CRYSTAL GREEN® – THE MOST EFFICIENT GRANULAR PHOSPHATE FERTILIZER

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ABSTRACT

Over 80% of applied conventional phosphate is lost to soil fixation or the environment and leaves crops hungry for nutrients when they need them the most. Not only are crops missing out on proper plant nutrition, but nutrients lost to the environment are responsible for harmful algae blooms. At Ostara, we're fixing this industry challenge by producing Crystal Green (CG) granule phosphate fertilizers. Crystal Green fertilizers provide critical nutrients throughout the growing season to maximize yield and quality while also protecting the environment. By combining concentrated ammonium phosphate with other proprietary ingredients, Crystal Green is produced as a magnesium ammonium phosphate hexahydrate. The result is an industry-leading granular fertilizer that is sparingly water-soluble and eliminates nutrients lost due to soil P tie-up, runoff, and leaching. Nitrogen, phosphate, and magnesium released by Crystal Green are over 90% weak organic acid-soluble and 100% plant available. Unlike conventional phosphate fertilizer sources, Crystal Green will only release nutrients in response to crop demand as plant roots naturally exude organic acids. Due to its unique weak organic acid solubility, Crystal Green can be applied in the fall or spring with the assurance that the fertilizer will be there when crops need it. Research conducted in the U.S. and Canada proves farmers can reduce phosphate application rates by choosing Crystal Green over other phosphate fertilizers and continue to receive positive yields and ROI. When Crystal Green fertilizers are applied, farmers maximize phosphate efficiency and take significant strides to reduce nutrients released into the environment.

INTRODUCTION

Crystal Green is the first commercially available struvite-based fertilizer (5-28-0 with 10% Mg) to harness the power of nutrients as a root-activated phosphate fertilizer. Composed of magnesium ammonium hexahydrate, Crystal Green performs differently than conventional water-soluble phosphate fertilizers because it is only sparingly water-soluble. Crystal Green is the first Root Activated™ nutrient technology that releases in response to weak organic acids such as those produced by growing roots and soil microbes. Crystal Green's mode of action delivers plant-available nitrogen (N), phosphorus (P), and magnesium (Mg) when the plant needs it most. Nutrients released to plant demands mean improved nutrient efficiency, reduced nutrient losses, the potential for greater yields, more uniform growth, and improved quality. Crystal Green excels when it is placed in the root zone because it stays where it is applied. Over a decade of university and third-party field trials and laboratory evaluations prove high-yielding results in a wide range of soil types and crops. It is seed safe, easy to blend, and a proven complement to traditional phosphate fertilizer programs for season-long availability. Crystal Green is the next generation of highly effective sustainable phosphate fertilizer that can reduce the amount of phosphate needed per acre.

Potatoes have a high demand for phosphorus (P) but also have a shallow inefficient root system which often requires high phosphate application rates on acid or calcareous soils. Studies

on the effect of Crystal Green (5-28-5 with 10% Mg) on potato (Solanum tuberosum L) were conducted in 2014 and 2017 by Dr. Byran Hopkins (BYU-Provo).

METHODS

2014 – Russet Burbank potatoes were planted in research plots near Rupert, Idaho May 2014. Plots were 6 rows wide (36-inch width) by 50 feet in length in a randomized complete block design with 5 replications. Phosphate treatments were applied as a broadcast application and incorporated prior to bedding. Phosphate treatments included 1) 0 P control, 2) MAP (11-52-0) at 100 lb. P_2O_5/acre, 3) 38% CG + 62% MAP at 100 lb. P_2O_5/acre, 4) 38% CG + 62% MAP at 75 lb. P_2O_5/acre, and 5) 65% CG + 35% MAP at 75 lb. P_2O_5/acre. Nitrogen was balanced across all treatments. The soil type was a sandy loam with excellent drainage. Thirty-foot row length from the center two rows was mechanically harvested and used to determine yield and quality.

