

SOUTH AFRICAN SUGAR INDUSTRY
AGRONOMISTS' ASSOCIATION

Code : HW 258
Cat. No. : 2905 1578

Title : The effect of different water regimes on the efficacy of Lasso (alachlor) against five weed species.

1. Particulars of the project

This crop : Weeds only

Site : Traysite Mount Edgecombe

Region : N. Coast Coastal

Soil system : Umzinto, C. lowlands

Soil form/series : Shortlands

Design : Latin square for sub plot treatments

Weed species : Digitaria sanguinalis

Panicum maximum

Portulaca oleracea

Sorghum verticilliflorum

Rottboellia exaltata

Soil analysis :

pH		O.M. %		Clay %	
6,30		2,10		55	
ppm					
P	K	Ca	Mg	Zn	Al
19	142	>1800	>220	-	-

Dates : 22.5.85 - 25.7.85

Irrigation: See treatments

2. Objectives

1. to determine whether the efficacy of alachlor at three rates is affected by the presence or absence of moisture at spraying
2. to determine the extent to which the efficacy of alachlor is affected by increasing time periods between spraying and first irrigation/rainfall

3. Treatments

	Chemicals	Moisture
1. Trial A:	a) Untreated control	10 mm of water applied just before spraying in half of the pots and the remainder sprayed dry. All pots watered at 12 days and every 3-4 days thereafter with 10mm per application.
	b) Alachlor at 0,18 kg ai ha ⁻¹	
	c) Alachlor at 0,9 kg ai ha ⁻¹	
	d) Alachlor at 1,8 kg ai ha ⁻¹	

Chemicals

2. Trial B: a) Untreated control
b) Alachlor at 0,18 kg ai ha⁻¹
c) Alachlor at 0,9 kg ai ha⁻¹
d) Alachlor at 1,8 kg ai ha⁻¹

Moisture

10mm of water applied just before spraying in half of the pots and the remainder sprayed dry. The first watering after spray was varied i.e. 1 week, 2 weeks, 3 weeks and 4 weeks. All pots were watered every 3-4 days after the first watering.

4. Experimental

Fumigated soil was placed in pots of approximate dimensions 30 x 30 x 10 cm. A measured volume of seeds of five weed species was placed on the soil surface of each pot. Seeds were then covered with approximately 10 mm of soil and either left dry or watered with 900 ml per pot (± 10 mm) using a fine rose watering can.

Pots were then sprayed with alachlor treatments using a gas-operated knapsack sprayer and subsequently placed under plastic rainshelters.

Soil thermometers were installed to measure soil temperature at 50 mm depth during the trial period. Weed seed germination counts were made at regular intervals.

5. Application details

Date : 22.5.85

Weather : clear and warm

Temp °C : 8 am : 18,1

2 pm : 28,0

Relative humidity % 8 am : 56

2 pm : 31

Wind : Mild

Applicator : Gas operated knapsack sprayer

Nozzle : 8004-E fanjet

Pressure : 200 kPa

Output : 765 l ha⁻¹

Method : Applied directly over the pots using two passes in opposite directions.

6. Results

1. Trial A : See tables 1 and 2

Comments

Very few plants of Digitaria sanguinalis and Rottboellia exaltata germinated in the control pots but fair numbers of the other three species did germinate. Weeds began germinating approximately seven days after regular watering was begun indicating that the moisture in the wet pots at spraying was insufficient for weed germination.

The tables show the control achieved of these weeds by alachlor and it is of interest that Panicum maximum and Sorghum verticilliflorum plants emerged after treatment with the medium and high rates of alachlor and then subsequently died back. This suggests that some root absorption of alachlor may have occurred.

A marked rate response was apparent to alachlor and this influenced weed control far more than did the existence of wet or dry pots at spraying.

(See figure 1)

Comments

Weed germination began earlier in all pots with wet soil at spraying and germination was thus slightly delayed in dry soil. All these pots were watered regularly from twelve days after spraying and germination in pots which had been treated when the soil was dry increased and surpassed the numbers in pots which had been sprayed when the soil was wet.

