Nutri-Facts

Agronomic information on nutrients for crops

Nutri-Facts #6

It's Well Known —
Calcium Is Required by Plants

DON'T LET your calcium (Ca) guard down. This low-key essential nutrient carries a heavy load in plant growth. Too often, however, it takes a back seat as soil fertility programs are developed for many high yield and high quality crops. There are some exceptions. Peanut and tomato growers, for example, emphasize good Ca nutrition. Do they know something about Ca that others do not? The answer comes with a better understanding of Ca contributions to soil fertility and to crops under intensive management or stress.

Functions of Calcium in Soil

Calcium contributes to the formation of a fertile soil in the following ways:

- Calcium replaces hydrogen (H) from the surface of soil particles when limestone is added to reduce soil acidity.
- Calcium is essential for microorganisms as they turn crop residues into organic matter, release nutrients, and improve structure and water holding capacity of soils.
- Calcium helps Rhizobium bacteria do a better job of fixing atmospheric nitrogen (N) into forms leguminous plants can use.
- Calcium improves the absorption of other nutrients by roots and their translocation within the plant.

> A good liming program is the best supplier of Ca to most crops.

Functions of Calcium in Plants

Calcium is vital to several plant functions, including:

- Calcium helps to convert nitrate N (NO_3N) into forms needed for protein formation.
- Calcium activates a number of plant growth regulating enzyme systems.
- Calcium is needed for cell wall formation and normal cell division.
- Calcium, along with magnesium (Mg) and potassium (K), helps to neutralize organic acids in the plant.
- Calcium contributes to improved disease resistance.

How Much Calcium Do Plants Absorb?

The total amount of Ca in a plant is not a good indicator of its importance. Alfalfa contains only 22 lb of Ca per ton, peanuts about 10 lb, and tomatoes even less. Yet, Ca is vital to the production of high yield and quality forage, fruit and vegetables. Calcium, sulfur (S) and Mg are considered as secondary nutrients. **Table 1,** above, lists the content of these nutrients in various crops.

Table 1. Calcium, Mg and S content of crops.

Crop	Yield level	Total pounds taken up		
		Ca	Mg	S
Alfalfa	8 tons	175	40	40
Bermudagrass	8 tons	52	26	44
Corn	160 bu	39	52	27
Cotton	1,000 lb lint	30	23	20
Peanuts	4,000 lb	20	25	21
Soybeans	60 bu	26	24	20
Tomatoes	40 tons	30	36	54
Wheat	60 bu	16	18	15
Onions	20 tons	4	58	33

Avoid Calcium Deficiency Problems

Calcium availability is adequate for most crops when soils are limed to properly adjust soil acidity. As soils become more acidic, crop growth is often restricted by toxic soil concentrations of aluminum (Al), manganese (Mn) and/or iron (Fe), not a Ca shortage. Soil testing and a good liming program are the best management practices (BMPs) to prevent these problems.

In the real world, Ca deficiencies do exist, and they need to be avoided or

corrected. Watch for any one or more of the following symptoms:

- Slow root development. Roots often develop a dark color and in severe cases the growing point will die.
- New leaf growth slows and gelatinous leaf tips develop. Remember, Ca does not translocate in the plant so deficiency symptoms will appear on new growth.
- Poor nodulation on legumes. Ineffective nodules are grayish green inside ... healthy nodules are pink in color.
- Blossom end rot on tomatoes. Calcium and proper water management improve plant resistance to this disease.
- Aborted or shriveled fruit on peanuts. A shortage of Ca at pegging results in a high percentage of "pops".
- Darkened plumule or "black heart" in peanut seed. This abnormality is caused by a shortage of Ca. It reduces yield, quality and crop value.
- Pod rot diseases on peanuts. Pods are predisposed to fungus infections when Ca is deficient or out of balance with Mg and K. Research shows lower pod rot with a higher content of surface soil calcium.

Calcium deficiencies are most likely to occur on acid, sandy soils from which available Ca has been leached by rain or irrigation water and on strongly acid peat and muck soils where total soil Ca is low. High exchangeable soil sodium (Na) may depress plant uptake of Ca.

Pick the Right Source of Calcium

A good liming program is an efficient supplier of Ca to most crops. High quality calcitic limestone is effective when pH adjustments are needed. If Mg is deficient, dolomitic limestone would be the preferred source. Gypsum (calcium sulfate) provides Ca when soil pH is adequate. Some common sources of Ca are listed in **Table 2.**

Table 2. Common Ca sources

Liming material	Ca, %	Acid neutralizing value[1]
Gypsum	22	None
Basic slag	29	50-70
Calcium limestone	32	85-100
Dolomitic limestone	22	95-108
Hydrated lime	46	120-135

[1]Pure calcium carbonate = 100.

BMPs for Calcium and Plant Nutrition

The following BMPs can help to improve plant nutrition and insure that Ca does not become a limiting factor for optimum crop yield, quality and profitability.

- Soil test on a regular schedule.
- Correct soil acidity. Calcium in limestone can provide the nutritional needs of most crops.
- Balance the plant nutrition program. Calcium, Mg and K are competitive for root absorption sites. A shortage of one can be antagonized by an abundance of the others.
- Apply Ca for specific plant functions. Calcium applied when peanuts begin setting pods helps to improve seed development.
- Improve plant disease resistance. Team Ca with other BMPs to minimize crop stress and improve tolerance to disease.
- Build soil productivity. Fertile soils are not always productive, but productive soils are always fertile.

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Ca is required by crops. ■

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