1984

Studies on the effects of nutrition and tillage systems on cereal root diseases

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DEPARTMENT OF AGRICULTURE

STUDIES ON THE EFFECTS OF NUTRITION AND TILLAGE SYSTEMS ON CEREAL ROOT DISEASES

EXPERIMENTAL RESULTS 1984

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CONTENTS

1. SPLIT APPLICATIONS OF NITROGEN AND TAKE-ALL 84 N 1

Aim: To determine whether a split application of nitrogen applied four weeks after sowing can improve the effectiveness of take-all control by ammonium nitrogen.

Soil: Yellow Brown Gravelly sand
Newdegate Research Station

Sown: 22/6/84 Wheat at 50 kg ha^{-1}

Basals: P at 28 kg ha^{-1} drilled
N at seeding (25 kg ha^{-1}) TRS 4-15

Harvest: 4/12/84

TABLE 1
Grain yield (t ha^{-1})

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	2.24	2.31	2.17
18:5	2.18	2.17	2.17
D.A.P.	2.13	2.12	2.13
Agras No. 1	2.20	2.25	2.20
Am. Sulphate*	2.28	2.24	2.19

* Ammonium Sulphate granulated
Nitrogen topdressed four weeks after sowing

TABLE 2
1,000 Grain yield (grams)
(Mean of 3 reps.)

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	36.92	34.16	35.73
18:5	33.97	34.35	35.46
D.A.P.	35.23	36.67	35.53
Agras No. 1	34.33	34.25	34.36
Am. Sulphate	32.06	34.25	35.27

TABLE 3
Dry matter production (tha^{-1}) at anthesis

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	4.54	4.37	4.50
18:5	5.19	5.08	5.64
D.A.P.	5.60	5.72	5.68
Agras No. 1	5.60	5.83	5.43
Am. Sulphate	5.65	5.63	5.54

NB: 1. Roots sampled at anthesis for take-all assessment have not been completed.

2. Nutrient status and uptakes unavailable at this time as are soil analyses.

3. All data the mean of 3 replicates.

TABLE 4
Plant/metre of row at $1^1/_2$ leaf stage

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	15.7	16.0	16.7
18:5	14.8	15.8	16.3
D.A.P.	16.3	16.6	15.6
Agras No. 1	16.3	16.0	16.1
Am. Sulphate	15.3	15.0	15.4

2. SPLIT APPLICATIONS OF NITROGEN AND TAKE-ALL 84 E 2

Aim: To determine whether a split application of nitrogen applied four weeks after sowing can improve the effectiveness of take-all control by ammonium nitrogen.

Soil: Grey sand/Gravel
E.D.R.S.

Sown: 20/6/84 Wheat at 50 kg ha^{-1}

Basals: P at 28 kg ha^{-1} drilled
N at seeding (25 kg ha^{-1}) TRS 4-15

Harvest: 18/12/84

TABLE 5
Grain yield (t ha^{-1})

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	1.63	1.89	1.88
18:5	2.16	2.19	2.21
D.A.P.	2.09	2.25	2.32
Agras No. 1	2.04	2.04	2.29
Am. Sulphate*	2.04	2.36	2.32

* Ammonium Sulphate granulated
Nitrogen topdressed four weeks after sowing

TABLE 6
1,000 Grain yield (grams)
(Mean of 3 reps.)

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	37.17	36.68	36.88
18:5	37.77	38.44	38.34
D.A.P.	37.30	37.10	37.66
Agras No. 1	38.59	39.70	39.06
Am. Sulphate	38.20	38.52	38.19

TABLE 7
Dry matter production (tha^{-1}) at anthesis

Fertiliser drilled	Nitrogen TD ($kg\ ha^{-1}$) Nil	Urea (33)	Am. sulphate* (71)
Super	2.15	2.47	2.49
18:5	2.54	2.71	2.73
D.A.P.	2.46	2.65	2.73
Agras No. 1	2.38	2.54	2.63
Am. Sulphate	2.43	2.73	2.78

NB: 1. Roots sampled at anthesis for take-all assessment have not been completed.

2. Nutrient status and uptakes unavailable at this time as are soil analyses.

3. All data the mean of 3 replicates.

TABLE 8
Plant/metre of row at $1^1/_2$ leaf stage

Fertiliser drilled	Nitrogen TD ($kg\ ha^{-1}$) Nil	Urea (33)	Am. sulphate* (71)
Super	17.8	17.8	18.4
18:5	18.5	17.6	17.8
D.A.P.	18.2	18.1	18.8
Agras No. 1	17.8	18.3	18.3
Am. Sulphate	17.5	17.3	17.6

3. SPLIT APPLICATIONS OF NITROGEN AND TAKE-ALL 84 MT 4

Aim: To determine whether a split application of nitrogen applied four weeks after sowing can improve the effectiveness of take-all control by ammonium nitrogen.

