MHPEC Sulfur Study Report 2019

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Introduction: The Field Variability Study (FVS) has offered insight into the amount of soil sulfur typically seen in Manitoba potato grower fields. In a cursory examination of the data set, 40-60 lbs of sulfur appeared to be the beneficial amount of available soil sulfur, and compromised yields were observed outside of this range. **The goal of this study was to identify the exact range of lbs of soil sulfur needed by row closure and possible products and rates needed to accomplish the task.**

Results: The first year of study in 2019 indicated that sulfur treatments had a significant effect on the amount of available soil sulfur, in lbs, at row closure (P = 0.0277) and late bulking (P = 0.0079). The availability of petiole sulfur at row closure, expressed in the percentage of dry plant matter composed of sulfur, was also significantly impacted by sulfur treatment (P = 0.0002).

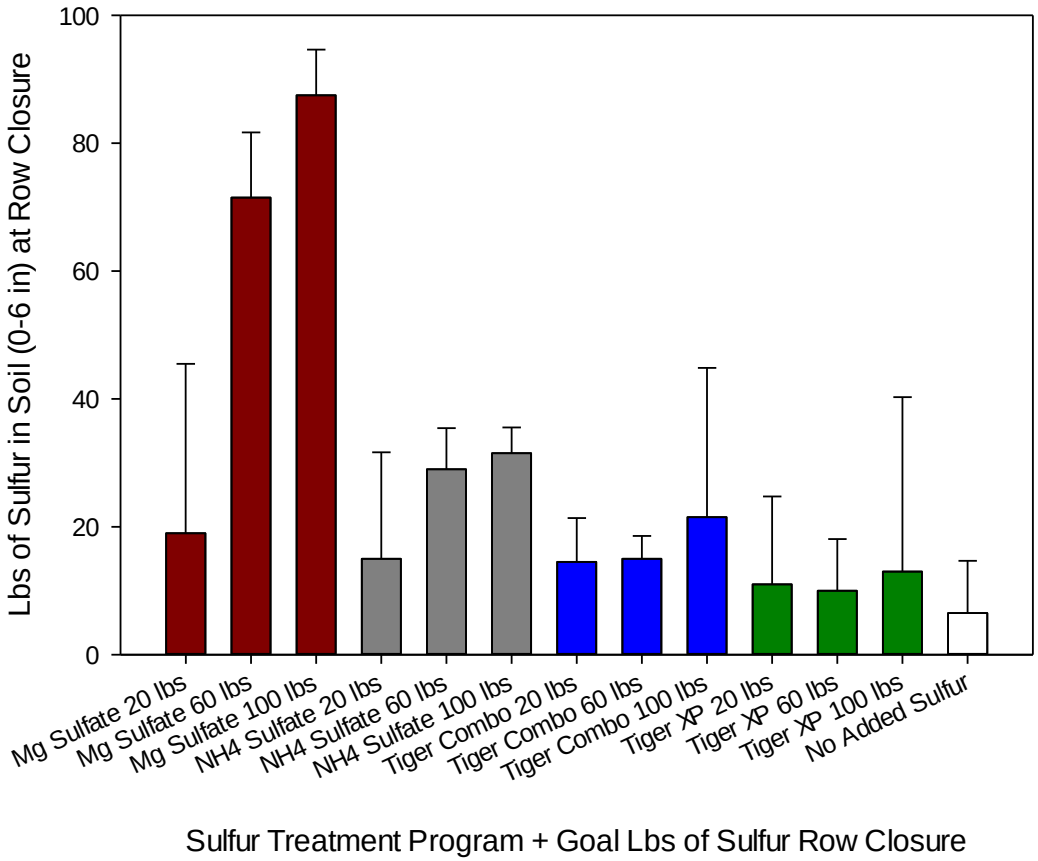

Fig 2. The effect of sulfur treatment program (x-axis) on the availability of soil sulfur (y-axis) at row closure. Bars indicate mean lbs of sulfur and the standard error is above each bar. Mg sulfate signifies magnesium sulfate, while NH4 sulfate stand for ammonium sulfate. All fertilizer rates for each treatment can be found in Table 1 of the full report.

The goal of each treatment, whether 20, 60, or 100 lbs, was to have a standardized amount of sulfur available by row closure in order to evaluate the impact on final yield parameters and compare between fertilizer products. Treatments where 20 lbs of sulfur was intended to be available in the soil were generally very close to the target because the means in Fig 2 are generally close to 20 lbs. However, 60 and 100 lbs of soil sulfur were harder to achieve with the same precision. The 60 and 100 lbs targets for ammonium (NH4) sulfate, Tiger combo, and Tiger XP were less than expected by approximately 20-60 lbs of sulfur at row closure. The exception was observed with the magnesium (Mg) sulfate treatment, where the amount of available sulfur was within 10 lbs of the target by row closure (Fig 2).

