Integrated Cranberry Crop Management for Wisconsin

Cranberry Crop Management Newsletter

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GROWER POTASSIUM RESULTS

Cranberry growers want to ensure that fertility is not a limiting factor for achieving the highest possible yields. In the fall of 2005 about fifteen Wisconsin cranberry growers shared some of their data from Stevens beds with the University of Wisconsin-Madison. These data were assembled into a single file and statistical correlations were made between yield and various measures of fertility. Data collected included the county where the marsh was located, data year, year planted, percent organic matter in the soil, estimated cation exchange capacity, years since last sanding, soil pH, soil test P, soil test K, tissue N, tissue P, tissue K, pounds of N applied, pounds of P_2O_5 applied, pounds of K_2O applied, and the number of applications of N, P, and K.

The data shown in Table 1 document that there is great variation in grower practice in the application of potassium fertilizer and there is great variation in the results. Correlations between yield and potassium are not as one might predict. Strong correlations do not necessarily mean cause and effect relationships. Further, the fertilizer correlations are not independent because most growers apply complete N-P-K fertilizers so increases in one element are not independent of increases in others.

Potassium is an important mineral element for all fruit crops. However, growers may be overemphasizing the importance of potassium. In a 400 bbl/a crop only 35 pounds of potassium are removed in the crop. [40,000 lbs x 12.5% dry matter= 5,000 lbs dry matter x 0.7% potassium in fruit = 35 lbs K/a].

Both tissue K and soil test K had a negative relationship with yield, particularly soil test K (Figs 1 & 2). This may be the results of too much K in the soil, but it may also be related to chloride injury if the chloride form of potassium is used or it may simply be a salt effect. Lower yield with high soil test K may also be related to higher clay content of soil or high organic matter soils that may not be well drained or that may be older beds. There was a positive correlation between K fertilizer applied and yield (Fig. 3) However since most fertilizer is applied as a complete N-P-K this may simply be residual effects from N and P. It is impossible to segregate these effects in this dataset.

There was not a significant relationship between soil test K and tissue test K (Fig 4). Thus, increasing soil K did not lead to higher tissue levels. Virtually all samples in this dataset were within the guidelines of 0.4 to 0.7%.

Table 1. Summary statistics for grower data from 'Stevens' beds in Wisconsin. Mean is the average value. Median is the middle number with an equal number of observation above and below. R^2 values describe the variation in yield described by variation in the parameter measured. P values describe the strength of the correlation. Small p values suggest strong correlations. $198 < n < 311$.

Variable	Min	Max	Mean	Median	r^2	p value
Year planted	1965	2001	1992			
Percent organic matter	0.1	10	1.73	1.1	0.043	0.0047
Cation exchange capacity	0.5	17	4	2.5	0.057	0.0012
Years since sanded	0	8	1.2	1	0.013	0.0612
Soil pH	4.1	6.8	5.1	5.0	0.024	0.034
Soil test K	0.2	361	87.6	74.4	0.043	0.0043
Tissue test K	0.07	0.71	0.55	0.55	0.008	0.234
Pounds of K_2O applied	28.5	347	162	168	0.149	0.0001
Number of K_2O applications	1	11	6.9	7	0.104	0.0001
Yield	17	439	233	233		

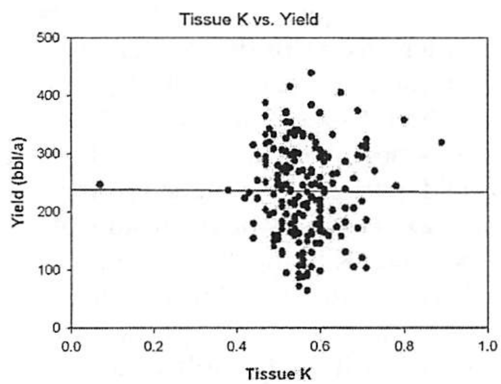

Figure 1. Relationship between tissue K and yield in 'Stevens' cranberries grown in Wisconsin.

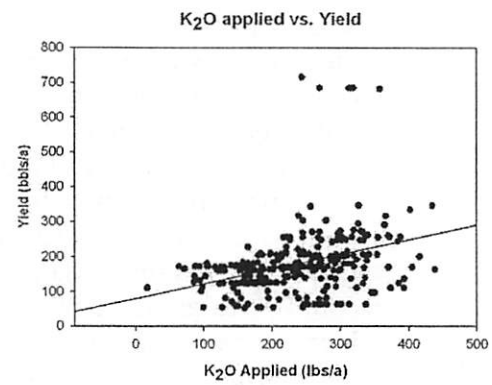

Figure 3. The relationship between the amount of K_2O fertilizer applied and yield in 'Stevens' cranberries in Wisconsin.

