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DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

Minimum Tillage Investigations
1964 - 1973 Summary

Prepared by

J.M. Allen

February 1976

INTRODUCTION

The following investigations into methods of establishing cereals have been carried out by G.A. Pearce in the period 1964 - 1973.

1964 - 1968

Although a number of experiments were carried out in these years they involved pre and post emergence herbicides with and without cultivations in combinations not directly related to minimum tillage as known today.

One of them 66M28 is included in this summary because it gives a direct comparison between the triple disc drill with and without an early cultivation, with and without nitrogen and a cultivation treatment with and without nitrogen.

An extract from an ICI report on their 1967 trial programme is included as it gives a good indication of the results obtained at the time. Appendix I. These results led to the development of the "spray seed" technique rather than the use of the Triple Disc Drill.

1969

Triple disc drill vs combine after spraying, with and without nitrogen, with and without cultivation at break. Joint project with ICI at Wongan Hills and Merredin.

1970

A number of alternatives involving ploughing, scarifying, spraying and seeding at different times were evaluated at Salmon Gums, Merredin and Lake Grace. Some of the treatments are extracted for presentation in this summary.

1971

The "spray seed" technique was compared with a conventional cultivating technique with and without an early shallow cultivation at Newdegate Wongan Hills and Avondale. Some of the treatments are extracted for presentation in this summary.

1972

The spray seed technique was compared with a conventional cultivating technique with and without a shallow additional cultivation
a) early and b) late
at Merredin, Avondale, Wongan Hills, Newdegate and Salmon Gums.

1973

The "spray seed" technique was compared with a conventional cultivating technique with and without an early shallow cultivation at Chapman, Wongan Hills, Avondale, Newdegate and Salmon Gums.

Spray Seed Comparisons 1969

Treatments

TDD - Triple disc drill 1 day after spraying

Spray Seed - combine sown 1 day after spraying

Nitrogen - 50 kg/ha urea.

Cultivation - cultivation 2 days after break.

Results:

Treatment	Yield kg/ha	
	69WH23	69M16
TDD	634	360
TDD + Nitrogen	1016	462
TDD + cultivation	1159	413
TDD + cultivation + nitrogen	1220	415
Spray Seed	889	375
Spray Seed + nitrogen	1091	414
Spray Seed + cultivation	1233	364
Spray seed + cultivation + nitrogen	1333	357
Plough + Scarify	1363	375
Plough + Scarify + nitrogen	1215	393
Plough + spray	1357	393
Plough + spray + nitrogen	1345	421

Comment

Both experiments were on clover ley on light land, selected as being free of ryegrass. The low yields at Merredin reflect the 1969 drought. Because the whole crop was under moisture stress the influence of the TDD was minimised.

The reasons for the response to cultivation are unknown.

Nitrogen lifted the TDD and spray seed yields closer to the yields on the cultivated plots.

Spray Seed Comparison 1970Annual Ryegrass Problem Areas

Normal cultivation - plough, work back, sow
 Spray Seed - spray 2 days before seeding
 T₁ - seed 21 days after break
 T₂ - seed 35 days after break

Actual timing of operations uncertain.

Ryegrass was topdressed across the plots in April.

Results

Yield kg/ha

Treatment		70 SG 5	70 M 4	70 LG 3
Spray seed	T ₁	198	1129	264
Normal	T ₁	924	931	713
Spray seed	T ₂	0	732	416
Normal	T ₂	1320	1076	535

Comment

Ryegrass contributed to the yield differences at Salmon Gums and Lake Grace.

As ryegrass seed was spread onto the surface in April the germination pattern was probably different from that in a normal paddock situation.

Spray Seed Comparisons 1971

- Early cultivation - dry shallow working
- Normal cultivation - plough, work back, seed
- Spray seed - Spray when working back on other plots, seed with combine 3 to 7 days later.
- T₁ - Seeded in 2nd week of June.
- T₂ - Seeded in 3rd week of June.

All T₁ and T₂ plots sown on the same day at each site. May rains very light at Newdegate and Wongan Hills. Avondale had good May rain and plots were sprayed twice in lieu of grazing.

Results

Yield kg/ha

Treatment		71 A 12	71 WH 18	71 N 14
Spray seed	T ₁	1836	643	1059
Normal	T ₁	-	1213	-
Normal + early cult.	T ₁	2000	1353	1642
Spray seed	T ₂	2137	737	1025
Spray seed + early cult.	T ₂	-	951	-
Normal	T ₂	-	1273	-
Normal + early cult.	T ₂	2050	1407	1601

- Comment
- 71 A 12 - Weedy site, particularly T₁ sown plots, so probably a weed effect.
- 71 WH 18 - Weeds were not a problem at this site, therefore there was a large response to cultivation which was not attributable to weeds.
- 71 N 14 - Ryegrass and clover were greater on the spray seed plots. Combine penetration was difficult on spray seeded plots.

