

# SUL-PO-MAG<sup>®</sup> AGRI-FACTS

## Vegetables

Progressive vegetable growers everywhere are becoming increasingly aware of the benefits of including Sul-Po-Mag in fertilization programs. This is due, in large part, to the fact that the three essential nutrients in Sul-Po-Mag potassium (K), magnesium (Mg) and sulfur (S) can increase the yield of vegetables and often have considerable beneficial effects on crop quality.



### Potassium

Vegetables in general have a high requirement for K. Table 1 gives the amount of K<sub>2</sub>O absorbed for several vegetable crops.

**Table 1. K<sub>2</sub>O Absorption by Several Vegetable Crops**

Crop	Yield MT/Ha	K <sub>2</sub> O Uptake Kg/Ha
Potatoes	56.5	612
Cabbage	78.5	279
Lettuce	44.8	207
Table Beets	56.5	650
Tomatoes	67.3	377
Onions	67.3	179

Many experiments have shown the dual effects of K fertilization on yield and quality of vegetables. Table 2 shows the effects of K applications at three nitrogen levels on the total and marketable yield of tomatoes.

**Table 2. K Affects Total and Marketable Yields of Tomatoes**

K <sub>2</sub> O Kg/Ha	N, Kg/Ha		
	134	202	269
	Yield, MT/Ha and (% marketable)		
0	15.9 (41)	16.8 (56)	20.8 (55)
336, preplant	33.8 (71)	34.8 (76)	36.3 (77)
168, preplant	39.4 (80)	46.6 (85)	59.9 (85)
+ 168, sidedressed			

Both total yield and, especially, marketable yield were substantially increased with combinations of N and K. Also, note that nitrogen had only a minor effect on yield unless K was also applied.

Table 3 shows that heavy applications of K had a marked effect on several quality factors of two tomato cultivars.

**Table 3. Effect of K Applications on Tomato Fruit Quality**

Cultivar	K applied (Kg/Ha)		
	392	785	1569
	Uneven ripening %		
1	18.1	5.1	1.4
2	29.5	9.3	3.1
	Irregularly-shaped fruit %		
1	17	11	9
2	22	14	11
	Hollow fruit %		
1	56	23	10
2	32	14	9

### Magnesium

The high K demand of most vegetables emphasizes the special importance of maintaining adequate levels of Mg in tissues of these crops because application of K fertilizers reduces plant absorption of Mg. On soils low in Mg content, applications of K fertilizers can induce a deficiency of Mg, unless Mg is also applied. Table 4 shows how increasing levels of K fertilizer increased K content of potato leaves, but markedly reduced Mg levels.

**Table 4. Effect of Increasing Levels of K on nutrient Content of Potato Leaves<sup>†</sup>**

K <sub>2</sub> O applied Kg/Ha <sup>**</sup>	Petiole analysis	
	% K	% Mg
0	4.6	0.63
168	7.5	0.34
280	8.4	0.25
560	9.0	0.20
1121	9.0	0.21

<sup>†</sup> Values averaged over 4 years data.

<sup>\*\*</sup> All plots received 224 kg N and 168 kg P<sub>2</sub>O<sub>5</sub>/ha.

Magnesium fertilization has been found to have the following effects on the quality of potatoes:

- Increased protein content**
- Reduced internal discoloration**
- Increased firmness**

Under carefully controlled greenhouse conditions, Mg was shown to have a marked beneficial effect on early maturity and length of blossoming period of canning peas. Under high Mg levels, plants matured earlier, and the length of the blossoming period was reduced (the shorter the blossoming period, the more uniform is the harvested crop).

Tomatoes have a relatively high requirement for Mg. Deficiencies frequently occur on light-textured sands, under acid conditions. Table 5 illustrates yield response of tomatoes to Mg at two pH levels. Note that responses occurred even when tissue Mg levels were 0.31 - 0.33% Mg.

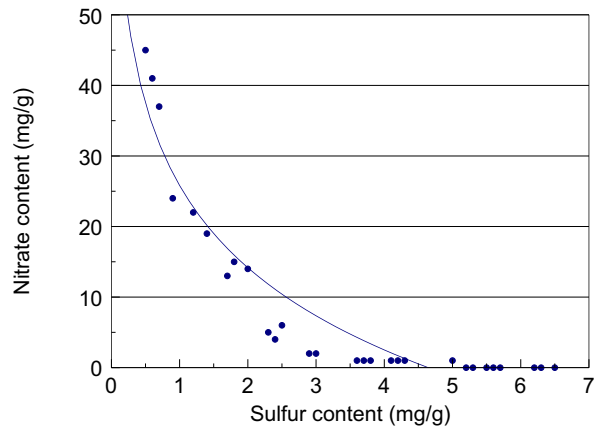
**Table 5. Tomatoes Respond to Mg**

Soil pH	Mg Rate (Kg/Ha)	% Mg in leaf	Yield MT/Ha
4.9	0	0.33	32.3
	56	0.45	37.7
	121	0.54	39.0
	168	0.66	41.5
5.5	0	0.31	36.7
	56	0.41	45.5
	121	0.51	51.3
	168	0.60	49.1

### Sulfur

This element is a component of several of the amino acids that are the “building blocks” of proteins. For this reason, S is essential for the formation of proteins in all plants. Under conditions of S deficiency, plants simply cannot manufacture sufficient amounts of proteins and this, in turn, means that nitrogen (N) can accumulate in plant tissues in non-protein forms such as nitrate (NO<sub>3</sub>). Elevated levels of NO<sub>3</sub> can be toxic to animals and humans. Figure 1 shows the effects of S deficiency on the nitrate content of lettuce. This effect of S deficiency on nitrate levels is particularly severe under high N fertilization rates. Since vegetables are often heavily fertilized with N, this relationship between S and N assumes great importance.

Figure 1. Effects of sulfur on nitrate content of lettuce leaves.



Aside from its obvious effect on protein content, S affects the quality of vegetables in many additional ways.

- The symptoms of S deficiency adversely affect the appearance of plants, and this is especially true with respect to green, leafy vegetables. Sulfur deficient leaves are not only pale green in color, but are also noticeably more stiff to the touch.
- Proper S nutrition increases resistance to pests and diseases.
- Certain S-containing compounds are directly responsible for the unique flavor of many vegetables. The flavor of asparagus is due to a particular S compound. Allin and cycloallin are two S compounds that have a beneficial effect on the flavor and medical effectiveness of onion and garlic. The “hot” flavor of mustard and horseradish is due to a class of S-containing compounds called glucosinolates.
- Sulfur is essential for the formation of the vitamins biotin, thiamine, glutathione and vitamin B<sub>1</sub>.

**Sul-Po-Mag a “low chloride” fertilizer:** Sul-Po-Mag is essentially a chloride free fertilizer, typically containing less than 1.5% Cl. This can be advantageous under certain conditions, especially when fertilizers are applied in the row, close to germinating seeds. Since vegetables are often fertilized in this manner, the low Cl content of Sul-Po-Mag can be very important.

So, no matter how you look at it, Sul-Po-Mag can play a very important — and beneficial — role in vegetable fertility programs. When used as part of a complete, well-balanced fertility program, Sul-Po-Mag can help assure not only maximum economic yields, but high quality vegetables as well.