



ULTRA GRO

All Nutrition is Not Assimilated Equal

Many times as farmers we get so caught up in our hectic day to day that we have to rely on others to help us maximize yields. Whether it's your PCA, CCA, Agronomist or all of the above, it usually becomes a team effort. Maximizing crop nutrition has inspired quite a bit of debate over the years from all of these factions. Deciphering the advice we receive and making our own opinions is critical to keeping our operations efficient and profitable.

Over the years we have turned some of our attention from the essential primary macro nutrients Nitrogen, Phosphorus and Potassium to the secondary macro nutrients, Calcium, Magnesium, and Sulfur. As we get more sophisticated at evaluating these nutrients and their effect on our crops, we have fine-tuned their application timing to maximize uptake. Assessing the Four R's: Right Rate, Right Time, Right Place and Right Source, we may need to take a closer look at how important that source is at affecting yield optimization.

When we look at our potassium options for crop nutrition it can be a bit daunting. Our potassium sources come in the form of Sulfate of Potash (SOP), Potassium Chloride (Muriate), Potassium Hydroxide (KOH), Potassium Thiosulfate (KTS), Potassium Acetate, Potassium Nitrate (KNO₃), and even crude potassium salts such as Sylvinit and Kainit. The question then arises as to which form is best, what is the best timing and how can we measure it?

Are all forms of a specific nutrient the same? The answer is probably no. KNO₃, SOP and KCl are all normally delivered at 46% to 60% as a dry weight percentage of potassium. However, in chasing our plant uptake of K we have to consider the anion (- charge) part of the fertilizer salt we are using. SOP is 45% sulfate. KNO₃ is 13% nitrogen. KCl is 40% Chloride. KTS is 25% K and 17% Sulfur in the form of both Sulfate and elemental Sulfur. We have to consider the effects of the entire salt we are applying, not just the nutrient we are trying to maximize. Many of these salts can be detrimental to plant leaf tissues and roots if applied to soils with high tests or too high of a rate at the wrong time.

Now let's take a look at another critical component, solubility. SOP has historically been applied as a post-harvest application with a dry broadcast on the berms or banded. High quality SOP comes in at 50% potassium by volume but only tests at 7% solubility. A 400 pound application yields 200 pounds of K by volume, but at 7% solubility, only yields 14 pounds of soluble Potassium. Although studies show K is not as mobile as Sodium in the soil, having a single charge and relatively similar molecular size, it will move with soil solution. Applied once in a big slug in the fall brings up the question of how much of that 7% soluble K gets leached in the winter. KTS boasts a 100% solubility and can greatly enhance K uptake. But with the

efficacy of the K with sulfate and sulfur, KTS applied too heavy can easily burn roots. Muriate of Potash is 100% soluble but you're applying 45% chloride to your soil with each application. KOH (potassium hydroxide) by itself is 100% soluble but has a pH of 11, so it's very basic. Without the buffering capacity of an acid, KOH, or caustic potash as its also known, may also burn roots.

That brings us to the question of pH. What effect does acidity or basicity have on nutrient uptake? Our fertilizer companies have become very good at manufacturing cleaner, more efficacious and sustainable nutrients. However, when we look at the labels of many of our nutrient products often we see a range on the pH scale from 6-8. That's a big swing and tough to set up a specific protocol for our mixers. Since pH is a logarithmic measure of hydrogen/hydroxide concentration, a 1 point change in pH is equivalent to 10 times more acidic or basic! This difference can exist even in packaged products and not just improperly mixed bulk deliveries. Looking at the pH scale of nutrient efficacy we see that many of the minor nutrients availability is greatly affected by pH. If it's too low, copper, zinc, boron, and Iron can be out of balance on the high side. When it's too high, it will enable Calcium, Sodium and Magnesium to compete more aggressively with the uptake of Potassium. With many of our fertilizers having a broad range of pH potentials, we also need to be cognizant of how they are being applied. It can be of critical importance when applying nutrients foliarly. Testing your spray tanks and adjusting their pH can ensure you aren't throwing away your money when applying micronutrients to your crops. Make sure you test your source water before, and your spray tank after you have mixed your nutrients. Opening lines at the far end of a run on your drip or sprinkler systems will allow you to measure the pH of your water during a fertigation event. You can then adjust acid systems or water source blending to create a better environment for plant nutrient absorption.

Every year it seems we are facing an environment of more stringent regulatory restrictions to ensure every nutrient we apply to our crops are more readily absorbed. Being more diligent in the source of nutrients we apply with proper timing will help us comply with those restrictions. Just as importantly, working with our crop nutrition experts will ensure our compliance efforts are beneficial and optimize our yields. It is important to lean on your consultants for pre-season nutrient application plans to predict specific budgetary and yield outcomes. Final analysis that measures your outcomes will enable year to year modifications to enhance those results. After applying specific nutrients, calculate their percentages by both weight and solubility. Comparing that with your crops nutrient uptake curves and subsequent tissue testing, you will be able to determine which products are more effective. This will have a positive effect on your return on investment. Being able to apply a specific nutrient at a lower rate and seeing a beneficial response in your crops will make compliance simple. Better crop health and a positive bottom line will ensure that your efforts keep the lifeblood of our economy growing in the right direction.

Richard Kreps, CCA