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DEPARTMENT OF AGRICULTURE, SOUTH AUSTRALIA

Agronomy Branch Report

INVESTIGATIONS INTO THE USE OF HERBICIDES AS AIDS TO PASTURE ESTABLISHMENT OR SKELETON WEED LAND IN THE MURRAY MALLEE

R. McR. WOOD

Report No. 32

FOREWORD

This series of fifteen experiments was commenced in 1963 with financial support from the Wheat Industry Research Council and the South Australian Wheat Industry Research Committee.

The work was co-ordinated through the Sub-Committee for Skeleton Weed Research which was formed at the 53rd Meeting of the Australian Agricultural Council in 1960. This Sub-Committee continued its work until November 1971 and during that period approximately $630,000 was directed from Wheat Funds to the Skeleton Weed research projects carried out by various research groups throughout Australia. South Australia was allocated approximately $57,000 which not only supported the work reported herein but it also made possible the projects recorded in Agronomy Branch Report No. 31 and No. 33. Mr. A.F. Tideman acted as the South Australian technical representative on the Sub-Committee.

Although many farmers in the Murray Mallee assisted by making land available for trials, most of the work was conducted on the properties of Messrs. D.G. Dutschke of Karronda and C.H. Johnson of Parilla. Their helpful co-operation is greatly appreciated.

I also wish to thank my colleagues in the Department of Agriculture for their advice and assistance. Much of the work reported was commenced by my predecessor, R.J. Luxmoore. His work was a good foundation for the programme. I also wish to particularly mention Messrs. Spry, Hughes and Lewis whose assistance in the field enabled the work to proceed under the many difficulties experienced.

October, 1971

R. McR. WOOD

Investigations into the use of herbicides as aids in pasture establishment on skeleton weed land in the Murray Mallee

(Experiments 1-15B)

a. GENERAL SUMMARY

During 1964 and 1965 herbicides such as 2,4-D, 2,3,6-TBA, dicamba and picloram were compared at various rates and times of the year. It was soon realised that toxic residues of these herbicides (with the exception of 2,4-D) prevented legume establishment particularly when they were applied close to sowing. Picloram has shown the greatest long term activity on skeleton weed but has also caused more problems with toxic residues.

More recent experiments, conducted at Karoonda and Parilla have shown that 1 oz. a.e. of picloram per acre will prevent useful legume establishment for at least 18 months.

The rate of disappearance of picloram from a sandy soil is mainly dependent on rainfall. When the chemical reaches a clay layer, fixation is likely to be important. It has been observed throughout this project that skeleton weed recovers before residues have fallen to a low enough level to allow legumes to be established.

The post emergent selective herbicide 2,4-DB has been used as an aid for establishing lucerne. However, seasonal variability and poor timing have not assisted in clarification of its effectiveness for this purpose in the Murray Mallee.

It is claimed that 2,4-DB will not harm 2-8 leaf seeling lucerne but will suppress skeleton weed. The timing of application is quite important because lucerne may become susceptible under slow growing conditions. Experience has shown that many seedlings have been killed but the remaining plants have a better chance of surviving the first summer.

Amine 2,4-D (12 oz. a.e./acre) when applied to skeleton weed at the first sign of bolting, can suppress the weed over most of the summer-autumn period. In years of low summer rainfall, some moisture could be conserved by this treatment. Coupled with suppression of skeleton weed, this may improve chances of pasture establishment in the autumn- winter period.

Further studies with low rates of picloram (less than 1 oz. a.e. acre) applied during August and October 1968 have indicated residual toxicity to legume growth at rates greater that $\frac{1}{4}$ oz. a.e. per acre. The value of using picloram for broad acre skeleton weed control is greatly reduced by the toxicity of its residues to legume pastures in the Murray Mallee environment.

b. BACKGROUND

The rapid spread of skeleton weed throughout the Murray Mallee has taken place mainly on the sand over clay or solodised solonetz soil type which is common throughout the lower half of the district. On these soils and particularly on the sandy rises, legume pastures are often sparse, consisting mainly of woolly Burr medic (Medicago Minima) and Cluster Clover (Trifolium glomeratum). it is in these areas of relatively weak pasture that skeleton weed has established most readily. Once it is established, the land becomes a very poor cropping proposition, for reasons already outlined in project 2.

While infestations are small, plants are kept grazed down by stock - particularly when summer rains encourage fresh growth. However, the stems become very tough after flowering if stock numbers are insufficient to hold the weed in check.

As density increases, the vigour of individual plants decreases. Eventually stock carry capacity decreases. It has been estimated that the carrying capacity of areas abandoned from cereal cropping in the Parilla area has fallen from about 0.5 dry sheep equivalent to 0.25 D.S.E. or less per acre. (Hogg 1968).

Some attempts at improved pasture establishment on skeleton weed land in the Murray Mallee had been a failure. In view of the declining productivitiy of this land, it was decided in 1963 to control skeleton weed with herbicides to be followed by pasture sowing at varying intervals.

c. OBJECTIVES

1. To compare herbicides and assess rates and time of application for effective skeleton weed suppression.

2. To assess the benefits (or otherwise) of these herbicides on subsequent legume pasture establishment (lucerne, annual medics and subterranean clovers).

EXPERIMENT 1. AN ASSESSMENT OF DICAMBA, 2,3,6-TBA AND 2,4-D FOR SUPPRESSION OF SKELETON WEED TO AID LUCERNE ESTABLISHMENT IN THE KAROONDA DISTRICT (W.E. 33)

LOCATION:

Karoonda. Section 44. Hundred of Marmon-Jabuk (D.G. Dutschke)

Rainfall: Average 13.8" 1963 rainfall 14.2"
1964 rainfall 13.8"

Soil Type: Solodized solonetz

DURATION:

29/5/63 - 19/10/64

DESIGN:

Randomised Block: 4 replicates
4 Chemicals: 2,3,6-TBA, Dicamba, Amine 2,4-D Control
2 Lucerne Seeding Rates: 1½ and 5 lb./acre
Plot Size: 15' x 100'

METHOD:

The chemicals were applied on 29/5/63 with the Chesterford Logarithmic sprayer at a starting rate of 5 lb. a.e./acre. Half dosage distance = 23.8 feet. Inoculated lucerne was lime pelleted and sown with 105 lb. of superphosphate and 35 lb. Sulphate of Ammonia per acre on 13/8/63 (Spring sowing). A cover crop of Kent oats at 20 lb./acre was also sown.

Following the failute of the spring sown lucerne to establish a second sowing was made on 27/4/64 with 130 lbs. superphosphate per acre and a cover crop of Kent oats.

RESULTS:

Assessment of Skeleton weed density (rosettes sq. link)

(a) on 21/10/63 (4½ months after spraying)

Chemcial lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	3.4	3.5	3.0	4.3	3.1	3.6	2.9	2.8	3.3
2,3,6-TBA	3.5	4.8	3.4	3.6	3.7	2.8	1.7	2.4	3.2
Dicamba	4.3	3.3	2.8	1.8	1.3	1.4	0.9	0.6	2.0
Control	4.7	4.8	5.8	4.4	5.2	4.4	5.3	6.0	5.1
Mean	4.0	4.1	3.7	3.5	3.3	3.1	2.7	2.9	3.4

L.S.D. 5% (chemical x rate means) = 2.4

Dicamba was the most effective chemical for suppression of skeleton weed, 2,3,6-TBA was also effective at higher rates.

(b) Skeleton Weed Density on 19/10/64 (data transformed to log (x+1) where x = rosettes per 4 sq. links).

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	0.76	1.05	0.84	1.06	1.03	0.94	0.97	0.97	0.95
2,3,6-TBA	1.08	1.03	0.93	1.01	0.98	0.93	0.79	0.83	0.95
Dicamba	1.02	0.90	0.85	0.75	0.61	0.59	0.38	0.39	0.69
Control	1.18	1.11	1.14	1.12	1.09	1.13	1.18	1.12	1.13
Mean	1.01	1.02	0.95	0.99	0.93	0.90	0.84	0.83	0.93

L.S.D. 5% = 0.23 (spray x conc. means)

Assessments of lucerne density

(a) Lucerne density on 21/10/63 (data transformed log (x+1) where x = plants/12 sq. links)

Lucerne density 21/10/63 log (plants/121h2+1)

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	0.37	0.23	0.25	0.44	0.46	0.40	0.47	0.34	0.37
2,3,6-TBA	0.41	0.46	0.40	0.47	0.45	0.30	0.46	0.48	0.43
Dicamba	0.69	0.62	0.65	0.73	0.57	0.45	0.73	0.57	0.36
Control	0.19	0.21	0.11	0.0	0.12	0.14	0.14	0.28	0.15
Mean	0.42	0.38	0.35	0.41	0.40	0.33	0.45	0.42	0.40

L.S.D. 5% = 0.29 (spray x rate means)

(b) Lucerne density on 10/19/64 (data transformed log (x + 1) where x = plants/4 sq. links).

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	0.17	0.19	0.33	0.31	0.14	0.22	0.31	0.18	.23
2,3,6-TBA	0.17	0.30	0.18	0.36	0.15	0.31	0.31	0.12	.24
Dicamba	0.27	0.25	0.20	0.34	0.38	0.35	0.39	0.24	.30
Control	0.29	0.24	0.19	0.24	0.20	0.17	0.17	0.14	.21
Mean	0.23	0.25	0.23	0.31	0.22	0.26	0.30	0.17	0.25

L.S.D. 5% = 0.16 (spray x rate means)

Assessment of cover crop vigour

Statistical analysis of the data showed significant differences between the rates of application of the various spray treatments. (Data transformed).