At low rates of alachlor ultimate weed control was better after treating dry soils while at moderate rates and the high (standard) rate control was better in soils treated when they were wet. The difference was very small however, when the high rate of alachlor was used. This suggests that when adequate moisture occurs from twelve days after application similar weed control will be obtained whether the chemical had been applied to wet or dry soil.

(See figure 2)

Comments

Figure 2 illustrates clearly the strong rate response to alachlor. Only the rate of 1,8 kg ai ha⁻¹ provided acceptable control of all weed species. The standard registered rate of this product is from 1,92 to 2,3 kg ai ha⁻¹.

Similar patterns of germination occurred with all treatments and this showed germination of all weeds from about seven days after the first application of water after treatment. This germination increased to a peak for untreated and treated pots and subsequently decreased in treated pots. The peak germination was reached 36 days after treatment application after which a rapid decline occurred presumably due to root uptake of the herbicide.

(See figure 3)

Comments

Figure 3 illustrates the control of Panicum maximum by alachlor and it is apparent that very effective control was provided by a relatively low rate of alachlor 0,9 kg ai ha⁻¹ in these favourable conditions.

2. Trial B : See tables 3 and 4

Comments

Table 3 shows that weed germination was delayed in all pots until two weeks after watering was begun. The moisture in the soil at spraying was therefore insufficient to stimulate germination of the weeds. However in pots sprayed dry (table 4) germination was delayed an extra week in each case.

Weed control was only acceptable after treatment with the rate of 1,8 kg ai ha⁻¹ and the pattern of weed control varied according to the time between spraying and first irrigation.

(See figure 4)

Comments

Although more weeds germinated where water was applied soon after spraying than where it was delayed, pots treated with 1,8 kg ai ha⁻¹ of alachlor showed better final weed control in the pots watered earlier. However, this difference was relatively small compared to the difference between alachlor rates.

It is of interest that even where the application of water was delayed for one month after spraying (and this occurred in both wet and dry situations at spray) the activity of alachlor was still remarkably good.

(See figure 5)

Comments

Weed control was ultimately very similar irrespective of the interval between spraying and first watering when all rates of alachlor are considered. The differences in control between wet and dry pots at spraying were very small but favoured pots treated when wet.

Discussion

1. The efficacy of alachlor was affected to a relatively small extent in these trials by the presence or absence of moisture at spraying. Moisture in the wet pots consisted of only one application of 900 ml (10 mm) of water and this was obviously insufficient to stimulate germination until further regular applications of water were made.

The rate of alachlor had far more influence on weed control than the presence or absence of moisture. In general however, application to moist soil was slightly more effective (at the rate closest to that in commercial use) than application to dry soil.

2. Delaying the first watering after spraying had the obvious effect of delaying the start of weed germination. It also affected the germination pattern in treated pots with a less obvious peak in numbers when wetting was delayed by three or four weeks. However, the ultimate weed control achieved with alachlor at 1,8 kg ai ha⁻¹ (the rate closest to that used commercially) was best when the first watering occurred soon (1 or 2 weeks) after spraying onto moist soil. On the other hand treatment of dry soil with alachlor at 1,8 kg ai ha⁻¹ was equally effective irrespective of the delay between spraying and first watering.

Conclusions

1. Indications from these trials are that moisture at spraying is not as critical as the herbicide rate (and therefore by implication correct application) for the performance of alachlor.
2. Also a delay between spray and first watering is similarly less important than the application rate used. However, at the correct application rate under moist conditions the shorter interval between spray and watering is best.

3. Due consideration in the interpretation of these results must be given to the fact that only a limited amount of water was applied to create the 'wet' soil at spray and once the first watering after spraying was given, adequate watering followed.
4. Further trial work concentrating on commercial rates of alachlor and perhaps varying the quantities of water applied at each watering and the frequency of application would be useful to follow on from these results.

