Calcium Source and Time of Application For Runner and Virginia Peanuts[1]

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ABSTRACT

Sandy soils of the southern coastal plain are commonly deficient in Ca in the upper 8 cm; this limits development of high yielding and high quality peanut (*Arachis hypogaea* L.). Calcium is often leached by rainfall and irrigation from such soils and is not available for the development of pods. Previous studies have shown that gypsum applied at bloom is effective for supplying Ca and increasing yield and grade when Mehlich 1 soil Ca in less than 200 to 250 mg kg^{-1} for runner-type peanut, and is nearly always effective for virginia-type peanut. Field experiments were conducted over 3 years to compare preplant incorporated limestone and gypsum application at bloom for both runner- and virginia- types. Preplant incorporated limestone was effective for reducing pod rot and for increasing pod yield, SMK, and value ha^{-1} for runner peanut in experiments conducted on sandy soils with pH less than 6.2 and with Mehlich 1 extractable Ca less than 200 mg kg^{-1}. Application of Ca was not effective when extractable Ca was greater than 200 mg kg^{-1}. Calcitic and dolomitic limestones were both effective for the runner-type. Limestone was also an effective source for virginia peanut. However, in our studies conducted on sands, the least pod rot and the greatest yield, grade, and value of virginia peanut were only attained when bloom gypsum was applied. Preplant incorporated gypsum was not as effective as bloom gypsum for either type of peanut.

Key Words: Calcitic limestone, dolomitic limestone, gypsum, Mehlich 1 soil Ca, pod rot, runner-type, virginia-type.

High yielding and good quality peanuts (*Arachis hypogaea* L.) require adequate Ca in the top 8 cm of the soil during pegging and pod filling. Sandy soils of the southern coastal plain (Kandiudults and Quartzipsamments) are often deficient in Ca for peanut (Walker and Keisling, 1978). Yields in such soils are limited by Ca deficiency more often than by any other plant nutrient deficiency (Cox *et al.*, 1982). A portion of the low yield and poor quality attributed to Ca deficiency and/or to a Ca imbalance with K and/or Mg is due to pod rot (Walker and Csinos, 1980). Large-seeded virginia-type peanut requires more Ca in the pegging zone than does the smaller-seeded runner-types (Walker *et al.*, 1979; Cox *et al.,* 1982). This is probably due to the lower surface area to

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mass ratio in the virginia-type peanut which results in decreased area per unit mass for the absorption of Ca by the developing pod (Sumner *et al.*, 1988).

In Georgia, for the runner-type, gypsum is recommended at bloom (BG) as a source of Ca when the Mehlich 1-extractable soil Ca is less than 250 mg kg^{-1} in the upper 8 cm of soil at 10 to 14 days after planting (Plank, 1989). For virginia-type and all peanuts grown for seed, BG is always recommended. In cases where limestone is recommended to increase soil pH (initial pH less than 6), it would normally be turned down with a mold board plow in the early spring. Limestone applied in that manner, is not effective for supplying Ca to developing pods in the upper 8 cm of soil (Sullivan *et al.*, 1974). However, research shows that limestone applied by the plow-down method for a previous crop provides Ca for a later peanut crop once the limestone is turned back into the rooting zone (Gaines *et al.*, 1991).

Studies conducted in the 1940's with both small- and large-seeded peanuts indicated that limestone added to the soil in a manner that keeps Ca in the pegging zone generally ensures good pod development (Rogers, 1948; Reed and Brady, 1948). Yields of virginia-type peanut were similar when either preplant broadcast gypsum or bloom topdressed gypsum were applied in studies conducted in North Carolina (Reed and Brady, 1948).

