

Justus Von Liebig & The Law Of The Minimum

In the 19th century, the German scientist, Justus von Liebig, formulated the “Law of the Minimum,” which states that if one of the essential plant nutrients is deficient, plant growth will be poor even when all other essential nutrients are abundant.

The Law of the Minimum takes on added importance when fertilizer prices — especially of N and P₂O₅ products — are high. This may tempt some of your customers to reduce or even eliminate applications of micronutrient or secondary nutrient fertilizers such as K-Mag. But von Liebig’s “Law” tells us clearly that if a soil is deficient in, say magnesium, yields will be depressed regardless of how much N-P-K is applied. So, such a course of action doesn’t make sense at any time, but can be especially ill-considered during periods of elevated prices of N-P-K products.

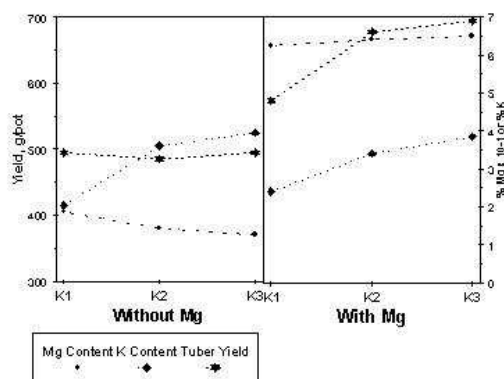
Let’s look at what can happen when a soil is deficient in magnesium and/or sulfur — but the grower elects not to apply these nutrients because he thinks he can better spend his fertilizer dollars for N-P-K products.

Potassium/Magnesium Interaction

Agronomists and plant nutritionists have long been aware of the interaction between these two nutrients. Applications of potash (potassium) fertilizers reduce a plant’s ability to absorb magnesium. The figure below clearly demonstrates the effects of K and Mg fertilizers on a soil that is low in both these nutrients.

Effect Of K And Mg On Yield And Nutrient Content Of Leaves — Potatoes.

When Mg was left out of the fertility program (left side of the graph) there was absolutely no yield response to added potash, because Mg deficiency depressed yields. Only when both these nutrients were applied together were yields increased — a perfect example of the “Law of the Minimum!” If a customer purchased and applied an N-P-K product and got results like those shown on the left side of this graph, he wouldn’t be a satisfied customer — especially if he paid a high price for that fertilizer.



The data in the table below show similar results with respect to the nutrients nitrogen and sulfur.

Effect Of N And S On Yield Of Canola And Barley

| Fertilizer Applied ¹ | Yield (cwt/A) | | | |
|---------------------------------|---------------|--------|--------|--------|
| | Canola | Barley | Canola | Barley |
| None | 2.2 | 13.1 | 3.5 | 15.6 |
| Sulfur | 3.3 | 14.4 | 5.2 | 20.4 |
| Nitrogen | 0.3 | 13.0 | 0.8 | 12.2 |
| Nitrogen plus Sulfur | 17.2 | 39.5 | 16.0 | 35.6 |

¹ N rate = 100 lb/A
S rate = 20 lb/A

On this soil, that was very deficient in sulfur, the application of nitrogen alone produced no yield increase, and especially in the case of canola, even decreased yields. The application of sulfur by itself was also largely ineffective. The results achieved when both these nutrients were applied together is another clear example that the Law of the Minimum works. In these examples, a customer who purchased nitrogen only — and left out sulfur in order to “save” some money — would be a very disappointed customer. If he had to pay a high price for his nitrogen, he’d be downright mad!

The basic truths of profitable fertility practices are just as sound today as they ever have been.

- Lower inputs — such as cutting back on fertilizer rates — can lead to lower yields and profits.
- Optimum fertility helps ensure Maximum **Economic** Yield and lessens the effects of adverse weather, diseases and pests.
- No amount of good seed, chemicals, machinery or cultural practices can profit a farmer if he allows the fertility of his soil to run down.