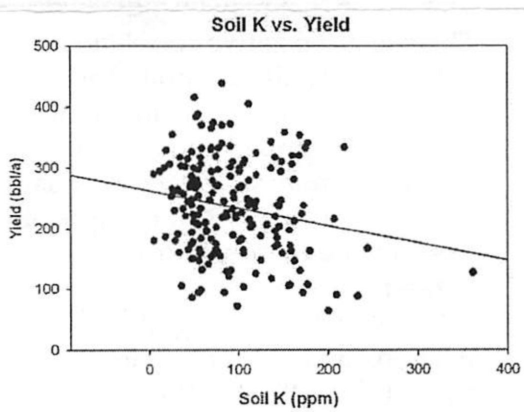

Figure 2. The relationship between soil test K and yield in 'Stevens' cranberries grown in Wisconsin.

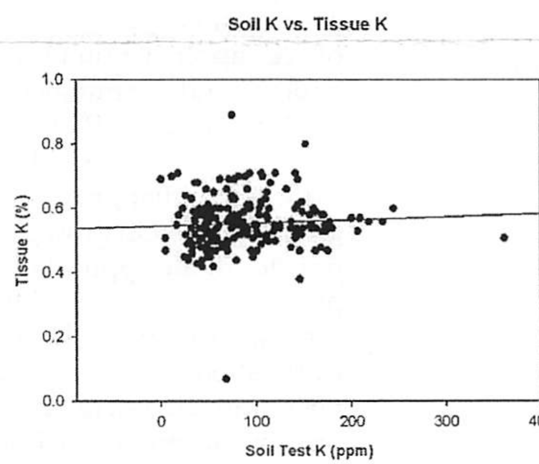

Figure 4. The relationship between soil test K and tissue test K for 'Stevens' cranberries grown in Wisconsin.

If yield is negatively related to increasing soil potassium, perhaps it is useful to consider what affects soil potassium. The amount of potassium fertilizer applied had a positive relationship with soil test potassium, but this was not a strong correlation (Figure 5). The best correlation with soil test potassium was cation exchange capacity (Figure 6). This is not surprising since potassium is a positively charged ion (cation). The other soil factor that correlated well with potassium was percent organic matter in the soil (Figure 7). This suggests very strongly that a large fraction of the ability of soil to retain and exchange cations resides in the organic fraction of cranberry soils (Figure 8).

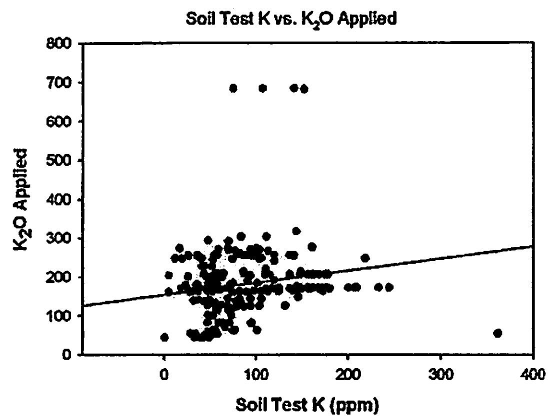

Figure 5. The relationship between applied potassium fertilizer and soil test K for 'Stevens' cranberries grown in Wisconsin.

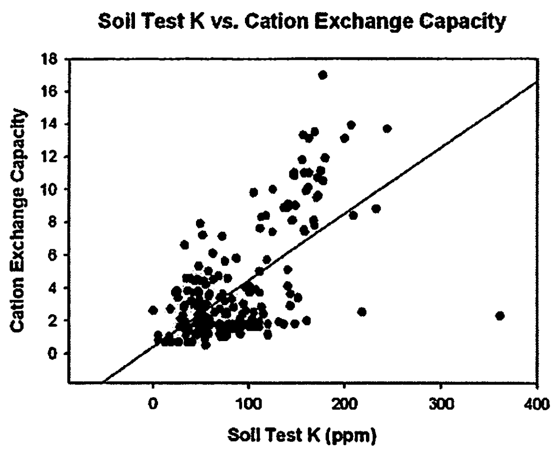

Figure 6. The relationship between estimated cation exchange capacity and soil test potassium in Wisconsin cranberry soils.

