

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code No : R100/89/R1
Cat No : 1737

Title: Soil moisture x Fusilade Super

1. Particulars of project

This crop : 1st ratoon	Spray method: Overhead boom with two TK 1,0 floodjets and CP3 knapsack.
Site : Pongola Field Station Blocks 308 and 309	Pressure: High setting
Region : Northern area	Volume/ha: 62 l
Soil system : Komatipoort	Weather at spraying: Clear, sunny and cool
Soil form/series: Shorrocks	Condition of cane at spraying: W1 = plots 9-10 green leaves W4 = plots not showing signs of stress.
Design : Randomised blocks	Sampling technique: Four stalks taken from 4 predetermined points in net rows (4 x 4 = 16 stalks). For partitioning 25 marked stalks/plot were taken at random.
Plot size : 6 rows x 12,2m x 1,5m	
Variety : NCo376	
Date and age at spraying : 27.5.89 (8,5 months)	
Date and age at harvest : 27.7.89 (10,5 months)	
Sampling dates : 25/5; 23/6; 5/7; 26/7	
Days after treatment (spray) : (0) (29) (41) (62)	
Partitioning : 23/5, 13/6, 4/7, 25/7	
Irrigation : See treatments	
Rainfall (1988) : See water balance (4.1)	

2. Objectives:

- a. To assess the effects of various levels of stress on the response to Fusilade Super.
- b. To observe the residual effects of Fusilade Super used on cane subjected to levels of stress in (a) above.
- c. To study the changes in sucrose, glucose and fructose in sections of the stalk due to ripening.

3. Treatments:

1. No dry off and ripener (RW1)
2. No dry off and no ripener (CW1)
3. Moderate dry off and ripener (RW3)
4. Moderate dry off and no ripener (CW3)
5. Severe dry off and ripener (RW4)
6. Severe dry off and no ripener (CW4)
7. Interrupted dry off and ripener (RW2)
8. Interrupted dry off and no ripener (CW2)

Notes on treatments

Irrigation: The trial was irrigated with overhead sprinklers (61 mm per cycle) until February after which Perf-o-rain pipes were used to irrigate plots separately. W1 plots were irrigated until July; W2 plots were irrigated up to February after which they received only one irrigation in May; W3 plots were irrigated up to April and W4 plots up to February.

Ripener: Fusilade Super was sprayed at 329 ml/ha on 24 May 1989 when the crop was 8,5 months old.

Procedure of sectioning stalks

- ° At spraying the upper most leaf with a visible collar was marked with paint (100 stalks/plot). (Previous measurements estimated the stalk apex to be 10-30 mm from the point of attachment of this leaf).
- ° On the day of spraying Fusilade Super the first 3 internodes longer than 5 cm below the point at which the marked leaf was attached to the stalk, formed section 1. Two lengths of 20 cm below section 1 formed sections 2 and 3. The 1 m length of the stalk base formed section 5 and the remaining middle part of the stalk (of variable length) formed section 4. Twenty five stalks from W1 and W4 plots were sectioned in this manner on 23 May, 13 June, 4 July and 25 July.
- ° Juice from each section was clarified and frozen in sealed sachets for analysis (G.C) at a later date. Lodged stalks could not be avoided when taking samples for sectioning in W1 plots. Stalks from W4 plots were mostly upright.

Leaf water potential

A pressure chamber (Scholander pressure bomb) was used to measure leaf water potential (Ψ_l) on 24 May, 14 June and 5 July.

4. Results

4.1 Moisture balance

Month	Moisture received		Moisture lost (Et) mm	Accumulated moisture rainfall + irrigation - Et			
	Rainfall (mm)	Irrigation (mm)		All plots			
				W1	W2	W3	W4
Sept	8,5	61	51,2	+ 18,3			
Oct	13,49	-	83,9	+ 69,3			
Nov	62,3	61	122,8	+ 69,8			
Dec	113,7	61	136,9	+107,6			
Jan	18,0	61	181,0	+ 5,6			
Feb	201,7	61	126,2	+142,1			
Mar	82,4		167,1	+ 57,4	+ 57,4	+ 57,4	+ 57,4
Apr	20,9		119,9	+ 58,4	- 41,6	+ 8,4	- 41,6
May	9,4		92,4	+ 75,4	- 74,6	- 74,6	-124,6
June	54,9		78,1	+102,2	- 97,8	- 97,8	-147,8
Jul	11,0		78,0	+ 35,2	-164,8	-164,8	-214,8
Totals	717,7	555	1237,5				

