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Potato Bruising

Michigan State University Cooperative Extension Service

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POTATO BRUISING

Tuber bruising costs potato growers millions of dollars annually because it significantly reduces raw product quality for processing, tablestock or seed. Recognizing the problem, the frozen processing industry has provided financial incentives to growers to adopt production, harvest and handling practices that reduce tuber bruising. The chip processing industry is also building awareness of the problem that could lead to financial incentives to reduce bruising.

The tablestock and seed industries do not have the same direct linkage between producer and raw product user, and so cannot establish marketwide incentives for bruise-free potatoes.

However, bruised potatoes are of great concern for these markets, too. Bruised potatoes that end up in fresh pack containers present a poor image to the consumer who usually must cut off the bruised area before cooking. Bruises on seed potatoes give decay a place to start.

Types of Bruises

Skinning (Fig. 1) occurs during harvesting and handling when tubers are not completely mature. A suberized (corky) layer usually forms on the skinned area.

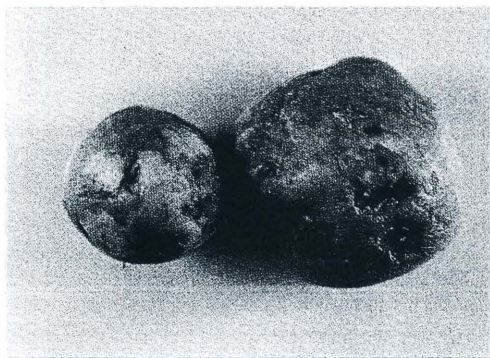


Fig. 1

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Because it often is darker colored than the normal skin, it detracts from the general appearance.

Using a top killer at least 10 to 14 days before harvest helps reduce skinning.

Shatter bruise (Fig. 2)

appears as a crack or split

in the tuber surface and penetrates into the flesh. It can serve as an entry site for decay organisms. Hydrated or turgid potatoes (those harvested from a wet soil) are susceptible to shatter bruise. Low temperatures (below 50° F) during harvest and handling cause tubers to shatter bruise easily. Potatoes with high specific gravity also seem to be more susceptible to this type of injury.

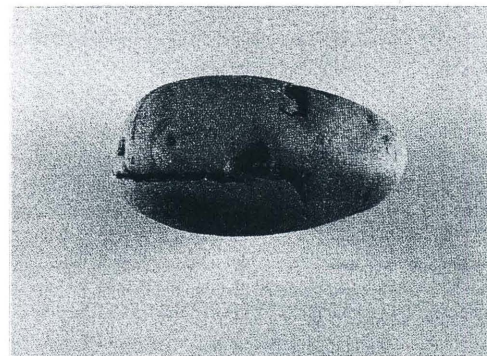


Fig. 2

Cuts and Scrapes (Fig. 3)

generally result when potatoes strike or are forced against sharp cutting objects, such as the blade of a windrower or harvester.

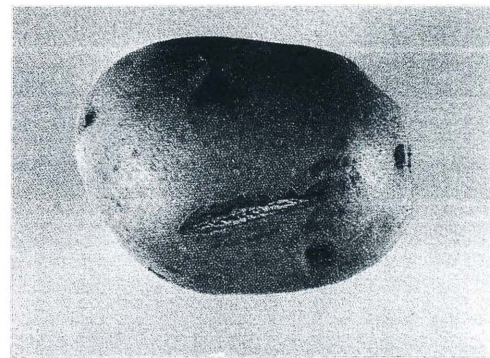
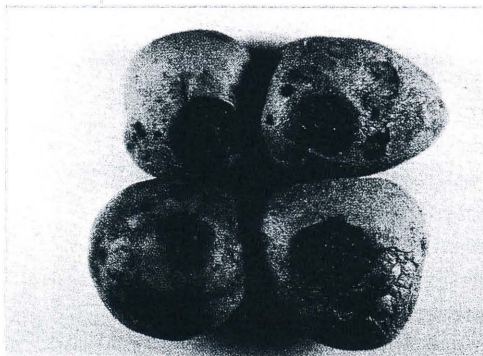


Fig. 3

Pressure bruise (Fig. 4) occurs in storage and usually is most severe when relative humidity is low. (Relative humidity should be greater than 90 percent throughout the storage period.) The potatoes develop softened, flattened



or indented areas as a result of continuous pressure. The bruises frequently discolor the flesh and provide potential entry sites for disease and decay.

Fig. 4

Blackspot (Fig. 5) appears as a dark, semispherical spot in the tuber flesh beneath the skin from 24 to 48 hours after impact on a hard surface. Blackspot is a physiological disorder resulting from a series of biochemical reactions leading to the production of a black pigment (melanin) in the bruised flesh. Generally, no evidence of blackspot is visible on the tuber surface—the injury cannot be detected until the potato is peeled. The injury occurs most frequently on the stem end but can occur anywhere on the tuber. Potato varieties differ in their susceptibility to blackspot. Any variety is more susceptible to blackspot when soil moisture at harvest is low and tubers are dehydrated. Also, when potatoes are to be handled, the pulp temperature should not be

lower than 45° F. Experiments have shown that inadequate potassium in the soil increases tuber susceptibility to blackspot.

