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Use of Magnesium (Mg) for Crop Production in Kentucky

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Magnesium (Mg) is an important element in the nutrition of plants and animals, although it has long been considered a "secondary" nutrient for plants. Nitrogen (N), phosphorus (P), and potassium (K) are "primary" nutrients and are usually given the greatest consideration in crop fertility programs. However, as yield levels have risen, more attention has been directed towards Mg and other nutrient elements. Concern about hypomagnesemia (grass tetany) in ruminants (cattle, sheep) has led to particular concern about soil and plant Mg levels.

Plant Mg Deficiency Symptoms - Magnesium is a component of chlorophyll, the pigment that gives plants their green color and "traps" sunlight for subsequent conversion to the chemical energy used in plant growth. Magnesium deficiency symptoms vary among crop species. Dicots (tobacco, soybeans) enhibit interveinal yellowing of the leaf. In monocots (grasses, small grains, corn) pale yellow regions develop at the base of leaves and yellow strips run towards the leaf tip as the deficiency intensifies. On all crops the older leaves are first to show signs of Mg stress.

Soil Mg Availability - Several soil factors affect the availability of Mg to plants. As soil clay and organic matter contents increase, available Mg also tends to increase. Heavier textured soils may respond less dramatically to Mg fertilization, primarily because both clay and organic matter adsorb added Mg and slow the release of Mg to the soil solution and plant roots. Excessive levels of available soil K may suppress Mg uptake by plants. Magnesium deficiency has often been observed to disappear as the growing season progresses, indicating that as roots move deeper into the soil, adequate quantities of Mg are found. Any factor restricting root proliferation (drought, soil acidity, compact soil structure) may prolong or worsen the deficiency condition.

Crop Response to Mg in Kentucky - Reports of Mg stress have not been numerous in Kentucky. Research on Mg fertilization of Kentucky soils has given mixed results.

Results from some field trials are summarized on the following page:

Year	County	Crop	Mg Added (lbs Mg/A)	Yield	Soil Test Mg(lbs/A)
1969	Greenup	Tobacco	0	2350 lbs/A	91
			56	2260 "	--
1970	Daviess	Soybeans	0	41 bu/A	50
			100	42 "	--
1978	Wolfe	Fescue	0	3000 lbs DM/A	28
			100	2900 "	91
1970	Daviess	Corn	0	121 bu/A	74
			100	121 "	--
1970	Pulaski	Corn	0	98 "	18
			52	104 "	--
1975	Wolfe	Corn	0	192 "	25
			50	209 "	69
1979	Wolfe	Corn	0	175 "	23
			54	178 "	34

These data show little yield response to Mg fertilization, even though most soils tested "low" in available Mg. In 1963, 31 field trials (8 counties) were conducted on Mg fertilization (30 lbs Mg/A) of burley tobacco. Magnesium soil tests ranged from 16 to 372 lbs/A. Only one site responded favorably to Mg application. Based on these and other trials current UK recommendations call for Mg application only when soil test Mg levels fall below 80 lbs/A (neutral N ammonium acetate extraction).

Diagnosis and Correction of Plant Mg Stress - Growers who suspect Mg stress to be a problem in one or more of their fields should consider use of plant analysis as well as soil testing. Observations of crop rooting depth and measurement of subsoil Mg levels could also be useful in making correct diagnoses.

While magnesium sulfate, magnesium oxide, and sulfate of potash magnesia can be used to correct Mg deficiency, liming with dolomitic lime can provide Mg and control soil acidity as well. Also, correction of grass tetany by adding Mg to animal rations is more efficient and economical than correction by Mg fertilization of soils.

Summary - The UK Agronomy Dept. considers available soil Mg in Kentucky to be adequate for maximum crop production. If magnesium deficiency is suspected both plant and soil analyses should be done.