SOUTH AFRICAN SUGAR INDUSTRY

AGRONOMISTS' ASSOCIATION

Code: FTK 3 ETv1/87/R

Cat No: 1638

TITLE : Timing of potassium application to winter cut cane.

1. PARTICULARS OF THE PROJECT :

This crop	: 5th ratoon
Site	: Eendag - Block 201
Region	: Northern irrigated
Soil system	: Komatipoort
Soil form/series	: Shortlands
Design	: Randomised block 6 reps
Variety	: J59/3
Fertilizer/ Ameliorants	: N P K : See treatments

Soil analysis: Date: 1/9/87

pH	O.M.%	Clay %	P.D.I.
6,8		730	

ppm

P	K	Ca	Mg	Zn	Al
23	234	1848	1141		

Age: 9,6mths Dates: 25/8/87 - 13/6/88

Rainfall: 542mm L.T.M.:629mm

Irrigation: 23mm on 7 day cycle

2. OBJECTIVES :

1.1. To test whether delayed application of K fertilizer to winter cut cane growing in Ca and Mg saturated soils in the Lowveld influences crop response to K.

1.2. To confirm whether or not it is necessary to introduce a seasonal correction factor for leaf K threshold value on these soils, and/or increase soil K threshold value.

TREATMENTS :

	TIMING - Potassium $kgha^{-1}$	
	4 weeks after harvest	October
1.	0	0
2.	300	0
3.	300	300
4.	600	0
5.	0	300
6.	0	600

Note on treatments :

Nitrogen (140kg N ha^{-1}) in the form of urea (46%) and Phosphate (20kg P ha^{-1}) as single supers (11,3%) were applied with the first potassium treatments on 23/9/87. Potassium was applied in the form of KCℓ (50%) on 23/9/87 in treatments 2, 3 and 4 and on the 3/11/87 in treatments 3,5 and 6.

IRRIGATION:

MONTH	A	S	O	N	D	J	F	M	A	M	J
Irrigation (mm)	46	92	92	184	46	138	92	92	92	92	Harvest
Rainfall (mm)	0	34	65	23	129	14	187	40	48	4	
TOTAL	46	126	157	207	175	152	279	132	140	96	
Eo (mm)/month	25	105	158	142	176	204	183	145	114	95	
Et (mm)/month	10	74	134	142	176	204	138	109	86	71	
Total moisture-Et	36	52	23	65	-1	-52	141	23	54	25	
Accumulated excess moisture (mm)	36	88	111	176	175	123	263	286	340	365	
Soil Temp C (8:00am) at 5cm	16	19	21	25	26	28	27	25	22	16	

RESULTS:

1. Yield at harvest

Treatment K (kgha^{-1})	Cane t ha^{-1}	Sucrose % cane	Sucrose t ha^{-1}
1. 0 + 0	98	15,7	15,4
2. 300 + 0	96	16,0	15,3
3. 300 + 300	99	15,8	15,6
4. 600 + 0	104	16,3	16,9
5. 0 + 300	102	15,6	15,9
6. 0 + 600	108	16,0	17,4
MEAN	101	15,9	16,1
C.V.%	13,2	6,5	14,1
S.E.D.	7,7	0,59	1,3
LSD(P=0,05)	15,9	1,2	2,7
LSD(P=0,01)	21,5	1,7	3,7

2. Third leaf K, Ca and Mg - dm%.

Treatments	K % dm				Ca % dm				Mg % dm			
	17/9*	29/10**	8/12	11/2	17/9	29/10	8/12	11/2	17/9	29/10	8/12	11/2
1. 0 + 0	1,39	0,96	1,11	1,45	0,53	0,73	0,44	0,28	0,60	0,42	0,43	0,27
2. 300 + 0	1,32	0,94	1,36	1,61	0,62	0,64	0,38	0,29	0,61	0,37	0,32	0,25
3. 300 + 300	1,30	0,98	1,55	1,59	0,52	0,62	0,33	0,26	0,54	0,40	0,32	0,24
4. 600 + 0	1,42	1,16	1,68	1,81	0,55	0,59	0,33	0,26	0,57	0,38	0,33	0,25
5. 0 + 300	1,11	0,78	1,39	1,68	0,65	0,71	0,38	0,26	0,60	0,46	0,36	0,26
6. 0 + 600	1,21	0,83	1,53	1,65	0,55	0,68	0,33	0,25	0,57	0,47	0,30	0,26
MEAN	1,29	0,94	1,44	1,63	0,57	0,66	0,37	0,27	0,58	0,42	0,34	0,26

* pre treatment ** prior to treatments 3, 5, 6.