In Alabama, preplant limestone incorporated into the top soil following moldboard plowing (PPI limestone) has become the main source of Ca for peanut. Experiments conducted in commercial fields in that state have indicated responses to BG following PPI limestone are rare (Adams and Hartzog, 1980; Hartzog and Adams, 1988). Studies making direct comparisons of the effects of PPI limestone and BG have not been reported previously for virginia- or runner-type peanuts on sand and loamy sand soils that dominate the Ca responsive sites of southwest Georgia. Needs for Ca applications for peanuts and reaction of these soils to applied Ca differ markedly from soils in the upper coastal plain of Georgia and those dominating the peanut belt in Alabama, which contain more clay (Walker and Keisling, 1978; Gascho and Alva, 1990; Alva and Gascho, 1991; Alva *et al.*, 1991).

The objectives of this study were to compare PPI-limestone with BG in soils where both limestone and gypsum would normally be applied in Georgia. The comparisons made were pod rot, yield, grade, and value of both runner- and virginia-type peanut. A second objective was to compare calcitic and dolomitic limestone as sources of Ca for PPI. The final objective was to evaluate the effects of PPI-gypsum in comparison to BG and PPI-limestone.

Materials and Methods

Nine field experiments were conducted from 1988 to 1990 in Bulloch, Crisp, Lee and Tift counties of Georgia. Only five of the nine experiments had Mehlich 1 soil Ca of <250 mg kg^{-1}, the current level below which gypsum is recommended for runner peanut in Georgia (Table 1). Only these five are presented in this paper. Three of the five (PNCAGG8, PNCAH89 (and PNCAH90) included both runner- (cv. Florunner) and virginia- (cv. GK-3) types. These same three included calcitic and dolomitic limestone and gypsum as PPI main plots and are herein termed "uniform experiments." "Other Experiments" did not include gypsum as a main plot PPI material and one experiment did not include calcite as a main plot material (Table 2). All experiments were split plot arrangements with either four or five blocks per experiment; main plots were PPI-Ca sources and subplots were BG or no BG. Subplot size was 5.5 by 7.6 m. All Ca sources were broadcast at 1120 kg ha^{-1} of material. Calcite contained 39.1% Ca and 0.2% Mg. Dolomite contained 21.5% Ca and 9.8% Mg. Gypsum contained 20.6% Ca and 0.02% Mg.

Best recommended management practices were used for the cultures. Peanut had not been planted in the previous two years in the experimental areas with the exception of PNCAH90 which followed in the same plots as PNCAH89. Soil was prepared by deep turning and surface tillage with either a fine-toothed field cultivator or bed shaper. Phosphorus and potassium fertilizers were applied at rates recommended by the Georgia Extension Service from preplant soil samples taken to a 15 cm. depth. The PPI applications were rototilled into the soil to a depth of 8 cm from 2 to 10 d prior to planting. Preplant incorporated herbicides, metolachlor at 1.7 kg ha^{-1} active ingredient (AI) and ethulfuralin at 0.85 kg ha^{-1} AI were applied. Vernolate (2.2 kg ha^{-1} AI) was also applied to experiment 1. Thimet was applied in the furrows at 1.1 kg ha^{-1} AI at planting. Row spacing was 0.91 m and seeding rates were 110 to 130 kg ha^{-1}. Planting dates were between 15 April and 10 May, corresponding to the recommended dates of planting in southwest Georgia. Cracking sprays of metolachlor at 1.7 kg ha^{-1} AI and paraquat at 0.14 kg ha^{-1} AI were applied as peanuts emerged. All BG applications were broadcast over the surface at first bloom. Disease control was by 5 to 7 sprays with tetrachloro-isophthalonitrile (Bravo) at 1.7 kg ha^{-1}. The first two sprays contained boron (sodium tetraborate) at 0.28 kg B ha^{-1}. Experiments PNCAGG8 and PNCAH90 were irrigated. Irrigation was planned for PNCAH89, however, none was required due to adequate rainfall during the growing season.

Soil samples were collected in all plots in the spring to a depth of 15 cm., prior to the application of any fertilizers and at a depth of 8 cm. at 10 to 14 days after planting. The samples were analyzed for pH (1:2 soil to water ratio) and Mehlich 1-extractable P, K, Ca, and Mg (Gaines and Mitchell,

Table 1. Soil classification, analyses prior to planting and soil calcium 10-14 days following planting[1].

