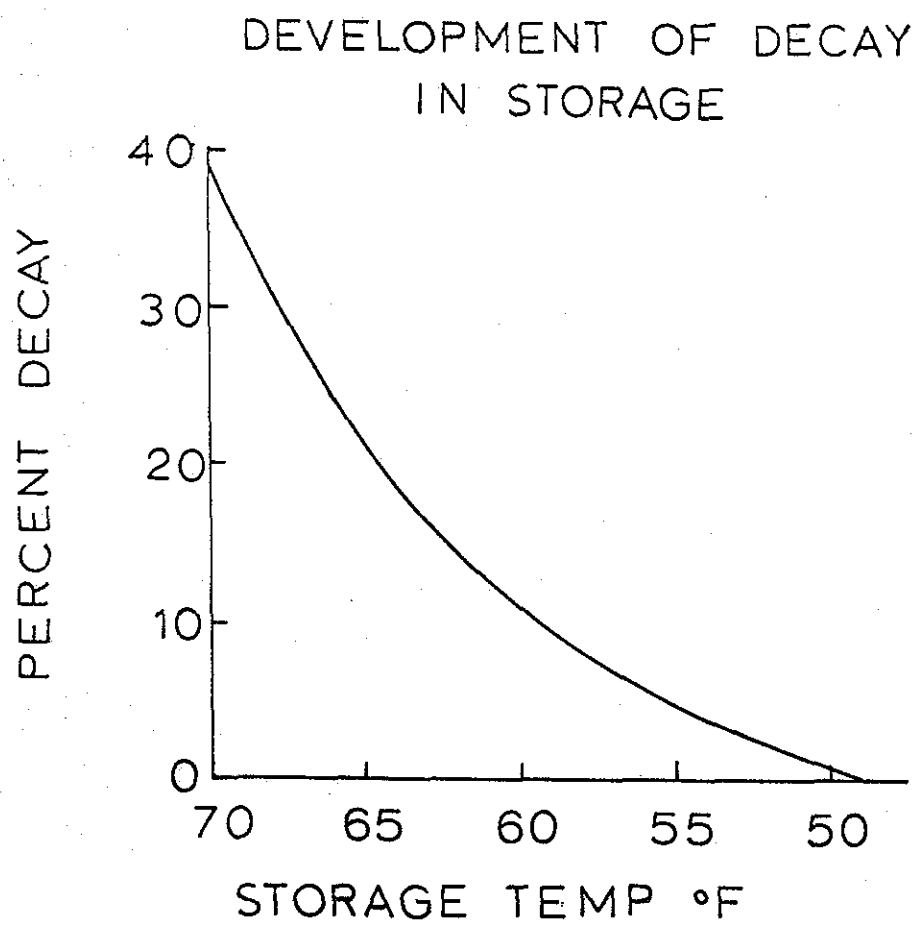
by
W. M. Iritani

There are three factors or conditions in storage which should be controlled in order to prevent or impede the progress of rot development. These are: ventilation, temperature, and humidification. Proper management of these factors can mean a profit or complete loss due to rot development.

Ventilation

Ventilation is important in controlling rots because it is the mechanism by which temperature control is attained. Rot progression is slowed considerably by lowering temperatures as indicated in Figure 1. The present recommendation is to cool potatoes as rapidly as possible to curing or suberizing temperatures of 50° F. In Washington, a ventilation rate of at least 17 cfm is recommended since ambient nocturnal temperatures for cooling are slightly higher than most of Idaho. During early filling of storages, the ducts not being used can be closed off to concentrate larger amounts of air through potatoes harvested early.

Figure 1.



Ventilation also prevents accumulation of CO_2 and provides a constant supply of oxygen which is essential to rapid suberization and maturation of tubers. Anaerobic conditions as caused by high CO_2 accumulation enhances development of some bacterial rots. Proper ventilation also provides uniformity of temperature in the pile which is important in preventing excessive weight loss. Free movement of air is also important in controlling condensation or free water on tubers which enhances soft rot development. Wet areas on piled potatoes should be avoided by constant ventilation. Hot spots or areas of rot activity can be controlled from spreading by forcing increased amounts of cool dry air through that portion of the pile. Condensation from the ceiling can be controlled by adding more insulation or applying it more evenly on exposed beams and rough areas of the ceiling. Blowing air across the ceiling will also help to cut down on condensation.

