1982

Seed Ecology of weeds. Control of Calotropis and Parkinsonia. Calotropis/Buffel grass Interactions.

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DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

EXPERIMENTAL SUMMARY 1982

- Seed Ecology of Weeds
- Control of *Calotropis* and *Parkinsonia*
- Calotropis/Buffel grass Interactions

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EMERGENCE OF WEED SEEDLINGS FROM DIFFERENT SOIL DEPTHS

EXPERIMENT: 82 MT 49

LOCATION: Mount Barker Research Station

OBJECT: To investigate the effect of soil depth on emergence of weed seedlings.

TREATMENTS:

Seeds of Curled dock (A - 1982 collection), Fiddle dock (B - 1982 collection), Pennyroyal (C - 1982 collection), Wild radish (D - 1978 collection), Wild turnip (E - 1978 collection), Ryegrass (F - 1982 collection), Brome grass (G - 1978 collection), Doublegee (H - 1982 collection), Ryegrass (I - 1978 collection) and Pennyroyal (J - 1981 collection) were used in this experiment. The depths of seed burial were: 0, 1, 5, 10 and 15 cm. The seeds were buried in May 1982 and seedling emergence was recorded at monthly intervals. The experiment is designed to run for several years.

RESULTS:

Species /Depth (cm)	Emergence % one month after sowing										Depth Means
	A	B	C	D	E	F	G	H	I	J	
0	5.8 *	2.3	6.3	14.3	3.5	40.3	65.5	1.0	42.0	4.5	18.6
	(11.71)	(7.16)	(13.94)	(20.85)	(7.65)	(39.36)	(54.21)	(4.07)	(40.34)	(11.40)	(21.07)
1	0.5	22.5	0.3	55.8	2.3	59.8	89.8	19.2	75.5	0	32.6
	(2.03)	(27.87)	(1.43)	(48.34)	(7.41)	(50.67)	(71.78)	(25.84)	(60.72)	(0)	(29.61)
5	0	0	0	4.0	0	35.8	61.3	4.8	51.8	0	15.8
	(0)	(0)	(0)	(9.37)	(0)	(36.62)	(51.67)	(11.67)	(45.89)	(0)	(15.52)
10	0	0	0	0	0	3.8	12.3	0.3	10.0	0	2.6
	(0)	(0)	(0)	(0)	(0)	(9.41)	(14.81)	(1.43)	(17.24)	(0)	(4.29)
15	0	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Species means	1.3	5.0	1.3	14.8	1.2	27.9	45.8	5.1	35.9	0.9	
	(2.75)	(7.01)	(3.08)	(15.71)	(3.01)	(27.21)	(38.49)	(8.60)	(32.84)	(2.28)	

LSD, 5% : Depth = 3.99; species = 3.22; depth x species at the same depth = 7.20; depth x species at different depths = 7.73.

* Transformed (inverse sine) values given in degrees used for statistical analysis are shown in brackets.

COMMENTS:

This research sheds light on the quantity of the seed population that emerges from various depths and also reveals the periodicity of emergence of the weed species under investigation. Generally, more seedlings emerged from the shallow depths and the main flush of emergence occurred between May 18 to June 15, the first one month period after seed burial.

The seedling emergence data recorded one month after sowing are presented in this report. Seedlings of curled dock, fiddle dock, pennyroyal and turnip emerged from the 0 and 1 cm depths only but 4% of the radish seedlings emerged from the 5 cm depth and none from the 10 and 15 cm depths. Ryegrass, brome grass and doublegee emerged from even the 10 cm depth but no emergence occurred from 15 cm. Maximum emergence was from 1 cm depth. This could be attributed to the fact that conditions are more favourable just below the soil surface than on the surface. However, pennyroyal has a light requirement for germination and this explains its preference to germinate on the soil surface. The environmental requirements for germination of pennyroyal and the other species are currently being sought to provide a better understanding of the germination and emergence behaviour of the species under field situations.

EMERGENCE OF WEED SEEDLINGS FROM DIFFERENT SOIL DEPTHS

EXPERIMENT: 82 NR 12

LOCATION: Northam Research Station

OBJECT: To investigate the effect of soil depth on emergence of weed seedlings.

TREATMENTS:

As for Experiment 82 MT 49. A = curled dock, B = Fiddle dock, C = Pennyroyal 1982 collection, D = Wild radish, E = Wild turnip, F = Ryegrass 1982 collection, G = Brome grass, H = Doublegee, I = Ryegrass 1978 collection, J = Pennyroyal 1981 collection.