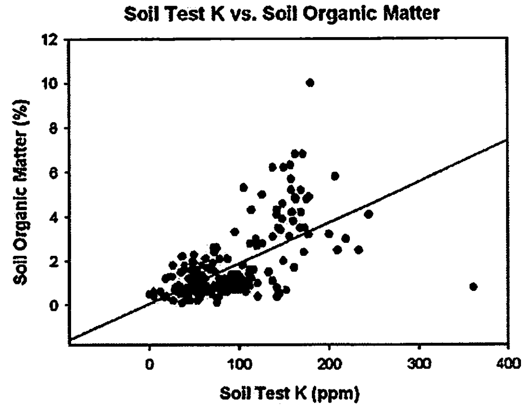

Figure 7. The relationship between soil organic matter and soil test potassium in Wisconsin cranberry soils.

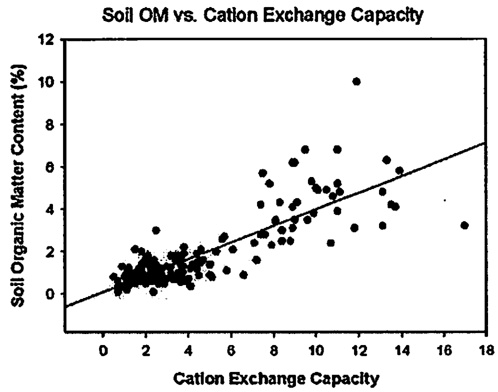

Figure 8. The relationship between soil organic matter content and estimated cation exchange capacity in Wisconsin cranberry soils

From this exercise we learned that as soil and tissue potassium increased that yield decreased. Thus, applying more potassium fertilizer may actually decrease yields. Soil test K was more closely aligned to cation exchange capacity and soil organic matter than to the pounds of K_2O applied. The ability of soil to retain K is more important than the amount of K applied.

One important weakness of the data included in this analysis is that there was no control. None of the data represented beds that had received no fertilizer. Further, virtually all of the samples included in this study were in the sufficient range for N, P, and K. Because all samples were in the sufficient range increases in yield resulting from additional applications of fertilizer are negligible.

Drawing conclusions from the fertilizer application data is troublesome because the data for individual elements are not independent from the other two elements since most growers apply complete products containing N-P-K.

The take home message is that adding K will not necessarily increase tissue K, Soil K or yield. When the ability of a soil to retain K is saturated the remaining K ions will leach below the root zone and are lost.

Teryl Roper, UW-Madison Extension Horticulturist

FERTILIZER SALT INDEX

All common non-organic fertilizers are salts. A salt is simply a combination of a positively charged ion (cation) and a negatively charged ion (anion) creating a compound with no net electrical charge. (Na+ + Cl– à NaCl) Salts generally dissolve into their charged ions quickly when placed in water or when put in a wet environment (like soil). When fertilizers dissolve in the soil they increase the salt concentration of the soil solution. An increase in salt concentration increases the osmotic potential of the soil solution making it more difficult for plants to extract soil water they need to grow.

Common table salt (Sodium chloride) has been used since ancient times to preserve food. Wars have been fought over access to salt. Salt works as a food preservative by drawing moisture away from the food, thus making it impossible for fungi or bacteria to live on it.

When the salt concentration of the soil is too high water can actually be drawn away from the plants. While this might only be fleeting in time, the results can be far reaching. Roots are damaged and the further ability of roots to take up water and nutrients can be compromised.

Salt burn occurs when excessive concentrations of soluble salts come in contact with roots. Salts have a high attraction for water and can draw water out of root tissue causing plant injury and drought like symptoms, particularly on sandy soils. This salt effect could also injure beneficial soil microbes such as mycorrhizae.

The potential for 'fertilizer burn' is determined by the material's salt index. Salt index is a measure of a fertilizers effect on the salt level in the soil solution and is calculated by placing the fertilizer material in soil and measuring the osmotic pressure (suction) of the soil solution. As the salt index increases so does the osmotic pressure. Fertilizers with a high salt index are more likely to injure roots than fertilizers with a low salt index. In general, N and K fertilizers have a higher salt index than P fertilizers.

Table 1 shows the salt index of common fertilizer materials for cranberry. I have also included ordinary road or table salt as a comparison. Sodium chloride has the highest salt index on the list at 154, but potassium chloride is not far behind at 116, which was the highest value of any of the fertilizers. This suggests that potassium chloride has a high potential to cause salt injury. High doses of potassium chloride (muriate of potash) would have a high potential to cause vine injury.

