



Department of
Primary Industries and
Regional Development

Research Library

Experimental Summaries - Plant Research

Research Publications

1984

Soil acidity in the eastern wheatbelt

W Porter

S Carr

J Garlett

Follow this and additional works at: <https://researchlibrary.agric.wa.gov.au/rqmsplant>



Part of the [Agronomy and Crop Sciences Commons](#), and the [Soil Science Commons](#)

Recommended Citation

Porter, W, Carr, S, and Garlett, J. (1984), *Soil acidity in the eastern wheatbelt*. Department of Agriculture and Food, Western Australia, Perth. Report.

This report is brought to you for free and open access by the Research Publications at Research Library. It has been accepted for inclusion in Experimental Summaries - Plant Research by an authorized administrator of Research Library. For more information, please contact jennifer.heathcote@agric.wa.gov.au, sandra.papenfus@agric.wa.gov.au, paul.orange@dpird.wa.gov.au.

DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

SUMMARY OF EXPERIMENTAL RESULTS, 1984

SOIL ACIDITY IN THE EASTERN WHEATBELT

W. PORTER
S. CARR
J. GARLETT

CONTENTS:

PAGE NO.:

1. Surface incorporated lime:

80M30 - Wheat	3
82ME54 - Lupins	4
82TS33 - Wheat	5
80M31 - Wheat	6
81M5 - Medic	7

2. Subsoil banded lime:

81M54 - Lupins	8
----------------	---

3. Whole profile incorporated lime:

82M5 - Wheat	9
82ME10 - Wheat	9

4. Acid tolerant species:

84ME50 - interaction with N	10
84ME51 - interaction with P	14
84ME52 - growth on non-acid sand	15

80M30/383IEX

Effect of lime on wheat on an eastern wheatbelt sandplain.

Operations

14/5/84 2 L Sprayseed + 500 ml Barrel 200/ha.
21/5/84 Scarified.
28/5/84 Sown with trash combine: 45 kg Gutha/ha with
98 kg DAP/ha.
9/7/84 1.4 L Bromoxinal M/ha.

GRAIN YIELD

t LIME/ha	t/ha
0.0	1.60
0.5	1.57
1.0	1.56
2.0	1.58
4.0	1.59

Comments

In it's fifth year this trial has again shown no effect of lime incorporated to about 6 cm.

Lime response in lupins in the eastern wheatbelt.

Operations

14/5/84 1 L Sprayseed/ha
 28/5/84 1.5 L Simazine/ha
 Agran (200 kg/ha) and Super (400 kg/ha) applied to appropriate cross strips.
 Sown to Yandee (99 kg/ha) with Super + Mo (200 kg/ha).
 When the crop came up it was clear major problems had occurred during seeding. Many plots were not sown.
 6/7/84 Plant density in sown plots was 0.37 million/ha.

VEGETATIVE YIELD kg/ha-1, OCTOBER 15, 1984.

t LIME/ha	CROSS STRIP				
	NIL	N	P	NP (NIL Mg)	NP (Mg)
0	650	920	768	1154	1326
1/2	896	812	876	1263	1463
1	548	914	901	1246	1017
2	645	986	1282	1387	1046
4	832	801	523	1165	900
CEMENT	1115				

*NP (Nil Mg) Strip has never received Mg. The NP Mg strip received 100 kg MgSO₄/ha in 1982 and another 50 in 1983. The other three strips received 100 kg MgSO₄/ha in 1983 only.

Comments

There appears to have been no consistent effect of lime on lupin vegetative yield in this trial.

82TS33/3831EX

Presence and components of lime responses in the eastern wheatbelt.

Location

E. Coonan, East Perenjori.

Operations

11, 12/6/84 1.5 L Roundup/ha plus 1.5 L Sprayseed/ha.
19/6/84 Disc harrowed. Cross strips topdressed with
Agron (75 kg/ha) and/or Super (200 kg/ha).
Wheat (72 kg weevily Gamenya/ha) drilled with
100 kg Super Mo/ha.

GRAIN YIELD (t/ha)

1982 LIME (t/ha)	CROSS STRIP TREATMENT				
	COMPLETE	-N	-P	-NP	-Mg
0	1.32	0.81	1.61	0.89	1.53
0.5	1.14	0.94	1.67	0.99	1.56
1.0	1.24	0.98	1.58	1.01	1.58
2.0	1.09	0.95	1.50	0.92	1.55
4.0	1.08	0.97	1.55	0.90	1.49
Lime effect significant?	NS	NS	NS	NS	NS

Comments

The 20% yield increase associated with lime application (on nitrogen deficient strips only) was not statistically significant.

