Local Research and Development Results

February 2011

2011

LIEBE GROUP

Working together in Agriculture

Dear Liebe Group Members and Supporters,

It is with great pleasure that we present to you the Liebe Group Local Research and Development results book for 2011. This book contains results from research and development conducted in the Coorow, Dalwallinu, Perenjori and Wongan-Ballidu shires from the 2010 season. The book also outlines current Liebe Group projects to keep you updated with the interesting work that is going on in the district. Due to unavoidable circumstances, there are some results that are not available at the time of printing, these will be published in subsequent Liebe Group newsletters.

Many thanks must go to the researchers, agribusiness organisations and growers who have cooperated to conduct valuable local research and development. We thank you for the opportunity to present these results in our 2011 book.

Also we would like to remind you that many trial results will be reviewed at the **2011 Trials Review Day on the 14th February** at the Wubin Sports Club and the **2011 Liebe Group Crop Updates on the 2nd March** at the Buntine Hall**.** We invite you to bring this book along to these days so you can follow the trials and ask questions regarding any results you may have found interesting.

Please interpret the results in this book carefully. Decisions should not be based on one season's data and please contact the Liebe office if you have any further queries.

Throughout the book our major financial sponsors are promoted. All of our sponsors and supporters play a vital role in ensuring the continued success of the Liebe Group. We acknowledge the invaluable support we receive from the Grains Research and Development Corporation (GRDC), the Department of Agriculture and Food WA (DAFWA), the Department of Agriculture, Fisheries and Forestry (DAFF), Rabobank, CSBP, COGGO, the Farm Weekly, the Grower Group Alliance and many others.

All the best for the 2011 season and let's hope it brings plenty of rain!

Kind regards,

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The Liebe Group would like to thank the following organisations for their invaluable support:

- Grains Research and Development Corporation (GRDC)
- Department of Agriculture and Food WA
- Department of Agriculture, Fisheries and Forestry – Caring for Our Country
- Department of Agriculture, Fisheries and Forestry – FarmReady
- University of Western Australia
- CSIRO
- Farm Weekly
- Shire of Dalwallinu
- Future Farm Industries CRC
- Grower Group Alliance
- Northern Agricultural Catchments Council

LONG TERM RESEARCH SITE SUPPORTERS

GRDC Grains Research & Development Corporation

The Liebe Group would like to acknowledge and thank all the sponsors and contributors to the Long Term Research site for 2010. Without the generous support and assistance from supporters and contributors the management of this unique site would not be possible.

The following is a list of people/organisations the Liebe Group would like to thank:

- **Grains Research and Development Corporation (GRDC)**
- **DAFWA -** Technical advice throughout the year and harvesting of the soil biology trial.
- **The University of Western Australia -** For technical assistance.
- **CBH Group -** Grain sampling and analysis.
- **CSBP labs -** Analysing soil samples.
- **Elders - Scholz Rural Supplies -** Chemical donations for the 63ha site and agronomic advice throughout the season.
- **CSIRO -** For providing and maintaining the weather station, classifying soils and technical advice.
- **Stuart McAlpine and staff -** For seeding and harvesting the crop, agronomic assistance and monitoring the site throughout the season.
- **Michael Dodd and staff -** For use of his machinery, agronomic assistance, spraying and monitoring of the site throughout the season.
- **Syngenta -** Chemical donations for the 63ha site.
- **Bayer CropScience** - Chemical donations for the 63ha site.
- **Summit Fertilizers -** Fertiliser donation for the 63ha site.
- **Wesfarmers Federation Insurance –** Donation of crop insurance.

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Understanding Trail Results and Statistics

We have tried to present all trial results in one format throughout this results book. However, due to differences in trial designs, this isn't always possible. The following explanations and definitions should provide you with sufficient statistical understanding to get the most from the trial results.

Mean
The results of replicated trials are often presented as the average (or mean) of all replicates for each treatment. Statistics are used to determine if the difference between means is a result of treatment or natural variability (i.e. soil type).

Significant Difference
In nearly all trial work there will be some difference between treatments, i.e. one rate of fertiliser will result in a higher yield than another. Statistics are used to determine if the difference is a result of treatment or some other factor (i.e. soil type). If there is a significant difference then there is a very strong chance the difference in yield is due to treatments, not some other factor. The level of significance can also play a role. If it says P<0.05% there is a greater than 95% guarantee that a difference is a result of treatment and not some other factor.

The LSD test
To determine if there is a significant difference between two or more treatments a least significant difference (LSD) is often used. If there is a significant difference between two treatments their difference will be greater than the LSD. For example when comparing the yield of five wheat varieties (table 1), the difference in yield between variety 4 and 5 is greater than 0.6 t/ha (LSD), therefore it can be said there is a significant difference. This means it is 95% (P=0.05) certain that the difference in yield is a result of variety not soil type or some other factor. Whilst there is a difference in yield between variety 1 and 2, it is less than 0.6, therefore it is unsure if the difference is a result of variety; it may be due to subtle soil type change or other external factors. Letters are often used to indicate which varieties are significantly different, using the LSD value (table 1.), so in this example, there is no significant difference between varieties 1, 2 and 3, whereas varieties 4 and 5 are significantly different to each other and the rest of the varieties. Where the LSD result reads as 'NS' this represents that the values are not significantly different from each other.

Table 1: Yield of five wheat varieties.

Treatment	**Yield (t/ha)**
Variety1	2.1 a
Variety2	2.4 a
Variety3	2.3 a
Variety4	2.9 b
Variety5	1.3 c
LSD (P=0.05)	0.6

Non-replicated Demonstrations
This book presents the results from a range of non-replicated demonstrations. In this case we cannot say for certain if a difference is the result of treatment or some other factor. Whilst the results from demonstrations are important, they need to be interpreted carefully as they are not statistical.

Wheat National Variety Trial - Buntine

Information from Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Mike Dodd, West Buntine
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Loamy Sand
Soil pH	4.8
EC	0.0 dS/m
Sowing date	4/6/2010
Seeding rate	75 kg/ha
Fertiliser	Atlas at 100 kg/ha, Urea at 180 kg/ha
Paddock rotation	08 Lupin, 09 Canola
Herbicides, Insecticides & Fungicides	Paraquat at 2 L/ha, Diquat at 2 L/ha, Trifluralin at 2 L/ha, Chlorpyrifos at 1 L/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha, Clopyralid at 0.15 L/ha, LVE MCPA at 0.2 L/ha
Growing Season Rainfall	158mm

Results

Table 1: Yield and quality of wheat sown at Buntine.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
AGT Katana	2.85	108	76.2	12.5	9.45
Arrino	2.82	106	74.0	11.7	10.01
Binnu	2.79	105	74.6	11.3	13.5
Bullaring	2.46	93	73.4	11.3	16.05
Bumper	2.64	99	73.6	12.6	10.65
Calingiri	2.48	94	73.8	12.9	10.56
Carnamah	2.36	89	71.4	12.5	12.38
Cascades	2.34	88	73.0	12.3	9.86
Catalina	2.56	97	75.2	12.6	14.65
Clearfield Jnz	2.41	91	75.2	11.8	13.64
Clearfield Stl	2.45	92	74.0	12.6	12.84
Datatine	2.37	90	71.0	11.5	23.01
EGA Bonnie Rock	2.78	105	74.4	12.3	13.55
EGA Gregory	2.50	94	75.2	11.7	18.88
EGA Wentworth	2.08	79	70.4	12.2	20.24
Espada	2.82	106	71.2	12.7	11.91
Estoc	2.64	100	75.6	12.1	15.95
Fortune	2.71	102	72.6	12.2	11.29

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
Gladius	2.49	94	72.6	12.2	9.37
Guardian	2.85	107	74.4	11.3	16.13
King Rock	2.57	97	75.0	12.3	8.96
Kunjin	3.03	114	73.4	11.6	17.98
Mace	2.96	112	73.4	12	12.64
Magenta	2.72	103	75.0	12.3	10.64
Peake	-	-	-	-	-
Tammarin Rock	2.77	104	71.0	12.2	14.2
Wedin	2.59	98	73.0	11.5	9.62
Westonia	2.76	104	72.2	11.7	7.73
Wyalkatchem	3.00	113	73.0	12.3	9.86
Yandanooka	2.53	95	72.8	12.5	11.81
Yitpi	2.65	100	75.0	11.7	12.8
Young	2.67	101	77.0	12.1	16.13
Zippy	2.74	103	75.2	12.4	9.27
Site Mean (t/ha)	2.65				
CV (%)	3.3				
Probability	<.001				
LSD (t/ha)	0.15	6			

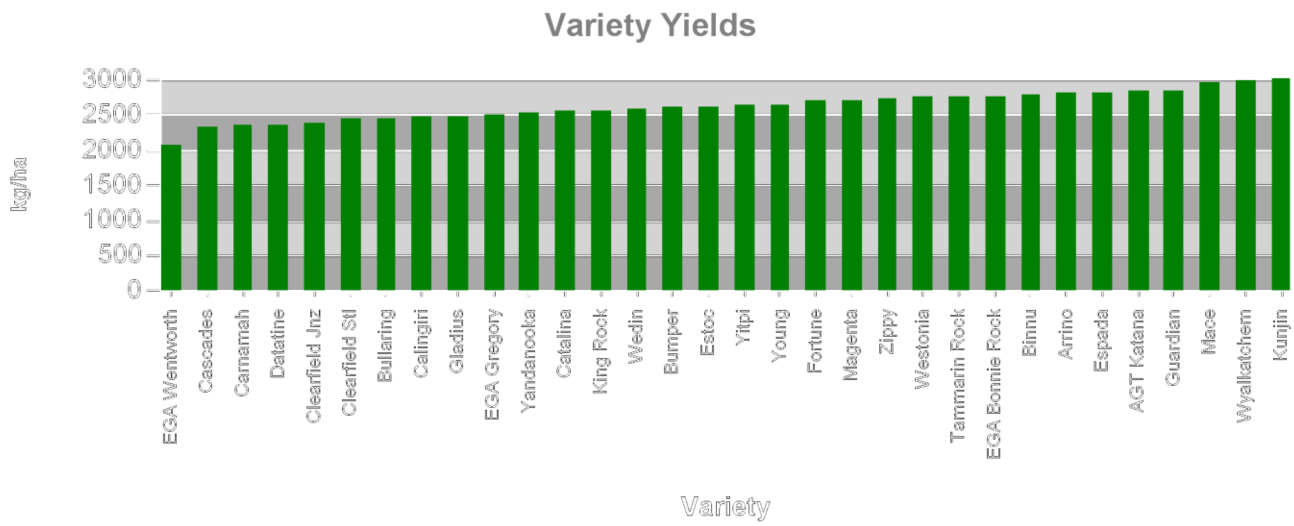

Figure 1: Yield comparisons of wheat varieties sown at Buntine

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Wheat National Variety Trial - Winchester

Information from Australian Crop Accreditation System Limited

Aim Wheat variety evaluation.

Background
NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Bruce White, Winchester
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Sandy Loam
Soil pH	5.2
EC	0.1 dS/m
Sowing date	7/6/10
Seeding rate	75 kg/ha
Fertiliser	Vigour® Special at 100 kg/ha, Urea at 170 kg/ha, Sulphate of Ammonia at 0.5 kg/ha
Paddock rotation	07 Wheat, 08 Other, 09 Wheat
Herbicides, Insecticides & Fungicides	Glyphosate at 0.9 L/ha, Trifluralin at 1.2 L/ha, Diuron at 0.3 kg/ha, Chlorpyrifos at 1 L/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha, Alpha-cypermethrin at 0.4 L/ha
Growing Season Rainfall	197mm

Results

Table 1: Yield of wheat sown at Winchester.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
AGT Katana	1.41	103
Arrino	1.64	120
Binnu	1.58	116
Bullaring	-	-
Bumper	1.34	98
Calingiri	1.10	81
Carnamah	1.38	101
Cascades	1.15	84
Catalina	-	-
Clearfield Jnz	0.93	68
Clearfield Stl	1.28	94
Datatine	-	-
EGA Bonnie Rock	1.64	120
EGA Gregory	-	-
EGA Wentworth	0.77	56
Espada	1.39	102
Estoc	1.39	102
Fortune	1.35	99
Gladius	1.30	96
Guardian	-	-
King Rock	1.50	110

Variety Name	**Yield (t/ha)**	**Percentage of site mean (%)**
Kunjin	-	-
Mace	1.66	122
Magenta	1.09	80
Peake	-	-
Tammarin Rock	1.47	108
Wedin	-	-
Westonia	1.57	115
Wyalkatchem	1.54	113
Yandanooka	1.42	104
Yitpi	1.35	99
Young	1.50	110
Zippy	1.83	134
Site Mean (t/ha)	1.36	
CV (%)	5.51	
Probability	<.001	
LSD (t/ha)	0.13	10

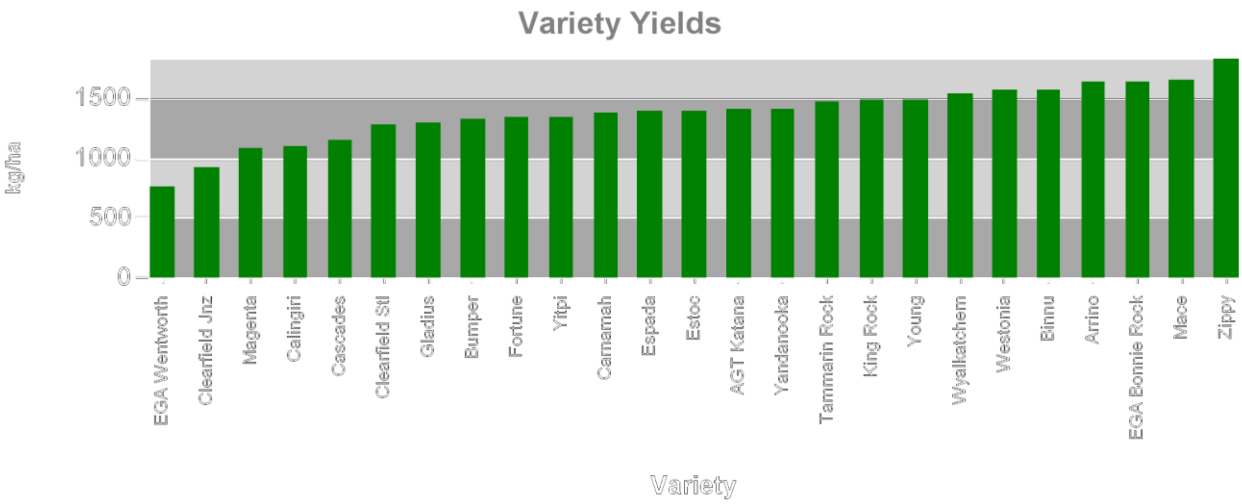

Figure 1: Yield comparisons of wheat varieties sown at Winchester

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Wheat National Variety Trial - Maya

Information from Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed
by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Red Sandy Loam
Soil pH	5.2
EC	0.05 dS/m
Sowing date	31/5/2010
Seeding rate	75 kg/ha
Fertiliser	Vigour® Special at 100 kg/ha, Urea at 100 kg/ha
Paddock rotation	08 Lupin, 09 Field Pea
Herbicides, Insecticides & Fungicides	Glyphosate at 2 L/ha, Chlorpyrifos at 1 L/ha, Trifluralin at 2 L/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha, Clopyralid at 0.12 L/ha
Growing Season Rainfall	141mm

Results

Table 1: Yield and quality of wheat sown at Maya.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
AGT Katana	1.80	106	74.4	14.6	19.84
Arrino	1.81	107	76.2	12.6	5.43
Binnu	1.85	109	72.6	12.0	20.11
Bullaring	1.73	102	70.8	12.7	20.34
Bumper	1.67	99	69.6	13.6	17.70
Calingiri	1.47	87	69.6	15.1	13.45
Carnamah	1.68	99	71.4	12.5	13.36
Cascades	1.44	85	70.6	13.4	9.18
Catalina	1.52	90	70.8	14.4	28.53
Clearfield Jnz	1.52	90	69.4	14.2	28.53
Clearfield Stl	1.59	94	71.0	13.4	19.01
Datatine	1.58	93	72.2	11.5	21.33
EGA Bonnie Rock	1.84	109	76.2	12.6	12.07
EGA Gregory	1.68	99	71.2	12.7	25.56
EGA Wentworth	1.39	82	73.2	12.7	17.21
Espada	1.87	110	71.6	12.0	9.39
Estoc	1.74	103	73.6	14.6	25.54
Fortune	1.55	92	65.4	14.3	19.27

Variety Name	**Yield (t/ha)**	**Percentage of site mean (%)**	**Hectolitre weight (kg/hectolitre)**	**Protein (%)**	**Screenings (%)**
Gladius	1.59	94	70.6	14.1	11.56
Guardian	1.82	107	75.2	11.9	19.63
King Rock	1.96	116	72.4	13.0	15.66
Kunjin	1.61	95	70.8	13.9	26.55
Mace	1.81	107	71.6	14.7	18.99
Magenta	1.51	89	69.8	14.2	22.06
Peake	-	-	-	-	-
Tammarin Rock	1.81	107	62.4	14.4	25.10
Wedin	1.46	86	70.6	13.5	18.41
Westonia	1.75	103	67.2	12.9	16.37
Wyalkatchem	1.75	103	75.8	12.7	6.12
Yandanooka	1.58	93	68.8	13.5	14.83
Yitpi	1.71	101	70.0	15.4	18.00
Young	1.82	107	71.4	13.1	28.01
Zippy	1.82	107	72.8	12.6	13.6
Site Mean (t/ha)	1.69				
CV (%)	5.90				
Probability	<.001				
LSD (t/ha)	0.18	11			

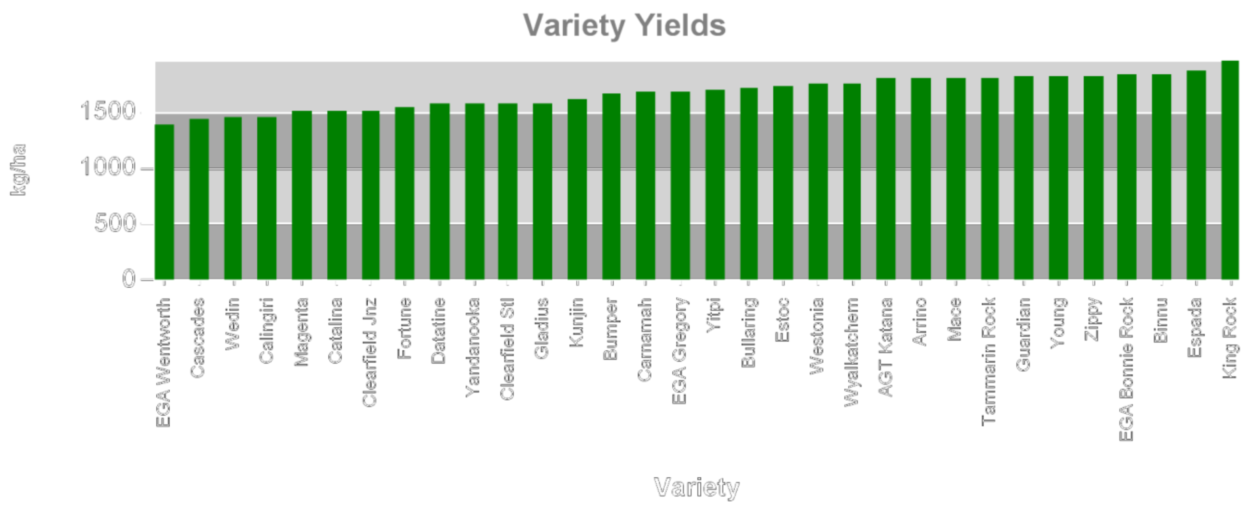

Figure 1: Yield comparisons of wheat varieties sown at Maya

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Wheat National Variety Trial - Miling

Information from Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Wade Pearson, West Miling
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Sandy Loam
Soil pH	6.3
EC	0.1 dS/m
Sowing date	2/6/2010
Seeding rate	75 kg/ha
Fertiliser	Vigour® Special at 100 kg/ha, Urea at 100 kg/ha, MAXam at 150 kg/ha
Paddock rotation	07 Grassy Pasture, 08 Wheat, 09 Grassy Pasture
Herbicides, Insecticides & Fungicides	Paraquat at 2 L/ha, Diquat at 2 L/ha, Triasulfuron at 30 g/ha, Trifluralin at 2.2 L/ha, Chlorpyrifos at 1 L/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha, Sulfosulfuron at 25 g/ha
Growing Season Rainfall	142mm

Results

Table 1: Yield and quality of wheat sown at Miling

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
AGT Katana	3.27	104	80.2	11.8	9.78
Arrino	3.24	103	76.0	11.2	6.74
Binnu	3.56	113	75.8	11.3	13.72
Bullaring	2.91	92	74.4	11.4	10.75
Bumper	3.06	97	78.4	11.0	6.07
Calingiri	3.15	100	75.8	12.1	5.49
Carnamah	3.19	101	73.4	11.6	13.08
Cascades	2.68	85	71.8	12.1	12.03
Catalina	3.00	95	78.0	11.2	11.54
Clearfield Jnz	2.85	90	76.0	11.6	12.11
Clearfield Stl	3.01	95	77.2	12.3	9.33
Datatine	2.70	86	74.0	11.8	15.81
EGA Bonnie Rock	3.31	105	77.6	11.8	8.45
EGA Gregory	3.11	99	77.0	11.3	10.05
EGA Wentworth	2.60	83	76.4	11.5	10.26
Espada	3.32	105	74.4	12.4	11.61
Estoc	3.36	107	78.4	11.8	12.84

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
Fortune	3.19	101	74.0	11.6	9.00
Gladius	2.95	94	74.4	11.9	9.68
Guardian	3.31	105	77.8	12.0	15.96
King Rock	3.25	103	77.4	12.4	11.11
Kunjin	3.46	110	76.2	10.6	10.87
Mace	3.42	109	77.2	10.9	9.95
Magenta	3.06	97	75.8	11.8	12.35
Peake	-	-	-	-	-
Tammarin Rock	3.41	108	75.0	11.6	11.28
Wedin	2.86	91	74.4	11.6	9.68
Westonia	3.31	105	76.6	10.9	8.41
Wyalkatchem	3.28	104	74.8	11.5	7.06
Yandanooka	3.18	101	72.2	12.6	11.36
Yitpi	3.09	98	73.4	11.9	13.73
Young	3.53	112	79.4	11.3	11.34
Zippy	3.42	108	77.4	11.8	9.51
Site Mean (t/ha)	3.15				
CV (%)	5.27				
Probability	<.001				
LSD (t/ha)	0.30	9			

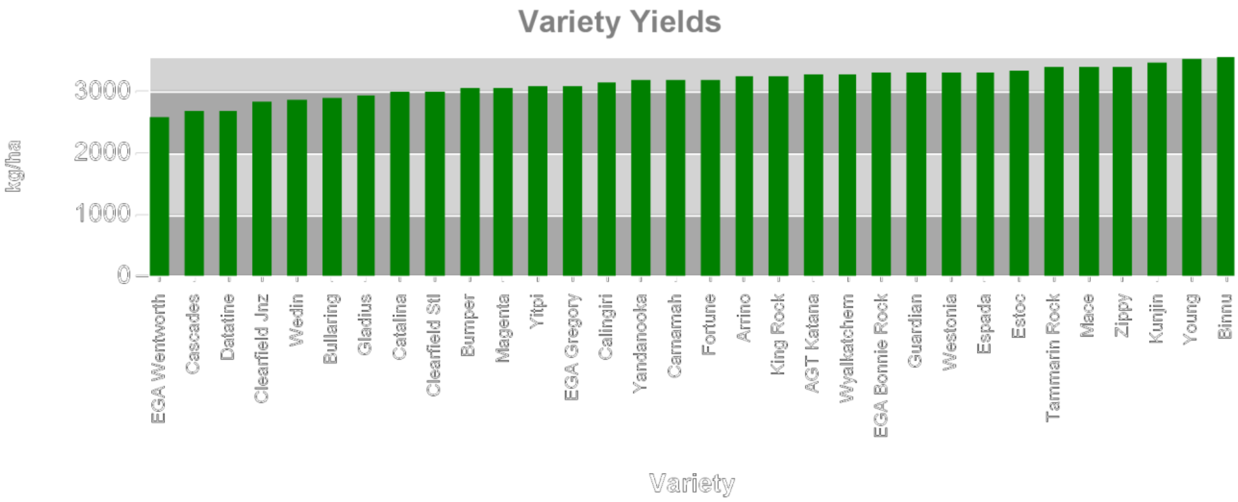

Figure 1: Yield comparisons of wheat varieties sown at Miling

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Wheat National Variety Trial – Pithara

Information from Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Gary Butcher, Pithara
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Loamy Clay
Soil pH	6.6
EC	0.1 dS/m
Sowing date	1/6/2010
Seeding rate	75 kg/ha
Fertiliser	Vigour® Special at 100 kg/ha, Urea at 100 kg/ha
Paddock rotation	08 Wheat, 09 Legume Pasture
Herbicides, Insecticides & Fungicides	Glyphosate at 2 L/ha, Chlorpyrifos at 1 L/ha, Trifluralin at 2 L/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha, MCPA Amine at 0.4 L/ha, Cloquintocet-Mexyl at 0.3 L/ha
Growing Season Rainfall	172mm

Results

Table 1: Yield and quality of wheat sown at Pithara.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (%)
AGT Katana	1.86	107	77.6	10.8	14.94
Arrino	1.84	106	77.0	9.6	6.91
Binnu	1.86	108	75.0	9.4	15.73
Bullaring	1.55	89	74.6	11.0	12.87
Bumper	1.80	104	75.2	10.4	11.01
Calingiri	1.60	92	73.8	11.3	7.98
Carnamah	1.77	102	72.2	10.6	9.97
Cascades	1.58	91	73.2	10.8	6.50
Catalina	-	-	-	-	-
Clearfield Jnz	1.60	93	78.0	9.6	9.00
Clearfield Stl	1.81	105	76.8	10.6	9.84
Datatine	1.56	90	74.4	10.4	16.69
EGA Bonnie Rock	1.77	102	76.8	10.7	9.38
EGA Gregory	-	-	-	-	-
EGA Wentworth	1.46	84	74.2	11.1	12.37
Espada	1.90	110	76.0	10.4	8.47
Estoc	1.65	95	78.2	10.7	10.92
Fortune	1.68	97	73.4	9.9	8.50
Gladius	1.74	101	76.0	10.6	7.92
Guardian	1.83	105	76.4	10.4	11.91

Variety Name	**Yield (t/ha)**	**Percentage of site mean (%)**	**Hectolitre weight (kg/hectolitre)**	**Protein (%)**	**Screenings (%)**
King Rock	1.74	101	78.0	10.6	6.92
Kunjin	1.75	101	76.4	10.5	10.47
Mace	1.86	108	80.6	9.7	6.55
Magenta	1.76	102	74.6	10.7	8.63
Peake	1.73	100	76.2	9.6	9.92
Tammarin Rock	1.87	108	75.2	9.5	9.31
Wedin	1.54	89	74.2	10.4	8.19
Westonia	1.83	106	74.2	10.8	6.15
Wyalkatchem	1.73	100	75.2	10.6	5.11
Yandanooka	1.65	95	73.0	11.2	9.42
Yitpi	1.72	99	75.4	11.1	8.73
Young	1.81	105	79.4	9.4	10.58
Zippy	1.87	108	78.4	10.3	6.25
Site Mean (t/ha)	1.73				
CV (%)	5.33				
Probability	<.001				
LSD (t/ha)	0.16	9			

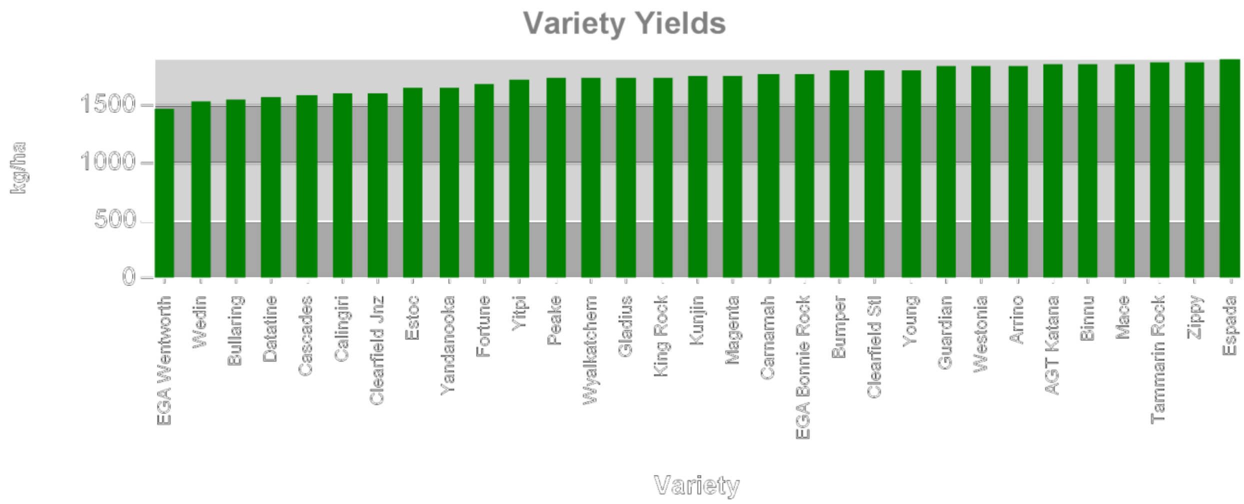

Figure 1: Yield comparisons of wheat varieties sown at Pithara

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Barley National Variety Trial - Maya

Information from Australian Crop Accreditation System Limited

Aim

Barley variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Red Sandy Loam
Soil pH	6.6
EC	0.1 dS/m
Sowing date	1/6/10
Seeding rate	75 kg/ha
Fertiliser	100 kg/ha Vigour® Special, 100 kg/ha Urea
Paddock rotation	08 Lupin, 09 Field Peas
Herbicides, Insecticides & Fungicides	Glyphosate at 2 L/ha, Trifluralin at 2.2 L/ha, Chlorpyrifos at 1 L/ha, Clopyralid at 120 g/ha, Bromoxynil at 0.8 L/ha, Pyrasulfotole at 0.8 L/ha
Growing Season Rainfall	141mm

Results

Table 1: Yield of barley sown at East Maya.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
Baudin	1.89	98
Buloke	1.80	93
Commander	1.71	88
Doolup	1.91	99
Fleet	2.06	106
Gairdner	1.87	96
Hannan	2.03	104
Hindmarsh	2.29	118
Lockyer	1.88	97
Maritime	2.22	114
Molloy	2.01	103
Mundah	2.19	113

Variety Name	**Yield (t/ha)**	**Percentage of site mean (%)**
Oxford	1.53	79
Roe	2.09	108
Scope	1.86	96
Stirling	1.91	98
Vlamingh	1.68	86
Site Mean (t/ha)	1.94	
CV (%)	9.77	
Probability	0.001	
LSD (t/ha)	0.33	17

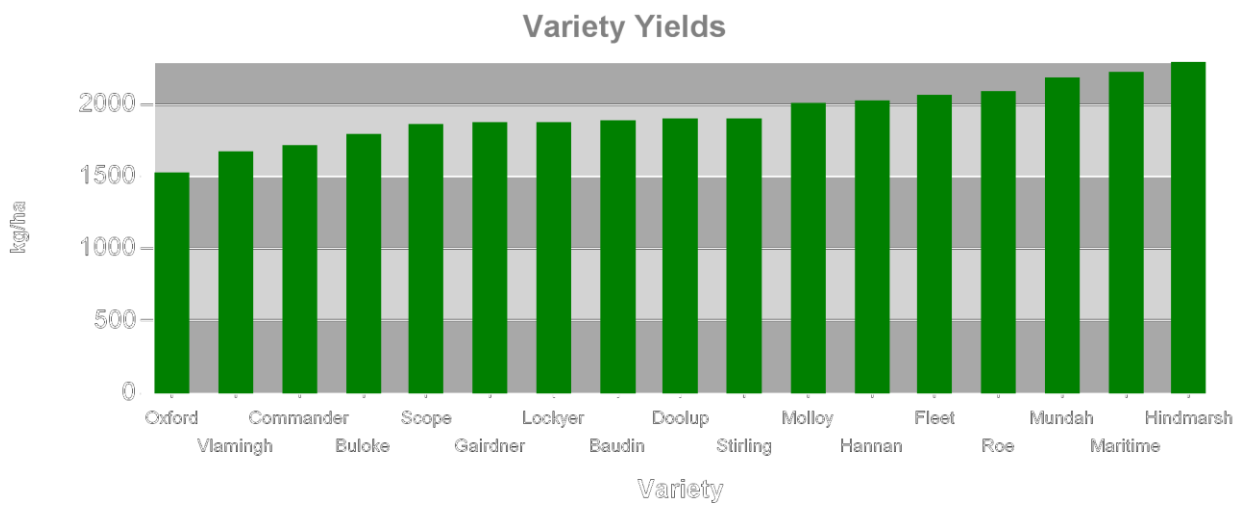

Figure 1: Yield comparisons of barley varieties sown at Maya

Comments

For more information please refer to www.nvtonline.com.au

Cereal Practice for Profit

Darcy Fleay, Research Agronomist, Kalyx Agriculture

Aim

To examine the profitability of increasing inputs for cereal varieties representing APW, noodle and hard wheat grades, as well as new malt and feed barley varieties, on a loam soil, with increasing acidity at depth.

Background

This trial was designed to investigate the response of a range of cereal types to increasing seeding rate, fertiliser including nitrogen manipulation, disease management and grass/broadleaf weed management strategies. Low, District and High management strategies that ranged in cost from $170-$345/ha were applied to each variety, and crop growth, weed counts, disease infection, crop head counts, yield, grain quality and gross margin were measured. Management practices are explained below;

Low input treatments are based on a farmer delivering grain to the bin at the lowest possible cost, regardless of seasonal conditions (approx. $170/ha).

District input is based on what is considered common farm practice for the area as determined by growers via Liebe R&D Committee (approx. $255/ha).

High input treatments simulate a paddock with high yield potential matched with increased inputs to maximise yields and profitability (approx. $345/ha).

Analysis in this report is based on estimated 2010 input prices and returns calculated from current cash grain prices.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	2.5m x 12m x 3 replications
Soil type	Loam increasing to acid at depth
Sowing date	31/5/2010
Seeding rate	As per protocol
Fertiliser (kg/ha)	As per protocol
Paddock rotation	07 Cadiz serradella, 08 Wheat, 09 Peas
Herbicides	As per protocol
Growing Season Rainfall	141mm, May-October (long term growing season average 246mm)

Treatments

Table 1. Crop Protection

No.	Date	Product	Rate		Placement
1	31/5/2010	Roundup PowerMAX® Chlorpyrifos	2 1	L/ha L/ha	knockdown IBS
2	1/9/2010	Ally® Lontrel Hasten®	4 300 1	g/ha mL/ha % v/v	post emergent (volunteer peas)

Table 2. Treatments

Input	No.	Variety	Treatment	Rate		Timing		Date
Low	1	Wyalkatchem wheat	Trifuralin	1.2	L/ha	IBS	A	31/5/2010
	4	Calingiri wheat	MAP	20	kg/ha	IBS	A	31/5/2010
	7	Tammarin Rock wheat	Seed rate	40	kg/ha	seeding	B	31/5/2010
	10	Hindmarsh barley	MCPA LVE	300	mL/ha	Z13-Z14	C	29/6/2010
	13	Buloke barley	Diuron	350	mL/ha	Z13-Z14	C	29/6/2010
			Flexi N®	30	L/ha	Z15-16	D	15/7/2010
Active	2	Wyalkatchem wheat	Trifluralin	1.5	L/ha	IBS	A	31/5/2010
	5	Calingiri wheat	Avadex	1.6	L/ha	IBS	A	31/5/2010
	8	Tammarin Rock wheat	Agstar®	80	kg/ha	IBS	A	31/5/2010
	11	Hindmarsh barley	Seed rate	60	kg/ha	seeding	B	31/5/2010
	14	Buloke barley	Paragon®	250	ml/ha	Z13	C	29/6/2010
			Flexi N®	40	L/ha	Z15-16	D	15/7/2010
			Tilt	250	mL/ha	Z30	E	31/8/2010
			Flexi N®	30	L/ha	Z37	F	31/8/2010
High	3	Wyalkatchem wheat	Boxer Gold®	2.5	L/ha	IBS	A	31/5/2010
	6	Calingiri wheat	Agstar®	120	kg/ha	IBS	A	31/5/2010
	9	Tammarin Rock wheat	Flexi N®	60	L/ha	IBS	A	31/5/2010
	12	Hindmarsh barley	Seed rate	90	Kg/ha	seeding	B	31/5/2010
	15	Buloke barley	Jockey	3	L/tonne	with seed	B	31/5/2010
			Axial®	150	ml/ha	Z12-13	C	29/6/2010
			Adigor	0.5	% v/v	Z12-13	C	29/6/2010
			Flexi N®	30	L/ha	Z15-16	D	15/7/2010
			Paragon®	400	mL/ha	Z16	D	15/7/2010
			Bromicide MA	600	ml/ha	Z16	D	15/7/2010
			Flexi N®	30	L/ha	Z37	F	31/8/2010
			Tilt	250	mL/ha	Z39	G	31/8/2010

Results

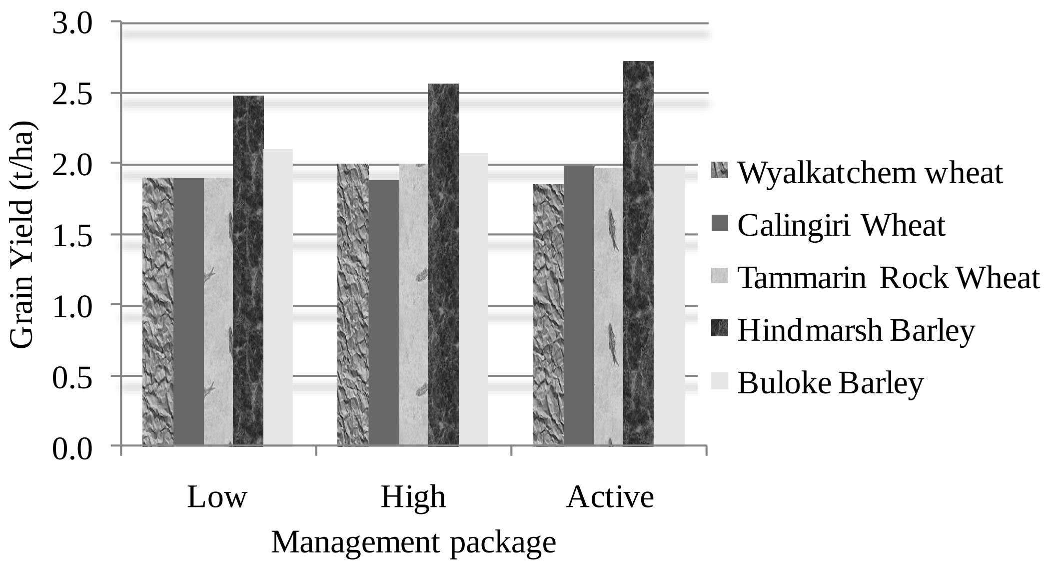

Figure 1. Yield (t/ha) for each cereal variety relative to management practice at 166 DAS (LSD =0.33 t/ha).

Table 1. Crop density (29 DA-S), Vigour (92 DA-S), Weed Counts (92 DA-S), Crop Head Number (152 DA-S), Grain Yield (166 DA-S), Quality and Gross Margin for each Crop Variety and Management Treatment.

No	Variety	Input	Crop counts #/m^2	Crop vigour 0-100	Vol. Pea counts /m^2	Crop heads #/m^2	Grain yield t/ha	Screen-ings %	Protein %	Gross Margin * $/ha
1	Wyalkatchem	Low	84 c-f	70 bcd	1.0 a	165 e	1.9 b	11.2 c	11.7 efg	156
4	Calingiri		101 bcd	67 cd	1.3 a	155 e	1.9 b	9.8 c	11.3 fg	297
7	Tammarin Rock		59 ef	60 e	1.7 a	155 e	1.9 b	15.6 c	12.5 c-f	156
10	Hindmarsh		73 def	65 de	0.7 a	325 c	2.5 a	36.4 b	10.9 g	303
13	Buloke		53 f	72 abc	1.5 a	263 d	2.1 b	61.5 a	11.8 d-g	229
2	Wyalkatchem	Active	111 a-d	72 abc	2.0 a	177 e	1.9 b	10.6 c	12.9 a-e	70
5	Calingiri		100 bcd	72 abc	2.0 a	166 e	2.0 b	10.1 c	13.1 abc	235
8	Tammarin Rock		94 b-e	65 de	0.6 a	166 e	2.0 b	12.1 c	13.0 a-d	87
11	Hindmarsh		107 bcd	77 a	0.5 a	495 a	2.7 a	32.7 b	12.7 b-e	254
14	Buloke		92 b-e	75 ab	1.3 a	376 bc	2.0 b	66.8 a	12.8 a-e	124
3	Wyalkatchem	High	113 abc	77 a	0.7 a	204 e	2.0 b	11.9 c	13.9 ab	- 23
6	Calingiri		130 ab	75 ab	0.5 a	190 e	1.9 b	13.6 c	14.0 a	- 43
9	Tammarin Rock		99 bcd	73 ab	0.5 a	192 e	2.0 b	11.7 c	13.8 ab	- 23
12	Hindmarsh		148 a	77 a	0.8 a	480 a	2.6 a	39.2 b	13.6 abc	146
15	Buloke		122 ab	73 ab	0.4 a	413 b	2.1 b	70.6 a	13.5 abc	53
LSD (P=.05)			**38.1**	**6.3**	**1.2**	**54.1**	**0.325**	**9.4**	**1.3**	
CV			**23.0**	**5.3**	**72.1**	**12.4**	**9.320**	**20.5**	**5.9**	
Treatment F			**3.717**	**5.260**	**1.676**	**43.633**	**5.804**	**47.3**	**5.0**	
Treatment Prob (F)			**0.002**	**0.000**	**0.119**	**0.000**	**0.000**	**0.000**	**0.000**	

Means followed by same letter do not significantly differ (P=.05, LSD)

* *Hectolitre weight was not measured and grain was not graded so assumptions of feed grade(screenings > 10%) and GP grade (screenings between 5-10%) were made for calculation of Gross Margin in wheat and barley was assumed to be feed.*

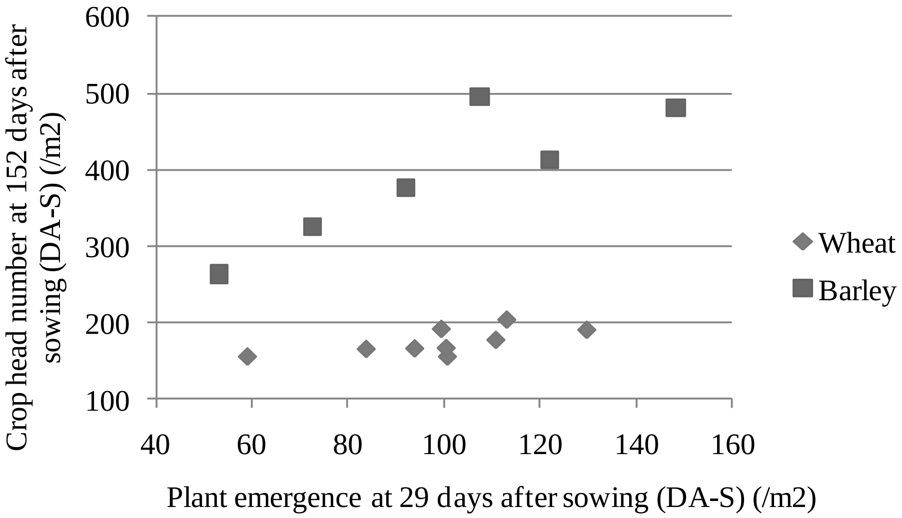

Figure 2. Relationship between head number and plant emergence.

