

CALCIUM

Fertilization and Potatoes

D. Gunter - Agricultural Advisor, Kynoch Fertilizers (Pty) Ltd Calcium sources

A wide variety of calcium containing fertilizers are available but for the purpose of this article only the two most important will be discussed i.e. Calcium Nitrate and Phosphogypsum.

Calcium Nitrate

Calcium nitrate is a white granular free-flowing fertilizer. Its unique combination of nitrate nitrogen and fully water-soluble calcium offers many properties and advantages not found in other fertilizers. Calcium nitrate contains 15.5% nitrogen and 19% water-soluble calcium.

Calcium nitrate gives a fast growth response because:

- The granules dissolve very quickly.
- Nitrate-N is readily available to plants.

Phosphogypsum

Phosphogypsum is a by-product from the manufacture of superphosphate. Gypsum is a highly effective and cheap source of the plant nutrients calcium and sulphur. A general analysis of phosphogypsum is $\pm 20\%$ Ca, $\pm 16\%$ S and $0,2-1,0\%$ P. Other advantages of phosphogypsum are:

- It improves soil structure.
- It prevents soil capping.
- It improves water infiltration.



This photograph shows typical hollow heart symptoms.

Calcium benefits

Calcium is different from other macro-nutrients in that a high proportion of the total calcium in the plant tissue is located in the cell wall. Calcium, bound as pectate in the

middle lamella, which provides stability and strength to the cell wall.

The most common effect of the stability provided by calcium is firmness (quality) and disease resistance.

Calcium and disease resistance

A typical symptom of calcium deficiency is the disintegration of cell walls and the collapse of the affected tissues. This tissue collapse is an open door for fungus and bacteria. Calcium is also essential for membrane stabilization, and the lack of calcium leads to leakage of sugars from the cytoplasm. This leakage of sugars collects on the surface of the tissue and provides food for the pathogens.

Calcium and quality

The market for fresh potatoes is based on different local quality definitions:

Peel Quality

A smooth surface is regarded as good quality. Soil pH from 6,0 to 7,0 favors the development of fungal diseases in the peel. Adding calcium with phosphogypsum has no effect on soil pH.

Hollow Tubers

Hollow tubers are regarded as low quality and reduce the bulk density. The occurrence of hollow tubers partly depends on variety, but growth conditions also influence the number of hollow tubers. Calcium deficiency, in particular, creates hollow tubers, therefore good management of calcium is important. (Boron defi-

ciency is also known to trigger the development of hollow tubers.)

Internal Browning

The tubers develop brown to black areas within the tuber flesh. Internal browning may develop during cooking. Internal browning is caused by oxidation of chemical complexes of chloride containing acid and ferri ions. Internal browning before cooking is often connected to calcium and boron deficiency. Internal browning after cooking is often connected to high nitrogen – low potassium situations.

Calcium and tuber absorption

Calcium is absorbed by the root system and transported to other parts by the transpiration process. The flow of calcium follows the flow of water through the plant, meaning that those parts of the plant which have the highest rate of transpiration, also receive the highest amount of calcium. As the tubers show very little tran-



Internal brown spot shows small round or irregularly shaped, light tan, reddish brown, or rust-coloured spots or blotches scattered throughout the tuber flesh.

Table - Absorption of calcium

Ca Applied (mg/kg) Stolon/Tuber	Ca Applied (mg/kg) Main Root	Ca (% d. w.) Peel Tissue
100	100	0.09
100	3000	0.09
3000	100	0.27

spiration, they hardly receive any calcium from the root system. The stolon and the tuber are equipped with very fine roots. These roots play an important role in the absorption of calcium by tubers. To increase the absorption of calcium by potato tubers, calcium must be made available to these roots on the stolon and tuber. (See table below)

Calcium's effect on seed

The calcium content in seed potatoes might influence the yield of the following crop. Calcium will influence the storability of the seed potatoes. It may be possible to increase the potato yield by using calcium enhanced seed potatoes.

References:

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