80M31/3831EX

Residual value of lime in the eastern wheatbelt.

Operations

14/5/84 2 L Sprayseed/ha + 500 ml Barrel 200/ha.
21/5/84 Scarified.
28/5/84 Sown with trash combine : 45 kg Gutha/ha with
98 kg DAP/ha.
9/7/84 1.4 L Bromoxinal M/ha.

GRAIN YIELD

t LIME/ha	t/ha (% OF NIL)
0.0	1.78 (100)
0.5	1.90 (107)
1.0	1.95 (110)
2.0	1.98 (111)
4.0	1.91 (107)

Treatment Effect Significant ($p < 0.005$) LSD 0.05 = 0.06.

81M5/3831EX

Effect of lime banding on the persistence of Rhizobium melilotii.

Operations

Pre-seeding 2 L Sprayseed/ha
 30/5/84 Topdressed Super (196 kg/ha)
 Sown to Gamenya (45 kg/ha) with lime in
 treatments 13 (67 kg/ha), 14 (195 kg/ha) and 15
 (440 kg/ha).
 6/7/84 Plant density 0.98 million/ha.

GRAIN YIELD

TREATMENT						1984 GRAIN YIELD (t/ha)
1981 (ALL MEDIC)			1982			
METHOD	kg LIME/ha	METHOD	kg LIME/ha	SPECIES		
Mix	3000	-	0	Medic	2.07	
-	0	-	0	Medic	1.90	
Band	50	-	0	Medic	1.94	
Band	200	-	0	Medic	1.88	
Band	800	-	0	Medic	1.94	
Mix	3000	-	0	Wheat	2.08	
-	0	-	0	Wheat	1.85	
Band	50	-	0	Wheat	1.91	
Band	200	-	0	Wheat	1.99	
Band	800	-	0	Wheat	1.87	
-	0	Mix	3000	Wheat	1.81	
-	0	-	0	Wheat	1.65	
-	0	Band	50	Wheat	1.78	
-	0	Band	200	Wheat	1.68	
-	0	Band	800	Wheat	1.81	

Treatment effect was significant (p<0.05) LSD 0.05 = 0.23

81M54/4231EX

Lime banding in acid subsoils.

Operations

21/5/84 Scarified
24/5/84 1.5 L Simazine/ha plus 0.5 L Treflan/ha.
Sown to Yandee (80 kg/ha) with plain Super
(250 kg/ha).

LUPIN YIELD

SEPTEMBER 1981 TREATMENT			
RIP DEPTH	LIME DEPTH	t LIME/ha (1)	t GRAIN/ha
-	-	0	0.50
-	0 cm	0.4	0.54
40; 20	-	0	0.47
40; 20	0 cm	0.2	0.48
40; 20	0 cm	0.4	0.51
40; 20	20 cm	0.2	0.50
40; 20	40	0.2	0.44
40; 20	40; 20	0.2	0.48
40;20;40;40	-	0	0.51
40;20;40;40(2)	40; 20	0.2	0.45

(1) Rate of lime applied at each depth of application.

(2) Lime applied with first rip at each depth.

82M5/4231EX

Effect on wheat yield of liming a 'Wodjil' soil profile.

Location

Merredin Research Station

Operations

9/5/84 Roundup 100 ml/L

		t/ha		HI
		DM	GRAIN	
Drums	- lime	2.94	1.22	0.30
	+ lime	4.37	1.80	0.30
Control plots		2.50	1.84	0.37

82ME10/4231EX

Effect on wheat yield of liming a 'wodjil' soil profile.

Location

E. Aitken, North Mukinbudin.

Operations

21/5/84 Roundup 100 ml/L

30/5/84 Super (200 kg/ha) and seed (50 kg Gamenya/ha or 60 kg Tyalla/ha) placed in a layer at 2 cm depth. Agran (300 kg/ha) topdressed.

The trial was badly damaged by birds. No reliable yield data was obtained.

84ME50/4231EX

Nitrogen responses of crops varying in acid tolerance on a 'wodjil' soil.

Location

M. McGinnis, 20 km north of Merredin.

Soil Type

Deep yellow loamy sand/sandy loam, very acid.

Original Vegetation

3-4 m tall - Acacia sp., Grevillea sp., Hakea sp.

ESTABLISHMENT RATE (JUNE 27, 1984 - DAY 33)

CROP	g/1000 SEED	% NORMAL SEEDLINGS (1)	PLANT DENSITY	
			MILLIONS/HA	% ESTABLISHED (2)
Wheat	27.4	97	1.02	58
Oats	38.1	98	0.90	70
Triticale	38.3	94	0.96	65
Cereal Rye	19.0	89	1.40	50
Lupins	164.0	86	0.43	82

(1) Department of Agriculture seed testing laboratories.