Soil: Brown Gravelly loamy sand
Mt. Barker R.S.

Sown: 4/6/84 Wheat at 50 kg ha^{-1}

Basals: P at 28 kg ha^{-1} drilled
N at seeding (25 kg ha^{-1}) TRS 4-15

Harvest: 9/1/85

TABLE 9
Grain yield (t ha^{-1})

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	0.46	0.81	0.63
18:5	0.90	0.73	0.80
D.A.P.	1.15	1.15	1.27
Agras No. 1	0.87	0.82	1.04
Am. Sulphate*	0.96	0.90	0.95

* Ammonium Sulphate granulated
Nitrogen topdressed four weeks after sowing

TABLE 10
1,000 Grain yield (grams)
(Mean of 3 reps.)

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	27.83	27.34	26.60
18:5	31.01	29.25	30.22
D.A.P.	30.16	30.61	29.41
Agras No. 1	29.46	31.43	31.28
Am. Sulphate	29.57	28.42	29.58

TABLE 11
Dry matter production (tha^{-1}) at anthesis

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	1.95	2.37	2.24
18:5	2.21	2.25	2.36
D.A.P.	2.52	2.93	3.02
Agras No. 1	2.73	2.95	2.90
Am. Sulphate	2.82	3.37	3.46

NB: 1. Roots sampled at anthesis for take-all assessment have not been completed.

2. Nutrient status and uptakes unavailable at this time as are soil analyses.

3. All data the mean of 3 replicates.

TABLE 12
Plant/metre of row at 2 leaf stage

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	20.3	20.6	21.1
18:5	19.6	20.3	20.9
D.A.P.	21.6	18.4	23.2
Agras No. 1	20.6	20.7	21.4
Am. Sulphate	21.5	20.9	19.2

4. SPLIT APPLICATIONS OF NITROGEN AND TAKE-ALL 84 LG 1

Aim: To determine whether a split application of nitrogen applied four weeks after sowing can improve the effectiveness of take-all control by ammonium nitrogen.

Soil: Yellow Brown Gravelly sand
S.W. Newdegate, G. Cugley

Sown: 14/6/85 Egret at 45 kg ha^{-1}

Basals: P at 28 kg ha^{-1} drilled
N at seeding (TRS 4-15) 25 kg ha^{-1})

Harvest: 30/11/84

TABLE 13
Grain yield (t ha^{-1})

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	333	486	486
18:5	524	686	695
D.A.P.	581	590	610
Agras No. 1	610	667	685
Am. Sulphate	638	695	743

TABLE 14
Plants/metre of row at 4 leaf stage

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate (71)
Super	17.8	18.3	17.3
18:5	17.6	18.0	17.0
D.A.P.	17.5	17.9	17.8
Agras No. 1	16.9	17.0	17.3
Am. Sulphate	17.8	16.9	17.4

TABLE 15
1,000 grain weights

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate* (71)
Super	21.55	24.89	24.84
18:5	26.88	26.85	26.53
D.A.P.	24.69	25.66	27.07
Agras No. 1	25.23	26.25	27.66
Am. Sulphate	29.48	29.28	29.00

TABLE 16
Dry matter production at anthesis (tha^{-1})

Fertiliser drilled	Nitrogen TD (kg ha^{-1}) Nil	Urea (33)	Am. sulphate (71)
Super	1.18	2.13	2.31
18:5	2.21	2.85	3.18
D.A.P.	2.47	2.90	3.08
Agras No. 1	2.34	2.88	3.01
Am. Sulphate	2.47	2.86	3.13

5. NITROGEN AND PHOSPHORUS RATES AND TAKE-ALL 83 ES 41

Aim: To determine the effects of rates of nitrogen and phosphorus on the build up of take-all in a virgin soil.