RESULTS:

Species /Depth (cm)	Emergence % one month after sowing										Depth Means
	A	B	C	D	E	F	G	H	I	J	
0	20.0 *	9.3	3.0	9.3	9.0	35.3	56.3	2.5	39.8	3.8	18.8
	(25.62)	(16.86)	(8.36)	(15.23)	(14.06)	(36.29)	(48.60)	(8.45)	(39.03)	(10.96)	(22.35)
1	32.3	34.0	0.5	62.0	7.0	64.3	86.0	23.8	75.3	0.8	38.6
	(34.19)	(35.49)	(2.03)	(52.05)	(14.62)	(53.30)	(68.55)	(29.08)	(60.27)	(2.49)	(35.21)
5	0.8	4.0	0	14.5	0	41.3	64.3	8.3	61.0	0	19.4
	(3.47)	(7.78)	(0)	(18.20)	(0)	(39.88)	(53.45)	(15.93)	(51.59)	(0)	(19.03)
10	0.3	0	0	0	0	3.8	35.5	0.3	10.0	0	5.0
	(1.43)	(0)	(0)	(0)	(0)	(7.94)	(36.48)	(1.43)	(18.21)	(0)	(6.55)
15	0	0	0	0	0	0	5.5	0	0	0	0.6
	(0)	(0)	(0)	(0)	(0)	(0)	(6.99)	(0)	(0)	(0)	(0.70)
Species means	10.7	9.5	0.7	17.2	3.2	28.9	49.5	7.0	37.2	0.9	
	(12.94)	(12.03)	(2.08)	(17.10)	(5.74)	(27.48)	(42.81)	(10.98)	(33.82)	(2.69)	

LSD, 5% : Depth = 2.16; species = 3.74; depth x species at the same depth = 8.36; depth x species at different depths = 8.17.

* Transformed (inverse sine) values given in degrees used for statistical analysis are shown in brackets.

COMMENTS:

The results are very similar to those obtained from the Mt Barker site (Experiment 82 MT 49), namely, that seedling emergence is inversely related to the depth of seed burial and that maximum emergence was from 1 cm depth for the majority of species. The only species capable of emerging from 15 cm depth was brome grass, but the seedlings appeared unhealthy. Both the curled and the fiddle dock showed a distinctly higher emergence at Northam than at Mt Barker.

EMERGENCE OF WEED SEEDLINGS FROM DIFFERENT SOIL DEPTHS

EXPERIMENT: 82 C 37

LOCATION: Chapman Research Station

OBJECT: To investigate the effect of soil depth on emergence of weed seedlings.

TREATMENTS:

As for Experiment 82 MT 49. A = Curled dock, B = Fiddle dock, C = Pennyroyal 1982 collection, D = Wild radish, E = Wild turnip, F = Ryegrass 1982 collection, G = Brome grass, H = Doublegee, I = Ryegrass 1978 collection, J = Pennyroyal 1981 collection.

RESULTS:

Species /Depth (cm)	Emergence % one month after sowing										Depth Means
	A	B	C	D	E	F	G	H	I	J	
0	32.8 *	5.3	42.8	35.0	19.3	61.0	74.0	13.5	62.0	11.8	35.8
	(32.74)	(11.45)	(40.74)	(36.22)	(25.84)	(51.39)	(59.37)	(21.50)	(52.22)	(19.98)	(35.15)
1	17.8	15.8	1.0	29.0	0	72.0	74.0	26.0	72.3	0	30.8
	(23.95)	(22.31)	(2.88)	(28.15)	(0)	(58.14)	(59.38)	(30.62)	(58.53)	(0)	(28.40)
5	0	1.8	0	2.0	0.5	37.5	54.0	7.8	53.5	0	15.7
	(0)	(3.84)	(0)	(5.77)	(2.03)	(37.54)	(47.34)	(15.93)	(47.04)	(0)	(15.95)
10	0	0	0	0	0	7.3	11.8	1.5	9.3	0	3.0
	(0)	(0)	(0)	(0)	(0)	(12.68)	(16.84)	(5.96)	(14.89)	(0)	(5.04)
15	0	0	0	0	0	0	1.0	0	0	0	0.1
	(0)	(0)	(0)	(0)	(0)	(0)	(2.88)	(0)	(0)	(0)	(0.29)
Species means	10.1	4.6	8.8	13.2	4.0	35.6	43.0	9.8	39.4	2.4	
	(11.34)	(7.52)	(8.73)	(14.03)	(5.57)	(31.95)	(37.16)	(14.80)	(34.54)	(4.00)	

LSD, 5% : Depth = 3.02; species = 4.06; depth x species at the same depth = 9.08; depth x species at different depths = 9.04.

* Transformed (inverse sine) values given in degrees used for statistical analysis are shown in brackets.

COMMENTS:

Although the warmer temperatures of Chapman Valley were presumably responsible for a higher level of seedling emergence in some species, such as in pennyroyal, the overall ability of the different species to emerge from different soil depths was very similar to the trend observed at the other two sites, viz., Northam and Mt Barker (see Experiments 82 NR 12 and 82 MT 49).

