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Thumbnail Cracks of Potato Tubers

Michael Thornton
Professor, Department of Plant Sciences, University of Idaho, Parma Research and Extension Center

Nora Olsen
Professor, Department of Plant Sciences, University of Idaho, Kimberly Research and Extension Center

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University of Idaho Extension

Introduction

ACCORDING TO SURVEYS, appearance is one of the most important factors for consumers when selecting fresh market potatoes in grocery stores. Because potatoes with visible skin defects look undesirable, consumers tend to pass over them. One of the unappealing skin defects is what is commonly called **thumbnail cracks** or **air checks**. The name derives from the arched shape of the crack in the tuber skin, which resembles a thumbnail (Figure 1). Thumbnail cracks develop from a slight injury that just breaks the tuber skin but leaves the underlying flesh undamaged. To understand more about this common condition in potatoes, this bulletin summarizes current research regarding its cause and how it differs from other potato defects and offers tips about its management.

Occurrence and Cause

Research studies have identified two major causes of thumbnail cracks. The most commonly reported cause of this defect is excessive drops during handling of tubers. The force of impact necessary to result in a thumbnail crack is much less than the force that causes shatter bruise, another

Figure 1. Thumbnail cracks (air checks) reduce the appeal of potatoes in retail displays.

impact-related defect (see section “Shatter Bruises Versus Thumbnail Cracks”). After impact damage occurs, tubers subjected to low humidity, such as while sitting in a truck or on the warehouse floor prior to shipment or in retail store displays, can form more severe thumbnail cracks.

The majority of studies have found that some level of handling injury is required to initiate the development of thumbnail cracks. Handling injury can occur during harvesting and handling operations, but removal from storage, packing, and shipping operations can cause additional damage that will result in visible thumbnail cracks.

Thumbnail cracks have also been reported to occur in the absence of impact injury. These reports indicate that thumbnail cracks may develop when highly hydrated (crisp or turgid) tubers are exposed to rapid changes in temperature. As the tuber temperature changes, the skin cracks to relieve internal pressure. The small break in the tuber skin then develops into a thumbnail crack when the tuber is exposed to dry air. Thumbnail cracks that occur under these conditions are often referred to as air checks. Freshly harvested tubers are more prone to air-check development when exposed to dry air during transloading and handling into storage. Covering loaded trucks may lessen the risk of this type of thumbnail cracking because it prevents tubers from rapidly drying during transport to a storage or packing facility.

Shatter Bruises Versus Thumbnail Cracks

It is well known that when tubers strike a hard surface, cracks known as shatter bruise develop. What is the difference between shatter bruises and thumbnail cracks?

A shatter bruise is caused by an impact that breaks a tuber’s skin and its underlying tissue. The extent of the injury depends on the force of the impact, the tuber’s condition, and the cultivar. Cold, hydrated tubers are more susceptible to shatter bruises than warm, less hydrated ones. After exposure to identical impact forces, some cultivars develop a high incidence of shatter bruises, while others either express less overall bruising or tend to develop blackspot bruising instead of shatter bruise.

Figure 2. Visible cell damage under the skin and discoloration around the damaged areas are symptoms of shatter bruising.

Figure 3. Thumbnail cracks and shatter bruises often occur on the same tuber.

When a tuber is shatter bruised, not only are a tuber’s skin and flesh fractured, but the cells along the crack in its flesh may discolor (Figure 2). Severe shatter bruises may be immediately visible, but less severe damage may not be noticeable. It is not uncommon to have both shatter bruises and thumbnail cracks on the same tuber (Figure 3).

Thumbnail cracks develop from much less impact force than that which causes shatter bruise. Also, when an impact causes a crack to form, the damage is confined to the tuber skin. There is usually no discoloration of the tuber flesh, but sometimes a slight black spot can be visible under the thumbnail-cracked area.

Management Practices to Minimize Thumbnail Cracks

Whether a thumbnail crack is caused by an impact or temperature change, the following management practices will minimize its degree.

Harvest Conditions

Ideal pulp temperatures for harvesting tubers with minimum bruising are between 50ºF and 60ºF. Handle tubers as gently as possible by operating conveyors on harvesters, pilers, and all packing equipment at full capacity. Avoid excessive drop heights from all equipment. (See *Preventing Potato Bruise Damage* [BUL 725] for additional information on bruise management).

Packing and Shipment Handling

Keep pulp temperatures at 50ºF–55ºF while removing tubers from storage. Handling tubers at pulp temperatures below 40ºF increases the risk for thumbnail cracks to occur due to handling injury. After packing, maintain pulp temperatures in that same 50ºF–55ºF range during loading and transit to reduce the risk for soft rot development. Once tubers reach the retail store, avoid handling them roughly. Gently place them on a display case to avoid cracking.

Relative Humidity during Packing and Shipment

Tubers kept under low relative humidity conditions (less than 90%) after handling are more prone to severe thumbnail cracking. In contrast, tubers packed wet that are placed into plastic bags for shipment are more likely to develop soft rot decay under warm conditions. Therefore, remove excess surface moisture before packing tubers into bags; then maintain the relative humidity above 90% during loading and transport to market.

Further Reading

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