

**Idaho Grower News from the University of Idaho Extension System**

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**July 2008****Environment Plays a Key Role in Management Decisions**

William Bohl and Mike Thornton

The current potato-growing season has thus far been challenging. For much of Idaho planting was wrought with cool, windy, and sometimes wet weather followed by temperatures remaining unseasonably cool for quite some time. Subsequently, temperatures have warmed, but no one knows what lies ahead for the rest of the season.

Although producers cannot control the environment, there are environmentally related management decisions that need to be made to maintain a vigorously growing potato crop. The risks associated with too cold or too hot weather are many, and include such problems as Rhizoctonia stem canker and seed decay (too cold and wet when planted), frost damage (untimely spring frosts), hollow heart (prolonged periods of cold during tuber initiation), slow canopy development (too cold or too hot), and poor bulking rate or sugar ends (too hot) to name a few.

Likely, most potato producers will at some time or another encounter a field that did not emerge well. Although there's little that can be done once a field is planted, you can record notes on what happened in an effort to prevent it from happening again in the future. When potatoes are planted, a race begins between the disease organisms trying to infect the cut surface on a seed piece and the tuber tissue that is trying to heal the cut surface and produce sprouts. Research has shown that the longer a seed piece remains intact, the more productive a plant. Ideally, the seed piece should remain sound until the plant has a chance to utilize all the stored energy and nutrients.

Rhizoctonia stem canker girdles sprouts, stolons, and roots of potato plants and is favored by cool, wet conditions often associated with early planting. These conditions delay emergence subjecting developing plant tissues to potential damage from the

Rhizoctonia pathogen for longer periods of time. Both seed piece decay and Rhizoctonia can be minimized by planting when soil is at least 45°F at planting depth. Also, use a seed piece fungicide treatment that is effective against pathogens causing seed decay.

Untimely spring frosts are a major concern in some Idaho production regions. It's not uncommon in localized areas to get a frost that will destroy some or all the young foliage. Frost damage negatively impacts yield potential by decreasing the time available for tuber bulking following emergence.

"Potatoes actually have a fairly low optimum growth temperature, and it's likely they experience some heat stress even during seasons with 'normal' temperatures."

Severe frosts can even destroy plant tissue to below the soil surface causing branching of the sprouts. This often results in an increase in tuber set and a resulting shift of the tuber size profile towards the smaller sizes. If frost occurs, realize there are no "magical" cures. Simply, provide the frost-damaged crop adequate moisture and nutrition to re-grow.

Brown center and hollow heart are internal tuber defects in some cultivars that form when soil temperatures are below 55°F for 5 to 7 days during early tuber initiation. Under the right conditions, brown center can develop into hollow heart, but it may also dissipate if tuber growth is moderate and uniform throughout the bulking period. If you suspect this defect, maintain even plant growth during the bulking season by using proper fertilizer applications, and provide uniform soil moisture by applying the correct amount of water evenly over the entire field. No additional plant nutrients such as calcium or other micronutrients are recommended.

We often hear that a particular growing season was stressful for a potato crop. This is generally more often heard when temperatures were extremely hot. Realize, though, that stress can be defined as any condition that is above or below the optimum for plant growth and tuber production.

Potatoes actually have a fairly low optimum growth temperature, and it's likely they experience some heat stress even during seasons with "normal" temperatures. For vine growth, the optimum temperature is around 75°F, but for tubers it's closer to 65°F. If heat stress occurs for an extended period during tuber initiation, the vines will appear big and healthy but have very few tubers.

Not only is the average daytime temperature important, but nighttime temperatures are especially critical in determining the timing of tuber initiation and rate of growth. The optimum day/night temperatures for potato growth are generally considered to be 74/54°F. However, at any given daytime temperature, there is a corresponding optimum night temperature. Consequently, as the daytime highs increase, a larger difference between day and night temperatures is required for optimum growth.

As you would expect, crop water use increases greatly with increasing temperature resulting in rapid depletion of soil moisture. A couple of things happen as the soil dries. First, the pores (stomata) on the leaf responsible for evaporative cooling start to close resulting in higher leaf temperature. Secondly, evaporative cooling is an important factor in soil temperature—the drier the soil, the closer the soil temperature will be to the air temperature. Research has shown that increasing soil temperature by as little as 6 to 9°F during tuber initiation is enough to reduce tuber yield and quality.

You can think of the potato plants as basically starch factories. Over 90 percent of the dry weight of a potato tuber directly results from a process called photosynthesis, whereby the plant uses sunlight, carbon dioxide and water to produce starch. Part of this starch is used to keep a plant alive through a process called respiration. Rising air temperature dramatically increases the rate of respiration while simultaneously photosynthesis declines resulting in less starch available for plant and tuber growth. Additionally, high temperatures promote more vine growth at the expense of tuber growth resulting in lower yield.

High temperatures will also increase the potential for internal and external defects—pointed ends, knobs, and dumb bells—as well as low specific gravity. Low specific gravity in the stem-end of a tuber is often associated with high levels of reducing sugars, and when processed, makes sugar-end fries that are viewed as very poor quality. Stress that occurs during the early part of tuber bulking causes the highest incidence of sugar ends.

It would seem that producers are at the mercy of the environment, but there are management practices that can be used to mitigate extreme temperatures. Maintain a full potato canopy by using cultural practices that promote leaf growth to increase soil shading resulting in lower soil temperatures. Such practices would include accurately planting good seed; managing fertility and diseases to prevent early vine death; and closely monitoring and maintaining available soil moisture so it does not fall below 65%.

So, the next time you are observing the weather, don't think there's nothing you can do; think about what you can do to manage your potato crop considering the current environmental conditions.

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#### Did You Know?

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would need to grow at a rate of nearly 15 lbs. per hour.

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