

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code No.: HW 247/P/83

Cat. No.: 1423

TITLE: *C rotundus* control in plant cane

1. Particulars of the project

<u>This crop</u>	:	Plant cane
<u>Site</u>	:	Glen Park Estate
<u>Region</u>	:	Northern Area
<u>Soil system</u>	:	Alluvium
<u>Soil form/series</u>	:	Oakleaf
<u>Design</u>	:	Random block
<u>Variety</u>	:	NCo 376
<u>Fertilizer/</u>	:	<u>N</u> <u>P</u> <u>K</u>
In furrow (kg/ha)	:	47 - 47
Top-dressing (kg/ha):	:	47 - 47
Total	:	<u>94 - 94</u>

Soil analysis: Date: 26.11.82

<u>pH</u>	<u>O.M.%</u>	<u>Clay%</u>	<u>Silt%</u>	<u>Sand%</u>	<u>F.</u>	<u>M.</u>	<u>C.</u>
7,25	0,19	13	8	59	29	1	0
ppm							

<u>P</u>	<u>K</u>	<u>Ca</u>	<u>Mg</u>	<u>Zn</u>	<u>Al</u>
>80	124	1439	>220		

Age: 13,4 months Dates: 3.3.83-16.4.84

Rainfall : 1438 mm L.T.M.: 866

Irrigation: + 56 mm/month

NB. For the first eight months rainfall was 87% of long term mean. Thus good rains occurred late in the crop cycle

2. Objectives

To assess methods of ploughout and subsequent treatment for the most efficient management of *C rotundus* in plant cane.

3. Treatments

See table 1.

Table 1

Treatments

Treatments	No. of sub-plots	Weed control programme	Tillage procedure
Control : Plough (<i>C. rotundus</i> left to compete)	2	Hand weeded of grass and broadleaf)No soil disturbance after Roundup application. Ridged directly into soil
Treated : Plough + Roundup on <i>C. rotundus</i> (1 application)	1)Dual+ametryne+paraquat/diuron +	
Treated : Plough + Roundup on <i>C. rotundus</i> (2 applications)	1) (ioxynil + 2,4-D)	Rotary hoe for incorporation into soil
Control : Plough (<i>C. rotundus</i> left to compete)	2	Hand weeded of grass and broadleaf	
Treated : Plough + Eptam Super at planting	2	Diuron+(ioxynil+2,4-D)(2 applications)	No soil disturbance
Control : Plough (<i>C. rotundus</i> left to compete)	2	Hand weeded of grass and broadleaf	
Treated : Plough + Dual + ametryne + paraquat	2	Diuron+(ioxynil+2,4-D)(2 applications)	In-row incorporation only
Control : Min.tillage-1 R/up application (<i>C. rot.</i> left to compete)	1	Hand weeded of grass and broadleaf	
Treated : Min.tillage-1 R/up application + Eptam Super on row	1	Diuron+(ioxynil+2,4-D)(2 applications)	No soil disturbance
Control : Min.tillage-2 R/up applications(<i>C. rot.</i> left to compete)	1	Hand weeded of grass and broadleaf	
Treated : Min.tillage-2 R/up applications + Eptam Super on row	1	Diuron+(ioxynil+2,4-D)(2 applications)	In-row incorporation only

Notes on treatments:

1. All furrows in plots were drawn by a three furrow tractor-drawn ridger body.
2. Plough treatment consisted of a cross ripping (in two directions) and two subsequent discing operations except in treatment A which had only one discing operation.
3. Regrowth of *C. rotundus* was extensive where Roundup had been applied so another 6 l/ha was applied to one plot of each treatment.
4. Where Eptam Super was used in minimum tillage plots, furrows for planting did not always follow through the treated area only. A hand held motorised rotary hoe was used to incorporate the herbicide into the soil.
5. Where Eptam Super was used in ploughed plots, a tractor-drawn rotary hoe was effective in incorporating the herbicide into the soil and also produced an extremely fine soil tilth.

4. Experimental

On the site used for the experiment was a young ratoon crop infested with *Cyperus rotundus* which had been treated with a paraquat based mixture. The cane was slashed back and allowed to ratoon again while the *Cyperus rotundus* regrew to form a dense stand.

As indicated in the treatments the area was either cross ripped and then disced or subsequently treated with Roundup.

Plot sizes consisted of four cane rows x 32 m each of which was split into two 16 m length subplots one being treated to control *Cyperus rotundus* and the other being left untreated for comparison. Two sample areas of two rows x 8 m were used in each subplot for the purpose of crop growth measurements and *Cyperus rotundus* population assessments.