4.2 Changes in factors related to canopy structure.

4.2.1 Lodging and flower emergence rating

Treatments	Dates	Lodging % rated			Flowers emerged %
		23/4	22/5	20/7	20/7
CW1		36	71	96	1,8
RW1		21	57	100	1,1
CW2		25	25	64	1,2
RW2		36	46	82	0
CW3		0	21	68	2,3
RW3		0	21	39	0
CW4		0	25	61	1,6
RW4		0	39	75	0

4.2.2 Number of green leaves per stalk

Treatment	28 June	3 July	26 July
CW1	7,6	8,4	8,3
RW1	7,3	7,7	7,1
CW4	7,5	8,3	8,2
RW4	7,6	7,6	6,7

4.3 Sample data

4.3.1 Changes in quality of unsprayed plots

Date and (DAT)	ers % cane			
	25/5 (0)	23/6 (29)	5/7 (41)	26/7 (62)
<u>Treatments</u>				
W1	6,3	7,6	8,2	8,2
W2	5,6	7,6	8,1	8,9
W3	5,0	8,5	8,8	8,9
W4	6,1	8,4	8,2	9,5
MEAN	5,8	8,0	8,3	8,9

4.3.2 Responses to Fusilade Super (ers % c)

<u>Treatments</u>				
W1	-0,42	0	-0,11	+0,54
W2	+0,12	+0,52	+0,92	+0,37
W3	+1,31**	-0,21	-0,26	+0,93*
W4	+0,41	-0,47	+0,99*	-0,19
MEAN	+0,36	-0,04	+0,39	+0,41
CV %	15,0	10,5	10,9	7,4
SED ±	0,47	0,45	0,49	0,36
LSD (P=0,05)*	0,95	0,91	0,99	0,73
LSD (P=0,01)**	1,28	1,21	1,33	0,97

4.3.3 Changes in stalk mass of unsprayed cane

Date and (DAT)	g/stalk			
	25/5 (0)	23/6 (29)	5/7 (41)	26/7 (62)
Treatments				
W1	1132	1162	1211	1287
W2	1015	1106	1121	1171
W3	1054	1222	1136	1304
W4	1132	1107	1016	1210
MEAN	1083	1149	1121	1243

4.3.4 Effects of Fusilade Super on stalk mass (Ripened-Control)

Treatments	mass g/stalk			
W1	+57	-64	-104	-44
W2	-72	+6	-96	+24
W3	+13	-65	+1	-119
W4	-64	+80	+59	-24
MEAN	-17	-108	-35	-41
CV %	11,3	10,3	8,4	12,3
SED ±	65,1	63,2	49,3	80,4
LSD (P=0,05)	131,4	127,5	99,4	162,2

4.3.5 Responses to Fusilade Super (Ripened-Control)

Date and (DAT)	ers g/stalk		
	23/6 (29)	5/6 (41)	26/7 (62)
Treatments			
W1	-5,4	-8,9	+1,6
W2	+6,1	+0,8	+6,1
W3	-7,7	-2,3	-0,1
W4	-0,9	+15,4*	-4,8
MEAN	-2,0	+1,25	+0,7
CV %	15,4	14,3	12,4
SED ±	7,6	7,2	7,3
LSD (P=0,05)	15,3	14,5	14,8

4.4 Harvest data

Treatments	ers % cane	Response	t cane ha ⁻¹	t ers ha ⁻¹	Response	Stalk	
						Height (cm)	pop. x1000 ha ⁻¹
CW1	8,2		134,3	10,9		270	126
RW1	8,7	+0,5	128,6	11,1	+0,2	264	122
CW2	8,9		135,6	12,1		268	107
RW2	9,3	+0,4	135,6	12,6	+0,5	270	120
CW3	8,9		137,6	12,2		271	119
RW3	9,8	+0,9*	133,0	13,1	+0,9	268	123
CW4	9,5		129,2	12,3		265	118
RW4	9,3	-0,2	134,0	12,5	+0,2	258	124
MEAN	9,1		133,5	12,1		267	119
CV %	7,4		5,4	7,9		3,5	10,0
SED ±	0,36		3,6	0,48		5,0	5,9
LSD (P=0,05)*	0,73		7,2	0,96		10,1	12,0
IRRIGATION MEANS							
W1	8,4		131,4	11,0		267	124
W2	9,1		135,6	12,3		269	113
W3	9,4		135,3	12,6		270	121
W4	9,4		131,6	12,4		262	121
SED ±	0,26		2,5	-		5,0	-
LSD (P=0,05)	0,51		5,1	0,68		10,1	8,5
RIPENER MEANS							
Control	8,9		134,2	11,9		268	117
Fusilade Super	9,3*		132,8	12,3		265	122
SED ±	0,18		1,8	0,24		2,5	3,0
LSD (P=0,05)*	0,36		3,6	0,48		5,1	6,0