PETT/1b
16 March 1987

FIGURE 1 : Weed germination after application of three rates of alachlor to wet or dry soil

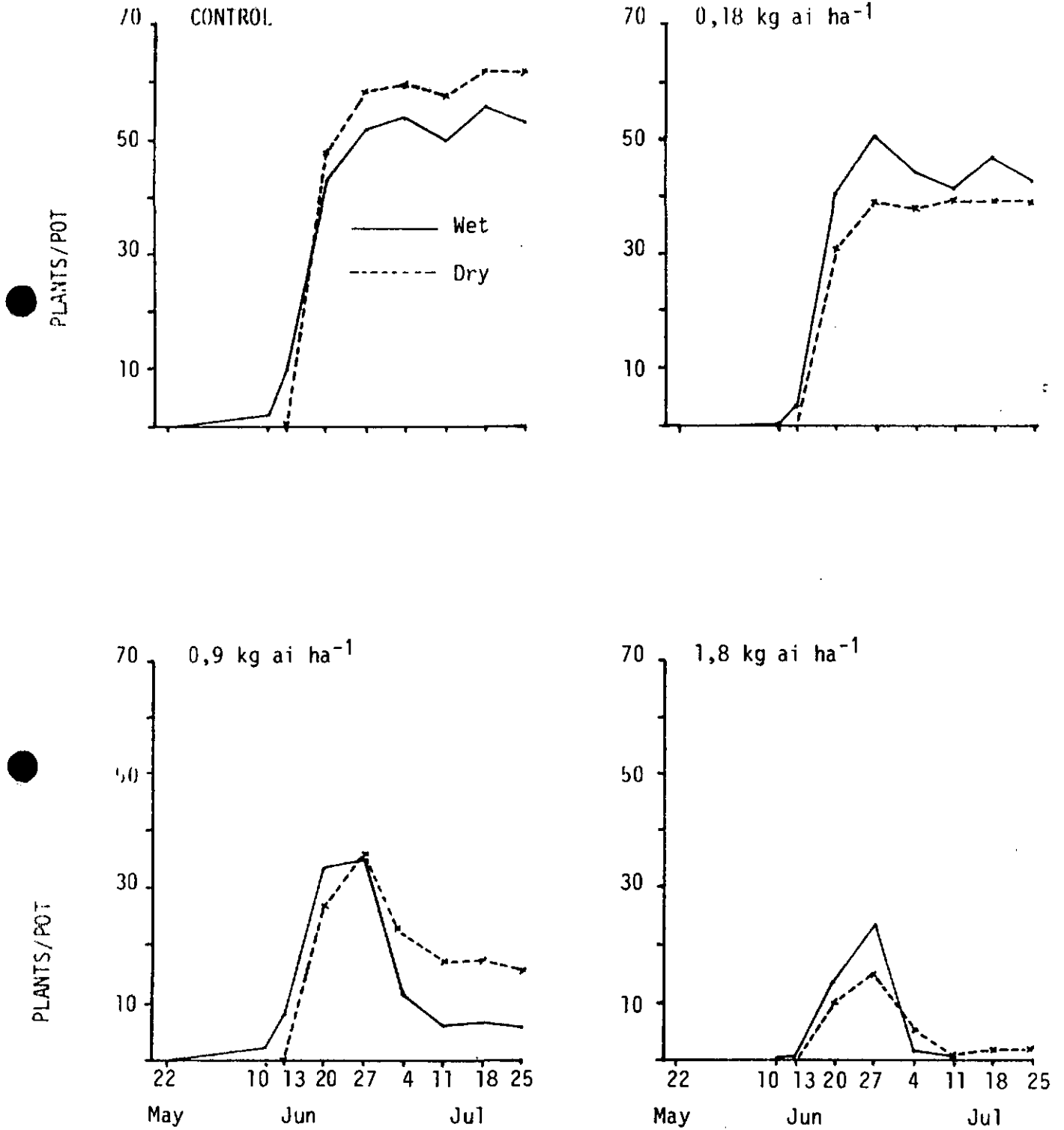


FIGURE 2 : Weed germination patterns after treatment with three rates of alachlor