Experiment		Year	Soil		pH[2]	Mehlich 1 K	Ca	Mg	0-8 cm. Ca
						mg kg^{-1}			
1	PNCAGG8	1988	Lakeland s.	(Grossarenic Typic Quartzipsamment)	6.1	54	155	9	152
2	PNCAH89	1989	Bonifay s.	(Grossarenic Plinthic Kandiudult)	5.4	10	42	4	56
3	PNCAH90	1990	Bonifay s.	(Grossarenic Plinthic Kandiudult)	5.7	25	68	6	50
4	PNCAK88	1988	Norfolk s.l.	(Thermic Typic Kandiudult)	5.2	40	84	22	91
5	PNCACH29	1989	Cowarts l.s.	(Thermic Typic Kanhapludult)	5.5	12	130	22	125
6	PNCABAB8	1988	Tifton s.l.	(Thermic Plinthic Kandiudult)	6.4	82	268	35	448
7	PNCABSB8	1988	Tifton s.l.	(Thermic Plinthic Kandiudult)	6.2	100	250	28	436
8	PNCACH19	1989	Cowarts l.s.	(Thermic Typic Kanhapludult)	6.3	14	334	54	335
9	PNCAJP90	1990	Tifton l.s.	(Thermic Plinthic Kandiudult)	6.6	35	421	40	421

[1]Soil samples collected 0-15 cm. deep in spring prior to moldboard plowing the soil and prior to fertilization from all plots and 0-8 cm. soil samples taken 10-14 days after planting in control-no gypsum plots except in Experiments 6 and 7 where blanket application of 1120 kg ha^{-1} of PPI calcitic limestone was made in the period between the two sampling dates.

[2]pH determined in a 1:2 soil to water ratio.

Table 2. Effects of preplant calcium and bloom gypsum on pod rot.

Calcium treatment[1]		Uniform Experiments				Other Experiments	
PPI	Bloom	PNCAH89	PNCAH90	PNCAGG8	Mean[2]	PNCACH29	PNCAK89
		%					
Runner-type							
Calcite	gypsum	1.7a*[3]	8.8a	9.3a	6.0	---	0
Calcite	no gypsum	0f	5.6e	6.8ef	4.1	---	0.5
Dolomite	gypsum	0.6a	5.4ab	12.8a	6.3	2.0	1.0
Dolomite	no gypsum	0.5f	3.4e	4.5f	2.8	2.5	1.2
Gypsum	gypsum	0.0a	2.4b	9.0a	3.8	---	---
Gypsum	no gypsum	1.0f	1.8e	4.0f	2.3	---	---
Control	gypsum	0.0a	3.6ab	12.0a	5.2	0.3	0.8
Control	no gypsum	3.7e*	5.6e	15.5e	8.3	0.2	3.5*
LSD (0.10)[4] =		1.4	5.2	9.7		4.8	2.3
Virginia-type							
Calcite	gypsum	3.2a	5.6a	2.5a	3.8		
Calcite	no gypsum	3.5e	5.2e	4.3ef	4.3		
Dolomite	gypsum	2.6a	5.2a	2.0a	3.3		
Dolomite	no gypsum	5.2e	7.4e	5.5ef*	6.0		
Gypsum	gypsum	0.5a	3.6a	4.3a	2.8		
Gypsum	no gypsum	5.2e	3.8e	2.5f	3.8		
Control	gypsum	1.8a	7.6a	1.5a	3.6		
Control	no gypsum	3.0e	9.6e	7.0e*	6.5		
LSD (0.10)[4] =		5.4	5.1	3.3			
				2.9			

[1]Calcite, dolomite, and gypsum PPI rate was 1120 kg ha^{-1} ; Bloom gypsum rate also 1120 kg ha^{-1}.