Partitioning Data

Changes in sucrose content (Figure 4), stalk mass (Fig 5) and sucrose mass (Figures 6a and 6b) of various sections of the stalk are shown for W1 and W4 cane with and without ripener.

Leaf water potential (Ψ 1)

Leaf water potentials taken on 24 May are shown in Figure 1, Figure 2 shows leaf water potential differences on 14 June and Figure 3 shows differences between W1 and W4 cane sprayed with Fusilade Super and unsprayed cane.

General Comments

The Ψ 1 readings taken on 24 May indicate that stress in W4 plots (0,8 MPa) was higher than in W1 plots (0,55 MPa) (Figure 1). This difference in Ψ 1 was not evident on 5 July after 54,9 mm of rain fell during June. The initial stress is reflected in the increased ers % cane of W4 cane sampled on 23 June (see 4.3.1). The cane quality of W1 and W4 were similar on 5 July after which the quality in W4 cane again was better than W1 cane. Following the initial stress in W4 cane, which resulted in lower stalk mass, differences between the stalk mass of W1 and W4 cane were small on 25 July.

Cane in W1 plots was partially lodged at spraying and continued to lodge so that all plots were entirely lodged by the time of harvesting. The cane in W4 plots started lodging during May and was 70% lodged at the time of harvesting.

At the time of harvesting the moderate stress which had developed in plots where irrigation was suspended had raised the cane quality ($P=0,05$) without having any significant effect on cane yields (see 4.4). The standard 16 stalk samples (topped at NBP) which included lodged cane (particularly from W1 plots) indicated little response to Fusilade Super with the exception of a significant ($P=0,05$) response in W4 plots 41 days after spraying which was only partially lodged at the time.

The mean response to Fusilade Super of 0,4 t ers/ha ($P=0,05$) at harvesting can be attributed mainly to the good responses in W3 plots in which cane had lodged the least (40%).

Analysis of stalk sections on 25 July indicate substantial responses to Fusilade Super in W4 cane (31,8 ers g/stalk) and little response in W1 cane (5,8 ers g/stalk). This data shows no adverse effects from Fusilade Super on stalk mass while sucrose content was raised by more than 1,5 units of pol in sections 1 and 2 and by more than 1,0 units in sections 3, 4 and 5. The significantly lower ($P=0,05$) stalk populations in CW2 plots do not correlate with sample data and yield data.

Note: This comparison of sectioned stalks is based on lodged cane in W1 plots and upright cane in W4 plots. The standard 16 stalk sample taken after harvesting was drawn from bundles in plots which had been topped with cane knives.

