

The importance of tuber condition in preventing blackspot bruise

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There is no doubt that some of the recent growing seasons have been filled with lots of unusually warm days. These environmental conditions can greatly influence the susceptibility of tubers to bruise damage. In this article we talk about how tuber condition can impact blackspot bruise susceptibility.

Key Points:

- **Very green vines at the end of the season can make it difficult to kill the crop, increasing susceptibility to skinning injury, as well as blackspot bruise if tubers become dehydrated under the warm conditions forecast for the next few weeks.**
- **Tubers under dead vines can become over-mature, and are also more susceptible to blackspot bruise.**
- **Potatoes can become dehydrated when soil moisture content falls below 50% near or after vine kill.**
- **Blackspot tends to show up more on the stem end compared to the bud end of the tuber due to differences in cell age and chemical content.**

Each year's potato crop can show some extreme differences in maturity at the end of the growing season. Some fields may remain very green and immature, while other fields are showing a lot of natural senescence. Both of these conditions can influence tuber susceptibility to bruise damage. Rapid changes in tuber hydration can occur when irrigation is discontinued in preparation for vine kill. This is especially true when plants are still green and growing, but occurs at a slower rate even when the vines are dead. The threat of tuber dehydration is highest when warm conditions result in high evaporative loss from the soil surface. If the tubers become dehydrated, they can become very susceptible to blackspot bruise damage. Extremely vigorous vine growth also makes it difficult to kill the crop, increasing the likelihood of skinning injury during harvest.

Crop maturity at the time of vine kill also interacts with tuber hydration to influence how susceptible tubers are to blackspot. For Russet Burbank, fields that have in excess of 50% dead vines are more susceptible to blackspot than fields that remain green up to vine kill. For Ranger Russet, the benchmark for increased bruise susceptibility is around 20% dead vines. We do not know the impact of vine maturity on blackspot susceptibility of varieties like Russet Norkotah.

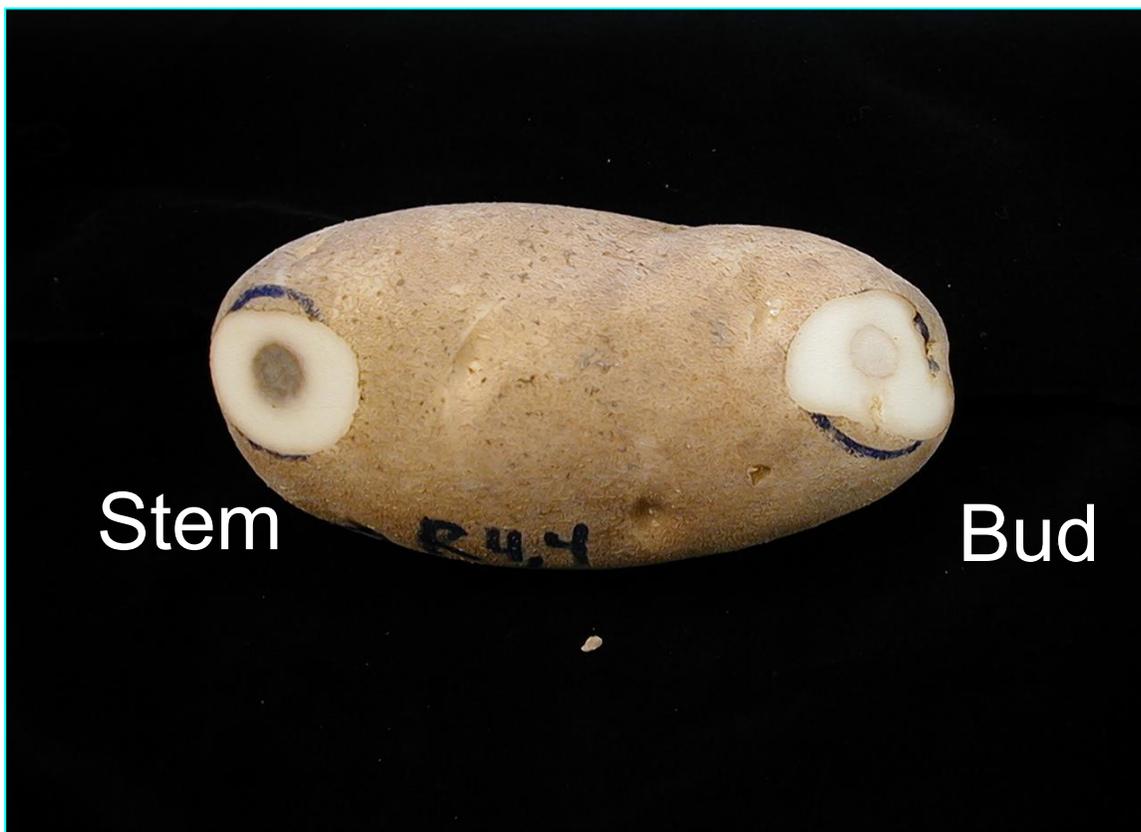
There are two reasons that tubers under dead vines become more susceptible to blackspot bruise. The first reason has to do with the chemical makeup of the tubers. Tubers under dead vines are exposed to wider fluctuations in soil temperature than when a green, healthy canopy is present to provide shade to cool the soil. The exposure to fluctuating soil temperatures at the end of the season ages the crop, and is associated with an increase in free tyrosine, the compound responsible for the black pigment that forms after a bruise or cut to tuber tissue.

The second reason has to do with tuber hydration. It is important to cut back on water applications as the canopy senesces to prevent overwatering and the associated increase in diseases such as pink rot, soft rot, and enlarged lenticels. However, allowing the soil moisture content to drop below 50% prior to, or following vine kill can actually dehydrate the tubers, making them much more susceptible to blackspot bruise. Research in Idaho has shown that on a silt loam soil, irrigation needs to be applied at

least one week prior to harvest to allow Russet Burbank tubers to rehydrate and minimize blackspot damage. We do not know the pre-harvest irrigation requirements for other varieties grown in Idaho.

One of the interesting facts about blackspot bruise is that it tends to be worst on the stem (stolon) end compared to the bud end. Figure 1 shows a Ranger Russet potato that was impacted with the same amount of force on both the stem and bud end. The stem end developed lots of the black pigment, resulting in formation of a dark bruise. Bruising the bud end resulted in a white spot of damaged tissue, but little pigment formation. This difference between the stem and bud ends is due to the physical and chemical differences between the two ends (the stem cells are older, larger, higher in starch and higher in tyrosine).

Figure 1. Artificially bruised 'Ranger Russet' potatoes. The same pendulum impact was given to both the stem and bud ends of the tuber.



This information can be used when checking your crop for level of handling injury during harvest. Take tuber samples at each point throughout the harvest and handling process (eg. hand dug, harvester, conveyors, and storage) and hold them at warm temperatures for 24 to 48 hours. The higher the holding temperature, the quicker the pigment formation will occur and the sooner the results will be available. Concentrate evaluations for blackspot bruises on the stem end of the tuber, while shatter bruise can be seen on both ends.