GEORGIA

Aglime: A Low-Cost Alternative Source of Calcium for Peanuts

By Gary J. Gascho

Calcium is often considered the essential element most commonly deficient for peanuts in noncalcareous soils. The need for Ca in peanuts is exceptionally high and its uptake by the peanut plant is unique. The fruit develops by absorbing nutrients directly from the soil as opposed to nutrients being absorbed by roots, transported to shoots and back to the fruit. It is this unique aspect that has required much research and which guides the application of Ca for greatest yield, quality and seed germination.

> Farmers are looking for methods to decrease their input costs for peanuts due to the decreasing support prices. In many instances, using aglime in the pegging zone to supply calcium (Ca) for fruit development as well as to provide the proper soil pH for both peanuts and the rotational crops will help them meet their objective.

Deficiency Symptoms

It is rare that Ca is deficient to the point where peanut vine growth is stunted. However, the growth of peanuts without supplemental Ca visibly suffers compared to peanuts with adequate Ca supplied by preplant-incorporated dolomitic lime. The normal consequences of Ca deficiency are blackened plumules, high incidences of pod rot, and unfilled pods (termed "pops") resulting in low yield and substandard grade. Seed peanuts produced in Ca-deficient conditions will exhibit much poorer germination than those produced with an adequate Ca supply.

Soil Effects

Peanuts are most often grown on sandy soils which have limited ability to supply Ca to replenish that in the soil solution. Further, such soils are often relatively droughty. Since peanuts are relatively drought tolerant in comparison to most plants grown in semi-humid regions, they are often grown in locales with limited rainfall during some portion of pod and seed development. The problem of limited soil moisture in the developmental period adds to the Ca deficiency problems of peanuts since added Ca compounds will not dis-

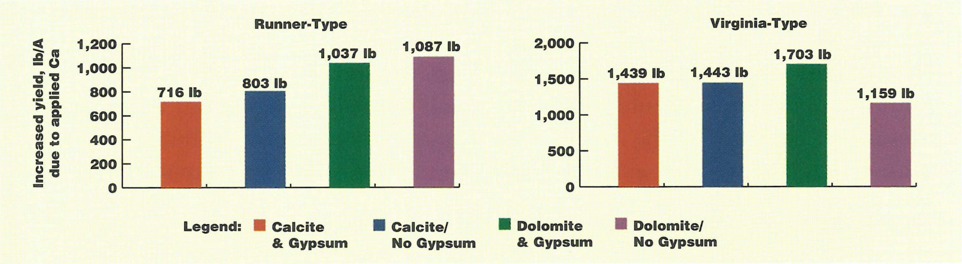

FIGURE 1. Increased yields of two types of peanuts due to calcite or dolomitic lime application preplant and gypsum at bloom.

GROWTH of peanuts without supplemental Ca (on left) suffers compared to peanuts with adequate Ca supplied by preplant-incorporated dolomitic lime (on right).

solve or move to the pod without soil moisture. Calcium in droughty soils is, therefore, not rapidly replenished in the soil solution close to the developing pod due low solubility of Ca sources and an inability to maintain a diffusion gradient toward the pod. The result is Ca deficiency.

Predicting Calcium Needs

Soil analysis is the most useful diagnostic tool for determining the need for supplemental Ca fertilization. Samples taken from the surface 6 to 8 inches prior to planting are often used. Soil test Ca in the pegging zone (top 3 inches), 10 to 14 days following planting, has been an important diagnostic tool for determining needs for supplemental Ca in the form of gypsum applied at bloom (BG) in Georgia. Data combined from the literature for 168 experiments conducted in Alabama and Georgia with small-seeded, runner-type peanuts showed that 95 percent of maximum yield was obtained when soil test Ca (Mehlich 1 extractable) was 200 parts per million (ppm). For the larger-seeded Virginia-type, soil test Ca is less valuable since supplemental Ca is normally recommended regardless of the soil test level. Recently, data from experiments conducted in Alabama, Georgia, North Carolina and Virginia were combined to show the effect of soil Ca on relative yield of Virginia-type peanuts. Maximum yield was attained at about 525 ppm Mehlich 1 Ca.

