TRIAL REPORT

Evaluation of Hibrix BB with varying rates of Agras fertiliser for growth and yield effects in wheat cv. Eradu

Northam, Western Australia, 2013-2014

Protocol Number:
MWS Wheat 2014

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SUMMARY

At Northam in the central wheatbelt of Western Australia in 2014, wheat cv. Eradu was sown into a wheat stubble paddock to evaluate the effects of various rates of fertiliser in combination with Hibrix BB. Agras fertiliser was banded below the seed at sowing at 0, 25, 51, 75 or 99 kg/ha whilst Hibrix BB was applied to half of each plot as a broadcast soil spray at 2.5 L/ha two days after sowing. The 2014 trial was a duplicate of and overlayed on a 2013 trial to show the effects of the Hibrix treatments after two years of treatment.

There were significant biomass increases with increasing rates of Agras and small increases in biomass with Hibrix compared to non-Hibrix application.

The untreated control (no Hibrix BB or Agras) yielded 1.67 t/ha with all treatments other than the low rate of Agras (25 kg/ha) with no Hibrix, increasing yield with increases ranging from 6% to 39%. There was a dose response trend to increasing rates of Agras and also to Hibrix compared to non-Hibrix plots. Overall non-Hibrix treatments increased yields by 7.3% whilst the Hibrix treatments overall increased yields by 17.9% compared to the untreated control.

There were no differences between treatments in the harvest grain quality components of hectolitre weight, protein content or screenings. Full rate Agras (99 kg/ha) without Hibrix yielded 1.833 t/ha which was 16.7% greater than the untreated control. In comparison, half rate Agras (51 kg/ha) plus Hibrix yielded 1.992 t/ha which was 18.2% greater than the untreated control, whilst three quarter rate Agras (75 kg/ha) plus Hibrix yielded 2.215 t/ha which was 39% greater than the untreated control.

There were no visible signs of phytotoxicity or adverse crop effects by any treatment in this trial.

INTRODUCTION

Aims

- To evaluate the effects of Hibrix BB on the growth and yield of wheat when applied post sowing and pre-emergence.
- To compare the effects of Hibrix BB on the growth and yield of wheat when applied in combination with varying rates of Agras fertiliser.
- To confirm the safety of Hibrix BB to wheat cv. Eradu.

MATERIALS AND METHODS

Treatments

No.	Treatment	Rate		Application schedule
		Hibrix BB (L/ha)	**Agras (kg/ha)**	
1	Untreated control	0	0	
2	Agras	0	25	Agras applied at sowing banded below the seed. Hibrix applied as a single broadcast soil application two days after sowing.
3	Agras	0	51	
4	Agras	0	75	
5	Agras	0	99	
6	Hibrix BB	2.5	0	
7	Hibrix BB + Agras	2.5	25	
8	Hibrix BB + Agras	2.5	51	
9	Hibrix BB + Agras	2.5	75	
10	Hibrix BB + Agras	2.5	99	

Chronology of events

Date	Days after sowing (DAS)	Crop stage		Event
		Zadok's scale	Description	
23/05/13	0	Z00	Seed	2013 crop sown
25/05/13	2	Z01	Seed germinating	2013 Hibrix application
16/05/14	0	Z00	Seed	Crop sown
18/05/14	2	Z01	Seed germinating	Hibrix application
28/06/14	43	Z22-23	2-3 tillers	Maintenance – Axial application (annual ryegrass)
16/07/14	61	Z29	End of tillering	Maintenance – Kamba M application (Emex and wild radish)
30/07/14	75	Z32	2 nodes	Biomass assessment
31/07/14	76	Z32	2 nodes	Site visit
11/08/14	87	Z37	Flag leaf visible	Biomass & NDVI assessment
03/09/14	110	Z65	Flowering	Biomass & NDVI assessment
10/10/14	147	Z85	Soft dough	Biomass & NDVI assessment
03/12/14	201	Z92	Ripe grain	Harvest yield & grain quality

RESULTS

Table 1. Crop biomass

No.	Treatment	Rate (L or kg/ha)	Mean crop biomass (% of best plot)			
			75DAS	87DAS	110DAS	147DAS
1	Untreated control	-	78.8	92.5	70.0 c	90.0 c
2	Agras	25 kg	76.3	85.0	73.8 bc	92.5 bc
3	Agras	51 kg	80.0	80.0	75.0 bc	92.5 bc
4	Agras	75 kg	86.3	88.8	67.5 c	97.5 ab
5	Agras	99 kg	88.8	88.8	97.3 a	100.0 a
6	Hibrix BB	2.5 L	70.0	88.8	68.8 c	96.3 ab
7	Hibrix BB Agras	2.5 L 25 kg	75.0	76.3	80.0 b	92.5 bc
8	Hibrix BB Agras	2.5 L 51 kg	82.5	66.3	76.3 bc	95.0 abc
9	Hibrix BB Agras	2.5 L 75 kg	87.5	81.3	72.5 bc	100.0 a
10	Hibrix BB Agras	2.5 L 99 kg	91.3	91.3	100.0 a	98.8 a
		***P*-value**	**0.3274**	**0.1287**	**0.0001**	**0.0683**
		CV	**15.17**	**14.67**	**8.58**	**5.15**
		LSD (*p*=0.05)	**NSD**	**NSD**	**9.72**	**5.92***