LEAF WATER POTENTIALS $-\psi_l$

Figure 1

24/5/89

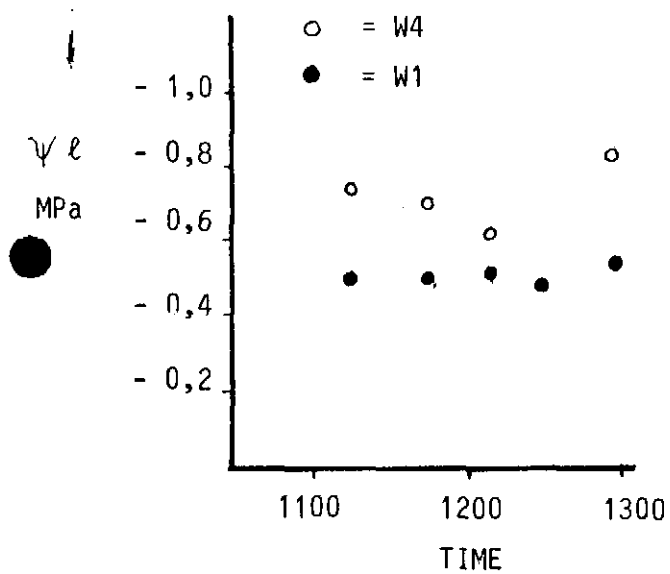


Figure 2

14/6/1989

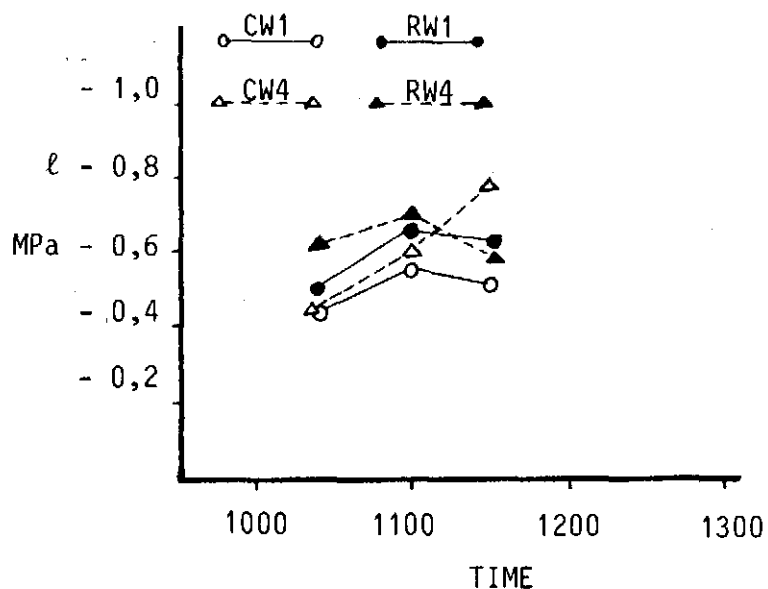


Figure 3

5/7/89

W1

5/7/89

W4

▲ = CW4
▲ = RW4

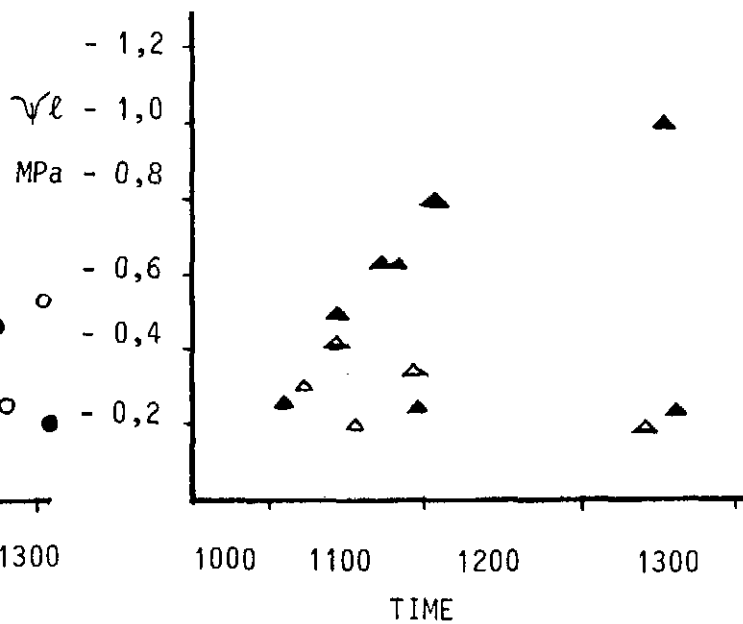
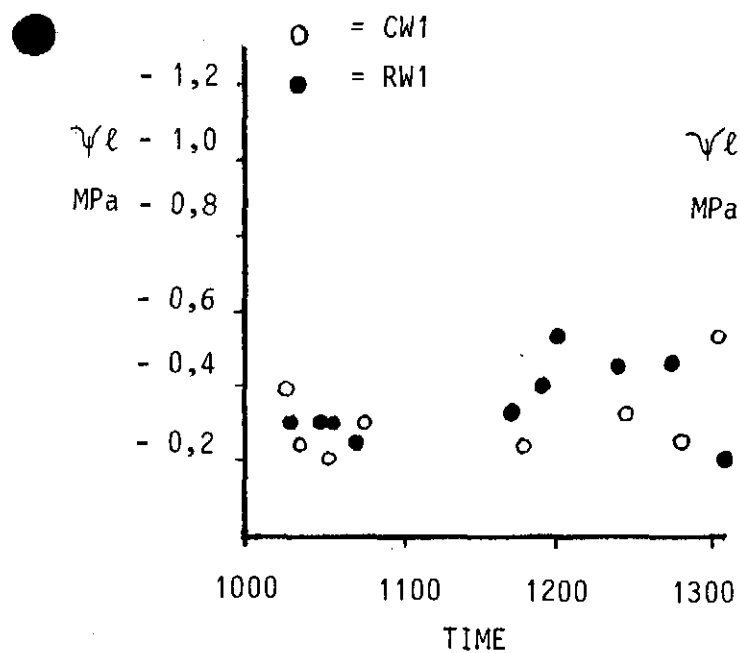


