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The effect of chemical grass control in pastures on subsequent crop production and take all levels

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THE EFFECT OF CHEMICAL GRASS CONTROL IN PASTURES ON SUBSEQUENT CROP PRODUCTION AND TAKE-ALL LEVELS

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Trial: 82 LG 25
Location: Lake Grace, J. McMahons
Soil: Sandy gravel
History: Cropped 1980, pasture 1981

Aim: To evaluate the effect of chemical grass control in pastures on;

1. Pasture production and composition.
2. Crop production and take-all incidence.
3. Soil nitrogen build-up.

Treatments:

	1982	1983	1984
1.	Pasture	Pasture	Crop
2.	Pasture	Crop	Crop
3.	Kerb®	Pasture	Crop
4.	Kerb®	Crop	Crop
5.	Spray.seed®	Pasture	Crop
6.	Spray.seed®	Crop	Crop
7.	Crop	Crop	Crop

Introduction:

Cereal crop yields are mainly reduced by either direct competition with grass weeds or indirectly by crop diseases and pests of which many rely on annual grasses as their host to carry them over from one cereal crop to another. Early trials conducted by D. Nicholas and Gordon McNish indicated a relationship between crop take-all levels and the previous years grass levels in the pasture.

It was decided to test whether annual grass control in the pasture phase prior to cropping would provide a 'break' and protect the following cereal crop from take-all. The duration of the protection was also under test with the pasture being manipulated 1 and 2 years prior to cropping. The other question that needed to be answered was whether 1 year of grass control was sufficient to reduce take-all and what level of grass control was needed; 20%, 60%, 100%?

Methods:

The site was selected in 1981 in the knowledge that the area had a known take-all problem. On 27/4/1982 the site was dry sown with 20 kg/ha of a 50/50 Northam/Nungarin sub-clover mixture with 60 kg/ha of superphosphate. Areas to be cropped in 1982 (treatment 7) were excluded. On the 28/5/1982 the Kerb® and Spray.seed® herbicides were applied at a rate of 1.5 kg/ha and 1.0 l/ha respectively in 32 l of water.

The 1982 crop area was worked with a scarifier on the 27/4/1982 and sprayed with 4 l/ha of Spray.seed® on the 19/6/1982 and Gamenya wheat was sown with a 12 run combine at 50 kg/ha plus 156 kg/ha of superphosphate 2 hours later. The nitrogen rates were applied on the 19/6/1982 at the following rates 0, 40, 80, 160 kg/ha of Agran 34.0. The crop was not harvested in 1982 due to sheep breaking down the fences and eating out the plots. Anthesis dry matter was collected.

In 1983, the pastures were allowed to regenerate (treatments 1, 3, 5) while the other areas were prepared for cropping. These areas were worked with a scarifier on 20/5/1983 and sown with 50 kg/ha Gamenya on 24/6/1983 following an application of 4 l/ha of Spray.seed. Superphosphate was sown with the seed at 156 kg/ha. The crops were sprayed with 1.5 l/ha of Hoegrass plus 1.4 l/ha of Brominil M at the 2-4 leaf stage.

Soils were collected from the site by taking 20 pogo samples/plot on the 20th March. These samples were analysed for pH, total soil nitrogen %, available NH_4^+ and NO_3^- levels.

Pasture assessments were made during the 1982/83 season by using the Cambell and Arnold visual assessment method coupled with the Mannettje and Haydock dry weight rank method for composition.

Plant regeneration was recorded in 1983 by taking 20 cores of 0.5 dm^{-2}/plot, the plant species were recorded as total annual grasses, sub-clover and capeweed plus sorrel. In 1983 wheat and weed counts were recorded by taking 5 quadrats of 0.1 m^{-2} per plot, the quadrat encompanied 2 rows by 28 cm.

In 1982 the crop anthesis dry matter was collected by taking 5 x 0.1 m^{-2} quadrats/plot. In 1983 5 lengths of 0.5 m x 2 rows was collected by taking whole plant samples. The roots were removed and saved for disease assessment, while the tops were used to record dry matter.

Plant disease assessments were carried out by Dr G. McNish using a visual scoring method. The plants were classified as either nil, light (<25%), moderate (25-75%) or heavy >75% of the root system affected). The plants were scored for both take-all and rhizoctonia.

General notes on the trial:

The site is known to be a poor wheat producing area, in the past take-all was reduced yields.

The resowing of sub-clover in 1982 tickled up the ryegrass and the resulting pasture had a good balance of clover and ryegrass.

Some radish and sorrell was evident on the site in 1982/83.

Observations of the crop in 1983 indicate that a hard pan may be evident, due to the abnormally poor crop growth.

Results and Discussion 1982 season:

In 1982, following pasture manipulation, spring pature production and composition were recorded. Spray.seed reduced total pasture production by 28% from 1,389 in the untreated pasture to 1,011 kg/ha. There was little difference between the production of the Kerb and untreated pastures. The grass content was markedly reduced by Kerb (82%) and 64% by the Spray.seed treatment (Table 1).