Spray Seed Comparisons 1972

Treatments

- Scarify early - dry shallow working
 Normal cultivation - plough, work back (except 72 ME 5) seed
 Spray seed - spray when working back, 1.4 to 2.8 li/ha, depending on growth
 Scarify late - extra working for comparison with scarify early treatments.

Results

Treatment	Yield kg/ha				
	72ME5	72A6	72WH6	72N5	72SG1
Normal	1300	1189	672	803	557
Normal + scarify early	1228	1317	644	947	767
Normal + scarify late	1175	1263	605	934	604
Spray seed	1063	627	511	871	774
Spray seed + scarify early	1188	772	500	672	808
Spray seed + scarify late	1076	720	472	816	672

Treatment Dates

	Early Scarify	Plough	Work back + Spray	Scarify late + seed
72ME5	21/4	6/6	23/6	30/6
72A6	15/4	7/6	22/6	29/6
72WH6	?	?	19/6	24/6
72N5	21/4	22/5	7/6	14/6
72SG1	3/5	28/6	7/7	13/7

The season opened in all areas on 31/5/72, thus there was no requirement for heavy grazing.

- Comment
- 72ME5 - Yields reflect differences in ryegrass and doublegee in the crop.
- 72A6 - Weed numbers were low. There was a large response to cultivation. Webworm was worse on the spray seed treatments but after early treatment with DDT there was not a significant difference in crop plant numbers. Crop growth on the spray seed plots was visibly inferior through the season.

- 72WH6 - Ryegrass effect.
- 72N5 - Considerable variation between different reps, not a straight block effect.
- 72SG1 - Very high level of ryegrass on all plots. Even though there was significantly less ryegrass on the cultivated plots they still had over 100 m⁻².

Spray Seed Comparisons 1973Treatments

Scarify early	=	dry shallow working April
Early seed	=	plough, seed 2-3 days later
Normal cultivation	=	Plough, work back, seed
Spray seed	=	Spray when working back and seed at same time as normal. Herbicide rate 2.8 li/ha.

Results

Treatment	Yield kg/ha		
	73C12	73WH14	73A16
1 Normal cultivation	1870	2597	2291
2 Normal cultivation + Scarify early	2089	2764	2528
3 Early seeding	888	2187	972
4 Early seeding + scarify early	1138	2942	1871
5 Spray seed	864	2442	1569
6 Spray seed + scarify early	972	3041	1982

<u>Comment</u>	73C12	- Unable to suggest reasons for difference, weed counts are not available.
	73WH14	- Yield differences are in line with differences in weed numbers counted in the plots. Mainly doublegee (up to 100m ⁻²) some ryegrass (up to 10 m ² that emerged after seeding).
	73A16	- This was a very weedy site. Spear grass ryegrass and doublegee. Yields are in line with the weed numbers counted in the plots. Rains were generally inadequate for a good germination before ploughing on 25/5 and working back on 4/6. Crop establishment was poor on the early seeded (T3) treatment. Mr. Sherrington (Manager) observed that both in the trial and in paddocks working back was not required when an early dry working had been carried out.
	73SG9	- Yield data not available
	73N13	- Trial wiped out by hail.

APPENDIX I

Extract from "A progress report of work carried out in Western Australia in 1967" by J.A. Whitehead ICI.

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"The Value of Additional Cultivations

In two of the 1967 trials F805&F806 the value of a scarification on the point of break was investigated. Work at Merredin Research Station in 1966 indicated that on light land this practice led to higher yields being obtained, presumably due to an increase in nutrient release. (See 66 M 28 results, JMA)

The results obtained in these two trials confirmed this finding and the table below summarises this point."

TABLE VII

Yields of Grain in bushels/acre

Trial F 806				
Treatment	0	28	84	
Triple Disc Drill	27.4	32.5	34.1	
"Spray Seed"	39.2	43.7	44.9	
"Spray Seed" + Early Cultivation	47.8	50.7	49.8	

Trial F 805				
Treatment	0	28	56	112
Triple Disc Drill	17.2	-	19.4	-
"Spray Seed"	25.8	34.9	33.7	30.8
"Spray Seed" + Early Cultivation	27.6	35.1	42.0	43.7

In these experiments the spray involved 1½ pts of gramoxone and 1½ pints of reglone and 1½ pints pespruf DDT and 3½ Fl ozs imidon and 3 ozs Agral 60 in 10 gallons of water per acre.

The early cultivation was a scarification at the break 11.5.67.

All plots were sprayed on 5.6.67 and triple disc or combine seeded on 9.6.67

In another part of the report there is the following comment

"Note: In F 805 and F 806 considerable clover survival under non-disturbance seeding occurred and this through competition may have reduced yields."