Means followed by the same letter are not significantly different (p = 0.05, LSD).
* Means followed by the same letter are not significantly different (p = 0.10, LSD).
DAS: Days after sowing

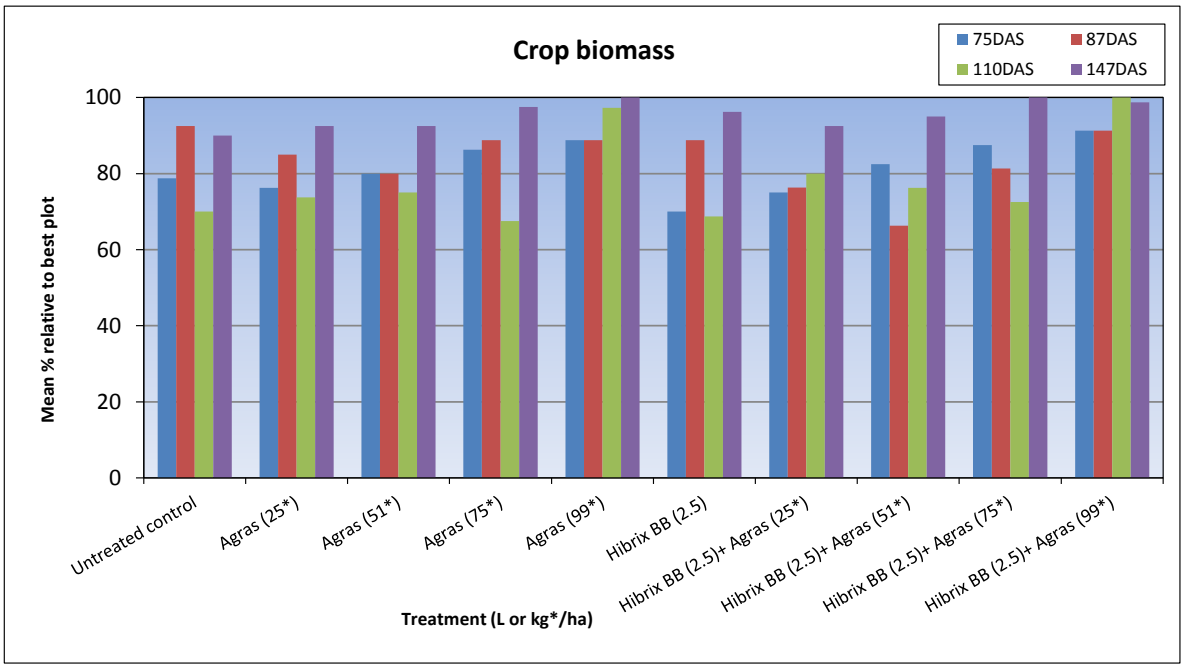

Figure 1: Crop biomass

Factorial analysis – Mean crop biomass – 75DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	82.0	74.4
2.5 L	81.3	
25 kg		75.6
51 kg		81.3
75 kg		86.9
99 kg		90.0
***P*-value**	**0.8048**	**0.2608**
LSD (*p*=0.05)	**NSD**	**NSD**
Factorial analysis – Mean crop biomass – 87DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	87.0	90.6 a
2.5 L	80.8	
25 kg		80.6 ab
51 kg		73.1 b
75 kg		85.0 ab
99 kg		90.0 a
***P*-value**	**0.1457**	**0.0036**
LSD (*p*=0.05)	**NSD**	**8.40**
Factorial analysis – Mean crop biomass – 110DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	76.7	69.4 c
2.5 L	79.5	
25 kg		76.9 b
51 kg		75.6 bc
75 kg		70 bc
99 kg		98.6 a
***P*-value**	**0.3536**	**0.1522**
LSD (*p*=0.05)	**NSD**	**7.50**

Means followed by the same letter are not significantly different (p = 0.05, LSD).
DAS: Days after sowing
NSD = No significant difference due to a p-value > 0.05

Factorial analysis – Mean crop biomass – 147DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	94.5	93.1 c
2.5 L	96.5	
25 kg		92.5 c
51 kg		93.8 bc
75 kg		98.8 ab
99 kg		99.4 a
***P*-value**	**0.1612**	**0.1522**
LSD (*p*=0.05)	**NSD**	**7.10**

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant
NSD = No significant difference due to a p-value > 0.05
tA = Data transformed using y = Arcsine square root percent (x)
DAS: Days after sowing