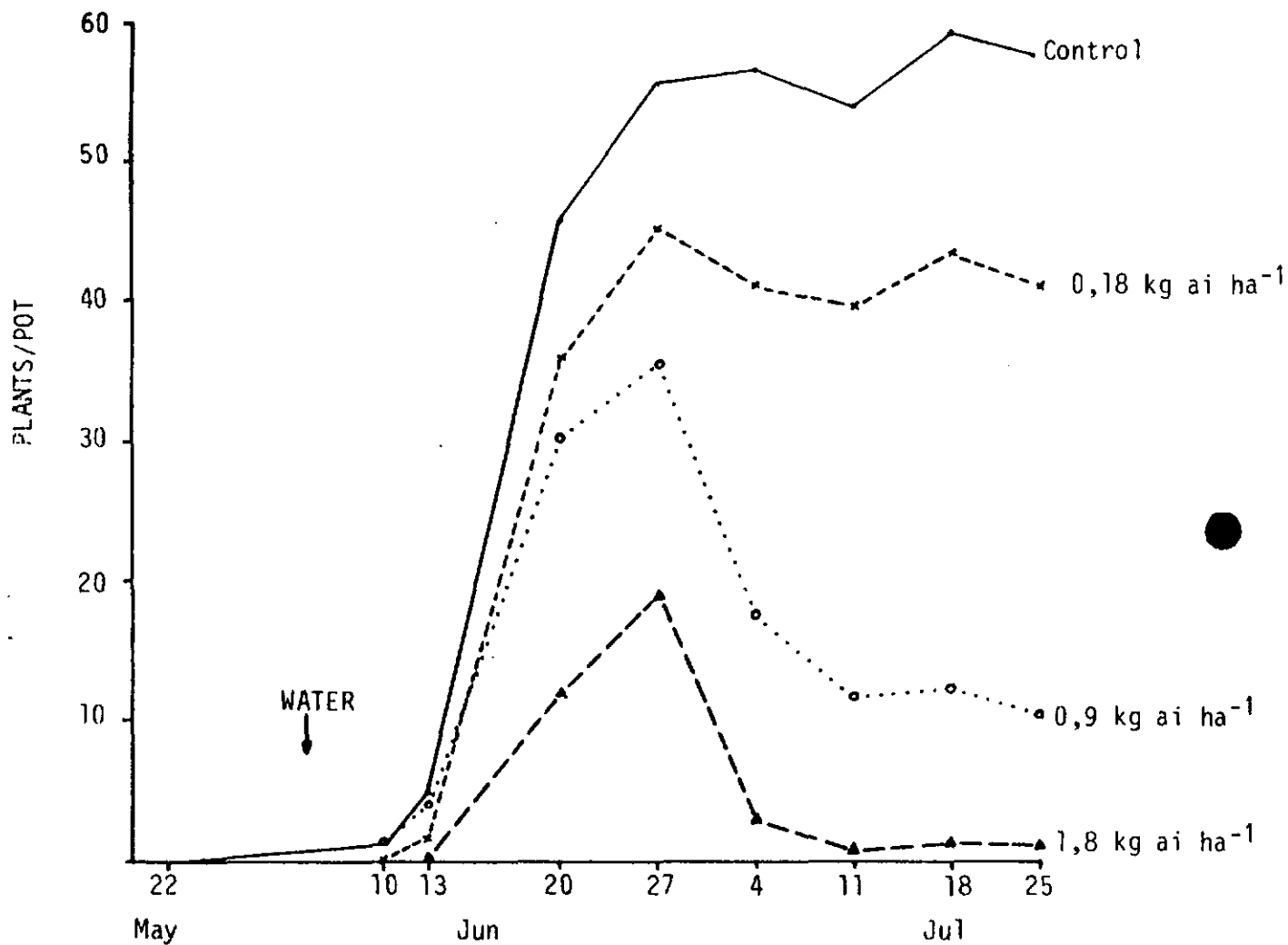


FIGURE 3 : Germination patterns of Panicum maximum after treatment with three rates of alachlor

