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National Peanut Board
Final Report for 2014
Nutrient Management Trials in Peanut – Glen Harris (UGA-Tifton)

Executive Summary

Supplying calcium to the pegging zone of peanuts to 1) maintain high yields by avoiding pops, 2) maintain high quality in terms of grade and 3) maintain high germination rates for when saved for seed, continues to be the emphasis of soil fertility on peanut. Gypsum at bloomtime and lime at planting are the traditional ways of fertilizing peanut with calcium. The main objective of this project was to compare two new calcium materials to both lime and gypsum. "Topflow" is a very finely ground liquid lime normally used in the paper industry but is thought to have potential in the Ag market. Rate (5 or 10 gal/a) and placement (10 gal broadcasted vs 5 gal/a banded) of the Topflow was investigated. Polyhalite is another new fertilizer material that contains 16 % calcium (half of which is "pure gypsum") so it also has potential for peanuts. Calcium chloride through the pivot at peak pod fill under irrigation and at planting on dryland were also investigated. Overall, results from 4 location in 2014 (three irrigated and one dryland) indicate that lime at planting or gypsum at bloomtime are still the best recommendations for supplying calcium to the pegging zone of a peanut. The best response to calcium treatments was at the dryland site (there were little differences observed in the irrigated sites) with the current recommendations of lime at planting or gypsum at bloomtime being the best options. Polyhalite did increase calcium in the nut but not as high as these recommended treatments. Topflow at 10 gala broadcast at planting did an adequate job of getting calcium into the peanuts and was better than 5 gal/a banded which was also adequate but 5 gal/a broadcast was inadequate. Also, 10 gal/a of calcium chloride broadcast at planting was insufficient in terms of supply calcium to the developing peanuts.

Background

Previous work by the authors on this grant in recent years has resulted in confirming calcium fertilizer recommendations for modern peanut varieties. New fertilizer sources and applications techniques for supplying calcium to the pegging zone such as calcium chloride and calcium sulfate thru the center pivot during peak pod fill later in the season have also be explored. Gypsum at bloom time and lime at planting are the traditional ways of fertilizing peanut with calcium. However, there are always new calcium materials being suggested or promoted as ways to provide calcium to the pegging zone. Initial field trials done by this author on corn indicated that at high rates, Topflow raised the pH of soil significantly. These high rates (160 gal/a) were determined to be too high and not economical. The question posed to us were 1) would lower amounts of Topflow such as 10 gal/a broadcast be comparable to lime or gypsum for supplying calcium to the pegging zone ? And would a banded (i.e. concentrated over the row) application of 5 gal/a be comparable. In addition, there is a new fertilizer material called "Polyhalite" that contains calcium that may be useful for calcium on peanut. This material has never been tested on peanut before. Finally, the rate and timing of calcium chloride on peanut still

needed to be fine-tuned and confirmed. Is 10 gal/a or 20 gal/a needed on irrigated land during peak pod fill (60-90 days after planting) ? And is 10 gal/ at planting sufficient at planting on dryland peanut?

Materials and Methods

Calcium Source Trial

A calcium source to compare two new sources of calcium (Topflow and Polyhalite) to calcium sources tested in the past (such as lime, gypsum and calcium chloride) was established at three irrigated sites and one dryland site in Georgia in 2014. Treatments also included different rates, timing and placement of calcium sources to determine the best usage of these products for providing available calcium to the pegging zone of peanut. The four site used in 2014 with panting dates were:

1) UGA Ponder farm (Ty Ty, GA) - irrigated (center pivot), planted May 5
2) UGA RDC Pivot (Tifton, GA) – irrigated (center pivot), planted May 13.
3) UGA Stripling Irrigation Park (Camilla, GA) - irrigated (center pivot), planted May 20.
4) ABAC (Tifton, GA) – dryland, planted June 3.

All locations were planted in single rows (36 inch spacing) to GA 06G. No inoculant was used. Plots size was 6 foot (2 rows) wide by 30 foot long at the 3 irrigated sites and 40 foot long at the dryland site.

Treatments for this study were as follows: (Note: Treatments 10, 11 and 12 NOT included at site 4 because dryland.)