Table 2: Factorial analysis for Crop density (29 DA-S), Vigour (92 DA-S), Weed Counts (92 DA-S), Crop Head Number (152 DA-S), Grain Yield (166 DA-S) and Grain Quality

No.	Variety	Crop counts #/m²	Crop vigour 0-100	Vol. Pea counts /m²	Crop heads #/m²	Crop yield t/ha	Screen-ings %	Protein %
TABLE OF A MEANS								
1	Wyalkatchem	102	73 a	1.2	182 c	1.9 b	11.2 c	12.8
2	Calingiri	110	71 a	1.2	171 c	1.9 b	11.2 c	12.8
3	Tammarin Rock	84	66 b	0.9	171 c	2.0 b	13.2 c	13.1
4	Hindmarsh	109	73 a	0.6	433 a	2.6 a	36.1 b	12.4
5	Buloke	89	73 a	1.1	351 b	2.1 b	66.3 a	12.7
LSD (P=.05)		**NSD**	**3.7**	**NSD**	**31.2**	**0.188**	**5.5**	**NSD**
TABLE OF B MEANS								
1	Low	74 c	67 c	1.2 a	213 b	2.1	26.9	11.6 c
2	Active	101 b	72 b	1.3 a	276 a	2.1	26.5	12.9 b
3	High	122 a	75 a	0.6 b	296 a	2.1	29.4	13.7 a
LSD (P=.05)		**17.0**	**2.8**	**0.6**	**24.2**	**NSD**	**NSD**	**0.6**

Means followed by same letter do not significantly differ (P=.05, LSD)

Comments

Increasing seed rate led to higher crop emergence with an average 122 plants /m2 under high inputs, though the higher plant number was primarily due to higher emergence in barley varieties (reflecting lighter grain). This has set the crop up for a high yield potential, but has also increased the risk of yield loss from infrequent rainfall events and drying soil early in the season. There was also increased plant vigour under the High Input strategy, but the increase was primarily a reflection of the lower vigour in Tammarin Rock under Low and Active Input. Crop head density was also highest under High Input, reflecting the higher seeding rate and crop nutrition, and was positively correlated with seedling establishment.

The greater tillering ability of barley compared to wheat was apparent, especially as seeding rate and fertiliser rate increased.

Leaf disease was low at this site with ratings at 92 DA-S indicating damage of between 0.3 and 6%. Volunteer peas were the primary weed in this trial and, whilst easily controlled with herbicide, it is still worth noting that the increased competitive ability of the High Input strategy was effective in reducing volunteer pea weed density and at the Low and Active Input treatments Hindmarsh barley tended to compete best.

Grain yield was quite high, keeping in mind the low rainfall, with wheat and Buloke barley at about 2 t/ha. The stand out performer was Hindmarsh barley at 2.5 t/ha under Low Input. Increasing inputs resulted in only a slight increase in yield and this increase under Active and High Input was at an additional cost of about $85 and $175/ha respectively. Water Use Efficiency (8.75mm summer rain contribution + season rainfall – 60mm evaporation – 0mm at season end rainfall) was similar amongst the wheat variety and Buloke barley at 22 to 24 kg/mm/ha and was much higher in Hindmarsh barley at 29 to 31 kg/mm/ha.

As expected the grain protein increased with higher inputs, including Flexi-N®, and protein ranged 13.5 to 14% under High Inputs. The high yield of Hindmarsh did not necessarily reduce grain protein, which may reflect the pea rotation. A dry May/June of 17mm and 26mm combined with the dry finish (21mm for September) resulted in wheat screenings of 9.8 to 15.6%. Seed rate and fertiliser had little effect on wheat screenings with factorial analysis showing no significant difference between the level of input and also no significant difference between wheat varieties.

Screenings were high in general and very high in Buloke with 61% recorded under Low Inputs and increasing to 71% under high nputs. Hindmarsh had significantly lower screenings compared to Buloke and overall appeared to have the best agronomic adaptation to the prevailing season. Comments on quality measurements are constrained by the lack of Hectolitre weight.

For all wheat and barley varieties the highest return was achieved in the Low Input strategy with returns ranging from $156/ha to $303/ha and averaging $228/ha. Increasing inputs of seed, fertiliser and weed control did not lead to higher yield or better quality but did lead to a decrease in gross margin; an average $74/ha under Active Inputs and $206/ha under High Inputs. In fact wheat lost the grower $23 to $43/ha under the High Input strategy. The high yield of Hindmarsh was reflected in it achieving the highest gross margin of $303/ha, under Low Input, and this was the highest return of any variety under any of the three input strategies.

An Active Management strategy, where the aim is to establish a reasonable yield potential early and then play the season with remaining inputs, has appeared to be the most reliable strategy, producing the highest, or close to the highest, margin over several years, even in the dry season of 2007. In 2009 and 2010 the District Input turned out to be high risk with losses of $60 to $246/ha in 2009 and reduced gross margins of $49 to $105/ha compared to the Low Input strategy in 2010. On the loam soil, with slightly acidic subsoil, the Low Input Practice resulted in equivalent yields to higher input strategies, but this inputs also included the benefits of a pea rotation. Too low inputs, demonstrated in earlier years that opportunities can be missed. Seasonal conditions, risk management, weed control, weed seed set and nutrient depletion strategies must be managed across, and evaluated, season by season.

It must be remembered that the Liebe Group's membership comprises a wide and varied region. This trial was conducted in a season that recorded 56% of the average growing season rainfall and late in the season the crop suffered from moisture stress. The data generated from this trial needs to be evaluated in light of the season, soil type, variety choice and inputs and compared with similar trials from previous years.

Acknowledgements
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Paper reviewed by Julie Hodge, Kalyx Agriculture.

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Wheat variety trial- response to sowing time

Christine Zaicou-Kunesch, Cereal Researcher,
Melaine Kupsch and Anne Smith, Technical Services DAFWA, Geraldton.

Aim

To support growers with agronomic decisions such as sowing time and variety selection to enhance industry profitability through improved wheat yields and grain quality.

Background

Twenty four commercially popular, recently released wheat varieties or unreleased varieties were sown at two sowing times at East Maya to provide growers with useful information to understand the impact of sowing time on the yield and quality. This trial is one of a state wide set of trials conducted by DAFWA's GRDC supported project 'Variety specific agronomy for wheat yield and quality in the Western Region'.

Trial Details

Property	Rob Nankivel, East Maya
Plot size & replication	1.54 x 18m x 3 replicates
Soil type	Red Sandy Loam
Soil pH	0-10cm: 5.2, 10cm-30cm: 4.5, 30cm-60cm: 5.2
EC	0-10cm: 0.078dS/m , 10cm-30cm: 0.036dS/m, 30cm-60cm: 0.047dS/m
Sowing date	TOS1: 25th May; TOS2: 15th June.
Seeding rate	70 kg/ha
Fertiliser	100 kg/ha Agstar Extra drilled and 80 kg/ha Urea topdressed at seeding
Paddock rotation	08 Wheat, 09 Peas
Herbicides	SpraySeed, Dominex and Talstar at seeding. Ally and Barracuda post emergent
Growing Season Rainfall	141mm

Results

Table 1: Yield and quality of wheat sown at East Maya on 25th of May and 15th of June 2010.

	Yield (t/ha)		**Protein (%)**		**Screenings (%) (inc whole and cracked grain)**		**Hectolitre Wt**	
	25-May	**15-Jun**	**25-May**	**15-Jun**	**25-May**	**15-Jun**	**25-May**	**15-Jun**
EGA Bonnie Rock	1.83	1.15	14.1	15.8	5.7	23.4	82.1	76.0
King Rock	1.82	1.34	14.0	15.0	6.0	17.5	81.4	77.1
IGW 3119	1.77	1.37	14.1	15.1	4.1	22.9	81.9	74.4
Espada	1.76	1.32	14.0	16.7	7.2	13.7	78.2	73.7
IGW 3186	1.74	1.17	14.0	15.8	4.4	23.4	82.1	74.8
Katana	1.74	1.17	15.1	16.6	5.3	23.4	82.1	76.8
Mace	1.74	1.32	14.1	15.2	4.3	25.8	79.8	75.2
Wyalkatchem	1.73	1.28	14.2	16.2	3.7	16.6	79.1	73.9
RAC 1683	1.72	1.23	13.7	16.3	6.0	18.9	76.3	71.5
IGW 3167	1.69	1.28	14.6	16.6	5.0	16.0	81.4	75.0
Westonia	1.68	1.18	14.1	15.6	6.9	12.5	77.7	73.3
Gladius	1.62	1.07	14.4	17.1	6.4	17.5	79.4	73.2
Fortune	1.59	1.06	14.9	16.2	9.9	14.0	75.6	73.5

	Yield (t/ha)		Protein (%)		Screenings (%) (inc whole and cracked grain)		Hectolitre Wt	
	25-May	15-Jun	25-May	15-Jun	25-May	15-Jun	25-May	15-Jun
Binnu	1.58	1.29	13.5	14.6	10.8	26.2	77.9	74.7
Magenta	1.56	1.08	14.2	16.6	11.0	15.5	75.8	74.6
Calingiri	1.55	1.08	14.8	16.7	11.5	9.9	75.0	75.9
Tammarin Rock	1.54	1.25	14.2	16.0	5.4	16.7	79.3	72.3
IGW 2944	1.52	1.14	15.0	17.3	9.8	14.9	74.6	71.9
Carnamah	1.51	1.08	13.8	15.9	8.6	11.1	76.1	75.1
IGW 2886	1.46	1.03	15.3	17.8	8.7	23.6	78.2	75.1
IGW 3097	1.39	1.30	15.6	15.8	2.3	13.6	81.1	74.5
Average within each TOS	1.66	1.2	14.26	16.18	6.75	18.25	78.8	74.3
TOS (lsd)	0.004	(0.12)	0.034	(0.4)	0.022	(7.5)	0.014	(2.3)
Var (lsd)	<.001	(0.13)	<.001	(0.4)	<.001	(2.7)	<.001	(1.1)
Var (lsd) between TOS	0.002	(0.19)	0.031	(0.7)	<.001	(5.8)	<.001	(2)
Var (lsd) within TOS		(0.18)		(0.6)		(3.9)		(1.6)
%CV		7.8		4.8		19.1		1.3

Comments

EGA Bonnie Rock and King Rock (1.8 t/ha) were the highest yielding varieties with screenings at 5.7 and 6% when sown on the 25th May. The next sowing opportunity was the 15th June and this delay reduced yields by 680 and 480 kg/ha for EGA Bonnie Rock and King Rock and screenings increased to 23.4 and 17.5% respectively.

Espada, Katana, Mace, Wyalkatchem and Westonia all yielded similarly to EGA Bonnie Rock and King Rock at time of sowing 1 however only Mace and Wyalkatchem had screenings of less than 5%.

In 2010, a season based on very low rainfall, the water use efficiencies of the crops which were sown on the 25th May ranged from 30 – 38 kg per millimeter of rain (Note evaporation was calculated at 2/3 of GSR). Screenings ranged from 3.7% (Wyalkatchem at 1.37 t/ha) to 11.5% (Magenta at 1.56 t/ha). Delayed seeding caused WUE to drop to 22 – 29 kg/mm of rain and screenings to increase to a range of 9.9% (Calingiri at 1.08 t/ha) to 26% (Binnu at 1.29 t/ha).

A number of unreleased cultivars were assessed at this site in 2010. The two IMI wheat varieties in the trial, AGT1683 and IGW3097, both had screenings of less than 5%. However AGT1683 yielded significantly higher than IGW3097. IGW2944 (a noodle type) yielded similarly to Calingiri. The potential APW and hard wheat varieties (IGW 3119, IGW 3186 and IGW 3167) all yielded similarly to EGA Bonnie Rock and King Rock.

Acknowledgements

The technical services team, including Melaine Kupsch and Anne Smith at DAFWA Geraldton, for excellent trial management. The Liebe Group and Rob Nankivell for access to a superb trial site and opportunities to develop the information for industry.

Paper reviewed by: Brenda Shackley DAFWA

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New Clearfield Wheat Varieties

Sally Edwards, Agronomist, Landmark

LANDMARK look to us

Aim

To evaluate two new imidazolinone tolerant wheat varieties compared to Clearfield STL, using Intervix® and Midas®.

Background

RAC1664: Testing has shown similar adaptation and yields to Wyalkatchem. Unfortunately, RAC1664 will not be released as there have been quality issues with the variety.
RAC1683: This variety is derived from the Spear and Gladius families of wheat. Testing has shown similar adaptation and yields to Gladius and Wyalkatchem. Maturity is slightly later than Wyalkatchem and earlier than Magenta.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	50m x 2m x 4 replicates
Soil type	Red Sandy Loam
Soil pH	5.2
EC	0.078 dS/m
Sowing date	25/5/2010
Seeding rate	70 kg/ha
Fertiliser	MAP at 80 kg/ha, Urea at 80 kg/ha, MOP at 20 kg/ha
Paddock rotation	08 Wheat, 09 Field Peas
Herbicides, Insecticides & Fungicides	Pre-emergent: Boxer Gold® at 2.5 L/ha 4-5 Leaf: Treatment A: 0.75 L/ha Intervix® + 1% Hasten® Treatment B: 0.9 L/ha Midas® + 1% Hasten® Early tillering: 5g Ally® + 1L Precept ®+ 150mL Prosaro® + 1% Hasten® (rates all per ha).
Growing Season Rainfall	141mm

Results

In this trial, the best performing variety was RAC 1683, however it is yet to be determined when it will be released (Table 1). There was no significant difference between Clearfield STL and RAC 1664, but RAC 1683 was significantly different to both Clearfield STL and RAC 1664 (Figure 1).

Table 1: Yield and quality of wheat sown at East Maya

Variety	Yield (t/ha)	Protein (%)	Screenings (%)
CL STL	1.28	11.2	17.08
RAC 1664	1.35	10.3	20.80
RAC 1683	1.68	11.6	9.78
LSD (5%)	0.22	ns	ns

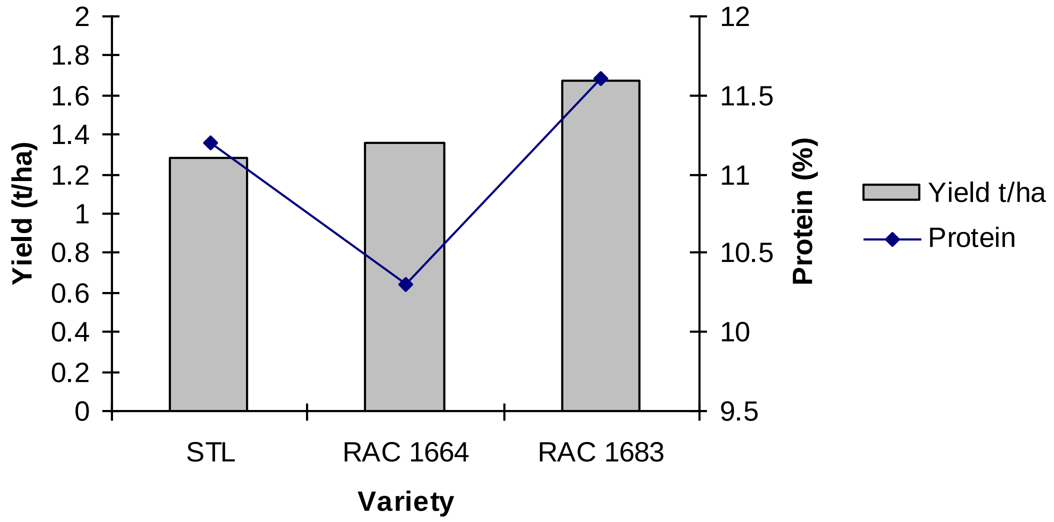

Figure 1: Yield and protein of each variety at Maya

Comments
The trial was initially seeded a little deeper than anticipated, but due to the 2010 season being dry, this modification has proved beneficial.

Due to the many consecutive frosts experienced in 2010, we were unable to get our herbicides on at the correct timings for each chemical; therefore the wild radishes were too large and robust for chemicals to work effectively.

Initially a high population of brome and barley grass was anticipated at the site, but unfortunately there were not enough plants to make an accurate assessment.

Precept® + Ally® were applied as a salvage spray to control Wild Radish however they were not controlled effectively by either Intervix® or Midas®.

Best management practices should be implemented at all times. A lethal dose of a pre-emergent herbicide, plus a full rate of the 'imi' technology post emergent will give the best results on grasses. Especially when spraying conditions are less than ideal and for resistance management.

Intervix® must be applied as early as possible for greatest efficacy on weeds; when the crop is at the 2-leaf growth stage. Both Intervix® and Midas® can be weak on Group B and I tolerant/resistant wild radish and on larger sized radish.

RAC 1683 has performed the best in this trial, and yielded significantly higher than the other two varieties.

Acknowledgements
Flora Danielzik (Liebe Group) & Nick Joyce (AGT Seeds)

Paper reviewed by Darren Chitty (Landmark)

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Assessing the Water Use Efficiencies of high and low input wheat production systems

Steve Milroy, Agronomist, CSIRO Plant Industry.

CSIRO

Aim

In this project we aim to compare the water use efficiency (WUE) and profitability of high *versus* low input cropping systems. We have established trials in collaboration with three grower groups: The Liebe Group, the Mingenew-Irwin Group and North-East Farming Futures. The exact treatments differ between the three trials based on input from the grower groups. The treatments were designed to compare logical "packages" that may include deep ripping, fertilizer application rates, sowing rate, genotype and rotation. Supplementary treatments were included to allow the effects of some of the factors to be separated.

Background

Water is the ultimate limiting resource in our dryland cropping systems and yet little is known about how effectively we can manipulate water use and productivity in cropping systems beyond just the single crop. This project is part of a suite of activities funded by the GRDC to explore how we can optimize WUE. In this project, our approach is to compare treatments with high and low input levels and to monitor summer water storage and water carry over between seasons as well as WUE of the crops in the short (two year) rotations.

Trial Details

Property	Liebe Long Term Trial Site, West Buntine
Plot size & replication	10m x 12m x 4 replicates
Soil type	Deep Yellow Sand
Soil pH (1:5 water)	5.8 (10cm); 5.8 (60cm)
EC	157 (10cm); 71 (60cm)
Sowing date	For wheat 2009: 12/6/09
Seeding rate	As per treatment
Fertiliser	As per treatment
Paddock rotation	As per treatment
Growing Season Rainfall	166mm (Buntine)

Treatments (Buntine)

The Buntine trial has eight treatments; four 'systems' and four supplementary treatments. The systems are: lupin/wheat rotation with high inputs for the wheat (ripping, high fertilizer and high plant density), canola/wheat high input, lupin/wheat low input and volunteer pasture/wheat low input. These are shown in Table 1.

Table 1: Treatments for wheat cropping systems at Buntine:

Treat No.	**Rotation crop (2008 & 2010)**	**Wheat management (2009 & 2011)**		
		Ripping	**N rate (kg/ha)**	**Sowing rate (kg/ha)**
	Monitored for water use:			
1	Lupin	Yes	60	90
2	Canola	Yes	60	90
3	Lupin	No	20	50
4	Volunteer pasture	No	20	50
	Supplementary treatments:			
5	Volunteer pasture	No	60	90
6	Lupin	No	60	90
7	Lupin	Yes	20	50
8	Canola	Yes	20	50

Results so far

Water use efficiency: The trial has been running for three seasons. In 2008 and 2010 the treatments were sown to a range of rotations. 2009 was the first season in which wheat was grown across all the treatments. The water balance for the wheat crops is presented in Table 2. Transpiration was estimated by subtracting 30% of in-season rainfall as an estimate of soil evaporation. Transpiration efficiency was then calculated as the yield divided by transpiration.

Total water use was very similar for high or low input systems and variation in transpiration efficiency was related to the yield of the different treatments. This is typical of crops in Mediterranean climates. Water use efficiency was low after the pasture, but was higher where N was supplied either as fertilizer or from the previous lupin crop.

Table 2: Water balance and water use efficiency for wheat grown under 'high' and 'low' input systems in the 2009 season at Buntine.

Rotation in 2008	**Pasture**	**Lupin**	**Canola**	**Lupin**
Wheat inputs 2009	**Low**	**High**	**High**	**Low**
Rainfall (mm)	227.0	227.0	227.0	227.0
Soil water depletion (mm)	27.3	39.9	37.1	36.9
Total water use (mm)	244.9	257.5	254.7	254.5
Yield (t/ha)	1.7	2.9	2.9	2.7
Transpiration efficiency (kg/ha/mm)	9.7	15.5	15.4	14.3

Summer fallow efficiency: Out of season rainfall was 112mm between November 2009 and June 2010. Monthly rainfall is shown in Fig 1. Fallow efficiency was 38% which contrasted to the Morawa and Mingenew trials where fallow efficiency was 0%.

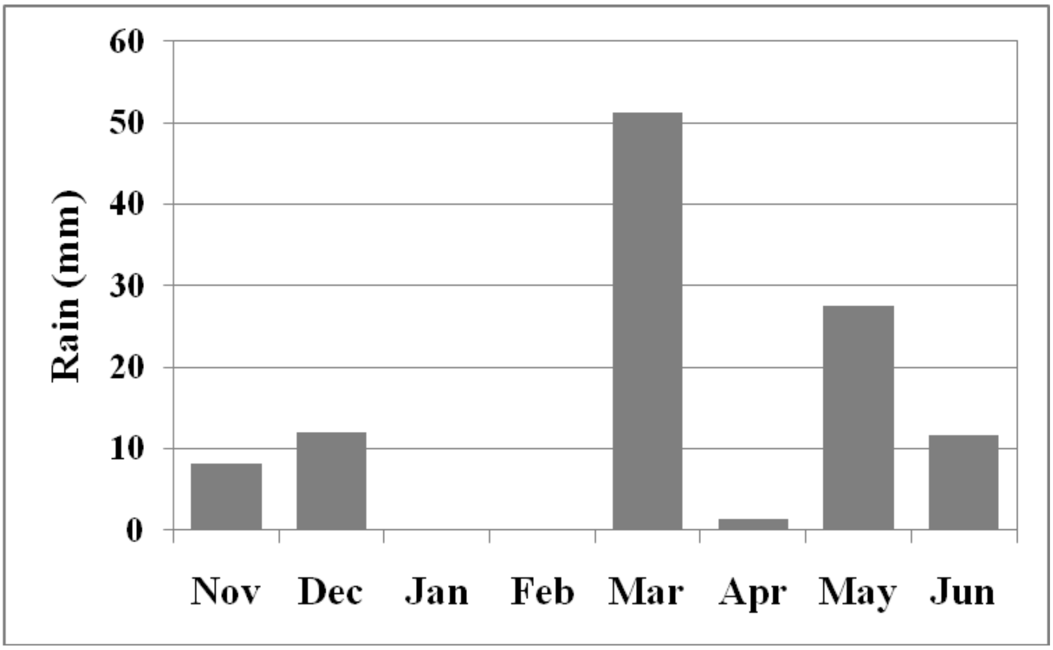

Figure 1: Out of season rainfall between the harvest (November 09) and sowing (June 10).

Comments

Crop water use in 2009 was dominated by in-season rainfall, with soil water depletion contributing 10-20% across locations and treatments. Variation between the treatments in the amount of soil water depletion was small relative to total water use, being in the vicinity of 5-10%.

Typical of Mediterranean-type climates, total water usage did not vary much between the treatments, even when deep ripping was included, with differences in WUE mainly being caused by the differences in yield.

Looking across the three sites, summer fallow efficiency did not differ between the treatments within each trial, but Buntine had an efficiency of 38% compared with 0% at Morawa and Mingenew. At the latter two sites, the rainfall was received in smaller events and was concentrated before Christmas. In addition, the soil was heavier at those sites. All these factors are known to reduce fallow efficiency.

These results are for the first cycle of the rotations. They will be supplemented with a repeated cycle and with simulation analysis to capture the year-to-year variation in rainfall patterns.

The economics of the systems will be calculated over the crop sequence.

Acknowledgements

This project was funded by GRDC and CSIRO. The generosity of the property owners and input of the grower group staff are greatly appreciated. Thanks to Kelley Whisson for critical technical support.

Paper reviewed by Phil Ward (CSIRO Plant Industry)

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LongReach Plant Breeders
Wheat Variety Trials – WA 2010

Matu Peipi & Matthew Whiting, LongReach Plant Breeders

Aim

To evaluate new wheat germplasm adapted to the main Western Australian Agricultural Zones and develop and release commercial varieties to WA farmers.

Background

LongReach Plant Breeders[1] has conducted trials in all the main production environments of the Australian wheat belt since it commenced operations in 2002. The LongReach breeding program reached full scale in 2005. Approximately 40% of the LongReach breeding investment is targeted at varieties for Western Australian growers.

In winter 2010, LongReach conducted over 25 field trials across the WA wheatbelt, with the aim of testing new germplasm at various stages of development. Nine of these trial sites were Elite line evaluations, each planted with a total of 72 entries, including LongReach wheat lines closest to release (first year NVT entries in 2010), as well as commercially available controls to enable agronomic, disease, yield and quality comparisons. This report details results for one of these trials, located at Buntine.

All of the LongReach trials are planted by independent contractors in carefully selected paddocks provided by farmer co-operators. Various assessments, including establishment, foliar disease resistance, maturity, height and lodging, were made throughout the season. Each of the trial sites has been harvested and subsequently analysed for yield and will also be tested for receival standards. Samples from each development stage will be fully evaluated against industry standards for wheat quality and suitability for classification into WA commodity grades.

Trial Details

Property	Dodd property, Buntine
Plot size & replication	10m x 3m x 3 replicates
Soil type	Brown Sandy Loam
Sowing date	3/6/10
Seeding rate	75 kg/ha
Fertiliser	3/6/10: Urea at 100 kg/ha, 3/6/10: Vigour at 100 kg/ha , 5/8/10: Urea at 80 kg/ha
Paddock rotation	08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	30/5/10: Sprayseed at 2 L/ha, 30/5/10: Trifluralin at 2.5 L/ha, 30/5/10: Chorpyriphos at 1 L/ha , 3/7/10: Velocity at 800 mL/ha, 3/7/10: Lontrel at 60 g/ha , 3/7/10: MCPA LVE at 200mL/ha, 3/7/10: Hasten at 1 %v/v, 14/7/10: Monza at 25 g/ha, 14/7/10: Hasten at 1 %v/v
Growing Season Rainfall	160mm

Results

[1] LongReach Plant Breeders is a Joint Venture between Pacific Seeds Pty Ltd and Syngenta Seeds Pty Ltd.

Table 1: Yield of wheat varieties sown at the LongReach Plant Breeders Buntine trial site (2010)

Variety	Yield (t/ha)	% of Mean	Rank
WYALKATCHEM	**3.36**	**117**	**1**
LPB08-1224	3.33	116	2
LPB08-1408	3.26	113	3
WESTONIA	**3.21**	**112**	**4**
MAGENTA	**3.20**	**111**	**5**
MACE AGT	**3.19**	**111**	**6**
LPB05-1157	3.18	110	7
LPB08-1223	3.13	109	8
EGA BONNIE ROCK	**3.11**	**108**	**9**
LPB08-1198	3.09	107	10
LPB08-1222	3.06	106	12
CALINGIRI	**3.04**	**106**	**14**
LPB08-0537	3.03	105	15
LPB08-1644	3.02	105	16
LPB07-0956	3.02	105	17
AXE	**3.01**	**105**	**18**
LPB08-0279	3.00	104	19
LPB08-1357	2.99	104	20
LPB08-1303	2.98	104	21
YITPI	**2.97**	**103**	**23**
ARRINO	**2.94**	**102**	**28**
CL-STILETTO	**2.86**	**99**	**43**
GLADIUS	**2.82**	**98**	**48**
SCOUT	**2.78**	**97**	**51**
CARNAMAH	**2.76**	**96**	**53**
MEAN GENERAL	**2.88**		
Reps w/data	3.00		
Entries w/data	72.00		
Design Used	RCB		
LSD (5%) General EE	0.52		
LSD (1%) General EE	0.68		
CV %	7.43		
Probability %	0.00		
RSQ:	0.63		
SAMPLE	**Guardian**	**Kennedy**	**Yitpi**
Test Weights	81.0	75.2	79.1
Screenings	7.8	3.0	3.5
Cracked Grain	0.9	0.5	2.1
Grain Weight	32.0	29.2	32.4
FN	391	346	371
Grain Protein	11.4	11.9	11.8

Table 1 lists the yield results of only the top ranking varieties, from the LongReach Buntine trial, including some of the new LongReach wheat lines in comparison with commercially available varieties.

Comments

The LongReach breeding objectives emphasize consistent field performance, attractive end-use quality and diverse disease resistance, and these targets are reflected in the evaluations conducted during the variety development processes. Currently the LongReach breeding pipe line carries a diverse range of materials from numerous local and international sources, including derivatives of proven WA wheat lines. The 2010 trial program will continue testing a full range of germplasm, assessing each line for a range of agronomic features and post harvest traits. Promising lines will continue to be included in the NVT network and other independent collaborative trials to enable growers and advisors to evaluate their suitability within each AgZone. LongReach Plant Breeders aim to have high quality milling wheats, with specific suitability to WA environments, available for commercial release within the next 2 years.

Acknowledgements

LongReach Plant Breeders acknowledges the assistance of numerous independent professional contract service providers, including Kalyx Agriculture for seeding and trial maintenance, and public agency researchers with the development of LongReach varieties, including LongReach Guardian. The support of farmer co-operators, in all parts of the Australian wheat belt (including Mike Dodd and family, Buntine) who have provided trial sites since 2001, has been invaluable and is acknowledged.

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Wheat Variety Demonstration

Flora Danielzik, R&D Coordinator, The Liebe Group

Aim
To determine the yield and quality performance of different wheat varieties when sown on a small paddock scale using farmer equipment.

Background
These small paddock scale demonstrations were conducted using farmer equipment. Farmer scale demonstrations are a valuable way to explore new varieties, products or practices, complementing results which are produced through more scientifically rigorous, small plot trials. The varieties tested are varieties that are widely grown in the area.

Varieties
- Calingiri: ASWN class, long maturity, intermediate tolerance to black point
- EGA Bonnie Rock: AH class, mid maturity, low screenings, useful sprouting tolerance, good black point tolerance
- Espada: APW class, mid maturity, yields comparable to Wyalkatchem, poor tolerance to black point
- Magenta: APW class, mi-long maturity, long coleoptile
- Mace: AH class, short-mid maturity, bred from cross with Wyalkatchem, superior yield and rust resistance
- Wyalkatchem: APW class, short-mid maturity, very good grain size, acid and boron tolerant (Christine Zaicou-Kunesch et al, 2010)

Trial Details - Watheroo

Property	Keamy property, Watheroo
Plot size & replication	35ha plots, non-replicated
Soil type	Sandy Gravel
Soil pH	4.4
Sowing date	20/6/10
Seeding rate	Bonnie Rock at 72 kg/ha, Wyalkatchem at 80 kg/ha
Seeding equipment	DBS-Knife point
Fertiliser	78kg K-Till Extra, 40L Flexi-N (banded), 40L Flexi-N (post-emergent)
Paddock rotation	08 Pasture, 09 Pasture
Herbicides, Insecticides & Fungicides	Glyphosate at 1 L/ha, Trifluralin at 1.5 L/ha, Flutriafol at 0.35 L/ha, Logran at 40g/ha
Growing Season Rainfall	175.2mm

Results

Table 1: Yield and quality of wheat sown at Watheroo.

Variety	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre weight (kg/hL)
Bonnie rock	1.4	12.2	4.5	80
Wyalkatchem	1.6	12.5	4	80

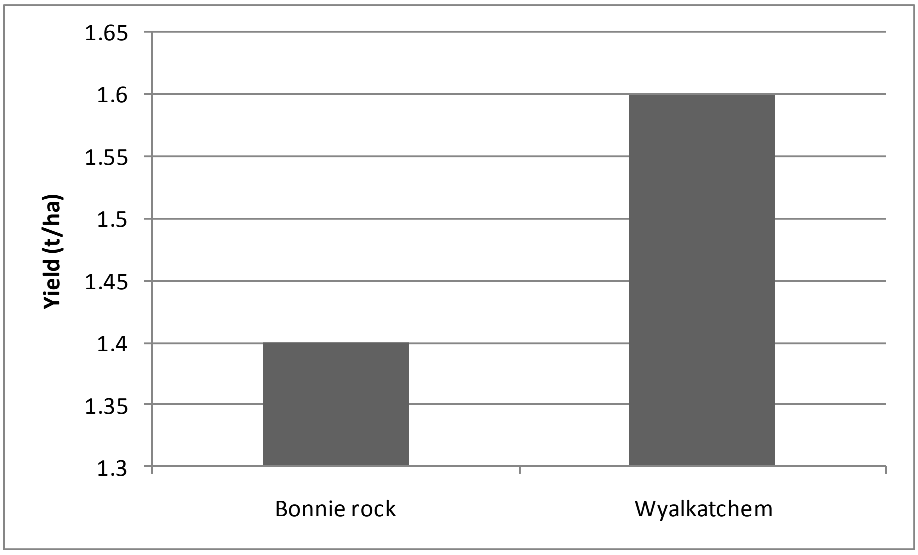

Figure 1: Yield of wheat sown at Watheroo

Trial Details – East Maya

Property	Nankivell property, East Maya
Plot size & replication	20ha plots, non-replicated
Soil type	Red Sandy Loam
Soil pH	5.2
EC	0.05 dS/m
Sowing date	27/5/10
Seeding rate	50 kg/ha
Seeding equipment	DBS – Knife point
Fertiliser	65 MAP
Paddock rotation	08 Lupins, 09 Field peas
Herbicides, Insecticides & Fungicides	Glyphosate at 1 L/ha, Trifluralin at 1.5 L/ha, Triasulfuron at 25 g/ha, MCPA LVE at 0.4 L/ha, Diflufenican at 15 ml/ha, 1% Ammoniumsulfate, 0.5% Hasten
Growing Season Rainfall	141mm

Results

Table 2: Yield and quality of wheat sown at East Maya.

Variety	Yield (t/ha)	Protein (%)	Screenings (%)
Wyalkatchem	1.5	11	4.8
Mace	1.5	10.1	8.9
Espada	2.3	10.1	4.8
Calingiri	1.5	11.1	5.8

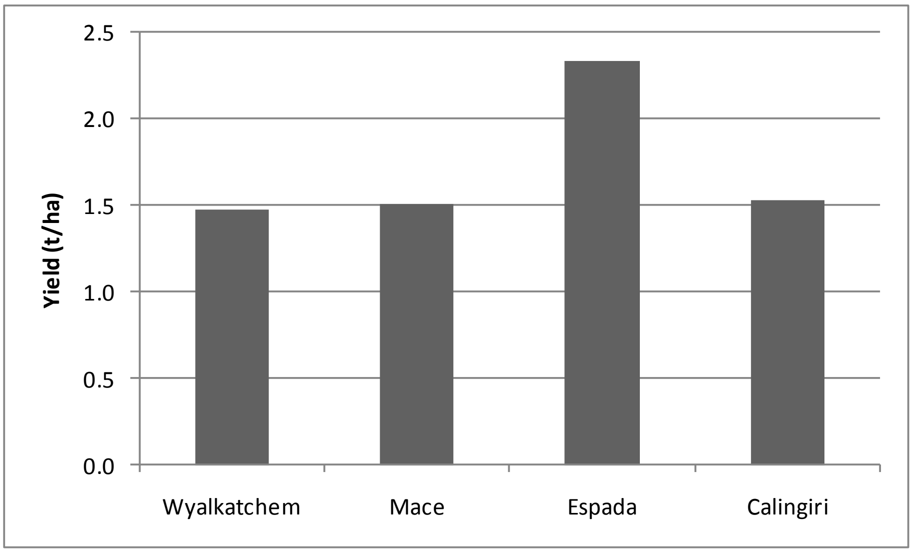

Figure 1: Yield of wheat sown at East Maya.

Trial details – West Buntine

Property	Dodd's property, West Buntine
Plot size & replication	3 ha strips, non-replicated
Soil type	Sandplain
Soil pH	5.1
Sowing date	16/5/10
Seeding rate	50 kg/ha
Fertiliser	AgStar at 80 kg/ha, MOP at 20 kg/ha, Flexi-N at 60 L/ha
Paddock rotation	07 Wheat, 08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	1.5 L/ha Treflan, 30 g/ha Logran, 0.4 L/ha Paragon
Growing Season Rainfall	160mm

Results

Table 3: Yield and screenings of wheat sown at West Buntine.

Variety	Yield (t/ha)	Screenings (%)
Mace	Magenta yielded 7 % higher than Mace	2.5
Magenta		6

Comments

Please note that Wyalkatchem at Watheroo was seeded at a higher rate than Bonnie Rock which may have influenced the yield results. The yields and quality of the varieties presented here need to be interpreted carefully. Use numerous sources of data to make decisions regarding varieties.

Acknowledgements
Thank you to Rob Nankivell for hosting and implementing the trial (along with many others!). Thank you to Alex Keamy and Michael Dodd for hosting and implementing the trials and their ability to remember all details from the top of their heads!

References

Christine Zaicou-Kunesch, Steve Penny, Brenda Shackley, Sarah Ellis, Shahajahan Miyan (2010, April). Wheat variety guide 2010 Western Australia. Retrieved January 13, 2011, from Department of Agriculture and Food, WA: http://www.agric.wa.gov.au

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Canola National Variety Trial - Miling

Information from Australian Crop Accreditation System Limited

Aim

Canola variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rod Stewart, Miling
Plot size & replication	1.76m x 12m x 3 replicates
Soil pH	5.6
EC	0.2 dS/m
Sowing date	1/6/10
Seeding rate	3.5 kg/ha
Fertiliser	MAXam at 300 kg/ha, Atlas at 100 kg/ha
Paddock rotation	08 Barley, 09 Wheat
Herbicides, Insecticides & Fungicides	Glyphosate at 1.2 L/ha, Trifluralin at 2 L/ha, Chlorpyrifos at 1 L/ha, Clethodim at 0.5 L/ha, Clopyralid at 0.3 L/ha, Glyphosate at 0.9 kg/ha, Atrazine at 2 L/ha, Imazamox 0.75 L/ha, Imazapyr at 0.75 L/ha, Diquat at 3 L/ha
Growing Season Rainfall	142mm

Results

Table 1: Yield and quality of Canola varieties sown at Miling.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Oil (%)	Protein (%)
ATR Cobbler	0.66	85	35.5	25.5
CB Eclipse RR	0.88	113	37.5	23.1
CB Jardee HT	0.61	79	34.6	26.3
CB Mallee HT	0.68	88	36.7	24.5
CB Scaddan	0.68	87	35.3	25.6
CB Tanami	0.63	81	35.2	25.2
CB Telfer	0.77	99	37.2	25.4
Fighter TT	0.44	56	34.3	26.9
GT Cougar	0.66	85	35.8	24.0
GT Mustang	0.63	81	36.2	24.5
GT Scorpion	0.63	82	34.8	24.5
GT61	0.95	123	37.4	22.2
Hyola 404RR	0.98	126	42.4	22.7
Hyola 502RR	0.86	111	39.0	24.0
Hyola 505RR	0.99	128	41.2	24.4

Variety Name	**Yield (t/ha)**	**Percentage of site mean (%)**	**Oil (%)**	**Protein (%)**
Hyola 571CL	0.85	109	39.0	24.6
Hyola 575CL	0.81	105	39.4	23.9
Pioneer 44Y84	1.00	130	41.0	22.7
Pioneer 45Y82	0.91	117	35.5	25.5
Pioneer 46Y20	0.79	102	40.1	24.3
Tawriffic TT	0.66	85	38.9	24.6
Site Mean (t/ha)	0.78			
CV (%)	8.21			
Probability	<.001			
LSD (t/ha)	0.11	14		

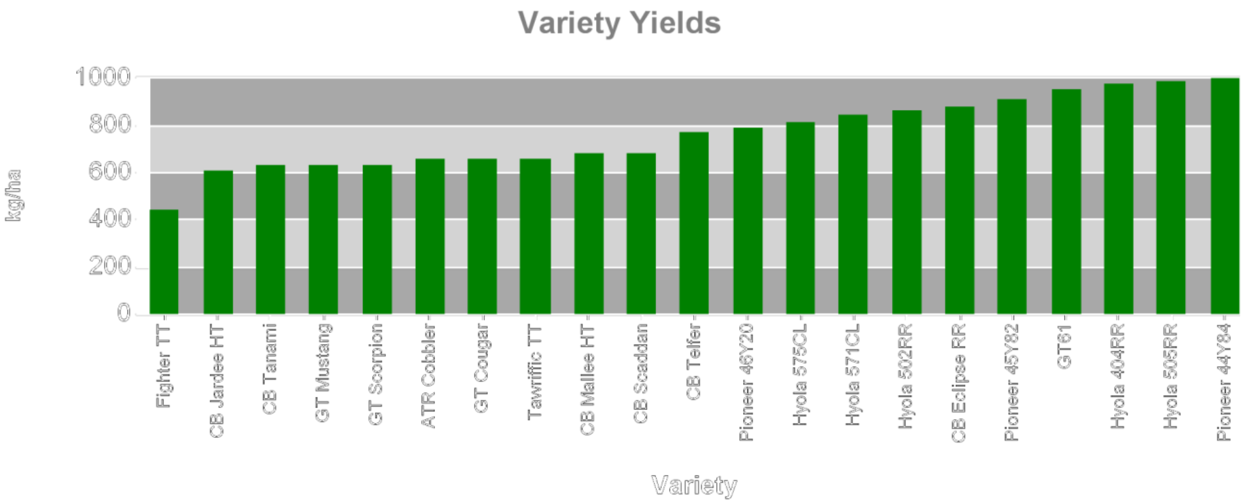

Figure 1: Yield comparison of canola varieties sown at Miling.

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Canola National Variety Trial - Eneabba

Information from Australian Crop Accreditation System Limited

Aim

Canola variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Nick Ashby, South Eneabba
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Loamy Sand
Soil pH	4.6
EC	0.1 dS/m
Sowing date	14/5/10
Seeding rate	3.5 kg/ha
Fertiliser	MAXam at 150 kg/ha, Atlas at 100 kg/ha, Urea at 100 kg/ha
Paddock rotation	07 Grassy Pasture, 08 Canola, 09 Wheat
Herbicides, Insecticides & Fungicides	Glyphosate at 1.7 L/ha, Carfentrazone-ethyl at 0.02 L/ha, Alpha-cypermethrin at 0.55 L/ha, Chlorpyrifos 1.3 L/ha, Atrazine at 4 L/ha, Paraquat at 4 L/ha, Trifluralin at 2 L/ha, Bifenthrin at 0.2 L/ha, Clethodim at 0.5 L/ha, Clopyralid 120 g/ha, Diquat at 3 L/ha
Growing Season Rainfall	331mm

Results

Table 1: Yield and quality of canola varieties sown at Eneabba.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Oil (%)	Protein (%)
ATR Cobbler	1.76	106	44.9	20.0
CB Argyle	1.38	83	44.3	21.3
CB Jardee HT	1.65	99	43.1	19.9
CB Junee HT	1.99	120	43.4	19.7
CB Mallee HT	1.77	106	43.1	19.6
CB Scaddan	1.68	101	43.1	19.9
CB Tanami	1.56	94	42.5	20.7
CB Telfer	1.62	97	46.6	19.8
CB Tumby HT	1.68	101	44.1	19.9
Fighter TT	1.43	86	42.2	22.7
Monola 76TT	1.73	104	47.4	18.7
Tawriffic TT	1.74	105	48.0	19.0
Site Mean (t/ha)	1.66			
CV (%)	2.63			
Probability	<.001			
LSD (t/ha)	0.07	4		

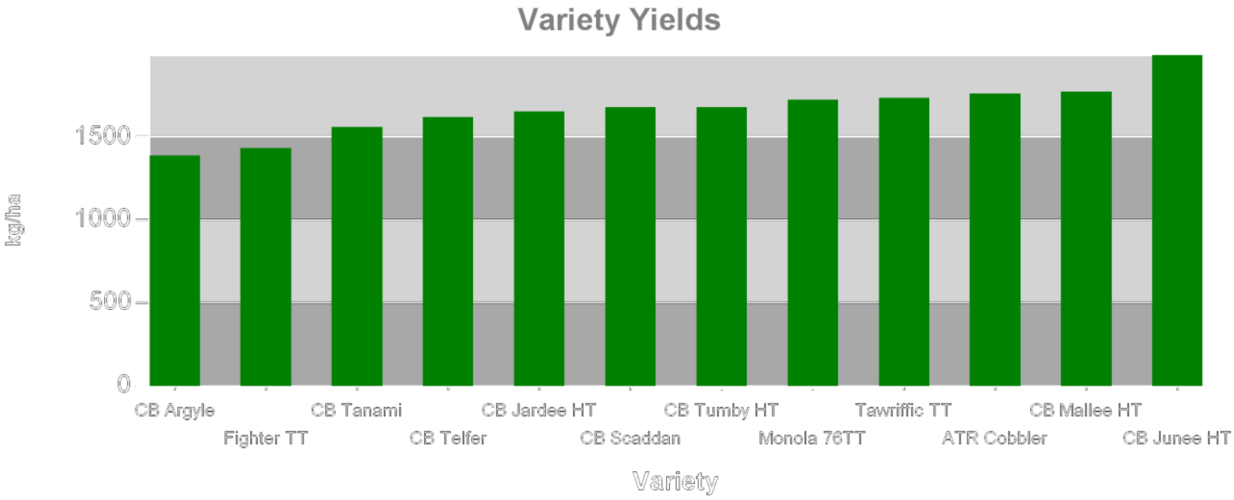

Figure 1: Yield comparisons of canola varieties sown at Eneabba

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

CBWA Canola Varieties (TT)

Jack Ellice-Flint, Agronomist, Elders – Scholz Rural

Aim
To compare hybrid performance to the standard Open-Pollinated Triazine-Tolerant varieties.