Soil: Grey sand/gravel
High school block

Sown: 1/6/84 Egret at 50 kg ha^{-1}

Basals: $CuSO_4$ (6.0 kg ha^{-1}))
ZnO (2 kg ha^{-1})) Basal 1983
Mo (80 g ha^{-1}))

Harvest: 11/12/84

TABLE 17
Grain yield (kg ha^{-1})

Super drilled (kg ha^{-1})	Rates of nitrogen as urea T.D. (kg ha^{-1}) 0	20	40	80
0	N.H.	N.H.	N.H.	N.H.
50	160	200	250	320
100	260	310	380	490
150	310	400	460	560
200	390	400	490	610

Nitrogen T.D. 24/6/84
N.H. Not Harvested

TABLE 18
1,000 Grain yield (grams)

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	-	-	-	-
50	24.3	25.3	26.5	26.9
100	26.4	29.0	27.5	27.0
150	28.4	28.2	27.6	26.8
200	28.5	29.7	28.2	27.2

TABLE 19
Plants/metre of row at 2nd leaf stage
(Mean 10 m counts)

Super drilled ($kg\ ha^{-1}$)	Rates of urea T.D. ($kg\ ha^{-1}$) 0	20	40	80
0	19.2	18.5	19.0	18.7
50	19.1	19.1	19.4	20.0
100	19.6	19.2	19.2	20.3
150	19.2	19.6	19.7	20.6
200	19.1	19.0	19.4	19.7

TABLE 20
Dry matter production at ear peep ($kg\ ha^{-1}$)

Super drilled ($kg\ ha^{-1}$)	Rates of urea T.D. ($kg\ ha^{-1}$) 0	20	40	80
0	100	130	160	160
50	230	260	310	360
100	330	350	410	530
150	380	420	500	590
200	460	470	570	640

NB: 1. Root samples at anthesis for take-all assessment have not been completed.

2. Plants sampled for nutrient status during the growing season.

3. Plants samples for nutrient uptake.. Chemical analysis of plant samples are as yet not complete.

4. Soil sampled, site and specific treatments. No data as yet is available.

5. All data the means of 3 replicates.

6. NITROGEN AND PHOSPHORUS RATES AND TAKE-ALL 83 ES 42

Aim: To determine the effects of rates of nitrogen and phosphorus on the build up of take-all in a virgin soil.

Soil: Grey sand/gravel/clay
J. Lay

Sown: 7/6/84 Egret at 50 kg ha^{-1}

Basals: $CuSO_4$ at 6.0 kg ha^{-1})
ZnO (2 kg ha^{-1})) Basal 1983
Mo (80 g ha^{-1}))

Harvest: 18/12/84

TABLE 21
Grain yield (t ha^{-1})

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	-	-	-	-
50	0.5	0.57	0.59	0.68
100	0.63	0.66	0.72	0.76
150	0.71	0.73	0.76	0.87
200	0.73	0.80	0.89	1.00

Nitrogen T.D. 24/6/84 at $1^1/2$ leaf stage

TABLE 22
1,000 grain yields (grams)

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	-	-	-	-
50	31.68	31.63	32.20	32.63
100	31.75	32.37	32.81	32.82
150	32.97	32.64	33.27	32.54
200	33.83	34.99	32.76	32.22

TABLE 23
Dry matter yield (kg ha^{-1}) at boot stage

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	56	60	58	67
50	236	278	350	423
100	320	423	491	643
150	404	480	556	720
200	423	522	583	770

NB: Comments as for previous experiment

TABLE 24
Plant/metre of row at $1^1/_2$ leaf stage
(mean of 10 m)

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	16.8	16.5	18.4	18.1
50	16.9	17.9	18.4	18.3
100	17.9	18.6	18.2	18.0
150	17.7	18.6	18.2	18.5
200	17.9	17.6	18.6	19.4

4. NITROGEN AND PHOSPHORUS RATES AND TAKE-ALL 83 ES 43

Aim: To determine the effects of rates of nitrogen and phosphorus on the build up of take-all in a virgin soil.

Soil: Brown loamy sand
G. Tyrell, Mt Ridley

Sown: 31/5/84 Madden at 50 kg ha^{-1}

Basals: $CuSO_4$ at 6.0 kg ha^{-1})
ZnO (2 kg ha^{-1})) Basal in 1983
Mo (80 g ha^{-1}))

Harvest: 11/12/84

TABLE 25
Grain yield (t ha^{-1})

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	*NH	NH	NH	NH
50	0.91	0.94	0.99	1.00
100	1.38	1.48	1.50	1.53
150	1.53	1.62	1.65	1.67
200	1.71	1.77	1.82	1.88

*NH: Not harvested, although few small plants with heads were on each nil plot.