[2]Mean for uniform experiments.

[3]*, a, b, c, e, f, g: *denotes a significant ($p < 0.10$) difference between no BG and BG for the same PPI source; a, b, c, denote a significant difference ($p < 0.10$) when PPI means receiving BG are not followed by a common letter; and e, f, g denote similarly for PPI means receiving no BG.

[4]LSD values: When one value appears beneath a column, it is based on the subplot error; when two values appear, the top value is based on the adjusted main plot/subplot error and the bottom value is based on the subplot error.

1979).

At harvest, freshly dug pod samples were brought to the laboratory for evaluation. One hundred randomly selected pods were examined for rot, insect, or nematode damage. Both insect and nematode damage were inconsequential in these experiments. Pod rot damage was recorded as percent of the pods with any visual rot. Yield and grade were determined and value was calculated from the Peanut Loan Schedule for pods harvested from the inner two rows of the subplot (1.83 by 6.7 m). Analysis of variance was performed on all data (SAS, 1985) and main plot x subplot means were separated by LSD at alpha = 0.10.

Results and Discussion

Runner-type

Pod rot was reduced by Ca application (from the no PPI, no BG subplots) in three of the five experiments reported (Table 2). In those experiments, all PPI and BG applications were equally effective. The mean reduction in percent pod rot for the uniform experiments was a difference of 4.2% for PPI-calcite, 5.5% for PPI-dolomite, 6.0% for PPI-gypsum and 3.1% for BG where there was no PPI application. Bloom gypsum did not reduce pod rot where a PPI application was made.

Yield responses to Ca applications for runner-type peanut were attained in all five experiments (Table 3). In the uniform experiments, Calcite-PPI increased yield by 899 kg ha^{-1} (179, 924*, 1594*) and PPI dolomite increased yield by 1218 kg ha^{-1} (1083*, 739, 1832*) compared to no Ca application. Response to PPI-gypsum, averaged 190 kg ha^{-1} (397, 80, 358), but was not significant in any of the experiments. Adding BG following a PPI application increased yield in only one of twelve comparisons. Application of BG where no PPI-Ca was applied increased yield of runner-type peanut in only one of the five experiments.

Percent sound mature kernels (SMK) was significantly

Table 3. Effects of preplant calcium and bloom gypsum on pod yield.

Calcium treatment[1]		Uniform Experiments				Other Experiments	
PPI	Bloom	PNCAH89	PNCAH90	PNCAGG8	Mean[2]	PNCACH29	PNCAK488
		kg ha^{-1}					
Runner-type							
Calcite	gypsum	2113ab[3]	3315a	4792ab	3407	----	4307*
Calcite	no gypsum	1629ef	3416e	5468e	3504	----	3561
Dolomite	gypsum	2734ab	3336a	5232a	3767	6058	4203
Dolomite	no gypsum	2533e	3231e	5706e	3823	5538	3891
Gypsum	gypsum	1767a	2952ab	3658b	2792	----	----
Gypsum	no gypsum	1847ef	2572e	4232f	2883	----	----
Control	gypsum	1353b	2305b	4062b	2573	5726	3960*
Control	no gypsum	1450f	2492e	3874f	2605	5133	3310
LSD (0.10)[4] =		891	858	921		826	631
		567	554	830			
Virginia-type							
Calcite	gypsum	2549a	3106a	6356a	4004		
Calcite	no gypsum	2024e	3580e	6048e	3884		
Dolomite	gypsum	3169a*	3213a	6146a	4176		
Dolomite	no gypsum	2211e	2560f	5928ef	3566		
Gypsum	gypsum	2676a*	2534a	6280a	3829		
Gypsum	no gypsum	1851ef	2645f	5598ef	3365		
Control	gypsum	2303a*	2900a*	6436a*	3880		
Control	no gypsum	860f	1515g	4428f	2268		
LSD (0.10)[4] =		953	885	1061			
		783	758	958			

[1]Calcite, dolomite, and gypsum PPI rate was 1120 kg ha^{-1}; Bloom gypsum rate also 1120 kg ha^{-1}.