FIGURE 4: EFFECTS ON SUCROSE CONTENT OF W1

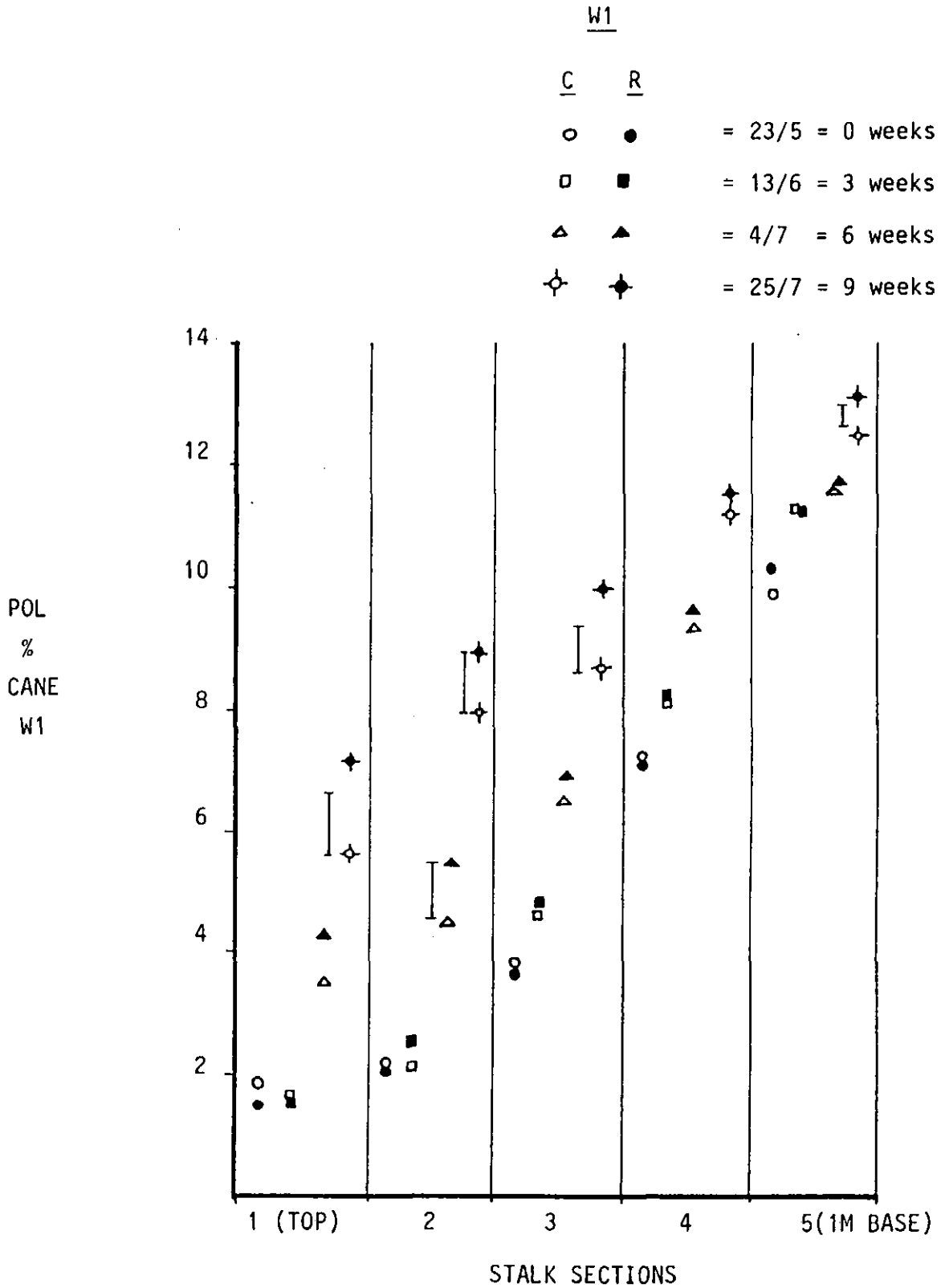


FIGURE 5: TREATMENTS