Background
Traditional Open-Pollinated (OP) varieties have traditionally performed well in the Dalwallinu area, but with the growing trend in Southern areas toward hybrid varieties for their early vigour and yield boost, we established a trial to evaluate the technology.

Trial Details

Property	G & H Pearse, West Wubin
Plot size & replication	20m x 6 replicates
Soil type	Sandy Loam
Soil pH	5.7
Sowing date	19/5/2010
Seeding rate	3 kg/ha
Fertiliser	Mallee at 100 kg/ha, NS31 at 100 kg/ha
Paddock rotation	08 Canola, 09 Wheat
Herbicides	1 L/ha Glyphosate, 1.1 kg/ha Atrazine, 1.7 L/ha Trifluralin, 500 ml/ha Clethodim
Growing Season Rainfall	165mm

Results

The hybrids did not match the standard OP's for yield in this trial (Table 1). Throughout the season the hybrids looked impressive and showed some promise, but with the lack of a late rainfall, they failed to finish strongly and therefore the yields suffered.

Table 1: Yield & Economic Analysis of Canola grown at West Wubin.

Variety	Yield (t/ha)	Gross Return ($/ha)	Variable Costs ($/ha)	Gross Margin ($/ha)
Tanami	0.73	447.49	170.00	277.49
Telfer	0.45	275.85	170.00	105.85
Tumby (Hybrid)	0.33	202.29	184.00	18.29
Mallee (Hybrid)	0.30	183.90	184.00	-0.10

Based on Cash Price for 24/12/10 CA-NGMCANOLA NON GM Base Price $613/tonne

Comments
The economic analysis says it all. The hybrids failed to produce in this trial. It is fair to say that the weather conditions played a large part in the outcome. If we had a late rain it may have been a completely different story. Yet, even in a year like this, they did exhibit exceptional vigour and plant height over the OP's and this was without any extra inputs (i.e. more N). Hybrid TTs warrant further investigation in this environment as this is only one year's data.

Acknowledgements
Thank you to Graham and Jeff Pearse for the use of their land and assistance throughout the year and Canola Breeders WA for the seed.

Paper reviewed by David Scholz, Elders

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Field pea National Variety Trial - Maya

Information from Australian Crop Accreditation System Limited

Aim

Field pea variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Red Loam
Soil pH	7.3
EC	0.121 dS/m
Sowing date	24/5/2010
Fertiliser	DAP at 80 kg/ha
Paddock rotation	08 Wheat, 09 Wheat
Herbicides, Insecticides & Fungicides	Imazethapyr at 0.15 kg/ha, Bifenthrin at 0.2 L/ha, Alpha-cypermethrin at 0.1 L/ha, Trifluralin at 1.5 L/ha, Cyanazine at 2 L/ha, Clethodim at 0.5 L/ha, Hasten at 0.1 L/ha
Growing Season Rainfall	141mm

Results

Table 1: Yield of field peas sown at East Maya.

Variety Name	Yield (t/ha)
Helena	0.93
Parafield	0.80
OZP0804	0.96
Yarrum	0.73
Kaspa	1.05
OZP0703	0.87
PBA Twilight	1.22
OZP0820	0.71
Dunwa	0.88
OZP0801	1.32
PBA Gunyah	1.15
OZP0805	1.18
Site Mean (t/ha)	0.98
CV (%)	9.61
Probability	<.001
LSD (t/ha)	0.15

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Chickpea National Variety Trial - Maya

Information from Australian Crop Accreditation System Limited

Aim

Chickpea variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Nankivell property, East Maya
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Red Loam
Soil pH	7.3
EC	0.121 dS/m
Sowing date	24/5/10
Fertiliser	DAP at 80 kg/ha
Paddock rotation	08 Wheat, 09 Wheat
Herbicides, Insecticides & Fungicides	Trifluralin at 1.5 L/ha, Balance at 0.1 kg/ha, Talstar at 0.2 L/ha, Dominex at 0.1 L/ha, Simazine at 2 L/ha, Select at 0.5 L/ha
Growing Season Rainfall	141mm

Results

Table 1: Yield of chickpea varieties sown at East Maya.

Variety Name	Yield (t/ha)	Variety Name	Yield (t/ha)
WACPE2239	0.32	WACPE2219	0.74
WACPE2217	0.54	WACPE2210	0.73
WACPE2233	0.46	WACPE2214	0.65
Sonali	0.85	Genesis 510	0.54
WACPE2160	0.57	WACPE2227	0.56
PBA HatTrick	0.63	CICA0604	0.44
WACPE2225	0.62	WACPE2228	0.43
CICA0603	0.81	WACPE2223	0.52
WACPE2229	0.47	WACPE2218	0.54
WACPE2216	0.60	WACPE2215	0.54
Genesis 090	0.47	WACPE2155	0.74
WACPE2198	0.51	WACPE2237	0.54
WACPE2213	0.70	WACPE2224	0.66
CICA0819	0.64	PBA Slasher	0.62
WACPE2232	0.54	WACPE2221	0.45
Filler	0.77	WACPE2211	0.72
WACPE2136	0.48	WACPE2226	0.35

Variety Name	Yield (t/ha)	Variety Name	Yield (t/ha)
WACPE2231	0.52	WACPE2152	0.51
Genesis 079	0.55	WACPE2222	0.51
WACPE2212	0.76	WACPE2196	0.69
WACPE2199	0.61	CICA0717	0.57
Genesis 836	0.51	WACPE2220	0.49
WACPE2201	0.55	**Site Mean (t/ha)**	0.58
WACPE2240	0.45	**CV (%)**	11.41
WACPE2236	0.47	**Probability**	<.001
WACPE2203	0.71	**LSD (t/ha)**	0.12

Comments

For more information please refer to www.nvtonline.com.au

NVT results will be presented at the Liebe Group Updates on the 2nd of March 2011.

Lupin National Variety Trial - Maya

Information from Australian Crop Accreditation System Limited

Aim

Lupin variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	1.76m x 12m x 3 replicates
Soil type	Red Loam
Soil pH	7.3
EC	0.121 dS/m
Sowing date	28/4/10
Fertiliser	100 kg/ha Superphos
Paddock rotation	08 Wheat, 09 Wheat
Herbicides, Insecticides & Fungicides	2 L/ha Simazine, 1.5 L/ha Glyphosate; 0.2 L/ha Talstar, 0.1 L/ha, Dominex 0.5 L/ha Select
Growing Season Rainfall	141mm

Results

Table 1: Yield of lupin varieties sown at East Maya.

Variety Name	Yield (t/ha)	Variety Name	Yield (t/ha)
WALAN2364	0.62	Danja	0.50
Tanjil	0.41	WALAN2365	0.56
WALAN2375	0.62	Mandelup	0.55
WALAN2362	0.61	WALAN2395	0.72
WALAN2388	0.60	WALAN2336	0.93
WALAN2333	0.65	WALAN2386	0.66
Jenabillup	0.59	WALAN2397	0.60
Filler	0.36	WALAN2289	0.53
WALAN2369	0.63	WALAN2357	0.69
WALAN2398	0.63	WALAN2390	0.58
WALAN2376	0.56	WALAN2325	0.40
WALAN2358	0.41	WALAN2393	0.80
Quilinock	0.44	WALAN2334	0.84
Coromup	0.58	WALAN2274	0.61
WALAN2373	0.49	**Site Mean (t/ha)**	0.59
WALAN2387	0.64	**CV (%)**	15.33
WALAN2337	0.52	**Probability**	<.001
WALAN2323	0.59	**LSD (t/ha)**	0.15
WALAN2328	0.46		

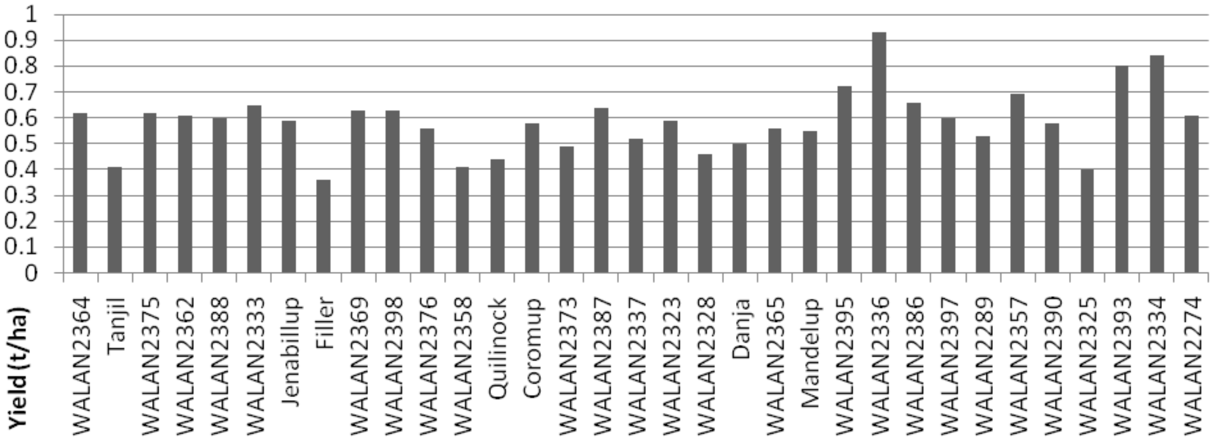

Figure 1: Yield of lupin varieties sown at East Maya.

Comments

For more information please refer to www.nvtonline.com.au

Summer sowing: Alternative technique to introduce legumes into pastures

Angelo Loi & Bradley Nutt, Research Officers, Department of Agriculture and Food Western Australia

Aim

To compare two methods for the establishment of pasture legumes; summer sowing – hard-seed is spread into the paddock after the crop is harvested; and traditional sowing in autumn/winter using scarified seed.

Background

Summer sowing is a technique that is being evaluated as a means to introduce legume species into pastures. This method utilises in the first instance legume seed dormancy to prevent undesirable germination and secondly the breakdown of this dormancy to provide an adequate number of germinating seed under favourable conditions. It is being developed to enable a cost effective and convenient means to improve pasture production and quality using low cost seed produced on farm. Summer sowing requires a sowing operation in the summer following crop harvesting. The pasture legume will establish as regenerating pasture making full use of the growing season. This technique has the potential to reduce the cost of the pasture legume establishment, particularly for species such as serradella where seed processing to enhance germination is difficult and costly.

The results of this trial are those from the Mingenew-Irwin Group trial site, South of Mingenew. This trial was replicated at the Liebe Group Main Trial Site, however dry conditions at this site in 2010 meant limited pasture growth and measurements were not taken.

Trial Details

Property	Mingenew-Irwin Group Main Trial Site, Arrino
Plot size & replication:	50m x 5m x 3 replicates
Seeding date:	2/2/2010, 1/6/2010
Seeding rate:	50 kg/ha of pods (summer sowing) and 10kg/ha of seed (normal sowing)
Fertiliser:	120 kg/ha Super/Potash (3:1), 10 kg/ha Alosca
Herbicides:	1 L/ha of Kerb as post-sowing-pre-emergence (2/6/10)

Treatments

Table 1: Treatments.

	Species	Sowing Time
1	Unsown	Summer
2	French Serradella Margurita	Autumn
3	Yellow Serradella	Summer
4	Yellow Serradella	Autumn
5	French Serradella Margurita	Summer
6	Subclover	Autumn

Results

Table 2: Plant densities.

	Species	Treatment	Plants/m^2
1	French serradella Margurita	Normal sowing	126
2	French serradella Margurita	Summer sowing	341
3	Yellow serradella	Normal sowing	150
4	Yellow serradella	Summer sowing	280
5	Subclover	Normal sowing	120

Table 3: Mean dry matter (DM) of plots measured in winter and at peak biomass in spring.

	Species	Treatment	DM (t/ha) 3/9/2010	DM (t/ha) 23/9/2010
1	French serradella Margurita	Normal sowing	0.5	0.9
2	French serradella Margurita	Summer sowing	1.0	1.3
3	Yellow serradella	Normal sowing	0.4	1.0
4	Yellow serradella	Summer sowing	0.4	1.2
5	Unsown	Normal sowing	0.2	0.3

Comments

Normally forage legumes are sown after the main cropping program is completed and require the application of a pre-sowing knockdown herbicide to control established weeds. This treatment seriously reduces early winter pasture production which is then compounded by the slow growth rate of legumes under the cold winter conditions.

This effect was clearly shown by the summer sowing plots of French Serradella which, in middle of winter, achieved a double amount of DM compared to the normal sown plots.

This technique could be applied to a number of scenarios and be more effective than the traditional winter sowing. In particular, it will offer early winter grazing in a mixed enterprise farm and will lift the legume component in a pasture with a low legume base due to drought and/or intensive cropping.

On a crop dominant farm, it could also be used to produce high legume content hay for brown manuring and thereby maximise the organic matter and nitrogen input to the soil either with or without grazing.

Summer sowing reduces establishment cost by minimising seed processing, particularly in the case of Serradella, where seed extraction is difficult and expensive, and sowing does not require a pre-sowing application of herbicide.

Sowing hard-seed in summer creates the right environment for hard-seed breakdown over time, so an increasing pool of seed is created that can germinate under moist conditions. Although some seed may establish on early autumn rainfall, there will be further breakdown of hard-seed to create a back up if there is insufficient follow up rains for plant survival. However success of the system is reliant on achieving the greatest amount of hard-seed breakdown during autumn.

The French Serradella cultivar and a pre-commercial ecotype of Yellow Serradella, appeared to do this in these experiments.

Time of sowing experiments suggests planting as late as the middle of March could provide sufficient breakdown of hard-seed for effective establishment of hard seed of French Serradella and the particular ecotype of Yellow Serradella.

With the right cultivars and on-farm seed production, annual forage legumes can be used to enhance the legume content of a pasture phase by summer sowing of hard-seed.

Acknowledgements
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Paper reviewed by Janette Drew, DAFWA

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Evaluating methods of inoculating dry sown pasture legumes

Dr. Ron Yates, Department of Agriculture and Food ,WA (DAFWA) and Centre for *Rhizobium* Studies (Murdoch University)

Department of Agriculture and Food

Aim

It is very important that pasture legumes be inoculated with the correct rhizobia strain (or Group) for maximum nitrogen fixation. Native or soil-borne strains of rhizobia are sometimes present, but they are generally poor at fixing nitrogen on pasture legumes compared with specialised commercial strains of rhizobia. This trial investigated the efficiencies of three commercially available inoculant carriers (peat-slurry, attapulgite-clay granules and bentonite-clay granules) to provide commercial strains of rhizobia to three pasture legumes (*Biserrula*, Serradella and Clover) when sown before the break into dry soils. It presents a challenging scenario as the dry soil presents many deleterious factors that kill the live bacteria, particularly high soil temperatures. *Biserrula* is specifically important in this trial as there are no native or background rhizobia to nodulate the plant in this paddock and thus is a true indicator of the efficiencies of each inoculant carrier.

Background

Pasture legumes form a symbiotic (mutually beneficial) association with specific soil bacteria (rhizobia) to meet their complete nitrogen requirements. Nodules develop on the plant roots and house millions of rhizobia that convert nitrogen from the air into a form the plant can use (in a process known as nitrogen fixation). The association between the host plant and its rhizobia is very specific. Pasture legumes must be inoculated with the correct rhizobia strain (or Group) for maximum nitrogen fixation. Inoculants come in four different carriers: (a) peat; (b) freeze dried powders; (c) granular; and (d) a pre-coated seed form, with inoculum as part of the pellet.

All forms of inoculant carry live cells of rhizobia and must be stored correctly to preserve high numbers. The shelf life of these products varies from several weeks in the case of some pre-coated seeds to three years for the freeze dried powder. The cost of inoculation can vary from $5–25/ha depending on the product. Peat-slurry is the cheapest form of inoculation to purchase but there are additional costs in time and labour to consider. The more expensive options can be easier to use and offer greater flexibility for sowing operations.

Trial Details

Property	Nankivell property, East Maya
Plot size & replication	1m x 0.25m x 4 replicates
Soil type	Yellow-Brown Sandy Loam
Soil pH	5.0
EC	0.033 dS/m
Sowing date	30/3/2010 and 3/6/2010
Seeding rate	Serradella at 50 kg/ha, Bladder clover at 30 kg/ha, *Biserrula* (Casbah) at 30 kg/ha
Fertiliser	Super/ Potash (3:1) at 120 kg/ha (at sowing), Super/ Potash (3:2) at 60 kg/ha (spring)
Paddock rotation	09 Lupins, 10 Wheat
Herbicides	3/6/2010 (new sowing) Glyphosate at 1.5 L/ha
Insecticide	3/6/2010 Talstar at 0.08 L/ha
Growing Season Rainfall	141mm

Results

The dry sown (30/03/2010) *Biserrula* (cv. Casbah) and Bladder clover (cv. Bartolo) plants were sampled (whole plants removed and root systems were carefully washed) on the 20/8/2010. As the *Biserrula* plants did not nodulate with the native or soil-borne strains of rhizobia (background) they were measured for the percentage of plants nodulated and the amount of nodules on each plant (Table 1). However this was not the case for the clover plots, where the plants were nodulated by the background rhizobia. Hence the nodules were collected from each plant and the strain of bacteria in the nodule was identified by fingerprint profiling using polymerase chain reaction (PCR) (Table 2). Nodule occupancies on the Serradella nodules are still being processed.

Table 1: Percentage of *Biserrula* plants nodulated and number of nodules per plant after being supplied with no or 3 different methods of inoculant when dry sown with uninoculated seed on the 30/3/2010.

DRY SOWN *Biserrula*		
Inoculant Method	**% of plants nodulated**	**No of nodules per plant**
no inoculant	1% (n=74)	0.04
peat slurry	7% (n=123)	0.29
Attapulgite-clay granules	18% (n=108)	1.00
Bentonite-clay granules	48% (n=83)	2.70

Table 2: Percentage of nodules from clover plants containing the commercial inoculant after being supplied with no or 3 different methods of inoculant when dry sown with uninoculated seed on the 30/3/2010.

DRY SOWN Bladder Clover	
Inoculant Method	**% of Nodules with Commercial Inoculant**
no inoculant	33% (n=14)
peat slurry	83% (n=18)
Attapulgite-clay granules	87.5% (n=17)
Bentonite-clay granules	100% (n=16)

Comments

The seed and inoculant carriers sown on the 30/03/2010 had 54 days of dry soil conditions (a significant rainfall of 7mm on the 23/05/2010) which was ideal for the trial. However, the lack of rainfall thereafter made it difficult to gather complete sets of data, particularly dry matter yields, with plants displaying very low growth. However, with what data was collected, the results indicated that the clay granular inoculant appears to be providing superior nodulation when dry sowing pasture legumes in comparison to the traditional peat slurry inoculation. This may be because the clay granules are air dried before sale and the rhizobia are stabilized within the dry granules. It was notable that the clover strain WSM1325 was identified in the plots that were not inoculated and had began to colonise the site, a characteristic that the strain was originally selected for. Farmers should be made aware that all commercial inoculant strains in Australia go through an exhaustive selection process that can take 10 years, which not only involves selecting strains for high nitrogen fixation and acid tolerance, but the ability to persistence and colonise or spread in WA soils.

Please take note that this is preliminary data for the project with more information to be gathered and processed before conclusive results are released for recommendations. This trial is one of many sown to different areas and soils in the state this year and additional trials will be required in following years to extensively evaluate the efficiencies of the inoculant products for dry sowing.

Acknowledgements
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Paper reviewed by Prof. John Howieson (Murdoch University)

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Field evaluation of Tedera (*Bituminaria bituminosa* var. *albomarginata*) for low rainfall areas of southern Australia

Dr. Daniel Real, Senior Plant Breeder, Future Farm Industries CRC
Department of Agriculture and Food Western Australia

Aim

To evaluate the potential of Tedera (*Bituminaria bituminosa* var. *albomarginata*) as a prospective new perennial legume for the cereal / livestock zone of southern Australia.

Background and Methods

Tedera is a perennial forage legume native to Lanzarote, Canary Islands Spain. Lanzarote Island has a Mediterranean climate with an annual rainfall that varies from 150mm to 300mm, and 3 to 5 months with almost no rainfall. This species was sown at the Liebe Group Long Term Research Site in 2006, 2007, 2008 and 2009. The 2006 trial consisted of 225 plants corresponding to 15 plant origins and the main purpose was to explore the adaptation of this novel species to the climate and soil. The 2007 trial evaluated the capacity of the species (9 accessions) to establish from seed and survive the first summer. Both of these trials were funded by the Salinity Co-operative Research Centre (CRC), (now Future Farm Industries CRC). The research program was expanded in 2008.

A spaced plant nursery of 1900 plants was transplanted to select the best individuals for breeding purposes. Another trial sown with seed in 1m rows, contrasts the performance of Tedera with several other new perennial legume species. These two trials are funded by the Future Farm Industries CRC. A third trial funded by the Rural Industries Research and Development Corporation (RIRDC)has been designed to test the productivity of Tedera and the native forage legume *Cullen australasicum* at five sowing densities (1, 2, 4, 8 or 16 plants /m^2) and four cutting regimes (1, 2, 3 or 4 cuts per year). The set of trials sown in 2008 have also been replicated at Merredin and Newdegate. In 2009, a new spaced plant nursery of 1000 plants was transplanted, in which we are evaluating 34 accessions of Tedera that includes the latest germplasm collection conducted in the Canary Islands in June 2008.

No trials were sown in 2010 in this site, however trials sown since 2006 have been continued and were all evaluated during 2010.

Results and Comments

Tedera has again performed very well in one of the driest years on record at Buntine. Final selections from the spaced plant nurseries sown in 2006, 2008 and 2009 will be conducted in April/May 2011 and selected plants will be used as parents in the tedera crossing/breeding program.

On the 8th October during the field day at the Long Term Research Site, the following three photos were taken during that day and they show the ability of the species to cope with dry conditions.

Figure 1. During field day (8th October) **Figure 2.** Spaced plant of tedera

Figure 3. 1m row sown by seed in 2008

Results for all these trials will be published in 2011.

Acknowledgements
The author would like to acknowledge the group of researchers involved in these set of trials (DAFWA- Daniel Kidd and Clinton Revell; UWA – Megan Ryan and Lalith Suriyagoda. I would also like to thank the Liebe Group and in particular Stuart McAlpine for the collaboration with this research work and the FFI CRC and RIRDC for research funding.

Paper reviewed by Dr Clinton Revell, DAFWA

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Perennial Pasture Demonstration

Flora Danielzik, R&D Coordinator, The Liebe Group

Aim

To evaluate new fodder shrubs on poor performing areas.

Background

Enrich is a project based out of SARDI which is exploring multipurpose healthy grazing systems using perennial shrubs. The Enrich perennial pastures trial is exploring the general performance of a range of fodder shrubs at the Liebe Groups' Long Term Research Site. The trial aims to assess this performance on a soil type gradient from poor shallow gravel, through to good sandy loam. The plots were replicated four times with two replicates on the good soil and two on the poor soil.

Trial Details

Property	Long Term Research Site, West Buntine
Plot size & replication	36 shrubs (6 x 6) per plot x 4 replicates
Soil type	Shallow Gravel – Sandy Loam Gradient
Soil pH	6
EC	0.02 dS/m
Sowing date	2/7/2009
Fertiliser	None
Paddock rotation	06 Lupins, 07 Wheat, 08 Wheat
Herbicides	None
Growing Season Rainfall	158mm

Results

Table 1. Mean and average survival percentage of the perennial species grown at the Liebe long term research site west of Buntine. Percentages are the mean of four replicates ± standard error.

Species	**Mean no of plants surviving / plot of 24 plants**	**Survival (%)**	**Standard error ± (plants)**
Atriplex nummularia (Old man saltbush)	19	79.2	2.3
Atriplex rhagodioides (Silver saltbush)	18.5	77.1	1.0
Rhagodia parabolica (Mealy saltbush)	18.25	76.0	2.5
Rhagodia spinescens (Thorny saltbush)	17	70.8	2.4
Enchylaena tomentosa (Ruby saltbush)	16.25	67.7	2.7
Atriplex amnicola (River saltbush)	15.5	64.6	2.1
Rhagodia preissii (Saltbush)	12.5	52.1	5.3
Atriplex semibaccata (Creeping saltbush)	11.75	49.0	4.5
Chenopodium nitrariaceum (Nitre goosefoot)	10.25	42.7	4.9
Acacia saligna (Golden wreath wattle)	3.75	15.6	2.6
Rhagodia crassifolia (Fleshy saltbush)	3.5	14.6	2.2
Medicago strasseri (Tree medic)	0.5	2.1	0.3
Eremophila glabra (Tar bush)	0.5	2.1	0.5
Chameacytisis prolifer (Tagasaste)	0	0.0	0.0
Convulvulus remotes (Australian bindweed)	0	0.0	0.0

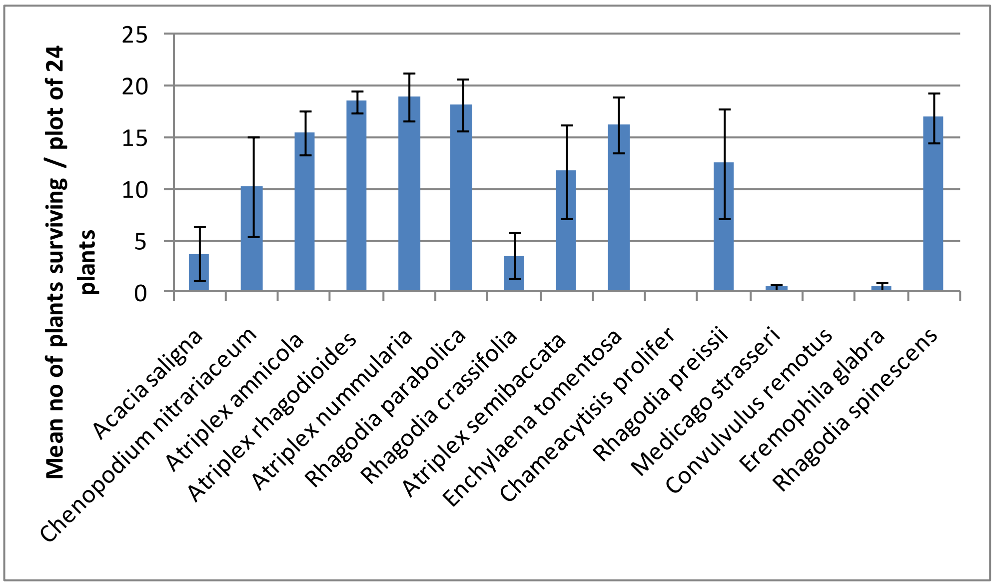

Figure 1. Mean number of plants surviving per plot of 24 plants of the perennial species grown at the Liebe long term research site west of Buntine and standard error.

Comments

Atriplex nummularia (Old man saltbush, 79.2% survival), *Atriplex rhagodioides* (Silver saltbush, 77.1% survival), and *Rhagodia parabolica* (Mealy saltbush, 76% survival) are the species with the highest survival rates.

Weed control was poor with wild radish competing strongly with the perennials for moisture.

The trial will continue next year with more results becoming available during this time, including palability, feed value and persistence.

Acknowledgements

Jason Emms, SARDI, for organising the freight of the plants to Buntine.

Paper reviewed by Chris O'Callaghan, Liebe Group

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N x seeding rate in Wheat

James Easton, Field Research Manager, CSBP

Aim

To determine the response to different Flexi-N strategies and seeding rates on wheat.

Background

One of the major aims of canopy management is to avoid excessively thick early season crops in order to preserve soil moisture until grain fill. Recommended strategies include; reduced seeding rates and delaying nitrogen (N) applications. A trial at Xantippe in the dry year of 2007 indicated that seeding rates had a bigger effect on soil moisture reserves than N timing (or rates). Last year at Pithara, there was a trend towards slightly higher yields at higher seeding rates (80 kg/ha v 40 kg/ha), but no effect of N timing. This trial continues CSBP's research into the relevance of canopy management strategies (i.e. seed rate and delay of N application) in the North Eastern wheatbelt.

Trial Details

Property:	Rob Nankivell, East Maya
Plot size & replication:	20m x 2.5m x 3 replicates
Soil type:	Red Clay Loam
Soil pH:	5.4 (0-10cm); 4.5 (10-20cm).
EC:	0.05 dS/m
Sowing date:	27/5/10
Seeding rate:	42 and 80 kg/ha Mace
Fertiliser:	Agstar + Flexi-N®70 kg/ha (treatments)
Paddock rotation:	07 Wheat, 08 Field Peas, 09 Wheat
Herbicides:	Treflan and Powermax
Growing Season Rainfall:	141mm

Results

Table 1: Yield, quality and grade of wheat sown at East Maya.

	Treatment						Harvest				
Trt	Seed (kg/ha)	Banded (L/ha)	Banded (kg/ha)	Z23 (L/ha)	N	P	Yield (t/ha)	Protein (%)	HL wt. (kg/HL)	Screens (%)	Grade
1	42	-	70 Agstar	-	10	10	1.18	12.8	78	6.3	ASW
2	42	50 FN	70 Agstar	-	31	10	1.16	12.6	74	9.2	ASW
3	42	-	70 Agstar	50 FN	31	10	1.19	13.0	75	7.7	ASW
4	42	50 FN	70 Agstar	50 FN	52	10	1.16	13.3	74	9.2	ASW
5	80	-	70 Agstar	-	10	10	1.15	11.0	77	6.4	ASW
6	80	50 FN	70 Agstar	-	31	10	1.14	14.1	77	7.3	ASW
7	80	-	70 Agstar	50 FN	31	10	1.14	13.1	76	6.7	ASW
8	80	50 FN	70 Agstar	50 FN	52	10	1.11	14.1	75	7.5	ASW
						Prob	0.84	0.96	0.045	0.09	
						Lsd	ns	ns	2.4	ns	

Economic Analysis

Nitrogen applications were unprofitable due to the dry season and limited yield potential. Economic comparisons between treatments are not valid because yield differences were not significant.

Residual N value can be expected in 2011 if the treatments are recropped.

Comments
Drought limited yields to 1.1 to 1.2 t/ha. Not surprisingly, there was no response to supplementary N and the lower seed rate of 42 kg/ha was sufficient to satisfy yield potential.

NUlogic models suggested that there was sufficient soil N to support a crop with 1.5 t/ha yield potential. There was no yield benefit from delaying N until early tillering compared to banding at seeding.

The main reason to delay N applications is not for 'canopy management' but to manage the risk of not getting a profitable response. Fortunately, there is often significant N carryover following a dry year.

The case for delaying N applications needs to be weighed up against the research which has shown more efficient recovery from banded applications – in responsive paddocks.

Soil testing is critical for understanding the need for N and whether applications at seeding are likely to be worthwhile.

Acknowledgements
Rob Nankivell; Ryan Guthrie and Rowan Maddern (CSBP Agricultural Officers).

Paper reviewed by Andreas Neuhaus, CSBP

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Liquid N strategies

Flora Danielzik, R&D Coordinator, Liebe Group

Aim

To evaluate the effectiveness of different, grower-chosen strategies to apply liquid Nitrogen.

Background

These demonstrations are on-farm demonstrations for the Liebe Group's FarmReady Project. The project is funded by the Federal Department of Agriculture, Fisheries and Forestry and aims to help industry and primary producers develop skills and strategies to respond to climate change.

Rising input costs and declining rainfall necessitate the constant trialing and re-evaluation of Nitrogen rates and the timing of these rates.

Three sites with annual rainfall varying from 120mm to 181mm in 2010 have been identified in Waddy Forest, West Buntine, and East Wubin.

The strategies chosen have been developed in consultation with the respective grower and demonstrate variations from the rates and timing used in each personal situation.

Varying nitrogen rates and timing is generally considered a valuable strategy in keeping flexibility in the farming system and managing climate risk. Flexible use of nitrogen allows for the farmer to 'play the season' and only apply nitrogen when the certainty surrounding rainfall in increased.

Trial Details - Waddy Forest

Property	Wade Parker, Waddy Forest
Plot size & replication	30m x 500m, non-replicated
Soil type	Sandy Loam over Gravel
Soil pH	5.0
EC	0.04 ds/m
Variety	Wyalkatchem
Sowing date	3/6/10
Seeding rate	70 kg/ha
Fertiliser	Agras Extra at 80 kg/ha at seeding, Cereal Plus 1.5 L/ha at seeding, Agriton at 0.3 L/ha at seeding, Flexi –N at 30 L/ha at seeding, Plus see treatments under results
Paddock rotation	08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	Jaguar at 0.7 L/ha Logran at 0.01 kg/ha
Growing Season Rainfall	155mm

Results

Table 1: Yield and quality of wheat sown at Waddy Forest.

Flexi-N rate (L/ha)	Yield (t/ha)	Protein (%)	Screenings (%)
0	1.46	13.2	4.1
20	1.49	12.9	3.5
30	1.43	12.7	3.2
40	1.36	12.7	2.5

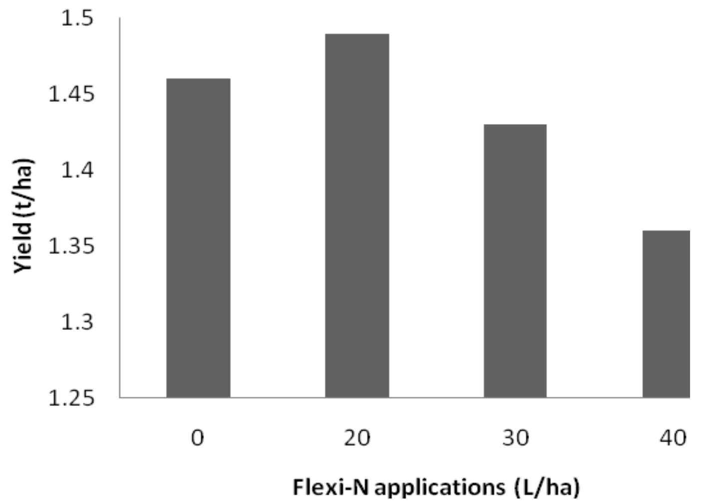

Figure 1: Yield of wheat sown in Waddy Forest.

Trial Details – West Buntine

Property	Stuart McAlpine, West Buntine
Plot size & replication	2m x 18m x 3 replicates
Soil type	Sandy Loam
Soil pH	6
EC	0.01 – 0.08 dS/m
Variety	Magenta
Sowing date	8/6/10
Seeding rate	60 kg/ha
Fertiliser	see treatments
Paddock rotation	08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	8/4/10: 0.8 L/ha PowerMax, 0.4 L/ha Ester 680, 8/6/10: 2.4 kg/ha Boxer Gold, 1.8 L/ha PowerMax, 0.2 L/ha TM 21, 0.1 L/ha TM21 (seed dressing), 19/7/10: 0.8 L/ha Jaguar, 0.2 L/ha TM 21, 28/8/10: 1 L/ha Ester 680
Growing Season Rainfall	181mm

Results

Table 2: Yield and quality of wheat sown at West Buntine.

Flexi-N treatments (L/ha)	**Kg/ha N**	**Kg/ha P**	**Yield (t/ha)**		**Protein (%)**		**Screenings (%)**	
0	0	0	1.59	a	8.33	ab	8.57	a
10 + 5	4.8	0	1.59	a	8.50	abc	9.17	a
20 + 10	9.6	0	1.63	a	9.13	bcd	7.93	a
40	12.8	0	1.71	a	9.17	cd	8.67	a
40 + 20	19.2	0	1.70	a	9.77	def	8.70	a
40 + 40	25.6	0	1.70	a	10.40	ef	8.57	a
K-Till Extra at 50 kg/ha + 0	5.0	6	1.90	b	8.17	a	8.67	a
K-Till Extra at 50 kg/ha + 10 + 5	9.8	6	1.89	b	8.50	abc	8.80	a
K-Till Extra at 50 kg/ha + 20 + 10	14.6	6	1.90	b	9.00	bcd	8.40	a
K-Till Extra at 50 kg/ha + 40	17.8	6	2.00	b	8.63	abc	8.28	a
K-Till Extra at 50 kg/ha + 40 + 20	24.2	6	1.87	b	9.73	de	8.60	a
K-Till Extra at 50 kg/ha + 40 + 40	30.6	6	1.96	b	10.57	f	9.03	a
LSD (5%)			0.08		0.47		1.52	

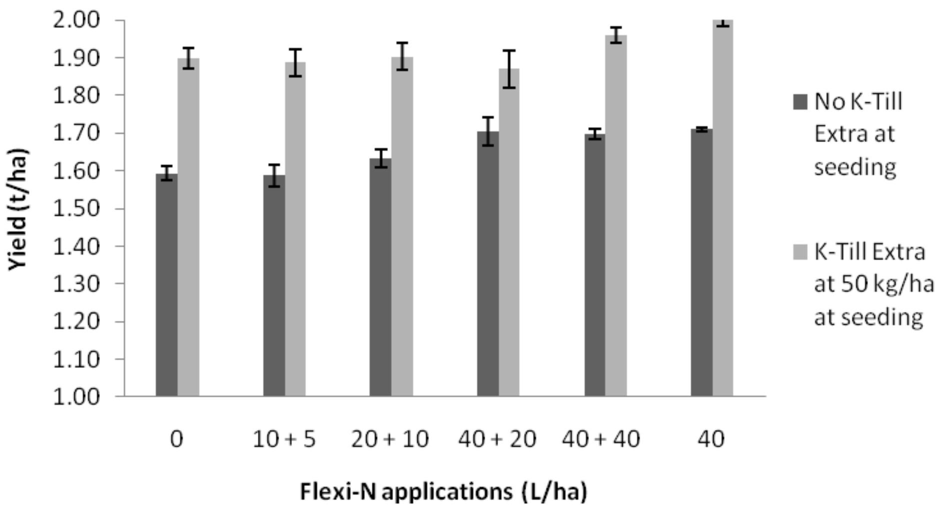

Figure 2: Yield of wheat sown in West Buntine

Trial Details – East Wubin

Property	Keith & Boyd Carter, East Wubin
Plot size & replication	42m x 200m x 3 replicates
Soil type	Red Loam
Soil pH	5.5
Variety	Wyalkatchem
Sowing date	1/6/2010
Seeding rate	60 kg/ha
Fertiliser	Flexi-N at 40 L/ha at seeding, Flexi-N at 25 L/ha on 14/8/10, Plus see treatments under results
Paddock rotation	08 Wheat, 09 Wheat
Herbicides, Insecticides & Fungicides	Sprayseed at 0.8 L/ha, Triflur X at 1.5 L/ha, Logran at 0.02 kg/ha
Growing Season Rainfall	120mm

Results

Table 3: Yield and quality of wheat sown at East Wubin.

Flexi-N treatment	Yield (t/ha)	Protein (%)	Screenings (%)
40 L/ha (seeding) + 25 L/ha (14/8/10) + 30 L/ha (31/8/10)	1.49	10.1	3.77
40 L/ha (seeding) + 25 L/ha (14/8/10) + 30 L/ha (12/9/10)	1.48	10.07	2.81
40 L/ha (seeding) + 25 L/ha (14/8/10)	1.50	9.97	2.43
LSD (5%)	0.21	0.46	2.98

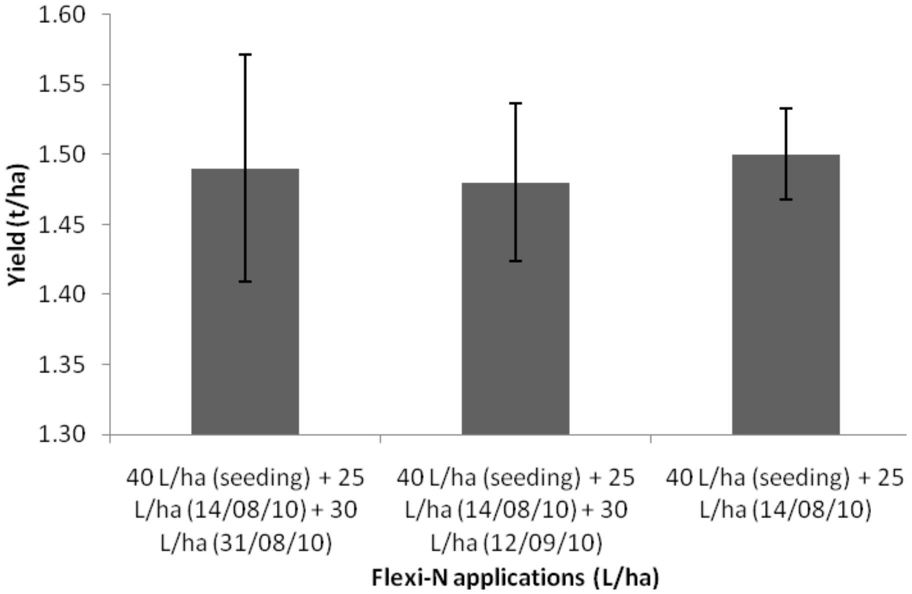

Figure 3: Yield of wheat sown in East Wubin

Comments
In all three trials there was no statistically significant yield response to additional post-emergent liquid nitrogen. Given the below average rainfall experienced in the district in this season, this result is probably not unexpected.

In the West Buntine trial, there was a significant response to the addition of K-Till Extra. It is important to note that several tramlines were going through the zero-compound section of the trial which may have reduced the yield, due to the small plot size. Additional phosphorus and other nutrients in the compound might also have influenced the yield response.

There was also an increasing trend in protein levels in the West Buntine trial to additional applied nitrogen.

As when making any decisions about soil and plant nutrient, the best strategy is to know what is in your soil and make decisions from there. This trial may indicate no response to applied nitrogen, however it is more than likely that there was adequate background N for the yield potential of this particular crop in this particular season. Background levels vary with soil type, fertilizer history, crop rotation and the yield of the previous crop, so soil testing, nutrient budgeting and a general understanding of where your fertilizer is going is highly important when making decisions about nutrition.

Acknowledgements Stuart McAlpine, Boyd and Keith Carter and Wade Parker for hosting and implementing the trials.

Paper reviewed by Chris O'Callaghan, Liebe Group

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Organic vs synthetic fertiliser

Flora Danielzik, R&D Coordinator, The Liebe Group

Aim

To evaluate the effectiveness of an organic fertiliser (chicken manure) compared to conventional synthetic compound fertilisers.

Background

Rising input costs and declining soil fertility has encouraged growers to trial alternatives to conventional fertilisers. These alternatives are hoped to be more cost effective and sustainable.

In this demonstration the economic value of chicken manure is compared to an AgStar and MOP-compound combination in 1.5-hectare plots of Tanami canola.

Trial Details

Property	Dodd property, West Buntine
Plot size & replication	1.5 ha, non-replicated
Soil type	Loamy Sand
Soil pH	4.8
Sowing date	10/5/10
Seeding rate	4 kg/ha
Fertiliser	see treatments
Paddock rotation	08 Wheat, 09 Wheat
Herbicides	1.1 kg/ha Atrazine (pre-seeding), 0.5 L/ha Select, 1.1 kg/ha Atrazine
Growing Season Rainfall	160mm

Table 1: Nutrient breakdown of organic and synthetic fertiliser used in West Buntine.

Nutrient Breakdown	Units N/ha	Units P/ha	Units K/ha	Units S/ha
Chicken manure at 3 m^3/ha	48.0	15.6	20.4	6.12
AgStar at 80 kg/ha, MOP at 20 kg/ha	11.4	11.2	10.0	2.06

Assumption: 1m^3 of chicken manure weighs 400kg.

Results

Table 2: Yield and quality of canola sown at West Buntine.

Treatments	Yield (t/ha)	Protein (%)	Moisture (%)	Oil content (%)
Chicken manure at 3 m^3/ha	0.43	23.61	5.2	39.9
AgStar at 80 kg/ha, MOP at 20 kg/ha	0.36	23.17	5.1	40.3

Economic Analysis

Table 3: Economic Analysis ($/ha).