[2]Mean for uniform experiments.

[3]*, a, b, c, e, f, g: *denotes a significant ($p < 0.10$) difference between no BG and BG for the same PPI source; a, b, c, denote a significant difference ($p < 0.10$) when PPI means receiving BG are not followed by a common letter; and e, f, g denote similarly for PPI means receiving no BG.

[4]LSD values: When one value appears beneath a column, it is based on the subplot error; when two values appear, the top value is based on the adjusted main plot/subplot error and the bottom value is based on the subplot error.

increased by PPI-calcite and by PPI-dolomite in three experiments (Table 4). Gypsum PPI increased SMK in two experiments. Bloom gypsum increased SMK in one experiment where a PPI was made; but increased SMK in all five experiments where no PPI application had been made.

Changes in gross return for quota runner-type peanuts for the Ca applications in comparison to control main plots with no BG are shown in Table 5. Calcite-PPI increased return in two experiments. Gross return from PPI-calcite averaged \$746 ha^{-1} for the uniform experiments. Dolomite-PPI increased gross return in three experiments and averaged \$925 ha^{-1} for the uniform experiments. Gypsum-PPI did not significantly increase gross return in any experiment but averaged \$277 for the uniform experiments. Bloom gypsum without PPI-Ca source increased gross return in only one experiment and averaged \$103 ha^{-1} for the uniform experiments. Bloom gypsum did not increase gross return significantly when following any PPI Ca application.

For pod rot, yield, grade and value data as a whole, the most effective application for runners was PPI dolomite. However, BG following PPI-dolomite added an average gross return of \$26 ha^{-1} for the uniform experiments and \$176 ha^{-1}, for all experiments, to the value obtained from PPI-dolomite alone. This added value was not statistically significant in any individual experiment (LSD 0.10). The consistency of the data and the magnitude of the response may, however, suggest that the response may be economically significant for peanuts grown under the USDA program, because an investment of approximately \$75 ha^{-1}, resulted in a gross return of \$176 ha^{-1}. The return for BG would not have been economical for peanuts grown as "Additional" outside the USDA program. Top yield, SMK and value for the PPI

Table 4. Effects of preplant calcium and bloom gypsum on sound mature kernels.

Calcium treatment[1]		Uniform Experiments				Other Experiments	
PPI	Bloom	PNCAH89	PNCAH90	PNCAGG8	Mean[2]	PNCACH29	PNCAK88
		%					
Runner type							
Calcite	gypsum	68a*[3]	65a	68a	67	--	57
Calcite	no gypsum	65f	64e	69e	66	--	55
Dolomite	gypsum	71a	65a	69a	68	71	57
Dolomite	no gypsum	70e	62ef	67ef	66	70	54
Gypsum	gypsum	70a	66a	68a	68	--	--
Gypsum	no gypsum	69e	63e	65fg	66	--	--
Control	gypsum	67a*	63a*	68a*	66	72*	56*
Control	no gypsum	64f	58f	63g	62	70	46
LSD (0.10)[4] =		4.0		4.0		1.6	
		2.4	4.3	3.2		2.0	5.0
Virginia-type							
Calcite	gypsum	64a*	54a	63a	60		
Calcite	no gypsum	55ef	49e	58e	54		
Dolomite	gypsum	63a*	54a*	62a*	60		
Dolomite	no gypsum	52f	39f	56ef	49		
Gypsum	gypsum	65a*	53a*	62a*	60		
Gypsum	no gypsum	59e	47e	54ef	53		
Control	gypsum	62a*	44b*	61a*	56		
Control	no gypsum	54ef	36f	51f	47		
LSD (0.10)[4] =		5.6	5.3				
		3.6	5.0	5.5			

[1]Calcite, dolomite, and gypsum PPI rate was 1120 kg ha^{-1}; Bloom gypsum rate also 1120 kg ha^{-1}.