(a) Cover crop vigour on 24/10/63 (visual assessment based on four classes 0.47 (stunted) 1.20 (weak tillers) 1.80 (tillering) 2.53 (Many strong tillers).

Chemcial lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	1.4	1.3	1.3	1.2	1.3	1.4	1.3	1.6	1.4
2,3,6-TBA	1.2	1.2	1.5	1.5	1.5	1.5	1.8	1.8	1.5
Dicamba	1.3	1.6	1.6	1.9	1.9	1.8	1.9	2.1	1.8
Control	1.3	1.1	1.3	1.3	1.3	1.1	1.0	1.2	1.2
Mean	1.3	1.3	1.4	1.5	1.5	1.5	1.5	1.7	1.5

L.S.D. 5% (spray x rate means) 0.3

The growth of oats was enhanced particularly where the skeleton weed had been suppressed with the spray application.

(b) Cover crop vigour on 11/10/64 (visual assessment based on three classes 0.65 (poor, stunted) 1.50 (weakly tillering) and 2.35 (many strong tillers).

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	0.86	0.81	0.97	1.08	0.97	0.92	1.08	0.81	.94
2,3,7-TBA	0.81	0.81	0.92	0.92	0.86	1.02	1.13	1.23	.96
Dicamba	0.86	0.86	0.92	1.02	1.50	1.34	1.61	1.39	1.19
Mean	.89	.84	.95	1.01	1.06	1.06	1.20	1.13	1.02

L.S.D. 5% (spray x rate means) = 0.32

SUMMARY:

1. Skeleton Weed density
The application of the benzoic acid herbicide dicamba during May was effective in reducing the density of skeleton weed for up to 15 months at rates greater than 2 lb. acid equivalent per acre. 2,3,6-TBA and 2,4-D were less effective.

2. Lucerne Establishment
The establishment of lucerne on the sprayed areas was generally unsuccessful. The spring sowing during 1963 was not ideal and establishment was poor. Again, the second sowing in 1964 was not very successful. It is likely that herbicide residues caused lucerne mortality at the higher rates, and where skeleton weed was unchecked, severe competition limited lucerne establishment.

The chemical fallow effect observed in the oat cover crop where skeleton weed had been suppressed indicated that herbicides may make soil nutrients and moisture more readily available to tolerant plant species. (e.g. grasses).

The practice of spring sowing is not suited to the Mallee environment in the case of dryland lucerne. The sulphate of ammonia did not improve establishment, and further clarification on trace elements and lime pelleting is desirable.

EXPERIMENT 2. AN ASSESSMENT OF DICAMBA, 2,3,6-TBA AND 2,4-D FOR SUPPRESSION OF SKELETON WEED AS AN AID TO LUCERNE ESTABLISHMENT

(W.E. 33 Expt. 2)

LOCATION:

Mulpata. Section Hundred of
(R.M. Pocock)

Rainfall: Average 15.0" 1963 18.17"
1964 17.6"

Soil Type: Sandy Mallee

DURATION:

31/5/63-31/6/64

DESIGN:

Randomised block: 4 replicates
3 herbicides: Dicamba, 2,3,6-TBA, Amine 2,4,-D, Control
Plot Size: 15' x 100'

METHOD:

The chemicals were applied on 31/5/63 with the Chesterford logarithmic sprayer at a starting rate of 5 lb. a.e./acre. Half dosage distance = 23.8 feet. The method was basically the same as for Experiment 1 with only one lucerne sowing rate (1½ lb./acre)

Following the poor establishment on the 1963 sowing, a second sowing was made in June, 1964. However, this was sand blasted and failed to establish and the trial was concluded.

RESULTS:

(a) Skeleton Weed Density (rosettes/sq. link) on 24/10/63

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	7.8	8.5	8.7	10.4	9.8	8.0	5.9	5.1	8.0
2,3,6-TBA	5.1	7.2	6.8	9.0	6.4	4.1	2.2	3.5	5.5
Dicamba	3.3	2.8	1.8	1.9	0.7	0.5	0.3	0.4	1.5
Control	7.8	8.7	10.9	11.2	9.8	9.5	7.3	8.2	9.2
Mean	6.0	6.8	7.0	8.2	6.7	5.5	3.9	4.3	6.0

L.S.D. 5% (chemical x rate means) = 3.8
1% = 4.9

Dicamba has shown excellent suppression of skeleton weed five months after application.

(b) Lucerne density (Plants/12 sq. links) on 24/10/63

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	5.3	6.5	2.8	2.8	6.0	12.5	14.5	3.0	5.4
2,3,6-TBA	4.5	4.3	4.3	4.8	5.0	4.5	2.8	2.5	4.1
Dicamba	2.8	3.5	4.8	3.8	1.3	4.8	1.5	0.8	2.9
Control	4.0	3.0	5.5	2.8	3.3	4.8	5.0	4.8	4.2
Mean	4.2	4.3	4.4	3.6	3.9	6.7	3.5	2.7	4.2

L.S.D. 5% (spray x rate means) = 4.4

These data show that there was a reduction in lucerne density as the rate of chemical was increased and that the density was less on dicamba plots.

(c) Visual assessment of cover crop vigour on 24/10/63
The same method outlined in Experiment 1 of this project was used. The data have been transformed according to Fisher's scores for ordinal or ranked data.

Cover Crop Vigour 24/10/63

Chemical lb./acre	½	¾	1	1½	2	2½	3½	4½	Mean
Amine 2,4-D	1.7	1.6	1.9	1.7	2.0	2.2	1.9	1.5	1.8
2,3,6-TBA	1.4	1.6	1.7	1.8	1.9	2.2	2.3	2.1	1.9
Dicamba	1.6	1.8	2.3	2.1	2.5	2.3	2.2	1.9	2.1
Control	1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.6
Mean	1.5	1.6	1.9	1.8	2.0	2.1	2.0	1.8	1.9

L.S.D. 5% (Spray x rate means) = 0.4

The vigour of the oat crop was most pronounced on dicamba plots and more particularly at rates between 1 to 2½ lb. a.e./acre.

SUMMARY:

This experiment was similar to experiment 1 with a similar pattern of results, except that lucerne was adversely affected on dicamba plots.

EXPERIMENT 3. AN ASSESSMENT OF FIVE CHEMICALS APPLIED IN DECEMBER FOR SUPPRESSION OF SKELETON WEED TO AID PASTURE ESTABLISHMENT

LOCATION:

Sandalwood. Section Hundred of (C. Shilton)

Rainfall: average = 13.2" 1964 = 14.9"
1965 = 8.9"

Soil Type: Sandy Mallee

DURATION:

1964-1965

DESIGN:

Randomised Block: 3 replicates
6 treatments: Dicamba, 2,3,6-TBA, Amine 2,4-D, Diquat, Picloram, Control
Plot Size: 10' x 120'

METHOD:

The chemicals were applied on 16/12/63 with the Chesterford logarithmic sprayer at a starting rate of 2 lb. a.e./acre, except Picloram which was applied at a starting rate of 1.6 lb. a.e./acre. Half dosage distance = 23.8 feet.

In the following season, Barrel 173 and harbinger medic (each 4 lb./acre) and lucerne (2 lb./acre) were sown on 13/5/64 over the plots in strips with 120 lb. superphosphate per acre, using a disc drill.

In the 1965 season, the plots were dry sown on 23/3/65 with approximately 30 lb. Avon oats, 1¼ lb. lucerne, ¾ lb. harbinger medic and 60 lb. superphosphate per acre.

RESULTS:

(a) Effects on Skeleton Weed

The December application of the five chemicals resulted in a considerable range of effects. The diquat and amine 2,4-D had little effect on the skeleton weed while the benzoic acids (2,3,6-TBA and dicamba) reduced skeleton weed density particularly at higher rates (1½-2 lb./acre). Picloram was extremely effective in suppressing skeleton weed and eradication may be obtained at the highest rates. The following table shows the skeleton weed regrowth on picloram plots at various times.

TABLE: Rates of picloram to suppress skeleton weed for various periods

Time (months after application)	8	10	15	18
Rate of Picloram (oz. a.e./acre)	1.6	7.4	8.4	14.8

(b) Effects on medics

The sown species did not grow well on this site. The annuals (harbinger and barrel 173) generally grew better than lucerne. Residual herbicide toxicity was apparent at the higher rates of application of the benzoic acids ($\frac{3}{4}$-2 lb./acre) and on almost the whole of the picloram plots ($1\frac{1}{2}$-12 oz./acre) some annual medic growth occurred, however the growth was stunted and toxicity symptoms were apparent.

In the 1965 season, some medic growth was occurring on picloram plots where less than 12 oz./acre had been applied 18 months previously.

(c) Volunteer species

Where the skeleton weed had been suppressed, with $1\frac{3}{4}$-2 lb./acre of benzoic acids or 2-26 oz./acre of picloram volunteer species established, including Brassica tournefortii and Lolium rigidum particularly.

SUMMARY:

Where good control of skeleton weed was obtained, no effective legume establishment occurred due to residual herbicide toxicity. Legume growth on control plots was poor due to weed competition.

The most interesting aspect of this experiment is the effect of picloram of skeleton weed which could still clearly be seen during 1966 regrowth with time.