TABLE 26
1,000 grain weights (grams)

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0				
50	33.53	33.49	34.44	34.42
100	34.60	34.68	34.90	34.75
150	34.62	35.04	35.38	35.75
200	35.00	35.31	35.75	36.32

TABLE 27
Plants per metre of row at 2nd leaf stage

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	18.4	18.7	19.0	19.3
50	18.1	19.2	18.9	19.0
100	19.1	18.3	20.5	19.3
150	19.7	19.6	18.8	20.4
200	18.9	20.0	20.2	20.0

TABLE 28
Dry matter production (t ha^{-1}) at boot stage

Super drilled (kg ha^{-1})	Rates of urea T.D. (kg ha^{-1}) 0	20	40	80
0	0.11	0.12	0.13	0.14
50	0.72	0.81	0.89	0.96
100	1.03	1.17	1.27	1.37
150	1.15	1.27	1.38	1.52
200	1.22	1.28	1.42	1.52

NB: Comments as for previous two experiments

8. MICRONUTRIENTS (Cu, Zn) AND TAKE-ALL 83ES 39

Aim: To study the nutritional and fungicidal effects of copper and zinc on take-all in wheat.

Soil: Grey sand
Neridup, W. Mincherton

Sown: 4/6/84 Madden at 50 kg ha^{-1}

Basals: P = 22.75 kg ha^{-1}
Mo = 80 g ha^{-1}
N = 27.6 kg ha^{-1}

Harvest: Very severely waterlogged throughout season.

TABLE 29
Plant per metre of row at 2 leaf stage

		ZnO (kg ha^{-1}) drilled				
		0	2	4	8	16
$CuSO_4$	0	14.9	14.9			
(kg ha^{-1})	5	14.8	14.5	14.9	14.5	15.4
drilled	10		14.6			
	15		15.1			
	20		14.1			

9. MICRONUTRIENTS (Cu, Zn) AND TAKE-ALL 83ES 40

Aim: To study the nutritional and fungicidal effects of copper and zinc on take-all in wheat.

Soil: Brown loamy sand
G. Tyrell, Mt Ridley

Sown: 31/5/84 Madden at 50 kg ha^{-1}

Basals: P = 23 kg ha^{-1}
Mo = 75 g ha^{-1}
N = 27.6 kg ha^{-1}

Harvest: 11/12/84

TABLE 30
Grain yield (t ha^{-1})

		ZnO (kg ha^{-1}) drilled				
		0	2	4	8	16
$CuSO_4$	0	1.96	2.01			
(kg ha^{-1})	5	1.98	1.99	1.95	2.00	2.02
drilled	10		2.04			
	15		1.99			
	20		2.07			

NB: No response to Cu and Zn

TABLE 31
1,000 grain yields (grams)

		ZnO (kg ha^{-1}) drilled				
		0	2	4	8	16
$CuSO_4$	0	34.29	34.68			
(kg ha^{-1})	5	34.19	34.22	34.21	33.59	32.48
drilled	10		33.31			
	15		33.12			
	20		33.24			

TABLE 32
Dry matter production (t ha^{-1}) at early boot

		ZnO (kg ha^{-1}) drilled				
		0	2	4	8	16
$CuSO_4$	0	1.61	1.60			
(kg ha^{-1})	5	1.71	1.63	1.76	1.70	1.68
drilled	10		1.68			
	15		1.69			
	20		1.70			

NB: 1. Nutrient status and nutrient uptake unavailabl at this time.

2. Soil data unavailable. Chemical analysis incomplete.

3. Roots sampled for take-all this stage but assessments unavailable at this stage.

4. All data is the mean of 3 replicates.

TABLE 33
Plants per metre of Row at 2 leaf stage

		ZnO (kg ha^{-1}) drilled				
		0	2	4	8	16
$CuSO_4$	0	20.4	17.8			
(kg ha^{-1})	5	18.7	18.6	18.1	19.8	19.3
drilled	10		19.6			
	15		19.3			
	20		19.6			

10. Cu RESIDUAL ON WHEAT AND TAKE-ALL 67 E 9

Aim: To determine the residual effectiveness of previously applied copper and to measure the effect of copper applications on the build up of take-all.

Soil: Grey sand/gravel
EDRS

Sown: 25/6/84 Madden at 45 kg ha^{-1}

Basals: P = 17 kg ha^{-1}
N = 30 kg ha^{-1}

Harvest: 11/12/84

TABLE 34

	Treatment	Plant/ MROW	Dry matter (t ha^{-1})	1,000 grain wt (grams)	Grain yield (t ha^{-1})
1	Nil Cu	20.3	1.55	27.49	1.58
2	$CuSO_4$ (4.4 kg ha^{-1} in 1976)	20.1	2.23	31.03	2.21
3	" (1.1 kg ha^{-1} in 1967)	19.6	2.12	29.54	1.79
4	" (2.2 " " ")	19.6	2.11	30.41	1.74
5	" (4.4 " " ")	19.8	2.18	31.45	1.92
6	" (8.8 " " ")	20.8	2.20	32.80	2.18
7	" (4.4 " " ")	20.0	2.25	30.97	2.12
8	" (4.4 " " ")	19.2	2.30	31.19	2.23

