

Effect of Soil and Seed Calcium on Peanut Seed Quality **APPA-RIA03-SOIL&SEED CALCIUM**

Principle Investigators

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Objectives

1. Determine the feasibility of using seed-calcium (pre- and/or post-harvest) as an indicator of potential seed quality prior and/or post storage.
2. Establish a minimum seed-calcium level that ensures calcium is not limiting in seed quality.
3. Identify relationships between quality seed, seed-calcium, and soil-calcium.
4. Evaluate current recommendations for gypsum application in seed production.

Executive Summary for 2008

Gypsum applications of 0, 500, and 1000 lb/A were evaluated for their effect on Georgia 06G and Georgia Green yield, grade, germination, and seed calcium at Headland, AL, and Tifton, GA. Lime (2 T/A) and a liquid calcium fertilizer were also evaluated, but only on Georgia 06G in Headland, AL. Sites were selected with a relatively low initial soil calcium level (< 400 lb/A) in the pegging zone. Treatments had no effect on yield, but peanut grade of Georgia 06G, assessed as percent total sound mature kernels, increased with 500 lb/A gypsum treatment at both sites. Grade of Georgia Green increased only at the Tifton site with the 1000 lb/A. The liquid calcium fertilizer treatment did not differ from the control and was lower than all other calcium treatments. Using the loan chart to calculate the dollar value of peanuts, the price per ton increased with 1000 lb/A on Georgia 06G and with 500 lb/A on Georgia Green, but only at the Tifton site. While there were no significant differences on a price per acre basis, there was a strong trend of increasing dollar/A with increasing gypsum.

In Georgia 06G, seed calcium increased with each additional rate of gypsum. Seed calcium in the lime treatment was between the two gypsum treatments and did not differ from either. The liquid calcium treatment was equivalent to 500 lb/A gypsum. In Georgia Green, the 500 lb/A gypsum treatment had the highest seed calcium. Cold germination test results indicate an increase in germination in Georgia 06G with 500 and 1000 lb/A gypsum and lime, but not with liquid calcium. Germination of Georgia Green was not affected by gypsum treatment.

Although this is the first year of data, initial results indicate that supplemental calcium has a greater effect on seed quality (i.e., grade and germination) than on overall yield. Lime appears to be as good a gypsum as a source of calcium, but may cause high soil test calcium values that are not translated into seed calcium; thus, making soil calcium using the traditional Mehlich I extractant potentially unreliable as an indicator for available calcium. There appears to be a good relationship between seed-calcium and germination and may prove to be a technique to evaluate seed quality. Results from this study support current recommendations for production that would not have required supplemental calcium for yield increases. However, results from this field season may be compromised by tropical storms that delivered high rainfall that may have leached calcium from the pegging zone.

Final

251
GA-105
577

AL-44
576

2008

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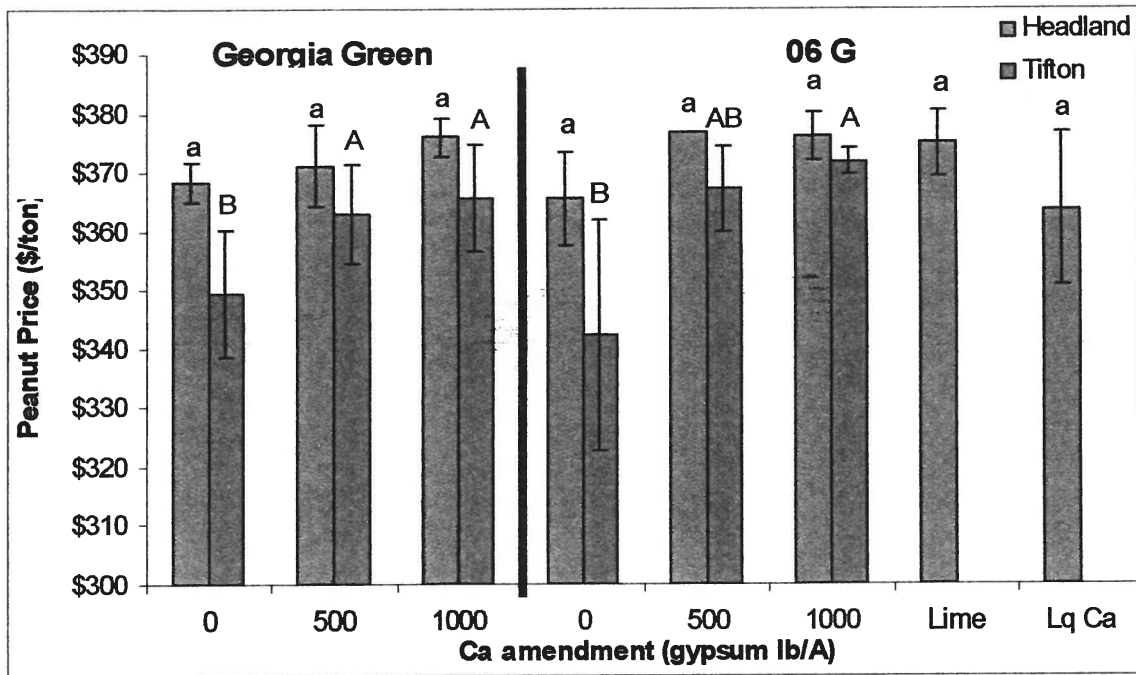
Progress as of July 2008

