

Thumbnail Cracks of Potato Tubers

by William H. Bohl and Michael K. Thornton

There continues to be concern about a tuber defect that is particularly noticeable in retail potato displays. The defect is termed "thumbnail cracks," or "air checks." The name is derived from the arched shape of the crack in the tuber skin, which resembles a thumbnail (figure 1). Thumbnail cracks in fresh-market potatoes are a quality problem because they significantly reduce the appeal of potatoes to consumers. This publication summarizes published information about the cause and management of this defect.

Occurrence and cause

A limited amount of information is available concerning the conditions that cause thumbnail cracks to appear in potatoes. Published information identifies two major causes.

One reported cause is rough handling of tubers. Thumbnail cracks can develop from a slight injury that just breaks the tuber skin but does not damage the underlying flesh. The force of impact resulting in a thumbnail crack is much less than that causing damage typically referred to as shatter bruise, as discussed below. After the damage occurs, tubers subjected to low humidity, such as in retail store displays, will form the characteristic thumbnail cracks.

Minor tuber damage occurring during harvest usually heals rapidly in storage under high relative humidity (95 percent or more), lessening the chance of thumbnail cracks becoming visible later. Therefore, damage that occurs during packing, shipping, and handling by retailers is probably more important than harvest damage in the development of 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 warm, highly hydrated (crisp) tubers are moved into colder air. As the tuber cools, the flesh cannot hold as much moisture, and the tuber skin cracks to relieve internal pressure. The small break in the tuber skin then develops into a thumbnail crack when the tuber is placed in dry air. Thumbnail cracks that occur under these conditions are often referred to as air checks.

Shatter bruises vs. thumbnail cracks

Some researchers have reported that an impact is necessary for thumbnail cracks to develop, while others suggest thumbnail cracks occur from a sudden temperature change. It is also well known that cold, crisp tubers striking a hard surface will develop cracks known as shatter bruise. The question then arises, What is the difference between shatter bruises and thumbnail cracks?

According to reports in the literature, a shatter bruise is caused by an impact that breaks the tuber skin and the underlying tissue directly below. The extent of the injury depends on the force of the impact and tuber condition. Cold, hydrated tubers are more susceptible to shatter bruises than warm, less hydrated ones. When a tuber is shatter bruised, not only are the tuber skin and flesh fractured, but the cells along the crack in the flesh may discolor. Severe shatter bruises may be immediately visible, but less severe damage may not be noticeable.

When an impact is involved in forming a thumbnail crack, the damage is confined to the tuber skin. There is usually no discoloration of the tuber flesh, but occasionally a slight black spot of the tuber flesh will be associated with the thumbnail-cracked area.



Figure 1. Thumbnail cracks, or air checks, reduce the appeal of potatoes in retail displays.

Management practices to minimize thumbnail cracks

Whether the thumbnail crack is related to temperature change or a slight impact, the same management practices will minimize this defect.

Harvest—Harvest tubers when pulp temperatures are 50° to 60°F and tuber hydration level is midway between dehydrated (limp) and hydrated (crisp). Harvesting tubers too cool and subjecting them to rapid dehydration increases tuber susceptibility to thumbnail cracking. Handle tubers as gently as possible by making certain conveyors on harvesters, pilers, and all packing equipment are operated at full capacity. Avoid excessive drop heights on all equipment.

Storage temperature and humidity—Place tubers in storage at 50° to 55°F with 95 percent or more relative humidity for 2 to 3 weeks to promote rapid wound healing. High humidity plays a crucial role in promoting wound healing during the first few weeks of storage after harvest. Relative humidity below 95 percent delays wound healing and may promote the development of thumbnail cracks.

Handling—Keep pulp temperatures at 50° to 60°F while removing tubers from storage, while packing tubers, and while transporting tubers to reduce their susceptibility to injury. However, be aware that the potential for disease development increases with tuber pulp temperatures warmer than 60°F. Handling tubers with pulp temperatures below 40°F without causing damage that can lead to thumbnail cracks is very difficult. Once tubers reach the retail store, avoid rough handling. Gently place tubers on the display case to avoid cracking.

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