It appears that weeds with small seeds can only emerge from shallow soil layers while large-seeded ones can germinate from greater depths if conditions are suitable. Apart from this consideration there are probably several other factors governing the range of depths of seed germination of a particular species. For example, it has been suggested that although light may play an important part in restricting germination of buried seeds, the ability to respond to a particular amplitude of temperature fluctuation in darkness is the main depth-sensing mechanism in seeds of species forming persistent seed banks. Results of this and similar studies have practical implications for depth of cultivation and herbicide placement for weed control.

LONGEVITY OF BURIED WEED SEEDS

EXPERIMENT: 82 MT 50

LOCATION: Mount Barker Research Station

OBJECT: To investigate the effect of depth of seed burial on the longevity of weed seeds.

TREATMENTS:

Seeds of Curled dock (A - 1982 collection), Fiddle dock (B - 1982 collection), Pennyroyal (C - 1982 collection), Wild radish (D - 1978 collection), Wild turnip (E - 1978 collection), Ryegrass (F - 1982 collection), Brome grass (G - 1978 collection), Doublegee (H - 1982 collection) and Ryegrass (I - 1978 collection) were buried on May 19, 1982. Buried seed samples consisted of randomly-selected lots of 100 seeds for each species placed in closed nylon mesh envelopes with a small quantity of soil. The depths of seed burial were: 0, 1, 5, 10 and 15 cm. At 3, 6, 12, 24, 36 and 48 months after burial the appropriate envelopes are to be recovered from the soil and remnant seeds tested for viability by the germination test and the tetrazolium chloride method. Results on the percentage of viable seed remaining after burial for three months have been obtained and are presented below.

RESULTS:

Species/ Depth (cm)	% live seed remaining three months after burial								
	A	B	C	D	E	F	G	H	I
0	51.0	3.0	23.3	1.7	76.7	29.3	0.7	21.7	14.7
1	86.3	9.0	74.3	3.0	90.3	21.3	0	11.7	9.3
5	94.7	26.7	76.3	23.7	87.7	39.3	0	5.7	10.7
10	87.3	28.7	76.0	41.0	90.7	53.3	0	7.3	18.3
15	88.7	26.0	58.0	38.3	79.7	54.0	0	26.0	32.7

COMMENTS:

More results from this trial are yet to arrive before one can make any substantial comment with regard to the decline in the number of viable seeds with time. Results to date confirm that generally there is a trend to greater retention of viability with increasing burial depth; this trend was particularly obvious in the docks, radish and ryegrass seeds. The decrease in the upper levels of the soil was mainly due to germination. Therefore, when non-dormant seeds remained on or near the soil surface, the seed pool would be depleted more rapidly. Brome grass, once it has lost its dormancy should be easy to control because of its ability to germinate even at 15 cm depth. Out of the two different collections of ryegrass seeds, a greater retention of viability was observed in the fresh collection (F).

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LONGEVITY OF BURIED WEED SEEDS

EXPERIMENT: 82 NR 13

LOCATION: Northam Research Station

OBJECT: To investigate the effect of depth of seed burial on the longevity of weed seeds.

TREATMENTS:

Treatments as for Experiment 82 MT 50, except that the seeds were buried one week later on May 26, 1982. A = Curled dock, B = Fiddle dock, C = Pennyroyal 1982 collection, D = Wild radish, E = Wild turnip, F = Ryegrass 1982 collection, G = Brome grass, H = Doublegee, I = Ryegrass 1978 collection.

RESULTS:

Species/ Depth (cm)	% live seed remaining three months after burial								
	A	B	C	D	E	F	G	H	I
0	69.3	4.0	51.7	2.3	74.0	48.7	0	24.3	26.3
1	84.7	1.0	64.0	9.7	85.0	19.3	0	21.3	8.3
5	95.0	3.7	78.0	24.7	88.7	29.7	0	20.0	12.0
10	98.3	16.0	76.0	33.7	86.7	38.3	0	26.3	17.7
15	97.3	16.7	74.0	43.0	88.7	42.3	0	28.0	22.0

COMMENTS:

The greater retention of viability under increasing burial depth agrees with the findings at Mt Barker and Chapman Valley. At any given depth, the proportion of live seed remaining varies greatly between different weed species. Brome grass seeds collected in 1978 had obviously lost its dormancy, germinated at all depths and not a single viable seed was recovered. Again, of the two collections of ryegrass seeds, a greater retention of viability was observed in the fresh collection (F).

LONGEVITY OF BURIED WEED SEEDS

EXPERIMENT: 82 C 38

LOCATION: Chapman Research Station

OBJECT: To investigate the effect of depth of seed burial on the longevity of weed seeds.

TREATMENTS:

Treatments as for Experiment 82 MT 50, except that the seeds were buried fifteen days later on June 10, 1982. A = Curled dock, B = Fiddle dock, C = Pennyroyal 1982 collection, D = Wild radish, E = Wild turnip, F = Ryegrass 1982 collection, G = Brome grass, H = Doublegee, I = Ryegrass 1978 collection.

