Cooperative Extension System

# the SPUDVINE

University of Idaho Extension

**Idaho Grower News from the University of Idaho Extension System** **March 2007**

## Limited Water Supplies Affect Potato Irrigation Management Decisions

William H. Bohl and Jeff Stark

***Abstract***

As another growing season approaches, potato producers should take into consideration the availability of irrigation water supplies before planting the crop. Water stress during any potato growth stage will impact yield or quality, but water stress spread over long periods of time impacts yield less than an equivalent reduction in water use over a shorter periods. The most critical time to avoid water stress is during tuberization through mid-bulking. Options for dealing with a potential limited supply of water include reducing potato acreage, selecting fields that have the greatest potential for maintaining adequate soil moisture, reducing applied nitrogen, planting potato varieties with greater ability to withstand water stress or mature before drought develops, planting physiologically older seed, or planting at a wider in-row spacing.

During the past several months, the topic of water has frequently been in the news. As another growing season approaches, potato producers should take into consideration the availability of irrigation water supplies before planting the crop.

If you are wondering what the water supply looks like for this coming season, there is a website you can view to help you get a better picture of the water outlook. It's the USDA National Resources Conservation Service website at http://www.wcc.nrcs.usda.gov. Here you can find water supply forecasts, year-to-date precipitation, and more. This is a useful site to help you keep informed.

So you say to yourself, I can keep informed, but I can't make more water. True, but you can use a limited water supply as efficiently as possible to irrigate your potato crop. However, some strategies for dealing with limited water supplies need to be implemented before planting.

One course of action would be to limit the acres planted. This allows for a reduced water supply to be used on fewer acres, thus eliminating the possibility of not having enough water to irrigate the potato crop. This could also be beneficial in that a potentially reduced supply of potatoes could result in better prices. However, if acreage reduction is not an option, then you must plan on how best to use the water if it is in limited supply.

It almost seems elementary, but be sure your irrigation system is maintained and managed properly. It will be well worth the money spent to make certain that nozzles are the correct size and are working properly to ensure irrigation uniformity. Research has shown that over-applying or under-applying water can have a significant effect on potato crop yield. If all the nozzles on a system are not working correctly, it is virtually impossible to evenly apply water to achieve maximum yield over an entire field.

A major challenge in raising a potato crop is the relatively shallow root system and the plants inability to withstand even mild water stress compared with other crops commonly grown in Idaho. Water stress spread over longer periods of time impacts yield less than an equivalent reduction in water use over shorter periods. However, adjusting the length and intensity of water deficits may not be a viable option, so it is essential to understand how water stress affects each growth stage.

Water stress during the vegetative growth stage, which begins when the seed piece sprouts until stolons are formed, tends to cause the plants to become acclimated to later water stress, thus reducing the effect of water stress later in the season. Water stress during vegetative growth tends to reduce the number of tubers per plant with an increased tuber size at harvest. However, available soil moisture in the upper twelve inches should not be allowed to drop below 55 percent during this growth stage.

Research has shown that water stress during tuberization—beginning when stolon tips swell and ends when tubers are about one-half inch in diameter—causes substantial reduction in yield and quality. At harvest you will likely see severely misshaped tubers with pointed ends, multiple knobs, or other malformations. It is extremely important to minimize or avoid water stress during tuberization through mid-bulking.

From the time tubers are about one-half inch in diameter until plants senesce is the tuber-bulking growth stage. Tubers are steadily increasing at a constant rate, and under ideal conditions this stage in Idaho can last up to twelve weeks. Research in Idaho has shown that Russet Burbank potatoes that were irrigated with either 60 percent or 80 percent of normal crop water use during early-to-mid or mid-to-late tuber bulking had a greater reduction in tuber yield and quality than potatoes with no water stress. Spreading water stress over the entire bulking season, or confining the water stress to the early and late tuber-bulking periods minimized yield and quality loss. The key to preventing major yield losses is to avoid severe water stress during the main portion of the tuber bulking period.

The maturation growth stage is characterized by older leaves beginning to die with an eventual loss of the entire crop canopy. Tuber bulking rate slows dramatically once vines (stems) begin to die. Moisture stress during maturation can reduce tuber yield, but will also shorten tuber dormancy, reduce specific gravity, and increase reducing sugars making tubers fry darker when processed into frozen products. Soil moisture should not be allowed to drop below 50 percent prior to killing vines.

In addition to those practices discussed above, there are a limited number of options available for dealing with a limited water supply, but these options must be implemented prior to planting.

First, not all fields are equally productive. Select fields that have the greatest potential for maintaining adequate soil moisture with limited water supply. Fields with a loam or silt loam texture have a high water holding capacity and will develop water stress at a slower rate compared with sandy fields.

Second, the amount of nitrogen needs to be reduced if late-season water stress is expected. Research has shown that for every 15 to 20 percent reduction in water application during tuber bulking, nitrogen application should be reduced by 30-40 lbs per acre.

Third, potato varieties differ in their ability to avoid or tolerate water stress. Late-season water stress can be avoided by planting an early-maturing variety, such as Russet Norkotah, or by planting Ranger Russet for an early delivery contract. GemStar Russet and Premier Russet are examples of varieties that can tolerate longer periods of water stress. Be cautioned, however, that growers must be familiar with raising these varieties and have a market for them before planting.

Lastly, seed piece physiological age and spacing can affect yield under water-stress conditions. Physiologically older seed will generally result in earlier plant emergence and tuber development, thus minimizing the effects of late-season drought by the crop completing more of the tuber bulking stage before water stress develops. Consider, also, planting seed pieces at a wider in-row spacing, which increases the unit area per plant so each plant has more area from which to draw water and nutrients. This approach has been shown to be particularly beneficial for high water use varieties such as Alturas.

We don't yet have a clear picture of how much water will be available for the upcoming growing season. Limited water supplies are best utilized by applying irrigation during the most sensitive growth stages, which are tuber initiation and mid-season bulking. Unfortunately, seasonal changes in surface water supplies and decisions made at the irrigation district level may limit the flexibility of deficit irrigation management.

For a more complete discussion of this topic, please refer to University of Idaho CIS 1122, Potato Production with Limited Water Supply available at your local University of Idaho Extension Office or online at http://info.ag.uidaho.edu/pdf/CIS/CIS1122.pdf.

Authors: W.H. Bohl (see pub box); J. Stark, Division Chair, Horticultural Sciences, Idaho Falls, (208) 529-8376 or jstark@uidaho.edu. Both with University of Idaho.

**Did You Know?**

Twenty-four inches of water per acre, the approximate amount needed to raise a potato crop, is equal to approximately 651,700 gallons.

All comments should be directed to the editor, William H. Bohl.

William H. Bohl, Ph.D.
Extension Educator-Potatoes
583 W. Sexton St., Blackfoot, ID 83221
phone (208) 785-8060
wbohl@uidaho.edu
www.if.uidaho.edu/~bingham

Associate Editor.....Phil Nolte, Ph.D.

NON-PROFIT ORGANIZATION
U.S. POSTAGE PAID
PERMIT NO. 291
BLACKFOOT, ID 83221

UNIVERSITY OF IDAHO
COOPERATIVE EXTENSION SYSTEM
Bingham County
583 W. Sexton Street
Blackfoot ID 83221-2063