LIME AS AN AMELIORANT OF PHYSICAL AND NUTRIENT PROPERTIES OF IRRIGATED CRACKING CLAYS

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INTRODUCTION

There have been claims that the addition of lime to irrigated heavy textured clays have improved soil conditions and yields. For soils that already have high levels of free natural lime or high pH there exists theoretical grounds that the practice should be rejected. This project was initiated to record the effects such a practice could have on soil properties, plant growth and yield and to establish if this practice has merit for soils of this nature

OBJECTIVES:

1. To evaluate the effectiveness of lime in mitigating soil structural and water relationships associated with adverse contents of sodium and magnesium in vertisols of the Namoi and Macquarie regions that are utilised for irrigated cotton.

2. To evaluate crop response to physical and chemical/nutritional changes brought about by alteration of Ca : Mg ratios.

3. To determine the relative effectiveness of lime compared to gypsum as an ameliorant.

TREATMENTS

Experimental sites were established in the Namoi and Macquarie valleys. The sites were selected as those with high pHs, sodium levels and having soil structural problems. Some soil properties are shown in Table 1. The treatments imposed on plots located within irrigated commercial crops were as follows:

1. Lime at 5 mt/ha
2. Gypsum (applied rate equivalent to calcium content of lime at 5 mt/ha)
3. Lime at 2.5 mt/ha + gypsum at equivalent rate
4. Nil. (control)

(An additional treatment using Agri-SC soil conditioner was also included at the Namoi valley site)

Table 1. Soil properties of the sites.

PROPERTY	NAMOI	MACQUARIE
Colour	Grey - grey brown	Grey brown - brown
Texture	clay	clay
pH (1:5 water)	9.3	8.4
P(Colwell) mg/kg	6	6
K meq/100g	1.11	0.5
Ca meq/100g	27.26	16.2
Mg meq/100g	14.51	11.5
Na meq/100g	9.51	1.80
Cl mg/kg	80	30
EC(1:5) dS/m	0.37	0.16
CEC meq/100g	52	30
Ca : Mg	1.88	1.4
ESP	18	6
% OC	1.74	0.6

RESULTS

At present all the results are not available. However preliminary calculations of yield are available for both sites and these indicate no

statistically significant differences between treatments at either site - see Table 2.

Table 2 Yields - bales/acre for the two sites

TREATMENT	NAMOI	MACQUARIE
AGRI SC	2.73	
GYPSUM	2.64	2.28
GYPSUM/LIME	2.81	2.06
LIME	2.55	2.07
CONTROL	2.75	2.08

At this stage the quality of the lint has only been completed for the Namoi site. As with the yields no significant differences have noted for any component.

Analyses are in progress of nutrient uptake throughout growth. Currently only analyses of the first harvest at the 5 leaf stage are available - see Tables 3 and 4.

Table 3 Macquarie site- influence of treatment on nutrient concentration (harvest 1, 5 leaf stage)

		TREATMENT			
ELEMENT	SIG	G	L	LG	N
P%	ns	0.468	0.472	0.463	0.468
S%	*[1]	1.948c[2]	1.328a	1.885c	1.441b
K%	ns	2.406	2.462	2.321	2.381
Ca%	*	5.448b	5.224a	5.388b	5.324ab
Mg%	*	1.162b	1.120a	1.184b	1.127a
Na%	*	0.242bc	0.215a	0.257c	0.226ab
Mn mg/kg	*	103ab	109b	98a	108ab
Fe mg/kg	ns	417	444	425	430
Zn mg/kg	ns	38	35	36	37
Cu mg/kg	ns	20	18	18	19
Al mg/kg	ns	89	89	90	91
B mg/kg	ns	71	70	70	72
Mo mg/kg	ns	7	7	7	7

[1]-*- significant at 5% level; [2]-means with different letters are significantly different

Table 4 Namoi site- influence of treatment on nutrient concentration (harvest 1, 5 leaf)

ELEMENT	SIG	TREATMENT				
		A	G	L	LG	N
P%	ns	0.364	0.368	0.373	0.368	0.365
S%	*	0.941a	1.129b	0.902a	1.341b	0.968a
K%	ns	2.176	2.329	2.337	2.314	2.206
Ca%	ns	3.821	3.888	3.927	3.952	3.856
Mg%	ns	1.076	1.082	1.025	1.079	1.054
Na%	*	0.356c	0.327c	0.266a	0.302b	0.299a
Mn mg/kg	*	119a	129b	127a	118a	128b
Fe mg/kg	ns	502	541	495	476	623
Zn mg/kg	ns	35	32	40	32	32
Cu mg/kg	ns	19	17	17	17	17
Al mg/kg	ns	99	104	100	96	114
B mg/kg	ns	46	45	47	44	46
Mo mg/kg	*	7.07b	6.55a	6.65a	6.76a	7.06b

[1]-*- significant at 5% level; [2]-means with different letters are significantly different

At this early stage of growth it appears that the levels of calcium applied have not interfered with the uptake of phosphorus but have depressed the uptake of sodium. Higher sulfur concentrations were observed where gypsum was applied.