RESULTS:

Species/ Depth (cm)	% live seed remaining three months after burial								
	A	B	C	D	E	F	G	H	I
0	79.3	19.3	41.3	7.3	62.7	57.3	3.7	21.7	45.0
1	68.3	1.3	87.7	0.3	73.7	12.7	0	7.0	5.0
5	86.7	3.0	86.0	5.7	82.0	17.7	0	5.3	7.3
10	95.7	2.0	87.3	11.0	77.0	23.7	0	4.0	11.0
15	97.0	7.0	88.7	18.7	73.0	24.0	0	7.3	15.3

COMMENTS:

The decline in the number of viable seeds over a period of three months at different soil depths followed a similar trend as observed at Mt Barker and Northam. However, in some species such as fiddle dock, radish, ryegrass and doublegee, a more rapid loss of viability in the buried seeds was noted. This more rapid decline was probably due to the more conducive environmental conditions at Chapman. A further loss in dormancy could be another contributory factor. Data on brome grass viability in soil again suggest that this weed should be easy to eradicate once it has lost its dormancy.

EMERGENCE OF WEED SEEDLINGS IN RELATION TO SOIL TYPE AND CULTIVATION

EXPERIMENT: 82 PE 32

LOCATION: South Perth Experimental Farm

OBJECT: To determine the effects of soil type and cultivation on the emergence and longevity of weed seeds.

TREATMENTS:

Seeds of eight weed species were mixed with soil collected from Wongan Hills (light soil), Northam (medium soil), and Merredin (heavy soil) to a depth of 10 cm and seedling emergence and seed survival are to be recorded over a 5 year period with and without cultivation. The species examined included Curled dock, Fiddle dock, Pennyroyal, Wild radish, Wild turnip, Ryegrass, Brome grass and Doublegee. This summary reports the results of the first year of the long-term study.

RESULTS:

Species	Soil type	Surface treatment	Emergence % at monthly intervals					
			1(Ju)	2(Jly)	3(Aug)	4(Sep)	5(Oct)	6(Nov)
Curled dock	Light	Undisturbed	8.4	0	0	0	0	0
		Cultivated	22.5	0	0.4	0	0	0
	Medium	Undisturbed	21.6	0	0	0.1	0	0
		Cultivated	30.1	0	0	0	0	0
	Heavy	Undisturbed	19.9	0	0	0.1	0	0
		Cultivated	26.8	0.3	0.1	0.1	0.1	0
Fiddle dock	Light	Undisturbed	6.9	0	0	0	0	0
		Cultivated	10.4	0	0	0	0	0
	Medium	Undisturbed	9.1	0	0	0	0	0
		Cultivated	14.1	0	0	0.3	0	0
	Heavy	Undisturbed	17.3	0.3	0.3	0.3	0	0
		Cultivated	8.8	0.3	0	0.1	0.3	0
Pennyroyal	Light	Undisturbed	0.8	0	0	0	0	0
		Cultivated	0.6	0.1	0	0.1	0	0
	Medium	Undisturbed	1.3	0	0	0.1	0	0
		Cultivated	0.9	0	0.1	0.1	0	0
	Heavy	Undisturbed	1.4	0	0.1	0	0.1	0
		Cultivated	1.8	0.3	0	0.5	0	0

RESULTS continued ...

Species	Soil type	Surface treatment	Emergence % at monthly intervals					
			1(Ju)	2(Jly)	3(Aug)	4(Sep)	5(Oct)	6(Nov)
W. radish	Light	Undisturbed	35.5	1.5	0.1	0.1	0.1	0
		Cultivated	37.4	1.6	0.3	0	0	0
	Medium	Undisturbed	37.0	0	0	0	0	0
		Cultivated	50.4	0.3	0.1	0.3	0	0
	Heavy	Undisturbed	54.3	0.8	0.8	0.6	0.8	0.1
		Cultivated	65.0	0.8	0.4	0.1	0	0
W. turnip	Light	Undisturbed	2.3	0	0.1	0	0	0
		Cultivated	2.6	0	0	0	0	0
	Medium	Undisturbed	5.5	0	0	0	0	0
		Cultivated	7.4	0	0	0	0	0
	Heavy	Undisturbed	5.0	1.4	0	0	0.4	0
		Cultivated	3.8	1.4	0	0	0.1	0
Ryegrass	Light	Undisturbed	44.8	0.1	0	0	0	0
		Cultivated	42.8	0.3	0	0	0.1	0
	Medium	Undisturbed	53.9	0.1	0	0.1	0.1	0
		Cultivated	47.6	0.3	0.4	0	0.3	0
	Heavy	Undisturbed	63.5	0.1	0.1	0.3	0.3	0
		Cultivated	51.1	0	0.8	0.1	0	0.1
Brome grass	Light	Undisturbed	72.1	0	0	0	0	0
		Cultivated	71.1	0.1	0	0	0	0
	Medium	Undisturbed	84.9	0	0	0	0	0
		Cultivated	79.6	0	0	0	0	0
	Heavy	Undisturbed	93.9	0	0	0	0	0
		Cultivated	83.8	0	0	0	0	0
Doublegee	Light	Undisturbed	6.0	0	0	0	0	0
		Cultivated	9.0	0	0.1	0	0	0
	Medium	Undisturbed	16.8	0	0	0	0	0
		Cultivated	15.9	0	0	0	0	0
	Heavy	Undisturbed	19.1	0.3	0	0	0	0
		Cultivated	18.3	0.1	0	0	0	0

