K-Mag® Insight

BANANA



Higher Yields are Available With K-Mag® Fertilizer

The K-Mag Advantage

Provides a natural combination of Potassium (K), Magnesium (Mg), and Sulfur (S) - all in a single granule.

FEATURES

- 3-in-1 nutrient source
- Low chloride
- Water solubility
- pH neutral

BENEFIT

- Higher yield and profitability

Why K-Mag?

The shortage of just one essential nutrient can shortchange tree fruit yields and quality. Growers can optimize yields and maximize profits by providing a balanced soil fertility program that ensures all 17 essential nutrients are available to plants.

K-Mag fertilizer provides three essential nutrients in a highly available and soluble form. Available in PREMIUM, GRANULAR and STANDARD grades, K-Mag provides 21–22% potassium (K_2 O),10.5–11% magnesium (Mg) and 21–22% sulfur (S).

Also known as langbeinite or potassium magnesium sulfate, K-Mag is sourced from ore beds deep beneath the earth's surface, where an isolated lake of ocean water once existed. Langbeinite is an evaporite mineral but becomes soluble upon soil application.

Increasing Banana Yields

In Eastern legends, the banana symbolizes fertility and is known as the tree of "good and evil." The banana is a tropical fruit with a thick skin and fleshy pulp, white or slightly yellowish in color, and when ripe, it has a mild and delicate taste and aroma. For every 100 grams, the fruit provides about 90 calories, 396 mg of potassium (K), and 29 mg of magnesium (Mg). It is rich in sugars, folic acid, vitamin C, and fiber; it also contains proteins, fats, iron, beta-carotene, vitamins B and E, and has a low sodium content.

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K-Mag is a natural fertilizer derived from the mineral called Langbeinite; it provides potassium (22% K_2O), magnesium (11% Mg), and sulfur (22% S), nutrients that are exported in large amounts by banana cultivation and are positively correlated with high yields and good quality.

Potassium (K)

Banana is perhaps the crop with the highest demand for K. It is estimated that a crop yielding 60 tons per hectare exports approximately 395 kg of K_2O. For this reason, any deficiency of K will have a strong negative effect on production. Some other consequences[1] of low K supply include: delayed flowering and reduction in the number of bunches, in the number of hands per bunch, and in fruit size. Field studies have shown that low K supply reduces production by up to 35%. K also has a considerable[2,3] effect on banana tolerance to pests and on fruit quality. Optimal K nutrition increases[4] the amount of soluble solids, Vitamin C content, fruit color, peel lifespan after harvest, and resistance to Sigatoka sp.

Magnesium (Mg)

This nutrient is the central atom of the chlorophyll molecule, which is the pigment that gives plants their green color. Therefore, Mg is essential for photosynthesis, the process by which plants convert carbon dioxide and water into simple sugars. Various experiments have shown that as the Mg content in plant tissues decreases, the rate of photosynthesis also decreases.

Banana has a high demand for Mg. It is estimated that a crop yielding 60 tons per hectare exports approximately 21 kg of Mg[1]. It is important to highlight that technologically managed banana crops traditionally receive high applications of K, which can cause an imbalance of exchangeable bases within the cation exchange complex, making Mg absorption more difficult[5]. In soils with contents in marginal Mg conditions, K applications can induce Mg deficiency, which, of course, significantly reduces fertilizer efficiency and yield[6].

Table 1 presents the results of a greenhouse study showing that, as the K dose increases, the levels of Mg absorbed in different parts of the banana plant decrease. Under high productivity conditions, it is important to maintain the proper balance between K and Mg[7], both in the soil and in the plant. Researchers have shown that the Mg/K ratio in the soil is a determinant in crop nutrition; the optimal range for this ratio is estimated to be between 6:1 and 15:1. With values lower than these, Mg deficiency symptoms may be observed.

Additionally, field research (Table 2) demonstrates that even when adequate N-P-K doses are supplied, when Mg was omitted from the nutrition program, the yield was reduced to 52% of the total yield obtained when all four nutrients were applied[8,9].