NB: TR7 had extra $CuSO_4$ in 1968, 69, 70 at a rate of 275 g ha^{-1}

TR8 had extra $CuSO_4$ in 1968, 69, 70 at a rate of 550 g ha^{-1}

Comments:

1. Extensive areas of Rhizoctonia patch damage in the trial. Grain yields corrected for areas completely wiped out by this root disease.

2. Nutrient status and uptake unavailable.

3. Trial sampled for root rots; with the same comments as the preceeding trials.

11. Cu RESIDUAL ON WHEAT AND TAKE-ALL 67 E 8

Aim: To determine the residual effectiveness of previously applied copper and to measure the effect of copper applications on the build up of take-all.

Soil: Caitup gravelly sand
EDRS

Sown: 25/6/84 Madden at 50 kg ha^{-1}

Basals: P = 17 kg ha^{-1}
N = 30 kg ha^{-1}

Harvest: 11/12/84

TABLE 35

	Treatment	Plant/ MROW 2 Leaf	Dry matter (t ha^{-1}) Anthesis	1,000 grain wt (grams)	Grain yield (t ha^{-1})
1	Nil Cu	19.5	1.56	27.57	1.16
2	$CuSO_4$ (2.2) (kg ha^{-1})	19.6	2.20	27.37	1.54
3	" (4.4) "	20.5	2.55	29.84	1.76
4	Nil Cu	19.9	1.76	32.79	1.09
5	$CuSO_4$ (1.1) "	19.4	2.64	27.62	1.39
6	" (2.2) "	19.5	2.54	29.67	1.53
7	" (4.4) "	19.2	2.49	30.68	1.69
8	" (8.8) "	19.6	2.46	31.85	1.87
9[1]	" (2.2) "	19.3	2.53	29.13	1.79
10[1]	" (4.4) "	19.7	2.49	30.43	1.89
11[2]	" (2.2) "	19.8	2.49	27.98	1.77
12[2]	" (4.4) "	19.7	2.47	28.23	1.79
13[3]	" (2.2) "	19.7	2.41	29.32	1.73
14[3]	" (4.4) "	19.3	2.64	29.78	1.87

NB: [1] Extra $CuSO_4$ (2.2), and $CuSO_4$ (4.4) in 1976
[2] Extra $CuSO_4$ (130 g ha^{-1}) in 68, 69
[3] Extra $CuSO_4$ (260 g ha^{-1}) in 68, 69

Comments:

1. Nutrient status and uptake unavailable.
2. Trial sampled for root rots; with the same comments as the preceeding trials.

12. TAKE-ALL AND MANGANESE/AMMONIUM INTERACTION 84 LG 2

Aim: To test the hypothesis that the control of take-all by NH_4^+ form of N is actually an effect on plant health stimulated by the removal of marginal manganese deficiency rather than any direct effect on take-all *per se*.

Soil: Yellow gravelly sandy loam
G. Cugley; S.W. Nedegate

Sown: 15/6/84, Gutha at 45 kg ha^{-1}

Basals: P = 30 kg ha^{-1} TD

Harvested: 30/11/84

TABLE 36
Grain yields (tha^{-1})

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	0.76	1.12	1.05	1.33	1.17
Sodium Nitrate T.D.	0.62	0.66	1.00	0.96	1.07
Am. Sulphate T.D.	0.94	1.02	1.08	1.14	1.35
Am. Sulphate drilled	1.03	1.19	1.22	1.20	1.30
Am. Chloride drilled	0.78	0.97	1.06	1.13	1.12

TABLE 37
Plants/metre of row at 4 leaf stage (10m/plot)

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	20.9	22.4	20.5	21.6	20.3
Sodium Nitrate T.D.	19.7	19.5	20.1	21.0	19.9
Am. Sulphate T.D.	21.0	19.5	19.7	20.6	20.6
Am. Sulphate drilled	20.3	17.8	19.1	18.2	18.4
Am. Chloride drilled	19.8	19.1	17.3	17.3	18.9

TABLE 38
Plants/metre of row (a fortnight later)

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	19.4	19.5	18.8	19.7	19.2
Sodium Nitrate T.D.	18.7	18.9	20.9	19.0	18.4
Am. Sulphate T.D.	18.3	18.9	19.4	18.7	18.5
Am. Sulphate drilled	18.4	17.0	18.5	17.5	18.0
Am. Chloride drilled	18.1	17.9	16.8	17.5	16.7