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COMMENTS:

Data on seed survival will not be available until the end of the experiment. The extent to which emergence occurred during the period from sowing until mid-November of the same year is shown. Greatest emergence of all species occurred during the first month after sowing, in disturbed or undisturbed soil and irrespective of soil type. Generally, more seedlings emerged from heavier than from lighter soil. The relative emergence from cultivated compared with undisturbed soil varied. With some species, such as the docks and radish, there were more emergence in cultivated soil, whereas with ryegrass, brome grass, doublegee, pennyroyal and turnip, a less definite trend of emergence was seen. With ryegrass and brome grass, cultivation appeared to result in a slightly lower count. This could be attributed to the destruction of the newly germinated grasses that were still beneath the soil surface at the time of cultivation.

DATE OF PLANTING STUDY WITH SELECTED WEED SPECIES

EXPERIMENT: 82 PE 31

LOCATION: South Perth Experimental Farm

OBJECT: To establish the effects of sowing date on: (a) the time of emergence, (b) the time of flowering, and (c) the seed production potential for a range of weed species.

TREATMENTS:

Species included in the experiment were: Curled dock (A - 1982 collection), Fiddle dock (B - 1982 collection), Pennyroyal (C - 1981 collection), Wild radish (D - 1978 collection), Wild turnip (E - 1978 collection), Ryegrass (F - 1978 collection), Brome grass (G - 1978 collection) and Doublegee (H - 1982 collection). There were seven times of planting beginning on May 11, 1982 and continuing at three-weekly intervals until September 14, 1982. The sequential planting times were used to provide a range of environmental conditions during plant growth. The time of emergence, days from sowing to flowering, and final seed yield of the various species were recorded for all times of sowing.

RESULTS:

Table 1. Emergence % of weed seedlings from seeds planted at three weekly intervals at South Perth in 1982

Species	Planting	Month after planting				
		0.5	1	2	3	4
Curled dock (A)	P_1 (11.5.82)	29.2	3.8	1.9	2.7	4.9
	P_2 (1.6.82)	19.4	7.7	10.3	5.9	2.4
	P_3 (22.6.82)	11.2	7.3	25.5	3.2	1.5
	P_4 (13.7.82)	12.5	10.2	2.8	2.9	0.2
	P_5 (3.8.82)	60.3	14.5	0.9	0.3	0
	P_6 (24.8.82)	48.3	8.8	2.0	0	0
	P_7 (14.9.82)	58.3	1.8	0.3	0	0
Fiddle dock (B)	P_1	25.9	3.2	0.4	0.8	0.4
	P_2	23.3	8.9	2.5	1.9	0.3
	P_3	0.5	23.4	8.5	1.4	0.8
	P_4	4.0	19.9	3.2	1.4	0
	P_5	9.7	12.7	0.9	0.3	0
	P_6	3.0	13.9	2.3	0	0
	P_7	24.0	4.2	0.2	0	0

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Table 1 continued ...

Species	Planting	Month after planting				
		0.5	1	2	3	4
Pennyroyal '81 (C)	P_1	7.9	5.3	0.8	2.0	1.5
	P_2	7.9	6.3	3.0	0.5	0
	P_3	0.2	0.8	1.4	0.2	0
	P_4	0.3	2.8	0	0	0
	P_5	0	0.2	0	0	0
	P_6	0	0	0	0	0
	P_7	0	0	0	0	0
Radish (D)	P_1	83.0	3.9	1.0	0.2	0
	P_2	78.0	5.4	1.8	0	0
	P_3	38.9	12.0	5.9	0.2	0
	P_4	23.4	10.3	1.2	0.4	0.2
	P_5	26.9	4.7	0.8	0.2	0
	P_6	29.0	2.9	0.8	0	0
	P_7	11.2	0.4	0.4	0	0
Turnip (E)	P_1	34.8	0.5	0	0.2	0
	P_2	11.0	0.8	0.3	0	0.2
	P_3	2.5	0	0.2	0	0
	P_4	2.2	0	0	0	0
	P_5	0.5	0	0	0	0
	P_6	1.2	0	0	0	0
	P_7	2.9	0	0	0	0
Ryegrass '78 (F)	P_1	80.0	3.8	0.3	0	0
	P_2	74.0	3.9	2.0	0	0
	P_3	68.0	6.3	3.9	0.7	0.3
	P_4	66.3	8.0	1.2	0	0
	P_5	72.7	5.8	1.2	0	0
	P_6	72.3	7.7	2.0	0.2	0
	P_7	73.2	9.4	0.4	0	0
Brome grass (G)	P_1	86.2	0.9	0	0	0
	P_2	69.0	1.4	0.4	0	0.2
	P_3	81.3	3.0	0.5	0	0
	P_4	82.7	4.0	1.9	0	0
	P_5	59.8	4.0	0.8	0	0
	P_6	76.7	4.2	0.7	0	0
	P_7	76.7	3.8	0.7	0	0

