

Potassium and Specific Gravity of Potato Tubers

By Joan R. Davenport

Potato growers are paid based on a combination of yield and tuber quality factors. Tuber specific gravity is an important quality factor. For processing potatoes there is a range of specific gravities that is considered optimal. Typically, if there is a reduction in payment related to tuber specific gravity it occurs when specific gravity is low.

Many factors influence tuber specific gravity. Climatic conditions will determine if a growing region has a “good” or “bad” year for gravity. However, over the years, K fertilizer has been recognized for its influence on specific gravity.

In the 1970s, research results from Idaho reported that tuber specific gravity was reduced with increased K fertilizer rate. The same study concluded that the reduction in specific gravity was more pronounced when K was applied in the Cl form than when K_2SO_4 was used. In the 1980s and 1990s, scientists in Idaho and Oregon studied potato response to K fertilizer and found a slight, but statistically significant, decrease in tuber specific gravity when K fertilizer was used, but no difference between sulfate (SO_4) or Cl forms.

From 1997 to 1999, a research project was conducted in Quincy, Washington, in the

Columbia Basin, an area where potato production is quite extensive. This project studied both liquid and granular K fertilizers on potato production, using KCl and K_2SO_4 . The study was conducted on a combination of Russet Burbank and Norkota Russet potatoes.

Other than a zero K control, each year the research plots were fertilized with the K rate recommended based on soil testing. Annual rates ranged from 325 to 400 lb K_2O/A . In-season K fertilization consisted of two equal applications (tuber initiation and early tuber bulking) for the 50 percent in-season treatment and three equal applications (tuber initiation, early tuber bulking, and late tuber bulking) for the 75 percent in-season treatment.

During the three years of this study, the 1998 growing season was extremely hot (**Figure 1**), and tuber specific gravity was low throughout the growing region.

The results of different K fertilizer treatments are shown in **Figure 2**. In all three years of this study, tuber specific gravity was similar whether potatoes were fertilized with KCl or K_2SO_4 .

Moreover, for the duration of this study, K fertilizer did not appreciably reduce specific gravity when compared to the control (no K) treatment.

Potassium (K) fertilizer, particularly potassium chloride (KCl), has been reported to reduce potato tuber specific gravity. The research reported here was conducted over the course of three years, including one growing season associated with very poor potato specific gravity throughout Washington state. Potassium fertilizer was associated with a reduction in tuber specific gravity only when 50 to 75 percent of the fertilizer was applied during the growing season. This occurred in only one of the three years of the study, and it did not matter if the fertilizer was KCl or potassium sulfate (K_2SO_4). Neither source caused a reduction in tuber specific gravity during an extremely hot growing season.

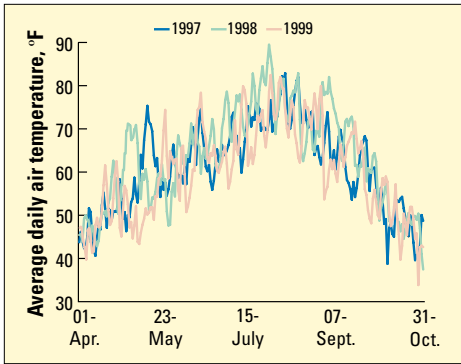


Figure 1. Average daily air temperature in Quincy, Washington, from 1997 to 1999.

In 1999, there was a tendency for slight reduction in tuber specific gravity when some of the K fertilizer was applied in-season (Table 1). This reduction was statistically significant only once with the Cl form. More important than the impact on specific gravity, this research showed that delaying 75 percent of the K application until in-season actually decreased crop yield.

The results of this Washington research do not support the research conducted in the 1970s, but do support the results from later studies. Potassium chloride fertilizer does not adversely affect the potato specific gravity when used according to soil test recommendations. The results do indicate in-season applications of K fertilizers can have an adverse

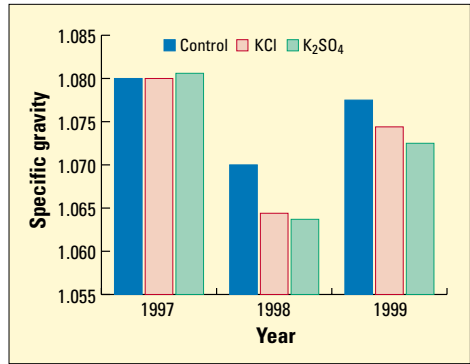


Figure 2. Average potato tuber specific gravity with KCl and K₂SO₄ fertilizers.

effect on tuber specific gravity. In addition, applying 75 percent of the season's K in-season reduced crop yield.

Thus, when soil test values indicate a need for K fertilizer, KCl or K₂SO₄ can be used without adversely affecting tuber specific gravity, regardless of the weather conditions. This research suggests that the best crop yield and tuber specific gravity result when K fertilizer is applied preplant versus applying some of the K during the growing season. **BC**

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Research by Dr. Davenport in Washington state is investigating effects of K fertilizers on specific gravity of potato tubers.

TABLE 1. Average potato tuber specific gravity and yield for different K fertilizer treatments in 1999.

..... Potassium fertilizer				
Source	Form	% applied in-season	Specific gravity	Yield, tons/A
None	N/A	0	1.0775 a	33.80 abc
Sulfate	Granular	0	1.0750 ab	35.09 a
Chloride	Granular	0	1.0775 a	34.44 a
Sulfate	Liquid	0	1.0725 ab	32.64bc
Chloride	Liquid	0	1.0775 a	31.68bc
Sulfate	Liquid	50	1.0750 ab	34.48 a
Chloride	Liquid	50	1.0700 b	31.25 bc
Sulfate	Liquid	75	1.0725 ab	30.73 c
Chloride	Liquid	75	1.0725 ab	27.17 d

Numbers in columns followed by the same letter are not statistically different at P_{0.05}.