(2) Percentage established = number of plants established as a percentage of number of seeds sown, adjusted for dead seed or seed likely to produce unhealthy seedlings.

DRY MATTER PRODUCTION AND GRAIN YIELD

CROP	kg AGRAN /ha	kg/ha					GRAIN
		JUL 10 (DAY 47)	JUL 30 (DAY 67)	AUG 20 (DAY 88)	SEP 18 (DAY 117)	HARV. DM.	
<u>Lupins</u>							
	0	80	161	357	609	809	191
<u>Wheat</u>							
	0	-	-	-	492	976	290
	50	61	144	307	(950)*	893	229
	100	-	-	506	819	1160	319
	450	-	-	-	-	1265	270
	450+100	81	188	-	1030	1401	295
<u>Oats</u>							
	0	-	-	-	(710)	1123	233
	50	-	-	-	-	-	416
	100	-	-	831	858	1395	433
	450	-	-	-	-	-	456
	450+100	-	-	-	-	1940	430
<u>Triticale</u>							
	0	-	-	-	1080	1417	319
	500	116	300	600	(1247)	2086	487
	100	-	-	847	1640	2048	650
	450	-	-	-	-	(2731)	755
	450+100	95	550	-	2110	2614	722
<u>Cereal Rye</u>							
	0	-	-	-	2070	2089	378
	50	-	-	-	-	-	414
	100	-	-	1284	2890	2940	520
	450	-	-	-	-	-	439
	450+100	-	-	-	3290	3407	489

* Data in brackets - 1 rep only. Others - means of 3 reps.

NITROGEN CONCENTRATION AND UPTAKE

CROP	kg AGRAN /ha	kg N/ha (% N IN DRY MATTER)		
		JUL 10 (DAY 47)	JUL 30 (DAY 67)	AUG 20 (DAY 88)
<u>Lupins</u>	0	2.8 (3.48)	5.9 (3.64)	12.1 (3.40)
<u>Wheat</u>	0	-	-	-
	50	3.0 (4.89)	5.4 (3.77)	8.2 (2.26)
	100	-	-	10.9 (2.15)
	450 + 100	5.10 (6.18)	8.9 (4.75)	-
<u>Oats</u>	0	-	-	-
	100	-	-	16.0 (1.93)
	450 + 100	-	-	-
<u>Triticale</u>	0	-	-	-
	50	5.3 (4.55)	9.3 (3.11)	13.4 (2.23)
	100	-	-	17.2 (2.03)
	450	-	-	-
	450 + 100	6.3 (6.57)	31.3 (5.69)	-
<u>Cereal Rye</u>	0	-	-	-
	100	-	-	23.6 (1.84)
	450 + 100	-	-	-

ROOTING DEPTH (cm)*

CROP	kg AGRAN /ha	JUL 10 (DAY 47)	JUL 30 (DAY 67)	AUG 20 (DAY 88)	SEP 18 (DAY 117)
<u>Lupins</u>	0	33	40	67	96
<u>Wheat</u>	0	-	-	-	67
	50	37	43	57	-
	100	-	-	67	73
	450	-	-	-	-
	450 + 100	33	33	-	67
<u>Oats</u>	0	-	-	-	-
	100	-	-	77	70
	450 + 100	-	-	-	-
<u>Triticale</u>	0	-	-	-	97
	50	43	53	63	-
	100	-	-	67	73
	450	-	-	-	-
	450 + 100	30	53	-	87
<u>Cereal Rye</u>	0	-	-	-	103
	100	-	-	80	116
	450 + 100	-	-	-	103

*Maximum depth that roots were found in four 6 cm diameter cores in each plot. Mean of 3 reps.

Comments

Applying Nitrogen did not overcome the yield advantage that Aluminium tolerant species have on acid, eastern wheatbelt sandplain soils.

84ME51/4231EX

Interaction between phosphorus supply and crop acid tolerance on a wodjil soil.

Site

Adjacent to 84ME50.

Operations

18/5/84 2 L Sprayseed/ha.
 25/5/84 Sown in one operation with cone seeder to Wheat (50 kg West/ha), Triticale (60 kg Tyalla/ha), Cereal Rye (60 kg South Australian Commercial/ha), and Lupins (100 kg Yandee/ha) drilled with the appropriate rate of Super Cu Zn Mo and topdressed with Agran (400 kg/ha).
 31/7/84 200 g Na₂MoO₄/ha sprayed across all plots in 50 L water/ha.