Table 1 continued ...

Species	Planting	Month after planting				
		0.5	1	2	3	4
Doublegee (H)	P_1	33.8	0.2	0	0.3	0.2
	P_2	27.4	2.3	0	0	0
	P_3	11.2	16.8	0.7	0	0
	P_4	17.7	6.3	0.3	0.2	0.4
	P_5	21.2	3.7	0.3	0	0
	P_6	19.9	3.2	2.3	0	0
	P_7	26.7	0.2	0	0	0

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Table 2. Days from sowing to flowering and seed production of various weed species planted at three weekly intervals at South Perth in 1982

Species	Planting	Days from sowing to flowering	Seed/plant	(r)[a/] value
Curled dock (A)	P_1 (11.5.82)	-	-	
	P_2 (1.6.82)	-	-	
	P_3 (22.6.82)	-	-	
	P_4 (13.7.82)	-	-	-
	P_5 (3.8.82)	-	-	
	P_6 (24.8.82)	-	-	
	P_7 (14.9.82)	-	-	
Fiddle dock (B)	P_1	168	174	
	P_2	168	0	
	P_3	-	-	
	P_4	-	-	-
	P_5	-	-	
	P_6	-	-	
	P_7	-	-	
Pennyroyal (C)	P_1	195	11	
	P_2	182	41	
	P_3	160	43	r =
	P_4	147	159	- 0.85
	P_5	-	-	
	P_6	-	-	
	P_7	-	-	
Radish (D)	P_1	90	789	
	P_2	76	228	
	P_3	72	190	
	P_4	66	120	r = 0.9**
	P_5	60	44	
	P_6	56	31	
	P_7	49	8	
Turnip (E)	P_1	112	684	
	P_2	91	209	
	P_3	88	94	
	P_4	91	337	r = 0.96**
	P_5	77	0	
	P_6	-	-	
	P_7	-	-	

Table 2 continued ...

Species	Planting	Days from sowing to flowering	Seed/plant	(r)[a/] value
Ryegrass (F)	P_1	105	381	
	P_2	89	189	
	P_3	85	139	
	P_4	78	95	r = 0.99***
	P_5	72	51	
	P_6	67	14	
	P_7	66	1	
Brome grass (G)	P_1	133	348	
	P_2	115	181	
	P_3	103	144	
	P_4	91	83	r = 0.98***
	P_5	84	23	
	P_6	87	7	
	P_7	-	-	
Doublegee (H)	P_1	90	74	
	P_2	77	97	
	P_3	72	59	
	P_4	77	21	r = 0.23
	P_5	72	25	
	P_6	80	4	
	P_7	-	-	

a/ (r) values are the correlation coefficients for seed production values with days from sowing to flowering.

** significant ($P < 0.01$)
*** significant ($P < 0.001$)

COMMENTS:

Irrespective of the time of planting, most of the seedlings emerged within two weeks after sowing for all species, with the exception of the docks, pennyroyal and doublegee. In pennyroyal, no emergence occurred at all in later plantings presumably because of the lack of soil moisture. Considering the effect of planting dates on total emergence during the first two weeks after the respective planting, an interesting trend could be seen in some species. Curled dock for example, showed a somewhat higher percentage of emergence with later plantings whereas in radish the response was in reverse. One possible explanation could be the difference in the complexity of the dormancy mechanisms in the two species resulting in a difference in environmental requirements for germination and emergence.

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Most of the plantings for radish, turnip, ryegrass, brome grass and doublegee were able to complete their respective life cycle under South Perth conditions. Days from sowing to flowering was affected by planting date in all species. There was a shorter duration with later plantings. Photoperiodicity was obviously one of the main determining factors. With radish for example, first planting took 90 days to reach flowering, whereas seventh planting took only 49 days. Seed production was inversely related to the time of planting in radish, turnip, ryegrass, brome grass and doublegee. Results for pennyroyal need further confirmation because the collected data were from limited number of plants. Seed production per plant was positively correlated with days from sowing to flowering for radish, turnip, ryegrass and brome grass. The longer vegetative stage obviously results in a greater food reserve which in turn contributes to a better seed production.