2017 – Russet Burbank potatoes were planted at the Brigham Young University research facility near Provo, Utah on May 14. Phosphate treatments were applied 6 inches below the soil's surface prior to planting. Phosphate treatments included 1) 0 P control, 2) MAP (11-52-0) at 150 lb. P_2O_5/acre, 3) 25% CG + 75% MAP at 150 lb. P_2O_5/acre and 4) 50% CG + 50% MAP at 150 lb. P_2O_5/acre. Nitrogen was balanced across all treatments. Plots were arranged in a randomized complete block design with 5 replications. Plots were 4 rows (30 inch) by 30 ft. in length. Cut potato seed was planted 6 inches below the soil surface. The soil was a sandy loam with a 1% slope, low soil fertility, and excellent drainage. Eighteen-foot row length from the center two rows was hand harvested and used to determine yield and quality.

RESULTS AND DISCUSSION

There was a significant response of Russet Burbank potatoes in 2014 when Crystal Green granular phosphate fertilizer was included as part of the preplant phosphate application (Figure 1). Marketable yields (US#1 + US#2) significantly increased compared to the same phosphate rate as MAP alone. A 25% reduction in P_2O_5 rate (75 lb. P_2O_5) significantly outyielded 100 lb. P_2O_5 as MAP. Treatments containing CG had higher petiole P concentrations than the MAP-only treatment for the first petiole sampling date and treatments containing CG had higher Mg concentrations (data not shown). CG increased the US#1 compared to only MAP and 0 P treatments. There was no difference in internal quality or specific gravities resulting from any of the phosphate treatments.

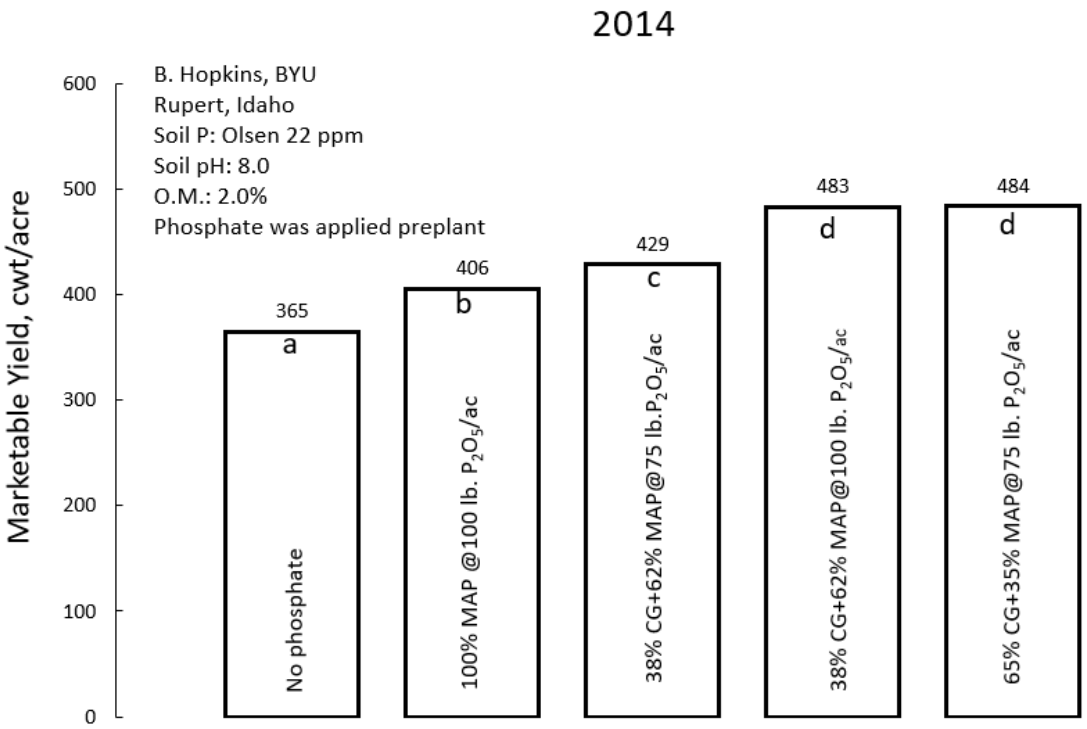

Figure 1. Effect of Crystal Green on Russet Burbank potato production near Rupert, Idaho in 2014