EXPERIMENT 4. AN ASSESSMENT OF FIVE CHEMICALS APPLIED IN FEBRUARY FOR SUPPRESSION OF SKELETON WEED TO AID PASTURE ESTABLISHMENT (W.E. 33 Expt. 4)

LOCATION:

Parilla. Section 7 Hundred of Parilla
(C.H. Johnson)

Rainfall: average = 13.7 1964 = 17.8"
1965 = 11.7"
1966 = 10.89"

Soil Type: Solodized solonetz

DURATION:

12/2/64-December, 1966

DESIGN:

Randomised Block: 4 replicates
6 Treatments: Dicamba, 2,3,6-TBA, Amine 2,4-D, Ester 2,4-D, Picloram, Control
Plot Size: 15' x 100'

METHOD:

The chemicals were applied on 12/2/64 with the Chesterford logarithmic sprayer at a starting rate of 3 lb. a.c./acre, however picloram was applied at 2.4 lb. a.e./acre starting rate. Half dosage distance 24 feet.

A mixture of harbinger medic (4 lb./acre) and barrel 173 (4 lb./acre) in one half of a combine with Hunter River lucerne (2 lb./acre) in the other half were sown with 120 lb. superphosphate per acre on 7/5/64 across the sprayed plots.

In the 1965 season, the picloram plots were sown with Dwalganup sub clover and barrel 173 medic from a small seeds box with 130 lb. superphosphate/acre on 27/5/65.

RESULTS:

(a) Effects on Skeleton Weed

Picloram was the most effective of the five chemicals applied and eight months after application no skeleton weed had regorwn on the plots. (Rates from $2\frac{1}{2}$ to 38 oz./acre).

Fifteen months after spraying, skeleton weed regrowth for the four replicates was occurring at rates less than $10\frac{1}{2}$, $4\frac{1}{2}$, $4\frac{1}{2}$, and 6 oz. a.e./acre. 2,3,6-TBA and dicamba were effective in reducing skeleton weed density where 1 to 3 lb./acre had been applied. Nevertheless, the skeleton weed regrowth increased with decrease in rate of application. There was some regrowth even at the highest rate.

The ester and amine 2,4-D chemicals slightly suppressed skeleton weed at the highest rates of application ($2\frac{1}{2}$-3lb./acre).

(b) Effects on Sown Medics

No legumes grew on picloram plots in 1964 season, while on 2,3,6-TBA and dicamba plots poor growth occurred and mainly where less than 1 lb./acre of chemical was applied. Medic growth on 2,4-D plots was not as vigorous as control plots which had the best legume growth. The overall pasture growth however was poor and production was low. It is suspected that a nodulation problem exists on the soil under test.

(c) Volunteer Species

Where skeleton weed had been suppressed as on picloram plots and with 2-3 lb./acre of benzoic acid chemicals, volunteer species readily established. Annual grasses were prominent particularly Vulpia sp. and also Lolium rigidum and Bromus rigidus. Broadleaf species included Erodium sp., Brassica tournefortii and Cryptostemma calendula. On picloram plots, the grasses particularly and turnip volunteered.

EXPERIMENT 5. EFFECTS OF SUPERPHOSPHATE RATES AND 2,4-DB HERBICIDE ON THE ESTABLISHMENT OF TWO LUCERNE VARIETIES. (W.E. 33 Expt. 5)

LOCATION:

Parilla. Section 12 Hundred of Parilla
(C.R. Gilbertson)

Rainfall: average 13.7" 1964 = 17.8"
1965 = 11.7"
1966 = 10.9"
1967 = 6.9"
1968 = 15.5"
1969 = 16.8"
1970 = 13.6"

Soil Type: Solodised solonetz.

DURATION:

1964-1970

DESIGN:

Randomised split plot factorial: 4 replicates
Superphosphate: 50,100,150 lb./acre
Lucerne seeding rates: 2 & 5 lb./acre (approx).
2,4-DB rates: 0, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ lb. a.e./acre
Plot size: 15' x 6'

METHOD:

Lucerne was inoculated, lime pelleted and sown on 26/6/64 through a small seeds box of a 20 hoe combine. African lucerne was placed in the left half of the box and Hunter River in the right hand side (split plot treatment). A cover crop of oats was sown at 15 lbs./acre.

The 2,4-DB herbicide was applied 23/9/64 in 15' strips sprayed across the combine strips, in 30 gallons water per acre.

RESULTS:

(a) Lucerne establishment - density counts were made on 25/2/65 and statistical analysis of transformed data showed significant effects of lucerne seeding rate and 2,4-DB spray rates.

x = plants per 4 sq. links

Density of Lucerne Plants 25/2/65

Rate of 2,4-DB (lb./acre)	0	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$
Mean density (transformed) log (x + 1)	0.13	0.31	0.39	0.46	0.45	0.47

L.S.D. 5% = 1.10

Lucerne Sowing Rate	D2	D5
Mean density (transformed) log (x + 1)	0.28	0.46

There were no significant effects from superphosphate rate or lucerne variety on density of lucerne by February 1965.

The 2,4-DB was effective in increasing lucerne establishment by reducing skeleton weed competition during the spring and summer.

Visual observations showed that annual grasses, particularly Bromus rigidus were prominent on 2,4-DB sprayed plots.

Lucerne vigour - During winter 1965, African lucerne was growing more vigorously than Hunter River and a response up to 100 lb. superphosphate/acre could be seen. The lucerne varieties were more vigorous where 2,4-DB had been applied while on control plots, skeleton weed was strongly competing with the lucerne.

(b) Lucerne Density counts made on 25/8/65 showed significant effects due to sowing density and lucerne variety.

Density (lb. per acre)	Mean (plants per 8 sq. links)	
2	3.4	
5	5.6	L.S.D. 0.1% = 1.1

Variety	Mean	
African	3.6	
Hunter River	5.4	L.S.D. 1% = 1.8

Spray (lb. per acre)	Mean	
0	3.4	
½	4.3	
¾	4.3	
1	5.0	L.S.D. 5% = 2.19
1¼	4.9	Differences not significant
1½	5.0	

(c) Visual estimates of Lucerne production made on 28/10/65 showed significant effects due to sowing density while small but not significant increases were obtained with higher superphosphate rates and Hunter River appeared more vigorous than African lucerne.

Lucerne Density (lb. per acre)	Mean (visual estimates)	
2	2.7	
5	3.3	L.S.D. 1% = 0.5

The visual estimates were made with four subjective classes.

1 = little production
2 = some
3 = considerable
4 = much

(d) Assessments of Lucerne and Skeleton Weed Growth during the 1966 season

On 14/9/66, inspection indicated that:

1. Lucerne plant density was similar within sown plots, irrespective of the 2,4-DB treatments.
2. The Hunter River variety had established at a greater density than the African, and was showing more vigorous growth, despite below average seasonal rainfall.
3. Quadrat counts of skeleton weed indicated an average of 10 rosettes per sq. link (250 per m2) over the trial area. At this high density, rosettes were small and weak, showing the lack of rainfall and low soil fertility.

(e) The 1965-67 seasons

Below average rainfall was recorded during these three years and at the beginning of the 1966 summer, it appeared as if the lucerne would not survive. The fence around the trial was removed in 1967, and pegs were removed. The lucerne establishment was regarded as a failure.

(f) The 1968-70 period

Remarkable recovery of the lucerne was noted during 1968, following good seasonal rains. On 23/9/68 the area was topdressed in order to encourage more rapid recovery, as the plots had received no superphosphate since sowing. Four superphosphate rates were applied, (Nil, 187, 336 and 672 lbs. per acre), in strips at right angles to the original sown plots. Fertiliser was dropped onto the surface with a 9 hoe combine. Sulphate of ammonia was applied on a split plot treatment at 1 cwt./acre approximately. A useful fall of rain was recorded within a month of this topdressing, and a response to phosphorus fertiliser could be seen early in 1969. Following heavy rains during February 1969, these lucerne responses were quite distinct up to 336 lbs. of superphosphate with a small additional response to 672 lbs. No response to the sulphate of ammonia could be seen.

Following rains in May 1969, the whole trial was topdressed, and renovated with lucerne points. A superphosphate plus Copper, Zinc and Molybdenum trace element mixture was applied at 140 lbs. per acre. (Each 187 lb. sack contained 7 lbs. Cu. 7 lbs. Zn and 2 oz. Mo.) A cover crop of Noyep barley was sown.

Throughout the 1969 season, the lucerne growth continued to improve, and areas which received no superphosphate during 1968 showed a clear response to the 1969 application.

The area was topdressed with a further 100 lbs./acre of superphosphate during May 1970, and an infestation of "spittle bugs" was treated also.

When the trial was inspected during October 1970, the Hunter River lucerne was actively growing on plots where it had been sown and the average density of plants was estimated at about 6 per square metre. Both initial sowing rates have reached similar plant densities over the 6 year period since sowing. Skeleton weed was still present, but each plant was very weak, indicating that carefully managed lucerne will gain the upper hand.

CONCLUSION:

This experiment has shown the value of Hunter River lucerne as a competitor against Skeleton weed. The 1964 season was a good one for lucerne to establish, but the three following seasons were a severe test.

The use of lime pelleted and inoculated seed is wise on country where lucerne has not previously been grown, but a direct comparison with plain seed was not attempted.

The trial area was grazed only for short periods. A lack of water supply made it impossible to keep stock on the area for any length of time.

EXPERIMENT 6. EFFECTS OF PICLORAM ON SKELETON WEED AND SUBSEQUENT ESTABLISHMENT OF LEGUMES AND CEREALS

LOCATION:

Parilla. Section 6 Hundred of Parilla
(C.H. Johnson)

Rainfall: average 13.7" 1964 = 17.8"
1965 = 11.7"
1966 = 10.9"

Soil Type: Solodised solonetz

DURATION:

September, 1964-1966

DESIGN:

Randomised block: 4 replicates
Picloram rates: 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 oz. a.e/acre (the potassium salt formulation was used).