Calcium Sources

Getting soluble Ca into the pegging zone and maintaining a supply to replenish depletion by crop uptake and leaching can be especially difficult in sands. Very soluble Ca sources such as calcium chloride ($CaCl_2$) are generally expensive and short-lived due to leaching losses. Gypsum (calcium sulfate, $CaSO_4$) is much less soluble, but its application on the soil surface at first bloom is generally appropriate for supplying Ca over the 60-day period when there is a great requirement for available Ca.

In addition to mined gypsum, byproduct and phosphogypsum are also available in many places at lower cost. When soil Ca is less than the chosen threshold level, gypsum is either broadcast or banded over the peanut row at first bloom. Most prod-

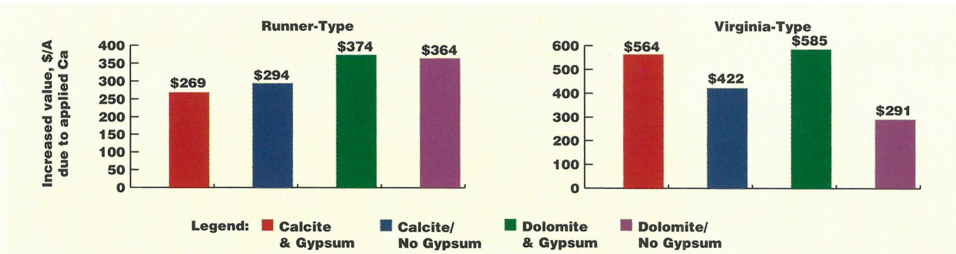

FIGURE 2. Increased gross value of two types of peanuts due to calcite or dolomitic lime application preplant and gypsum at bloom.

ucts have a range of particle sizes that solubilize over time to provide Ca. Gypsum has been a very successful source of Ca for peanuts; however, its application can add considerable cost to peanut production. Dependent on source and recommended rate of application, the applied costs may range from about $15 to $30/A.

Aglime is an important source of Ca for peanuts grown in the acidic soils of the southeastern U.S. and other regions. The main response of peanuts to aglime is due to the ability to supply Ca, whether it was applied for that purpose or to increase soil pH.

Field experiments conducted with runner-type peanuts in Alabama prior to 1980 indicated that aglime appeared to do little more than serve as a source of Ca and that spring-applied aglime provided all of the Ca needed for maximum yield and grade when it was properly incorporated into the pegging zone. Since good farmers will lime their soils for their chosen crop rotation, they should attempt to apply aglime in a manner that will supply Ca to their peanut crop and thereby reduce or eliminate the expense of a gypsum application. When aglime was applied to the soil prior to planting and incorporated to a shallow depth of 2 to 5 inches, adequate Ca was usually available for runner-type peanuts since yield responses to gypsum applied at bloom were rare following such applications.

POD DEVELOPMENT in peanuts with adequate Ca is shown at left, in contrast with Ca-deficient peanuts on the right.

Georgia Studies

Similar results were recently recorded in Georgia for runner-type peanuts, but preplant-incorporated aglime, applied at rates required to increase pH to the recommended value, did not supply adequate Ca for the larger-seeded Virginia-type peanut. A comparison of increased yields of pods resulting from preplant-incorporated calcite and dolomite (1,000 lb/A) with and without gypsum application at bloom (1,000 lb/A) is presented in **Figure 1**. The BG application did not increase yield of pods above the increase provided by the aglime alone for runner-type peanuts, indicating that the Ca requirements for top yield were satisfied by the aglime. Dolomite was superior to calcite for the runner-type peanuts on sandy soils in Georgia only because soil magnesium (Mg) was very low. However, dolomite at 1,000 lb/A did not supply enough Ca for Virginia-type peanuts as

