Nutri-Facts

Agronomic information on nutrients for crops

Nutri-Facts #5

It's a Rule —
Magnesium Is Required by Plants

IT'S A RULE that for proper germination, a bushel of wheat seed needs the amount of oxygen contained in 900 cubic feet of air. Oxygen is required to release chemical energy in seeds. During germination, that bushel of seeds produces the same amount of energy needed by a tractor to plow an acre of land. It's a Rule.

Magnesium (Mg) is required for crops to capture the sun's energy for growth and production. It's a Rule. Magnesium is classified as a secondary nutrient, but it has a major effect on crop and animal production. There are three elements classified as secondary nutrients: sulfur (S), calcium (Ca) and Mg. The amounts of Mg required by crops are usually less than potassium (K) or Ca, but about the same as phosphorus (P) or S. **Table 1** lists uptake of Mg by crops at selected yield levels. Although soils supply varying amounts of Mg naturally, this supply has been depleted in many areas due to continued cropping without Mg fertilization. Growers are now noticing responses to fertilization with Mg.

Table 1. Magnesium uptake of crops at selected yield levels.

Crop	Yield level	Mg taken up in total crop, lb
Alfalfa	10 tons	53
Coastal bermudagrass	10 tons	50
Corn (grain & stubble)	200 bu	65
Cotton (seed & stalks)	1,500 lb	35
Irish potatoes (tubers)	25 tons	50
Rice (grain & straw)	7,000 lb	14
Soybeans	60 bu	27
Onions	30 tons	37
Tomatoes	40 tons	36
Wheat (grain & straw)	80 bu	24

Magnesium activates more enzyme systems than any other nutrient. Most of the Mg in the plant is contained in the sap. Functions include phosphate metabolism, plant respiration and activation of enzyme systems.

It's a Rule — Magnesium in Soils

The Earth's crust contains about 1.9 percent Mg, largely in the form of Mg-containing minerals. Some Mg is made available as minerals are weathered, a slow process. Magnesium can be added to deficient soils by applying Mg-containing fertilizers or dolomitic limestone. Dolomitic limestone contains both Ca and Mg carbonates (for neutralizing value), whereas calcitic limestone contains only Ca carbonate.

Magnesium availability is often related to soil pH. Research has shown that Mg availability to the plant decreases at low pHs and high pHs. On acid, low pH soils (pH below 5.8), excessive hydrogen (H) and aluminum (Al) influence Mg availability and uptake by plants. At high pHs (above 7.4), excessive Ca has an overriding influence on Mg uptake by plants. Other situations also increase needs for supplemental Mg:

- sandy soils with low cation exchange capacity, low Mg supplying power and a high Mg leaching potential;
- application of calcitic limestone on low Mg soils;
- crops with high Mg requirements;
- high application rates of ammonium-N and K;
- soil test levels below 25 to 50 parts per million (ppm). . .50 to 100 lb/A. . .exchangeable Mg.

It's a Rule — Magnesium in Crops

Some plant species have a higher Mg requirement than others: forage legumes and grasses, cotton, oil palm, corn, potatoes, citrus, sugar beets and tobacco need lots of Mg. And some varieties and hybrids of crops such as corn, soybeans, lespedeza, cotton and celery may require more Mg than others.

Rule of Thumb — In most crops, the critical concentration for Mg in dry plant tissue analyses is about 0.2 percent.

Functions and Deficiency Symptoms

Magnesium is taken up by plants as the Mg^{++} cation. It performs many functions in the plant. Most notably, however, it serves as a component of chlorophyll, the pigment responsible for photosynthesis and for the plant's green color. **It's a Rule.**

Since Mg is a mobile nutrient in the plant, it is easily translocated from older tissue to new plant parts. New growth areas of the plant contain the highest Mg concentrations. When a deficiency occurs, the older leaves are affected first:

- loss of color between the leaf veins generally starts at the leaf margins or tips and progresses inward. This gives corn leaves a striped appearance;
- leaves may become brittle and cup or curve upward;
- leaves may be thinner than normal
- tips and edges of leaves may become reddish-purple in cases of severe deficiencies (especially with cotton);
- low leaf Mg can lead to lowered photosynthesis and overall crop stunting.

Solving the Magnesium Deficiency Problem

Use soil tests to evaluate the soil's Mg availability status. Use plant tissue analyses to monitor plants' seasonal uptake and utilization. By considering these tests along with crop uptake, yield and soil management practices, a top-notch Mg fertilization plan can be achieved. Typical Mg recommendations for soil application may call for 10 to 50 lb/A each year.

Magnesium can be soil applied as broadcast or banded fertilizer. It can also be applied broadcast as dolomitic limestone not only to adjust soil pH, but also to supply the crop's Mg needs. **Table 2** shows benefits of dolomitic lime in a soybean study. Small amounts of Mg can be supplied to growing crops through foliar fertilization.

Table 2. Effects of lime source (dolomitic versus calcitic) on soybean yields.

Lime application rate, tons/A	Yield of soybeans, bu/A	
	Calcitic lime (Ca)	Dolomitic lime (Ca + Mg)
1	31	34
1	30	31
4	33	35
Average	31.4	33.4

Alabama

Grass tetany is a condition of cattle grazing on low Mg forages which can cause serious health implications and even death. Sometimes called hypomagnesia, it is associated with low levels of blood serum Mg. Researchers have discovered that even though Mg may be taken up by roots of forage plants, it cannot be translocated to the shoots if the plants are deficient in P. When this occurs, cattle grazing these forages become more tetany prone. Beef and dairy producers can help to avoid possible grass tetany problems with adequate P and Mg fertilization.

Magnesium is required by crops — it's a rule! ■

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