In 2017, phosphate fertilization resulted in greater shoot, root, and tuber biomass. Marketable yield of MAP at 150 lb. P_2O_5 per acre was similar to the untreated control. There was a tendency for potatoes receiving only MAP to have larger tubers with poorer quality. Crystal Green (38%) blended with MAP at 38% and (62%) out yielded 100% MAP applied at the same rate (Figure 2). CG (50%) plus MAP (50%) had the highest numerical yield and greater US#1 tuber yield than all the other treatments. There was no difference in internal quality or specific gravities resulting from any of the phosphate treatments.

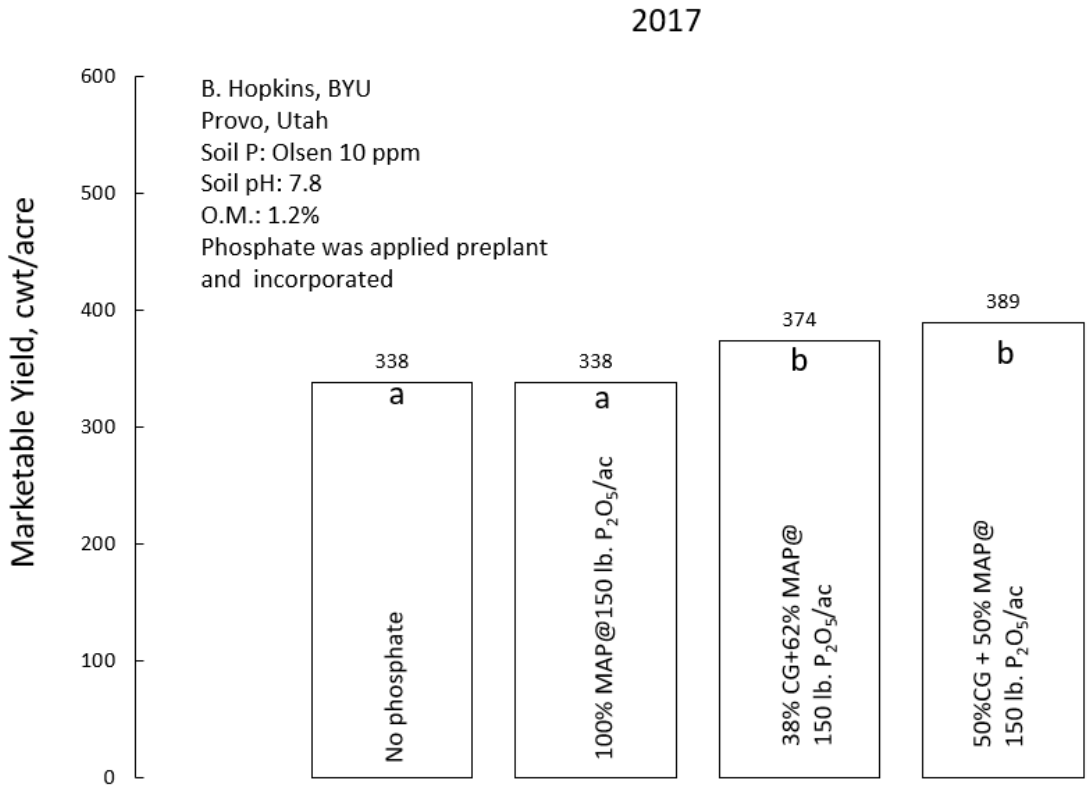

Figure 2. Effect of Crystal Green on Russet Burbank Potato production near Provo, Utah in 2017

CONCLUSIONS

This data along with numerous other research and field trials with Crystal Green granular fertilizer demonstrates that replacing a portion of the water-soluble phosphate with Crystal Green can improve crop yields with Root-Activated™ season-long phosphate uptake.