



## Calcium for Healthy Plant Growth

By Haiying Tao, UConn Home & Garden Education Center

Calcium is an essential nutrient in plants. Why is it? Well, calcium is directly involved in the nutrition and metabolic pathway of the plant. There is no other nutrient that can completely substitute for it, and ultimately, the plant can't complete its life cycle without it. Calcium concentrations in plants average from 0.1 to more than 5% by dry weight depending on the plant species, calcium availability in the soil, and calcium uptake by plants.

Calcium serves multiple important functions in plants. It is a structural component of cell walls and membranes so calcium deficiency can lead to loss of cell contents. It enhances plant uptake of nitrogen, so its sufficiency level impacts nitrogen metabolisms like the formation of proteins. It helps plant regulates nutrient uptake, so for example, plants are able to take up much more potassium than sodium (which is not an essential nutrient for plants) under adequate calcium supply, but they will take up more sodium when there is an insufficient calcium supply.

Another important function of calcium in plants is its essential role for cell elongation and division. This is why deficiency of calcium can result in poor development of terminal buds of shoots and apical tips of roots that can cause plants to exhibit curled and dead patches in the young leaves, as well as misshapen fruit and assorted buds. Some commonly seen symptoms of calcium deficiency in the gardens are blossom end rot in peppers and tomatoes, bitter pit in apples, internal brown spot in potatoes, black heart in peanuts and celery, tip burn in lettuce, cavity spot in carrots. The plants that have smaller root systems are more likely to have calcium deficiency problems.

Symptoms of calcium deficiency first appear on the younger leaves and active growing tissues like root tips and terminal buds of shoots. The newest young leaves are small and misshapen with chlorotic curling tips, as well as dead patches. Leaves also may be crinkled and torn. Veins on calcium deficient plants are also brown. Calcium deficiency is most likely to occur in acid soils and sandy soils.

Calcium is one of the most important nutrients in the management of plant diseases. Amending soils that are low in calcium and pH with limestone can be helpful in suppressing cavity spot disease of carrots mainly due to increased pH as a result of liming. In tomato plants, fusarium wilt incidence can be reduced with application of limestone and the application of a calcium salt, like calcium chloride or calcium nitrate, can help suppress powdery mildew, bacterial canker, and bacterial wilt on tomato plants. Application of calcium chloride can also reduce incidence and severity of pear fire blight and brown spot as well as bitter rot in apples.



*Blossom end rot on tomatoes. Photo by dmp2023*

Calcium is taken up by plants from the soil by their roots. So, sufficient calcium supply in the soil during the growing season is important. However, there are other soil properties that impact the availability and uptake of calcium. For example, calcium is most available when soil pH is above 6.0 and becomes much lower when pH is below 5.5. Sufficient water availability is especially important for calcium uptake by plants, and this is one of the reasons that you might see blossom end-rot of tomatoes and peppers even if your soil test shows that your soil has optimal amounts of calcium. How you fertilize your soil can also impact calcium uptake. For example, the calcium uptake by your plants can be reduced if you apply too much potassium, magnesium, manganese, or ammonium fertilizers.

Primary sources of calcium are liming materials such as calcitic and dolomitic limestone. Calcium-containing fertilizers like calcium chloride and calcium nitrate are also commonly used in commercial horticultural operations. Rock phosphate does contain substantial amounts of calcium, but its availability is low unless it applied at high rates to acid tropical soils. Animal manure contains 2-5% calcium by dry weight and can be an excellent source of calcium. Some phosphorus fertilizers such as triple superphosphate contain calcium as well.

This is still a great time to have your soil tested for pH and plant nutrients. If needed limestone can be applied any time the soil isn't frozen. Since it takes 6 to 18 months to work, it makes sense to put any recommended limestone down sooner rather than later. Check out the UConn Soil Nutrient Analysis Lab at [www.soiltesting.cahnr.uconn.edu](http://www.soiltesting.cahnr.uconn.edu).

For questions on soil testing or if you have any other gardening questions, contact the UConn Home & Garden Education at (877) 486-6271 or [www.homegarden.cahnr.uconn.edu](http://www.homegarden.cahnr.uconn.edu) or your local Cooperative Extension Center. Dr. Tao is a soil fertility specialist and Assistant Professor in the Dept. of Plant Science & Landscape Architecture.