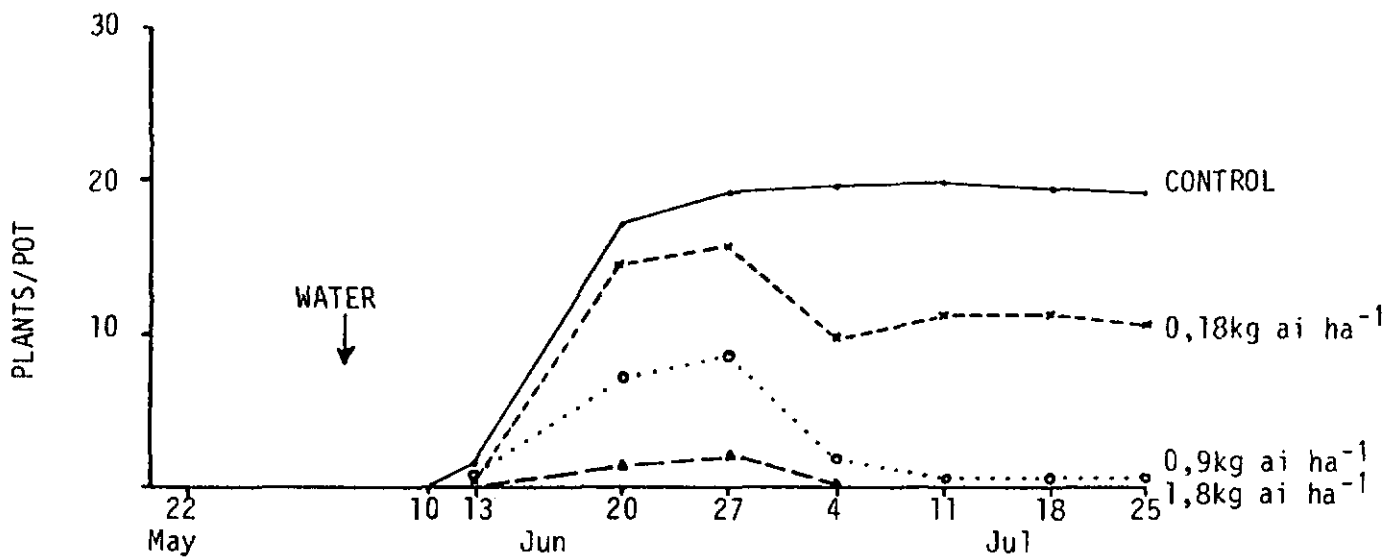


FIGURE 4 : Weed germination patterns after treatment with three rates of alachlor under various watering regimes. (Results of wet and dry pots at spraying combined)