Sown species:

dry sown with oats sown under wheat	Hunter River lucerne
	Harbinger medic
	Geraldton sub clover
	African lucerne
	Barrel 173 medic
	Dwalganup sub clover

Plot size:
15' x 12'

METHOD:

Skeleton weed was sprayed on 24/9/64. The water output was 28 gallons per acre, from Landrover mounted spray unit.

The dry sown legumes were inoculated, lime pelleted and sown with 130 lb. superphosphate and 130 lb. lime per acre on 1/4/65 with Kent oats.

The other plots were worked up and sown on 27/5/65 with lime pelleted legumes through a small seeds box and with Insignia wheat. Superphosphate 130 lb./acre.

ASSESSMENTS:

1. Quadrat counts of skeleton weed density.
2. Soil samples for assessing picloram effects on soil moisture and nitrate levels.
3. Visual assessment of cereal and legume growth.
4. Dry weight measurement of pasture.
5. Cereal yields and protein content of grain.

RESULTS:

(a) Skeleton Weed

Quadrat counts of skeleton weed density at three times after spraying (rosettes/100 sq. links).

TABLE I.

	Rate (oz. a.e./ acre)	0	¼	½	¾	1	1½	2
Feb 1965	5 months	195	43.5	4.5	3.9	3.0	3.9	1.5
Mid June 1965	8½ months	588	452	206	178	142	45	35
Sept. 1965	12 months	531	263	199	141	125	70	60

Before the opening rains in 1965, all rates of picloram considerably reduced skeleton weed density. Regrowth occurred with these rains and there was an increase in density on all plots. The 1½-2 oz. rates greatly restricted the regrowth while the ½ oz. rate had about a third of the control plot density at the second assessment (Table I).

(b) Soil Moisture and Nitrate

Soil moisture samples were taken on from plots receiving ½ oz. picloram/acre and from control plots. There was a significant increase in moisture storage with depth and sprayed plots contained more moisture than control plots (Table 2).

TABLE II Moisture percentage (gm. water per 100 gm. soil)

Spray	Mean	Depth	Mean
Control	3.27	0-12	1.81
½ oz./acre	4.90	12-24	2.14
		24-36	5.57
		36-48	6.82

L.S.D. C. 1% = 1.16 L.S.D. 5% = 0.94

Soil nitrate determinations showed an increase in nitrate concentration on plots sprayed with picloram at all sample depths (Table 3).

TABLE III Soil Nitrate (p.p.m.)

Spray	0-6"	6-12"	12-24"
Nil	3.3	1.5	1.2
½ oz./acre	8.5	5.8	3.5

Both improved moisture storage and soil nitrate levels resulted from the application of picloram spray at ½ oz. acid equivalent/ acre.

(c) Pasture Growth

Early observations on pasture growth indicated some picloram residue toxicity on the legumes even at the lower rates. Legumes generally emerged well, but subsequent growth was restricted, more so as the rate of picloram increased.

There was intense early competition on the dry sown legumes from annual weed species including Taraxacum officinale, Erodium botrys.

Herbage cuts were taken from Harbinger medic and Dwalganup Sub clover plots on 21/9/65. Pasture composition estimates were also made, based on four classes:
(1 = 100-75% medic 2 = 50-75% medic
3 = 25-50% medic 4 = 0-25% medic)

Picloram (oz. per acre)	0	¼	½	¾	1	1½	2	L.S.D. 5%
HARB.								
(Herbage (gm per sq. 1k)	6.3	8.1	7.3	6.0	5.2	5.3	3.7	2.2
(Composition estimate)	1.6	1.5	2.0	1.8	2.4	4.0	3.9	0.9
DWALG.								
(Herbage (gm per sq. 1k)	6.2	6.1	4.1	3.4	2.6	3.4	2.2	1.3
(Composition estimate)	2.3	1.8	3.1	2.8	3.4	3.9	4.0	0.9

These data suggest that Harbinger medic is less susceptible than at the lowest rates, legume production and composition was not influenced very much by picloram. At the high rates the pastures were predominantly Erodium botrys, Taraxacum officinale and Valpia sp. The legume seed set was much greater on low rate sprayed plots than on control (visual observation). This seed was quite viable (small lab. test).

(d) Cereal Growth

The growth of the dry sown oats was very poor, and yields could not be measured.

Differences were apparent in wheat yields; however absolute yields were very low and were not harvested. Visual observations indicated increased crop growth and yield where skeleton weed had been removed by picloram treatment.

Annual grasses, (particularly Bromus rigidus) were prominent weeds in the wheat crop.

(e) Picloram resistant species

September application of picloram effectively removed skeleton weed for many months. However, other species, (including Taraxacum officinale and Erodium botrys) readily volunteered and were problem weeds to pastures and crops.

TREATMENT OF THE PASTURE PLOTS DURING 1966

The area remained fenced until November when limited grazing was commenced.

The plots were topdressed in April with 86 lbs./acre of superphosphate, 7½ lbs./acre copper and zinc sulphate and 2 oz./acre of molybdenum. This application was carried out with a disc drill set at a depth of 1½".

Muriate of potash was applied to the surface with the same implement at 80 lbs./acre on 27/7/66. On the same date, 3 oz. of Rogor per acre were applied to prevent damage by red legged earth mite, which is prevalent in the area. This was applied by a knapsack mister.

Pasture growth was assessed on 15/9/66 as follows:

1. Hunter River lucerne: A thin stand - averaging one plant per 6 sq. links. The density varied greatly with picloram treatment. No plants had established on the 1½ or 2 oz. picloram plots.

2. African lucerne: A poor establishment, even where no picloram had been applied.

3. Dwalganup and Geraldton sub. clovers were conspicuously better pasture legumes than the annual medics at the time of assessment. However, later in the season, when the rainfall ceases, they dried off rapidly without setting much seed. Production was decreased on the 1, 1½ and 2 oz. picloram plots.

4. Harbinger medic and barrel 173 medic produced less than expected because of the abnormally low rainfall from April-October (7.16"). The effect of picloram was still evident, and legume density was reduced on 1, 1½ and 2 oz. plots.

The density of skeleton weed throughout the plots was high and it was rapidly regrowing, even on the 2 oz. picloram plots. The trial was concluded in December 1966.

EXPERIMENT 7. RESIDUAL EFFECTS OF FERTILISER NITROGEN AND CROP SPRAYS ON STUBBLE SOWN MEDICS. (W.E. 35 Expt. 1)

LOCATION:

Pata. Section 29 Hudred of Bookpurnong.

Rainfall: average 10.7" for 1964 13.5"
1965 8.6"

Soil Type: Red Mallee Sand

DURATION:

1965, 1965, 1966

DESIGN:

Randomised block with four replicates.

Sown medics: Barrel 173, Harbinger, Hunter River Lucerne

Plot Size: 20 hoe drill x 120 yards

METHOD:

Sowing: The plots were sown on 28/4/64 with a trash culti-seeder, applying 140 lb. superphosphate per acre.

Medics were sown through a small seeds box and harrowed at the following estimated rates:
Harbinger and barrel 173 each at 5 lb. per acre lucerne (Hunter River) at 2½ lb. per acre.

In 1965 season: All plots were disc harrowed and two replicates were treated with 1 cwt. superphosphate per acre.

PREVIOUS TREATMENTS:

In 1963, the area of this trial was a cereal variety x nitrogen rate and crop spray trial. Residual effects, particularly resulting from amine 2,4-D crop spray at 12 oz. a.e./acre, and a mixture of 2 oz. a.e. dicamba and 6 oz. a.e. amine 2,4-D per acre, could be seen in the reduction of skeleton weed density at the time of stubble sowing.

There were no apparent residual effects of the fertiliser nitrogen treatments of 9, 11½, 23 and 46 lb. N per acre.

ASSESSMENTS:

(a) Density counts of skeleton weed.
(b) Density and vigour estimates of lucerne and annual medics.

RESULTS:

(a) Skeleton weed density assessed on 20/10/64 showed significant differences associated with residual treatments, particularly crop spray treatments.

Residual Treatments	Mean Density (rosettes per sq.link)
Nil	11.6
11½ lb. N	11.1
23 lb. N	9.0
46 lb. N	6.5
amine 2,4-D	1.5
dicamba and 2,4-D	0.7

L.S.D. 5% = 2.6
1% = 3.5
0.1% = 4.7

The skeleton weed density was influenced by residual treatment effects and pasture competition during 1964. The decrease in skeleton weed density with applied nitrogen treatments was a continued expression of the results found in the cropping trial, as were the effects of the crop spray treatments.

(b) Lucerne density counts were made on 20/10/64 and there were no significant effects of residual treatments. The mean density was 1.45 plants per 10 sq. links.

(c) Visual assessments of lucerne vigour were taken on 20/10/64. These indicated an increase in vigour on the crop sprayed plots. The visual assessments were transformed to Fisher's Scores (+ 1.5) for ordinal or ranked data.

Residual Treatments	Mean values (transformed data)
Nil	1.41
11½ lb. N	1.46
23 lb. N	1.33
46 lb. N	1.39
amine 2,4-D	2.26
dicamba and 2,4-D	2.44

L.S.D. 5% = 0.35
0.1% = 0.62

where 1.00 = weak small lucerne plants
2.50 = vigorous plants

(d) Skeleton weed density assessed on 20/10/65 showed significant effects of resudial treatments and differences between sown species.