Temperature Management

As previously indicated, field or latent heat in tubers should be gotten rid of as rapidly as possible after tubers are placed in storage. Tubers with pulp temperatures above 60° F should probably not be harvested because of difficulty in cooling. A temperature of approximately 50° F appears to be sufficiently high for suberization and maturation of tubers to take place while sufficiently low to retard progress of most storage rots. These temperatures should be maintained as long as possible, between 1 and 2 months, and then gradually brought down to holding temperatures of around 45° F. Preliminary research data indicate that potatoes cooled too fast (Figure 2) will develop more rot than those held at 48° F for a longer period of time. The reason for this is lack of suberization at the lower temperatures.

Humidification

Contrary to the thinking of many people, low humidity in storages will cause greater rot development (Fig. 2) than where high humidity is maintained. High humidity is required for suberization and maturation. The most satisfactory type of humidifier has been found to be the air washer type which recirculates large volumes of water in a chamber through which air is passed. Essentially 100% R.H. is obtained regardless of R. H. of the air entering the chamber. This system has very low maintenance requirements. If condensation becomes a problem as outside temperatures get cold, humidification should be cut back. Generally, after several months storage, suberization and maturation have been fairly well completed and the tubers are able to withstand lower humidities without danger of rot infection or undue amount of weight loss. However, it is desirable to maintain as high humidity as possible without appreciable amounts of condensation.

If wet areas or watery type rots appear on the pile surface of stored potatoes after 2 to 3 weeks storage and these areas begin to spread, humidification should be discontinued and ventilation increased until the wet areas are dried up. After the progress of rot has been controlled by drying, then humidification can be resumed.

Washing of Potatoes into Storage

Experiments are being conducted on the possibility of washing potatoes into storage. There are many advantages to storage of clean potatoes. As shown in Fig. 3, it is possible to wash many of the rot organisms (spores) off of tuber surfaces. This should be done immediately after harvest. A delay of 4 hours can result in infection taking place. Washing allows better air circulation around the tubers. Chemicals, such as sprout inhibitors, fungicide and bactericides are more affective on clean tuber surfaces. A brighter periderm or skin color can also be retained by storage of washed potatoes. However, it is important to remove all free water from the tuber surface. Development of soft rot on washed potatoes can be a problem on which research needs to be conducted.

Figure 2.