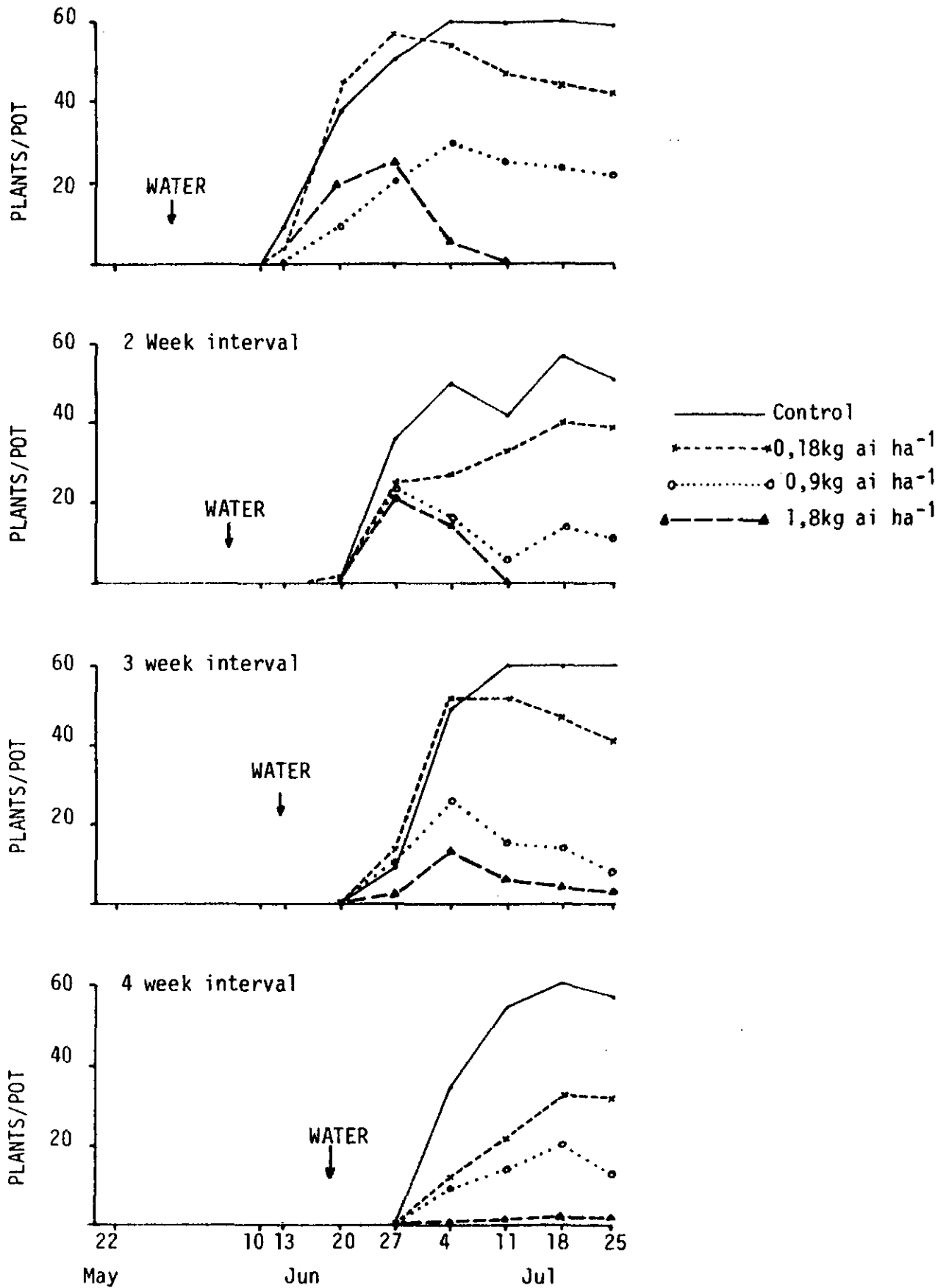


FIGURE 5 : Weed germination patterns after various intervals between alachlor applications on to wet or dry soils and the first watering

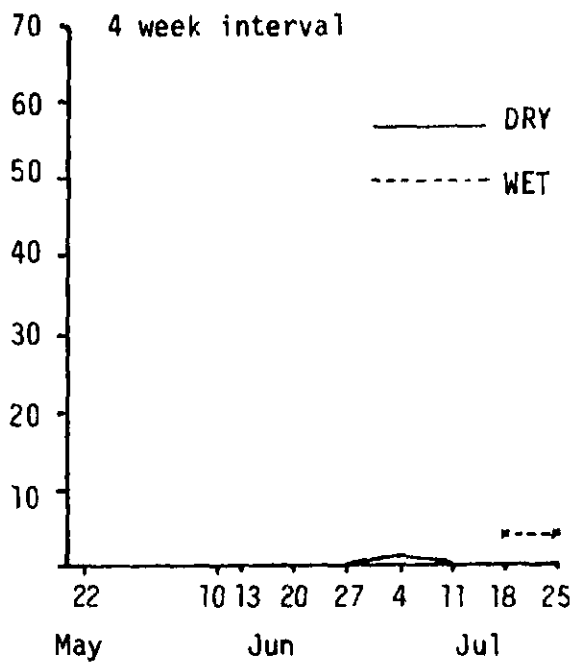
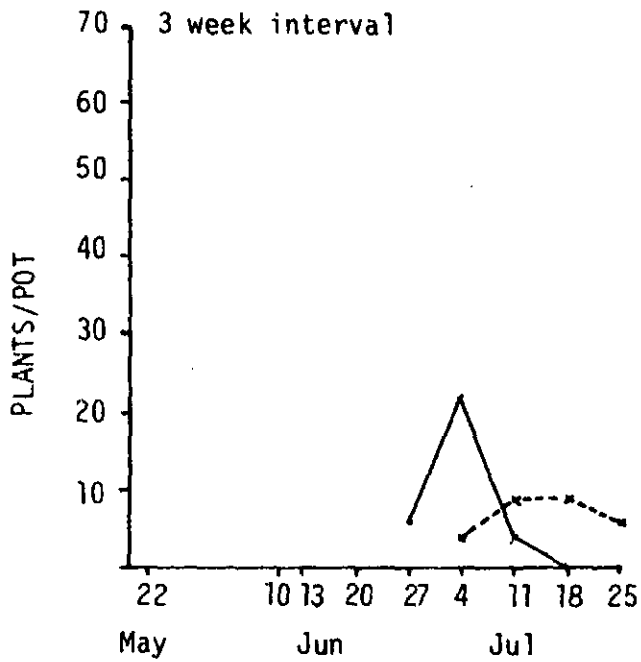
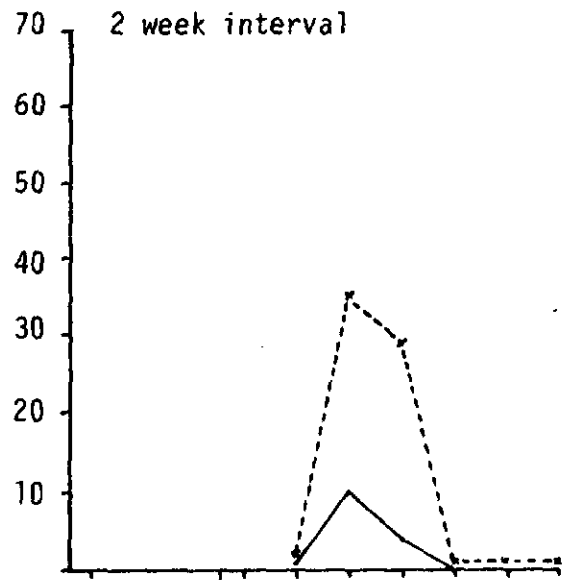
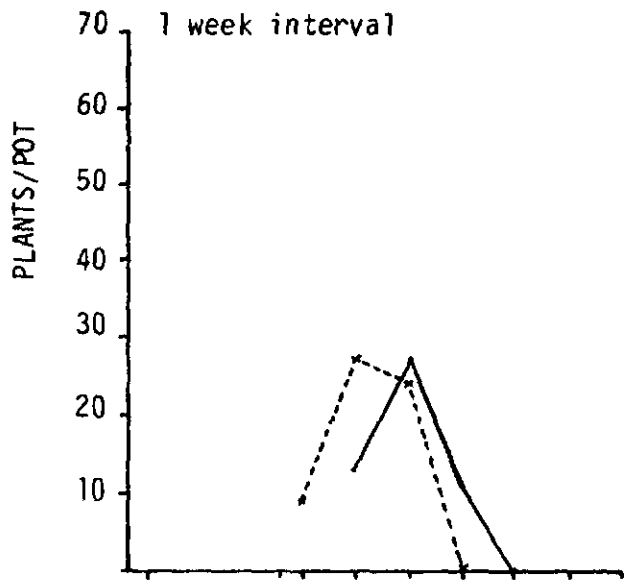