Residual Treatment	Mean Density (rosettes per sq.link)
Nil	1.86
Amine 2,4-D	1.05
Dicamba and 2,4-D	0.41

Sown species	Mean Density (rosettes per sq.link)
Barrel 173	1.28
Harbinger	1.39
Lucerne	0.65

(e) Estimates of pasture vigour during 1965 showed no significant differences between residual treatment effects (in contrast to the results obtained in the previous year). These data indicate that seasonal differences influence the competition between skeleton weed and legume pasture species. It is also likely that the chemical control of skeleton weed resulted in a chemical fallow effect which enhanced pasture growth in 1964. This effect would not have occurred in the second season, even though large differences in skeleton weed density were still maintained.

The superphosphate treatment applied in 1965 stimulated pasture grwoth (visual observation) indicating a large deficiency of phosphorus since the plots received 215 lb. superphosphate in the previous two years.

CONCLUSIONS:

Crop spraying with 2,4-D amine and dicamba + 2,4-D mixtures influenced the skeleton weed density for two years following, whereas the residual effect from nitrogen fertiliser applications had a shorter and less noticable effect.

The competitive ability and vigour of a sown pasture show marked seasonal variations. Similar results would be required for several years, preferably on different sites to obtain more reliable information. It is worth noting that the annual rainfall in 1964 was 3" above the mean for the locality.

The trial was concluded in September, 1966 when pasture growth was compared on different plots. Lack of rainfall had prevented any treatment differences from being expressed.

EXPERIMENT 8 RESIDUAL EFFECTS OF NITROGEN AND CROP SPRAY TREATMENTS ON LEGUME PASTURE GROWTH (W.E. 35 Expt.2)

LOCATION:

Parilla, Section 2 Hundred of Parilla
(C.H. Johnson)

Rainfall: average: 13.7" for 1964 = 17.8"
1965 = 11.7"

Soil Type: Solodized solonetz

DURATION:

1964 and 1965

DESIGN:

Randomised block with four replicates.

Sown legumes:
Harbinger medic, barrel medic 173, Dwalganup sub clover, Geraldton sub clover, Hunter River lucerne.

Plot Size: 20 hoe drill x 5 chains

METHOD:

Sowing: The legumes were sown on 7/5/64 with a combine through fertiliser box delivering 120 lb. superphosphate per acre at the following seeding rates.
Annual legumes at 5 lb. per acre
Lucerne at 2 lb. per acre

In 1965 season: All plots were disc harrowed and 60 lb. superphosphate per acre applied.

PREVIOUS TREATMENTS:

In 1963, the area of the current trial was a cereal variety x nitrogen x crop spray trial (reported in Project 2 experiment 1). Residual effects of 12 oz. a.e. amine 2,4-D per acre crop spray were apparent by the reduction in skeleton weed density at time of legume sowing.

ASSESSMENTS:

Visual Assessments of skeleton weed and lucerne growth.

RESULTS:

(a) Counts of lucerne density showed no significant effects due to residual treatments.

(b) Lucerne vigour estimates showed that growth was more prolific on plots receiving the crop spray in the previous season and there were no residual effects due to applied nitrogen.

Vigour of Lucerne Plants

Residual Treatment	Mean (transformed)
Control	0.77
2,4-D spray	1.42

L.S.D. 0.1% = 0.41

Scale: 0.47 very weak small lucerne plants
1.80 stronger growing plants

(c) Pasture growth in 1965 was very poor. The poor legume growth on this site even when copper and zinc were applied indicated that other factors were involved and inoculation and lime pelleting have been used in later trials on this soil type.

EXPERIMENT 9. THE EFFECT ON PRECROP (FEBRUARY) PICLORAM APPLICATION ON THE ESTABLISHMENT OF LEGUME IN A STUBBLE SOWN PASTURE. (Continuation of Project 2 Expt. 6)

LOCATION:

Taplan - 20 miles east of Loxton.

Rainfall: Average = 10.2" = 11.95"
April-October 1966 = 3.17"

Soil Type: Red Mallee sand

DURATION:

23/2/65 to December, 1966.

DESIGN:

Randomised block - as for project 2, experiment 6.

BACKGROUND:

Project 2, experiment 6 was a picloram-nitrogen-wheat trial which was commenced on 23/1/65 when picloram was applied to some of the plots. The other picloram treatments were applied at the 3 leaf and fully tillered stages of the crop. Useful information on the residual effects of picloram on pasture establishment could be obtained if the stubble was sown to suitable species. It was therefore decided to sow harbinger medic dry, into the stubble and sow Hunter River lucerne after the opening rains.

METHODS:

Harbinger medic was sown at 10 lbs./acre with 90 lbs. of superphosphate per acre on 25/3/66. Hunter River lucerne was sown at 2 lbs./acre with 90 lbs. of superphosphate on 24/6/66. A 20 hoe drill was used.

Harbinger medic was sown on replicates 3 and 4 and the lucerne on replicates 1 and 2.

The area was fenced on 19/10/66 to allow controlled grazing of the pasture plots.

ASSESSMENTS:

Skeleton weed density counts were made on 18/3/66 and 19/10/66.

Visual assessments of pasture production were made on 19/10/66.

RESULTS:

(a) Skeleton weed density treatment means at two dates are given in the following table:

Treatment		Skeleton Weed Density (rosettes per sq. link) 18/3/66	19/10/66
Controls	1	5.4	10.4
	2	5.7	9.8
	3	5.5	10.0
February	4	4.1	6.4
	5	3.7	8.4
	6	3.8	4.6
	7	2.3	4.1
	8	2.4	2.9
3 - leaf	9	4.8	7.4
	10	4.9	7.0
	11	4.3	6.5
	12	3.8	5.8
	13	4.3	6.1
Fully tillered	14	6.2	11.3
	15	4.4	8.7
	16	3.6	7.2
	17	3.6	7.8
	18	2.1	4.9

(b) Pasture growth - visual assessments.
The following subjective classes were used:
1 = none or little
2 = few (low density)
3 = some (medium density)
4 = much (dense)

The October assessment means for each treatment are shown in the following table:

Treatment No.		Pasture density Harbinger medic	Grasses
Control	1	3.5	1.3
	2	2.5	1.3
	3	2.5	1.3
February	4	2.0	2.0
	5	2.5	2.0
	6	3.5	3.3
	7	1.5	4.0
	8	3.5	3.8
3 - leaf	9	2.5	1.5
	10	3.5	3.0
	11	2.5	3.3
	12	1.5	3.5
	13	3.5	3.3
Fully tillered	14	2.5	1.5
	15	2.5	2.0
	16	2.5	2.5
	17	1.0	3.5
	18	1.5	3.25

DISCUSSION:

1966 was a very poor year for pasture establishment, especially in the northern areas of the Murray Mallee. A total of 50 points of rain was recorded by the farmer during July, August and September.

No lucerne established on this trial area during 1966.

The establishment of harbinger medic was satisfactory. It was not possible to detect any consistent residual picloram toxicity effect on this species however. Plots which had received 2 cwts. of ammonium sulphate when the cereal crop was sown in 1965 appeared to have poorer medic growth than plots which had received no nitrogen fertiliser. There appeared to be a weaker medic establishment where picloram had been applied at the fully tillered crop stage at the 1 oz. a.e./acre rate.

The picloram sprays affected skeleton weed density in the year following spraying. The October counts are likely to be more realistic than those done in March because maximum rosette density occurs in spring. Picloram applied in February caused a more marked reduction in rosette density than the August or September applications. The lowest density was recorded on plots sprayed with 1.75 oz. a.e. picloram/acre in February.

Application of fertiliser nitrogen with the crop resulted in a slight reduction in skeleton weed densities where picloram had been applied in February.

Variability in seasonal rainfall in this district has made interpretation of results very difficult. Further experiments have been conducted to check the residual effects of picloram on annual and perennial legume pastures.

EXPERIMENT 10. THE EFFECT OF PRECROP (FEBRUARY) PICLORAM APPLICATIONS ON THE ESTABLISHMENT OF LEGUMES IN A STUBBLE SOWN PASTURE. (Continuation of Project 2 Expt. 7)

LOCATION:

Parilla. Section 2 Hundred of Parilla (C.H. Johnson)

Rainfall: Average 13.8" 1966 = 10.89"
April-October 1966 = 7.16"

Soil Type: Solodised solonetz.

DURATION:

25/2/65 - December 1966.

DESIGN:

Randomised block (spray treatments) See Project 2, Experiment 7.

BACKGROUND:

The site of this trial was previously cropped in 1965 with wheat. Picloram was applied to some plots in February 1965 and to others in August and September, 1965.

The aim of this trial is identical with the previous experiment (project 3, experiment 9) and results will represent the solodized solonetz soil type common in the southern Murray Mallee.

METHODS:

Harbinger medic was sown mixed with lime through the fertiliser box of a 20 row disc drill on 13/5/66. Lucerne (c.v. Hunter River) was sown through a small seeds box with hoses tied behind the rear cultivating tynes, (14" spacing) on 17/6/66. A 20 hoe combine was used.

TREATMENTS:

	Harbinger medic sown 13/5/66	Hunter River lucerne sown 17/6/66
Fertiliser Rates:		
Superphosphate	90 lbs./acre	94 lbs./acre
+ Cu	7 lbs.	7 lbs.
+ Zn	7 lbs.	7 lbs.
+ Mo	2 ozs.	2 ozs.
Lime	113 lbs./acre	62 lbs./acre
Cover crop:	Oats	Noyep barley
	29 lbs./acre	26 lbs./acre

All legume seeds were inoculated and lime pelleted. On both occasions the depth of sowing was 1½". The soil was moist with little plant material present on the surface.