Two sites were selected with soil test calcium in the pegging zone < 400 lb/A. One site was on the Wiregrass Research Station in Headland, AL and the other was at the Coastal Plain Experiment Station in Tifton, GA. Two varieties were selected for trial, Georgia Green was selected as the medium or typical seeded variety and Georgia-06G was selected as the large-seeded variety. Field plots were designed for each site to establish a randomized complete block design. Peanuts were planted into each of the 6 plots per block with 3 plots per peanut variety in Headland on May 27, 2008 and in Tifton on May 29, 2008. At blooming (July 10th), pegging zone soil samples were taken and gypsum was applied at 0, 500, or 1000 lb/A by hand to randomly specified plots within each block. Gypsum was flue gas desulfurization (FGD) gypsum from power generation. To determine the effect of moisture on calcium availability, moisture sensors and soil temperature probes were installed in the pegging zone of each plant. Data loggers were installed to record moisture and temperature readings each half hour.

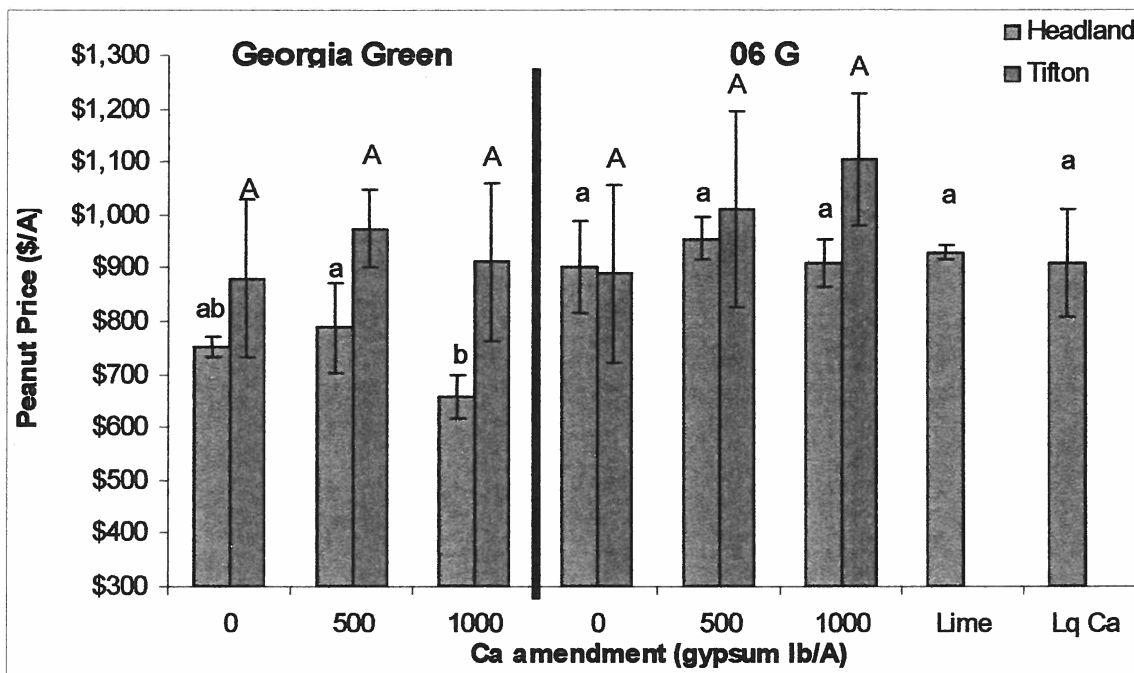
Progress from July to October 2008

Once pegging initiated and seeds began to develop, seed and pegging zone samples were taken weekly from each plot and analyzed for calcium, potassium, and pH. In anticipation of harvesting, moisture probe sensors and data loggers were removed and the final peanut samples were collected and brought to Auburn in early October. The lab is currently processing soil and seed samples for calcium, potassium, and soil pH. The peanuts in Headland were dug on Oct 13, 2008 and will be harvested the following week. The plots in Tifton will be dug the week following Headland and harvested when ready. Yield and grade will be evaluated from harvested peanuts. Seed samples from each plot will be delivered to the Georgia Seed Laboratory for germination and vigor testing. The experiment is nearing completion and the sample analysis is currently the major priority for this project.

Grades, factoring in both TSMK and OK and according to the "loan chart" were used to calculate value of the peanuts by treatment on a \$/ton bases as shown below. In Tifton, the higher gypsum rates improved grade enough to significantly increase the dollar value of the peanuts for both varieties compared to the zero gypsum treatment. There was only a slight increase in value when going from the 500 to 1000 lb/a gypsum rate indicating 500 lb/a gypsum was enough to significantly increase \$/ton. In Headland, a very similar result is reported with increasing gypsum rates increasing \$/ton value of the peanuts for both varieties.