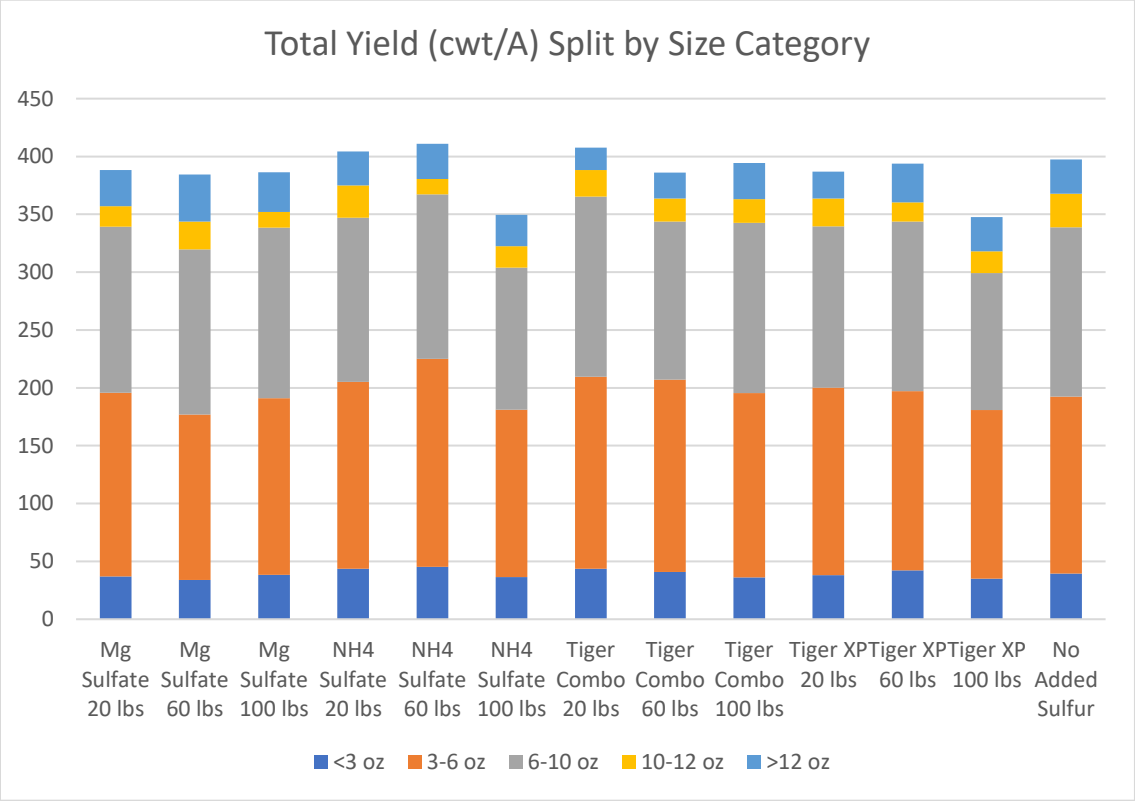

Fig 5. The total yield consisting of the average of the four replicates of each fertilizer treatment with each column separated by the tuber size profile. The tuber size profile also consists of the average of the four replicates within a given treatment.

There was no significant sulfur treatment effect on total yield (P = 0.2184), value (P = 0.3564), or any size profile. More specifically, observed differences in the 3-6 oz yield (P = 0.4908), 6-10 oz yield (P = 0.7179), 10-12 oz yield (P = 0.3162), and greater than 12 oz yield (P = 0.8958) were all not significant (Fig 5). The effect of sulfur treatment on specific gravity trended towards

significance (P = 0.1060, Fig. 6 on full report), which is a notable outcome for a single year of study.

Discussion: The results contained in this report are from a single year of study, indicating all results and trends are preliminary at best. At least two years of study are required for conclusive results. In addition, these results are from small plot studies. Field scale studies with grower partners are required to identify if trends carry over into larger scales and are economically feasible for processing growers to enact on their farms.

The inability to observe the desired rates of available soil sulfur despite correctly applying the theoretical amount of ammonium sulfate, Tiger Combo, and Tiger Xp needed to have 60 and 100 lbs of available soil sulfur by row closure presents a challenge for study. This challenge is a possible explanation why growers also theoretically apply enough sulfur fertilizer, but the data from the field variability study indicates that not enough sulfur is present at row closure; the absence of sulfur then becomes a contributor to variability in the total yield and size profile. **The study will still need to maintain treatments with the same amount of ammonium sulfate, Tiger Combo, and Tiger Xp as originally applied in 2019 to provide concrete conclusions with two years of data. Based on the challenge from this year's results, it is necessary to also introduce new treatments where increasing amounts of ammonium sulfate, Tiger Combo, and Tiger Xp are applied in the attempt to create 60 and 100 lbs of available sulfur in soil by row closure.**

Tiger Combo and Tiger Xp are also designed as slow-release products over several growing seasons. The challenge from the 2019 year of study could be attributed to this intended design. In 2020, it is imperative to sample the same sites from 2019 to determine that these products are indeed releasing sulfur slowly as intended. Likewise, it is imperative to increase the rates of these products in the attempt to successfully achieve the 60 and 100-lb rates to meet the goal of the present study.

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