RESULTS:

(a) Plots were counted and assessed on 14/9/66. The skeleton weed rosette density counts are summarised in the following table of treatment means:

SKELETON WEED DENSITY
(rosettes per sq. link)
(means of 8 quadrats)

Treatment as per project 2	Annual Medic Area	Lucerne Area
1	8.5	7.0
2	11.8	9.2
3	9.1	10.7
4	5.3	5.7
5	3.8	4.2
6	3.8	4.5
7	2.1	3.9
8	1.9	1.8
9	7.8	7.5
10	5.4	6.1
11	8.3	5.5
12	6.4	5.9
13	4.2	3.9
14	9.7	8.2
15	7.1	5.4
16	7.2	4.4
17	4.9	4.0
18	3.5	2.6

The above means are from eight 4 sq. link quadrats per treatment. The area sown to annual medic was counted separately from the lucerne area because of the different times of working up, but no consistent differences could be detected. The mean rosette density for the control plots (treatment 1, 2, and 3) was 9.5 rosettes per sq. link.

The February picloram plots carried the lowest skeleton weed densities. The 1¾ oz. picloram treatment lowered the density to a mean of 1.8 rosettes per sq. link.

Densities were apparently reduced slightly by addition of sulphate of ammonia at crop sowing in 1965.

(b) The treatment means for the cover crop and medic assessments are given in the following table:

Treatment No.	Legumes	Cover Crop and Grass
1	2.0	1.0
2	1.8	1.0
3	1.8	1.0
4	2.5	1.8
5	2.3	2.0
6	2.3	2.3
7	1.5	2.8
8	1.5	2.8
9	2.3	1.8
10	2.3	1.8
11	1.8	1.8
12	1.8	1.8
13	2.5	2.5
14	2.3	1.3
15	1.3	2.0
16	1.8	1.5
17	1.8	2.8
18	1.3	2.8

The visual assessments were based on the following classes:
1 = none or little
2 = few
3 = some
4 = much

Pasture growth during 1966 was very poor because of dry conditions. The germination of harbinger medic was a little uneven but this could have been due to the method of sowing. Production was so poor that no pasture samples were taken, and only estimation was by visual methods (above).

The medic growth was slightly less on plots which had previously received sulphate of ammonia (1965 wheat crop).* Some plots showed the effects of picloram toxicity on the legume - especially treatments 8 and 18. The effects were only slight and difficult to separate from the seasonal effects and normal background variation.

The lucerne establishment was very poor, and can only be attributed to the seasonal conditions.

The cover crops showed considerable differences in vigour on different plots. In general the oat cover crop sown early with the harbinger medic was poor, but the Noyep barley sown with lucerne germinated more evenly.

Cover crop growth was worst on the control plots and no differences due to the previous sulphate of ammonia treatments could be detected. Where picloram had been applied in February, (treatments 4-8) there was better growth of barley and natural grasses as the rate of picloram applied was increased. The best crop growth was recorded in treatments 7 and 8.

The application of picloram at the 3 leaf stage (August 1965) resulted in grass stimulation in 1966, but the differences were less noticable than the February treatments.

Very good cover crop growth was recorded on treatments 17 and 18 where picloram had been applied to the previous crop at the fully tillered stage at ½ oz. and 1 oz. a.e./acre.

DISCUSSION:

Apart from the below average rainfall resulting in very poor pasture growth, it is evident that picloram residues can adversely affect medics in the stubble year, 15 months or more often application. Further tests of this nature are required in better seasons to check this indication.

EXPERIMENT 11. THE EFFECT OF PICLORAM HERBICIDES APPLIED TO A CEREAL CROP ON THE SKELETON WEED DENSITY AND ON LEGUME PASTURES SOWN INTO THE STUBBLE

LOCATION:

C.H. Johnson, Parilla
Section 2, Hundred of Parilla

Soil Type: Solodised solonetz. Heavily infested with skeleton weed.

Rainfall: Mean 13.82"
Total for 1967 = 6.80" May-October = 4.91"
Total for period October 1966-May 1967 =

DURATION:

September 1966-December 1968

PERSONNEL:

R. McR. Wood and Field Assistant

BACKGROUND:

(1966) See project 2 Experiment 10.

The trial area was laid down in a barley crop and herbicides were applied on 6/9/66, when the crop was fully tillered. The primary aim of the experiment at that time was to compare several picloram formulations and 2,4-D amine in their ability to control skeleton weed in the crop.

After harvest it was decided to continue the experiment to study the residual effects of the herbicide treatments on legume pastures sown into the barley stubble. Skeleton weed control over the summer months may have had a beneficial effect on soil moisture (as had been measured previously in WE 33 Experiment 6).

AIM:

To study the effect of residual spray treatments on the establishment and growth of Hunter River lucerne, Harbinger medic and Geraldton subterranean clover on a solodised solonetz soil type, heavily infested with skeleton weed.

DESIGN:

Three pasture species sown across the 1966 randomised spray plots. Two replications = 6 pasture plots. Each pasture plot crossed 16 spray treatments.

(a) Treatments — 1966 herbicide spray treatments. Rates in ozs. a.e./acre.

No.	Formulation	Picloram	2,4-D	Dicamba	MCPA
1	Tordon 50D	0.2	0.8	-	-
2	"	0.4	1.6	-	-
3	"	0.6	2.4	-	-
4	Tordon M*	0.2	-	-	3.7
5	"	0.5	-	-	7.4
6	"	0.7	-	-	11.1
7	Tordon M2878*	0.4	5.7	-	-
8	"	0.7	11.4	-	-
9	"	1.1	17.1	-	-
10	I.C.I. Mix A	0.2	3.0	0.4	-
11	"	0.4	6.0	0.8	-
12	I.C.I. Mix B	0.2	-	0.4	3.0
13	"	0.4	-	0.8	6.0
14	Amine 2,4-D	-	8.0	-	-
15	"	-	12.0	-	-
16	Control	-	-	-	-

* It was originally intended that 0.2, 0.4 and 0.6 oz. a.e. picloram should be applied to these plots. See project 2. Expt. 10.

(b) Plot sizes
1966 chemical plots were 10 feet wide x 66 feet.
1967 pasture plots were 13 feet wide x 192 feet.

(c) Assessments
Skeleton weed density 1. Prior to sowing pasture 1967
2. Late Spring, in pasture

Estimates of legume pasture establishment and production in Spring 1967. Type of measurements to depend on seasonal conditions.

METHODS:

The trial plots were visually assessed for skeleton weed density on 8/6/67.

Following these assessments, the area was worked up on 16/6/67 using the farmer's Shearer Trash Seeder, in the direction the plots were sprayed in 1966. At the time the area was top-dressed with superphosphate (165 lbs./acre) plus trace elements Cu (7 lbs.), Zn (14 lbs.) and Mo (2 oz.) Total 187 lbs. super + trace elements per acre.

All small seed inoculated and lime pelleted before sowing:
Hunter River lucerne sown at 2 lbs./acre
Harbinger medic sown at 10 lbs./acre
Geraldton sub.clover sown at 10 lbs./acre

Agricultural lime was used as a seed carrier and was applied at 187 lbs./acre, through the fertiliser box.

A cover crop of 30 lbs./acre of Noyep barley was sown.

Weather conditions at the time of sowing were fine and cool. No rain had fallen for 14 days but the soil was moist at 2" depth - The trial was fenced off to allow the pasture to establish.

Skeleton weed density and pasture assessments were again taken on 8/11/67.

RESULTS:

Skeleton weed visual assessments, taken on 8/6/67 are shown in table 1. The recorded data does show some inconsistency between replications. Basing deductions on the average, the table shows that 0.4 oz. a.e. picloram had reduced skeleton weed density for the 9 month period September 1966-June 1967. The rates used had not suppressed all the weed at that time.

The 2,4-D treatment had only slightly depressed skeleton weed at the time of sowing.

Skeleton weed density counts (made on 8/11/67) are given in table 2, together with pasture visual assessments.

Table 3 shows the mean percentage regrowth of skeleton weed compared with the untreated control plots. Apart from the lowest rates of Tordon M2878, I.C.I. Mix A and Mix B, these percentages are all below 100, indicating some degree of effectiveness. Even 12 oz. a.e. 2,4-D reduced regrowth consistently, in both replications, to below 50%. It seems that 0.5 oz. of picloram (or more) per acre is needed for skeleton weed suppression to extend for 9 months or more.

The visual rating of pasture growth (Table 2) shows a fairly consistent picloram residue toxicity effect. While the 0.2 oz. a.e./acre treatments do not appear to reduce growth of either the Harbinger or Geraldton, 0.4 oz. and greater do not reduce growth. Harbinger medic showed greater tolerance to picloram residues than did Geraldton.

No lucerne established because of the dry conditions.

DISCUSSION:

Low rainfall during the 1966 and 1967 seasons did not aid the leaching of herbicide residues. The rainfall recorded at Parilla in the period September 1966-September 1967 was 942 points (578 below average). This period is the important one for leaching of chemicals applied in September 1966.

In addition, low growing season rainfall limited pasture growth (April-October inclusive = 455 points).

Present indications are that picloram at low rates is not an aid towards legume pasture establishment. This type of experiment requires repetition and refinement to permit any definite conclusions to be made.

Table 1. Skeleton Weed Density and Vigour (8/6/67)

(Visual Assessments)

Ratings: 1 = none or little skeleton weed
4 = growth equal to unsprayed control.

