

SUL-PO-MAG[®]

Potassium Magnesium Sulfate

Proper plant nutrition is key to high-yielding, high-quality sugarcane

Not only does sugarcane require large quantities of potash (K₂O), it also requires relatively large amounts of magnesium (Mg) and sulfur (S) for maximum economic yields. All of these nutrients are contained in the naturally-occurring fertilizer material Sul-Po-Mag; 22% K₂O, 11% Mg and 22% S. Sul-Po-Mag is thus an ideal fertilizer material for high-yielding sugarcane.

Why Sugarcane Needs Potash, Magnesium and Sulfur

Potash

A 150 ton sugarcane crop absorbs about 450 kg K. Potassium increases disease resistance and decreases lodging in plants. Potassium deficiency reduces the ability of the plant to utilize water and increases drought stress. Low levels of soil K have been observed to cause erratic germination. Because of the high demand of sugarcane for K, levels of available soil K can be depleted over a relatively short period of time — unless adequate levels of K fertilizer are routinely applied.

Magnesium

A 150 ton sugarcane crop absorbs about 75 kg Mg. Magnesium is present in plants as a component of chlorophyll, the green coloring matter of plants. Chlorophyll is essential for the process of photosynthesis, the process by which plants convert carbon dioxide and water into sugar. So plants that are deficient in Mg have depressed levels of chlorophyll, and the rate of photosynthesis (the production of sugars) is retarded. Both yield and quality are reduced. Numerous laboratory experiments have clearly demonstrated these relationships (Figure 1).

Note that when the leaf Mg level fell below 0.20%, the rate of photosynthesis declined dramatically. This is one very important reason for maintaining adequate levels of Mg in soils and plants.

FIGURE 1. Effect of Mg on Photosynthesis

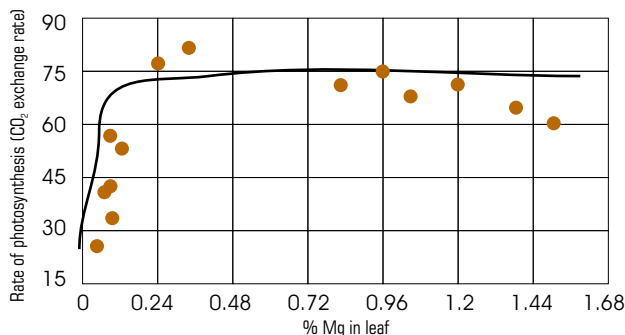
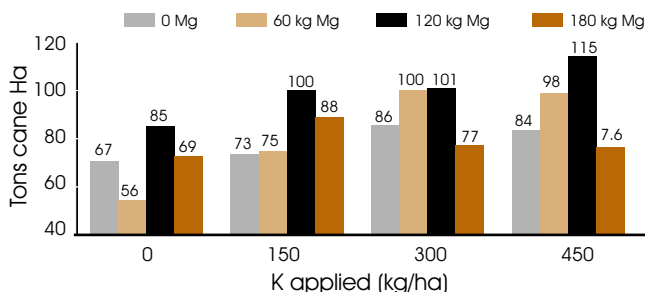


Figure 2. Potassium - Magnesium Teamwork — Philippines



Sugarcane responses to Mg fertilization have been well documented (Figure 2). In this study, applications of Mg increased yields in almost every case except at the highest rate (180 kg/ha). This application rate is too high and may have caused some salt problems. Also, note that response to Mg is greatest at the highest rate of K (450 kg/ha). This demonstrates a very important relationship between K and Mg.

As potash fertilizers are applied to soils, it becomes increasingly difficult for plants to absorb Mg. Since sugarcane is frequently heavily fertilized with K, it is very important to make certain we do not depress Mg absorption to the extent that yields and quality are depressed.

By including Sul-Po-Mag in the fertilizer program, a proper balance between K and Mg can be maintained, and K-induced Mg deficiency is thus avoided.

Sulfur

A 150 ton sugarcane crop absorbs about 65 kg S. Sulfur is a component of several amino acids in plants and is therefore essential for the formation of proteins. Like Mg, sulfur is also essential for the process of photosynthesis, and hence for the production of sugars.

Sul-Po-Mag for High Yields of Sugarcane

Sul-Po-Mag is an excellent fertilizer material to include in a well-balanced sugarcane fertility program. It is a highly water-soluble, plant-available source of potash, magnesium and sulfur. These nutrients begin to dissolve immediately on contact with soil moisture. However, the rate of solution is somewhat slower than that of many other water-soluble fertilizer materials. This property can reduce

possible leaching losses, especially in light-textured, sandy soils. Another beneficial property of Sul-Po-Mag is its very low chloride content (less than 2% chloride). Under some conditions, elevated chloride levels in fertilizers can cause problems. It's recently been reported that chloride may reduce the sugar content of cane. An extensive study in Pakistan showed a very close correlation between chloride levels and sucrose content of stalks. The conclusions drawn from this work were that chloride reduced sugar storage capacity, and also reduced the transport of sugar from leaves to stalks.

Many experiments have recently been conducted in China to study the effects of Sul-Po-Mag fertilization of sugarcane. Some of these trials consisted of just two treatments; a rate of N-P-K with all the K derived from KCl (muriate of potash, 60% K₂O) versus the same rate of N-P-K, but all the K derived from Sul-Po-Mag. In other instances, treatments were included wherein a portion of the K requirement was derived from Sul-Po-Mag and the remainder from KCl. Also, a treatment of N+P was sometimes included to determine the response to K. Typical results are shown in Tables 1 - 4.

Table 1. Response of Sugarcane to K, S, and to Sul-Po-Mag — Guangdong Province

Treatment	Yield	Sugar Content
	(kg/ha)	%
N+P	21,936	14.07
N+P+KCl	27,113	15.33
N+P+KCl+S	30,016	14.50
N+P+KCl+SPM1	44,144	15.83
N+P+KCl+SPM2	37,881	15.73

In Tables 1 and 3, note that there is some reduction in yield at the high Sul-Po-Mag treatment (N+P+Sul-Po-Mag2). This rate of Sul-Po-Mag (1,000 kg Sul-Po-Mag/ha) is too high. This soil required a higher application rate of potash (K₂O) than magnesium (Mg). This is the usual situation that we encounter in sugarcane production. The most efficient way to use Sul-Po-Mag is to supply the Mg requirement with Sul-Po-Mag. The remainder of the K₂O requirement is then supplied by muriate of potash (KCl).

Table 2. Sugarcane response to Sul-Po-Mag — Hunan

Treatment	Yield (kg/ha)
N+P+KCl	73,288
N+P+KCl+SPM	87,101

Table 3. Sugarcane response to Sul-Po-Mag — Hunan

Treatment	Yield (kg/ha)
N+P+KCl	66,109
N+P+SPM1	76,677
N+P+SPM2	67,510

Table 4. Sugarcane response to Sul-Po-Mag — Guangxi

Treatment	Yield (kg/ha)	
	Plot 1	Plot 2
N+P		61,776
N+P+KCl	79,222	79,937
N+P+SPM	110,539	116,259

Rates of N-P₂O₅-K₂O were 225-112-112 kg/ha except for the N-P-Sul-Po-Mag2 treatment, which received a double rate of Sul-Po-Mag (224 kg K₂O).

To summarize, use Sul-Po-Mag in a well-balanced sugarcane fertility program to supply water-soluble magnesium and sulfur, as well as a portion of the potash requirement in the premium, non-chloride form.