EFFECTS ON CANE FRESH MASS

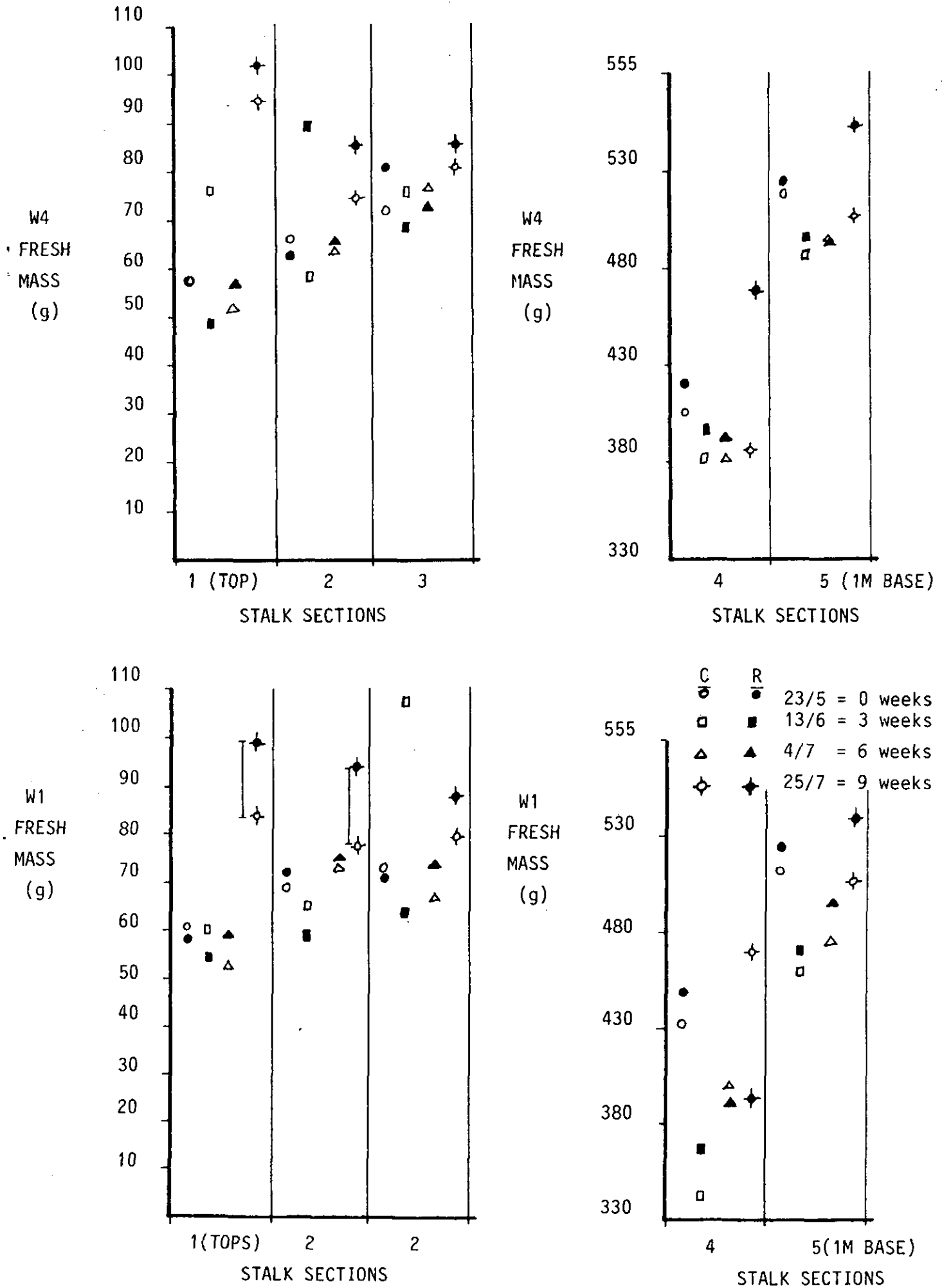


FIGURE 6(A): EFFECTS ON