TABLE 39
Dry matter production at Anthesis

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	1.73	2.33	2.51	2.52	2.46
Sodium Nitrate T.D.	2.17	2.45	2.67	2.44	2.68
Am. Sulphate T.D.	2.25	2.60	2.83	3.21	3.20
Am. Sulphate drilled	2.67	3.23	3.52	3.33	3.61
Am. Chloride drilled	1.49	2.22	2.46	2.81	2.72

TABLE 40
1,000 grain weights

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	30.51	37.19	35.78	35.31	36.67
Sodium Nitrate T.D.	31.38	32.55	35.59	35.32	34.87
Am. Sulphate T.D.	32.53	33.14	34.23	35.72	35.40
Am. Sulphate drilled	32.42	34.42	36.74	37.77	37.34
Am. Chloride drilled	33.23	35.56	34.70	35.74	35.87

13. TAKE-ALL AND MANGANESE/AMMONIUM INTERACTION 84 MT 5

Aim: To test the hypothesis that the control of take-all by NH_4^+ form of N is actually an effect on plant health stimulated by the removal of marginal manganese deficiency rather than any direct effect on take-all per se.

Soil: Brown gravelly sandy loam
Mt. Barker Res. Station

Sown: 4/6/84, Wheat at 45 kg ha^{-1}

Basals: P = 30 kg ha^{-1} TD

Harvested: 8/1/85

TABLE 41
Grain yields (tha^{-1})

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	2.52	2.42	2.47	2.38	2.46
Sodium Nitrate T.D.	2.03	1.93	1.97	2.17	2.12
Am. Sulphate T.D.	2.30	2.20	2.03	2.18	2.27
Am. Sulphate drilled	2.27	2.06	2.51	2.30	2.48
Am. Chloride drilled	2.48	2.28	1.93	2.16	2.30

TABLE 42
Plants/metre of row at 2 leaf stage

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	16.8	17.4	19.8	19.4	18.0
Sodium Nitrate T.D.	16.5	16.2	17.4	16.0	16.1
Am. Sulphate T.D.	16.0	16.9	17.6	16.6	18.1
Am. Sulphate drilled	18.4	18.4	17.8	19.1	18.8
Am. Chloride drilled	19.6	20.0	18.3	20.1	19.9

TABLE 43
Plants/metre of row at 4 leaf stage

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	16.8	17.2	18.5	18.2	17.9
Sodium Nitrate T.D.	16.8	16.8	18.0	17.8	15.8
Am. Sulphate T.D.	16.1	16.3	17.0	17.1	16.4
Am. Sulphate drilled	17.2	17.0	18.2	17.6	17.5
Am. Chloride drilled	15.9	16.7	16.9	16.5	16.5

TABLE 44
Dry matter production at Anthesis (tha^{-1})

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	3.93	3.70	4.20	4.18	3.89
Sodium Nitrate T.D.	3.83	4.06	3.68	3.86	3.91
Am. Sulphate T.D.	3.83	4.03	4.02	3.91	3.77
Am. Sulphate drilled	3.93	3.73	3.69	3.90	3.72
Am. Chloride drilled	3.76	3.98	3.76	3.72	3.79

TABLE 45
1,000 grain weights (grams)

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	36.46	37.65	36.19	35.68	36.06
Sodium Nitrate T.D.	37.42	36.76	37.82	36.35	34.55
Am. Sulphate T.D.	34.99	33.54	37.03	38.81	37.65
Am. Sulphate drilled	34.65	37.72	36.17	37.72	37.08
Am. Chloride drilled	34.92	38.27	37.44	37.14	37.74

14. TAKE-ALL AND MANGANESE/AMMONIUM INTERACTION 84 E 1

Aim: To test the hypothesis that the control of take-all by NH_4^+ form of N is actually an effect on plant health stimulated by the removal of marginal manganese deficiency rather than any direct effect on take-all per se.