All chemical applications were made using a lever operated knapsack sprayer fitted with an Albus APM Green floodjet. The nozzle was held directly over the cane rows for the initial Roundup application in minimum tillage plots but over the centre of the interrow for all other applications.

The cane had 6 - 8 leaves unfurled per shoot and was well tillered at the time of Roundup application. *C. rotundus* had on average 5 - 6 leaves unfurled per plant, was at a pre-flowering stage of growth and covered approximately 70 - 100% of the ground surface in minimum tillage plots at the time of Roundup application.

Dates of land preparation, spraying and planting are shown in table 2.

Table 2: Operations and sequence

Date	Operation
8 November 82	Cane slashed back
28 November 82	Conventional plots cross ripped
December 82	Conventional plots disced
7 January 83	Minimum tillage plots sprayed with Roundup. (10 l/ha)
20 January 83	Conventional plots A sprayed with Roundup (10 l/ha)
8 February 83	One minimum tillage and one conventional A plot resprayed with Roundup (6 l/ha)
February 83	Conventional plots B and C disced again. Broadleaf weeds in conventional A plots treated with paraquat.
2 March 83	Eptam Super applied to conventional B plots.
3 March 83	Trial planted. 3 furrow ridger tractor-drawn, hand planted. Sprayed conventional A and C plots with Dual+ametryne+paraquat.
18 March 83	Hand weeded
7 April 83	All treated plots sprayed with diuron+Actril DS. All control plots hand weeded.
21 April 83	All control plots hand weeded Fertilizer top-dressing applied
21 July 83	Sprayed all treated plots with a second application of diuron+Actril DS
August 83	Handweeded all control plots and treated plots

C rotundus growth stages at spraying are presented in table 3 and the weather conditions at spraying, at planting and subsequently are presented in table 4.

Table 3: *C rotundus* growth stages at spraying

Plot sprayed	Date	Growth stage of <i>C rotundus</i>
Minimum tillage plots	7 January 83	70 - 100 % ground cover pre-flowering 5 - 6 leaves per plant.
Conventional tillage plots	21 January 83	Varied between plots: 30 - 95% ground cover. Pre-flowering 6 - 12 leaves per plant. Some plants with lateral roots with basal bulb swelling and a few with developed daughter plants.
Minimum tillage and conventional tillage plots - repeat spray	8 February 83	10% ground cover minimum tillage plots, 20% in conventional plots. 8 - 12 leaves per plant

Table 4: Weather conditions at planting, at spraying and subsequently

Dates	Temp °C		Rel. Humidity%		Rainfall (mm)			
	8am	2pm	8am	2pm	On day of spray	Days to first rain	Amounts of first rain	Amount in two weeks
7 January 83	24,5	25,5	79	69	0	5	2,0	48,0
20 January 83	26,0	30,5	88	73	0	3	2,0	14,0
8 February 83	25,3	30,0	85	65	0	3	6,1	25,1
2 March 83	21,0	28,4	86	75	0	1	5,0	21,0
3 March 83	24,0	26,5	91	73	5,0	0	5,0	21,0
7 April 83	19,0	24,7	95	63	0	4	3,2	3,2
21 July 83	14,5	26,0	78	35	0	3	74,0	76,00

Table 5: *C rotundus* populations (counts and ratings of percent ground cover) at planting and at intervals up to 7.5 months of age. Taken on cane interrow or rated over whole plots

Treatments	Population (plants/m ²)				Percent ground cover (ratings)					
	At plant 3 Mar	7 Apr	17 May	21 June	18 Mar	7 Apr	17 May	21 June	21 July	27 Oct
A1 Control - Conv plough - (<i>C. rot.</i> left to compete)	111 (185) (37)	325 (525) (150)	625 (750) (475)	875 (1275) (475)	35 (45) (25)	83 (85) (80)	80 (85) (75)	29 (43) (15)	49 (50) (30)	65 (70) (60)
A2 Treated - Conv plough + Roundup 1 application	163	175	100	350	18	45	20	10	8	25
A3 Treated - Conv plough 1 Roundup 2 applications	96	75	75	100	5	10	7	5	13	5
B1 Control - Conv plough - (<i>C. rot.</i> left to compete)	148	700	600	975	60	93	70	33	63	50
B2 Treated - Conv plough + Eptam Super	148	125	500	825	7	28	60	16	33	35
C1 Control - Conv plough - (<i>C. rot.</i> left to compete)	148	525	675	900	45	90	73	26	66	63
C2 Treated - Conv plough + Dual + am + par.	148	425	475	925	30	73	55	24	65	60
D1 Control - Min. tillage 1 Appl. (<i>C. rot.</i> left to comp.)	303	375	350	825	50	60	30	10	8	40
D2 Control - Min. tillage 2 Appl. (<i>C. rot.</i> left to comp.)	7	0	75	175	3	10	12	5	8	3
D3 Treated - Min. tillage 1 Appl. + Eptam Super	303	225	325	850	38	45	25	18	30	40
D4 Treated - Min. tillage 2 Appl. + Eptam Super	7	13	150	100	3	10	7	5	8	3