Treatment (1966)		Rep. I	Rep. II	Mean
Unsprayed control		4	4	4.0
Tordon 50-D	0.2 oz.	4	4	4.0
	0.4 oz.	1	2	1.5
	0.6 oz.	2	3	2.5
Tordon M	0.2 oz.	3	3	3.0
	0.5 oz.	2	2	2.0
	0.7 oz.	2	2	2.0
Tordon M2878	0.4 oz.	2	2	2.0
	0.7 oz.	2	1	1.5
	1.1 oz.	2	2	2.0
I.C.I. Mix A	0.2 oz.	2	3	2.5
	0.4 oz.	1	3	2.0
I.C.I. Mix B	0.2 oz.	3	3	3.0
	0.4 oz.	1	2	1.5
2,4-D amine	8.0 oz.	3	4	3.5
	12.0 oz.	2	4	3.0

Table 2. Effect of various herbicide residues on Pasture establishment and Growth

Assessment: 8/11/67

Treatment		Skeleton weed counts per 2 square links					Skeleton Weed Visual Assessment	Visual Assessment of pastures	
Chemical	Rate	1	2	3	4	Total		Harbinger	Geraldton
Tordon 50-D	0.2	3	4	4	2	13	3	3	2
"	0.4	9	4	4	1	18	4	1	1
"	0.6	10	2	4	3	19	3	1	1
Tordon M	0.2	30	6	4	3	43	3	3	2
"	0.46	4	16	4	0	24	3	2	2
"	0.7	1	1	19*	1	22	3	1	1
Tordon M2878	0.36	9	4	34	3	50	4	3	2
"	0.7	0	0	3	1	4	3	3	2
"	1.1	5	5	19	11	30	4	1	1
I.C.I. Mix A	0.2	31	15	12	8	66	4	3	2
"	0.4	6	1	4	10	21	3	2	1
I.C.I. Mix B	0.2	1	10	4	39	54	4	3	2
"	0.4	2	0	1	1	4	2	3	2
2,4-D Amine	8.0	8	17	3	10	38	4	3	3
"	12.0	4	11	4	9	28	3	3	3
Control		16	15	10	11	52	4	3	3

* Rates for picloram (or 2,4-D is applicable) in ozs. a.e./acre)

Tordon 50-D	0.2	7	16	12	24	59	4	3	3
"	0.4	3	12	9	18	42	3	2	3
"	0.6	4	9	5	4	22	3	2	2
Tordon M	0.2	17	7	5	20	49	4	3	2
"	0.46	3	2	6	11	22	3	1	1
"	0.7	0	0	9*	3	12	2	1	1
Tordon M2878	0.36	5	16	26	15	62	3	3	2
"	0.7	3	9	1	5	18	2	3	1
"	1.1	0	0	4	6	10	2	2	1
I.C.I. Mix A	0.2	4	14	20	17	55	4	2	3
"	0.4	3	5	7	5	21	2	2	2
I.C.I. Mix B	0.2	6	24	15	21	66	4	3	3
"	0.4	0	2	0	7	9	2	2	1
2,4-D Amine	8.0	1	6	20	9	36	4	3	2
"	12.0	8	9	2	3	22	3	3	3
Control		29	4	5	12	50	4	2	1

Skeleton Weed Visual Assessment

Rating 1 = none or little
2 = sparse
3 = moderate
4 = dense infestation

Pasture Visual Assessments

Rating 1 = none or little
2 = intermediate (some seedset)
3 = good establishment

Table 3. Skeleton Weed Density
% Regrowth 8/11/67 (relative to untreated)

Treatment		% Regrowth	Treatment		% Regrowth
Tordon 50-D	0.2	70	I.C.I. Mix A	0.2	120
"	0.4	59	"	0.4	41
"	0.6	40	I.C.I. Mix B	0.2	118
Tordon M	0.2	90	"	0.4	13
"	0.5	45	2,4-D	8.0	73
"	0.7	33	"	12.0	49
Tordon M2878	0.4	110			
"	0.7	22			
"	1.1	39			

PROJECT 3. THE EFFECT OF PICLORA[M] RESIDUES ON THE ESTABLISHMENT AND GROWTH OF STUBBLE SOWN LEGUMES

EXPERIMENT 12A FOLLOWING A CROP OF BARLEY ON AN INFERTILE SANDY SOIL TYPE

LOCATION:

C.H. Johnson, Parilla.
Section 2 Hundred of Parilla

Soil Type: Solodized solonetz - heavily infested with skeleton weed.

Rainfall: Mean = 13.82"
Total for 1967 = 6.80"
Total for period April 1967-April 1968 inclusive = 830
April-October 1968 = 1,192 Total for 1968 = 1,554 pts.
April-October 1969 = 710

DURATION:

April 1968-December 1969

PERSONNEL:

R. McR. Wood and Field Assistant

BACKGROUND (1967):

The area concerned was treated with two picloram formulations (Tordon 50-D and Tordon 22K) on 30/3/67, prior to cropping with barley. (See project 2, Experiment 13). The 1967 treatments were applied in a randomised block layout with 6 replications, as follows:

2 Picloram formulations x 3 rates x 2 levels of nitrogen x 6 reps.

Tordon 50D	Nil	Nil
Tordon 22K	1 oz. a.e./acre	55 lbs. $(NH_4)_2SO_4$
	2 oz. a.e./acre	(as 2:1 super-ammonia)

All plots received 108 lbs. superphosphate at sowing.

DESIGN: 1968

Harbinger medic and Geraldton sub.clover, cross sown across the 1967 plots. Two seed treatments compared (plain seed and inoculated lime pelleted).

PLOT SIZE:

20 row Trash Seeder x 84 feet = 12' x 6'

ASSESSMENTS:

(1) Visual assessment of legume growth (1968)
(2) Estimates of pasture growth and production (1968)
(3) Seed set - estimated from re-establishment in 1969.

METHODS:

The annual legumes were sown on 30/4/68 with Shearer Trash Seeder belonging to Mr. Johnson. The small seeds (both plain and lime pelleted) were mixed with the superphosphate. The fertiliser (Superphosphate + Copper 3½ + Zinc 3½) was applied at 176 lbs./acre. Small seeds were sown at 5 lbs./acre. A cover crop of Noyep barley was sown at 20 lbs./acre. No initial seedbed preparation was carried out on this experiment. The soil was moist and there was some trash on the surface from the previous years' skeleton weed and barley crop.

The area was fenced to control grazing and allow the legumes to establish. The plots were not grazed until after December 1968.

The establishment of the Harbinger medic was assessed on 16/10/68, and the skeleton weed density and vigour was visually assessed on 11/12/68.

On 8/4/69, the area was topdressed with 170 lbs. of super with 7 lb. Copper, 7 lb. Zinc and 2 oz. Molybdenum. This was applied with Mr. Johnson's Trash Seeder set to 2½" depth. At that time, soil conditions were moist below 3" with a dry surface. Difficulty was experienced with the dense growth of mature skeleton weed and two runs were made with the seeder to break it down.

RESULTS:

Visual assessments were taken on 16/10/68, 17 months after the application of the picloram (see table 1). A greater amount of growth was produced by the Harbinger medic compared with the Geraldton. Lime pelleting of the seed did not improve growth or establishment of these legumes and picloram residues affected their growth markedly, especially at the 2.0 oz. rate.

Table 1. Visual Assessment of Harbinger medic grown 16/10/68

Treatment 1967	Harbinger medic	Average Rating
1. Control	3 4 4 4 3 4	3.6
2. " + N	2 4 4 4 3 4	3.5
3. 1 oz.	4 2 2 1 2 3	2.3
4. 1 oz. + N	1 1 1 3 1 1	1.3
5. 2 oz.	1 1 1 1 1 1	1
6. 2 oz. + N	1 1 1 1 1 1	1
7. Control	4 4 4 4 3 4	3.8
8. " + N	3 4 3 4 2 4	3.3
9. 1 oz.	1 1 1 3 1 3	1.6
10. 1 oz. + N	3 1 1 2 2 1	1.6
11. 2 oz.	1 1 1 1 1 1	1
12. 2 oz. + N	1 1 1 1 1 1	1

Tordon 50-D used in treatments 3-6. Tordon 22K in 9-12.
Rating 1 = little or no legume growth
4 = best legume growth (no toxic residues)

It can be seen from the above table that legume establishment was consistently reduced by residues of picloram. This was most marked at 2.0 ozs. per acre, although 1.0 oz. had more than halved the growth at the time of assessment.

Skeleton weed growth, assessed in December 1968 is recorded in table 2.

Table 2. Skeleton Weed density and vigour 11/12/68

(Visual Assessment)

Treatment 1967	Blocks 1-6						Average
1. Control	4	4	4	4	4	4	4.0
2. " + N	3	4	4	4	4	4	3.8
3. 1 oz.	4	4	4	3	4	4	3.8
4. 1 oz. + N	4	3	4	3	4	3	3.5
5. 2 oz.	2	3	3	2	2	3	2.5
6. 2 oz. + N	2	3	3	2	3	3	2.6
7. Control	4	4	4	4	4	4	4.0
8. " + N	3	4	4	4	3	4	3.7
9. 1 oz.	3	4	3	4	3	4	3.5
10. 1 oz. + N	4	3	3	3	3	4	3.3
11. 2 oz.	3	3	3	3	3	3	3.0
12. 2 oz. + N	3	3	2	3	2	3	2.6

Rating 1 = none or little - good control
4 = maximum growth - no control

These figures indicate rapid regrowth of skeleton weed, even on treated plots. The 2 oz. rate of picloram has retarded regrowth to some extent.