Treatments	Yield (t/ha)	Gross return ($/ha)	Variable costs ($/ha)	Gross margin ($/ha)
Chicken manure at 3 m^3/ha	0.43	240.8	104.15	136.65
AgStar at 80 kg/ha, MOP at 20 kg/ha	0.36	201.6	84.15	117.45

Chicken manure at $27/m3; Budget Guide 2010: AgStar at $540/t, MOP at $890/t; Farm gate canola price (Daily Grain) as at 12/11/10: $560/t, Select at $17/L, Atrazine at $6.66/kg

Comments

In this demonstration the part of the paddock that was fertilised with chicken manure yielded 19.4% higher than the part of the paddock that was fertilised with the conventional compounds. This may be due to the higher amount of nutrients applied with the chicken manure.

Although the chicken manure was cost intensive with $27/m^3 and was applied at a rate of 3m^3/ha an increase in the gross margin by $19.20/ha was noted.

Please note that this is a non-replicated farmer demonstration and results need to be interpreted carefully.

Acknowledgements

Mike Dodd for hosting and implementing this demonstration and Roger Susac for supplying the chicken manure.

Paper reviewed by Janette Drew, DAFWA

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Effectiveness of Molybdenum

Jack Ellice-Flint, Agronomist, Elders-Scholz Rural, Dalwallinu

Aim

To evaluate the effectiveness of molybdenum application in soil with a pH that is perceived to be non-limiting for molybdenum.

Background

Molybdenum is required for nitrogen assimilation within the plant. Molybdenum (Mo) inputs, in compound fertilisers or as a stand alone treatment, are not common and are considered less important than "popular" trace elements such as copper and zinc. This trial examined the need for molybdenum inputs to reach optimum yield potential.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	50m x 10m. 500sq/m
Soil type	Red Sandy Loam
Soil pH	5.25
Sowing date	27/5/2010
Seeding rate	65 kg/ha Calingiri
Fertiliser	MAP at 60 kg/ha
Paddock rotation	09 Field Peas
Herbicides	Glyphosate at 1 L/ha, Trifluralin at 1.5 L/ha, Diuron at 300 g/ha, Triasulfuron at 20 g/ha
Growing Season Rainfall	141mm

Trial Design & Results

Table 1: Yield t/ha of Na_2MoO_4 treatments.

Treatments	Yield t/ha
Control	1.02
0.1 kg/ha	0.99
1.0 kg/ha	1.05
LSD 5%	NS

0.1kg/ha 7()	Control (8)	1.0kg/ha (9)	Control (10)	0.1kg/ha (11)	1.0kg/ha (12)
Control (1)	0.1kg/ha (2)	1.0kg/ha (3)	0.1kg/ha (4)	1.0kg/ha (5)	Control (6)

Figure 1: Trial Design

There was no significant difference between any of the treatments over the control (Table 1). The plant analysis results (Table 2) indicate that the plants had indeed taken up the molybdenum at the excess rate (1 kg/ha). This intake of molybdenum also corresponded with lower total N and nitrates.
While harvesting the trial, Rob Nankivell noticed a gradual decline in the yields of the plots as he started from the east (plot 6) and moved further west (plot 1). The harvest plots recorded a Coefficient of Variation (CV) of 13.4 indicating a level of variation over the plots, which may have affected the results.

Table 2: Plant Analysis Results (Taken 20/8/10).

Treatment	Nitrogen (%)	Nitrate (mg/kg)	Moly (mg/kg)
Control	4.3	398	310
0.1kg/ha Sodium Molybdate	4.2	474	292
1.0kg/ha Sodium Molybdate	3.3	155	2,167
1.0kg/ha Sodium Molybdate	3.3	129	1,286

Comments

Molybdenum deficiency can occur on lighter soils when the pH is less than 6; however serious deficiency occurs when the pH is around 4.5. In this trial the pH was 5.25 and with this pH it is often supposed that there is no need for the addition of molybdenum. Although the soil pH did not reflect a need for molybdenum, the aim of the trial was to assess the yield of the crop with the molybdenum applied. Nitrogen uptake was also assessed. One would expect in sufficient supply of Mo, that nitrates would be lower, as the plants are better able to use the nitrates. However, this was not transferred into total N. This may be due to a dilution effect or simply that Mo in excess may have been inhibiting the plant's use of nitrates. More research is needed here.
Although we could see no significant yield increases molybdenum is still a crucial trace element for wheat. Levels should be monitored and maintained to ensure Mo is non-limiting. Deficiency of Molybdenum can cause delayed maturity, affect pollen formation and the plant may produce empty heads.

Acknowledgements

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Paper reviewed by David Scholz, Elders

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New nitrogen sources for improved efficiency

Pete Rees, Field Research Manager, Summit Fertilizers

Aim

To assess the logistical advantages and crop safety of resin coated urea relative to standard urea for use in WA agriculture.

Background

Nitrogen strategy and risk management can be difficult issues for farmers to address. One possible new technology to reduce both leaching and volatilization is resin coated urea, and this trial was designed to examine this strategy in comparison to more traditional products (Urea and UAN). This resin coating (Figure 1) forms a physical barrier to mineralization of the Urea and can be varied in thickness to increase the delay between seeding and N becoming available.

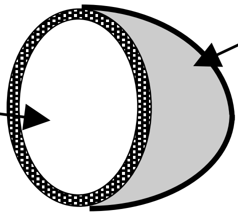

Figure 1. Diagram of Coated Urea

In recent years there has been a large increase in the number of growers who band UAN at seeding, which places a large amount of nitrogen in a highly leachable form beneath a plant without any root system to take up that N. Similarly there has been reduction in the amount of urea being spread IBS due to logistical concerns, and the importance of herbicide incorporation.

The aim of this experiment is to examine the possible agronomic and logistical advantages of coated Urea with the use of standard urea.

Trial Details

Plot size & replication	15m x 1.84m x 3 replications
Soil type:	Sandy Loam
Sowing date:	5/6/10
Seeding rate:	75 kg/ha, var. Wyalkatchem
Fertiliser (kg/ha)	5/6/10: 100 kg/ha MAPSZC, 100 kg/ha SOP
Herbicides:	5/6/10: 2.5 L/ha Glyphosate, 2.5 L/ha Trifluralin, 1.8 L/ha Avadex Xtra, 600 mL/ha Diuron 1/7/10: 300 mL/ha Axial, 800 mL/ha Precept, 50 mL/ha Brodal
Insecticides:	5/6/10: 1 L/ha Chlorpyriphos, 400 mL/ha Alphacypermethrin
Growing Season Rainfall	166mm (Buntine)

Table 1 : Treatment List.

No.	Name	Rate	Unit	N Rate (kg N/ha)	N source	Time of application
1	0 N	0	kg/ha	0		
2	CU 25 (3 WBS)	58.1	kg/ha	25	Coated Urea	3 weeks before seeding
3	Urea 25 (3 WBS)	54.3	kg/ha	25	Urea	3 weeks before seeding
4	CU 50 (3 WBS)	139.5	kg/ha	50	Coated Urea	3 weeks before seeding
5	Urea 50 (3 WBS)	130.4	kg/ha	50	Urea	3 weeks before seeding
6	CU 25 (WS)	58.1	kg/ha	25	Coated Urea	Drilled with seed
7	Urea 25 (WS)	54.3	kg/ha	25	Urea	Drilled with seed
8	CU 50 (WS)	139.5	kg/ha	50	Coated Urea	Drilled with seed
9	Urea 50 (WS)	130.4	kg/ha	50	Urea	Drilled with seed
10	Urea 50 (3-4 WAS)	130.4	kg/ha	50	Urea	Topdressed 4 weeks after seeding

Results

There were no significant differences between plant emergence for the untreated control and any of the top dressed nitrogen treatments (as expected) (Figure 2). Drilling Urea with the seed at the higher rate resulted in significantly lower plant emergence than all other treatments, while the resin coated urea showed no significant decrease in emergence at either rate.

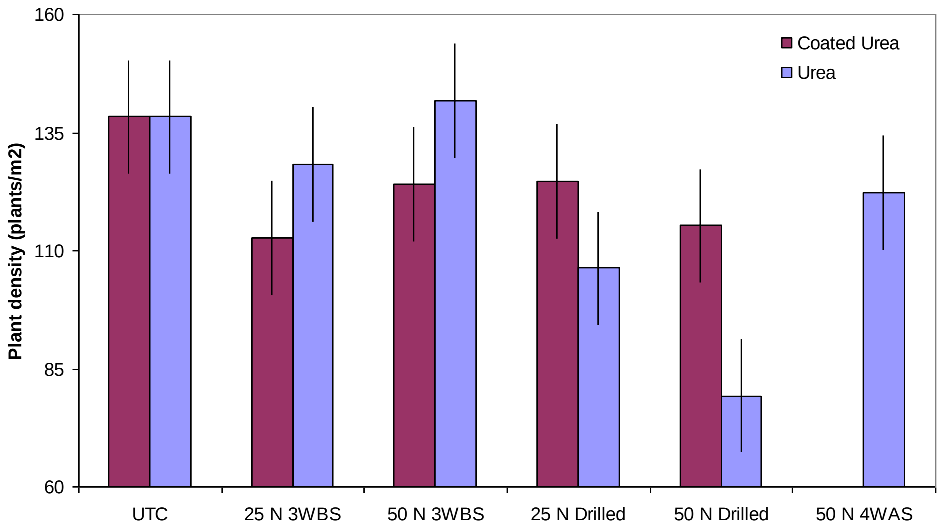

Figure 2. Plant emergence (plants/m^2) measured at 59 DAS.

Grain yields at the site were responsive to nitrogen, with all standard urea treatments yielding significantly higher than the untreated control, with increases ranging from 0.35-0.7 t/ha (Figure 3). Both top dressed coated urea treatments were equal to the untreated control, and both were they significantly less than the equivalent urea treatment, which suggests that the coating persists for a long period when it is present in dry top soil.

Coated urea was as effective as standard urea when drilled at 50 kg N/ha, however it yielded less when applied at the lower rate. Due to the extremely dry finish to the season there was no penalty in having significantly lower plant emergence for the standard urea drilled treatments.

It is worth noting that in the absence of significant rainfall in the three weeks prior to seeding, there was very little nitrogen loss from the standard urea treatments at this site.

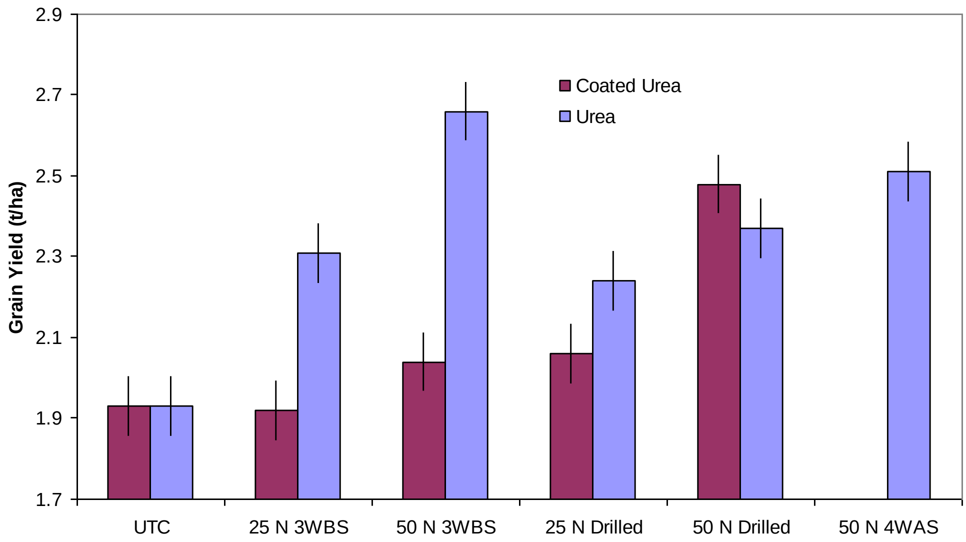

Figure 3. Grain Yield (t/ha) for each treatment as measured at crop maturity.

Table 2: Yield, quality and grade of wheat sown at Xantipee.

No.	Name	Rate	Unit	Vigour (0-100)		Grain Yield (t/ha)		Protein (%)		H/Weight (kg/hL)		Screenings (%)	
1	0 N	0	kg/ha	5.7	bc	1.92	d	8.40	d	79.7	a	3.23	e
2	CU 25 (3 WBS)	58.1	kg/ha	4.7	cd	1.92	d	9.00	cd	79.1	a	3.70	de
3	Urea 25 (3 WBS)	54.3	kg/ha	8.0	a	2.31	c	9.78	b	77.4	a	5.10	ab
4	CU 50 (3 WBS)	139.5	kg/ha	6.0	b	2.04	d	9.67	b	78.6	a	4.29	bcd
5	Urea 50 (3 WBS)	130.4	kg/ha	9.0	a	2.65	a	11.17	a	77.9	a	5.42	A
6	CU 25 (WS)	58.1	kg/ha	5.7	bc	2.06	d	9.67	b	79.9	a	4.54	a-d
7	Urea 25 (WS)	54.3	kg/ha	5.7	bc	2.24	c	9.60	bc	80.1	a	3.90	cde
8	CU 50 (WS)	139.5	kg/ha	6.3	b	2.48	b	10.17	b	78.0	a	4.96	ab
9	Urea 50 (WS)	130.4	kg/ha	4.3	d	2.37	bc	11.00	a	79.1	a	4.84	abc
10	Urea 50 (3-4 WAS)	130.4	kg/ha	8.3	a	2.51	b	11.27	a	79.0	a	4.78	abc
LSD (P=.05)				**1.27**		**0.14966**		**0.658**		**2.118**		**1.0506**	
Standard Deviation				**0.74**		**0.08646**		**0.382**		**1.2294**		**0.6098**	
CV				**11.59**		**3.84**		**3.83**		**1.56**		**13.62**	
Treatment F				**13.531**		**26.652**		**18.221**		**1.616**		**3.812**	
Treatment Prob(F)				**0.0001**		**0.0001**		**0.0001**		**0.1883**		**0.0085**	

Means followed by same letter do not significantly differ (P=.05, LSD)

All nitrogen treatments had higher grain protein than the untreated, although this increase was not significant for the coated urea at 25 kg N/ha. Application of nitrogen also increased screenings for all treatments, although again this increase was not significant for the low rate coated urea 3 WBS. Both of these results further suggest that the coating for this treatment did not break down during the early parts of the growing season.

Comments

There was very little nitrogen loss with standard urea through pre topdressing at this site. This suggests that the timing of top dressing applications prior to rain may be less important on acidic sands. This may expand the timing window for nitrogen topdressing on these soils during the season.

The resin coating evaluated in this trial appears to work well when drilled and banded, but did not break down when topdressed. Further work may continue to investigate agronomic suitability in WA.

Acknowledgements
Thanks to the Liebe group for the site, and Living Farm for conducting the research on Summit's behalf.

Paper reviewed by: Sandy Alexander, Summit Fertilizers.

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Overcoming Manganese Deficiency

Chris O'Callaghan, Executive Officer, The Liebe Group

Aim

To explore the use of manganese fertilisers to overcome Mn deficiency in narrow-leafed lupins

Background

Grain yield of narrow-leafed lupins (*Lupinus angustifolius* L.) grown in Western Australia (WA), is often limited by manganese deficiency. Manganese (Mn) deficiency causes a seed disorder called split seed, where the seed coat splits open, the seed leaves (cotyledons) protrude and the seed shrivels in the pod. Seed (grain) yields of lupins can be reduced by up to 70% by split seed. Mn fertiliser is used to overcome the deficiency. Many WA soils are naturally deficient in Mn and are unable to supply enough Mn to reach the lupins yield potential. Mn deficiency of lupins has been observed on slightly acidic deep grey sands, the pale yellow sands and the deep white sands of WA where seed yields are devastated without the application of Mn fertiliser. (Brennan 2001)

In 2009 the grower hosting this trial found patches of split seed in his lupin crop indicating soil Mn levels may be running down.

This trial aims to explore different rates and applications of Mn on lupins.

Trial Details

Property	Birch's property, East Coorow
Plot size & replication	12m x 400 m, non-replicated
Soil type	Sandy Loam
Soil pH	5.5 - 6
Sowing date	7/5/10
Seeding rate	75 kg/ha of Mandelup
Fertiliser	as per treatments
Paddock rotation	07 Canola, 08 Wheat, 09 Wheat
Herbicides	Simazine at 1.5 kg/ha, Ester 800 at 0.2 L/ha, PowerMax at 0.5 L/ha, Select at 0.5 L/ha, Brodal at 0.1 L/ha, Metribuzin at 0.1 kg/ha
Growing Season Rainfall	158mm

Results

Table 1: Yield and manganese uptake in lupins sown with different fertiliser regimes at East Coorow.

Treatment	**Yield (t/ha)**	**Mn Uptake (ppm)**
Lupin Mn 50 kg/ha	1.06	59
Legume Plus 50 kg/ha	1.12	43
Lupin Mn 100 kg/ha	1.14	47
Legume Plus 50 kg/ha	1.28	39
Legume Plus 100 kg/ha	1.29	31
Legume Plus 50 kg/ha	1.36	27
Legume Plus 50 kg/ha + Mantra 4 L/ha	1.36	31
Legume Plus 50 kg/ha	1.40	31

Comments
This trial is established as a nearest neighbor control design, so comparisons can be made in each plot with a control treatment. Results need to be interpreted carefully. Yield map analysis will also be conducted at a later date.

No Manganese deficiency was detected in this paddock, with stem tests (Table 1) for Mn uptake showing adequate levels of Mn present in the plant (Mn levels below 20ppm indicates deficiency).
A below average rainfall year may account for the absence of a deficiency given a deficiency was observed in other paddocks in 2009. Given there was no Mn deficiency present in the plant, it would be safe to assume that any difference in yield is more likely explained by soil type variation or another variable that was not examined in this trial.

It is also worth noting that the farmer's strategy is to stay on top of soil nutrition, and correct a potential deficiency before it becomes a severe problem.

Potentially this trial could be re-established in the next lupin phase of the rotation so any changes in Mn levels can be monitored.

Acknowledgements
Steve Davies (DAFWA) for assistance with the trial design, technical advice and stem tests.

Paper reviewed by Janette Drew, DAFWA

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Prosaro® 420 SC for control of Glume Blotch (*Phaeosphaeria nodorum*) and Yellow Leaf Spot in Wheat

Rick Horbury, Technical Advisor, Bayer CropScience

Aim

To compare the disease control of Prosaro ® 420 SC with commercially available foliar fungicides. To determine the best ROI from an application of either an in-furrow or foliar fungicide application or a complete program approach for control of Septoria nodorum or Yellow leaf spot.

Background

Septoria nodorum and Yellow Leaf Spot are stubble borne diseases of wheat. Prosaro ® 420 SC is registered for the control of Yellow Leaf Spot, Septoria nodorum, Stripe Rust, Stem Rust, Leaf Rust and Powdery Mildew in wheat. Prosaro ® 420 SC is a co-formulation of 210 g/L prothioconazole + 210 g/L tebuconazole. Raxil Pro is a new seed treatment from Bayer CropScience expected to be registered in time for the 2012 season. Raxil Pro will have a low use rate of 150 mL/ tonne seed. Raxil Pro will be registered for Bunt, Flag Smut and Loose Smut of wheat and Covered and Loose Smut of barley and oats. Raxil Pro is a co-formulation of 250 g/L prothioconazole + 150 g/L tebuconazole.

Trial Details

Property	Rob Nankvell, East Maya
Plot size & replication:	20 m x 2.5 m x 3 replicates
Soil type:	Red Loam
Seeding date:	25/5/2010
Seeding rate:	75 kg/ha Tammarin Rock
Fertiliser:	100 kg/ha Agstar Extra®, 80 kg/ha Urea
Herbicides:	0.8 L/ha Barracuda®, 2.5 g/ha *Ally®, 1.5 L/ha Sprayseed®, 1.5 L/ha Treflan®
Insecticides:	0.2 L/ha Talstar®, 0.1 L/ha Dominex®
Fungicide Application A:	2/7/2010
Fungicide Application B:	26/8/2010
Growing Season Rainfall	141mm

Site Comments

The trial was sown into 2009 Yandanooka stubble with moderate levels of yellow leaf spot and septoria nodorum on the ear. This was to replicate the common practice throughout the region of wheat on wheat rotations.

Consistent dry conditions throughout the season did not favour the early development of disease.
A trial inspection on 3/8/10 observed very low levels of disease, too low to assess.

Dry conditions and plant stress throughout spring, affected end yields and added variability to the disease assessment taken on 6/9/10 when the crop was at (Z55) half inflorescence emerged.
A follow up assessment of infection of the head was not possible due to hot and dry conditions throughout September, resulting in early senescence of the crop.

Results

Table 1: Yield (t/ha) and grain quality analysis in Tammarin Rock wheat.

	N	Treatment	rate/ha		t/ha		% untr	Protein (%)	Moisture (%)	Hecto litre (g)	Screenings (%)	Grade	Gross Return ($/ha)
	1	UNTREATED			1.20	a	100	12.8	9.7	78.3	6.3	AUH2	$435.60
	2	RAXIL PRO	15	mL/100 kg	1.45	a	121	12.8	9.1	77.6	7.4	AUH2	$526.35
	3	INTAKE® COMBI	400	mL/ha	1.31	a	109	12.6	9.8	79.0	7.4	AUH2	$475.53
	4	RAXIL PRO PROSARO 420 SC HASTEN®	15 150 1	mL/100 kg mL/ha % v/v	1.26	a	105	13.4	9.8	77.2	8.3	AUH2	$457.38
	5	INTAKE COMBI PROSARO 420 SC HASTEN	400 150 1	mL/ha mL/ha % v/v	1.15	a	96	13.3	9.3	77.7	7.7	AUH2	$417.45
	6	INTAKE COMBI TILT® 250 EC	400 500	mL/ha mL/ha	1.29	a	107	13.0	9.8	79.1	7.0	AUH2	$468.27
Foliar Only	**7**	**PROSARO 420 SC HASTEN**	**150 1**	**mL/ha % v/v**	**1.26**	**a**	**105**	**13.7**	**9.7**	**78.5**	**7.9**	**AUH2**	**$457.38**
	8	FOLICUR®	290	mL/ha	1.17	a	97	12.8	9.0	79.0	7.5	AUH2	$424.71
	9	TILT 250 EC	250	mL/ha	1.12	a	94	13.0	9.5	79.5	7.3	AUH2	$406.56
	10	TILT 250 EC	500	mL/ha	1.20	a	100	12.9	9.6	79.5	8.3	AUH2	$435.60
	11	OPUS®	250	mL/ha	1.09	a	91	13.6	9.7	78.1	9.0	AUH2	$395.67
	12	*OPERA®	500	mL/ha	1.21	a	101	13.7	9.6	77.6	7.7	AUH2	$439.23

Yields t/ha followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).
Pricing based on AWB contract pricing delivered to Fremantle port zone, AUH2 = $363 on 9/12/2010
All treatments met the receival standards for Australian Hard Varieties Utility Grade (AUH2).

Yield

High screenings prevented any of the treatments from achieving a higher grade.
None of the yield differences between treatments were statistically significant (P≤ 5%).
Prosaro 150 mL/ha + Hasten 1% recorded the highest yield from a foliar only spray.

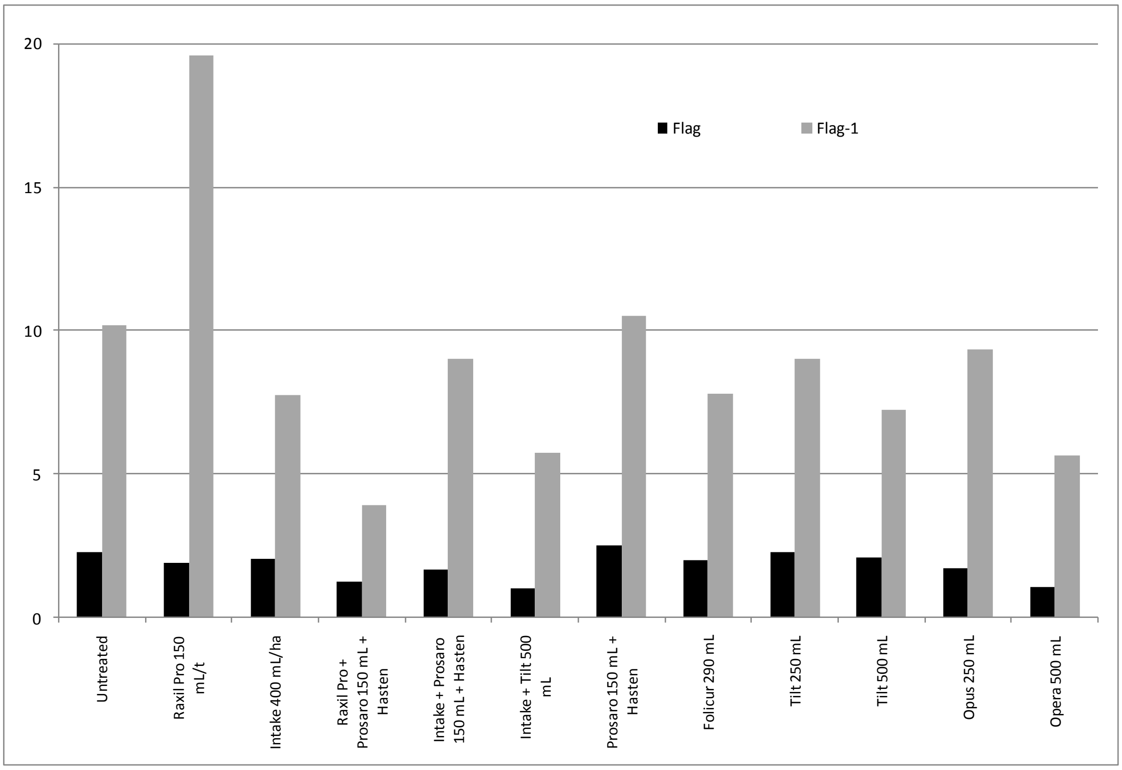

Figure 1: 6/9/10 (11 DAA) **%** Leaf area infected (LAI) by Glume blotch (*P. nodorum)* – Flag Leaf and Flag-1

Disease control

Due to the dry stressed conditions experienced throughout this trial there was very little difference observed between the untreated and the fungicide treatments.

Comments

Yield is the most accurate way to assess the efficacy of the different fungicides given the dry conditions and low levels of infection seen early in this trial.

There is a slight trend towards lower levels of infection where a pre seeding fungicide such as Raxil Pro or Intake in furrow are followed up by a foliar fungicide application.

*Ally ®2.5 g/ha is not a registered label rate.
*Opera is not registered for control of Yellow Leaf Spot in wheat.
At the time of publication Raxil Pro is not registered. An application for the registration of Raxil Pro has been made.
Prosaro®, Folicur®, Raxil® and Barracuda® are Registered Trademarks of Bayer CropScience.

Paper reviewed by Greg Skinner, Technical advisory manager, Bayer CropScience.

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SAKURA® 850WG, compared to commercial standards for the pre-emergent control of Barley Grass (*Hordeum leporinum*) in Wheat

Rick Horbury, Technical Advisor, Bayer CropScience

Aim

To demonstrate the crop safety and efficacy of Sakura 850WG pre-emergent herbicide on barley grass (*Hordeum leporinum*) in wheat compared to commercially available herbicides.

Background

Bayer CropScience is planning to launch Sakura 850WG containing the new active ingredient pyroxasulfone in time for the 2012 season. Sakura 850WG's mode of action is an inhibitor of Very Long Chained Fatty Acid biosynthesis and is likely to be classed as a Group K herbicide. It works through both root and shoot uptake and has been submitted for registration for the pre-emergent control of annual ryegrass, barley grass, phalaris, silver grass and toad rush in wheat, barley and triticale. Sakura 850WG is a pre-emergent herbicide that can be applied up to 14 days prior to sowing with knife points and press wheels or knife points and harrows. It works best when incorporated by sowing (IBS). Sakura 850WG is to be applied at 118 g/ha and is compatible with a range of other knockdown and pre-emergent products.

Trial Details

Property	McIlroy's property, Pithara
Plot Size & Replication	5m x 18m x 3 replicates
Soil Type	Clay
Soil Condition	40% average ground cover, barley grass seed, stubble and ash. Some patches up to 95% ash & seed cover
Application date	29/5/10
Water Rate	80 L/ha
Ground Speed	9.2 kph applied by quad bike
Nozzle Type	DG11002 (Yellow Drift Guard 02's)
Sowing Date	29/5/10
Time to Incorporation	6 hours
Seeding Equipment	Knife point & press wheels
Seeding Rate	80 kg/ha
Row Spacing	8 inch
Seeding Speed	8 kph
Seeding Depth	3cm
Fertiliser (kg/ha)	29/5/10 110 kg/ha Agras® & 28/7/10 50L/ha Flexi N®
Herbicides, Insecticides & Fungicides	25/5/10: 5 L/ha Sprayseed®, 29/5/10: 3 L/ha Sprayseed®, 500 mL/ha Lorsban®
Paddock Rotation	08 Pasture, 09 Wheat
Growing Season Rainfall	180mm

Site Comments

This site received two applications of Sprayseed® due to 1 leaf emerging barley grass across the site. The trial treatments were applied to moist soil on the 29/5/10. The trial was sown by the grower later that afternoon with knife point and press wheels on 8 inch row spacing. After sowing, there were lots of large clods across the site.

A site inspection on the 17/6/10 observed crop and weeds only just beginning to emerge with cloddy and dry top soil.

On the 19/7/10 crop emergence was still patchy through the site with high numbers of blue oat mite observed particularly in the last few plots of replicate 1 and into the plot 302. These were sprayed out by the grower on the 21/7/10. Weed emergence was also patchy with an accurate assessment not possible due to variability.

Rainfall

There was a 50mm summer rainfall event over two days on the 22/3/10 – 23/3/10. A total of approximately 180mm of rainfall was recorded at the site from the start of May to the end of November. 150mm of rainfall was recorded on the site from the application of the treatments to harvest, with the last significant rainfall event of 60mm over two days to the 1st September.

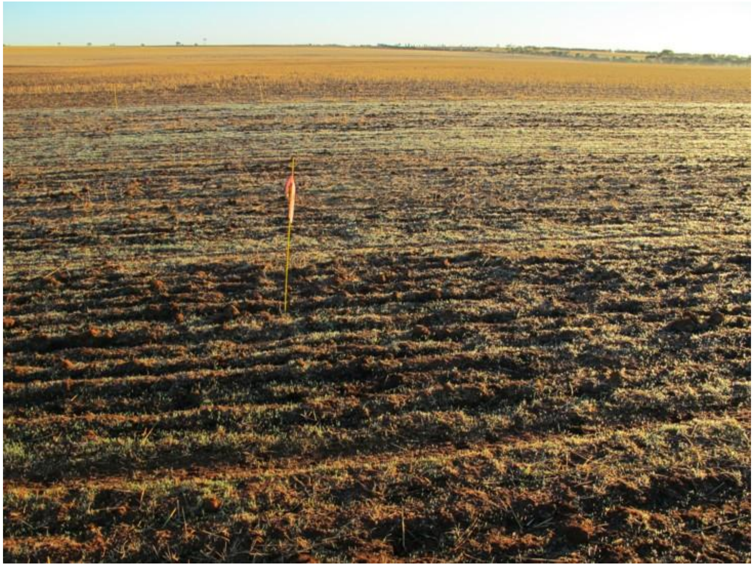

Figure 1: Site at application 29/5/10

Results

Table 1: Crop safety and yield (t/ha) from Bonnie Rock wheat.

		Assessment Date	17/6/10	16/8/10	16/8/10	29/9/10	10/11/10		10/11/10
		Appl.-Ass. Interval	19 DAA	79 DAA	79 DAA	123 DAA	161 DAA		161 DAA
		Rating Type	Rating	Rating	Rating	Rating	Harvest		Harvest
		Rating Scale	%	%	%	%	t/ha		%
No	**Treatment**	**Rate /ha**	Discolour	Discolour	Biomass Reduction	Biomass	Yield		% Untreated
1	UNTREATED		0	0	0	78	0.97	a	100
2	SAKURA 850 WG	118 g/ha	0	0	10	100	1.18	a	117
3	*PRODUCT X	X L/ha	0	0	10	87	1.13	a	111
4	SAKURA 850 WG *DIURON 900 WG	118 g/ha 300 g/ha	0	0	22	95	1.07	a	123
5	TRIFLURX® AVADEX XTRA®	1.5 L/ha 1.6 L/ha	0	0	13	80	1.24	a	128

Yields t/ha followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).

Crop Safety

All treatments were safe to the crop. Biomass reduction ratings at 79 DAA were in relation to untreated plot 101 that had the highest biomass across the site and was mainly due to BOM damage and lower weed numbers. At 123 DAA the increased Biomass from Sakura® treatments did not translate to yield with a lack of finishing rain.

Yield

Barley grass had mostly senesced at the 29/9/10 and was not using much water so a lower crop biomass may have been an advantage to grain fill. The grower also applied too much nitrogen for the seasonal conditions which lifted the crop biomass but without a finishing rain, overall grain fill and yield was below expectation. All treatments recorded higher yields than the untreated although none were significant (P≤ 5%). Late differences in barley grass control did not greatly influence end yield due to warm dry conditions throughout spring.

Table 2: Grain quality analysis and gross return ($/ha) from Bonnie Rock wheat.

No	Treatment	Rate /ha	Protein (%)	Moisture (%)	Hectolitre (kg/hl)	Screenings (%)	Grade	Yield t/ha	Gross return $/ha
1	UNTREATED		12.1	10.8	76.7	2.8	H2	0.97	$374.59
2	SAKURA 850 WG	118 g/ha	12.4	10.8	76.0	3.1	H2	1.18	$457.84
3	*PRODUCT X	X L/ha	12.6	10.9	76.7	3.1	H2	1.13	$438.44
4	SAKURA 850 WG *DIURON 900 WG	118 g/ha 300 g/ha	12.7	10.8	75.9	3.1	H2	1.07	$413.95
5	TRIFLURX AVADEX XTRA	1.5 L/ha 1.6 L/ha	12.3	10.8	77.5	2.3	H2	1.24	$479.61

*Based on Grain Trade Association wheat receival standards 2010-11.
Pricing based on AWB contract pricing delivered to Fremantle port zone, H2 = $388, 9/12/2010
All treatments regardless of seeding system met the receival standards for Australian Hard Varieties (H2).

Table 3: Weed Control – Barley grass (*Hordeum leporinum).*

		Assessment Date	16/8/10	29/9/10
		Appl.-Ass. Interval	79 DAA	123 DAA
		Rating Type	Rating	Rating
		Rating Scale	%	%
No	**Treatment**	**Rate /ha**	Control	Control
1	UNTREATED		0	0
2	SAKURA 850 WG	118 g/ha	75	83
3	*PRODUCT X	X L/ha	53	45
4	SAKURA 850 WG *DIURON 900 WG	118 g/ha 300 g/ha	80	84
5	TRIFLURX AVADEX XTRA	1.5 L/ha 1.6 L/ha	52	32

Barley Grass Control

The lack of a rainfall event in excess of 10mm until the 8th July did not favour the redistribution of Sakura® back into the cropping row or off stubble. The majority of barley grass in the Sakura® plots was in patches of high ash or large clods and on the edge of the furrow where nil herbicide was located.

An early weed assessment was not possible due to low and variable emergence of barley grass across the site due to the dry conditions.

Sakura® treatments recorded the best control of barley grass at 79 DAA.
Following the 60mm rainfall event on the 1st September, good activity with an improvement in control was recorded from the Sakura® treatments at 123 DAA with ideal conditions for root uptake with moist soil conditions for several weeks. At this final assessment the Product X and TriflurX + Avadex treatments did not record any improvement in activity with no reduction in biomass or emergence of late weeds observed.

Figure 3: 16/8/10 - Sakura® 118 g/ha symptoms of root activity on barley grass.

Comments

At the time of publication Sakura 850WG is not registered. An application for the registration of Sakura 850WG has been made.
Sakura® is a Registered Trademark used under license by Bayer CropScience.
Product X is not registered for the control of barley grass in cereals.
* Diuron 300 g/ha used pre-plant is not a registered label rate of Diuron.

Paper reviewed by Greg Skinner – Technical advisory manager, Bayer CropScience

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Herbicide Screen Trial

Paul Chatfield & Ian Macdonald, Syngenta

Aim

To evaluate the tolerance of wheat, peas and lupins, to a range of existing and experimental pre-emergent herbicides used at various rates and use patterns.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication:	15m x 1.84m x 3 replications
Soil type:	Loam
Tillage Type	Primary Sales Knife Point and Presswheels
Row Spacing	9 inch
Moisture	Poor. Marginal moisture at 2cm, drying profile
Seed Bed	Burnt and untilled
Sowing date	1/6/2010
Seeding rate	Wheat: 65kg/ha Tammarin Rock, Lupins: 100kg/ha Mandelup Peas: 100kg/ha Kaspa
Fertiliser	1/6/10: Wheat: 100 kg/ha Summit DPZ/SOP 80/20, 1/6/10: Lupins and Peas: 100 kg/ha Single Superphosphate, 13/7/10: 40 L/ha.Flexi N
Paddock rotation	07 Wheat, 08 Peas, 09 Wheat
Herbicides	As per treatments
Growing Season Rainfall	141mm

Table 1: Spray Details 1st June 2010.

Crop Growth Stage	IBS (Pre-seeding treatment application)
Date	1/6/2010
Temperature (0C)	21.7
Cloud Cover %	20%
Humidity	45%
Wind Speed	3-5km/hr
Wind Direction	SE
Application equipment	Hand held small plot sprayer
Spray volume	84 L/ha
Nozzles	Airmix 110-01

Table 2: Spray Detail 30th June 2010.

Crop Growth Stage	T1 Wheat: 50% 2 leaf, 50% 3 leaf Lupins: 20% 1 leaf-Cot, 50% 2 leaf, 30% 3 leaf+ Peas: 50% 2 leaf, 50% 3-4 leaf
Date	30/6/2010
Temperature (0C)	11.7
Cloud Cover %	0%
Humidity	47%
Wind Speed	7-10km/hr
Wind Direction	SE
Application equipment	Shrouded hand held small plot sprayer
Spray volume	84L/ha
Nozzles	Airmix 110-01

Table 3: Spray Details 13th July 2010.

Crop Growth Stage	T2 Lupins: 80% 6 leaf, 20% 4-5 leaf Peas: 70% 4-5th node, 30% 3-4th node
Date	13/7/2010
Temperature (0C)	17.1
Cloud Cover %	80%
Humidity	90%
Wind Speed	2km/hr
Wind Direction	W
Application equipment	Hand held small plot sprayer
Spray volume	84L/ha
Nozzles	Airmix 110-01

Table 4: Treatment List – Lupins.

Tmt #	Product	Rate	Timing
1	UTC	x	x
2	Boxer Gold IBS	2500	IBS
3	Boxer Gold T1	2500	1st true leaf lupins (T1)
4	SYNEXP3	-	6 leaf lupins (T2)
5	SYNEXP2	-	6 leaf lupins (T2)

Table 5: Treatment List – Peas.

Tmt #	Product	Rate	Timing
1	UTC	x	x
2	Boxer Gold IBS	2500	IBS
3	Boxer Gold T1	2500	1st true leaf peas (T1)
4	SYNEXP3	-	4-5 node peas (T2)
5	SYNEXP2	-	4-5 node peas (T2)

Table 6: Treatment List – Wheat.

Tmt #	Product	Rate	Timing
1	UTC	x	x
2	Boxer Gold IBS	2500	IBS
3	Treflan + Avadex	1500 + 1600	IBS
4	Boxer Gold T1	2500	1-2Leaf RG (T1)
5	Boxer Gold + Reglone 500	2500 +500	IBS + T1
6	Boxer Gold + Reglone 750	2500 +750	IBS + T1
7	SYNEXP3	-	2 leaf wheat (T2)
8	SYNEXP2	-	2 leaf wheat (T2)

Results

Table 7: Results Lupins.

Treatment Number	Treatment Name	Rate	Timing	Lupins plants/m² 13DAT1	Percent Crop Phytotoxicity 34DAT1		Yield t/ha	
1	UTC	x	x	53	0	c	0.278	a
2	Boxer Gold IBS	2500	IBS	54	0	c	0.266	a
3	Boxer Gold T1	2500	1st true leaf lupins (T1)	56	7	b	0.263	a
4	SYNEXP3	-	6 leaf lupins (T2)	50	100	a	0.000*	b
5	SYNEXP2	-	6 leaf lupins (T2)	48	100	a	0.000*	b
F prob				*NS*	*0.0001*		*0.0001*	
LSD				*NS*	*5*		*0.076*	
CV %				*NS*	*6.25*		*24.91*	
Grand mean				*52*	*41.3*		*0.160*	

*Only rogue wheat was harvested from these plots

Table 8: Results Peas.

Treatment Number	Treatment Name	Rate	Timing	Pea plants/m² 13DAT1	Percent Crop Phytotoxicity 34DAT1		Yield t/ha	
1	UTC	x	x	44	0	b	0.983	a
2	Boxer Gold IBS	2500	IBS	42	7	b	0.817	a
3	Boxer Gold T1	2500	1st true leaf peas (T1)	44	13	b	0.840	a
4	SYNEXP3	-	4-5 node peas (T2)	48	98	a	0.000 *	b
5	SYNEXP2	-	4-5 node peas (T2)	34	100	a	0.000 *	b
F prob				*NS*	*0.0001*		*0.0001*	
LSD				*NS*	*10*		*0.174*	
CV %				*NS*	*11.35*		*16.45*	
Grand mean				*42*	*43.8*		*0.530*	

*Only rogue wheat was harvested from these plots

Table 9: Results Wheat

Tmt Number	Tmt Name	Rate	Timing	Wheat plants/ m^2 13DAT1	% Crop Phyto-toxicity 13DAT1	% Crop at 3-leaf Stage 13DAT1	% Crop at 4-leaf Stage 13DAT1	% Crop Tillering 13DAT1	Yield T/ha
1	UTC	x	x	142	0	30	20	47	1.123
2	Boxer Gold IBS	2500	IBS	148	0	33	17	43	1.123
3	Treflan + Avadex	1500+ 1600	IBS	135	0	30	17	53	1.130
4	Boxer Gold T1	2500	1-2Leaf RG (T1)	154	0	33	18	47	0.977 **
5	Boxer Gold + Reglone 500	2500 +500	IBS + T1	128	32	30	10	60	1.173 **
6	Boxer Gold + Reglone 750	2500 +750	IBS + T1	129	30	27	17	53	1.173
7	SYNEXP3	-	2 leaf wheat (T2)	131	13	30	12	52	0.970 *
8	SYNEXP2	-	2 leaf wheat (T2)	126	12	13	10	80	1.093
F prob				*NS*	0.038	*NS*	*NS*	*NS*	*NS*
LSD				*NS*	24	*NS*	*NS*	*NS*	*NS*
CV %				*NS*	125	*NS*	*NS*	*NS*	*NS*
Grand mean				137	11	28	15	54	1.090

*Plot 304 excluded from the analysis due to an application error at spraying

**Reglone was included in this trial to evaluate its efficacy on seedling annual ryegrass. Due to the absence of ryegrass it precluded us from drawing any observations regarding its efficacy but the crop phytotoxicity data is included above for the record.

Comments

Lupins & Peas

There were no significant treatment differences in either the Lupin or Pea plant densities 13 days after the application of Treatment 1.

At 34DAT1 differences were noted in the percentage of crop phytotoxicity in the lupin treatments; Treatment 2 (Boxer Gold IBS) showed zero crop phytotoxicity, whilst Treatment 3 (Boxer Gold Post Emergent) showed 7% phytotoxicity.

Despite phytotoxicity being noted in the lupin post-emergent Boxer Gold treatment, there was no significant difference in yield when the plots were harvested in either the pre- or post-emergent treatments.

In peas at 34DAT1 phytotoxicity was noted in both pre- and post-emergent Boxer Gold treatments, however this was not significantly greater than the untreated. The observed phytotoxicity did not translate into a statistically significant yield difference come harvest. Treatment 4 (SYNEXP3) & Treatment 5 (SYNEXP2) caused total crop death. Consequently these plots had zero yield.

Wheat

There were no significant treatment differences between the plant stands, with all populations being between 142 and 154 plants/m^2.

At 13DAT, significant differences were seen in the Percent Crop Phytotoxicity scores. No crop injury was observed in Treatments 1 (Untreated Control) or Treatment 2 (Boxer Gold, IBS), however Treatment 5 (Boxer Gold + 500 ml/ha Reglone) & Treatment 6 (Boxer Gold + 750 ml/ha Reglone) both had approximately 30% crop phytotoxicity.