3. COMMENTS

1. Yield data

* Yields at this site were variable (CV of 13,2% for t cane ha^{-1}) and responses to treatments were not statistically significant (P=0,05). The entire trial area lodged at 6 months of age.

* Analysis of soil samples taken 5 days after harvesting the previous crop and prior to applying treatments indicate that potassium levels in reps 1, 2 and 3 were substantially higher than in reps 4, 5 and 6 and responses from these replications differed markedly.

Soil analysis - prior to applying treatments.

TREATMENT	Reps 1, 2 & 3 Soil depth: ± 815mm TAM = ± 114				Reps 4, 5 & 6 Soil depth: ± 630mm TAM = ± 88			
	Kppm	Cappm	Mgppm	$\frac{Ca+Mg}{K}$	Kppm	Cappm	Mgppm	$\frac{Ca+Mg}{K}$
1.	390	1983	1320	8,5	90	1777	1080	32
2.	424	1939	1327	7,7	91	1843	1003	31
3.	382	1790	1210	7,9	90	1805	993	31
4.	414	1888	1340	7,8	95	1767	1007	29,2
5.	293	1943	1273	10,9	88	1757	967	31
6.	343	1878	1233	9,1	105	1827	987	26,8
MEANS	374	1904	1284	8,7	93	1796	1006	30,2

Yield data from blocking.

Treatments	Reps 1,2 & 3 tcha^{-1}	Pol%c	tsucha^{-1}	Resp.	Reps 4,5 & 6 tcha^{-1}	Pol%c	tsucha^{-1}	Resp.
1.	105	15,6	16,4		91	15,7	14,3	
2.	96	16,6	16,0	-0,4	95	15,4	14,7	+0,4
3.	95	16,4	15,6	-1,0	104	15,1	15,7	+1,4
4.	102	15,7	16,0	-0,4	106	16,8	17,8	+3,5
5.	108	16,0	17,2	+0,8	95	15,2	14,5	+0,2
6.	107	16,9	18,1	+1,7	110	15,2	16,7	+2,4
MEANS	102	16,2	16,5		100	15,6	15,6	

* There were no responses to K applied at 300kg ha^{-1} in reps 4, 5 and 6 despite soil K levels being well below threshold. The mean responses to 600kg ha^{-1} were substantial in these reps. While the results from reps 1, 2 and 3 where soil K levels were adequate before treatments were applied indicate the possibility of some response to the late (October) application of 600kg ha^{-1} the responses where soil K levels were below threshold in reps 4, 5 and 6 to the early applications (23 Sept) of K were slightly better than the delayed applications (3 Nov). The response to splitting the 600kg ha^{-1} into an early and late application of 300kg ha^{-1} was clearly less effective than the single 600kg ha^{-1} application.

2. Third leaf analysis.

* Composite samples taken in September showed no deficiency in 3rd leaf K levels. With the exception of cane treated with 600kg ha^{-1} levels dropped to below threshold in November samples after which they rose substantially in subsequent samples. While the 3rd leaf K levels closely reflected the rates of K applied the early application of 600kg ha^{-1} maintained a higher K level than other treatments.

* The pattern of 3rd leaf Ca and Mg levels forms a nearly mirror image formed by K levels and appears to be associated with changes in soil temperature.