Blended and manufactured fertilizers begin with materials that are on this list and then blend them to the analysis you wish. Sometimes blended fertilizers can be formulated in different ways. If you are concerned about the salt index of the fertilizer you use, ask your fertilizer vendor what base materials were used in their various blends.

Using care in choosing and dosing fertilizer will minimize the opportunity for salt injury to your beds.

Table 1. Salt index of common fertilizer materials used in cranberry production.

Salt	Salt index
Ammonium Sulfate (21-0-0)	69
Calcium sulfate (gypsum)	8
Monoammonium phosphate (11-52-0)	34
Diammonium phosphate	30
Urea (46-0-0)	75
Potassium chloride (0-0-60)	116
Potassium sufate (0-0-50)	46
Triple superphosphate (0-45-0)	10
Sodium chloride (road salt)	154

Sometimes and under some conditions it is possible to escape from many things — from prison walls, from false friends, from bad company, from boring people, from old environments — but never from ourselves. When we lie down at night, we are there with our own thoughts — whether we like them or not. When we wake in the morning, we are still there — whether we like us or not. The most persistent thing in life (and, we have no doubt, in death also) is our own consciousness of ourselves. This being so, there is no more pitiable person than he who is uncomfortable in his own company — no matter where he runs, or how fast, or how far.

Richard L. Evans

All of us could retire nicely, without financial worries in our old age, if we could dispose of our experiences for what they cost us.

Author Unknown

One sure way to make life miserable is to live in a manner that you can't afford.

Author Unknown

ASSAIL INSECTICIDE REGISTERED

United Phosphorus, Inc. (UPI) has announced registration of its Assail® 30SG insecticide for use in cranberry, effective immediately. The active ingredient of Assail is acetamiprid, in the pyridylmethylamine subgroup of the nicotinoid class of insecticides. Acetamiprid is only the second nicotinoid registered on cranberry, imidicloprid being the first.

With this registration, cranberry is labeled along with "strawberries and other low growing berries (within Crop Sub-Group 13-07G)", with a rate of 4.0-6.9 oz. of formulated Assail per acre. Labeled cranberry insects include blueberry spanworm, cranberry fruitworm, flea beetle, and fireworm (suppression). UPI is expected to soon be adding gypsy moth, sparganothis fruitworm, and tipworm to the label at these same rates. No more than two applications may be made per season. Do not apply at an interval less than 7 days. There is a 1 day preharvest interval. The restricted entry interval is 12 hours. Assail may be applied by chemigation. Although Assail is somewhat broad spectrum in activity, it is considered somewhat safer to beneficial natural enemies that are important in an IPM program. Assail is toxic to wildlife, aquatic organisms, and bees.

Assail has been evaluated in our UW small plot trials since 2005 and has shown good efficacy against the fruitworm complex, flea beetle, and tipworm. As with all new products, we will learn more about the effectiveness of Assail now that we have registration and the product can be used on a commercial scale.

Dan Mahr & Jack Perry
UW-Madison, Dept. of Entomology

TERYL ROPER LEAVING UW-MADISON

After 20 years as a faculty member in the Department of Horticulture at the University of Wisconsin-Madison, I have accepted the position as Head of the Plants, Soils, and Climate Department at Utah State University in Logan, Utah. I have greatly enjoyed my work here in Wisconsin. I have especially enjoyed working with Wisc cranberry industry. Howev years of similar work I am loo new challenges and opportunities in my career. This position at Utah State University will allow me to use different skills and to be involved in new activities than in Wisconsin.

Utah State University is the Land-grant college for Utah. The Plants, Soils, and Climate department is an amalgamation of scientists similar to what is found in the Horticulture, Agronomy and Soils departments at UW-Madison. It is a diverse department, but one with great people who are doing quality science.

My wife and I grew up in Utah. We are looking forward to being closer to our families. We have two children who are living in Utah in addition to our extended families. My wife attended her freshman year of college at Utah State. In a sense we are 'going home'. I have B.S. and M.S degrees in Botany from Brigham Young University and a PhD in Horticulture from Washington State University. Thus, I have strong roots and pull to the western U.S.

I will miss my association with colleagues at the University as well as my interaction with growers in Wisconsin. I have come to respect the love that growers have for what they do. Hopefully you will remember some of the work I have done here as I have tried to help growers be more productive and to produce and market a high quality product. Perhaps I'll find reasons to return to Wisconsin on occasion in the future.

Whether my position is refilled or not is up to the Horticulture Department and the College of Agriculture and Life Sciences at UW-Madison. I am cautiously optimistic that the position will be refilled. A younger person will provide much needed energy to re-vitalize fruit Extension and research work in Wisconsin.

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