(At 13 DAT Treatments 3, 7 & 8 had not yet been applied).

Note: Treatments 7 & 8 show low phytotoxicity scores at 13DAT, despite being untreated at this timing. The likely reason for this is that a small area of the crop in Rep 1 of the trial suffered from an area of compacted clay soil (the rest of the trial was loamier), causing plants in this area to exhibit slow growth and uneven emergence which was rated as phytotoxicity at 13DAT.

Wheat growth phase was also observed at 13DAT, however no statistically significant differences were noted in the crop growth phase between different treatments.

While differences in crop phytotoxicity were noted at 34DAT, these were not statistically significant.

Yields were generally low across the site, ranging from 0.970 t/ha to 1.173 t/ha. No significant yield differences were observed between treatments.

Conclusions

The site was essentially weed free, making this a good opportunity to evaluate the crop safety of the proposed use patterns and newer chemistries.

Boxer Gold demonstrated excellent crop safety in pulses. This is consistent with field work from trials throughout Australia which we have conducted throughout the 2010 season.

As per crop safety observations in pulses, the pre- and post-emergent applications of Boxer Gold in wheat were both observed to be safe.

In the absence of any significant levels of ryegrass commentary on the efficacy of Boxer Gold post-emergent cannot be made, however in other field work very good results have been achieved but this use pattern is still being evaluated to identify factors critical to enhanced efficacy.

It is very important to highlight the fact that Boxer Gold is NOT registered for use in pulses or post-emergent in cereals. This trial was designed to take advantage of a weed free situation to accurately assess crop phytotoxicity from use patterns currently under evaluation. In no way should this trial be seen as a promotion of these use patterns.

Take Home Messages

Boxer Gold was safe in Mandelup Lupins and Kaspa Field Peas in a pre-emergent use pattern. As is consistently seen in the field, Boxer Gold pre-emergent again exhibited good crop safety in wheat. The early post-emergent (or peri-emergent) use pattern of Boxer Gold has some unique environmental requirements that are the key to reliable efficacy.

Acknowledgements

Richard Devlin, Michael Foss & Rebecca Clarke, Living Farm, for professional site management and trial assessment; Flora Danielzik & Chris O'Callaghan for assistance in co-ordinating Syngenta trial activities throughout 2010; and finally Rob Nankivell for his assistance not only with this site but all Syngenta development work on his farm.

Paper reviewed by Jason Sabeeney, Technical Services Manager, Syngenta Australia

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Demonstrate the effects of water rate on Velocity® and Jaguar® for the control of Wild Radish

Rick Horbury, Technical Advisor, Bayer CropScience

Aim

To evaluate the effect of water rate using a medium spray quality on bromoxynil based herbicides under conditions where coverage is not optimal; to evaluate the effect of coarse droplets; and to evaluate the effect on wild radish control at different water rates with MCPA in tank mixtures with Velocity®.

Background

Velocity® will control wild radish resistant to Group B, Group F and Group I herbicides. It is registered for control of a wide range of broadleaf weeds and volunteer legumes in wheat, barley, triticale and cereal rye. Velocity® requires good spray coverage of the target weed to achieve optimal results. Some field results below expectation in 2009 were due to low water rates and inappropriate product rate for weed size. Velocity® will be registered at use rates up to 1 L/ha in time for the 2011 season and at use in tank mixtures with MCPA LVE at 500 mL/ha in time for the 2011 season.

Trial Details

Property	Dodd's property, West Buntine
Plot size & replication	2.5 m x 12 m x 3 replicates
Soil type	Sandy Loam
Sowing date	29/5/10
Crop Variety	Magenta
Seeding Rate	80 kg/ha
Seeding depth	3cm
Seeding Equipment	Knife point and press wheels
Paddock rotation	08 Wheat, 09 Canola
Fertiliser	29/5/10 110 kg/ha Agras® + 28/7/10 50 L Flexi N®
Application date	13/7/10
Wild Radish Density	303/m^2
Wild Radish Stage	cotyledon (3%), 2 leaf (6%), 3 leaf (26%), 4 leaf (58%), 5 leaf (7%)
Crop Stage	Z14/ 21
Herbicides, Insecticides & Fungicides	20/5/10 Roundup® CT at 1.8 L/ha + Treflan® 480 at 1.5 L/ha + Logran® at 30 g/ha 25/8/10 Estericide® 680 at 800 mL/ha across the trial
Growing Season Rainfall	160mm

Table 1: Application.

Spray Volume	32 L/ha	48 L/ha	79 L/ha	82 L/ha Coarse
Application Method	Spray	Spray	Spray	Spray
Application Placement	Foliar	Foliar	Foliar	Foliar
Equipment Type	Hand Boom	Hand Boom	Hand Boom	Hand Boom
Ground Speed	12 kph	12 kph	12 kph	12 kph
Propellant Type	Compressed Air	Compressed Air	Compressed Air	Compressed Air
Diluent Carrier	Water	Water	Water	Water
Operating Pressure	200 kPa	200 kPa	300 kPa	200 kPa
Spray Swatch_Width	250cm	250cm	250cm	250cm
Nozzle Type	Hardi Orange LD-	Hardi Green LD-	Hardi Yellow LD-	Hardi Lilac LD-
Nozzle Size	110-01	110-015	110-02	110-025
Nozzle Spacing	50cm	50cm	50cm	50cm

Site Comments

The wild radish population was consistent and of high density (303/m2) across the site. Spray coverage was affected due to the high weed density and with 65% of the wild radish 4 leaf or larger across the site at application shading was also an influence.

This trial was applied immediately after rainfall so soil moisture was good but the weeds had just endured a fortnight of frosts with very dry conditions and were still highly stressed.

Coverage issues and the seasonal conditions prior to application, coupled with ongoing dry and stressed conditions following application, have contributed to lower than expected wild radish control from all treatments in this trial.

Figure 1: Site at application 13/7/10

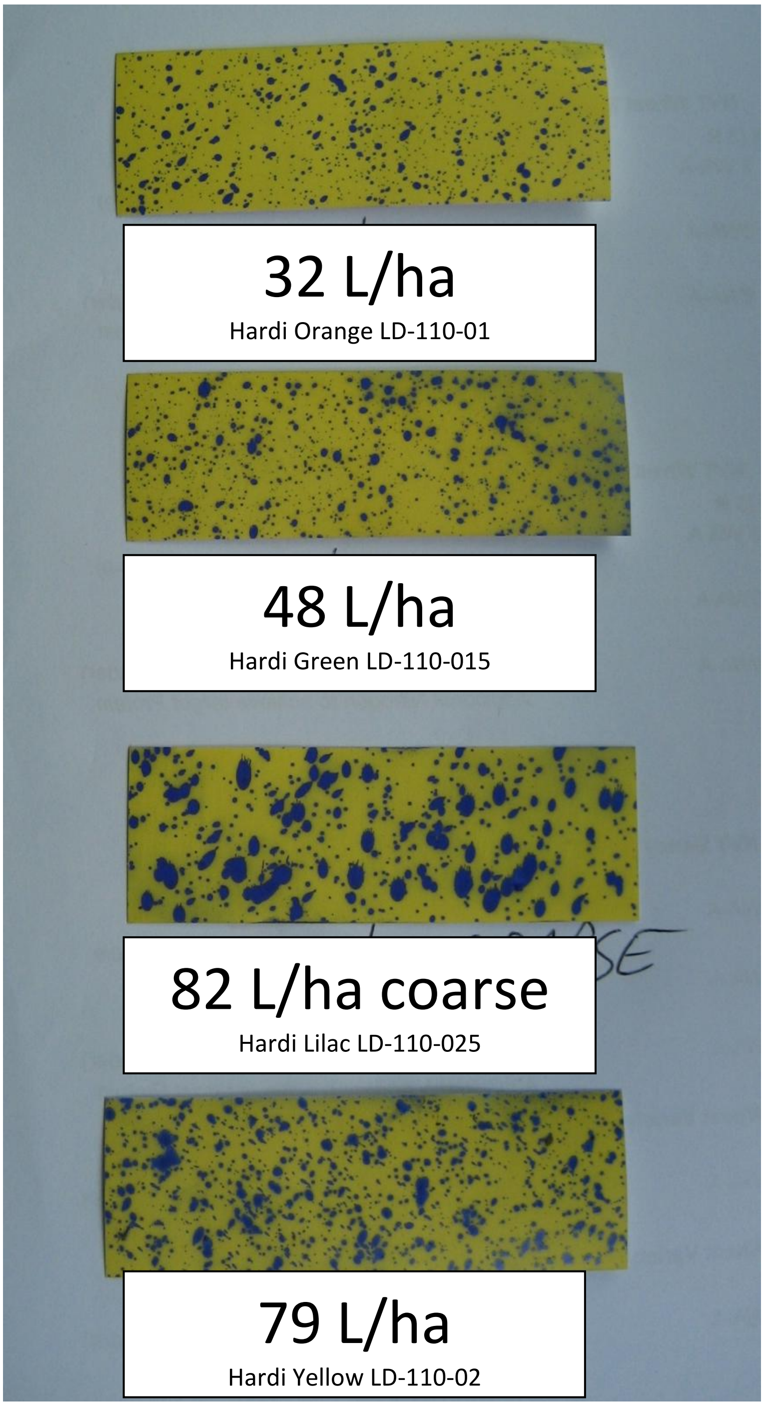

Figure 2: Spray quality by water volume – 13/7/10. (Water sensitive papers were placed on the horizontal weed leaf)

Coverage in the ranges produced by the Hardi Yellow LD-110-02 at 79 L/ha will help ensure optimal weed control provided weeds are not stressed.

To achieve the most effective control of wild radish aim for coverage comparable or better than that delivered by the 79 L/ha medium spray quality strip in this trial.

Results

Table 2: Crop safety and yield (t/ha) in Magenta wheat.

		Assessment Date		22/7/10	22/7/10	3/8/10	3/8/10	26/8/10	15/11/10	15/11/10
		Days after application		9DAA	9DAA	21DAA	21DAA	44DAA	125 DAA	125 DAA
		Rating Type		Rating	Rating	Rating	Rating	Rating	Yield	Yield
		Rating Scale		0-100	0-100	0-100	0-100	0-100	Harvest	Harvest
No	**Treatment**	**Rate/ ha**	**Water Rate L/ha**	**Discolour**	**Biomass Reduction**	**Discolour**	**Biomass Reduction**	**Crop Biomass**	**t/ha**	**% Untreated**
1	UNTREATED			0	0	0	0	80	1.37 a	100
2	VELOCITY HASTEN	670 mL/ha 1 % v/v	32 L/ha	0	0	0	0	95	1.91 a	139
3	VELOCITY HASTEN	670 mL/ha 1 % v/v	48 L/ha	0	0	0	0	100	1.82 a	132
4	VELOCITY HASTEN	670 mL/ha 1 % v/v	79 L/ha	0	0	0	0	100	1.78 a	130
5	VELOCITY HASTEN	670 mL/ha 1 % v/v	82 L/ha coarse	0	0	0	0	100	1.73 a	126
6	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	32 L/ha	0	0	0	0	100	1.66 a	121
7	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	48 L/ha	0	0	0	0	105	1.77 a	129
8	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	79 L/ha	0	0	0	0	110	1.88 a	137
9	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	82 L/ha coarse	0	0	0	0	110	1.70 a	124
10	VELOCITY HASTEN	1 L/ha 1 % v/v	32 L/ha	0	0	0	0	100	1.67 a	121
11	VELOCITY HASTEN	1 L/ha 1 % v/v	48 L/ha	0	0	0	0	100	1.70 a	123
12	VELOCITY HASTEN	1 L/ha 1 % v/v	79 L/ha	0	0	0	0	105	1.75 a	128
13	VELOCITY HASTEN	1 L/ha 1 % v/v	82 L/ha coarse	0	0	0	0	100	1.80 a	131
14	JAGUAR	1 L/ha	32 L/ha	16	0	20	0	85	1.76 a	128
15	JAGUAR	1 L/ha	48 L/ha	16	0	20	0	95	1.71 a	125
16	JAGUAR	1 L/ha	79 L/ha	15	0	22	0	100	1.82 a	132
17	JAGUAR	1 L/ha	82 L/ha coarse	18	0	22	0	85	1.84 a	134

Yield t/ha means followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).

Crop Effect

All Velocity® treatments were safe to the crop with no discolouration observed.
There was little effect of water rate on Jaguar®, with only the coarse droplets recording a slight increase in discolouration over the other treatments at 9 DAA. At 21 DAA there was no difference in discolouration between Jaguar® treatments and by 44 DAA no discolouration was observed in any treatment.

Crop Yield

All treatments out-yielded the untreated although none of the yield increases were statistically significant (P≥ 5%). The application of Estericide® 680 of 1 L/ha on the 25th August was effective in controlling surviving weeds from the previous herbicide treatments. A 35mm rainfall event on the 31/8/10 revived the crop and with the follow up herbicide application being effective, some of the potential yield differences captured in earlier weed biomass ratings did not translate to end yield.

Velocity® 670 mL/ha did not record any influence on yield from differences in weed control recorded from the different water rates. Velocity® 670 mL/ha + MCPA did record a numerical increase (not significant P ≥ 5%) in yield from weed control at the different water rates.

There was a general trend for increased crop yield from Velocity® 1 L/ha and Jaguar® 1 L at water rates of 79 L at a medium or 82 L/ha coarse spray quality that matched weed control.

Table 3: Weed Control – *Raphanus raphanistrum* – Wild radish

		Assessment Date		22/7/10	3/8/10	26/8/10
		Days after application		9DAA	21DAA	44DAA
		Rating Type		Rating	Rating	Rating
		Rating Scale		0-100	0-100	0-100
No	**Treatment**	**Rate/ ha**	**Water Rate**	**Control**	**Control**	**Control**
1	UNTREATED			0	0	0
2	VELOCITY HASTEN	670 mL/ha 1 % v/v	32 L/ha	33	66	73
3	VELOCITY HASTEN	670 mL/ha 1 % v/v	48 L/ha	37	77	82
4	VELOCITY HASTEN	670 mL/ha 1 % v/v	79 L/ha	40	81	86
5	VELOCITY HASTEN	670 mL/ha 1 % v/v	82 L/ha coarse	38	77	76
6	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	32 L/ha	45	76	86
7	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	48 L/ha	50	88	94
8	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	79 L/ha	60	90	95
9	VELOCITY MCPA LVE HASTEN	670 mL/ha 500 mL/ha 1 % v/v	82 L/ha coarse	53	87	90
10	VELOCITY HASTEN	1 L/ha 1 % v/v	32 L/ha	37	70	78
11	VELOCITY HASTEN	1 L/ha 1 % v/v	48 L/ha	47	84	84
12	VELOCITY HASTEN	1 L/ha 1 % v/v	79 L/ha	50	84	91
13	VELOCITY HASTEN	1 L/ha 1 % v/v	82 L/ha coarse	60	84	82
14	JAGUAR	1 L/ha	32 L/ha	33	42	42
15	JAGUAR	1 L/ha	48 L/ha	37	48	43
16	JAGUAR	1 L/ha	79 L/ha	43	62	63
17	JAGUAR	1 L/ha	82 L/ha coarse	40	65	57

Note: The size and density of the wild radish in this trial combined with the stressed conditions should be taken into account when evaluating the levels of weed control in this trial.

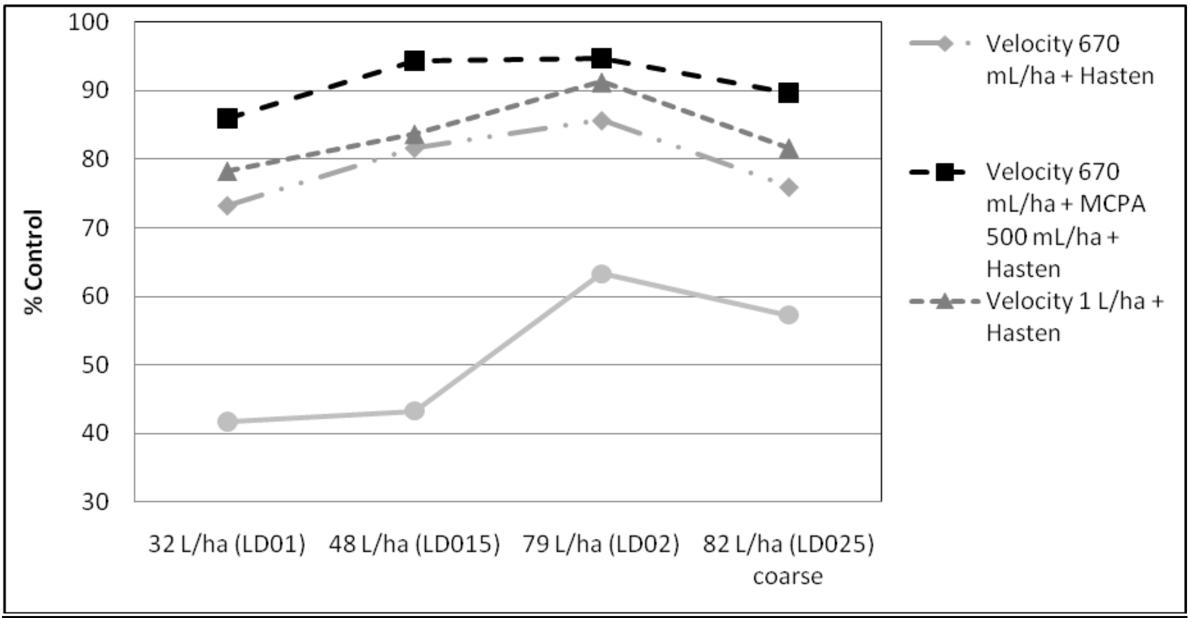

Figure 3: Wild radish control 26/8/10 (44 DAA).
Note: Scale starts at 30 % to highlight treatment differences and trends.

Effects of water rate on wild radish control
(All treatments were applied with a medium spray quality unless noted)
At 44 DAA with the density, size and levels of stress in the wild radish at this trial site Velocity® 670 mL/ha + Hasten® 1% v/v did not provide commercially acceptable control (≥90%) at any of the water rates. There was an increase in the level of control from increasing water rates from 32 L/ha (73 rating) to 48 L/ha (82) to 79 L/ha (86). When the spray quality was altered to a coarse spray quality at the 82 L/ha water rate control was reduced (76).

The addition of MCPA LVE at 500 mL/ha to Velocity® 670 mL/ha resulted in an increase in weed control at all water rates. The inclusion of the translocated herbicide MCPA to a tank mixture with Velocity® also resulted in a reduction in the influence of water rate on weed control. The 32 L/ha water rate recorded a 10% increase over the same water rate of Velocity® 670 mL/ha alone. Both the 48 L/ha (94) and 79 L/ha (95) rates recorded an increase in control of wild radish that was commercially acceptable. Application with the 82 L/ha (90) coarse droplet recorded a reduction in control from the 79 L/ha medium spray quality.

Increasing the rate of Velocity® from 670 mL/ha to 1 L/ha resulted in an increase in wild radish control at all water rates. Despite the slight increase in wild radish control from the increased herbicide rate, the influence of water rate was identical to the trends recorded from 670 mL/ha of Velocity®.

Resistance to Group F herbicides is not a likely factor in the poor control recorded by Jaguar® 1 L/ha at all water rates. These results have been influenced by the highly stressed conditions and coverage issues. The impact of water rate followed a similar trend to Velocity® with an increase in control recorded between the 32 (42) to 79 L/ha (63) water rates. Application at 82 L/ha (57) in a coarse spray quality resulted in a decrease in control from the 79 L/ha medium spectrum.

Comments
When applying Velocity® using a medium spray quality the results from this trial support previous field experience that suggests water rates of around 80 L/ha provide optimal coverage and control of high density wild radish. The addition of the translocated herbicide MCPA LVE to Velocity® is recommended where weed size or coverage may be an issue or if lower water volumes around 50 L/ha are to be used. Application of Velocity® with a coarse spray quality (droplet spectrum) cannot be recommended based on the results of this trial at rates below 80 L/ha. Further work needs to be conducted to determine if higher water rates with coarse droplets will improve control.

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Paper reviewed by Greg Skinner – Technical advisory manager, Bayer CropScience**.**

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Crop safety of SAKURA® 850WG with discs or knife points compared to Boxer Gold® for the pre-emergent control of Annual Ryegrass (*Lolium rigidum*) in Wheat

Rick Horbury, Technical Advisor, Bayer CropScience

Aim

To demonstrate the crop safety, extended incorporation time and efficacy of Sakura® 850WG pre-emergent herbicide on annual ryegrass (*Lolium rigidum*) in wheat compared to Boxer Gold®.

Background

Bayer CropScience is planning to launch Sakura®850WG containing the new active ingredient pyroxasulfone in time for the 2012 season. Sakura®850WG's mode of action is an inhibitor of Very Long Chained Fatty Acid biosynthesis and is likely to be classed as a Group K herbicide. It works through both root and shoot uptake and has been submitted for registration for the pre-emergent control of annual ryegrass, barley grass, phalaris, silver grass and toad rush in wheat, barley and triticale. Sakura®850WG is a pre-emergent herbicide that can be applied up to 14 days prior to sowing with knife points and press wheels or knife points and harrows. It works best when incorporated by sowing (IBS). Sakura®850WG is to be applied at 118 g/ha and is compatible with a range of other knockdown and pre-emergent products.

Trial Details

Property	Nankivell's property, East Maya
Plot size & replication	5m x 15m x 3 replicates
Soil type	Sandy Loam
Soil condition	40% average ground cover, Lupins and Ryegrass stubble thick in patches. Some germinated Lupins, and Wild Radish to 4 leaf.
Application date	28/5/10
Water Rate	80 L/ha
Ground Speed	9.2 kph applied by quad bike
Nozzle Type	DG11002 (Yellow Drift Guard 02's)
Sowing date	2/6/10
Time to incorporation	6 hours
Seeding Equipment	Nankivell's – Knife point and press wheels, McKenzie's – Bullet single disc
Seeding Rate	65 kg/ha
Row Spacing	12 inch
Seeding Speed	Nankivell's - 8 kph, McKenzie's – 16 kph
Seeding depth	3cm
Fertiliser (kg/ha)	2/6/10 60 kg/ha MAP
Herbicides	28/5/10: 5 L/ha Sprayseed®
Paddock rotation	07 Cadiz Serradella, 08 Wheat, 09 Lupins
Growing Season Rainfall:	141mm

Site Comments
This site received a single application of Sprayseed® applied by quad bike on the 28/5/10 immediately prior to application of the pre-emergent herbicides. The trial treatments were applied to moist soil on the 28/5/10. The trial was sown by the two different seeders on the 2/6/10 six days after the application of the pre-emergent herbicides using a Bullet single disc seeder and a standard Knife Point and Press Wheels system; both on 12 inch row spacing. The disc seeder had depth control issues with some of the seed being buried too deep. The aggressive setting of the sweep angle and the increased sowing speed of the disc resulted in more soil throw and therefore a greater stimulation and germination of weed seed. After sowing there was some trash across the site.

A site inspection on the 17/6/10 observed crop and weeds only just beginning to emerge with emergence from the knife point and press wheel system ahead of the disc seeder. Depth control problems with the disc seeder contributed to this reduced vigour.

Rainfall
There was a 30mm summer rainfall event over two days on the 21-22/3/10. A total of 138.5mm of rainfall was recorded at the site from the start of May to the end of November. 128.5mm of rainfall was recorded on the site from the application of the treatments to harvest with the last significant rainfall event of 36mm over two days to the 1st September.

Figure 1: Site at application 28/5/10

Results

Table 1: Crop effects in Arrino wheat.

		Assessment Date	7/7/10	3/8/10	3/8/10	9/9/10	9/9/10
		Days after application	40 DAA	67 DAA	67 DAA	104 DAA	104 DAA
		Rating Type	Rating	Rating	Rating	Rating	Rating
		Rating Scale	%	%	%	%	%
		Seeding System	Both	KNIFE	DISC	KNIFE	DISC
No	**Treatment**	**Rate /ha**	**Biomass Reduction**	**Biomass**	**Biomass**	**Biomass**	**Biomass**
1	UNTREATED		0	100	83	95	80
2	SAKURA® 850 WG	118 g/ha	0	100	85	100	93
3	BOXER GOLD®	2.5 L/ha	0	100	85	100	95

Note: Biomass ratings compared to Sakura 118 g/ha seeded by knife point and press wheels.

Crop Safety

All treatments were safe to the crop with no crop discolouration or biomass reduction recorded by either herbicide treatment.
On the 7/7/10, crop emergence was even across the site with the knife point and press wheel system still showing improved vigour over the disc seeded plots.

Biomass ratings at 67 and 104 DAA did not highlight any differences between herbicide treatments. The biggest factor was sowing system, with the improved crop vigour and reduced soil disturbance in the knife point and press wheel system resulting in lower numbers of ryegrass and therefore a larger crop biomass.

Table 2: Crop yield (t/ha) in Arrino wheat.

		Assessment Date	10/11/10		10/11/10	10/11/10		10/11/10
		Days after application	166 DAA		166 DAA	166 DAA		166 DAA
		Rating Type	Harvest		Harvest	Harvest		Harvest
		Rating Scale	t/ha		%	t/ha		%
		Seeding System	KNIFE		KNIFE	DISC		DISC
No	**Treatment**	**Rate /ha**	**Yield**		**% Untreated**	**Yield**		**% Untreated**
1	UNTREATED		1.19	a	100	0.77	b	100
2	SAKURA® 850 WG	118 g/ha	1.33	a	112	1.21	a	156
3	BOXER GOLD®	2.5 L/ha	1.37	a	115	1.25	a	161

Yields t/ha followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).

Yield

Knife points and press wheels: Both treatments recorded higher yields than the untreated although none were significant (P≤ 5%).
Single disc seeder: Both treatments recorded significantly higher yields (P≤ 5%) than the untreated although there was no difference between herbicides.
Yield differences between seeding systems were due to a combination of early crop vigour and the numbers of ryegrass present in the disc plots.
Late differences in ryegrass control did not influence end yield due to warm dry conditions throughout spring.

Table 3: Grain quality analysis and gross return ($/ha) in Arrino wheat.

	No	Treatment	Rate /ha	Protein	Moisture	H/Weight	Screenings	Grade	t/ha	Gross Return $/ha
Knife	1	UNTREATED		9.9	8.6	75.2	3.4	ANW1	1.19	$595.00
	2	SAKURA®	118	10.5	9.0	77.0	2.1	ANW1	1.33	$665.00
	3	BOXER®	2.5	10.2	9.0	77.7	2.1	ANW1	1.37	$685.00
Disc	1	UNTREATED		9.9	8.8	78.1	3.6	ANW1	0.77	$385.00
	2	SAKURA®	118	10.0	8.5	78.2	3.1	ANW1	1.21	$605.00
	3	BOXER®	2.5	10.1	8.9	78.1	2.2	ANW1	1.25	$625.00

*Based on Grain Trade Association wheat receival standards 2010-11.
Pricing based on AWB contract pricing delivered to Geraldton port zone, ANW1 = $500 9/12/2010
All treatments regardless of seeding system met the receival standards for Australian Standard White Noodle Varieties (ANW1).

Table 4: Weed Control – Annual ryegrass (*Lolium rigidum).*

		Assessment Date	3/8/10	3/8/10	9/9/10	9/9/10
		Days after application	67 DAA	67 DAA	104 DAA	104 DAA
		Rating Type	Rating	Rating	Rating	Rating
		Rating Scale	%	%	%	%
		Seeding System	KNIFE	DISC	KNIFE	DISC
No	**Treatment**	**Rate /ha**	**Control**	**Control**	**Control**	**Control**
1	UNTREATED		0	0	0	0
2	SAKURA® 850 WG	118 g/ha	85	82	87	76
3	BOXER GOLD®	2.5 L/ha	85	78	74	65

Annual ryegrass control

The lack of a decent rainfall event until the 8th July when 22.5 mm was recorded at the site did not favour the redistribution of Sakura® back into the cropping row or off stubble. The majority of ryegrass in the Sakura® plots was in patches of high stubble or on the edge of the furrow where nil herbicide was located. On the 7/7/10 there was no difference in control between herbicide treatments with ryegrass emergence too low to accurately assess.

Both herbicide treatments recorded comparable control of ryegrass at 67 DAA with the knife point system slightly ahead of the disc seeder.

Following a 36mm rainfall event over two days to the 1/9/10, good activity with an improvement in control was recorded from Sakura ®118 g/ha at 104 DAA with ideal conditions for root uptake with moist soil conditions remaining for several weeks. At the final assessment on the 9/9/10 the Boxer Gold® treatments did not record an improvement in weed control compared to Sakura®. Boxer Gold® had increased numbers of tillers per plant compared to Sakura® that resulted in a lower level of final ryegrass control recorded.

Figure 2: 9/9/10 (104 DAA) - Sakura® 118 g/ha symptoms of root activity on ryegrass.

Comments
At the time of publication Sakura 850WG is not registered. An application for the registration of Sakura 850WG has been made.
Sakura® is a Registered Trademark used under license by Bayer CropScience.

Paper reviewed by: Greg Skinner – Technical advisory manager, Bayer CropScience.

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Apron XL Seed Dressing Demonstration

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Aim

To evaluate whether Apron XL improves crop establishment, root development and yields in field pea crops by protecting seedlings against the early effects of root diseases.

Background

Apron XL is a Fungicidal Seed Treatment containing 350 g/L Metalaxyl-M. It is registered for the control of Damping Off caused by *Pythium* and for control of Downy Mildew in peas.

Although Downy Mildew is not a common problem in the Central Wheatbelt, *Pythium* has been found to be widely spread across cropping soils and although it is generally more prevalent in areas with annual rainfall greater than 350mm, it is by no means confined to these areas. In fact, new research has found that high rainfall or cold waterlogged soils are NOT a prerequisite for *Pythium* infection.[1] High incidences of root rot have been recorded in periods of drought - conditions not previously considered conducive to development of *Pythium* diseases. Even in the absence of Damping-Off (above ground) symptoms, *Pythium* has been found to reduce yield significantly through the damage it causes to the roots. A secondary effect is the increased susceptibility to other root and fungal diseases caused by the overall reduced plant health.Out of 141 Predicta B Root Disease tests carried out throughout WA in 2010, 94% were positive for *Pythium.*

Seed dressings are a highly effective means of managing disease during the development stage of a crop. Depending on the season, Apron XL can be expected to protect seedlings against fungal disease for up to five weeks after emergence. In 4 trials in South Australia Apron XL increased yield by an average of 318kg/ha.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	Seeder Bar Width x Length of Paddock
Soil type	Red Loam
Soil pH	7.3
EC	0.12 ds/m
Sowing date	28/5/2010
Seeding rate	100 kg/ha
Fertiliser	60 kg/ha MAP
Paddock rotation	05 Field Peas, 06 Wheat, 07 Wheat, 08 Wheat, 09 Wheat
Herbicides	0.1 L/ha Brodal®, 0.1 kg/ha Metribuzin, 0.2 L/ha Select, 0.075 L/ha Targa®
Growing Season Rainfall	141mm

Table 1: Treatments.

Site	Trmt	Herbicide Treatments	Fungicide Treatments
A	3	Terbyne (1.4 kg/ha) + Glyphosate (1 L/ha)	Nil
A	4	Terbyne (1.4 kg/ha) + Glyphosate (1 L/ha)	Apron XL
B	1	Diuron (1 kg/ha) + Metolachlor (1 L/ha) + Glyphosate (1 L/ha)	Nil
B	2	Diuron (1 kg/ha) + Metolachlor (1 L/ha) + Glyphosate (1 L/ha)	Apron XL
C	Nil	Rest of paddock	Apron XL

Results

Table 2: Yield and percentages of yield improvements of field peas treated with ApronXL compared to untreated peas.

Treatment	Yield (t/ha)	Percentage yield improvement over untreated (%)
1 Untreated	0.84	-
2 Apron XL	1.05	25%
3 Untreated	0.86	-
4 Apron XL	1.00	17%

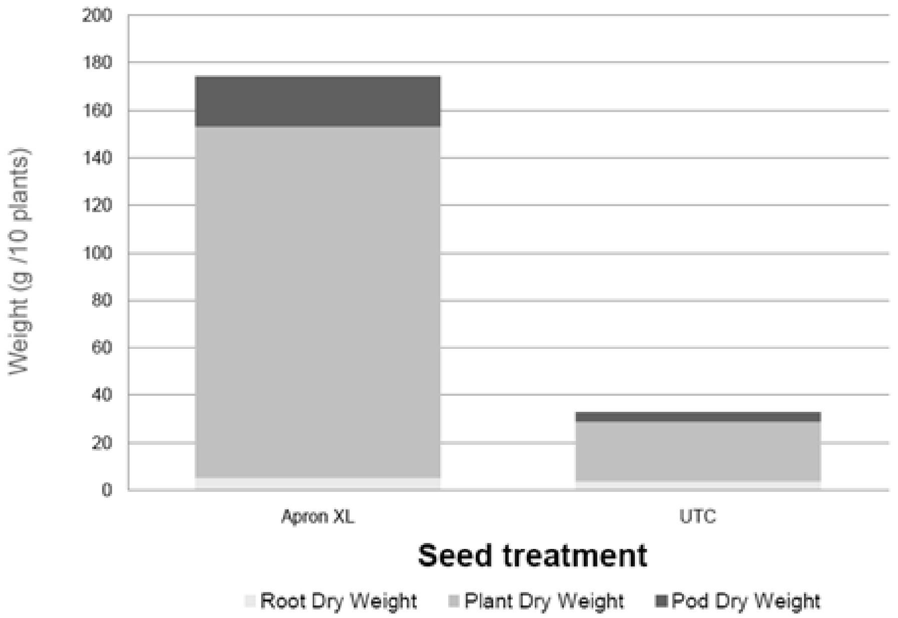

Figure 1. Plant weights (g/10 plants) recorded at site A.

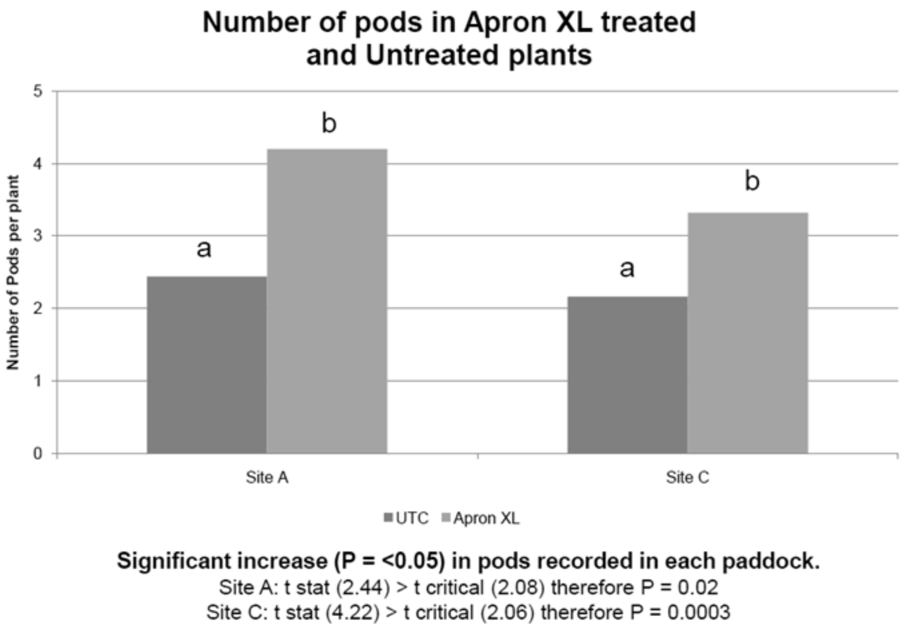

Figure 2. Number of pods in Apron XL treated and untreated plants.

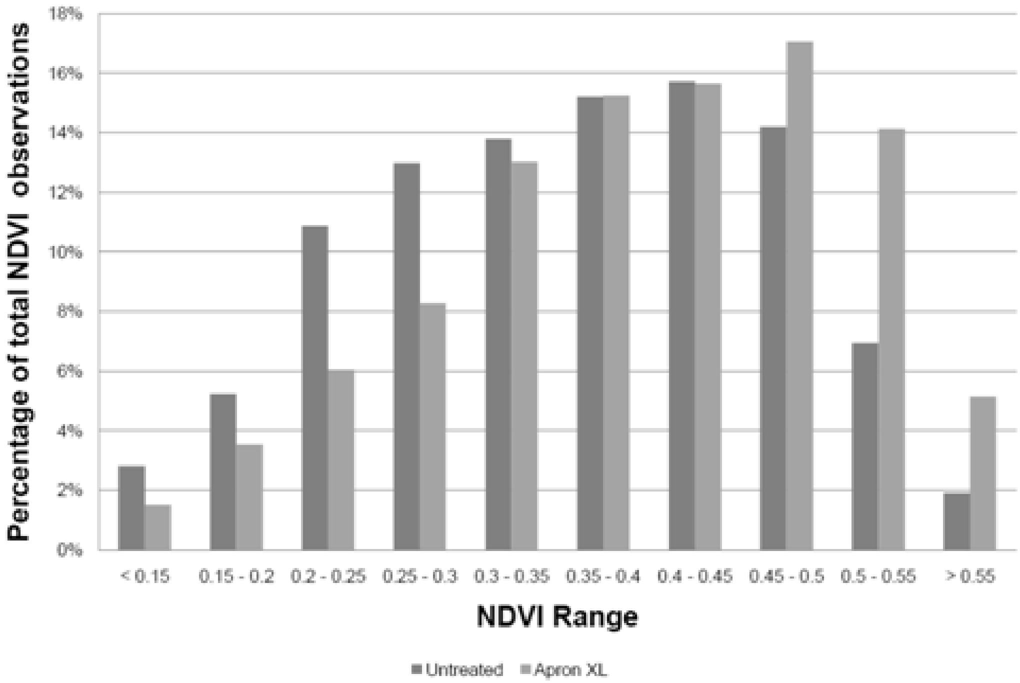

Figure 3. Histogram of NDVI scores recorded at Site A.

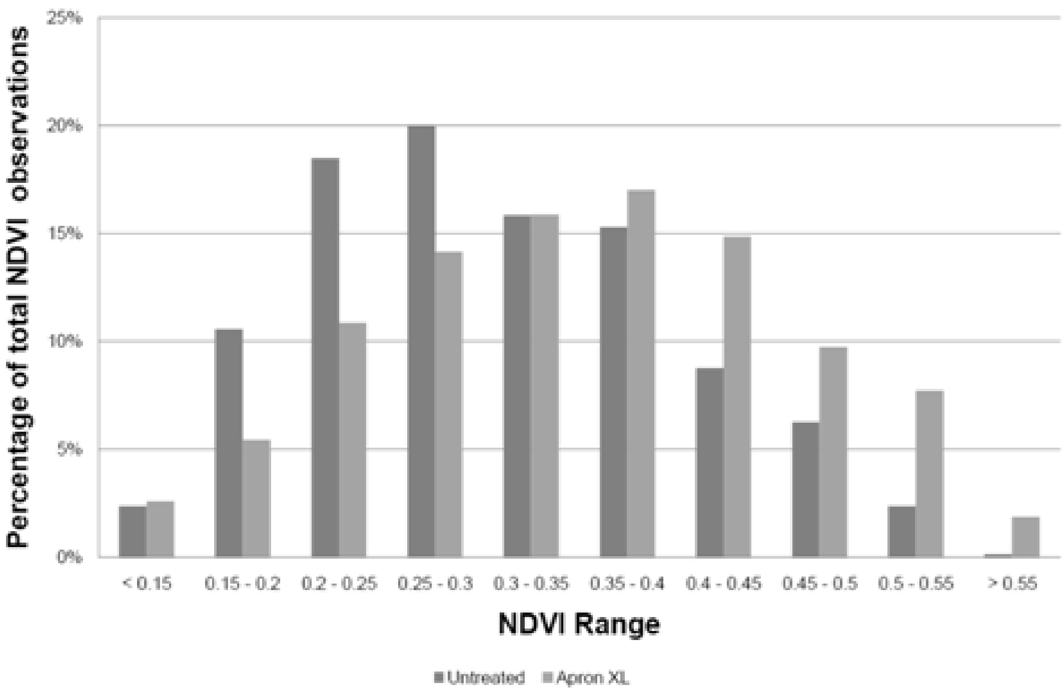

Figure 4. Histogram on NDVI scores recorded at Site B.

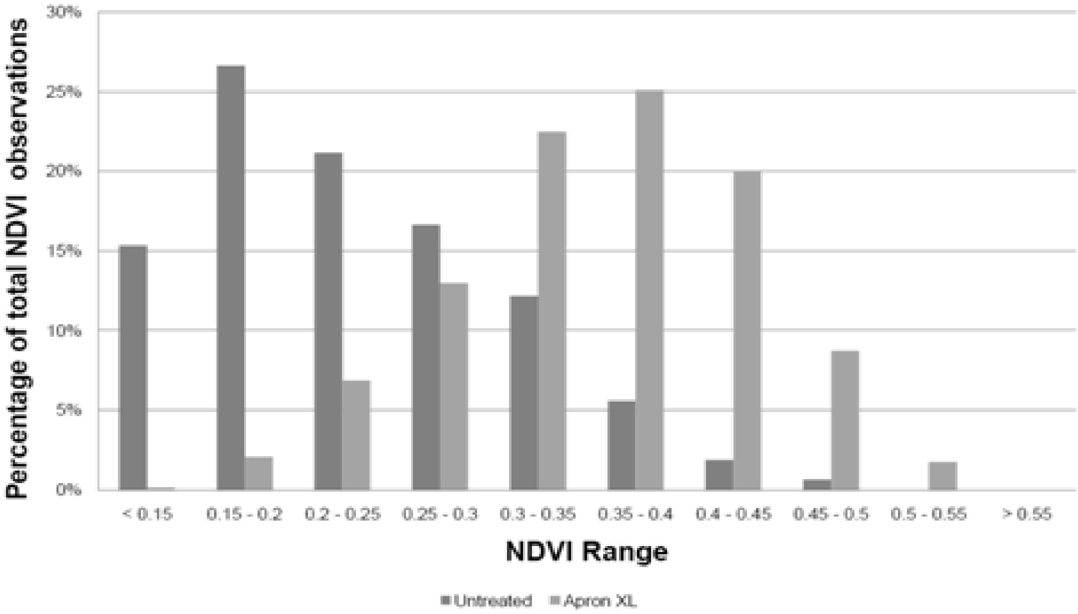

Figure 5. Histogram of NDVI scores recorded at Site C.

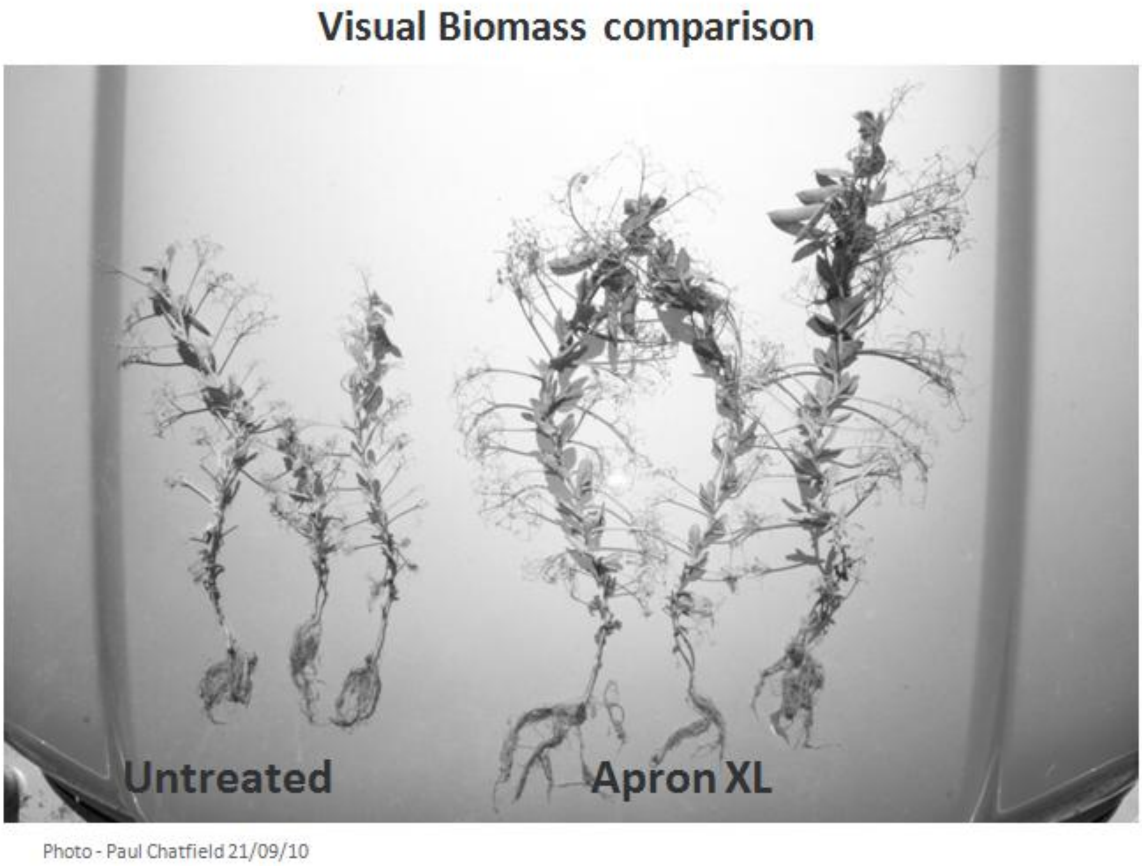

Figure 6. Visual Biomass comparison of field peas treated with Apron XL and Untreated.