Table 1 : Weed germination counts of five weed species at intervals after spraying on to wet soil

Date	Control					*1 Total	Alachlor 0,18kg ai ha ⁻¹					Total	Mean	Alachlor 0,90kg ai ha ⁻¹					Total	Mean	Alachlor 1,8kg ai ha ⁻¹					Total	Mean	Grand Total	*2 Mean	
	*3 1	2	3	4	5		1	2	3	4	5			1	2	3	4	5			1	2	3	4	5					
10 June	-	-	-	8	-	8	2	-	-	-	3	-	2	0,1	-	-	-	9	-	9	2,2	-	-	-	1	-	1	0,3	20	1,2
13 June	-	12	17	10	-	39	9,8	-	2	-	12	-	14	3,5	-	5	-	30	-	35	9	-	-	-	1	-	1	0,3	89	5,6
20 June	-	54	34	84	-	172	43	-	57	7	99	-	163	41	3	27	-	104	1	135	34	-	11	-	43	-	56	14	524	33
27 June	2	58	31	114	3	208	52	-	57	6	136	3	202	51	-	25	-	111	4	140	35	-	14	-	77	2	93	23	643	49
4 July	2	63	23	123	4	215	54	-	39	5	131	2	177	44	1	3	-	39	4	47	12	-	-	-	5	1	6	1,5	445	28
11 July	1	60	11	122	5	199	50	-	38	2	124	3	167	42	-	-	-	17	8	25	6,2	-	-	-	1	1	2	0,5	393	25
18 July	7	61	11	139	6	224	56	3	46	4	132	7	190	48	-	1	-	16	11	28	7	-	-	-	1	2	3	0,8	445	28
25 July	10	61	3	131	7	212	53	3	39	2	120	7	171	43	2	2	-	9	9	22	5,5	-	-	-	1	1	2	0,5	407	25