Soil: Grey sand/Gravel
EDRS

Sown: 25/6/84, Wheat at 45 kg ha^{-1}

Basals: P = 30 kg ha^{-1} TD

Harvested: 19/12/84

TABLE 46
Grain yields (tha^{-1})

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	1.23	1.45	1.41	1.41	1.52
Sodium Nitrate T.D.	1.45	1.39	1.50	1.43	1.48
Am. Sulphate T.D.	1.79	1.82	1.89	1.79	1.82
Am. Sulphate drilled	2.00	2.04	1.91	1.89	1.91
Am. Chloride drilled	1.89	1.88	2.02	1.96	1.96

TABLE 47
Plants/metre of row at 2 leaf stage

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	18.0	18.0	18.4	18.3	17.9
Sodium Nitrate T.D.	17.8	17.7	18.5	17.7	17.4
Am. Sulphate T.D.	17.7	17.1	18.0	18.0	15.3
Am. Sulphate drilled	16.2	16.0	15.5	14.9	15.7
Am. Chloride drilled	17.8	15.0	15.7	14.4	13.6

TABLE 48
Plants/metre of row at 4-5 leaf stage

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	17.8	17.5	17.7	18.0	17.3
Sodium Nitrate T.D.	17.3	17.4	17.5	17.4	17.1
Am. Sulphate T.D.	16.4	16.8	17.0	16.9	15.9
Am. Sulphate drilled	15.8	16.4	15.5	14.8	15.8
Am. Chloride drilled	16.2	15.8	15.1	14.6	13.7

TABLE 49
Dry matter production at Anthesis (tha^{-1})

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	1.48	1.43	1.25	1.37	1.36
Sodium Nitrate T.D.	1.62	1.52	1.52	1.52	1.57
Am. Sulphate T.D.	2.51	2.51	2.34	2.48	2.45
Am. Sulphate drilled	2.63	2.59	2.63	2.45	2.65
Am. Chloride drilled	2.33	2.33	2.70	2.65	2.47

TABLE 50
1,000 grain weights (grams)

N Sources	Manganese sulphate (kg ha^{-1}) 0	25	50	100	200
Nil	40.38	40.05	38.56	40.34	39.51
Sodium Nitrate T.D.	38.57	40.32	38.73	38.79	38.92
Am. Sulphate T.D.	39.85	39.66	39.70	38.53	38.36
Am. Sulphate drilled	39.30	38.76	39.36	40.30	38.66
Am. Chloride drilled	40.67	39.74	39.81	39.92	39.14

15. CULTIVATION DEPTHS AND TIMING EFFECT ON RHIZOCTONIA 84 E 23

Aim: To obtain information and recommendations on the minimum amount and timing of cultivation to control Rhizoctoria patch in the short and long term.

Soil: Sand (5 cm) over gravel.
Esperance Downs Research Station.

Sown: 6/84 wheat at 45 kg ha^{-1}

Basals: P at 8 kg ha^{-1}
N at 17 kg ha^{-1}

Harvested: 13/12/84

TABLE 51
Effect of Cultivations and Timing on the area affected by Rhizoctonia (m^2/plot), dry matter production and grain yield.
Data is the mean of 5 replications.

		Area of * Rhizoctonia m^2/plot	Dry matter production t ha^{-1}	Grain yield t ha^{-1}
1.	DD/TDD		3.98	1.66
2.	DD/Comb		3.85	1.59
3.	DD/Comb		3.76	1.66
4.	DD/Mod Comb 3cm $2^1/_2$ pts		3.90	1.52
5.	DD/Mod Comb 3cm 6 pt		4.41	1.85
6.	DD/Mod Comb 10cm $2^1/_2$ pts		4.60	1.78
7.	DD/Mod Combin 10cm 6 pt		4.38	1.78
8.	Scarify 10cm + Harrows 2WBS		4.42	1.88
9.	TR8 + WB 5cm IBS		4.42	1.74
10.	Scarify 10cm + HI WBS		4.31	1.76
11.	Scarify 10cm + HI IBS		4.36	1.90
12.	Disc plough 2 WBS + HIBS		4.51	1.86
13.	Agrowplow 10cm 2 WBS		5.25	2.15
14.	Agrowplow 20cm 2 WBS		5.35	2.37
15.	Agrowplow 30cm 2 WBS		4.74	1.97
16.	Agrowplow 30cm 2 WBS		4.65	1.92
17.	Agrowplow 30cm 2 WBS + Scarify 10cm + HIBS		5.55	2.37

BS = Before seeding
IBS = Immediately before seeding
H = Harrows

* No distinct Rhizoctonia samples that could be mapped. Plants were sampled for root assessment at anthesis but this data is unavailable at this time.

