

SUL-PO-MAG[®] AGRI-FACTS

Cotton

Sul-Po-Mag is a naturally occurring mineral (langbeinite) that contains three nutrients essential for the growth of all plants; potassium (21-22% K₂O), magnesium (10.5-11% Mg), and sulfur (21-22% S). These nutrients have each been shown to be very important in the production of high yields of top quality cotton.

POTASSIUM Cotton is considered to be a high K-demanding crop. Increases in vegetative growth at K₂O rates exceeding 650 kg/ha have been verified; and although the goal of fertilizing cotton is to produce maximum economic amounts of lint, rather than total vegetation, these results do give an indication of the very high demand for K by this crop.

Potassium is essential for the processes of photosynthesis and respiration. It is also essential for the translocation of sugars produced by photosynthesis to various organs of the plant where they are used for growth. Cotton has a particularly heavy demand for K during a relatively short time period, at early squaring to early bloom stage. In one experiment it was shown that of the total K uptake, fully one-third was absorbed during a 12-day period, 72-84 days after emergence. To assure adequate K for such a heavy demand, a high level of available soil potassium must be maintained.

MAGNESIUM This nutrient is a component of chlorophyll, the green coloring matter of plants. Chlorophyll is essential for the process of photosynthesis. Many experiments have shown that as the Mg level in plants is decreased, the rate of photosynthesis is likewise decreased, and this causes a slowdown in many different growth processes. Cotton has a relatively high demand for Mg. One reason for this is the fact that cotton is often heavily fertilized with K. There is a strong antagonism between K and Mg for plant absorption. As K application rates rise, it becomes increasingly difficult for plants to absorb Mg. Greenhouse studies have shown the marked extent to which Mg levels in cotton are depressed as K rates increase (Table 1).



Table 1. K/Mg antagonism in cotton. California, USA

ppm in Nutrient Solution		% Mg in Petiole
K	Mg	
1	10	1.2
10	10	0.7
50	10	0.5

It is important to maintain a proper balance between these two nutrients in order to prevent K-induced Mg deficiencies.

Extensive field trials were carried out over a period of 6 years in the largest cotton-producing area in the USA on the Mg requirements of cotton. Numerous yield responses were observed. Very good correlations were observed between Mg soil test levels, leaf Mg levels and expected response to Mg fertilization. These results are summarized in Table 2.

Table 2. Response of cotton to Mg. Mississippi

% Mg Saturation of CEC	Expected response to Mg	Probable leaf Mg (%)
< 3.0	Excellent	< 0.12
3.0 - 4.6	Good	.12 - .21
4.7 - 6.4	Probable	.22 - .30
> 6.4	None	> .30

Percent Mg saturation of the exchange complex was the soil diagnostic procedure that best correlated with yield response. Responses to Mg fertilization occurred when the % Mg saturation of the CEC fell below 6.4.

Severe Mg deficiencies of cotton have been documented in Benin, Africa. In some areas, over 20% of cotton fields sampled were found to be deficient in Mg. The primary visual symptom of the deficiency was a premature reddening of the more mature leaves, 70-80 days after planting. This condition was shown to be intensified by applications of potash. In an associated greenhouse study, seed yield was reduced 46% under conditions of Mg deficiency. Critical Mg levels in petioles was 0.25-0.3%.

SULFUR Sulfur is essential for the synthesis of chlorophyll, so this nutrient also is essential for the process of photosynthesis. Deficiencies of S have been reported in many cotton-growing areas of the United States. Deficiencies are frequently observed early in the growth period, before cotton roots reach subsoil layers, where S accumulations are sometimes found. Field trials have shown responses to as little as 4 kg/ha of S banded in the row at planting. In deep sandy soils, especially after periods of heavy rainfall, S can easily be leached below the rooting zone, and heavier applications are necessary to prevent deficiencies. Typical rates of application under these conditions are 20-30 kg S/ha.

Under conditions of S deficiency, cotton yields can be markedly reduced. In a carefully controlled greenhouse study, vegetative growth of cotton was increased over two-fold by the application of 5.6 - 11.2 kg S/ha (Figure 1). In this study, S applications increased cotton yields to a greater extent than either soybeans or peanuts growing on the same soil.

Sul-Po-Mag application rates:

Sul-Po-Mag is applied at rates sufficient to supply the Mg (and S) requirements of cotton. Additional K is usually required, and this is supplied by muriate of potash (MOP, 60% K₂O). Thus, if soil test results call for 150 kg K₂O and 25 kg Mg, these needs can be met as follows:

230 kg Sul-Po-Mag	=	25 kg Mg + 50 kg K ₂ O
168 kg MOP	=	100 kg K ₂ O
TOTAL	=	25 kg Mg + 150 kg K ₂ O

SUMMARY:

The use of sul-po-mag as part of a well-balanced cotton fertility program provides many benefits:

A highly water-soluble source of mg and s, two nutrients becoming increasingly important for maximum economic yields.

A source of potash in the premium sulfate (non-chloride) form.

Sul-Po-Mag is a neutral salt. it has no effect on soil ph. helps maintain a proper balance between k and mg in plants and soil.