CHEMICAL CONTROL OF CALOTROPIS - OPEN INFESTATION

EXPERIMENT: 81 KU 2

LOCATION: Carlton Station, Kununurra

OBJECT: To assess the effectiveness of ethidimuron (Ustilan) and hexazinone (Velpar) at various rates, formulations and application methods for the control of Calotropis.

TREATMENTS:

Twenty two treatments were applied on December 3, 1981 to individual Calotropis plants in an open infestation. Each treatment was on ten plants per plot and treatments were in randomized complete blocks with two replications. Height of all treated plants was approximately two metres. The spot-gun was used when applying the liquid concentrate and the sub-surface application was by means of a spear-attachment. All chemicals were applied to the ground on the outer edge of the drip line, i.e. the vertical projection of the canopy. Assessment on per cent control was taken on July 28, 1982.

RESULTS:

	Herbicide	Rate (gm) ai/plant	Application method	Percent control
1.	Ustilan	1	Surface	71
2.	Ustilan	1	Subsurface	82
3.	Ustilan	2	Surface	56
4.	Ustilan	2	Subsurface	79
5.	Ustilan	4	Surface	73
6.	Ustilan	4	Subsurface	65
7.	Velpar liquid	0.375 (1.5 ml)	Surface	37
8.	Velpar liquid	0.375 (1.5 ml)	Subsurface	31
9.	Velpar liquid	0.75 (3 ml)	Surface	70
10.	Velpar liquid	0.75 (3 ml)	Subsurface	75
11.	Velpar liquid	1.0 (4 ml)	Surface	80
12.	Velpar liquid	1.0 (4 ml)	Subsurface	62
13.	Velpar liquid	1.5 (6 ml)	Surface	83
14.	Velpar liquid	1.5 (6 ml)	Subsurface	78
15.	Velpar liquid	3.0 (12 ml)	Surface	79
16.	Velpar liquid	3.0 (12 ml)	Subsurface	79
17.	Velpar granule	0.75	Surface	47
18.	Velpar granule	1.5	Surface	44
19.	Velpar grid ball	0.375 (1 ball)	Surface	68
20.	Velpar grid ball	0.75 (2 balls)	Surface	48
21.	Velpar grid ball	1.5 (4 balls)	Surface	94
22.	Untreated control	-	-	0

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COMMENTS:

The most effective treatment was Velpar grid ball at the rate of four balls per tree. Velpar liquid applied at 4, 6 or 12 ml per tree gave acceptable control. Comparing sub-surface and surface applications of the Velpar liquid, the former did not appear to be more efficient. The action of Ustilan was rather erratic and the surrounding vegetation was badly affected by the chemical.

CHEMICAL CONTROL OF CALOTROPIS - DENSE INFESTATION

EXPERIMENT: 81 KU 3

LOCATION: Carlton Station, Kununurra

OBJECT: To assess the effectiveness of ethidimuron (Ustilan) and the various formulations of hexazinone (Velpar) applied at various rates, using a grid-pattern application for the control of a dense stand of Calotropis.

TREATMENTS:

The herbicide treatments were applied on December 4, 1981 to approximately uniform sized plants averaging 2 m in height in a dense infestation. At least ten plants per plot were treated and treatments were replicated twice. The spot-gun was used when applying the liquid concentrate and the sub-surface application was by means of a spear attachment. Assessment on per cent control was taken on July 29, 1982.

RESULTS:

	Herbicide	Grid spacing (m)	kg ai/ha	Percent control
1.	Ustilan	1	15	100
2.	Ustilan	2	3.75	48
3.	Ustilan	3	1.66	19
4.	Velpar liquid	1	3.75 (1.5 ml/grid)	99
5.	Velpar liquid	2	0.94 (1.5 ml/grid)	19
6.	Velpar liquid	3	0.42 (1.5 ml/grid)	29
7.	Velpar granule	1	3.75	75
8.	Velpar granule	2	0.94	34
9.	Velpar granule	3	0.42	34
10.	Velpar grid ball	1	3.75 (1 ball/grid)	31
11.	Velpar grid ball	2	0.94 (1 ball/grid)	25
12.	Velpar grid ball	3	0.42 (1 ball/grid)	5
13.	Untreated control	1	0	0
14.	Untreated control	2	0	0
15.	Untreated control	3	0	0

COMMENTS:

The most effective treatments were Ustilan (15 kg ai/ha) and Velpar liquid (3.75 kg ai/ha). The use of Ustilan at this very high rate is not recommended because its persistence in the soil affects trees and pasture species. Surprisingly, the Velpar liquid application did not cause serious damage to the surrounding vegetation.