5. Comments

- Populations of *C rotundus* at planting were measured in one plot of each whole plot treatment only. Measurement consisted of *C rotundus* counts in each of six sub sample areas (20 cm x 20 cm) per plot.
- *C rotundus* populations varied quite considerably between plots even within the same treatment. However, very good control was provided by some treatments which included Roundup and by the Eptam super treatment although control from the latter was short-lived.
- Roundup treatment in minimum tillage plots was only effective where a second application was made. This was probably due to the limited contact with *C rotundus* growing in the inter-row of large cane and the length of time between the initial spray and planting which allowed a certain degree of *C rotundus* regrowth.
- Figure 1 illustrates the degree of control of *C rotundus* during early crop growth.

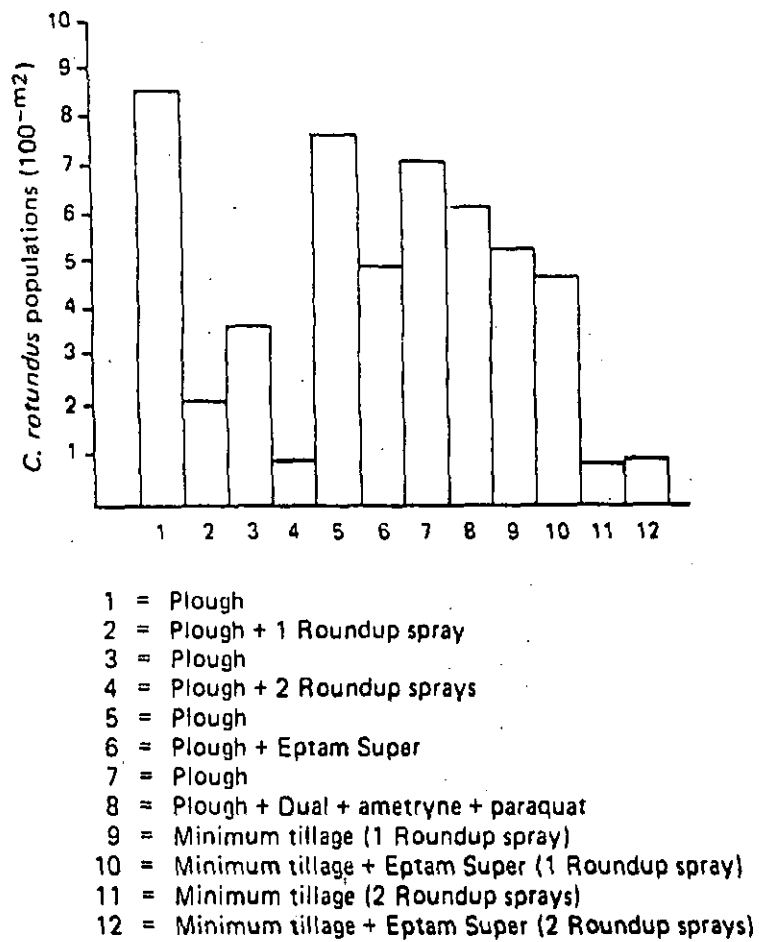


FIGURE 1: *C. rotundus* populations: mean of counts on three sampling dates.

5. Comments

- One month after planting differences in crop growth were noticeable and both shoot length and populations were greater in plots where *C. rotundus* had been well controlled - namely where Roundup had been applied twice.
- Benefits from Eptam Super after conventional ploughing and from the single application of Roundup after conventional ploughing only became apparent later in the growth stage of the crop (\pm 3,5 months after planting).
- One plot of the minimum tillage treatment which had received only one application of Roundup was particularly poor in growth (both stalk length and population) and this was considered to have been exaggerated by non-treatment effects such as possible mal distribution of irrigation or soil effects. Some cattle damage and termite damage was apparent in plots although no obvious preference was seen for any treatment.
- Although slight, some benefit in stalk length was apparent in plots conventionally ploughed and treated with Eptam Super or Dual + ametryne + paraquat.
- Diuron + Actril DS was applied twice to all treated plots to control regrowth of *C. rotundus* and damage from these applications may have decreased the noticeable benefits of *C. rotundus* control.
- Figure 2 shows the effects of treatments on crop growth measurements at 5,5 months of age.
- Figure 3 shows the relationship between *C. rotundus* populations and crop growth.