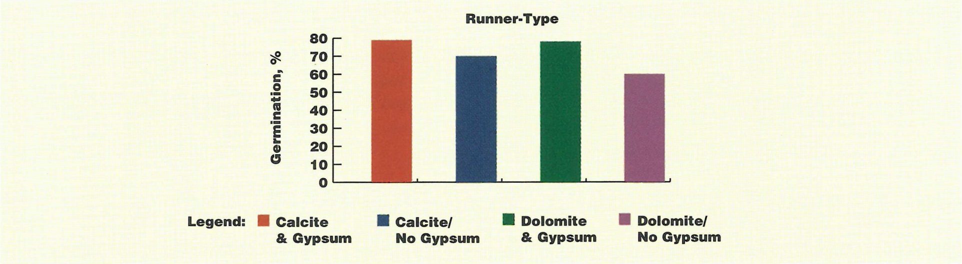

FIGURE 3. Effect of Ca source on germination of seed peanuts.

indicated by their additional response to BG after receiving the dolomite. Most rotational crops have a greater Mg requirement than peanuts, and their needs must also be considered in a liming program.

The gross value received for peanuts is also dependent on quality (grade), which includes several factors. Relations among Ca sources for runner-type peanuts are similar for yield and value (**Figure 2**), but value of the Virginia-type is increased greatly by BG following preplant-incorporated aglime.

Germination of seed produced from fields with inadequate Ca supplying power is poor. Preplant-incorporated aglime is effective in increasing the germination of seed produced (**Figure 3**), but gypsum applied at bloom increased germination percentage even when aglime had been applied preplant. For that reason, gypsum at bloom is always recommended for peanuts which will be used for seed.

Lime Placement

Lime placement is critical. Most aglime applications are incorporated much deeper than the peanut pegging zone either by harrows or plows. Nearly all peanut fields in the southern U.S. peanut belt are turned by moldboard plowing in order to bury trash and provide a loose bed for fruit development and removal. The modern moldboard plow essentially inverts the top foot of soil. If aglime is applied prior to plowing, it will remain far below the zone of nut development and not provide Ca needed by the peanut. We found no benefit to runner-type peanuts for preplow application (turned under). Benefits were equal for gypsum at bloom and preplant-incorporated aglime (**Figure 4**). Postplant incorporation to a depth of 3 inches was effective in increasing gross value, but not as effective as preplant incorporated.

Summary

Aglime preplant-incorporated for runner peanuts is effective for reducing pod rot, for increasing pod yield and increasing value per acre on sandy soils with pH less than 6 and a low Ca soil test.

Calcite and dolomite are both effective for runner-type peanuts. Dolomite should be the material of choice for fields with low or medium soil test Mg and calcite the choice for soil with high Mg.

When soil pH is less than 6 and aglime is recommended, preplant incorporation also appears to be a good means of applying Ca prior to planting Virginia-type peanuts. However, on sands, greatest yield, grade and value for the Virginia-type peanut will be attained by applying gypsum at bloom, regardless of the lime application. BC

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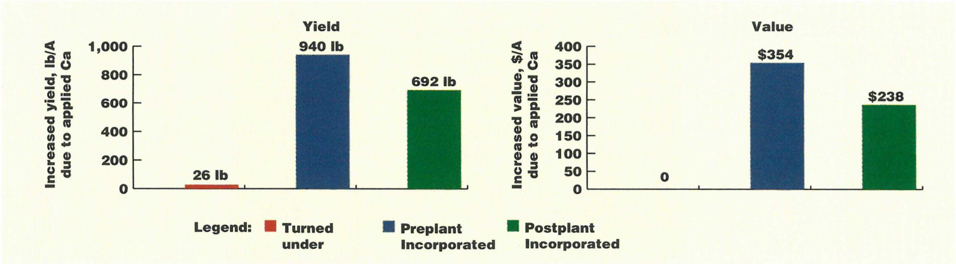

FIGURE 4. Yield and gross value of runner-type peanut as affected by aglime placement.