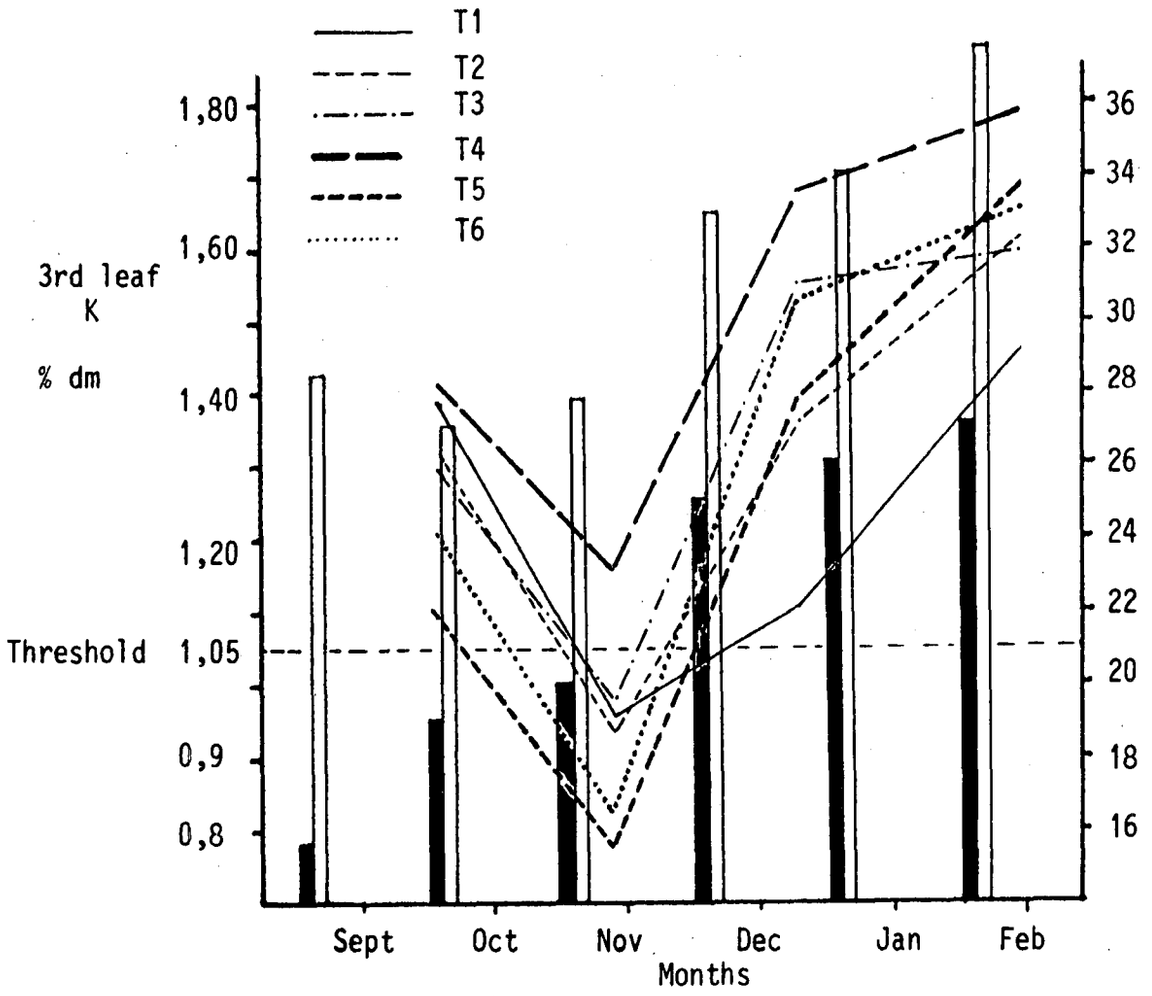
3. General.

* The moisture received by this crop exceeded its requirements and it is likely that the soil moisture content was very high before treatments were applied. The lower than average soil temperatures (recorded at Mhlati met site) during August and October may have reduced the mobility of K ions in the soil and could have been

exacerbated by the excessive soil moisture and consequently suppressed the uptake of K by the roots.

* It will be of interest to know whether similar responses to those from reps 4, 5 and 6 can be achieved on soils with apparently adequate levels of K but a high ratio of Ca + Mg : K.

CHANGES IN 3RD LEAF K % dm AT VARIOUS LEVELS OF APPLIED K



CHANGES IN 3RD LEAF Ca % dm WITH INCREASING SOIL TEMPERATURE