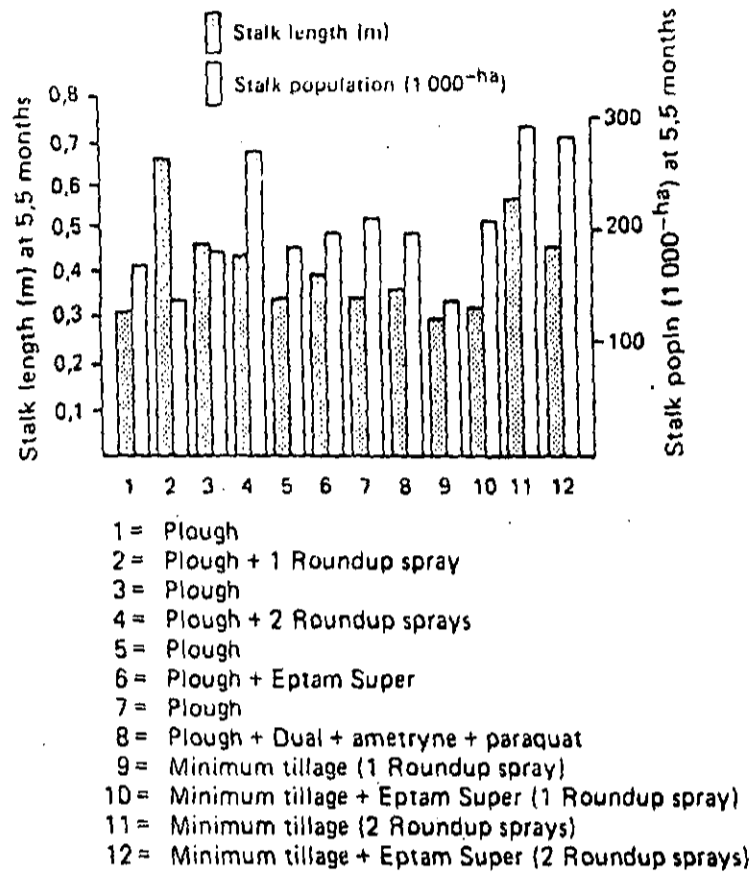


FIGURE 2: Crop measurements at 5,5 months of age.

FIGURE 5: Relationship between *C rotundus* population and (1) length (2) population of stalks.

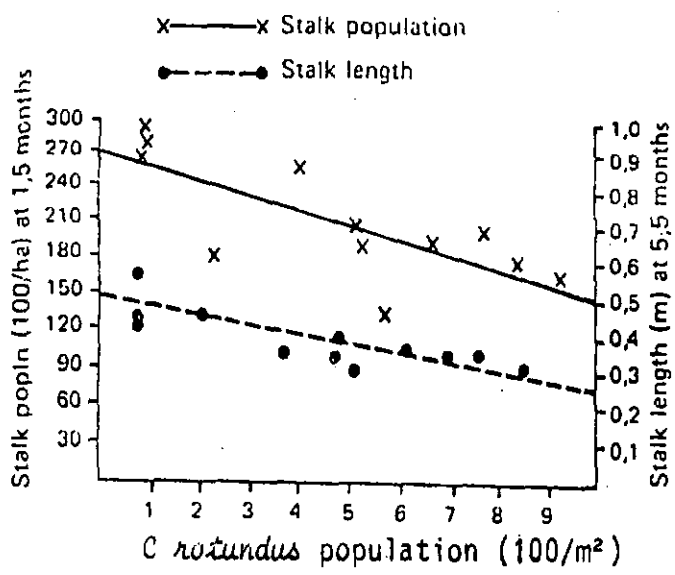


Table 6: Crop measurements taken one, 1,5, 2,5, 3,5, 4,5 and 5,5 months after planting