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CHEMICAL CONTROL OF PARKINSONIA - OPEN INFESTATION

EXPERIMENT: 81 PH 2

LOCATION: Degrey Station, Port Hedland

OBJECT: To assess the effectiveness of ethidimuron (Ustilan) and hexazinone (Velpar) at various rates, formulations and application methods for the control of Parkinsonia.

TREATMENTS:

The herbicide treatments were applied on December 16, 1981 to individual Parkinsonia plants in an open infestation. Height of treated plants was about two metres. At least ten plants per plot were treated and treatments were replicated twice. The spot gun was used when applying the liquid concentrate and the subsurface application was by means of a spear attachment. All chemicals were applied to the ground on the outer edge of the drip line, i.e. the vertical projection of the canopy. Assessment on per cent control was then taken on August 2, 1982.

RESULTS:

	Herbicide	Rate (gm) ai/plant	Application method	Percent control
1.	Ustilan	1.0	Surface	0
2.	Ustilan	2.0	Surface	5
3.	Ustilan	4.0	Surface	5
4.	Velpar liquid	0.5 (2 ml/plant)	Surface	10
5.	Velpar liquid	0.5 (2 ml/plant)	Subsurface	15
6.	Velpar liquid	1.0 (4 ml/plant)	Surface	35
7.	Velpar liquid	1.0 (4 ml/plant)	Subsurface	55
8.	Velpar liquid	1.5 (6 ml/plant)	Surface	88
9.	Velpar liquid	1.5 (6 ml/plant)	Subsurface	90
10.	Velpar liquid	3.0 (12 ml/plant	Surface	100
11.	Velpar liquid	3.0 (12 ml/plant)	Subsurface	100
12.	Velpar granule	0.75	Surface	0
13.	Velpar granule	1.5	Surface	60
14.	Velpar grid ball	0.375 (1 ball/plant)	Surface	5
15.	Velpar grid ball	0.75 (2 balls/plant)	Surface	0
16.	Velpar grid ball	1.5 (4 balls/plant)	Surface	100
17.	Untreated control	-		

COMMENTS:

All plants treated with four Velpar grid balls or 12 ml Velpar liquid concentrate applied as a surface or sub-surface treatment were completely dead at the time of assessment. Velpar liquid concentrate applied at 6 ml per plant also gave excellent control. The rest of the treatments were ineffective.

CHEMICAL CONTROL OF PARKINSONIA - DENSE INFESTATION

EXPERIMENT: 81 PH 3

LOCATION: Degrey Station, Port Hedland

OBJECT: To assess the effectiveness of ethidimuron (Ustilan) and the various formulations of hexazinone (Velpar) applied at various rates, using a grid-pattern application for the control of a dense stand of Parkinsonia.

TREATMENTS:

The herbicide treatments were applied on December 17,, 1981 to approximately uniform sized plants averaging 3 m in height in a dense infestation. At least ten plants per plot were treated and treatments were replicated twice. The spot-gun was used when applying the liquid concentrate and the sub-surface application was by means of a spear attachment. Assessment on per cent control was taken on August 3, 1982.

RESULTS:

	Herbicide	Grid spacing (m)	kg ai/ha	Percent control
1.	Ustilan	1	15	73
2.	Ustilan	2	3.75	0
3.	Ustilan	3	1.66	0
4.	Velpar liquid	1	3.75 (1.5 ml/grid)	100
5.	Velpar liquid	2	0.94 (1.5 ml/grid)	55
6.	Velpar liquid	3	0.42 (1.5 ml/grid)	0
7.	Velpar granule	1	3.75	78
8.	Velpar granule	2	0.94	25
9.	Velpar granule	3	0.42	25
10.	Velpar grid ball	1	3.75 (1 ball/grid)	98
11.	Velpar grid ball	2	0.94 (1 ball/grid)	4
12.	Velpar grid ball	3	0.42 (1 ball/grid)	0
13.	Untreated control	1	0	0
14.	Untreated control	2	0	0
15.	Untreated control	3	0	0

COMMENTS:

The most effective treatments were Velpar liquid and Velpar grid ball when applied at the rate of 3.75 kg ai/ha. Velpar granule was less effective at the same rate of application.

CALOTROPIS/BUFFEL GRASS INTERACTIONS

In an attempt to explain why in the East Kimberley in areas devoid of buffel grass (Cenchrus ciliaris) the invasion by Calotropis is not uncommon, I have suggested that the observed relationship might be due to phytotoxic substance(s) produced by living roots of buffel grass. Experiments have been designed and are currently in progress to test the validity of my suggestion. From the experiments, it is hoped that two important points can be demonstrated.

i) That an effective inhibitory chemical is being produced and occurs at a potentially effective concentration in the soil, and

ii) That the inhibition is not an effect of plant competition for light, water and nutrients.