[2]Mean for uniform experiments.

[3]*, a, b, c, e, f, g: *denotes a significant ($p < 0.10$) difference between no BG and BG for the same PPI source; a, b, c, denote a significant difference ($p < 0.10$) when PPI means receiving BG are not followed by a common letter; and e, f, g denote similarly for PPI means receiving no BG.

[4]LSD values: When one value appears beneath a column, it is based on the subplot error; when two values appear, the top value is based on the adjusted main plot/subplot error and the bottom value is based on the subplot error.

dolomite may have been due in part to better Mg nutrition where Mehlich 1-extractable Mg was low (less than 15 mg kg^{-1}). Some Mg deficiency was evident in the PNCAH89 and PNCAH90 experiments. In those experiments, main plots provided with PPI dolomite were dark green in comparison to control plots and plots receiving PPI-gypsum. Addition of BG to plots tended to increase the incidence of Mg deficiency symptoms, probably because Ca in the BG replaced some of the Mg in the pegging zone (Alva and Gascho, 1991). Under conditions of sufficient Mg, PPI-calcite would likely be as effective as PPI-dolomite. If soil Mg is high, PPI calcite may be more effective than PPI-dolomite. However, in the low Mg nutritional status environment of our experiments PPI dolomite is the material of choice for pH correction and for supplying both Ca and Mg for runner peanuts.

Virginia-type

Preplant-incorporated-Ca application was ineffective in reducing the incidence of pod rot in virginia-type peanut (Table 2). Limestones were completely ineffective while PPI-gypsum resulted in significant reduction in one experiment. Pod rot was reduced an average of 2.9% by BG when no preplant Ca was applied, but the reduction was significant in only one of the three uniform experiments. When a PPI application had been made, BG generally lowered pod rot, but significantly in only one experiment when BG followed PPI-dolomite.

Virginia-type pod yield responded to PPI-calcite in all experiments (Table 3). Mean response to PPI-calcite was 1616 kg ha^{-1}. Dolomite-PPI increased yield an average of 1298 kg ha^{-1}. The response was significant in two experiments. The average response to PPI-gypsum was 1097 kg/ha. However, that response was significant in only one experiment. Application of BG where no PPI was made significantly increased yield by an average of 1612 kg ha^{-1}. Bloom gypsum did not increase yield following PPI-calcite and increased yield in one experiment following either PPI-dolomite or PPI-gypsum. These results generally support the findings of Reed and Brady (1948); that yield responses of virginia-type peanut to PPI lime are similar to those from BG. Our study indicates that bloom gypsum without a PPI application was relatively more effective for virginia- than for runner-type peanut.

Percent SMK for virginia-types was lower than for runner-types (Table 4). Calcite-PPI increased virginia-type SMK by an average of 7% when no BG was applied. The response was significant in two experiments. Dolomite-PPI was ineffective. Gypsum-PPI was effective in one experiment and resulted in an average increase of 6% SMK. A BG application in plots receiving no PPI-Ca resulted in an average increase of 9% SMK. This effect was significant in all experiments. A BG application was also effective following PPI-dolomite or PPI-gypsum, with average increases of 11 and 7%, respectively. Following PPI-calcite, BG application was significantly effective in increasing SMK in only one experiment and the average response was 6%. Calcium sources had much greater effects on SMK content of virginia- than on runner-type peanut. This is especially true for BG.

The great value of applying Ca to virginia peanuts is emphasized in Table 5. Gross return was increased from $448 to $1794 depending on the particular experiments,

Table 5. Effects of preplant calcium and bloom gypsum on changes in gross return relative to plots receiving neither limestone nor gypsum[1].