TABLE 52
Effect of cultivations and timing on plants per metre of row and grain weight (1,000 grain wts)

		Plants/ M ROW	1,000 gram wts
1.	DD/TDD	14.7	41.40
2.	DD/Comb	16.3	38.83
3.	DD/Comb	19.5	38.60
4.	DD/Mod Comb 3cm $2^1/_2$ pts	15.6	38.03
5.	DD/Mod Comb 3cm 6 pt	15.0	40.83
6.	DD/Mod Comb 10cm $2^1/_2$ pts	12.7	38.27
7.	DD/Mod Combin 10cm 6 pt	12.7	39.17
8.	Scarify 10cm + Harrows 2WBS	20.1	38.07
9.	TR8 + WB 5cm IBS	19.3	38.17
10.	Scarify 10cm + HI WBS	18.4	38.63
11.	Scarify 10cm + HI IBS	19.7	38.97
12.	Disc plough 2 WBS + HIBS	19.3	38.63
13.	Agrowplow 10cm 2 WBS	19.1	40.87
14.	Agrowplow 20cm 2 WBS	17.7	41.33
15.	Agrowplow 30cm 2 WBS	19.2	39.06
16.	Agrowplow 30cm 2 WBS	19.3	39.67
17.	Agrowplow 30cm 2 WBS + Scarify 10cm + HIBS	18.9	40.50

BS = Before seeding
IBS = Immediately before seeding
H = Harrows

16. CULTIVATION DEPTHS AND TIMING EFFECT ON RHIZOCTONIA 84 E 24

Aim: To obtain information and recommendations on the minimum amount and timing of cultivation to control Rhizoctoria patch in he short and long term.

Soil: Deep sand (25-50 cm) over gravel.
Esperance Downs Research Station.

Sown: 6/84 wheat at 45 kg ha^{-1}

Basals: P at 8 kg ha^{-1}
N at 17 kg ha^{-1}

Harvested: 13/12/84

TABLE 53
Effect of Cultivations and Timing on the plants per metre of row and the grain weights per 1,000 grains.

		Plants/ M ROW	1,000 gram wts
1.	DD/TDD	15.5	38.03
2.	DD/Comb	14.7	38.23
3.	DD/Comb	14.7	38.17
4.	DD/Mod Comb 3cm $2^1/_2$ pts	14.3	39.10
5.	DD/Mod Comb 3cm 6 pt	12.2	36.20
6.	DD/Mod Comb 10cm $2^1/_2$ pts	12.8	35.57
7.	DD/Mod Combin 10cm 6 pt	12.5	37.63
8.	Scarify 10cm + Harrows 2WBS	15.7	38.37
9.	TR8 + WB 5cm IBS	16.7	36.40
10.	Scarify 10cm + HI WBS	13.9	34.90
11.	Scarify 10cm + HI IBS	14.5	37.60
12.	Disc plough 2 WBS + HIBS	15.9	37.43
13.	Agrowplow 10cm 2 WBS	14.2	38.90
14.	Agrowplow 20cm 2 WBS	15.0	40.60
15.	Agrowplow 30cm 2 WBS	15.2	39.27
16.	Agrowplow 30cm 2 WBS	15.0	40.20
17.	Agrowplow 30cm 2 WBS + Scarify 10cm + HIBS	13.7	39.27

BS = Before seeding
IBS = Immediately before seeding
H = Harrows

TABLE 54
Effect of cultivations and timing on the area affected by Rhizoctonia (m^2/plot) dry matter production and grain yield.
Data is the mean of 5 replications

		Area of * Rhizoctonia m^2/plot	Dry matter production t ha^{-1}	Grain yield t ha^{-1}
1.	DD/TDD	8.5		1.21
2.	DD/Comb	10.3		1.23
3.	DD/Comb	12.9		0.99
4.	DD/Mod Comb 3cm $2^1/_2$ pts	11.4		1.30
5.	DD/Mod Comb 3cm 6 pt	8.9		1.27
6.	DD/Mod Comb 10cm $2^1/_2$ pts	7.4		1.56
7.	DD/Mod Combin 10cm 6 pt	4.0		1.55
8.	Scarify 10cm + Harrows 2WBS	5.9		1.14
9.	TR8 + WB 5cm IBS	4.2		1.11
10.	Scarify 10cm + HI WBS	9.8		1.02
11.	Scarify 10cm + HI IBS	8.3		1.27
12.	Disc plough 2 WBS + HIBS	6.6		1.32
13.	Agrowplow 10cm 2 WBS	9.4		1.40
14.	Agrowplow 20cm 2 WBS	4.6		1.78
15.	Agrowplow 30cm 2 WBS	3.9		1.91
16.	Agrowplow 30cm 2 WBS	3.5		1.72
17.	Agrowplow 30cm 2 WBS + Scarify 10cm + HIBS	1.4		1.86

BS = Before seeding
IBS = Immediately before seeding
H = Harrows