1) Untreated control
2) Lime - 2000 lb/a (dolomitic) @ planting
3) Gypsum - 1000 lb/a, ("Agri-Cal FGD) @ planting
4) Topflow – 5 gal/a broadcast @ planting
5) Topflow – 5 gal/a banded (12 inch band) @ planting
6) Topflow – 10 gal/a Broadcast @ planting @ planting
7) "Hi-Cal" Calcium Chloride – 10 gal/a broadcast @ planting
8) "Polyhalite – 1500 lb/a @ early bloom
9) Gypsum - 1000 lb/a, ("Agri-Cal FGD) broadcast @ early bloom
10) "Hi-Cal" Calcium Chloride – 10 gal/a "thru pivot at peak pod fill approx. 70 days after planting
11) "Hi-Cal" Calcium Chloride – 20 gal/a "thru pivot at peak pod fill approx. 70 days after planting
12) Topflow – 10 gal/a "thru pivot at peak pod fill approx. 70 days after planting

Peanuts were grown using standard UGA Extension recommendations in terms of herbicides, fungicides, irrigation scheduling etc. All plots at all locations were machine harvested for yield, subsampled for grade (Federal State Inspection) and also shelled and sized for warm and cold germination – and most importantly – calcium content in the nut (Georgia Department of Ag, Tifton).

Results and Discussion

Yields and grades for the three irrigated locations are found below:

	RDC Pivot		Ponder		Stripling	
Treatment	Yield	Grade	Yield	Grade	Yield	Grade
UTC	8162	77.5	8305	76.2	7802	77.8
Lime AP	8595	77.8	7373	75.8	8025	78.5
Gyp AP	8400	77.2	7177	73.8	7930	78.0
TF 5Broad AP	8328	78.0	7352	75.2	7858	77.5
TF 5Band AP	8556	77.5	7747	75.8	7882	78.2
TF 10Broad AP	8339	77.2	7981	75.5	7803	77.5
CaCl 10 Broad AP	7934	77.2	7716	76.2	7795	77.5
Polyhalite	8341	77.0	7668	76.8	8041	78.0
Gyp EB	8092	78.8	7385	76.8	8253	78.5
CaCl 10 PPF	8439	76.5	7415	77.0	7389	77.8
CaCl 20 PPF	8372	76.8	7130	76.2	7335	77.0
TF 10 PPF	8562	77.0	7818	76.2	7642	78.0
Stat. Signif.	0.2134	0.1428	NS	NS	0.2239	0.2041
CV (%)	4	1	12	3	5	1

Overall, both yields and grades at all three irrigated locations were very good due to fairly "normal" weather during the growing season and because the sites were irrigated. There were, however, no statistically significant differences in yield or grade between calcium treatments applied. This is not totally unexpected since irrigated land with normal soil test calcium levels can usually provide enough calcium to the pegging zone without adding calcium in some form of fertilizer.

Even though there was no difference in yields and grade between calcium treatments, the amount of calcium that gets absorbed through the hull and raises the level of ca in the nut (above the untreated control) may be a good indicator of how effective each treatment was. Since the level of calcium in the nut is also know to affect germination (the higher the level of calcium in the nut the higher the percent germination) this is also a good indicator of the attentiveness of the treatments. Warm germination and calcium levels in the nuts for the three irrigated sites can be found in the table below.

	RDC Pivot		Ponder		Stripling	
Treatment	Warm Germ (%)	Ca in Nut (ppm)	Warm Germ (%)	Ca in Nut (ppm)	Warm Germ (%)	Ca in Nut (ppm)
UTC	94.0	519	96.5	523 e	92.5	690
Lime AP	94.8	534	96.5	624 ab	95.8	584
Gyp AP	95.3	562	97.0	620 abc	95.8	634
TF 5Broad AP	93.8	528	97.3	540 de	97.3	563
TF 5Band AP	94.5	516	95.8	580 bcde	96.3	618
TF 10Broad AP	94.5	554	98.0	542 cde	98.3	701
CaCl 10 Broad AP	94.3	537	97.8	524 e	93.5	643
Polyhalite	96.0	561	96.0	605 abcd	95.0	600

Gyp EB	95.5	539	97.8	662 a	95.0	612
CaCl 10 PPF	93.8	532	97.3	568 bcde	94.5	685
CaCl 20 PPF	95.0	502	96.8	573 bcde	95.0	619
TF 10 PPF	95.3	572	97.0	618 abcd	95.8	609
Stat. Signif.	0.2879	0.4660	0.2584	0.0150	0.2031	0.4447
CV (%)	1.34	7.8	1.25	9	2.7	13.5