*1 Mean number per pot (4 pots per treatment)

*2 Mean number per pot (16 pots per treatment)

*3 Weed species 1 = Digitaria sanguinalis
 2 = Panicum maximum
 3 = Portulaca oleraceae
 4 = Sorghum verticilliflorum
 5 = Rottboellia exaltata

Table 2 : Weed germination counts of five weed species at intervals after spraying on to dry soil

Date	Control					Total	*1 Mean	Alachlor 0,18kg ai ha ⁻¹					Total	Mean	Alachlor 0,90kg ai ha ⁻¹					Total	Mean	Alachlor 1,8kg ai ha ⁻¹					Total	Mean	Grand Total	*2 Mean	
	*3 1	2	3	4	5			1	2	3	4	5			1	2	3	4	5			1	2	3	4	5					
10 June	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0	0	-
13 June	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	0	0	-
20 June	-	83	13	95	1	192	48	1	60	6	58	-	125	31	-	31	3	74	-	108	27	-	4	-	37	1	42	11	467	29	
27 June	-	95	13	125	2	235	59	1	70	3	83	2	159	40	-	43	3	96	1	143	36	-	3	-	54	3	60	15	597	37	
4 July	2	92	15	126	3	238	60	-	40	19	89	5	153	38	-	12	-	80	2	94	24	-	-	2	14	2	18	45	503	31	
11 July	1	95	10	123	2	231	58	1	52	5	88	4	150	38	-	1	1	64	2	68	17	-	-	-	-	3	3	0,8	452	28	
18 July	5	91	6	142	5	249	62	2	47	4	99	5	159	39	2	2	2	63	2	71	18	-	-	-	-	7	7	1,8	484	30	
25 July	6	91	6	138	7	248	62	5	46	5	96	5	157	39	-	1	-	59	2	62	16	-	-	-	-	7	7	1,8	474	30	

*1 Mean number per pot (4 pots per treatment)

*2 Mean number per pot (16 pots per treatment)

*3 Weed species : 1 = Digitaria sanguinalis
 2 = Panicum maximum
 3 = Portulaca oleraceae
 4 = Sorghum verticilliflorum
 5 = Rottboellia exaltata

Table 3 : Weed germination counts after spraying to first watering intervals of 1, 2, 3 and 4 weeks in soils sprayed when wet

Date	W1 (29/5)*1					W2 (5/6)					W3 (12/6)					W4 (19/6)				
	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total
10/6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13/6	19	5	1	9	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20/6	48	50	7	27	132	1	5	3	2	11	-	-	-	-	-	-	-	-	-	-
27/6	59	55	15	24	153	32	23	19	35	109	1	9	7	-	17	-	-	-	-	-
4/7	64	47	29	-	140	40	22	13	29	104	34	57	31	4	126	47	5	2	-	54
11/7	59	43	28	-	130	37	36	10	1	84	50	46	16	9	113	67	16	8	-	91
18/7	60	36	29	-	125	43	46	12	1	102	55	47	10	9	121	76	20	8	4	108
25/7	61	38	24	-	123	39	47	15	1	102	52	41	6	6	105	67	22	13	4	106

*1 Date at first watering

Table 4 : Weed germination counts after spraying to first watering intervals of 1, 2, 3 and 4 weeks in soils sprayed when dry

Date	W1 (29/5)					W2 (5/6)					W3 (12/6)					W4 (19/6)				
	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total	Cont	0,18	0,9	1,8	Total
10/6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13/6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20/6	28	40	12	13	93	-	-	1	1	2	-	-	-	-	-	-	-	-	-	-
27/6	42	60	28	27	157	40	18	30	10	98	18	19	14	6	57	-	-	-	-	-
4/7	58	62	32	11	163	61	33	20	4	118	64	46	22	22	154	23	21	18	1	63
11/7	59	52	23	-	134	47	30	1	-	78	74	57	16	4	151	41	29	21	-	91
18/7	60	52	20	-	132	72	35	16	-	123	72	48	18	-	138	47	46	33	-	126
25/7	57	47	21	1	126	63	32	7	-	102	72	41	11	-	124	47	43	14	-	104