Comments

NDVI is an index which represents the "greenness" or relative biomass of a crop, with values closer to 1 reflecting a high chlorophyll density indicating lush, healthy crops. The closer the score is to zero, the lower the density of chlorophyll, either as a result of lower biomass or reduced crop health (yellower looking crop). NDVI has been used to measure differences in biomass as it takes human error or subjectivity out of the equation. As can be seen in the histograms above, there is a clear difference in biomass between the untreated crop and the crop treated with Apron XL, with a shift to higher NDVI scores in the Apron XL histogram.

Final yield was disappointing given the crop's potential at the beginning of September. As with most crops in the state, another 20mm fall was probably all that was required for a hugely improved yield.

Tissue testing by DAFWA showed *Fusarium* Stem & Root Rot (*Fusarium* spp.) present in all samples, both treated and untreated. The Apron XL treated plants appeared to have withstood the infection somewhat better than the untreated plants. There could be many reasons for this but a strong possibility is that an early infection from sub-clinical levels of *Pythium* may have caused a degradation in the root system of the untreated plants and made them more susceptible to the effects of the *Fusarium* infection. This *Fusarium* infection manifested itself late in the season, with blackened pea crowns restricting water flow to already drought stressed plants and as a result impacting on pod fill. The Apron XL treated plants may have had their roots better protected against the early infection and were better able to withstand later infections and access available moisture. *Pythium* strips away the fine root hairs from the root which will have a significant impact in lower rainfall seasons, reducing the surface area of the plant's root and reducing the roots ability to access soil moisture.

Another interesting observation was a substantial infestation of Heliothis grubs during one of our trial inspections. The grubs were present in large numbers in the Apron XL treated crop, but were barely touching the untreated crop.

Rob Nankivell commented that the Apron XL treated peas were much less prone to lodging and so were significantly easier to harvest.

Acknowledgements
[1] Root Disease Fact Sheet, GRDC, Paul Harvey, CSIRO

Paper reviewed by Lyndon May, Syngenta Seedcare Manager SA/WA & Paul Chatfield, Syngenta Technical Services Lead WA

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Metribuzin pre-sowing: safe on Mandelup lupins again

Peter Newman, Weeds Research Officer, DAFWA

Aim

GRDC are providing funding to attempt to discover alternative herbicides for wild radish control in lupins. So far we have found no new herbicides for this purpose but we have had some success with improving wild radish control with currently registered herbicides. Mandelup lupins appear to be tolerant of metribuzin pre-sowing of lupin. This data (along with other trial data) will be submitted to the APVMA with the aim of registering metribuzin for use pre-sowing of lupin.

Background

One of the major constraints to lupin production in Western Australia is broadleaf weed control, in particular wild radish. Wild radish that has developed resistance to commonly used herbicides in lupins, namely diflufenican, is widespread throughout the lupin growing area of Western Australia. Wild radish survival in lupins reduces grain production, contaminates grain and reduces the value of lupin as a break crop. There are currently low levels of resistance to triazine herbicides such as Simazine, however, their efficacy is variable due to variable soil moisture.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	16 treatments x 2 post em herbicides plots 3m X 13m
Soil type	Yellow Gravelly Sand
Sowing date	3/5/2010 (dry)
Seeding rate	100 kg/ha Mandelup lupin
Fertiliser	60 kg/ha
Paddock rotation	09 Wheat
Herbicides	Glyphosate 1 L/ha pre. Pre-emergent treatments applied 29/04/2010. Post emergent spray 22/06/2010. Lupins 4 leaf. Wild radish cotyledon to 4 leaf (10cm). Most radish 2 leaf at spraying. Northern half of trial sprayed with Brodal 150 mL/ha + Simazine 400 mL/ha. Southern half of trial sprayed with Brodal 150 mL/ha + Metribuzin 100 g/ha
Growing Season Rainfall	141mm

Results

There was no significant difference in lupin yield between pre-emergent herbicide treatments ($p>0.05$). Mean lupin yield was 670 kg/ha across all treatments. The trial design did not allow us to compare lupin yield between post-emergent herbicide options. However, there was a trend towards higher yields for plots that received Brodal + Metribuzin post emergent compared to those that received Brodal + Simazine. This is likely to be due to the superior weed control of the Brodal + Metribuzin treatment.

There were significant differences in wild radish control between pre-emergent treatments ($p<0.05$) (Figure 1). These differences were apparent both before and after the application of post emergent wild radish herbicides (Figure 2). Once again the trial design does not allow us to compare weed control between post-emergent herbicide options. However, there is a very strong trend indicating superior wild radish control where Brodal + Metribuzin was applied post emergent compared to those that received Brodal + Simazine post-emergent.

There was no significant difference in lupin establishment across all treatments ($p>0.05$). The mean lupin density was 19 plants /m^2 across all treatments.

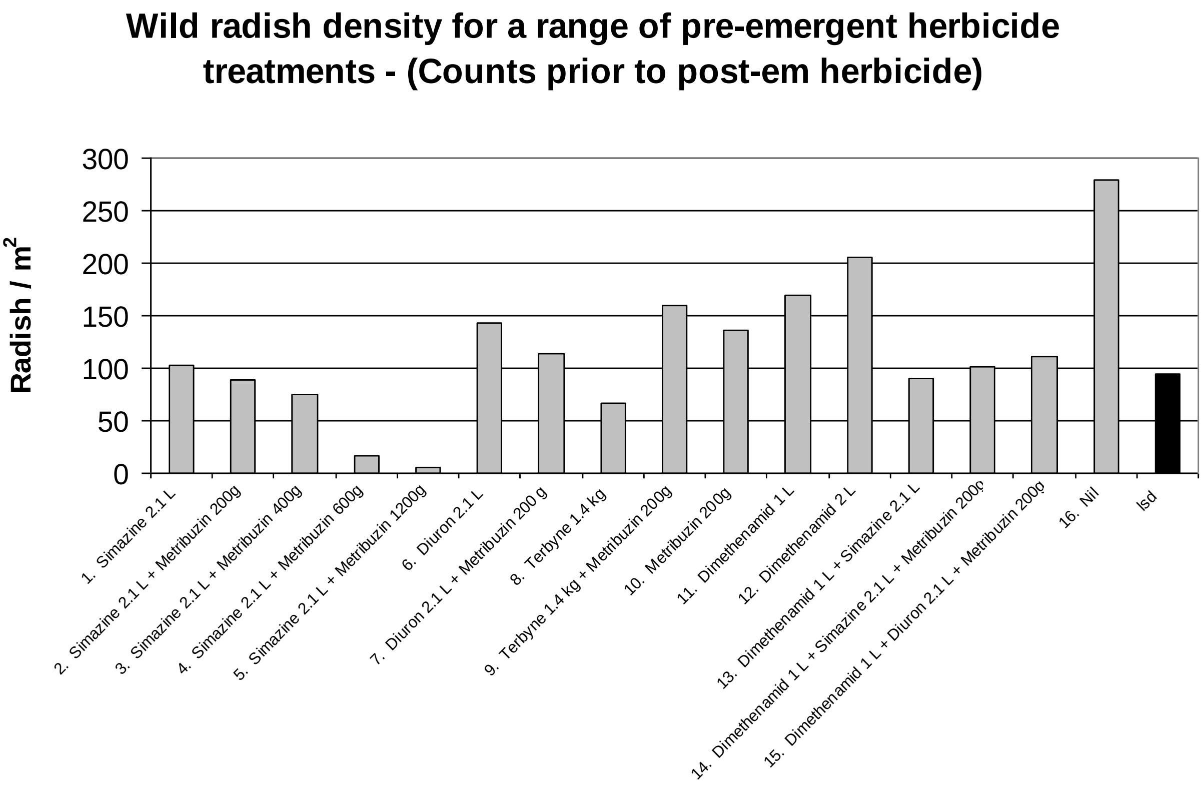

Figure 1: Surviving wild radish (plants / m^2) after a range of pre-emergent herbicide treatments but prior to post emergent herbicide application.

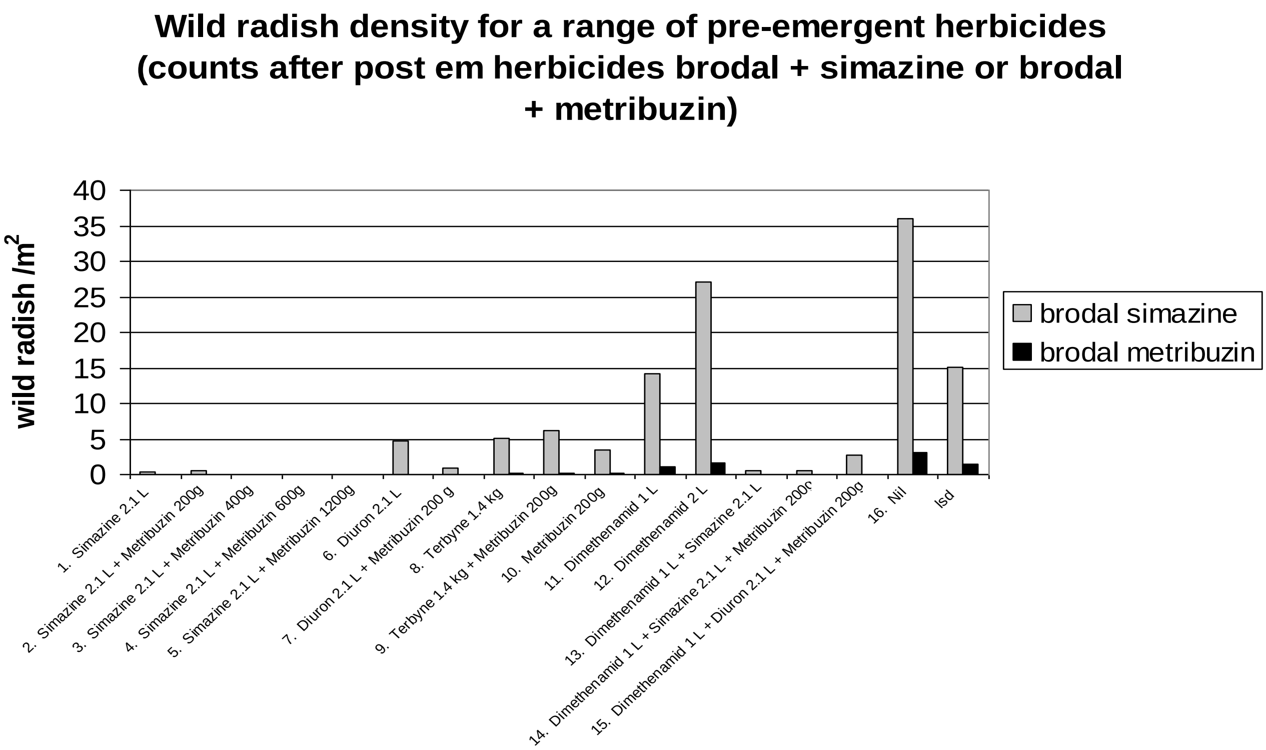

Figure 2: Wild radish density for a range of pre-emergent herbicide treatments counted 4 weeks after the post-emergent application of Brodal + Simazine or Brodal + Metribuzin.

Comments

This trial, along with several others over the past four growing seasons, indicates that Mandelup lupins have excellent tolerance of metribuzin when applied pre-sowing. This practice is currently not registered. All of this research will be submitted to the APVMA to attempt to add metribuzin pre-sowing of lupins to the herbicide label. The rate that we pursue for this registration will be governed by current MRL data for this product and is likely to be in the order of 150 to 300 g/ha.

We have limited efficacy data for the control of wild radish by applying metribuzin pre-sowing due to some trials in the past being weed free. This trial provides excellent data and demonstrates that useful suppression of wild radish can be achieved. This is demonstrated by the suppression of wild radish that was evident prior to applying post-emergent herbicides (Figure 1).

Complete (100%) wild radish control was achieved with Brodal 150 mL/ha + Metribuzin 100 g/ha post-emergent wherever Simazine was applied pre-sowing. It is likely that there are low levels of resistance to these herbicides at this site due to a limited lupin history in this paddock. If this result was typical there would be little need for this research!

This trial demonstrates the benefits of spraying small weeds in lupins. The post-emergent herbicides were applied when the lupins were 4 leaf and the biggest wild radish were 10cm diameter. This may be considered a little early for the Brodal + Metribuzin mix, however, in this situation there was excellent weed control with no crop phyto toxicity. Rob sprayed the surrounding paddock much later as he was considering spraying it out with glyphosate due to the dry season. Unfortunately this resulted in very poor wild radish control.

Dimethenamid is a new product due to be registered by Crop Care next year as Outlook®. Its specialty is ryegrass control in pulse crops. Dimethenamid was included in this trial because previous work by Crop Care indicated that it may give wild radish suppression at high rates. No such suppression was observed here.

Terbyne (terbuthylazine) is a triazine herbicide similar to Simazine. Wild radish control with Terbyne appeared similar to simazine when counted prior to post-emergent herbicides. However, weed counts after the post emergent herbicides revealed that wild radish survived post-emergent Brodal + Simazine where Terbyne was applied pre-sowing but not where simazine was applied pre sowing.

Diuron gave poor wild radish control and is known to be soft on grasses so it is not a good alternative to Simazine.

Acknowledgements

Many thanks to Rob Nankivell for providing a nice, weedy site! Many thanks also to Dave Nicholson for technical support and Trevor Bell for harvesting the trial. Thankyou to GRDC for supporting this research.

Paper reviewed by Wayne Parker, DAFWA

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Assessment of WMF Mineral/Microbe Broadacre Cropping Package and Nitrogen Management

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Richard Devlin, Rebecca Clarke, Living Farm Agricultural Research and Consultancy

Aim

Western Mineral Fertilisers (WMF) Mineral and Microbe cropping programs have basically performed well on relatively low applications of Nitrogen and Phosphorus. This current trial is part of on-going research being conducted to examine mineral fertiliser/microbe programs and the value of adding various forms of extra or top up N.

Background

To evaluate crop vigour, nutrient status (plant tissue analysis), yield and quality - growing wheat with conventional granular fertiliser or Western Mineral's granular mineral fertiliser NPK Crop Plus.

To compare the effects of various "extra" Nitrogen applications.

Trial Details

Property	Nankivell property, East Maya
Plot size & replication	12m x 1.84m x 4 replicates, complete randomised block
Soil type	Loam, marginal moisture at 2cm, drying profile with hardpan at 20cm
Soil pH	5.5 ($CaCl_2$)
EC	0.152 dS/m
Sowing date	2/7/2010
Seeding rate	55 kg/ha Clearfield Stiletto (untreated with pickle or seed dressing). WMF plots treated with Ag Microbes @ 750 g/ton
Fertiliser	see table below
Nitrogen Application	at sowing or post emergent at 50% GS 12, 25% GS 13, 25% GS 14 (29/6/2010)
Paddock rotation	08 Peas, 09 Wheat
Herbicides	pre-emergent - Diuron at 400 mL/ha, Trifluralin at 2.5 L/ha, Avadex at 1.8 L/ha, Round-Up at 2 L/ha
Growing Season Rainfall	141mm

Table 1: Treatments.

Tml	Fert	Microbes	Nitrogen	Type of Fert	Units of N	N Timing
1	0	N	0	None	0	No N applied
2	NPK	Y	0	None	0	No N applied
3	NPK	Y	10 Units Granular WMF N	WMF	10	At Seeding
4	NPK	Y	20 Units Granular WMF N	WMF	20	At Seeding
5	NPK	Y	10 Units Granular Urea	Conventional	10	At Seeding
6	NPK	Y	20 Units Granular Urea	Conventional	20	At Seeding
7	NPK	Y	10 Units Granular WMF N	WMF	10	3WAS
8	NPK	Y	20 Units Granular WMF N	WMF	20	3WAS
9	NPK	Y	10 Units Granular Urea	Conventional	10	3WAS
10	NPK	Y	20 Units Granular Urea	Conventional	20	3WAS
11	DAP	N	0	None	0	No N applied
12	DAP	N	10 Units Granular WMF N	WMF	10	At Seeding
13	DAP	N	20 Units Granular WMF N	WMF	20	At Seeding

Tml	Fert	Microbes	Nitrogen	Type of Fert	Units of N	N Timing
14	DAP	N	10 Units Granular Urea	Conventional	10	At Seeding
15	DAP	N	20 Units Granular Urea	Conventional	20	At Seeding
16	DAP	N	10 Units Granular WMF N	WMF	10	3WAS
17	DAP	N	20 Units Granular WMF N	WMF	20	3WAS
18	DAP	N	10 Units Granular Urea	Conventional	10	3WAS
19	DAP	N	20 Units Granular Urea	Conventional	20	3WAS

Note: All WMF treated plots had seed treated with 750g/t of WMF AgMicrobes.

Table 2: Nutrient breakdown.

Typical %	N	P	K	S	Ca	Mg	Fe	Si	Cu	Zn	Mo	Mn	B	Ni
WMF NPK Crop Plus	8.5	8.5	4.5	8.0	4.0	0.8	2.1	5.4	0.035	0.035	0.0002	0.33	0.0013	0.0026
DAP	18.0	20.0	-	1.7	-	-	-	-	-	-	-	-	-	-
WMF N*	23.9	-	-	10.8	4.4	-	-	-	-	-	-	-	-	-
Urea	46.0	-	-	-	-	-	-	-	-	-	-	-	-	-

* **WMF N** contains nitrogen in the Ammonium (16.5%) and Nitrate (7.4%) forms

Results

Vigour

Plots were rated for vigour on two occasions. Vigour scores take into account biomass, colour and general plot fitness. There was generally very little vigour response to fertiliser, regardless of type or timing. The possible reason for this is outlined below in the yield section.

Yield

The mean site yield was 0.806 t/ha, with yields ranging between 0.717 t/ha and 0.866 t/ha.
Initially, each treatment combination (e.g. Treatment 2: NPK, microbes, No Urea) was tested against the yield. There were no significant differences noted between yields from different treatments. No significant differences were seen in the type of Nitrogen fertiliser applied, or the timing of Nitrogen application.

There are two factors which may have influenced this; firstly, the paddock had a large pea crop in 2008 and low yielding wheat crop in 2009, hence there may have been high background levels of soil nitrogen which may have masked some of the effects in this trial.
Secondly the poor seasonal conditions meant that yields were far below what might have been expected. Thus, nutrition may not have been a limiting factor, even in the low input plots.

Grain Quality

Significant differences were observed between the protein levels for different treatments. These differences can be seen in Table 3. A consistent protein rate response to levels of nitrogen applied was observed, with those plots which received higher rates of nitrogen generally returning higher grain protein. The type of Nitrogen (WMF N or Urea) applied did not have a significant effect on protein levels at equivalent rates of Nitrogen. Results for screenings varied (Table 3 and 4 respectively).

Hectolitre weight was not significantly affected by the Nitrogen Fertiliser Type (Table 3) or timing of Nitrogen (Table 4).

Table 3: Nitrogen fertiliser type and yield and quality

Nitrogen Fertiliser Type	Yield t/ha	Protein (%)	H/Weight (kg/hl)	Screenings (%)
Zero Urea	0.801	12.59	75.55	3.66
10 Units Granular WMF N	0.831	13.93	74.28	4.45
10 Units Granular Conventional Urea	0.819	14.06	74.74	4.51
20 Units Granular WMF N	0.808	14.71	73.92	5.11
20 Units Granular Conventional Urea	0.775	15.24	73.42	5.48
F prob	***NS***	***<.001***	***NS***	***0.024***
LSD	***NS***	***0.822***	***NS***	***1.142***
CV %	***NS***	***6.30***	***NS***	***31.9***
Grand Mean	***0.806***	***14.18***	***74.32***	***4.69***

Table 4: Nitrogen timing and yield and quality

Nitrogen Timing	Yield t/ha	Protein (%)	H/Weight (kg/hl)	Screenings (%)
No N applied	0.801	12.59	75.55	5.02
At Seeding	0.826	14.34	74.20	4.76
3WAS	0.790	14.64	73.98	3.66
F prob	***NS***	***<.001***	***NS***	***0.035***
LSD	***NS***	***0.681***	***NS***	***1.031***
CV %	***NS***	***7.10***	***NS***	***32.5***
Grand Mean	***0.806***	***14.18***	***74.32***	***4.69***

Paper reviewed by Janette Drew, DAFWA

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Liebe Group Soil Biology Trial

Nadine Hollamby, GRDC Project Coordinator, Liebe Group
Andrew Wherrett, Soil Researcher, University of Western Australia

Aim
To investigate the potential of organic matter inputs to increase soil water storage, increase yield and improve soil health.

Background
This long term trial was established in 2003 to investigate how soil biology and carbon affect crop yield and soil health.

The trial site was selected as it had no significant chemical or physical soil constraints, therefore capacity to increase grain production through improved moisture conservation and enhanced soil biota can be demonstrated.

The trial aims to understand how agronomic factors such as yield and grain quality are affected by organic matter (OM) breakdown and cycling. Although the application of 20 t/ha of organic matter is not practical in a commercial farming enterprise this treatment is designed to demonstrate the potential upper level of organic carbon for sandy soils in our environment. After three separate applications (2003, 2006, and 2010) of organic matter, totalling 60 t/ha, we assume the soil is near soil organic carbon capacity.

In 2010 treatments used in the Soil Biology Trial were simplified, microbial products that previously have not shown any yield and quality benefit were removed from the trial.

Trial Details

Property	Liebe Group Long Term Research Site, West Buntine
Plot size & replication	10.5m x 80m x 3 replicates
Soil type	Sandy Loam
Soil pH	Topsoil= 6, Subsoil = 5.9 to 4.6
EC	0.02 dS/m
Sowing date	28/5/10
Seeding rate	60 kg/ha Magenta
Fertiliser	28/5/10: K-till Extra at 60 kg/ha 12/7/10: Flexi-N at 40 L/ha
Paddock rotation	07 Wheat, 08 Wheat, 09 Lupins
Herbicides	6/4/10 at 1L/ha Powermax, 28/5/10 at 2.5 L/ha BoxerGold, 21/6/10 at 0.3 L/ha Jaguar, 6/8/10 at 0.8 L/ha Ester 680
Growing Season Rainfall	166mm

2010 Treatment List
1. Control (minimum till with knife points and full stubble retention)
2. Tilled soil using offset disks
3. Till soil plus 20 t/ha organic matter (organic matter is applied once every 3 years)
4. Tilled soil, organic matter run down (plots where organic matter was previously applied in 2003/2006)
5. Burnt (plots last burnt in March 2009)

Trial history

Year	Crop type	Yield range	Treatment notes
2003	Lupin	None recorded	Set up phase: 20 t/ha Barley chaff applied, Lupin crop brown manured
2004	Wheat (cv. Wyalkatchem)	2.9-3.5 t/ha	Brown manuring and addition of 20 t/ha organic matter increased yield by 18-22%
2005	Wheat (cv. Wyalkatchem)	2-2.8 t/ha	Burnt plots yielded 25% higher than control.
2006	Lupins	None recorded	Set up phase: 20t/ha Canola chaff applied, brown manure
2007	Wheat – sprayed out	None recorded	Trial sprayed out for weed control.
2008	Wheat (cv. Wyalkatchem)	2.4-3.4 t/ha	Addition of organic matter increased yield by 23% compared to control.
2009	Lupin	1.5 t/ha	Set up phase.
2010	Wheat (cv. Magenta)	2.5-1.9 t/ha	20 t/ha chaff applied. No significant difference between treatments

Results

There were no statistically significant differences in yield between treatments. There was a trend towards a lower yield in the organic matter plots however large variation between replicates made it difficult to draw any strong conclusions about the relationship between organic matter inputs and grain yield in this season. There was also no significant difference between grain quality parameters. Organic matter plots had a significantly lower harvest index than the other treatments, indicating the amount of grain was low relative to crop biomass.

The low yield and small grain size in the organic matter plot (although not statistically different from the other treatments) could be explained by the dry season. High OM treatments may have increased water retention following rainfall events compared to other treatments, allowing for early crop growth and therefore increase biomass early in the season. A lack of rain during the latter stages of crop growth may have contributed to the trend toward a lower yield in this treatment. This would also explain the significantly lower harvest index of the high OM treatment.

Table 1: Harvest yield and grain quality of wheat comparing different tillage and stubble retention methods at West Buntine.

Treatment	Yield (t/ha)	Harvest Index (%)	Hect-weight (kg/hL)	Protein (%)	Screen. (%)
Control	**2.5**	**20 b**	**74**	**13.8**	**15**
Organic Matter	1.9	15 a	73	12.3	22
OM run down	2.5	21 b	74	14.6	19
Till	2.4	19 ab	75	12.3	14
Burnt	2.4	21 b	75	13.7	18
l.s.d	NS	3.9	NS	NS	NS

Table 2: Soil analysis for 0-10cm as sampled in August 2010.

Treatment	Nitrate N (mg/kg)	Amm. (mg/kg)	Phos. (mg/kg)	Potassium	Sulphur	Organic carbon (%)
Till	13 a	2	33 a	74 a	3 a	0.7
Burnt	19 a	2	38 ab	70 a	4 ab	0.8
Control	**20 ab**	**2**	**41 abc**	**87 a**	**4 ab**	**0.9**
OM	22 ab	3	61 bc	240 b	8 bc	1.2
OM rundown	30 b	3	62 c	138 a	11 c	1.0
l.s.d	*7.38*	*NS*	*15.4*	*56.87*	*2.7*	*NS*

Levels of phosphorus, potassium and sulphur in the topsoil were all higher in the organic matter plots. In the case of potassium, adding organic matter had more than doubled the plant available nutrients compared to the control. Organic carbon tended to be higher in the plots with high organic matter additions and lowest in the tilled plot however this difference was not statistically significant. Although significant external sources of carbon have been applied in this treatment, this result is not unexpected as changes in the total soil organic carbon pool takes time (>10 yrs).

Soil moisture at seeding was not altered by organic matter or tillage in 2010 (Figure1).

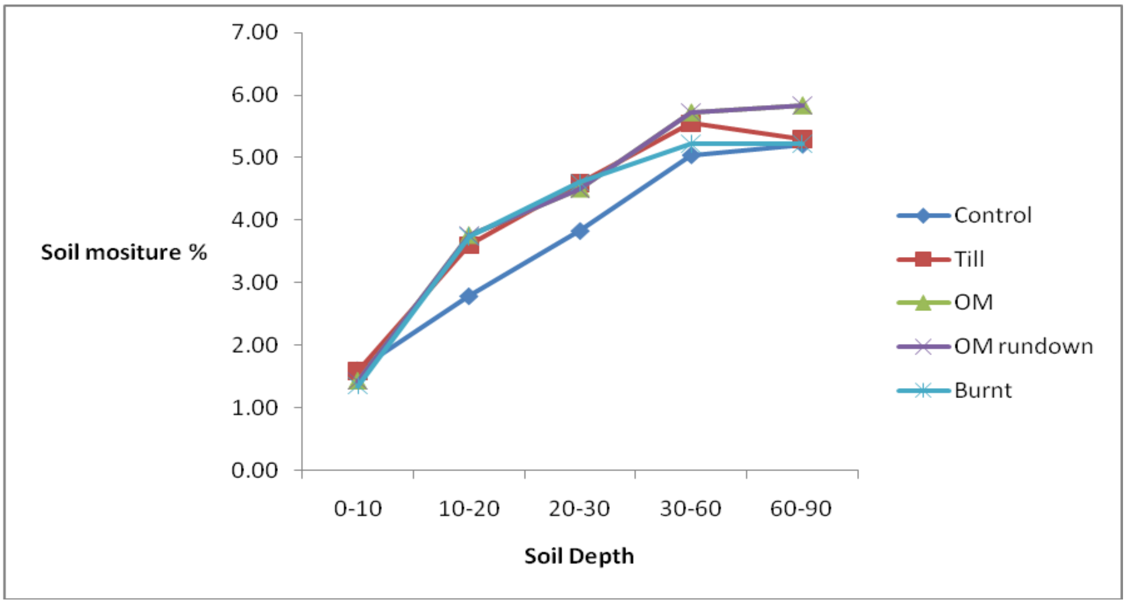

Figure 1: Soil moisture at seeding

Comments

The significantly higher potassium concentration in the OM treatments is likely to be linked to the type of organic matter added to those trial plots. In effect, the addition of chaff is having the opposite effect of hay cropping, where potassium removal requires additional K fertiliser for subsequent crops. The addition of chaff to the OM plots has lead to a significant import of K to these plots.

Nitrogen levels are not significantly higher in the OM plots as chaff will have a very high Carbon to Nitrogen ratio, which limits the organic nitrogen available for crop uptake. In essence, the addition of chaff as the organic matter source will provide very little extra nitrogen for crop growth. Cereal residues naturally have a carbon to nitrogen (C:N) ratio between 50:1 and 100:1 and therefore provide very little organic N to the soil solution. In addition, the relationship between soil microbes and the C:N ratio of residue is also important. Typically, a C:N ratio between 22:1 and 30:1 is optimal for OM breakdown (Hoyle, 2006). A C:N ratio higher than that infers there is not enough N in the system for the soil microbes themselves, resulting in net immobilisation of nitrogen in the soil. Conversely, a C:N ratio below these levels results in excess nitrogen becoming plant available. It is likely the chaff applied in 2010 is resulting in net immobilisation of nitrogen in the soil. It is important to understand organic matter quality plays a significant role in soil nitrogen cycling.

In general, the treatment effects combined with a difficult finish to the 2010 season highlighted a few important soil processes;

- High C:N ratio of the wheat chaff most likely contributed to a net immobilisation of nitrogen into the microbial biomass.
- The addition of chaff to the OM treatment was a significant source of K.

Acknowledgements

The Liebe Group would like to express our appreciation to GRDC for funding this trial and Andrew Wherrett, Daniel Murphy and Richard Bowles from the University of Western Australia for advice and assistance in sampling.

Thank you to Stuart McApline and staff for conducting the seeding, spraying the harvesting of this trial.

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Paper reviewed by Chris O'Callaghan, Liebe Group

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Impact of Biochar on crop yield and nitrogen

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Aim

To determine the impacts of Biochar on crop yield
To determine how Biochar influences plant nitrogen uptake and soil nitrogen mineralization
To compare the effectiveness of different methods of applying Biochar to the soil

Background

Biochar is a carbon rich product created when organic matter is heated to temperatures greater than 250 °C in low oxygen conditions. During the conversion of organic matter to Biochar, volatile compounds are released. These compounds can be combusted to produce energy; hence it can be considered a carbon negative method of producing energy. Biochar is also very stable in soils. It can remain in soils for many hundreds or thousands of years, providing a method of carbon sequestration.

Our interest lies with its potential agronomic impact. It is suggested that application to soil may aid yield improvement. However, trial results have been varied. There are many potential explanations for varying results. One is the range of sources being used for Biochar. Biochar made from oil mallee will react differently in soil than Biochar made from a manure source. On top of this, the same Biochar may react differently in contrasting soil types.

There are many mechanisms by which Biochar can alter soil properties. The high cation exchange capacity of Biochar should improve nutrient retention, particularly in coarsely textured soils. As most Biochar is alkaline, it may also provide a liming effect. From a biological perspective, Biochar is also a potential habitat for microbes to avoid predation by nematodes and protozoa. Some Biochars can also supply nutrients.

With the proposed construction of a Biochar pyrolysis plant in Kalannie, the Liebe Group felt it was a timely opportunity to investigate the potential benefits and negative impacts of Biochar on crop production. The aim of this experiment is to examine the interaction between Biochar (made from wheat chaff) and nitrogen. From this we hope to determine whether Biochar changes nitrogen fertiliser use efficiency. Through funding from GRDC and Woolworths, the Liebe Group has been able to collaborate with the University of Western Australia in undertaking this trial.

Experimental methods

If Biochar does prove to be a beneficial soil ameliorant, growers will need to consider how to apply the product. In this trial, Biochar was either banded or applied on the soil surface at a rate of 4 t/ha using the Department of Agriculture and Food’s trial seeder. The Biochar was applied in April 2010. The crop was then seeded on the 25th of May but due to a high ryegrass burden was sprayed out and re-seeded on the 17th of June. To investigate the claim that Biochar increases fertiliser efficiency the trial compares 3 nitrogen rates (0 units, 20 units or 40 units of N) applied as urea at seeding. No further nitrogen was applied.

Trial Details

Property	Liebe Long Term Research Site, West Buntine
Plot size & replication	20m x 2m x 4 replicates
Soil type	Deep Yellow Sand
Soil pH ($CaCl_2$)	topsoil 5.5, subsoil 4.6
EC	0.04 dS/m
Sowing date	17/7/10
Seeding rate	75 kg/ha Wyalkatchem
Fertiliser	17/7/10: 50 kg/ha Double phos. Urea as per treatments
Paddock rotation	07 Wheat, 08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	17/7/2010: 2 L/ha Sprayseed, 1.5L Treflan
Growing Season Rainfall	166 mm

Results

Table 1: Average crop yield, grain protein and biomass production after Biochar was applied on surface and deep banded with 3 rates of nitrogen fertiliser (0, 20, 40 units of N). The L.S.D used is for comparing biochar treatments.

Nitrogen Treatment (kg N/ha)	Biochar Treatment (t/ha)	Yield (t/ha)	Protein %	Grain N (kg N/ha)	Post-tillering Biomass (t/ha)	Anthesis Biomass (t/ha)
40	Nil	1.5	10.7	35.3	0.8b	5.2
40	Banded	1.5	11.4	39.5	0.8b	5.5
40	Spread	1.4	11.4	35.3	0.9a	4.7
20	Nil	1.4	9.8	28.6	0.6d	4.5
20	Banded	1.4	10.0	29.5	0.7c	4.2
20	Spread	1.3	9.7	26.0	0.7c	4.9
0	Nil	1.4	9.2	27.7	0.4f	3.9
0	Banded	1.3	8.9	23.0	0.5e	3.8
0	Spread	1.6	8.7	28.7	0.5e	4.3
L.S.D (biochar)		**NS**	**NS**	**NS**	**0.08**	**NS**

Means followed by the same letter do not significantly differ (P=0.05)

Biochar and nitrogen had no effect on crop yield or protein in 2010 (Table 1). The total amount of nitrogen in the grain did not change with Biochar addition (Table 1), as such, the export of nitrogen from the soil did not change as a result of Biochar addition. There was no interaction between Biochar and nitrogen present in harvest results.

In the early stages of crop growth (post tillering) the addition of Biochar by topdressing increased plant biomass (0.7 t/ha compared to 0.6 t/ha where no Biochar was applied). By anthesis, however, Biochar had no significant effect on crop growth.

The increased crop biomass early in the season where Biochar was spread, could be attributed to Biochar's high water holding capacity, thereby aiding establishment and early plant growth in this below average rainfall season. In relative terms, 4 t/ha of Biochar contributes to only 0.5% of total soil mass of the topsoil (0-10cm). The effect this amount of Biochar has on water holding and cation exchange capacity in sandy soil, is largely unknown and required further analysis.

Comments

Biochar addition in this trial did not alter the grain yield, protein or total grain N harvested. This trial did not find any interaction between Biochar application and nitrogen fertiliser usage. The Liebe group will continue to monitor this trial in order to understand how Biochar affects crop production and the nitrogen cycle over time.

Using Biochar in broadacre agriculture, is a relatively new concept and is largely untested. Conditions for this experiment were not ideal, rainfall was below average, plots were cultivated 4 times in order to apply Biochar, and due to a high weed burden, the trial was seeded late. However, these are important considerations for farmers. Although not tested in this trial, laboratory plot trials have shown decreased pesticide efficacy with Biochar application (Yu et al., 2009). This, along with the potentially enhanced weed germination due to cultivation and the site's high ryegrass burden, are all potential contributors to the need for re-seeding.

Biochar is also considered a long term soil ameliorant. Once applied, it cannot be removed. Therefore, it is important to discover any potential negative ramifications prior to farmer application. Biochar also oxidises with time, and changes characteristics, for example, cation exchange capacity. Therefore it is necessary to monitor this trial over a longer period of time, as future results may vary from the first year.

Reference

Yu, X. Y., Ying, G. G., Kookana, R. S. (2009) Reduced plant uptake of pesticides with addition of biochar to soil. Chemosphere 76, 665 - 671.

Acknowledgements

Daniel Dempster and Andrew Wherrett from the University of Western Australia for collaborating with the Liebe group on this trial.

Trevor Bell and colleagues at DAFWA's Research Support Unit in Geraldton for applying Biochar and seeding and harvesting the trial.

Paper reviewed by Andrew Wherrett, Soil Researcher, University of Western Australia

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Deep ripping – is it ok on sandy loams?

Nadine Hollamby, GRDC Project Coordinator, Liebe Group

Aim

To determine if deep ripping overcomes compaction and increases yield on a red sandy loam.

Background

The Butcher's suspect that hardpans exist in some of their paddocks and they have decided to investigate whether deep ripping will remove the hardpan and increase yield in a trial before using the method over the whole paddock.

Soil compaction is mainly caused by agricultural machinery traffic and is common on deep sandy soils or loamy sands. Compaction restricts root growth, reducing the plants ability to access water and nutrients (Jarvis R, 2000). The removal of this hardpan can significantly increase yield on light sandy soils, however heavy soils are not always as responsive. Deep ripping can be a costly and time consuming operation therefore it is important to know whether the chosen soil type will respond to deep ripping (Jarvis. R, 2000).

The deep ripping for this trial was done before seeding using the Liebe Group's trial size deep ripper and funding from GRDC.

Trial Details

Property	Gary Butcher, Pithara
Plot size & replication	11.5m x 200m x 3 replicates
Soil type	Red Sandy Loam
Sowing date	8/6/10
Seeding rate	50 kg/ha Wyalkatchem
Fertiliser	8/6/10 :45 kg/ha DAP xtra
Paddock rotation	07 Pasture, 08 Barley, 09 Wheat
Herbicides	8/6/10: 1.5 L/ha Glyphosate, 1.5L/ha Trifluron, 30 g/ha Unigran
Growing Season Rainfall	160mm

Results

Table 1: Average grain yield and quality with and without deep ripping on a sandy loam at Pithara.

Treatment	Yield (t/ha)	Hectolitre Weight	Protein (%)	Screenings (%)
Control	1.35	78.83	7.73	3.17
Deep ripped	1.37	79.35	7.90	4.50
L.S.D	*NS*	*NS*	*NS*	*NS*

Deep ripping did not increase yield in this trial. Nor did it have a significant effect on hectolitre weight, protein or screenings (Table 1). Plant tissue tests indicate that the deep ripped plots had 5% more zinc in tissue (data not shown). All other nutrients were present in equal and adequate amounts whether ripped or not, indicating deep ripping did not allow greater nutrient uptake, as sometimes occurs when a hard pan is removed.

When soil has a resistance greater than 2 MPa it is considered to restrict root growth. Therefore Figure 1 indicates that the site did indeed have a hardpan that was reduced by deep ripping in the 10-25 cm zone. While 2 MPa is the figure that is commonly used as an indicator of soil resistance that may restrict root growth, growth can be affected at 1.2 MPa depending on plant species, soil water content, structure and texture. The penetrometer readings themselves vary widely depending on soil conditions at time of testing and operator error. In some areas of the trial the soil resistance in the deep ripped plots was no different to the unripped area.

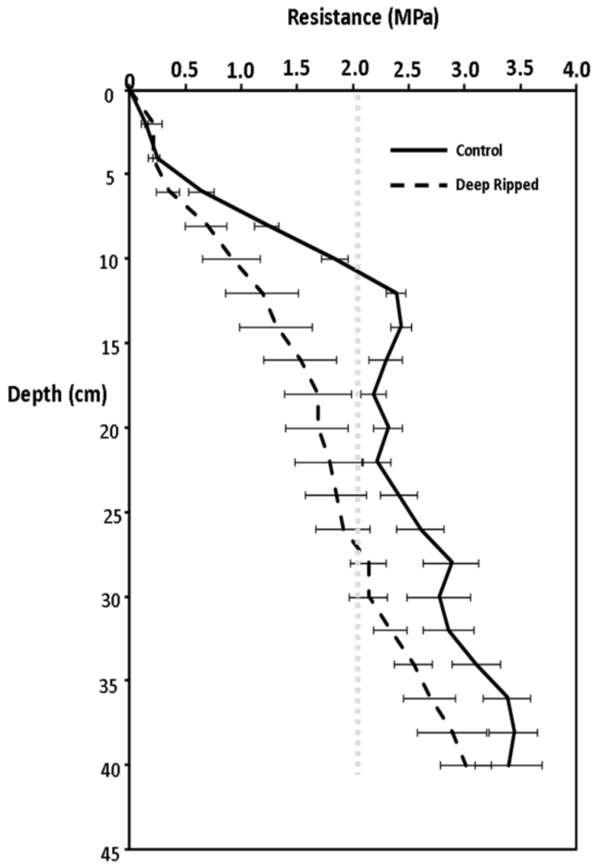

Figure 1: Soil compaction as measured with Penetrometer 5 months after deep ripping had taken place. Root growth can be hindered above 2 MPa.

Comments

Yield response to deep ripping is known to be very variable especially if rainfall is limited, as was the case this year, or the wrong soil type is chosen. Research indicated that deep ripping works well on light sandy soils but is not as responsive on medium textured soils (Jarvis, 2000). It is possible that the soil type in this trial is not suited to deep ripping.

A more thorough assessment of the soil strength will be undertaken in 2011 including an assessment of the subsoil texture. The gradual increase in resistance with depth as shown in Figure 1 may be indicative of the soil texture becoming heavier with depth. Heavier textured soils hold more water for a given depth, hence improving rooting depth and root growth rate using deep ripping is less critical than it is on deep sandy-textured soils where crop roots can grow several metres into the subsoil.

Acknowledgements

Thank you to Gary and James Butcher for hosting this trial, Stephen Davies (DAFWA) for advice and guidance and Andrew Wherrett (UWA) who lent the penetrometer and helped with data analysis.

References

Jarvis R (2000) Deep tillage. In ‘The Wheat Book: Principles and Practice’ (Eds. WK Anderson and JR Garlinge) pp 185-187. Department of Agriculture, Western Australia Bulletin 4443.

Paper reviewed by Stephen Davies, DAFWA

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Revisiting Gypsum for improved soil structure

Nadine Hollamby, GRDC Project Coordinator, Liebe Group

Aim

To determine the efficacy and rate of gypsum required to improve soil structure on heavy clay soils in a minimum tillage system.

Background

Gypsum (calcium sulphate) can improve soil structure on heavy clays by making the soil aggregates more stable (Jarvis R, 2000). Signs that the soil structure of a paddock might need improving include; hardsetting or crusting of top soil, patchy germination and slow water infiltration (ponding on the soil surface). The calcium in gypsum helps the clay particles stay bound together when the soil gets wet reducing the tendency for the particles to disperse (Jarvis R, 2000). The use of gypsum as a soil ameliorant has become less popular with the advent of minimum tillage farming systems, which are less destructive to soil structure than conventional cultivation. This trial will investigate whether gypsum still plays a role in a minimum tillage system.

This trial has 3 main aims; (a) to determine whether gypsum improves crop establishment and yield on the selected paddock, (b) to determine if 4 t/ha is more effective than 2 t/ha and (c) to determine how long the benefits of gypsum application lasts. The gypsum was applied on 17th April 2010 and the trial will be monitored until 2012 thanks to funding from GRDC.