CROP	kg SUPER /ha	MILLIONS PLANTS /ha	DECEMBER PRODUCTION (kg/ha)	
			BIOMASS	GRAIN
<u>Wheat</u>	NIL	0.886	968	124
	50	0.886	1394	201
	150	0.964	1362	187
	450	-	1419	133
	1250	0.714	1336	100
<u>Oats</u>	NIL	0.849	1025	100
	50	-	1336	117
	150	0.806	1898	239
	450	-	1958	174
<u>Triticale</u>	1250	0.632	1745	178
	NIL	0.825	1250	195
	50	-	1798	351
	150	0.877	2583	504
<u>Cereal Rye</u>	450	-	2936	717
	1250	0.672	3111	711
	NIL	1.206	1400	103
	50	-	2263	210
<u>Lupins</u>	150	1.390	2858	344
	450	-	3529	437
	1250	0.950	3209	430
	NIL	0.370	581	128
	50	0.362	654	144
	150	0.409	903	197
	450	0.416	1474	325
	1250	0.324	1781	438
LSD (p<0.05)		0.17	396	94

84ME52/4231EX

Growth of crops varying in aluminium tolerance on a non-acid eastern wheatbelt sandplain soil.

Location

N. Butler, 21 km west of Bruce Rock on Quairading road.

Soil Type

Deep yellow loamy sand, approximately pH 6.

Original Vegetation

Small Banksia prionotes trees (to 5 m) native pear bushes (to 3 m).

Operations

25/5/84 1.5 L Roundup/ha.
6/6/84 1.5 L Simazine/ha on lupin plots.
7/6/84 400 kg Super Cu Zn Mo topdressed across site.
Sown in one operation with cone seeder to Barley (50 kg Clipper/ha), Wheat (50 kg Gamenya/ha), Oats (50 kg West/ha), Triticale (60 kg Tyalla/ha), Cereal Rye (60 kg South Australian Commercial/ha) and Lupins (100 kg Yandee/ha) drilled with 200 kg plain Super/ha and topdressed with 400 kg Agran/ha (cereals only).

ESTABLISHMENT RATE (JULY 12, 1984 - DAY 35)

CROP	g/1000 SEED	PLANT DENSITY	
		MILLIONS/ha	% ESTABLISHED(*)
Barley	36.3	0.92	72
Wheat	27.4	1.06	60
Oats	38.1	0.98	77
Triticale	38.3	0.89	60
Cereal Rye	19.0	1.43	51
Lupins	164.0	0.42	81

* % established = number of plants established as a percentage of number predicted from seeding rate, 1000 seed weight and % of seeds which produced healthy seedlings in a W.A. Department of Agriculture Seed Testing Laboratories test.

DRY MATTER PRODUCTION AND GRAIN YIELD

CROP	kg/ha				
	JUL 23 (DAY 47)	AUG 13 (DAY 68)	SEP 3 (DAY 89)	HARV. DM.	GRAIN
Lupins	83	169	433	2790	420
Barley	204	654	1325	5410	1300
Wheat	151	744	1906	6340	1660
Oats	195	748	1902	4660	1160
Triticale	167	672	1801	5340	1390
Cereal Rye	284	1430	4064	7990	740
LSD (p<0.05)				1990	140

NITROGEN CONCENTRATION AND UPTAKE

CROP	kg N/ha (% N IN DRY MATTER)		
	JUL 23 (DAY 47)	AUG 13 (DAY 68)	SEP 3 (DAY 89)
Lupins	3.6 (4.28)	5.4 (3.22)	19.5 (4.50)
Barley	11.7 (5.74)	29.7 (4.54)	38.8 (2.93)
Wheat	9.3 (6.14)	35.0 (4.70)	54.9 (2.88)
Oats	11.3 (5.79)	32.6 (4.36)	39.9 (2.10)
Triticale	10.8 (6.47)	32.8 (4.88)	52.5 (2.92)
Cereal Rye	16.4 (5.77)	59.5 (4.16)	79.6 (1.96)

ROOTING DEPTH (cm) *

CROP	JUL 23 (DAY 47)	AUG 13 (DAY 68)	SEP 3 (DAY 89)
Lupins	57	77	90
Barley	57	93	103
Wheat	43	77	97
Oats	50	83	77
Triticale	53	83	83
Cereal Rye	53	90	123

*Maximum rooting depth at which roots were found in four 6 cm diameter cores in each plot. Mean of 3 reps.