SUCROSE MASS OF W1

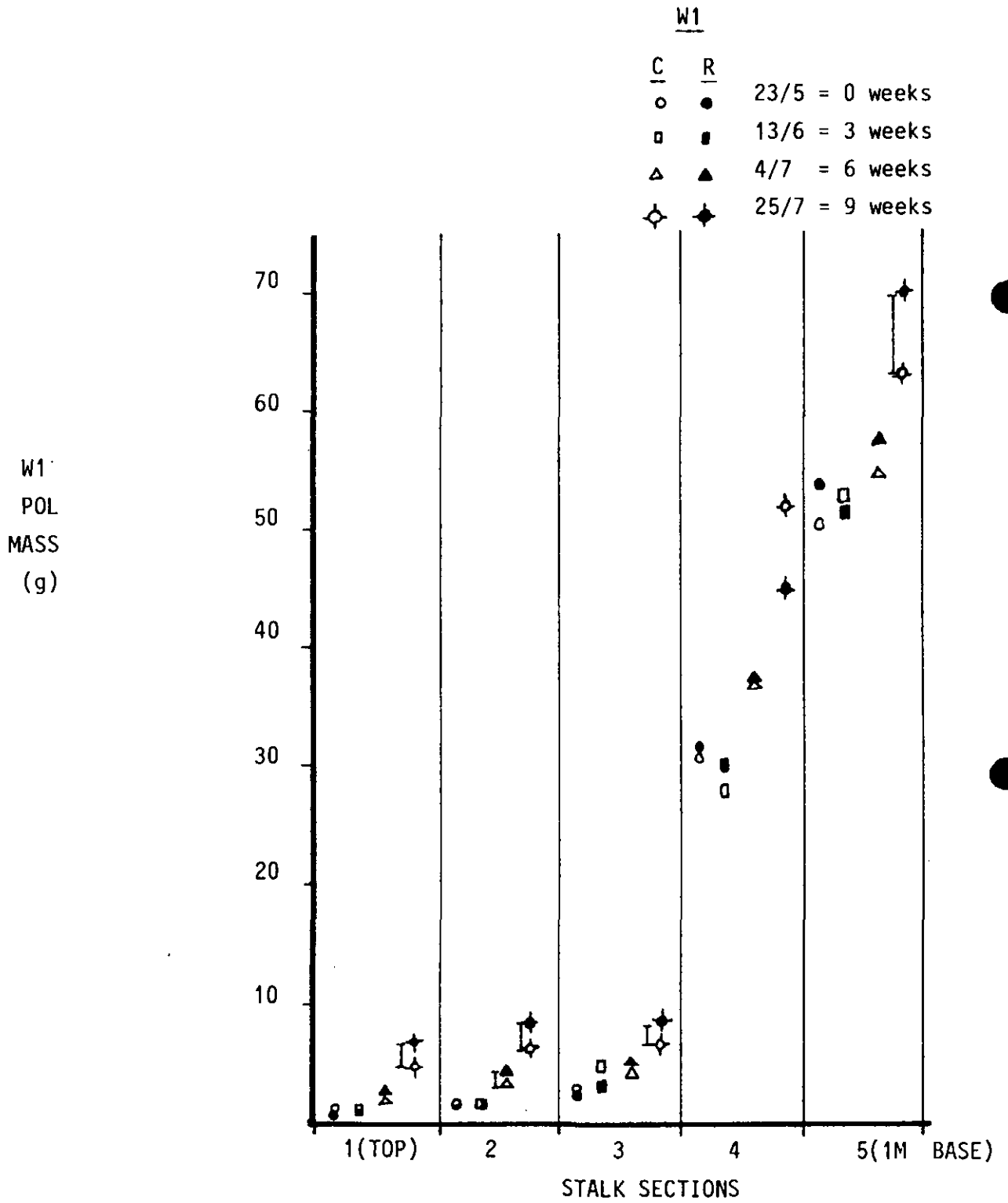


FIGURE 6(B): EFFECTS ON SUCROSE MASS OF W4