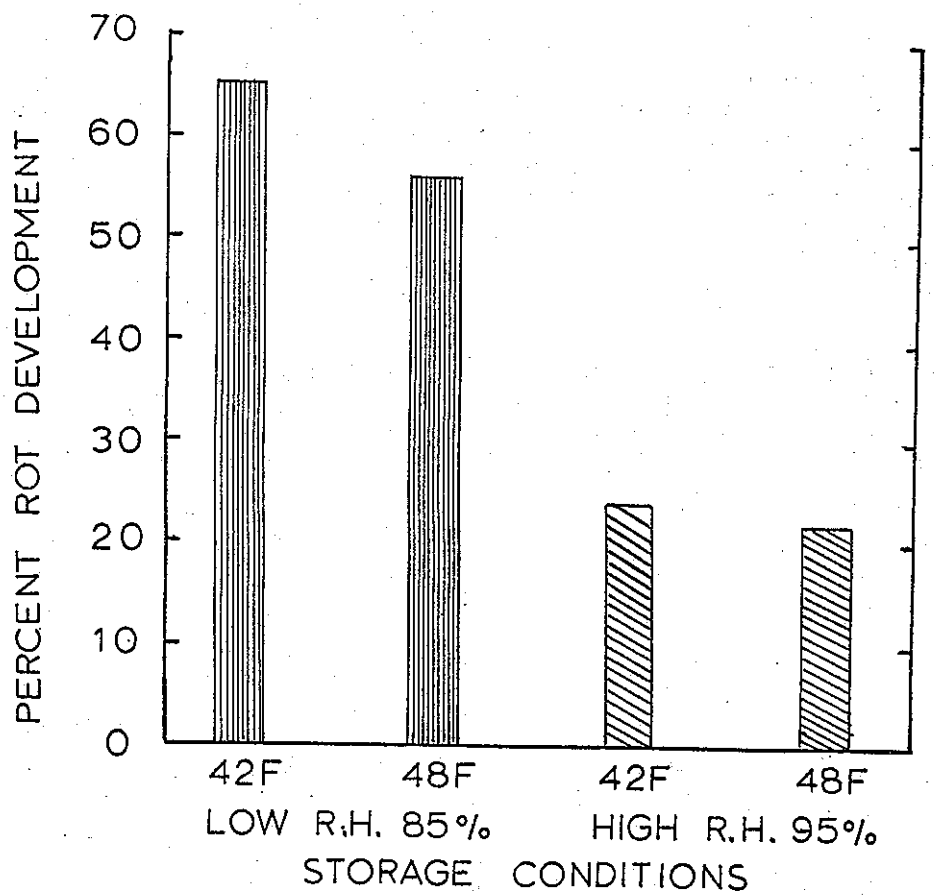
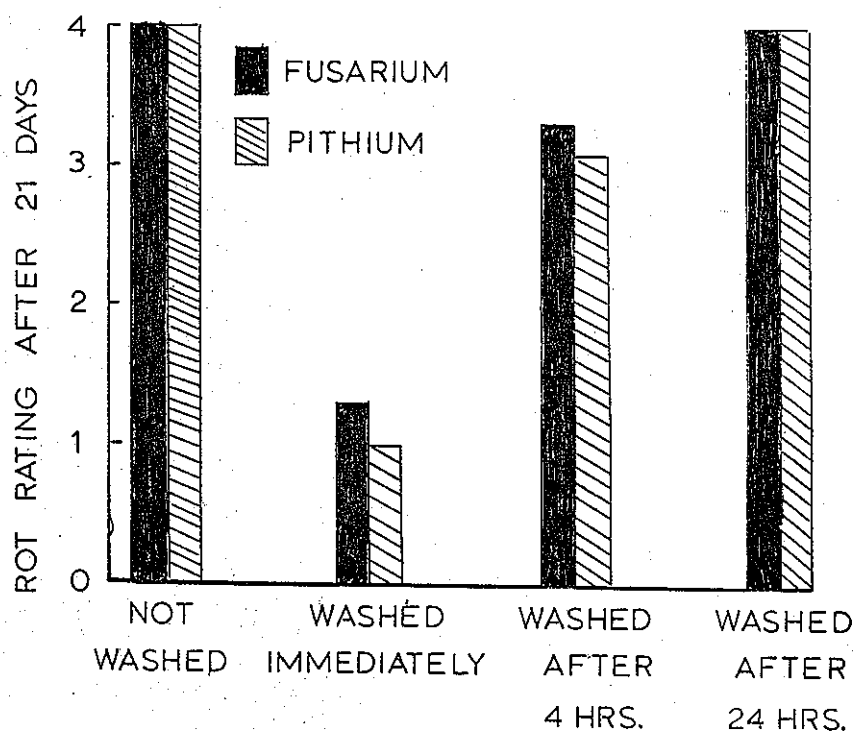


Figure 3.



Wound Healing

Generally, suberization or wound healing takes place faster at higher temperatures. However, infection and rot also progress much faster at higher temperatures. Suberizing temperatures of 50° F is a compromise temperature which is low enough to control rot, but still high enough to allow suberization to take place. As shown in Fig. 4, suberization at 50° F takes approximately 3 weeks to a month to significantly reduce fusarium infection. Although the data are variable, it appears that for pithium control, a longer period of suberization may be required.

Costs of producing potatoes are increasing faster than prices being paid. In order to keep ahead of the game, it is necessary to become more efficient by producing higher yields and quality and keeping losses to a minimum in storage. Since storage costs are also increasing rapidly, perhaps we should be thinking of storing only those potatoes which command high prices. Grading out undersize and malformed tubers would increase the capacity of many storages with very little additional costs.

Figure 4.