Table 1. Effect of increasing potassium dose on absorption of magnesium in different parts of the banana plant.

Magnesium concentration %	Potassium dose (ppm)		
	12	24	120
Roots	0.32	0.28	0.28
Corm	0.38	0.40	0.22
Stem (Pseudo-tallo)	0.70	0.39	0.28
3rd Leaf	0.45	0.41	0.31
Spine	0.23	0.13	0.10
Fruit	0.22	0.18	0.18

Table 2. Effect of the omission of nitrogen, phosphorus, potassium, and magnesium on relative banana yield.

Treatment				Relative Performance %
N	P_2O_5	K_2O	Mg	
kg ha^{-1}				
224	224	448	112	100
0	224	448	112	60
224	0	448	112	42
224	224	0	112	68
224	224	448	0	52

Sulfur (S)

Reports of sulfur (S) deficiencies in crops are becoming increasingly common every day. S is a component of several amino acids, which in turn are essential for protein formation. S deficiency is observed in the younger leaves of the plant, which turn pale green and even yellow. In the fruit, S deficiency is associated with a higher incidence of yellow pulp and with stalk rot. In mature fruits, this nutritional deficiency manifests as brownish-yellow coloring. On the other hand, adequate S nutrition is reflected in fruits with excellent appearance, bright yellow color at maturity, and greater post-harvest longevity.

Benefits of K-Mag in banana nutrition programs

K-Mag, used as part of a balanced nutrition program, helps to increase banana yield and quality. K-Mag should be included to meet Mg and S requirements. However, to meet the demand for K, it is necessary to supplement the potassium applied in the form of K-Mag with potassium chloride (KCl, 60% K_2O). For example, if the fertilization recommendation determines that 30 kg of Mg and 400 kg of K_2O are needed, these requirements can be supplied as follows:

Commercial Product	Commercial product dose	Nutrient supply		
		K_2O	Mg	S
	kg ha^1	kg ha^1		
K-Mag	275	60	30	60
MOP (KCl)	567	340	0	0
TOTAL		**400**	**30**	**60**

Ensure your banana crop has all the nutrients it needs to thrive. Contact us today for information on how to add K-Mag to your balanced soil fertility program.

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1-877-BUY-KMAG (1-877-289-5624)

*References: **1** Medina, L. 2010. Nutrient uptake curves in an established banana plantation (Musa AAA), cv Williams. In: Conference proceedings: ACORBAT 2010. Medellín-Colombia. **2** Lehav, E. 1972. Effect of different amounts of potassium on growth of the banana. Trop. Agric. Trin. 49: 321-325. **3** Khalid, A, and Rashid, A. 2009. Effect of NPK fertilizer on growth and yield of banana in Northern Oman. Journal of Horticulture and Forestry. Vol: 1 (8): 160-167. **4** Teixeira; L.A.J, Natale, W and Ruggiero, C. 2000. Nitrogen and Potassium fertilization of 'nanicao' banana (Musa AAA Cavendish subgroup) under irrigated and non-irrigated conditions. **5** López, A and Espinosa, J. 1995. Manual of banana nutrition and fertilization. Edited by: International Plant Nutrition Institute, Ecuador and CORBANA, Costa Rica. 86 pp. **6** Tijerino, J.M. and Bizonhin, C. 2002. Precision agriculture in Banana (Musa AAA); a tool for making correct decisions. Undergraduate Thesis: Agronomist Engineer. Earth University. Guacimo: Costa Rica. 61 p. **7** López, A. 1991. Response of banana crop (Musa AAA) Cavendish subgroup, Valery clone, to calcium and magnesium fertilization. In: Annual Report National Banana Corporation. S.A. San Jose, Costa Rica. p 52-54. **8** López, A and Solís, P. 1992. Nutrient contents and interactions in three banana-growing areas of Costa Rica. CORBANA (C.R.). 15 (36): 25-32. **9** López, C. 1983. Diagnosis of the nutritional status of banana plantations. ASBANA. 6 (19): 13-16.*

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