Calcium treatment[2]		Uniform Experiments				Other Experiments	
PPI	Bloom	PNCAH89	PNCAH90	PNCAGG8	Mean[3]	PNCACH29	PNCAK488
		$ ha^{-1}					
Runner-type							
Calcite	gypsum	507ab[4]	743a	795ab	682	---	917*
Calcite	no gypsum	151ef	769e	1318e	746	---	415
Dolomite	gypsum	958a	762a	1134a	951	748	863
Dolomite	no gypsum	803e	636ef	1336e	925	303	508
Gypsum	gypsum	276b	564a	215c	285	---	---
Gypsum	no gypsum	329ef	215ef	286f	277	---	---
Control	gypsum	-29b	18a	320bc	103	560	641*
Control	no gypsum	0f	0f	0f	0	0	0
LSD (0.10)[5] =		633	663	721		628	477
		393	438	656			
Virginia-type							
Calcite	gypsum	1275a*	1231a	1794a	1433		
Calcite	no gypsum	671e	1279e	1265e	1071		
Dolomite	gypsum	1595a*	1244a*	1622a	1487		
Dolomite	no gypsum	743e	448fg	1023ef	738		
Gypsum	gypsum	1419a*	843a	1682a*	1315		
Gypsum	no gypsum	686e	775f	787ef	749		
Control	gypsum	1071a*	809a*	1650a*	1177		
Control	no gypsum	0f	0g	0f	0		
LSD (0.10)[5] =		584	512	761			
			508				

[1]Values are differences from the control-no gypsum average value in the USDA Peanut Loan Schedule for quota peanuts.

[2]Calcite, dolomite, and gypsum PPI rate was 1120 kg ha^{-1}; Bloom gypsum rate also 1120 kg ha^{-1}.

[3]Mean for uniform experiments.

[4]*, a, b, c, e, f, g: *denotes a significant ($p < 0.10$) difference between no BG and BG for the same PPI source; a, b, c, denote a significant difference ($p < 0.10$) when PPI means receiving BG are not followed by a common letter; and e, f, f, g denote similarly for PPI means receiving no BG.

[5]LSD values: When one value appears beneath a column, it is based on the subplot error; when two values appear, the top value is based on the adjusted main plot/subplot error and the bottom value is based on the subplot error.

source(s), and timing. The mean increase in return was \$1139 from an investment of \$30 to \$75 ha^{-1}.Calcite-PPI without BG increased return by an average of \$1071 ha-1 with significant increases in all three experiments. Dolomite-PPI increased return by \$738 ha^{-1} with significance in two experiments. Gypsum-PPI increased return an average of \$749 ha^{-1} with significance in two experiments. A BG application, where no PPI-Ca treatment was applied, increased return of virginia-type peanut under USDA quota by an average of \$1177 ha^{-1}. The response was significant for all experiments. Response to BG was also quite effective following a PPI Ca application, with average responses following PPI-calcite = \$361 ha^{-1}; following PPI-dolomite = \$749 ha^{-1}; and following PPI-gypsum = \$566 ha^{-1}. Even though PPI-Ca sources were effective in increasing return, BG was needed to produce the greatest value ha^{-1}.

For virginia-type peanut, PPI Ca applications were effective, but regardless of the PPI application, BG appears necessary for lowest pod rot and greatest yield, grade, and return.

Conclusions

Limestone applied PPI was effective for reducing pod rot and for increasing pod yield, SMK, and value ha^{-1} for runner peanuts in experiments conducted on sandy soils with pH less than 6.2 and with Mehlich 1 extractable Ca less than 200 mg kg^{-1}.

Calcitic and dolomitic limestones applied PPI were equally effective for the runner-type. Therefore, dolomite should be considered the material of choice for fields with low or medium soil Mg concentrations.

When limestone is recommended to increase pH, PPI-limestone also appears to be a good application for virginia peanuts. However, in these studies conducted on sands, the least pod rot and the greatest yield, grade, and value for the virginia-type were only attained when BG was applied, regardless of the limestone application.

Gypsum applied PPI was not as effective as BG for either peanut type.

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