At the RDC Pivot location, there was no significant differences between treatments for germinations, which were all in the excellent range of approximately 95 %. There was no significant difference in calcium in the nuts at this location, although most treatments were above the untreated check, including lime at panting and gypsum at bloom which are standard practices currently used by Georgia peanut growers. Polyhalite also seemed to perform well at this site in terms of providing calcium to the nut. Topflow banded or broadcasted at the 5 gal/a rate at planting seemed to be underperforming near the untreated check but the 10 gal/ rate either at planting or peak pod fill later in the year did OK.

At he Ponder farm location, germinations again were excellent across the board, even better than the RDC Pivot, around 97 % with no significant differences between calcium treatments. Calcium levels in the nuts however were statistically different between treatments at this location. Gypsum at early bloom and lime at planting increased calcium in the nuts the greatest, followed by gypsum at planting, Topflow at peak pod fill, then Polyhalite. The rest of the treatments were not statistically different from the untreated check including calcium chloride at peak pod fill being very close to the untreated check.

At the Stripling location, germinations were again high, except for the untreated check. The level of calcium in the nut however for the untreated check was higher than most treatments at this location. There were essentially no significant differences between treatments for germination and calcium in the nuts at this location.

Yields and grades for the dryland location were calculated and analyzed and are found below:

Treatment	Yield	Grade
UTC	6466 bcd	71.8 d
Lime AP	7019 ab	75.0 ab
Gyp AP	6178 cd	75.5 a
TF 5 Broad AP	7039 bcd	73.5 bcd
TF 5 Banded AP	6468 bcd	74.0 abc
TF 10 Broad AP	7190 a	74.8 abc
CaCl 10 Broad AP	6042 d	75.2 ab
Polyhalite	6206 cd	73.2 cd
Gyp EB	6705 abc	75.5 a
Statistical Significance	0.0081	0.0023
CV (%)	7	2

For this dryland location there statistical differences between treatments for both yield and grade. This is not unexpected since moisture is more limiting in dryland than irrigated there is more of a chance of response due to the solubility of the calcium materials in water. The Topflow 10 gal/a broadcast at planting had the highest yield and the calcium chloride 10gal/a broadcast at planting at the lowest yield. Lime at planting and gypsum at early bloom both performed well. Polyhalite did not perform well in terms of yield as most of the other treatments. The untreated check had the lowest value for grade as predicted and gypsum both at planting and at early bloom performed well in terms of grade. Again, polyhalite did not increase grade as much over the untreated check indicating there may be some issues with less solubility compared to the other calcium fertilizer sources.

Warm germination and calcium in the nut for the dryland site appear in the table below:

Dryland

Treatment	Warm Germination (%)	Ca in Nut (ppm)
UTC	74.8	414 c
Lime AP	81.3	498 a
Gyp AP	88.8	546 a
TF 5 Broad AP	81.8	425 c
TF 5 Banded AP	90.5	490 ab
TF 10 Broad AP	80.5	511 a
CaCl 10 Broad AP	86.3	432 bc
Polyhalite	87.5	508 a
Gyp EB	90.0	525 a
Stat Significance	0.1030	0.0010
CV (%)	9.0	8.9

Overall, warm germinations were not as high as in the irrigated sites again as expected due to less water for production. The growing season in 2014 was more "typical" with a semi-droughty period during the month of August. Warm germination was lowest for the untreated check compared to all the other calcium treatments, however there was no statistical significance detected. Gypsum both at planting and at early bloom had the highest numerical warm germination percentages.

Again, calcium in the nut is the best indicator of how well the calcium treatments supply calcium to the pegging zone for peanut and at this dryland site, the untreated check was lowest as predicted. Gypsum at planting and gypsum at early bloom were both the highest in terms of calcium in the nut. Normally, gypsum at planting would be too earlry but in 2014 with the weather pattern it performed very well. Topflow at 10 gal broadcast performed adequately but 5 gal/a either broadcast or banded did not. Polyhalite did increase the calcium in the nut above the untreated check but not as high as gypsum or lime at planting. Therefore, polyhalite does not appear to be a good alternative to the current recommended treatments of gypsum at early bloom or lime at planting.