Treatments	Stalk length (cm) (months)						Stalk population (1000/ha)					
	1	1,5	2,5	3,5	4,5	5,5	1	1,5	2,5	3,5	4,5	5,5
A1 Conventional Competition (A 1a) (A 1b)	9,9 (8,8) (10,9)	14(12) (16)	22(19) (25)	22(20) (24)	26(25) (26)	33(31) (34)	39(34) (44)	54(44) (63)	85(57) (112)	129(89) (158)	137(110) (164)	214(166) (263)
A2 Conventional Roundup x 1	10,9	16	26	26	30	45	49	71	101	128	155	187
A3 Conventional Roundup x 2	12,4	20	28	30	35	44	53	86	132	183	164	263
B1 Conventional Competition	10,8	15	22	24	27	34	33	45	60	98	111	181
B2 Conventional Eptam Super	10,2	15	25	25	30	39	43	62	101	139	146	196
C1 Conventional Competition	10,5	14	22	25	26	34	32	42	63	99	139	207
C2 Conv. Dual + ametryne + paraquat	9,6	14	25	22	27	36	36	48	86	132	143	195
D1 Min. Till. Competition Roundup x 1	9,9	13	19	20	24	30	37	51	58	79	93	139
D2 Min. Till. Competition Roundup x 2	12,6	18	28	33	35	56	57	103	180	221	206	292
D3 Min. Till. Eptam Super Roundup x 1	10,3	14	21	21	27	34	46	58	82	129	139	212
D4 Min. Till. Eptam Super Roundup x 2	11,6	19	30	28	31	46	59	94	155	199	184	281

6. Comments on treatments

1. Conventional ploughout versus conventional ploughout followed by Roundup on *C rotundus* (plus two sprays of diuron + Actril DS directed away from cane foliage)

- *C rotundus* control

Two applications of Roundup provided very good control and one application fair control. One unsprayed plot had low populations of *C rotundus* compared to other plots, but despite this the *C. rotundus* population was higher than where Roundup had been applied.

- Crop growth

For the first six months stalk lengths and populations were noticeably better in the plots treated once with Roundup compared to the control. In the plot treated with two Roundup sprays - which gave much better *C rotundus* control there was also a noticeable improvement in both stalk length and populations during early crop growth and this appeared to persist in terms of stalk length till the time of harvest. However the difference was not large.

- Estimated yields (based on 40 stalk sample harvest)

A much greater difference in yields occurred due to plot position in the field layout than due to treatment effects. However where cane growth was good, there was a yield advantage due to treatment. This was of the order of 9%.

2. Conventional ploughout versus conventional ploughout followed by Eptam Super (plus two sprays of diuron + Actril DS).

- *C rotundus* control

Very good temporary (+ 7 weeks) control was provided by Eptam Super.

- Crop growth

In both plots stalk length and populations were improved by Eptam Super although only the effects on stalk length persisted till harvest (in one plot only).

- Estimated yield

A small benefit seemed to occur due to treatment in one plot while a disadvantage occurred in the other in spite of favourable early crop measurements. It may be possible that Eptam Super and diuron + Actril DS treatments affected cane more than the observed benefit from *C rotundus* control.

Again differences between replications were far greater than between treatments.

3. Conventional ploughout versus conventional ploughout followed by Dopax + paraquat (standard farm treatment).

- C. rotundus control

Very poor control was achieved by the treatment.

- Crop growth

Populations were increased by treatments at a very early stage but ultimately no differences were apparent in populations or stalk length.

- Estimated yields

No differences in yield are apparent.

4. Minimum tillage versus minimum tillage followed by Eptam Super (and 2 sprays of diuron + Actril DS)

- C rotundus control

Two plots were sprayed with Roundup once and two received two applications of Roundup. Excellent *C rotundus* control was provided by the repeat application treatment, but regrowth from the single application treatment was extensive and unacceptable.

- Crop growth

Very poor growth was apparent from the plots which received only one application of Roundup, but this was considered to be due to the position in the field layout and possibly non-uniform irrigation distribution. However in these plots the Eptam Super treated section had cane with better populations and stalk lengths.

In the plot treated twice with Roundup the Eptam Super treated plot was worse initially in terms of both population and length. Ultimately differences were far less noticeable.

- Estimated yields

Yields were increased by Eptam Super treatment where cane growth was generally poor but the opposite effect appeared to occur in well grown cane plots.

Again the difference between position in the experiment was far more marked than treatment differences.

7. Conclusions

In spite of early crop growth differences in favour of plots in which *C rotundus* had been well controlled, no marked benefits are apparent in yield terms. This suggests that under irrigated conditions (although this was erratic due to water shortages) and with variety NCo 376 the competitive effects of *C rotundus* in plant cane are small.

Variability in the trial site and the fact that a full harvest could not be conducted mean that yield reductions which may have occurred due to *C rotundus* competition were masked. However, results certainly indicated that in spite of fairly large *C rotundus* populations a reasonable yield of plant cane was achieved.

PETT/IS
18 June 1984