Trial Details

Property	Ian Hyde, Dalwallinu
Plot size & replication	24m x75m x 3 replicates
Soil type	Clay
Sowing date	10/5/2010
Seeding rate	Cobbler Canola 3.5 kg/ha
Paddock rotation	07 Pasture, 08 Wheat, 09 Wheat
Fertilisers	26/4/10: 0.5 kg/ha ammonium sulphate, 10/5/10: 90 kg/ha KTill extra, 0.5 kg/ha ammonium sulphate, 23/7/10: 100 kg/ha Urea
Herbicides	26/4/10: 1 L/ha Gladiator, 1 kg/ha Atragen, 10/5/10: 200 ml/ha Chlorphos, 1.5 L/ha Triflur x, 100 ml/ha LI 700, 18/5/10: 125 ml/ha Venom, 11/6/10: 1.1 kg/ha Geasaprim, 500 ml/ha Hasten, 17/7/10: 500 ml/ha Status, 50 ml/ha Exert, 300 ml/ha Enhance, 8/10/10: 300 ml/ha Chlorpyrophos, 300 ml/ha Alpha Suma Flex
Growing Season Rainfall	172 mm

Results

In 2010 applying gypsum did not increase canola yield (Table 2) and had no significant effect on plant emergence (Table 1). Yield for all plots was 0.5 t/ha and plant germination was good across the whole paddock. A jar dispersion test conducted at the site found that the soil did not disperse in water and therefore is unlikely to respond to gypsum. However the jar test only takes a small representative sample, results could change across the paddock.

Table 1: Canola emergence 67 days after sowing after 0, 2 & 4 t/ha of gypsum was applied.

Gypsum rate (t/ha)	Plants/m^2
0	55
2	42
4	43
l.s.d	*NS*

Table 2: Average canola yield (t/ha) for 2010 after gypsum was applied at 0, 2 and 4 t/ha in April 2010.

Gypsum rate (t/ha)	Yield t/ha
0	0.50
2	0.50
4	0.49
l.s.d	*NS*

Comments

One of the benefits of using gypsum can be more even crop germination, however this year the paddock did not develop a hardpan, therefore no differences in crop emergence were seen in the trial.

The lack of response from increasing rates of gypsum could stem from two reasons;

- Lack of rainfall in 2010 could have limited the gypsums ability to dissolve in the soil and the crop yield potential.
- Not all clays are responsive to gypsum so it is important to conduct dispersion tests (e.g. jar tests) and soil tests (exchangeable sodium percentage, ESP) to gain an indication of the paddocks potential response to gypsum (Jarvis, 2000). The jar dispersion test conducted on the site, indicated the site may not be responsive to gypsum because soil did not disperse in water. In general, a soils with an exchangeable sodium percentage of 6-10, will tend to be mildly dispersive, 10-15 moderately dispersive and >15 strongly dispersive.

In order to account for seasonal variation and allow the gypsum to move down the profile, the Liebe group will continue to monitor this trial into the future and conduct detailed soil tests to determine the severity of the problem.

Acknowledgements

Ian Hyde for hosting and conducting the trial**,** Grains Research and Development Corporation for funding the trial and Stephen Davies from DAFWA in Geraldton for support and technical advice

Paper reviewed by Stephen Davies, DAFWA

References

Jarvis R (2000) Deep tillage. In 'The Wheat Book: Principles and Practice' (Eds. WK Anderson and JR Garlinge) pp 185-187. Department of Agriculture, Western Australia Bulletin 4443.

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Evaluation of Spading x Lime incorporation in low pH, non wetting sand

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Aim
To examine whether spading (partial-inversion tillage) can be used to manage water repellence and subsoil acidity on sandplain soil.

Background
For the past few years growers and researchers have been assessing the impact of a one-off soil inversion using a rotary spader to dilute water repellent soils and ameliorate subsurface acidity through the burial of lime.

Water repellence in soils is caused by waxes from plant residues which coat the sand particles. These waxes are hydrophobic can cause slow and uneven infiltration of water into the soil. The mixing action of a spader reduces water repellence in sandy soils by diluting the organic matter-rich repellent topsoil through the top 30cm of the soil profile and by creating subsoil seams in the topsoil that can act as preferred pathways for water movement. As a consequence of the mixing action some of the topsoil can remain slightly water repellent after spading. The fate of the buried water repellent topsoil is not yet known, and there is a risk that cultivation of this type may increase the depth of non-wetting. However it is hoped that over time, the buried non-wetting topsoil will become wettable once the waxes causing repellence have been degraded by micro-organisms.

Surface applied lime can take over a decade to significantly increase the subsoil pH below 10 cm unless the lime is incorporated. Spaders can effectively incorporate surface applied lime into acid subsoils to depths of up to 30-35cm thereby significantly speeding up the amelioration of soil acidity.

With funding from GRDC and assistance from DAFWA's Stephen Davies the Liebe group has set up a farm scale demonstration at the property of Ian and Clint Hunt investigating the merits of using a rotary spaders to incorporate lime to depth and overcome non wetting soils. The spading was conducted in May 2010 to a depth of 30cm, the trial will be continued to be monitored in the coming years.

Trial Details

Property	Hunt partners, Marchagee
Plot size & replication	22.5m x 1000m
Soil type	Deep Yellow Sand
Soil pH ($CaCl_2$)	Topsoil =5.7, subsoil=4.5
EC	0.02 dS/m
Sowing date	17/5/2010
Seeding rate	80 kg/ha Kalya Lupins
Fertiliser	17/5/10: 70 kg/ha blend of 40% MAP, 30% BigPhosMang, 30% MOP
Paddock rotation	07 Wheat, 08 Lupins, 09 Wheat
Herbicides	27/4/10: 1.66 L/ha Glyphosate450, 25 ml/ha Oxyflurofen, 17/5/10: 800 ml/ha paraquat, 2 L/ha Trifluralin, 600 g/ha Diuron, 600 g/ha simazine, 23/6/10: 500 ml/ha clethodim, 6/7/10: 150 ml/ha Difluflenican; 100 g/ha Metribuzin; 300 g/ha Simazine, 20/10/10: 800 ml/ha paraquat
Insecticide	27/4/10: 100 ml/ha cypermethrin
Growing Season Rainfall	177mm

Results

Lupin yields at the site were poor and spading actually decreased the lupin yields (Table 1). Lupin establishment on the spaded plots was poor as a result of lupins being seeded too deep in the soft soil. Coil packers were used after spading prior to seeding and again after sowing, which resulted in some furrow infill which may have exacerbated the seeding depth problem.

Table 1: Lupin yield after using a rotary spader or deep ripper to cultivate soil at Marchagee in 2010.

Treatment	**Yield (t/ha)**
Control	0.7
Rip	0.7
Spade	0.5
Spade+ Lime+ Dolomite	0.5

The physical soil loosening caused by spading, reduced the strength of the subsoil to a depth of 25cm (Figure 1), but the soil strength was reduced more by deep ripping (when measured on the rip line) which loosened the soil to just over 30cm (Figure 1). Lupins tend not to be responsive to deep ripping, but in other trials some of the yield benefits for cereals have been partially due to soil loosening.

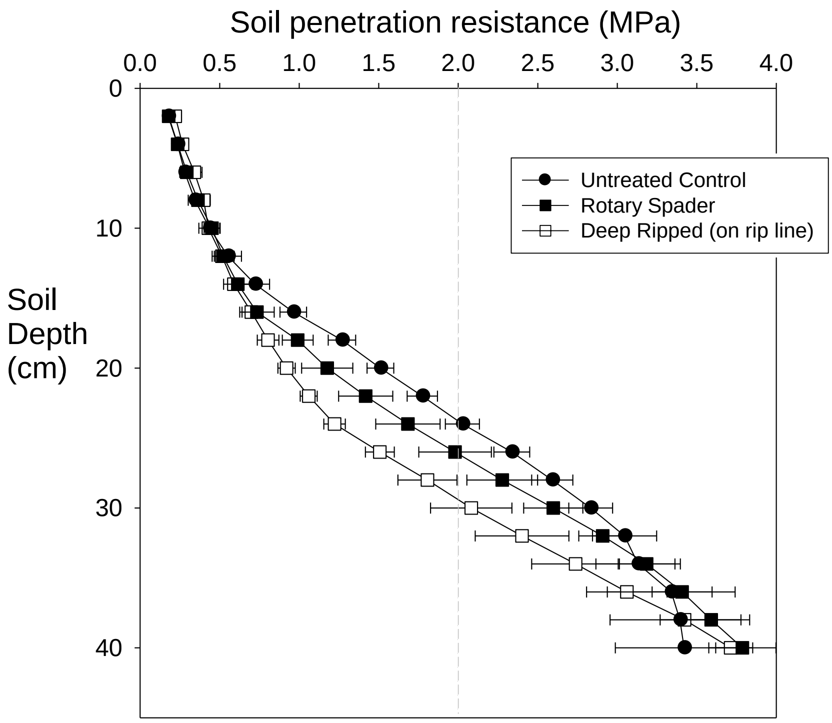

Figure 1: Impact of rotary spading and deep ripping on soil penetration resistance measured using a cone penetrometer in megapascals (MPa) in a yellow deep sand at Marchagee when the soil was wet. Note that at 2MPa or more crop root growth rates are reduced.

The subsoil acidity at the site is on the verge of becoming a problem with a subsoil pH below 20cm of 4.5, lower than the target level of 4.8 or more (Figure 2) although the topsoil pH was above the target pH of 5.5 or more. Spading on its own can alter the pH through the burial of higher pH topsoil (Figure 2), this is often accompanied by a decrease in the topsoil pH as more acidic subsoil is brought to the surface as has been seen at other sites. However incorporation of lime and dolomite using the spader significantly increases the pH of the top 20cm to 6.4, which should greatly enhance the amelioration of the acidity below 20cm and should prevent the subsoil acidity worsening to a point that it induces aluminium toxicity that typically occurs when the pH <4.5.

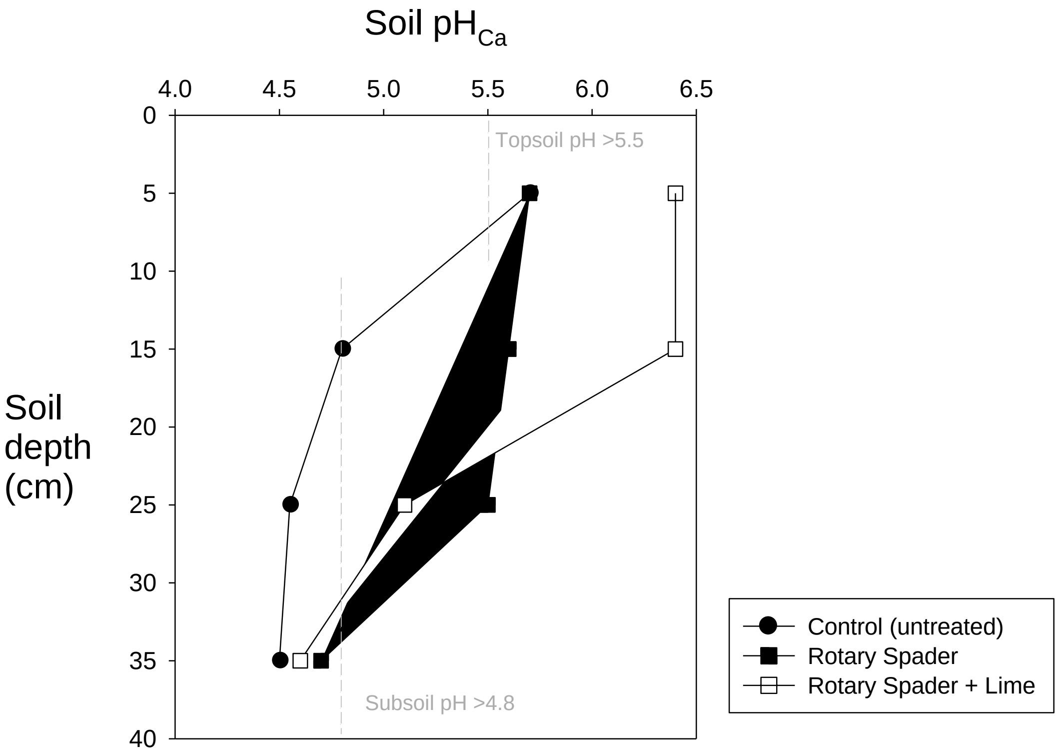

Figure 2: Impact of rotary spading and lime application on soil pH ($CaCl_2$). Target pH levels for topsoil (pH>5.5) and subsoil (pH>4.8) shown as dashed lines.

Comments

This trial highlighted some of the difficulties that can occur when seeding soils that have been loosened by tillage implements such as rotary spaders or mouldboard ploughs. Maintaining a good seeding depth can be difficult and it is important to firm loosened soils prior to seeding. Some growers have successfully established cover crops in the first year after loosening, using very simple techniques such as broadcasting cereal seed and pressing it into the soil using coil packers or something similar to avoid the seeding depth problem. This trial also demonstrates how rotary spaders can be used to incorporate lime into acid subsoils allowing for more rapid amelioration of subsoil acidity. It will be interesting to monitor whether this gives greater benefits in the future as the untreated soil continues to acidify and more acid-sensitive crop types are grown on the site. In general it is preferable to seed a cereal cover crop in the year a soil is spaded or mouldboard ploughs, as cereals are more tolerant of sandblasting than lupins, which is a risk with these techniques. It is recommended that soils only be spaded or ploughed when wet, and a cover crop sown immediately to reduced the risk of wind erosion.

Acknowledgements

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Paper reviewed by Stephen Davies, DAFWA

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Rotary spading pays on water repellent deep yellow sandplain at Marchagee

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Chris O'Callaghan, Executive Officer, Liebe Group, Dalwallinu

Aim
To assess the impact of rotary spading non-wetting sandplain soil on soil properties and on crop growth and productivity.
To assess the use of strip trial techniques for on-farm assessment of agronomic management options using Precision Agriculture tools.

Background
Water repellence is common in the sandy-textured soils of the wheatbelt. It is estimated that 3.3 million hectares of WA's agricultural soils are at high risk of exhibiting severe water repellence with a further 6.9 million ha at moderate risk (DAFWA Soil Map Unit database 2008). Management options for non-wetting soils have included furrow sowing, use of in-furrow soil wetting agents or spreading and incorporation of clay – rich subsoil into the water repellent surface layers. Alternative management options are starting to be investigated.

Water repellence is a problem that is concentrated at the soil surface as a consequence of the deposition and decay of plant residues and release of hydrophobic waxes and other compounds into the surface soil. Tillage tools can be used to move or displace this water repellent surface layer thereby allowing for improved water entry into wettable soil. Mouldboard ploughs completely invert the soil with associated benefits of nearly 100% weed seed burial when done correctly, while rotary spaders use rotating spades which carry some non-wetting topsoil down into the profile, while lifting some wettable subsoil to the surface. This mixing is not even (not homogenous) and spaded soil tends to end up with a heterogeneous mix of repellent topsoil and wettable subsoil. Observations suggest that the seams of subsoil the spader creates through the non-wetting layer act as preferred pathways for water entry into the soil allowing the soil to wet up quicker.

There is increasing interest in these technologies as farmers search for solutions to increase productivity on underperforming sandplain soils. These tools have a fit in minimum tillage farming systems, utilizing them as a one-off paddock renovation to reduce weeds, improve wettability and incorporate lime and/or clay.

Trial Details

Property	O'Callaghan property, Marchagee
Plot size & replication	900m x 12m, non-replicated
Soil type	Deep Yellow Sand and Deep Yellow Loamy Sand
Soil pH	0-10cm = 5.1; 10-20cm = 4.4; 20-30cm = 4.3; 30-40cm = 4.5; 40-50cm = 4.7
EC	0-10cm = 0.14 dS/m; 10-20cm = 0.03 dS/m; 20-50cm = <0.03 dS/m
Sowing date	22/5/2010
Seeding rate	65 kg/ha Magenta
Fertiliser	22/5/2010: 75 – 135 kg/ha (VRT) Mallee/MOP 5:1; 53 L/ha Flexi N 12/7/2010: 70 L/ha Flexi N
Paddock rotation	08 Wheat, 09 Canola
Herbicides, Insecticides & Fungicides	14/5/2010: 1.7 L/ha Glyphosate; 400 mL/ha Ester 800; 40 g/ha Triasulfuron; 40 mL/ha Oxyflurafen; 215 mL/ha Alpha Duo, 21/5/2010: 2.1 L/ha Treflan; 520 mL/ha Sprayseed, 800 mL/ha Gramoxone; 115 g/ha Diuron; 29/7/2010: 800 mL/ha Precept; 500 mL/ha Brom MA;
Growing Season Rainfall	177mm

Results

Water repellence at this site tended to be exhibited in patches. There were areas of good establishment and crop growth in the untreated area but there were also large patches with poor crop establishment and a high weed burdens. Water repellence at the site was moderate to severe, with an average water droplet penetration time of 182 seconds, spading reduced this to 5 seconds (Table 1).

The soil at the site ranged from deep sands with clay contents < 5% to deep loamy sands in which the clay content tends to increase with depth to levels between 5-10%. The action of the rotary spader in burying some of the topsoil while lifting some subsoil can increase the clay content of the surface soil. This is reflected in an average increase in the clay % of the top 10 cm from 4.6 in the control to 6.2% (Table 1). Typically when applying clay-rich subsoil to water repellent soils (claying) the aim is to increase the clay content to a level which overcomes the water repellence typically 5-7% in most situations. Thus the increase in clay content as result of spading in this trial will also help improve water infiltration in addition to the preferred pathway and dilution mechanisms.

Table 1: Soil particle size analysis conducted on untreated and rotary spaded deep yellow sand from Marchagee, 2010.

Treatment	Water Droplet Penetration Time (secs)*	Particle Size Analysis (0-10cm)			
		% Clay	% Fine Sand	% Coarse Sand	% Silt
Control	182	4.6	10.2	83.2	2.0
Spader	5	6.2	13.9	78.6	1.3

* Water droplet penetration times were measured under standard laboratory conditions for 0-5cm soil samples that were collected separately.

Both the topsoil and subsoil pH at the site were acidic and below the recommended target pH levels of 5.5 in the surface and 4.8 in the subsoil (Fig. 1A). Peak subsoil acidity occurred in the 20-30cm layer with a pH of 4.3 (Fig. 1A). Rotary spading alters the soil pH profile by partially burying the higher pH topsoil which has increased the pH in the 10-30cm layer, however subsoil pH is still lower than the target level of 4.8 (Fig. 1A).

Rotary spading loosens the soil to the depth of working, in this instance spading reduced soil penetration resistance to <2 megapascals to a depth of 26cm (Fig. 1B). This effectively gives the crop roots an additional 6cm of soil with little physical restriction, effectively similar to a partial deep ripping effect.

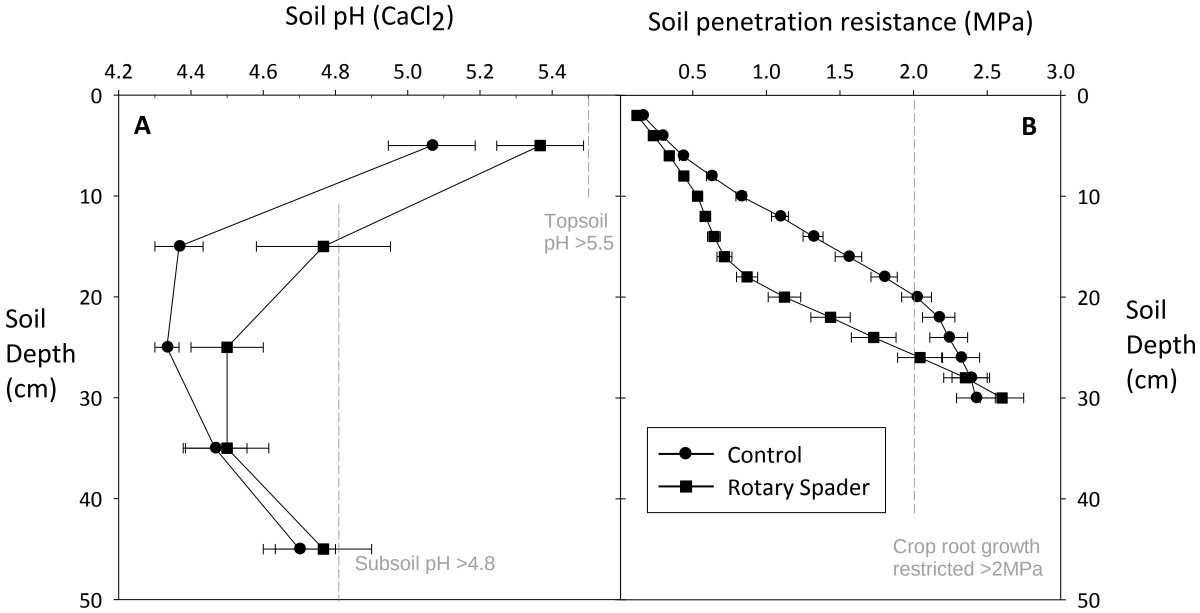

Figure 1: Impact of rotary spading of a deep yellow sand on: A) soil pH (CaCl2), note target pH levels for topsoil (pH>5.5) and subsoil (pH>4.8) shown as dashed lines; and B) soil penetration resistance measured using a cone penetrometer when the soil was wet. Note that at 2MPa or more crop root growth rates are reduced.

It was observed that spading reduced the number of weeds, particularly ryegrass but due to the partial nature of the inversion process significant ryegrass populations remained in the treated area. Enhanced weed control was most likely a combination of weed seed burial and stimulation of a more synchronous early weed germination allowing for a better knockdown. This paddock had a high weed seed bank after poor canola establishment in 2009.

Table 2: Impact of rotary spading of deep yellow sand on wheat yield components from hand harvest cuts and machine harvest grain yield, Marchagee, 2010.

Treatment	Hand harvest cut data					Machine harvest		
	Total Shoot Biomass (t/ha)	Number of Heads (#/m2)	Average Head weight (g/head)	Kernel Weight (mg)	Grain Yield (t/ha)	Grain Yield* (t/ha)	Grain Protein (%)	Screenings (%)
Control	5.6	243	0.78	39.1	2.4	2.14	9.8	4.7
Spader	8.0	309	0.72	36.2	3.5	2.92	9.0	3.5

* Machine grain yields taken directly from the header yield monitor and is an average yield for the 900m strip.

In combination these numerous soil changes resulted in substantial improvements in crop growth and productivity. Total above-ground (shoot) biomass determined by hand cuts was increased by 2.4 t/ha (43%) as a result of spading (Table 2). In the spaded area the crop had 66 more heads/m2 (Table 2) reflecting the improved plant establishment and crop vigour. With spading resulting in a larger biomass crop with more heads and more grains coupled with a relatively dry finish to the season average head weight and kernel weight was reduced by spading (Table 2). Spading increased machine harvest grain yield by 780 kg/ha, a yield increase of 36%. Spading tended to decrease grain protein by 0.8% to 9.0% compared with the control but also decreased screenings by 1.2%.

Comments

When looking at the spaded crop the most obvious thing was its consistent establishment resulting in an even crop compared with the crop in the untreated area which was variable with a mix of good and poor patches of growth. This is reflected in the increased biomass, head numbers and grain yield of the spaded crop. Improved establishment is due to a reduction in water repellence as measured by the lower water droplet penetration time. Higher crop growth and yield in the spaded situation is likely driven by a large combination of factors including reduced soil constraints such as water repellence, compaction, subsoil acidity together with higher N mineralisation, altered nutrient availability, reduced weed competition and possibly reduced soil and stubble-borne pest and disease levels. With higher yields as a result of spading grain protein was reduced, indicative of the need to possibly apply more N to crops growing in spaded areas because of the higher potential yield.

Spading and ploughing can be very useful for incorporating lime into acid subsoils and spreading of lime prior to spading would be very appropriate at this site given its subsoil acidity problem. Typically spading results in a decline in the topsoil pH as more acidic subsoil is brought to the surface but this wasn't apparent in this trial (Fig. 1A). This is most likely due to inadequate sampling. It would be recommended that a minimum of 2 t/ha of good quality lime be spread prior to spading with subsequent testing of soil pH the following year to assess if further surface lime applications are required. Increasing the pH through addition of lime may also improve the chemical environment for the wax degrading microbes that can potentially reduce the severity of the water repellence. It should be noted that while spading may assist weed control other research suggests it controls only 60-70% of the weeds and if weed control is a priority then full-inversion tillage using a mouldboard plough may be a better option as weed control is often >95%.

This trial has enabled the grower to assess the benefits and problems of spading and to consider how it may be incorporated into the farming system. Fitting spading in a cropping program can be complicated and costly as it is best to spade or mouldboard the soil when it is wet so a cereal cover crop can be established immediately to reduce the wind erosion risk. This often means that the paddocks or areas to be treated will often be sown last and if growers buy their own spaders or mouldboard ploughs they will need access to a tractor of sufficient size to pull the implement plus an operator.
This may compete with demands from other spraying or seeding operations at this time. Despite this the potential benefits of these tools is large and they have the capacity in some instances to make unprofitable and unproductive soils profitable to crop.

Acknowledgements
Our particular thanks to Michael and Julia O'Callaghan for allowing us access to the trial. This research was supported by the GRDC through the 'Putting PA on the ground in WA' (CSA00016) and 'Delivering Agronomic Strategies for Water Repellent Soils' (DAW00204) research projects.

Paper reviewed by Peter Newman, DAFWA

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Improved soil & stubble management for more profitable farming systems

Nadine Hollamby, Project Coordinator, Liebe Group

Aim

The Liebe group's new GRDC project '*Improved stubble management practices for sustainable farming systems in the Liebe area*' aims to:

1. Increase grower and researcher knowledge of the implication of stubble management on soil water
2. Provide information that contributes to informed grower decision making, leading to effective adoption of soil amelioration practices.
3. Increase grower and researcher knowledge of the long term effects of soil biology on crop productivity.

Background

This project, funded by the Grains Research and Development Corporation, commenced in September 2009 and will conclude in December 2012. The focus of the project was developed from grower's ambitions to increase crop resilience and increase water use efficiency in dry seasons.

Project activities for 2010

1. Grower survey

In order to ensure we are addressing the research priorities of our members, The Liebe Group has conducted a survey in the areas of soil health, soil moisture and soil carbon, where 80 Liebe members were surveyed. Growers will also be surveyed at the end of the project (2012) to measure any changes in attitudes, knowledge and practices resulting from this project.

The following is a summary of some of the key results found in the survey; a full report will be produced later in the year.

Of the growers surveyed, 50% of growers have non wetting soils, which equates to approximately 40,000ha of farmland in the Liebe Group region. 73% of growers also have subsoil acidity, both soil constrains are of major concern to growers. The average rate of lime applied in the Liebe area is 1.4 t/ha but rates range from 1 to 3 t/ha.

Half of the grower's surveyed crop top or conduct a tactical spring fallow, a winter fallow is less common with a quarter of farmers applying this management technique. Sowing in the previous year's furrow to utilise moisture, is relatively uncommon (7% of growers) while others try to avoid the furrow for trash management.

71% of growers feel farm management practices can influence soil organic carbon and 20% of those growers have a soil organic carbon target. The top 4 methods growers are using to increase soil organic carbon are stubble retention, minimum tillage, growing a pasture legume and soil amelioration. However growers identified there is a lack of research into what the level of organic carbon should be in each soil type and wether soil carbon can effectively be increased in our farming system.

2. Long term soil biology trial

The Soil biology trial is trying to answer the following questions

- How much carbon can a deep yellow sand hold?
- How many years will it take to increase soil carbon?
- How will increasing carbon affect grain yield and quality?

By comparing management practices that remove carbon (burning stubble year after year), to management practice that would increase carbon (adding organic matter to the soil), the trial aims to show the upper and lower limits of soil organic carbon on sandplain soil. By 2012 this unique trial will be in its 10th season. In 2004 and 2008 the addition of organic matter increased crop yield by 18-23% whereas in 2005 plots were carbon was removed (burnt) yielded higher. 2010 results can be seen in the soil health section of this book.

3. Biochar trial
Biochar is formed through a process called pyrolysis, which is the high temperature heating of organic materials in the absence of oxygen. Pyrolysis produces a very stable and compact form of carbon. To date addition of Biochar to agricultural soils has shown both yield increases and decreases depending on the variety of biochar used and soil type.
Biochar has the potential to increase fertiliser efficiencies and play a role in carbon sequestration. However knowledge about the product is limited and more research is required. The Liebe group in collaboration with UWA is currently researching Biochar in order to give growers and researchers a more fundamental understanding of Biochar's properties and its opportunities. The Liebe group will continue to conduct research into this area so that members can get a better understanding of Biochar's potential and risks. 2010 results can be seen in the soil health section of this book.

4. Stubble management trial
Different practices for managing stubble over the summer (burning, raking and full stubble retention) will influence stored soil water storage, evaporation, infiltration and nitrogen mineralization, all of which will effect growth and yield of the subsequent crop. As the climate changes, summer rainfall may play an increasingly important part in the farming system. Current there is very little quantitative data available on how summer rainfall contributes to crop establishment, weeds and yield performance in future cropping programs.

The main operation of the trial utilises surface moisture probes that are buried below the rip line on a tyne seeder . These continually monitor soil moisture to a depth of 1.8m, providing data feedback via a mobile phone signal to a computer. Information collected enables growers to see how much water the plants are consuming, from where in the profile the water is sourced from and how much soil water remains.

5. On farm soil amelioration demonstrations
Three on farm demonstrations were conducted this year and results can be found in the Soil section of this book.

- 'Use of spading to incorporate lime and overcome non wetting soils', Hunt partners- Marchagee
- 'Gypsum on heavy clays for improved soil structure', Ian Hyde- Dalwallinu
- 'Deep ripping- is it ok on loamy sands?' , Gary & James Butcher- Pithara

The trials will be continued to be monitored for the next two years to account for seasonal variability and the long term nature of some soil amelioration techniques.

6. Case studies
Thanks to funding from this project, two case studies are currently being produced. Both focus on local growers experiences with spading to overcome non wetting sands and the production of chickpeas and field peas. The case studies will be released in first half of 2011.

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Increasing water use efficiency and managing input costs for more sustainable farming

Chris O'Callaghan, Executive Officer, The Liebe Group

Aim

The overall objectives of the project are:

1. Increased adoption of strategies aimed at reducing input costs, whilst maintaining sustainability of nutrients, soil health, ground cover, rotations, finances etc.
2. Increased adoption of strategies aimed at increasing water use efficiency.
3. Increased capacity of growers to determine the appropriate best practice management strategy for particular seasons and soil types.
4. Increased community awareness of the projected impacts of climate change and seasonal variability on the farming system.
5. Increased grower awareness and practise of strategies available to mitigate the effects of climate change and season variability.

Background

Through the Australian Government's FarmReady initiative, and the Grains Research and Development Corporation, the Liebe Group is currently delivering a project aimed at assisting Liebe growers to better adapt to a changing and more variable climate.

The project aims to raise awareness of the drivers of climate and some of the predictions and scenarios going into the future. It will look at the current research into climate change, where the debate on climate change is at, and how farmers can adapt to an increasingly volatile climate.

Increasing water use efficiency is an area where significant improvements to the farming system can be made. This can be achieved by an increase in the adoption of best practice management strategies including; optimising sowing time, using the suitable crop varieties, managing soil type differences correctly, conserving soil moisture, managing fertiliser inputs correctly and understanding the capacity of their different soil types to make in-season decisions according to how the season is progressing.

Advances in precision agriculture techniques also allow growers to achieve best practice by increasing their capacity and efficiency across all farming operations. By managing inputs more effectively, chemical and fertiliser savings can be made, leading to a more financially resilient farming system.

Activities in 2010

Achieving water and nutrient use efficiency using Yield Prophet.

Yield Prophet is a web based interface for the agricultural production simulation model (APSIM). It uses real-time information from the paddock to simulate how the crop is growing, and because it is based on historical rainfall records, how it may yield. This provides an accurate forecast (if everything is set up well) of the chance of achieving a certain yield at any point in time during the season. From this we can match inputs to these yield potentials.

In 2010 three contrasting paddocks were monitored with yield prophet to give growers an idea of what the yield potential of that soil type is, and how inputs can be matched effectively. The yield prophet report contains a tremendous amount of information about the development of the plant and the amount of stored soil water and nitrogen. Understanding plant development can be important to assist in making decisions about fertiliser and herbicide applications and also in other systems where cereals are grazed and the timing of this grazing is important.

Knowing the amount of stored soil water and nitrogen can help with decisions at seeding time and throughout the year, particularly relating to time of sowing and timing and amount of N to apply.

In 2011, the Yield Prophet report will again be produced and workshops will be held to compliment these reports to assist growers in their decision making at seeding and throughout the growing season.

Complementing these reports were a series of farmer demonstrations, looking at different nitrogen applications and their impact on grain yield and quality. The results of these demonstrations can be found in the Fertiliser Herbicides and Fungicides section of this book. Seminars at the Post Seeding Field Walk and Spring Field Day given by Dave Cameron from Farmanco farm management consultants, assisted in the interpretation and application of these results.

Practice for profit input trial
The practice for profit input trial is conducted to determine the optimum input 'package' for achieving the highest gross margin. Low, medium and high input packages are applied to different wheat & barley varieties to determine which combination provides the highest gross margin. The results of this trial can be found in the cereal section of this book.

Climate Information
An information session was held at the Liebe Group Crop Updates where Dr Steve Crimp, a climate applications scientist from CSIRO, presented information on how Australian growers may have to adapt to increasing climate volatility. This presentation covered global food security and the impact of climate change on this security on a global scale; current rainfall and temperature trends for the south west of Western Australia and the possible drivers of climate change, now and in the future; the potential impacts on Western Australian Cropping Systems, now and in the future and possible adaptation options for farmers.

Activities in 2011
Yield Prophet will continue and will again be complemented by the Practice for Profit trial and farmer demonstrations exploring different nitrogen regimes.

Case studies will be produced, exploring different aspects of the farming system focusing on precision agriculture and practices that will improve water use efficiency.

A series of 'Building your farm business' workshops will be conducted which will be valuable in assisting farming businesses to be stronger and more resilient in times of increasing climate volatility. These workshops will cover precision agriculture, increasing water use efficiency and farm business management.

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Innovative and Improved Strategies to manage Wind Erosion Risk in the NAR

Flora Danielzik, R&D Coordinator, The Liebe Group

Aim

The overall aim of this project is to;

1) Increase adoption of strategies which reduce the extent and severity of wind erosion.
2) Explore innovative strategies being used by farmers to combat wind erosion.
3) Increase community knowledge of Natural Resource Management.

Background and Project Description

Through the Australian Government's caring for our country initiative, the Liebe Group is working with growers to develop innovative strategies to overcome problems with erosion.

Growers have always been at the forefront of driving innovation when it comes to overcoming on-farm issues and the Liebe Group are working directly with them to identify how exactly growers are adapting to different issues.

With the numerous different types of farming systems in the Liebe area, it is important to capture the whole range of strategies growers have been using to overcome erosion given different soil types, rainfall zones and enterprise mix.

The aim of most wind erosion control strategies is to maintain or increase ground cover, whether by increasing plant growth through amelioration of low production soil zones; through growing an alternative crop or pasture that may provide more cover than traditional crops on a specific soil type; through managing stock differently so that over grazing of paddocks doesn't occur; or by managing stubble in a strategic way so that a paddock is never left bare.

Four demonstration sites that will be monitored over the life of the project have been established and are outlined below:

1) *Using cereal rye as a cover cropping option on poor structured soils*
Cereal Rye is a tall growing cereal crop which can be used as a cover crop to protect susceptible paddocks from wind erosion. The main advantages of using cereal rye are its height and ability to produce large amounts of biomass. This protects poorly structured soil from wind erosion, by reducing the wind speed at ground level and providing stability to the soil. The crop can also be grown as a companion crop to lupins, grazed for sheep feed, or harvested for grain, whilst still providing enough ground cover to reduce soil erosion.

2) *Implementation of new perennial pastures into the farming system*
Poor performing soils are a major contributor to wind erosion in the Liebe Group area. Finding suitable options on these soils which may be too salty, acidic or poorly structured to support traditional winter cereal crops is considered vital to reduce erosion and soil degradation. Perennial Pastures may provide these options and through screening on a poor performing soil, the most effective species can be determined to optimise the system. This demonstration aims to compare different perennial pasture species on a poor performing soil type.

3) *Alternative options to increase soil organic matter*
On poorly structured, sandy soils, organic matter levels are traditionally low, given they are highly susceptible to wind erosion. In addition, these soils are often continuously poor performing making it uneconomical to apply high amounts of fertiliser. This demonstration explores the benefits of applying alternative and potentially more cost effective ways of increasing organic matter and nutrition to try and

improve crop growth and subsequent ground cover on these soils. These alternatives include animal manures and soil biological adjuvants.

4) *Use of Feedlotting & Limit feeders to protect paddocks over summer.*
In the Liebe Group region, the late summer and autumn feed gap is a major concern to growers with livestock and can be a major contributor to wind erosion in this area, particularly in times of reduced rainfall. Paddocks can be overgrazed and left bare, which can lead to a degradation of soil structure, loss of soil biodiversity and severe wind erosion events. By providing alternatives to feeding livestock in paddocks over summer this problem can be reduced. Limit feeders and feedlotting are methods of confinement feeding which can reduce the grazing pressure on paddocks over summer and autumn, reducing the risk and severity of wind erosion. This demonstration aims to provide information to growers about the practicalities of setting up such a system.

Activities in 2010/2011
The four demonstration sites have been soil sampled and monitored in 2010 to mark a starting point from which improvements to ground cover, soil structure and nutrient level can be assessed.

The Liebe Group conducted extension activities for three of the four sites in 2010. In these extension activities the respective strategy to overcome wind erosion was outlined to an audience of local growers.

1) Field walk at the cereal rye site in July 2010: Marchagee grower Clint Hunt outlined his experiences with growing cereal rye as a cover crop.

2) Field Walk at the perennial pasture site in October 2010: DAFWA-researcher Dr. Daniel Real gave an overview of research results regarding the potential of Tedera (*Bituminaria bituminosa* var. *albomarginata*) as a prospective new perennial legume for the cereal / livestock zone of southern Australia (see the article by Dr. Daniel Real earlier in this book). Furthermore, the Liebe Group continues to maintain and evaluate an Enrich plantation of around 1600 perennial shrubs in west Buntine (see the article earlier in this book).

3) Field Walk at the organic fertiliser site: to be conducted in 2011.

4) Spring Field Day presentation about limit feeders and feedlotting in September 2010: Marion Seymour (DAFWA) together with local grower Ross Fitzsimons presented a combination of research results and personal experience to growers at the Liebe Group Spring Field Day in 2010.

A total of six case studies will be distributed to growers in the Liebe Group area in 2011. These include reports on all of the demonstration sites outlined above and another two case studies on reducing wind erosion in the Liebe region – alley farming and disc seeding.

Acknowledgements
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Planfarm BankWest Benchmarks 2009-2010 Season

Both Planfarm and BankWest – producers of the two dominant and most respected farm business benchmarking surveys in Western Australia, have decided to join forces to create the Planfarm BankWest Benchmarks.

The Planfarm BankWest Benchmarks are derived mostly from the information supplied by clients of Planfarm Pty Ltd, BankWest and Bedbrook Johnston Williams, and represents a large cross section of WA broadacre farm businesses.

The survey results need to be viewed in context of the individual situation. If the performance of a business is low in a certain area then the factors affecting this area will need to be analysed. If the lower performance can be justified by something which cannot be changed (e.g. the farm in question has a lower than average rainfall or poorer than average soils than the group) then there may be little need for concern. However where, there are factors affecting performance that are directly influenced by management, then an assessment should be made on what changes will improve performance and profitability.

Definition of terms

Effective Area (Hectare) – land area used directly for the purposes of producing crops or livestock. Does not include non-arable land such as salt lakes, rocks and bush.

Gross farm income ($Eff/ha) – all income produced from farm related activities with respect to the area farmed.

Fertiliser ($Eff/ha) – cost of fertiliser applied with respect to the area farmed.

Plant Investment ($/Crop ha) – measures the value of machinery with respect to the area cropped.

Operating Costs (OPEX) – relates to any payments made by the farm business for materials and services excluding capital, finance and personal expenditures.

Operating Costs ($Eff/ha) – relates to any payments made by the farm business for materials and services excluding capital, finance and personal expenditures with respect to the area farmed.

Operating Surplus ($Eff/ha) – farm income less operating costs. Measures the return on farming activity before account is taken of depreciation expense.

Pesticides/Herbicides ($/Crop ha) – cost of any pesticides or herbicides used with respect to the area cropped.

May – October Rainfall (mm) – growing season rainfall (May-Oct) of survey participants.

Total Sheep Shorn – total number of sheep shorn including lambs.

Wool Cut (Kg/WGHa) – amount of wool cut with respect to winter grazed hectares.

Wool Price ($/kg) - value of wool sold with respect to the amount of wool cut.

Bottom 25% - the average of the low 25% of farms in the group surveyed ranked by operating surplus.

Top 25% - the average of the top 25% of farms in the group surveyed ranked by operating surplus.

These results have been extracted from the 'Planfarm BankWest Benchmarks 2009/2010'.
For more information please contact the BankWest Agribusiness Centre on (08) 9420 5178.

Table 1: Farm Group Statistics Medium Rainfall Zone, Region 2.

Variables	Top 25%	Ave.	Bottom 25%
Effective Area (ha)	2869	3610	4677
May – October Rainfall (mm)	302	285	287
Permanent Labour (persons)	1.8	2.2	2.6
Casual Labour (weeks)	17.8	15.5	11.7
Eff Area/Perm Labour (ha)	1655	1748	1887
Income/Perm Labour ($'s)	912,689	740,824	674,928
Op Surplus/Perm Labour ($'s)	274,133	110,381	39,274
Gross Farm Income (GFI) ($/eff ha)	573	435	351
Operating Costs (OPEX) ($/eff ha)	400	371	376
Farm Operating Surplus ($/eff ha)	**0.64**	**0.24**	**0.11**
OPEX as % GFI (%)	70	88	108
Return on Capital (%)	3.1	-0.4	-3.6
Wheat Yield (t/ha)	2.73	2.30	2.07
Wheat Area (ha)	1540	1851	2354
Wheat kg/mm ave (kg/mm)	6.57	7.82	6.42
Lupin Yield (t/ha)	2.45	1.61	1.36
Lupin Area (ha)	303	396	460
Barley Yield (t/ha)	3.54	2.68	2.35
Barley Area (ha)	303	342	403
Canola Yield (t/ha)	1.30	1.07	0.87
Canola Area (ha)	435	492	609
Total Crop area (ha)	2308	2780	3593
% Crop	78	78	79
% Legumes	8	11	11
N Use on Cereals (kg/ha)	55.66	53.07	57.41
P Use on Whole Farm (kg/ha)	10.8	9.83	9.94
Herbicide Costs ($/ha crop)	64.03	65.36	68.79
Plant Investments ($/ ha crop)	482.68	459.58	438.28
Opening Sheep Numbers (hd)	3149	2978	3106
No. of Ewes Mated (hd)	1406	1408	1561
Lambs/WG Ha (no.)	2.06	1.32	0.92
Wool Price ($/kg net)	5.02	4.59	4.35
Wool Cut/Grazed Area (kg/wgha)	27.39	16.92	10.83
Stocking Rate (dse/wgha)	4.57	3.82	3.43
Wool Production (kg greasy)	13731	12810	13247
Ave kg/Sheep Shorn (kg)	4.59	4.17	3.89

Table 2: Farm Group Statistics Low Rainfall Zone, Region 2.