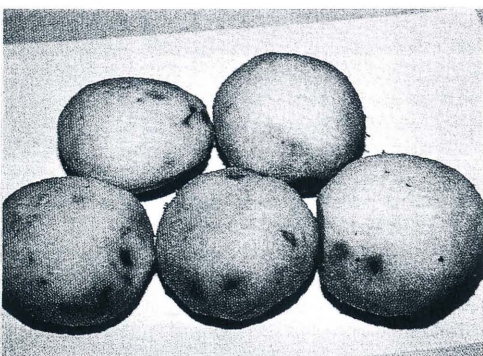


Fig. 5

Methods of Bruise Detection

Techniques are available to the grower and the industry to detect bruising that occurs in harvesting. A simple test using a catechol solution can detect skinning, cuts and shatter bruises. Blackspot detection, however, requires peeling the potato. Blackspot cannot be detected using catechol solution.

Catechol Test: Catechol is a polyphenol compound that reacts with certain enzymes naturally present in the tuber to color the bruised areas purplish to dark red (Fig. 6).

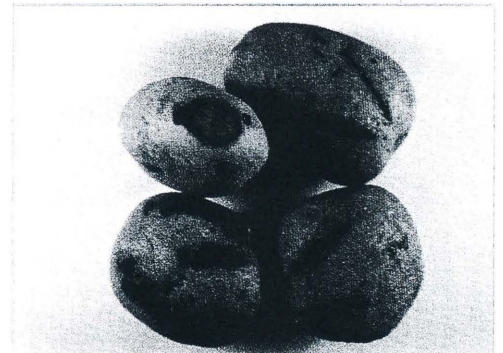


Fig. 6

The materials needed are: (Fig. 7)

- 2½- to 3-gallon plastic pail.
- 4- to 5-quart plastic pail with 10 to 15 holes, ¾ inch in diameter, drilled in the bottom and sides (a plastic open-mesh bag may also be used).
- rubber gloves.
- plastic funnel.
- plastic 1-gallon jug for storing the catechol solution with proper labeling.



Fig. 7

CAUTION:

Handle the catechol solution carefully. Avoid spilling on skin, eyes or clothing. Do not use the containers for any other purpose. Destroy the treated potatoes—do not use them for any purpose. Use rubber gloves when handling the solution. Do not flush away the discarded solution into any water source. Remove soiled clothing immediately and wash before reuse.

Wash hands thoroughly.

Prepare solution by mixing 1 ounce (28 grams) of catechol in 1 gallon of clean water. Add 1 teaspoon of liquid detergent as a wetting agent and thoroughly mix the solution. Store it in the closed 1-gallon jug between uses.

To begin the test, wear rubber gloves to pour the catechol solution into the 2½- to 3-gallon plastic pail.

Wash 3 to 5 pounds of potatoes in plain water. Place the potatoes in the smaller bucket with the holes (or the mesh bag), and immerse them in the catechol solution for 5 minutes. Swirl the potatoes in the solution to assure good coverage.

Remove the sample, drain excess solution into the bucket and set the potatoes aside for 10 minutes to allow the bruised areas to develop the red color. When all the samples have been processed, use the plastic funnel to return the catechol solution to the labeled plastic jug for future use. (Washing the potato samples before immersing them in the catechol solution helps extend the usefulness of the solution.)

After 10 minutes, observe the sample for red to reddish-black areas. That indicates bruises. Note the number of tubers with bruises and the number of bruises on each tuber. To determine the severity of the bruise, use a vegetable peeler. If one stroke removes the color, the bruise is considered slight. If it takes two or more strokes, then the bruise can be classified as severe.

Test samples from several locations to find out when damage is occurring in the harvest/handling operation (primary chain, side elevator, truck, unloader, bin piler or storage).

Blackspot detection: To assess blackspot damage, simply take a sample of potatoes and peel them carefully. Take the initial sampling from storage to determine if any blackspot is apparent at this stage of the

harvest/handling operation. If you find a significant amount, collect samples at other locations in the harvest/handling sequence to determine where the damage is occurring.

For the initial sample, select 10 tubers. Tubers over 10 ounces are most susceptible, so it may be most appropriate to select large tubers for the first sample. If damage is significant, check a second sample of 7- to 10-ounce tubers. Significant blackspot damage to tubers of this size indicates that a serious bruise problem exists and you should do further sampling to determine where the injury is occurring.

If the initial sampling is done at harvest, store the sample at room temperature for at least 24 hours before peeling to allow time for discoloration to develop. A blackspot bruise usually does not penetrate very deeply into the flesh. The damage appears as a bluish grey to black discoloration of the flesh 1/16 to 1/2 inch below the surface. To detect the damage, peel the tubers carefully without going too deeply into the flesh.

To determine the severity of blackspot, count the number of tubers showing blackspot and the number of bruised spots on each tuber. Establish severity index by dividing the total number of bruises observed by the number of tubers sampled.



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