Table 1. Pasture production and composition on the 16/9/1982 at Lake Grace

Treatment	Pasture production (kg/ha) Grass	Clover	Broadleaf	Total
Untreated	419	764	216	1,389
Kerb®	78	1,114	221	1,413
Spray.seed®	148	691	172	1,011

There was a marked crop dry matter and nitrogen uptake response to applied nitrogen (Table 2). There was a low incidence of take-all (<20%), but a high incidence of Rhizoctonia (Table 3). The incidence of take-all appeared to decline slightly with increasing levels of nitrogen while Rhizoctonia levels increased with increasing nitrogen levels.

Table 2. Crop dry matter production at anthesis

Rate of Agran (34:0)	Dry matter (t/ha)	Nitrogen uptake (kg/ha)
0	0.9	9
40	1.3	14
80	1.6	19
160	2.2	28

Table 3. Take-all and Rhizoctonia levels (% plants) in the crop (1982)

Rate of Agran (3,400)	Take-all Incidence	Take-all Severity	Rhizoctonia Incidence	Rhizoctonia Severity
0	16	6	21	3
40	12	8	40	6
80	13	4	53	13
160	11	4	55	12

Sub-clover seed yields in 1982 were markedly affected by the pasture treatment (Table 4). The Kerb® treated areas produced substancially more seed than the Spray.seed treated area (192 kg/ha) and 179 kg/ha more than the untreated pasture.

Table 4. Sub-clover seed yield kg/ha 1982

Treatment	Seed yield (kg/ha)
Untreated	214
Kerb®	393
Spray.seed®	201

1983 Results:

Pasture regeneration was measured in 1983. Sub-clover regeneration was higher in the Kerb® treated areas and also the annual grass levels were substantially reduced. Pasture manipulation with Spray.seed® resulted in only a 20% reduction in grass levels while Kerb achieved a 68% reduction (Table 5). There was a increase in broadleaf weeds in the Kerb treated area.

Table 5. Pasture regeneration following pasture manipulation

Treatment	Pasture regeneration (plants m^{-2})		
	Annual grasses	Sub-clover	Broadleaf weeds
Untreated	1,070	1,280	180
Kerb®	340	1,410	270
Spray.seed®	860	1,190	220

Soil analyses following the 1982 season indicated that the site had a pH of 6.0 to 6.2, and that there was a increase in the organic carbon levels and total soil nitrogen levels after pasture manipulating with Kerb and Spray.seed. Available nitrate levels were high in the continuous crop treatment (treatment 7) due to residual effects of the applied nitrogen the previous year. The nitrogen difference between the untreated and Kerb® soil was in the order of 0.003% or approximately 39 kg/ha.

Table 6. Soil analysis following pasture manipulation in 1982

Analysis / Treatment	pH	Organic carbon %	Total soil nitrogen %	Available nitrogen NH_4^+ (ppm)	NO_3^- (ppm)
Untreated	6.2	0.87	0.042	2	5
Kerb®	6.1	0.93	0.045	3	5
Spray.seed®	6.1	0.96	0.045	2	6
Continuous crop	6.0	0.87	0.043	3	10

Wheat and weed counts in the crop were recorded on the 28/7/1983. The rates of nitrogen plots were bulked/treatment giving a total of 16 replicates (4 main x 4 sub replicates (nitrogen)). There was little effect of previous treatment on wheat density. Sub-clover levels in the crop were lowest in the continuous crop as no sub-clover was sown on these areas. The lowest grass levels in the crop were associated with the continuous crop and Kerb® plots. In general the continuous crop treatment had the lowest weed burden followed by Kerb® and Spray.seed® (Table 7).

Table 7. In crop weed levels following pasture manipulation and a spray.seed direct drill seeding operation (values are mean of 4 rates of nitrogen)

Species treatment	In crop plant counts (Plant m^{-2}) Wheat	Sub-clover	Annual grasses	Broadleaf
Untreated	107	12	234	45
Kerb®	113	15	65	34
Spray.seed®	113	7	158	35
Continuous crop	109	1	56	12

Crop dry matter on the 26/10/1983 was extremely poor (<1.5 t/ha). There was little difference between the Kerb, spray.seed and the continuous crop treatments (Figure 1). The untreated control resulted in a poor crop. These observations were reflected in yield (Figure 2, Table 8). The grain yield was poor and factors other than nitrogen nutrition are involved. Take-all and Rhizoctonia levels are not available at this time.

Table 8. Grain yield (kg/ha) 1983

Rate of Agran (kg/ha) Treatment	Grain yield 0	40	80	160
Untreated	609	673	682	764
Kerb®	727	818	936	1,009
Spray.seed®	777	836	918	1,100
Continuous crop	818	1,018	1,027	1,182

Conclusions:

This trial is in the early stages of the planned rotation which is designed to run for 6 to 9 years.

Results so far have indicated that:

- the use of selective herbicides (Kerb) can give excellent annual grass control without a major loss in pasture production. Non-selective herbicides reduce pasture production;
- increased clover seed production can be achieved with the use of selective herbicides (Kerb);
- poor soil nitrogen status;
- the site has not produced a good wheat crop;
- take-all levels were low, but Rhizoctonia incidence was high. This is surprising since all crop plots were worked with a scarifier;
- in crop weed levels reflected the previous years treatment effects.