Variables	Top 25%	Ave.	Bottom 25%
Effective Area (ha)	6576	5759	4976
May – October Rainfall (mm)	206	218	214
Permanent Labour (persons)	2.4	2.3	2.5
Casual Labour (weeks)	18.1	15.5	13.3
Eff Area/Perm Labour (ha)	3131.8	2435.8	1909.4
Income/Perm Labour ($'s)	1,005,798	723,822	477,001
Op Surplus/Perm Labour ($'s)	480,885	215,669	35,648
Gross Farm Income (GFI) ($/eff ha)	343	296	239
Operating Costs (OPEX) ($/eff ha)	186	217	227
Farm Operating Surplus ($/eff ha)	**157**	**78**	**12**
Farm Operating Surplus/mm GSR rainfall ($/eff ha)	0.98	0.44	0.05
OPEX as % GFI (%)	53	76	96
Return on Capital (%)	11.9	3.5	-2.5
Wheat Yield (t/ha)	1.77	1.66	1.47
Wheat Area (ha)	3889	3344	2500
Wheat kg/mm ave (kg/mm)	11.95	8.67	4.58
Lupin Yield (t/ha)	1.41	1.29	1.24
Lupin Area (ha)	297	275	242
Barley Yield (t/ha)	2.06	1.81	1.73
Barley Area (ha)	380	399	434
Canola Yield (t/ha)	0.78	0.75	0.58
Canola Area (ha)	302	452	426
Total Crop Area (ha)	4811	4181	3431
% Crop	73	76	70
% Legumes	6	5	6
N Use on Cereals (kg/ha)	32.12	30.75	22.12
P use on whole farm (kg/ha)	7.13	7.7	8.28
Herbicide Costs ($/ha crop)	40.22	44.63	45.98
Plant Investment ($/ ha crop)	217.02	259.04	304.02
Opening Sheep Numbers (hd)	2842	2564	2442
Closing Sheep Numbers (hd)	2480	2433	2501
No. of Ewes Mated (hd)	1083	1080	1042
Lambs/WG Ha (no.)	0.50	0.67	0.78
Wool Price ($/kg net)	4.70	4.46	4.39
Wool Cut/Grazed Area (kg/wgha)	6.42	9.07	12.07
Stocking Rate (dse/wgha)	1.39	1.68	1.93
Wool Production (kg greasy)	11399	9231	7723
Ave kg/sheep shorn (kg)	5.05	4.54	4.33

2010 Rainfall Report

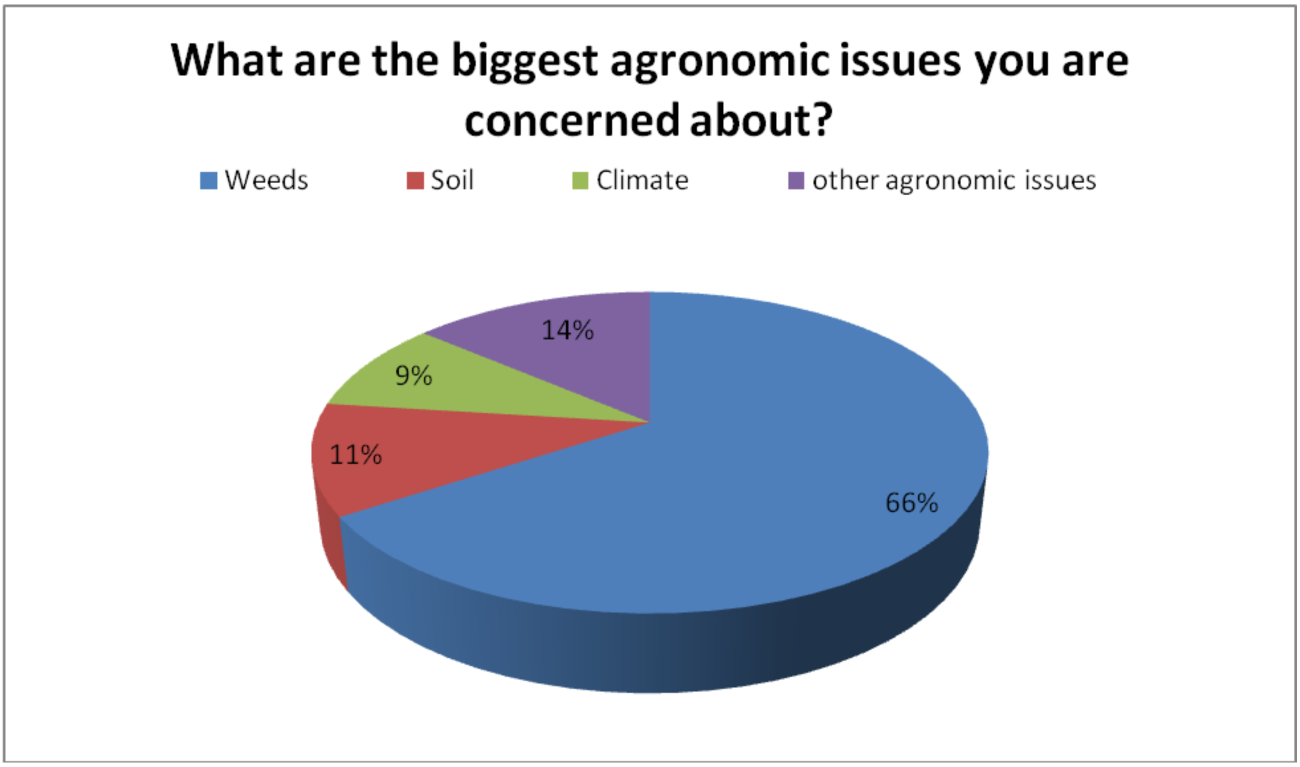
	Dalwallinu	Kalannie	Coorow	Carnamah	Latham	Perenjori	Wongan Hills	Goodlands	East Maya	West Buntine
Jan	0	0	0	0	0	0	0	0	0	0
Feb	13.8	0	8	0	0	0	0.4	0	0	0
Mar	60.2	16	37.8	28.3	25.6	17.8	55.4	9.2	16	33.5
Apr	0.8	1.4	0	3.7	2	9.2	0.8	1.2	1.4	1.5
May	32.4	45.9	29.4	37.1	26.2	9.4	34.4	20.4	45.9	17
Jun	16.8	16.4	19.3	22.6	23.8	9.5	18.8	23.2	16.4	26
Jul	43.2	33.8	56.3	50.1	37	35	50.8	33.6	33.8	36
Aug	42.2	30.8	45.2	43.5	45.8	48	33.2	25.2	30.8	38.5
Sep	36.6	20.3	9.2	10.9	23.2	16	10	14.8	20.3	21
Oct	0	0.1	0	0.8	0.4	0	3.1	0	0.1	0
Nov	0.4	8.6	0.5	1	1	0	9.4	0.6	8.6	N/A
Dec	37	14.6	3.8	7.4	7.2	19	7	10	14.6	N/A
Total	283.4	187.9	209.5	205.4	192.2	163.9	223.3	138.2	187.9	173.5

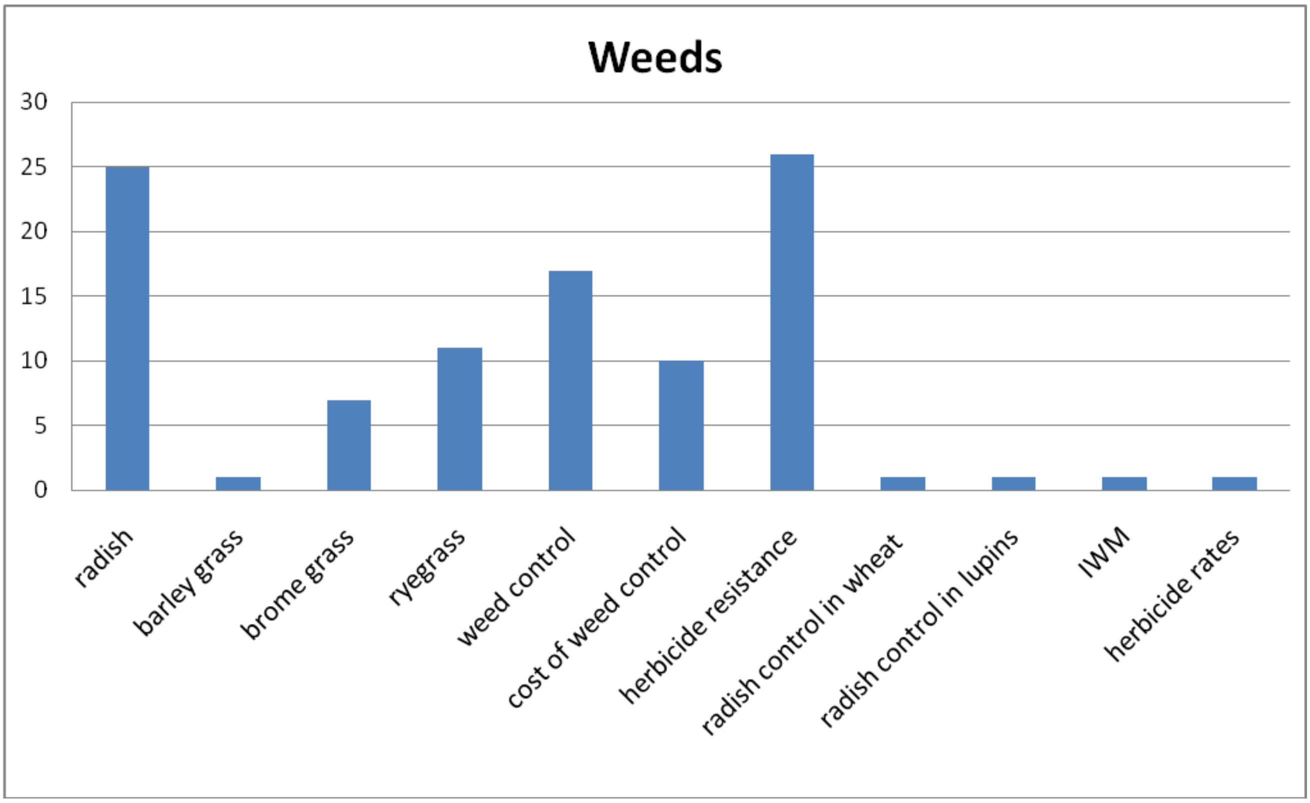
Prepared by (JR) Western Australian Climate Services Centre in the Western Australian Regional Office of the Bureau of Meteorology, Perth on 7th January 2011.

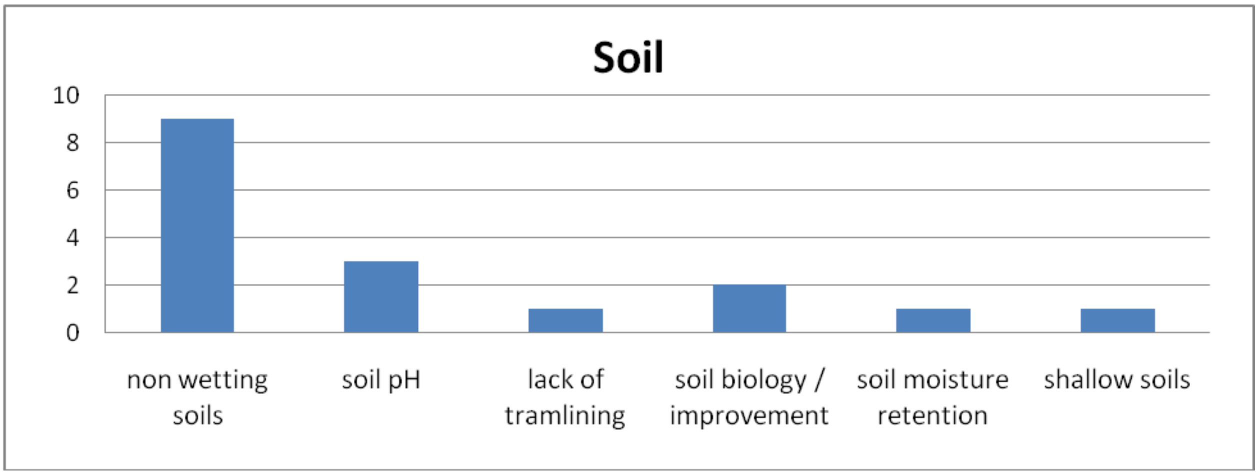
Contact us by phone on (08) 9263 2222, by fax on (08) 9263 2233 or by email at climate.wa@bom.gov.au

We have taken all due care but cannot provide any warranty nor accept any liability for this information.

2010 Liebe Group R & D Survey Results






Soil
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non wetting soils
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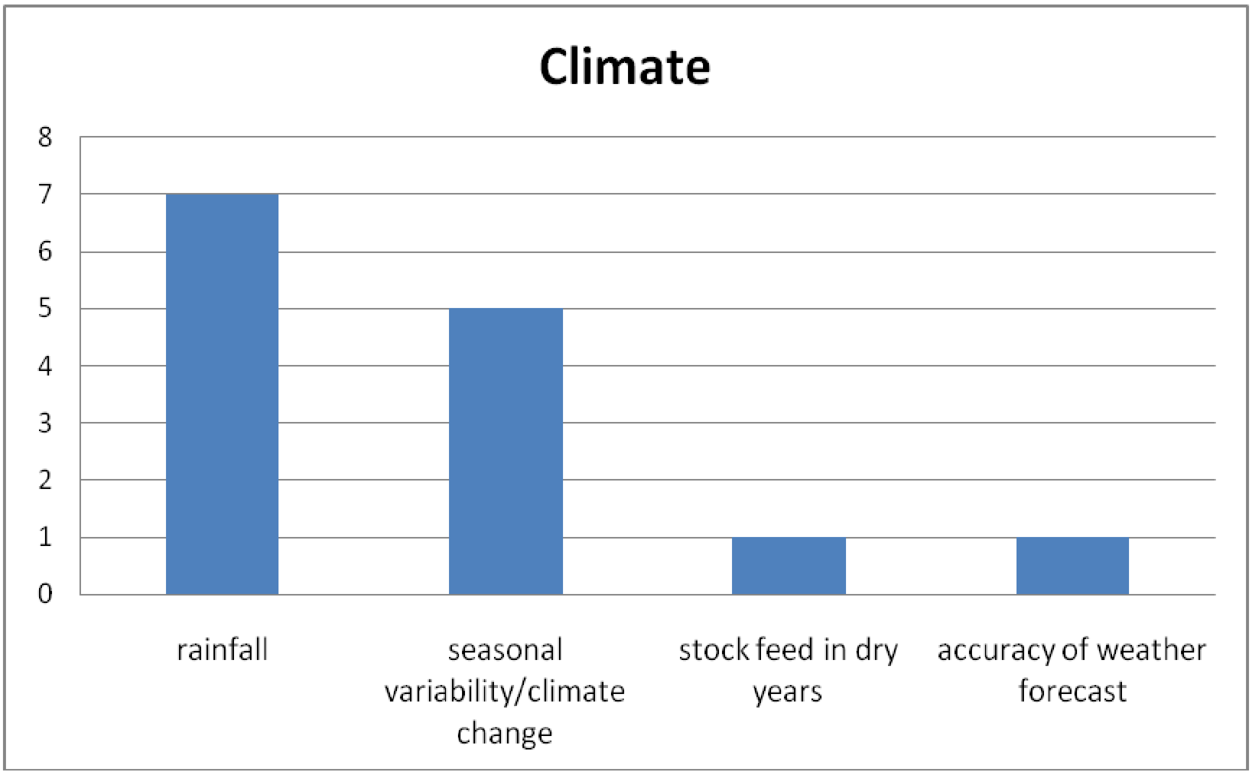
soil moisture retention
shallow soils


Climate
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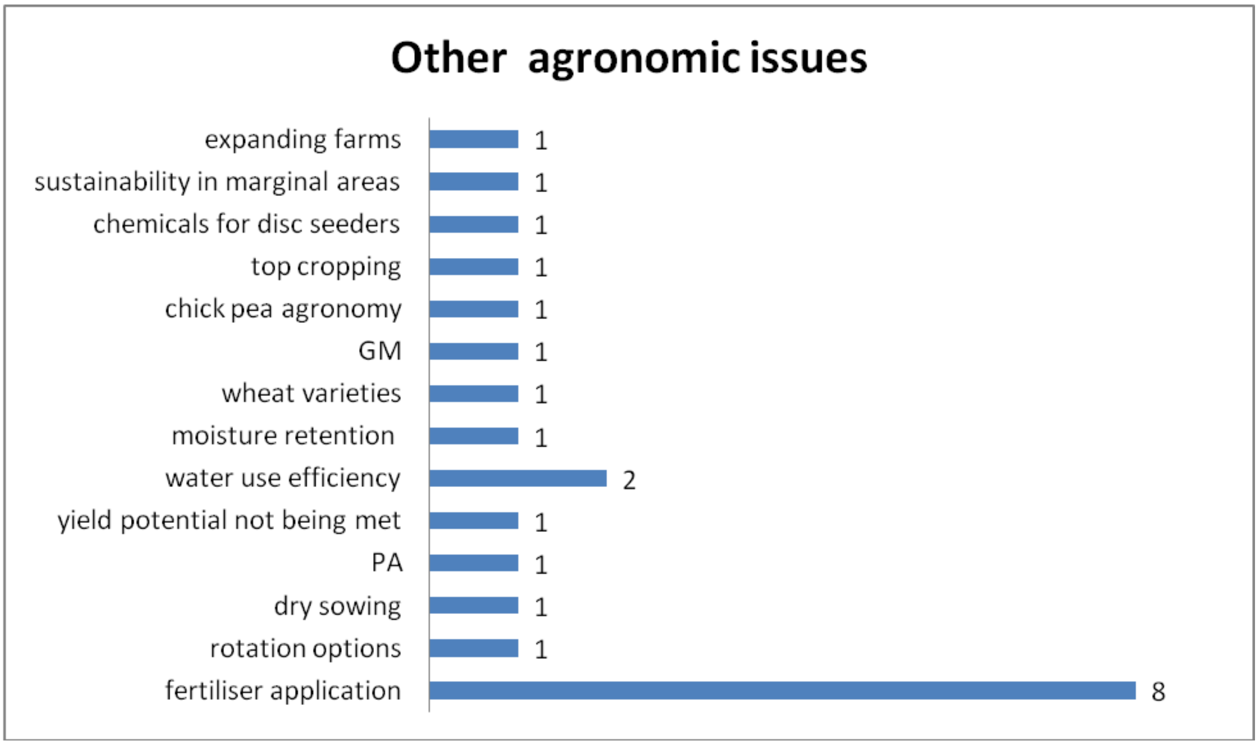
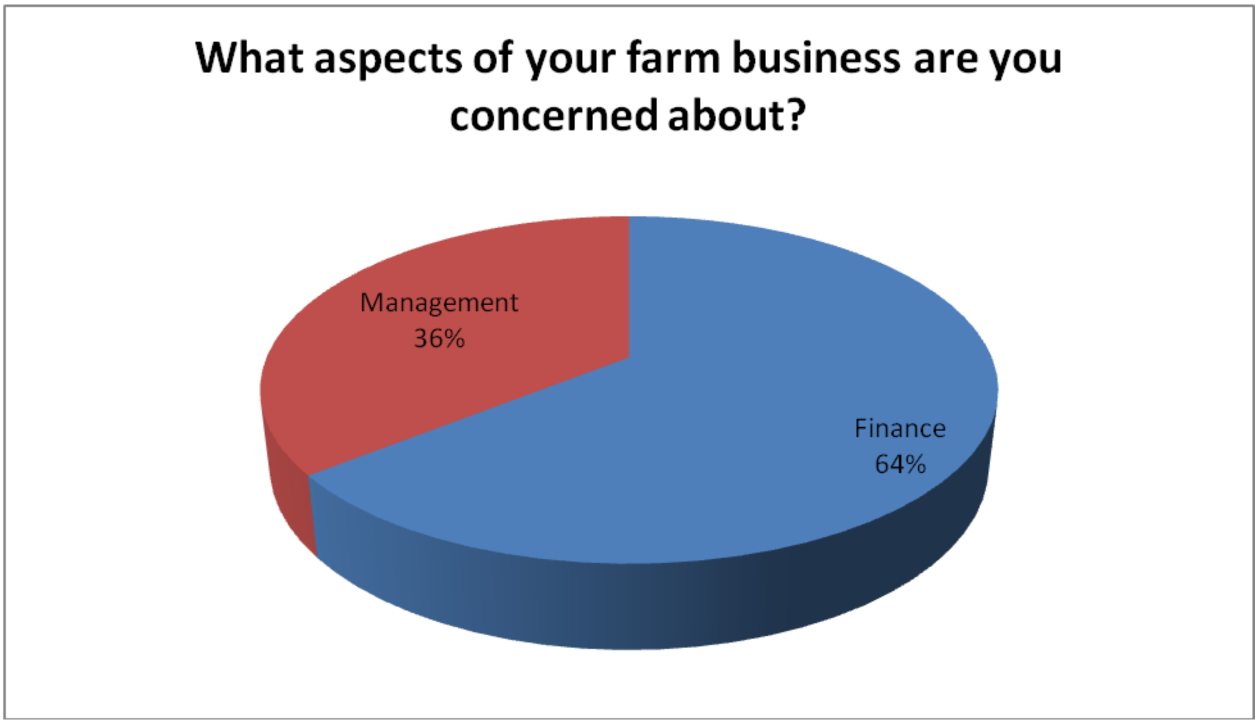
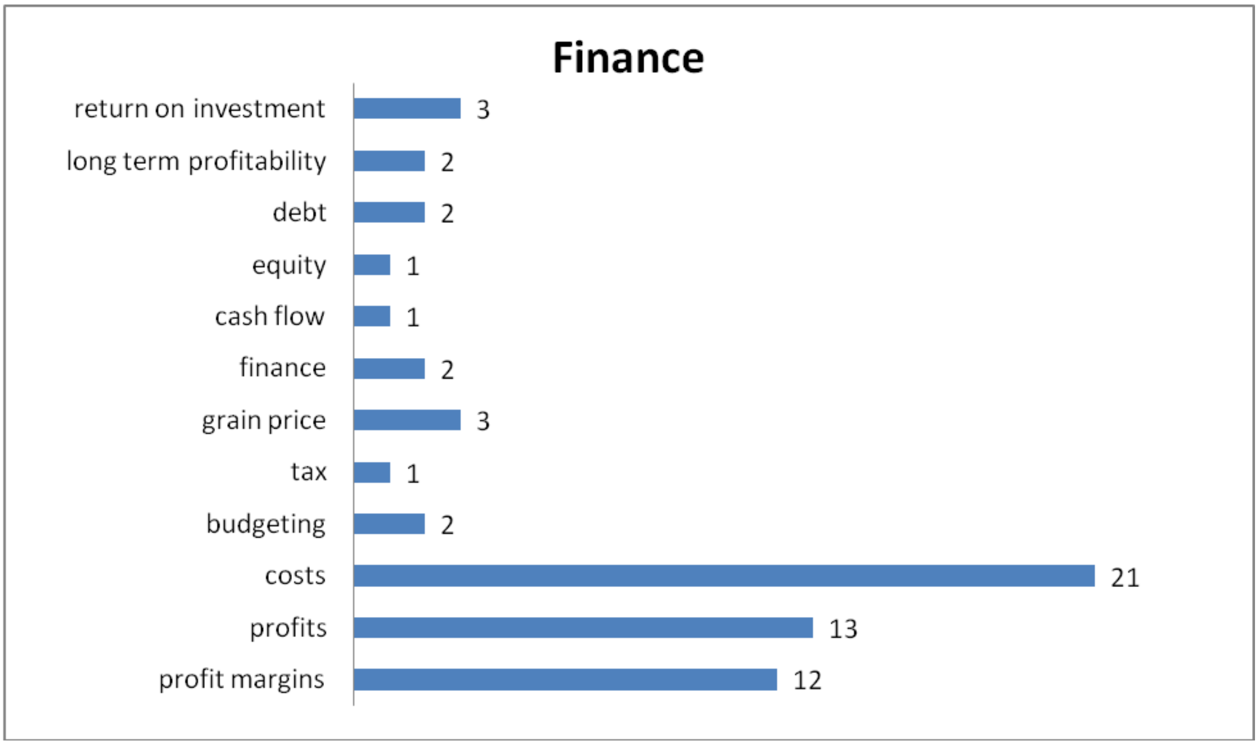
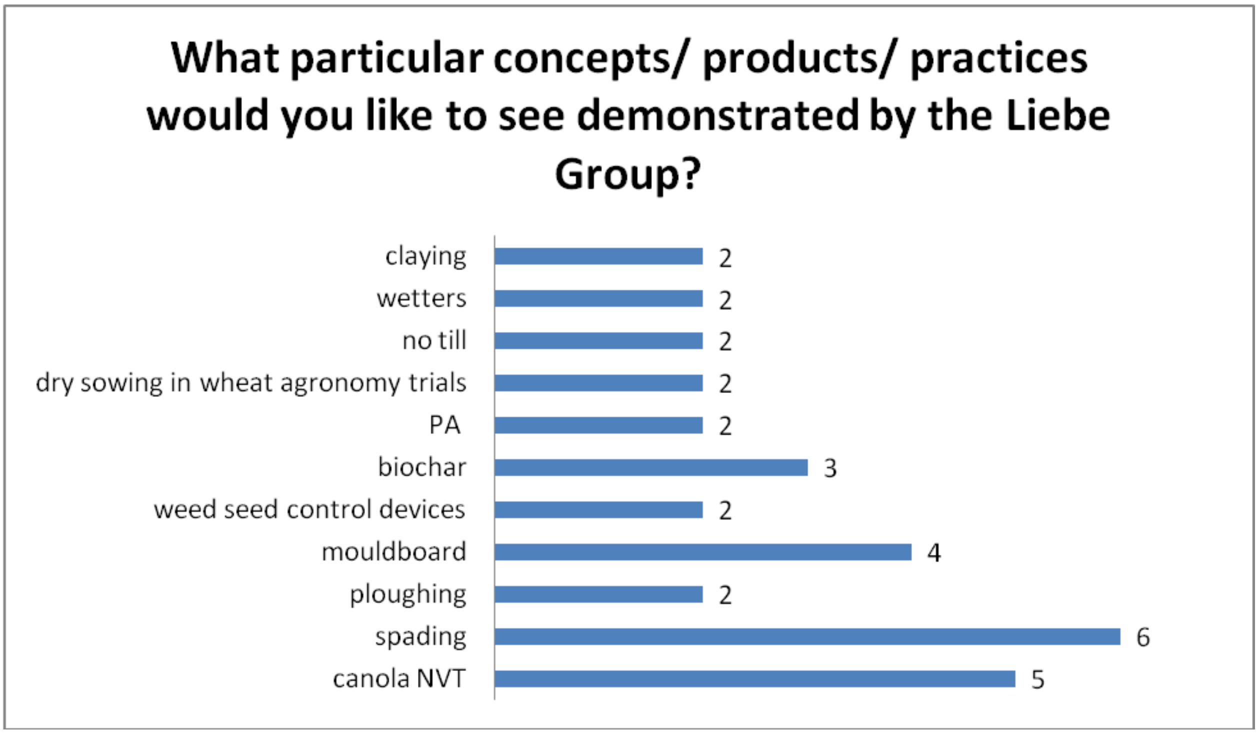
0
rainfall
seasonal variability/climate change
stock feed in dry years
accuracy of weather forecast


Other agronomic issues
expanding farms
sustainability in marginal areas
chemicals for disc seeders
top cropping
chick pea agronomy
GM
wheat varieties
moisture retention
water use efficiency
yield potential not being met
PA
dry sowing
rotation options
fertiliser application
1
1
1
1
1
1
1
1
2
1
1
1
1
8


What aspects of your farm business are you concerned about?
Management
36%
Finance
64%


Finance
return on investment
3
long term profitability
2
debt
2
equity
1
cash flow
1
finance
2
grain price
3
tax
1
budgeting
2
costs
21
profits
13
profit margins
12


Management
livestock
1
productivity
1
mining boom
1
R&D
1
supply to isolated areas
1
risk management
1
time management
4
labour
5
succession
3
diversification/ adding value
1
long term planning difficult
1
grain marketing
12
office organisation
2
accounting
1


What particular concepts/ products/ practices would you like to see demonstrated by the Liebe Group?
claying 2
wetters 2
no till 2
dry sowing in wheat agronomy trials 2
PA 2
biochar 3
weed seed control devices 2
mouldboard 4
ploughing 2
spading 6
canola NVT 5


What training and workshops do you think would be beneficial to your organisation?
accounting 1
drought management strategies 1
weed resistance 2
fencing 5
IWM 2
cost reduction 3
finance 4
electrics 5
mechanics 4
PA 3
grain marketing 17
employing 2

Liebe Group Strategic Plan 2007 – 2012
Updated: March 2007

Vision
Vibrance and innovation for rural prosperity.

Mission Statement
A progressive group working together to improve rural profitability, lifestyle and natural resources.

Core functions
- Agricultural research, development, implementation and validation
- Provide information, education, skills and training opportunities to members and wider community
- Strengthen communication between growers and industry and whole community

Our 2012 targets
- Recognised by stakeholders as a leading farmer group involved in rural profitability, lifestyle and natural resources.
- 20% increase in membership, as measured by land area in Dalwallinu, Coorow and Perenjori shires.
- 20% increase in attendance at major events.
- 100% of Liebe Group members have made an effective decision concerning the adoption of new technology assisted by the Liebe Group.
- All committee positions willingly filled.
- We will be a 'best practice' community group measured by an external audit.
- We will have one year's overhead costs in reserve.
- The Liebe Group will be viewed by the industry as a desired place of employment.

Objectives
1. Conduct high-priority research, development, implementation and validation.
2. Provide information, education, skills and training opportunities for members and wider community.
3. Target specific industry bodies and community media to raise awareness of successes in the agriculture industry and the needs of farmers.
4. Maintain sound financial base of the Liebe Group.
5. Support and maintain high performing staff.
6. Follow corporate governance strategies correctly and maintain group process.

Liebe Group Values

Key:
EO- Executive Officer; **AM**- Administration Manager; **PC** Project Coordinator; **R&D Coord –** R&D Coordinator, **SC** – Sponsorship Coordinator
Committees:
MGT – Management Committee; **R&D Com -** Research & Development Committee; **Finance** – Finance Committee; **EAC**- Employment Advisory Committee; **Women's** – Women's Committee, **Ethics** – Ethics Committee
Industry Bodies:
GGA- Grower Group Alliance; **GRDC** – Grains Research and Development Corporation; **DAFWA** – Department of Agriculture and Food WA.

OBJECTIVE 1
Conduct high-priority research, development, implementation and validation.

STRATEGIES	WHO	WHEN
Attract and form partnerships with agribusiness and research organisations.		
Key organisations on Liebe newsletter mailing list	EO	Ongoing
Maintain close relationship with Department of Agriculture and Food (local officers and Regional Manager) and CSIRO project partners	EO	Ongoing
Keep abreast of GRDC research priorities and maintain close relationship with Western Panel and grower group contact (Stuart Kearns)	PC & Staff	Ongoing
Develop and maintain partnerships other industry and research bodies when opportunities arise	R&D Coord, PC and EO	Ongoing
Distribute Liebe R&D priorities and trial site details to major research organisations and agribusiness	R&D Coord	Jan
Invite key personal to R&D planning meeting.	R&D Coord	Feb
Develop trials and demonstrations to address local priorities at Main Trial Site (MTS), Long Term Research Site (LTRS), satellite sites & on-farm		
Determine research and development priorities from annual member survey and R&D planning meeting	R&D Coord	Sept and Feb
Develop trial program for the MTS using agribusiness and research organisations partners	R&D Coord	Feb, March
Develop trial program for the satellite sites in conjunction with DAFWA and agribusiness	R&D Coord	Feb, March
Organise and conduct on-farm demonstrations	R&D Coord	Ongoing
Discuss Strategic R&D priorities at general meeting	MGT	Ongoing
Ensure we seek R&D opportunities that encompass a whole systems approach	EO and R&D Coord	Ongoing
Maintain soil biology trial at LTRS	PC	Ongoing
Raise profile of LTRS and attract research bodies wishing to conduct trials of a long term nature to the site	PC	Ongoing
Maintain trial program at LTRS	PC	Ongoing
Ensure R&D protocols are adhered to	PC and R&D Coord	Ongoing
3. Increasing adoption of new technologies		
Benchmark adoption level of Liebe members	PC	Feb 2007
Conduct final audit to assess the influence of the project on growers decision making processes towards technology adoption.	PC	2009
Conduct farmer case studies and economic analysis on growers that have adopted new technology	PC	2007/2008 2009
Conduct on-farm demonstrations and economic modelling with growers that are considering technology adoption	PC	2007/2008/ 2009

OBJECTIVE 2
Provide information, education, skills and training opportunities for members and wider Community.

STRATEGIES	WHO	WHEN
Extend Liebe Group research, development, implementation and validation results.		
Conduct a Spring Field Day at the Main Trial Site	R&D Coord & EO	Sept
Field walk at the Satellite Trial Sites	R&D Coord	Aug/Sept
Field walk at the LTRS	PC	Aug/Sept
Hold Crop Update to prepare growers for coming season	R&D Coord & EO	March
Promote results in R&D Results Book and review priority research at Trials Review day	R&D Coord	Feb
Promote results to wider community	R&D Coord, PC & EO	Ongoing
Assist in attracting members to events by having high profile guest	Staff	At events

speakers		
2. Workshops and study tours		
Use member survey and feedback to identify member requirements.	Staff	Sept & Ongoing
Conduct high priority workshops annually (e.g. Agronomic, Management, Financial, Skills based, Communication)	AM and staff	Ongoing
Conduct Intra or Interstate tours, visiting innovative, interesting and sustainable farming systems	EO and AM	Annually or on demand
3. Communication		
Members informed of local, relevant and timely information and case studies in monthly newsletters	AM and staff	Monthly
Early notification of all dates and opportunities to provide members with plenty of time to schedule time off the farm. Add dates to GGA calendar and check with local organisations to avoid clashes	AM	Ongoing
4. Encourage all sectors of community to attend Liebe Group activities		
Conduct events that encourage young farmers and women to be involved	Committees, staff and Women's	As required
Encourage mentorship within the Liebe Group through encouraging interaction processes at events	Committees and staff	Ongoing
Ensure we are being inclusive when catering for events	Relevant Committees	Ongoing
5. Member Development.		
Encourage greater input from non-involved members to come along to Liebe events. Bring a buddy philosophy.	Committees	Ongoing
Promote external workshop or development opportunities to members via email and newsletter	EO	Ongoing
Investigate sources of financial assistance for members to take up development opportunities or investigate possibility for the Liebe Group to provide financial assistance	EO and MGT	Ongoing
Review standard proposal for members to receive remuneration for voluntary time (e.g. $/hr and travel cost).	MGT	Prior to AGM
Ensure members are being well serviced and areas for improvement are sought by phone interviews, farm visits and talking with them at events	Staff	Ongoing
Ensure a sense of fun is incorporated at all Liebe Group events	Staff	Ongoing

OBJECTIVE 3
Target specific industry bodies and community media to raise awareness of successes in the agriculture industry and the needs of farmers.

STRATEGIES	WHO	WHEN
Develop & maintain linkages with agribusiness, government agencies, tertiary institutions and political organisations		
Maintain friends list for newsletter with all industry contacts made throughout the year and review each year	EO	Jan
The prospectus to be made available to above bodies with an update occurring when necessary	AM	Ongoing
Liebe Group website to be maintained monthly and placed under high priority as our 'industry face'	AM and staff	Ongoing
Encourage relevant industry to attend General Meetings.	EO and MGT	As required
Attend an Agricultural Industry Workshop developed by GGA and similar opportunities	EO, staff and MGT	Oct- Annually
Encourage attendance of above bodies to Liebe Group events	EO & Staff	For events
Maintain industry profile so that we are approached to facilitate contact if farmers individual opinions are required.	EO and MGT	As required
Promote agricultural successes in rural and non rural media		
Maintain partnership with Farm Weekly produce monthly Liebe updates for the paper	AM and staff	Monthly

Invite media to main Liebe Group events and publish appropriate press releases	AM	As required
Develop contact and build rapport with the West Australian and Sunday Times to promote agriculture outside the agriculture industry	EO	Ongoing
Publish monthly updates in local papers	AM	Ongoing
3. Celebrate Liebe and members success		
Keep abreast of awards and nominate appropriate members / group	Staff and MGT	Ongoing
Hold an annual Liebe Dinner	AM and staff	Oct
Cater for post event celebrations	Staff	At events
Promote great achievements and member success in Liebe newsletters	AM and staff	Monthly
Maintain and develop Liebe Group identity through staff uniform and badges to be worn at all events, promote sale of Liebe shirts and jumpers on membership flyer	Staff	Ongoing
Develop system to recognise farmers that have contributed significantly to the Liebe Group	AM	By July 2007

OBJECTIVE 4
Maintain sound financial base of the Liebe Group.

STRATEGIES	WHO	WHEN
1. Finance Committee to oversee Liebe finances and budget.		
Review project funding timeline	Finance	Ongoing
Prepare budget and allocations for subcommittees	Finance	As required
Approve finance for expensive purchase items	Finance	Ongoing
Track progress of income and expenditure areas	Finance	Ongoing
Committee meets regularly and when necessary	Finance	Quarterly
2. Seek funding.		
Maintain strong links with Sponsors and Partners	SC and AM	Bi-Annually
Seek new sponsors and partners	SC and AM	Ongoing
Review sponsorship guidelines and return on investment for each	SC and AM	Ongoing
Identify & target high-return sources of funding (sponsors, programs, membership and subcontracting)	Finance, SC and staff	Ongoing
3. Develop membership contributions.		
Review stability of membership numbers and ensure members are being well serviced	Finance, MGT and staff	Prior to AGM
Recommendation of fees and value of membership.	Finance	AGM

OBJECTIVE 5
Support and maintain high performing staff.

STRATEGIES	WHO	WHEN
1. Support and develop Liebe Group employees each year.		
Review performance appraisal document	EAC	Annually
Review performance, competitive salary, goals and objectives taking care to enhance employee's areas of special interest	EAC	Dec
Conduct annual performance appraisals. Include self and team assessment process (SWOT)	President & Staff	Nov
Review new employee induction program. Guided by protocol and list of required training.	EAC & EO	As required
Provide staff with professional development	EO	Ongoing
Conduct fortnightly team meetings	Staff	Ongoing
Ensure Management Committee adopt ethos of supporting staff	MGT	Ongoing
Review mentor program for employees	EO	Ongoing
2. Maintain and increase employment base in order to meet group requirements.		
Review list of all roles and responsibilities, delegating each responsibility to appropriate staff member.	EO	Oct

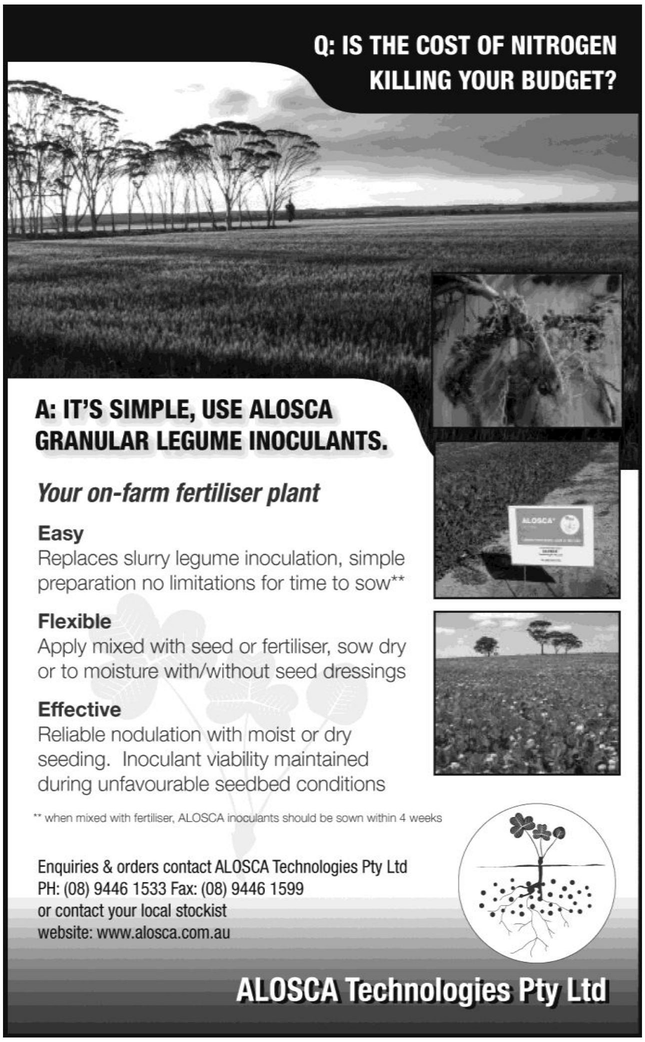
Identify “gaps” in roles and skills, and investigate employment options	EO	Oct
Seek external contracting of funding specialist	EO	As required
Seek feedback from employees to develop and maintain a conducive working environment.	EAC	Ongoing

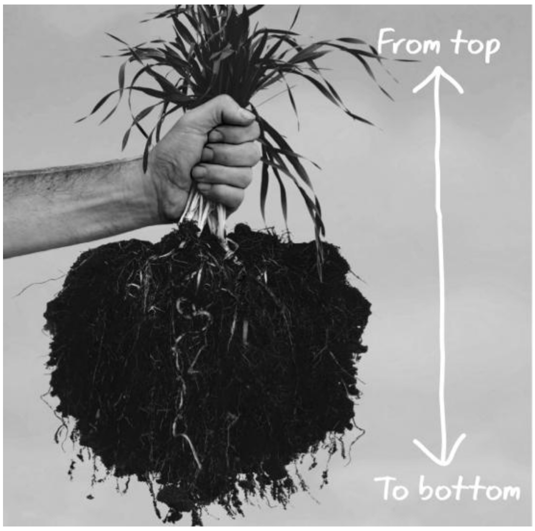
OBJECTIVE 6
Follow corporate governance strategies correctly and maintain group process.

STRATEGIES	WHO	WHEN
1. Management Committee, Sub-committee and reporting structure		
Management Committee meets on a monthly basis at a General Meeting (except May, Nov and Jan)	MGT and staff	Monthly
Sub-committees meet as required	Committee chairs	As required
Finance, R&D, Women’s and Ethics sub-committees report to the Management Committee	Finance, Ethics, MGT R&D Com, Women’s	When required
Employment sub-committees report to the EO	EAC and EO	When required
EO must sit on every Liebe Group committee	EO	Ongoing
Review Management Committee and sub committee operation and responsibilities annually	Committees	Pre AGM
After each AGM review responsibility of each committee (esp. Governance responsibilities)	All committees	After AGM
Analyse resources, skills and interests required for successful Liebe Group management and sub committees and individually approach members to be involved in various committees	EO and staff	Prior AGM
Identify training and educational opportunities for all Liebe Group committee members	Committees / Staff	Ongoing
Distribute folder for subcommittee members and include guidelines for effective committee meetings	EO	AGM
Follow succession strategy to increase member involvement on committees, as per succession protocol	Committee	As required
2. Effective Group Process		
Develop 5 year strategic plan and review objectives annually as a working document	Staff and MGT	Annually
Ensure inclusive processes are always used	All	Always
Maintain transparency in processes	All	Always
Develop written protocols on Liebe Group process to aid in transition of staff and group positions	Staff	Ongoing
All committees and staff are to operate by Liebe Group Code of Ethics	Ethics	Annually

Liebe Group Calendar of Events – 2011

EVENT	DATE	LOCATION	CONTACT
Liebe Group Trials Review Day	14th February 2011	Liebe Long Term Research Site	Chris O'Callaghan (08) 96610570
Planning for a volatile climate workshop	10th February 2011	Wubin Sports Club	Jemma Counsel (08) 96610570
Liebe Group AGM	14th February 2011	Buntine Bowling Club	Chris O'Callaghan (08) 96610570
Building Your Farm Business Workshop – Effective Conflict & Communication Management	17th-18th February 2011	Wubin Combined Sports Club	Jemma Counsel (08) 96610570
Liebe Group Crop Updates	2nd March 2011	Buntine Hall and Bowling Club	Flora Danielzik (08) 96610570
Precision Agriculture Workshop	14th March 2011	Buntine Hall & Bowling Club	Jemma Counsel (08) 96610570
March General Meeting	15th March 2011	Liebe Office	Chris O'Callaghan ((08) 96610570
April General Meeting	18th April 2011	Liebe Office	Chris O'Callaghan (08) 96610570
June General Meeting	13th June 2011	Liebe Office	Chris O'Callaghan (08) 96610570
Women's Field Day	21st June 2011	Dalwallinu Recreation Centre	Jemma Counsel (08) 96610570
Post Seeding Field Walk & Beer 'n' Burger Night	21st July 2011	Main Trial Site - Birch's Property, Coorow	Flora Danielzik (08) 96610570
July General Meeting	28th July 2011	Liebe Office	Chris O'Callaghan (08) 96610570
Annual Liebe Group Dinner	3rd August 2011	TBA	Chris O'Callaghan (08) 96610570
August General Meeting	22nd August 2011	Liebe Office	Chris O'Callaghan (08) 96610570
Spring Field Day	8th September 2011	Main Trial Site –'Catalina Farms' Birch's Property, Coorow	Flora Danielzik (08) 96610570
September General Meeting	19th September 2011	Liebe Office	Chris O'Callaghan (08) 96610570
October General Meeting	24th October 2011	Liebe Office	Chris O'Callaghan (08) 96610570
December General Meeting & Christmas Drinks	12th December 2011	Liebe Office	Chris O'Callaghan (08) 96610570





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- As a Liebe Group member, we are happy to discuss legal matters with you on an obligation free basis.

We visit Dalwallinu, Moora & Geraldton every month. Please contact our office for an appointment.

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