DISCUSSION:

Results in this experiment are consistent and indicate the long term effect that the herbicide picloram has on pasture production on treated areas. Even 1 oz. of this chemical will reduce growth of Geraldton sub. clover and Harbinger medic when they are sown into a stubble 13 months after chemical application. Low seasonal rainfall during 1967 reduced the leaching and possible breakdown of picloram but there seem to be other factors limiting pasture growth. The untreated control plots produced little feed, and this does not seem to be entirely due to competition from skeleton weed.

The growth of the legumes on plots treated with 55 lbs. of ammonium sulphate in 1967 seem slightly less than the other plots. A similar trend can be seen from table 2, where a slight reduction in skeleton weed growth can be seen on the nitrogen plots. This relationship cannot be upheld statistically and the trend is unexplained.

The topdressing of the plots in 1969 was carried out to ascertain whether either species would persist from seed set in 1968. However, both species failed to re-establish, except for scattered plants of Harbinger on the control plots. This is surprising in view of the fact that some seed was set in 1968 by both species.

The lack of pasture regrowth in 1969 may be attributed to:

1. Low level of seed set in 1968, due to picloram residues and poor soil fertility. Rainfall did not appear limiting.

2. Inadequate insect pest control in 1968.

3. Heavy rains in February 1969 may have caused all "soft" seed to germinate and subsequently die through lack of follow up moisture.

4. Topdressing in April 1969 may have been too deep at $2\frac{1}{2}$-3 inches and seedlings may have been unable to emerge.

5. The layout of the trial has limitations when trying to study picloram residues. The spray plots were 6 feet wide with 1 foot to buffer between plots. When these are cross sown, it is transferred from one plot to the next. The result is lack of definition of residue effects.

EXPERIMENT 12B THE EFFECT OF PICLORAM RESIDUES ON THE ESTABLISHMENT AND GROWTH OF STUBBLE SOWN ANNUAL LEGUMES

LOCATION:

D.G. Dutschke, Karoonda
Section 44 Hundred Marmon Jabuk

SOIL TYPE:

Solodized solonetz. Heavily infested with skeleton weed.

RAINFALL:

Mean = 13.43"
Total for 1967 = 6.90"
Total for period April 1967-April 1968 inclusive = 9.61"
Total for 1968 = 15.16" April-October 1968 = 10.97"
Total for 1969 = 13.8" April-October 1969 = 6.40"

DURATION:

April 1968-December 1969

PERSONNEL:

R. McR. Wood + Field Assistant

BACKGROUND:

On 31/3/67 the area was treated with picloram formulations (Tordon 22K and Tordon 50D), prior to sowing to Noyep barley in June 1967. (See Project 2 Expt. 11). The 1967 treatments were applied in a randomised block layout.

2 picloram formulations x 3 rates c 2 levels of nitrogen x 4 reps.

Tordon 50D	Nil	Nil
Tordon 22K	1 oz. a.e./acre	55 lbs. $(NH_4)_2SO_4$
	2 oz. a.e./acre	(as 2:1 Super ammonia)

DESIGN: (1968)

Harbinger medic x Two seed treatments - Plain seed
Geraldton sub. clover - Inoculated x lime pellete

These species sown across the 1967 picloram-barley plots in 1968.

Plot Size: 20 row disc drill x 84'
Individual pasture plots receiving same spray treatment are 20 row drill (12' x 6')

ASSESSMENTS:

1. Visual assessment of legume vigour (August 1968)
2. Estimate of production. Pasture samples, dry weights (September-October 1968)
3. Estimate of seed set from natural establishment in 1969.

Plots will be topdressed in April 1969

METHODS:

The annual legumes were sown with a Shearer Disc Drill on 29/4/68, by mixing (a known quantity of seed, or lime pelleted seed) with a known quantity of fertiliser in the box. The legumes were sown at 5 lbs./acre approximately.

Fertiliser (Superphosphate + $CuSO_4$ $3\frac{1}{2}$ lb. + $ZnSO_4$ $3\frac{1}{2}$ lb.) was applied at 195 lbs./acre (= 188 lbs. superphosphate/acre).

A cover crop of Noyep barley was sown at 20 lbs./acre.

No initial ground preparation was carried out. A small amount of stubble remained from the 1967 crop.

Soil conditions were moist at the time of sowing. (50 points of rain were recorded on the two days prior to sowing the plots, and good rains followed in May).

The area was fenced off to allow the legumes to establish and was not grazed until the end of 1968.

The legume growth was visually assessed on 15/10/68, and skeleton weed density was assessed at that time also.

The trial was topdressed with Super, Cu 7 lb., Zn 7 lb., Mo 2 oz. at 187 lbs. per acre on 15/4/69, using a disc drill. The fertiliser was dropped on the surface. There was little trash present as the area had been grazed.

An infestation of red legged earthmites was treated with Imidan (4 fl. oz./acre on 24/6/69. Further visual assessments of pasture regenerations were taken at that date.

RESULTS:

Visual assessments were taken on Harbinger medic growth because this species was showing more growth at the time. The Geraldton sub clover was showing similar variation due to picloram residues, but appeared less well adapted to the site.

Table 1. Visual assessment of Harbinger medic growth (15/10/68)

Treatments 1967	Harbinger Medic				Average Rating (4 blocks)
1. Control	2	2	4	4	3.0
2. Control + N	4	3	4	4	3.8
3. 1 oz.	3	3	3	4	3.3
4. 1 oz. + N	3	4	3	4	3.5
5. 2 oz.	2	4	3	3	3.0
6. 2 oz. + N	3	1	2	3	2.3
7. Control	3	4	4	4	3.8
8. Control + N	3	4	4	4	3.8
9. 1 oz.	3	3	4	4	3.5
10. 1 oz. + N	2	2	4	4	3.0
11. 2 oz.	2	2	3	3	2.5
12. 2 oz. + N	2	1	3	2	2.0

Tordon 50-D used in treatments 3-6. Tordon 22K treatments 9-12.
Rating 1 = little or no legume growth

Harbinger medic and Geraldton sub clover established on all treatments. While most control plots were supporting moderate growth, (taking into account the good seasonal conditions) the amount of growth on picloram treated plots was generally less, particularly where 2 oz. a.e. picloram had been applied in 1967. Surviving plants on both 1 oz. and 2 oz. plots showed leaf cupping symptoms, characteristic of picloram toxicity.

1 oz. of picloram seemed unlikely to prevent some plants setting seed in the 1968 season when assessed in October.

Effect of lime pelleting of the legume seed before sowing was not evident at the time of visual assessment in 1968.

Skeleton weed density assessed visually on 15/10/68 is recorded in table 2.

Table 2. Skeleton weed density 15/10/68

Treatments 1967	Block Ratings	Average Rating (4 Blocks)
Control	4 3 4 4	3.8
Control + N	4 4 4 4	4.0
1 oz.	3 4 4 4	3.8
1 oz. + N	4 3 3 4	3.5
2 oz.	3 4 4 3	3.5
2 oz. + N	3 3 3 3	3.0
Control	4 4 4 4	4.0
Control + N	4 4 4 4	4.0
1 oz.	4 4 4 3	3.8
1 oz. + N	4 4 4 4	4.0
2 oz.	3 3 4 3	3.3
2 oz. + N	3 3 4 3	3.3

Rating 1 = nil skeleton weed
4 = dense skeleton weed. No visible reduction.

The table suggests a small reduction in skeleton weed density at the 2.0 oz. picloram rate, still evident 18 months after spraying.

On 24/6/69, about two months after topdressing, the growth of the annual legumes was assessed again. Results are shown in table 3.

Table 3. Harbinger medic re-establishment, June 1969

Treatment 1967	Block Ratings	Average Rating
Control	7 8 9 8	8.0
Control + N	9 5 7 6	6.5
1 oz.	9 6 7 6	6.5
1 oz. + N	3 8 8 4	5.8
2 oz.	3 9 5 8	6.3
2 oz. + N	9 3 4 6	5.5
Control	7 10 8 10	8.8
Control + N	7 8 9 8	8.0
1 oz.	3 8 8 4	5.8
1 oz. + N	5 3 4 6	4.5
2 oz.	3 8 3 4	4.8
2 oz. + N	3 4 4 4	3.8

Rating 1 = nil establishment
10 = best establishment for the site

DISCUSSION:

The overall medic growth was disappointingconsidering the excellent opening to the 1969 season. Harbinger medic has shown itself better adapted than Geraldton sub. clover on this site, although the latter had regenerated from seed set the year before.

Table 3 does show some high variability between blocks and ratings within treatments are not entirely consistent. However an overall trend can be seen, and less legume was growing on the 2.0 oz. picloram plots. This is more likely to be due to a reduction in seed set in 1968 than direct toxicity to plants growing in 1969. Average rains in 1968 coupled with above average February rains in 1969 should have leached remaining residues from the topsoil.

The trial was reinspected in late September 1969 and the following comments were made.

1. Harbinger medic more prominent than the Geraldton. The former was flowering at the time, whereas the Geraldton had already set seed. There is no doubt that Harbinger medic was better adapted and produced more feed on this site.

2. Picloram residue effects showed some irregularity. There was generally no depression of Harbinger medic on 1 oz. plots and some 2.0 oz. plots. However on a few 1 oz. and 2 oz. plots, legume growth was reduced markedly. As the plants were not showing symptoms of direct picloram toxicity (distortion etc.), the main effect appeared to be a reflection of 1968 seed set, as mentioned before.

One way to overcome this variation would be to sow the legumes and confine all tillage operations to the same direction as the spraying. This would minimise the cross contamination effects.

The overall poor legume growth in 1969 may have resulted from a false break when over 400 points of rain fell in early February.

Trial concluded December 1969.

Continued in part 2