Finally, when yields are multiplied by \$/ton value the result is a gross return value to the farmer in terms of \$/a, as shown in the graph below. In Tifton, although there was no statistical differences, \$/a value increased when going from 0 to 500 lb/a gypsum but then decreased when going from 500 to 1000 lb/a gypsum for Georgia Green. For 06 G, \$/a value increased with increasing gypsum rates and was in general higher than for Georgia Green. In Headland, a similar trend for \$/a value for Georgia Green was noted compared to Tifton. However, unlike in Tifton where \$/a value increased at the 1000 lb/a gypsum rate for 06 G, in Headland the \$/a value decreased when going from the 500 to 1000 lb/a gypsum rate.



Soil temperature and moisture were monitored in this study throughout the season and the data is still being compiled and analyzed. Likewise, calcium levels in the developing nuts during the season was also monitored and will be reported in a future report. Finally, germination data for harvested nuts for each treatment will also be reported in the future.

Progress from October to December 2008

All peanuts have been harvested and assessed for yield and grade from plots in Headland, AL and Tifton, GA. Analysis of calcium and potassium in the seed should be completed by the end of January 2009. Soil calcium is also nearing completion and should be finished by mid-February. The seed samples are currently being tested for germination and vigor at the Georgia Seed Laboratory. Once all data has been collected, data analysis and statistics will be performed. Then results will be interpreted and presented in a final report. A no-cost extension has been approved for this project to finish sample and data analysis.

Progress from January to March 2009 (Extension)

Peanut yields from both locations are shown in the graph below. In Tifton, there was no significant statistical difference in yields between treatments. However, there was a numerical trend for an increase in yield when going from the 0 to 500 lb/a gypsum rate but decreasing yield from 500 to 1000 lb/a gypsum rate on Georgia Green. The reason for the decreasing yield is unknown. For 06 G, the numerical trend was increasing yield with increasing gypsum rate, probably due to the higher requirement of this larger-seeded runner. In Headland, there was also a significant yield decrease for Georgia green at the highest gypsum rate, again which is hard to explain. There was also a slight decrease in yield at the highest gypsum rate for 06 G, unlike in Tifton, which may be due to higher initial soil calcium levels in headland.