Table 2. Normalised difference vegetation index

No.	Treatment	Rate (L or kg/ha)	Mean NDVI/plot		
			87DAS	110DAS	147DAS
1	Untreated control	-	0.432 d	0.447	0.310
2	Agras	25 kg	0.492 cd	0.470	0.348
3	Agras	51 kg	0.512 bcd	0.469	0.326
4	Agras	75 kg	0.627 ab	0.572	0.332
5	Agras	99 kg	0.532 bcd	0.565	0.260
6	Hibrix BB	2.5 L	0.494 cd	0.490	0.312
7	Hibrix BB Agras	2.5 L 25 kg	0.526 bcd	0.526	0.366
8	Hibrix BB Agras	2.5 L 51 kg	0.555 abc	0.531	0.346
9	Hibrix BB Agras	2.5 L 75 kg	0.670 a	0.628	0.313
10	Hibrix BB Agras	2.5 L 99 kg	0.547 bcd	0.587	0.257
		***P*-value**	**0.0758**	**0.2862**	**0.3530**
		CV	**17.8**	**19.71**	**20.82**
		LSD (*p*=0.05)	**0.1155***	**NSD**	**NSD**

Means followed by the same letter are not significantly different (p = 0.05, LSD).
Means followed by the same letter are not significantly different (p = 0.10, LSD).
DAS: Days after sowing
NSD = No significant difference due to a p-value > 0.05
NDVI: Normalised difference vegetation index ranges from 0 - 1, the greater the number indicates a higher photosynthetic capacity which visually would appear greener.

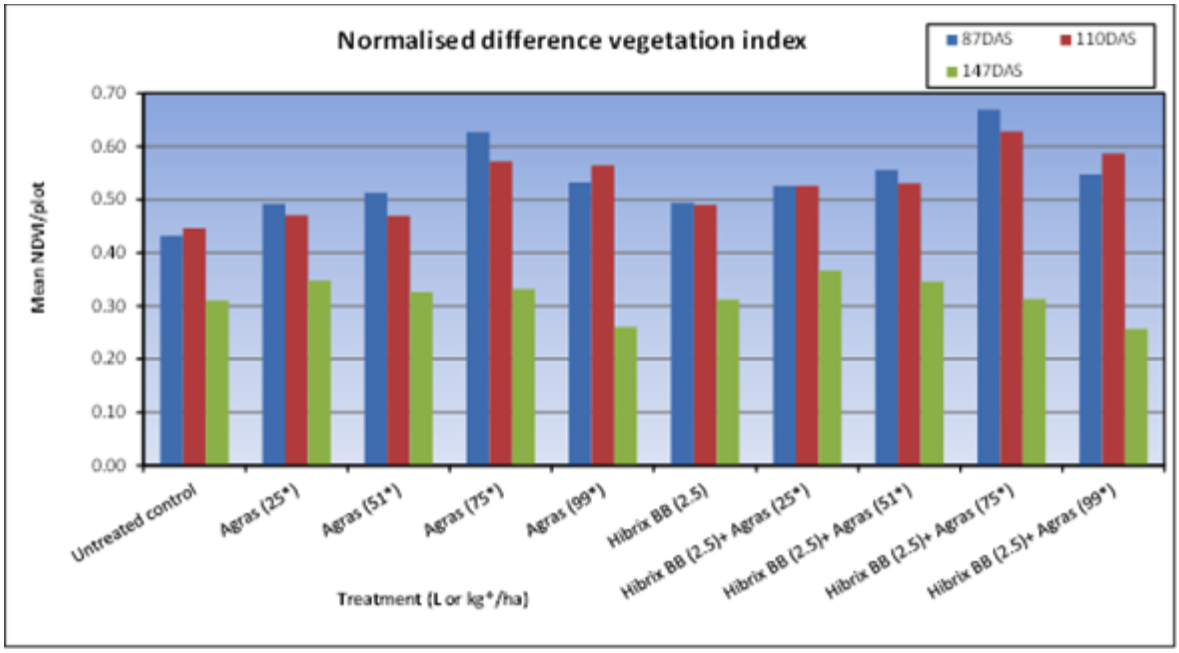

Figure 2: Normalised difference vegetation index

Factorial analysis – Mean NDVI – 87DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	0.519	0.463 b
2.5 L	0.558	
25 kg		0.509 b
51 kg		0.534 b
75 kg		0.649 a
99 kg		0.540 b
***P*-value**	**0.2249**	**0.1192**
LSD (*p*=0.05)	**NSD**	**0.139**
Factorial analysis – Mean NDVI – 110DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	0.505	0.468
2.5 L	0.552	
25 kg		0.498
51 kg		0.500
75 kg		0.600
99 kg		0.576
***P*-value**	**0.2466**	**0.3343**
LSD (*p*=0.05)	**NSD**	**NSD**
Factorial analysis – Mean NDVI – 147DAS		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	0.315	0.311 ab
2.5 L	0.319	
25 kg		0.357 a
51 kg		0.336 a
75 kg		0.322 a
99 kg		0.259 b
***P*-value**	**0.8721**	**0.2906**
LSD (*p*=0.05)	**NSD**	**0.0780***

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
*Means within columns followed by the same letter are not significantly different at the 10% level according to least significant difference (LSD) test.
NSD = No significant difference due to a p-value > 0.05
DAS: Days after sowing

Table 3. Harvest yield

No.	Treatment	Rate (L or kg/ha)	Mean harvest yield		
			Yield (kg/plot)	Yield (kg/ha)	Percentage of UTC yield
1	Untreated control	-	11.4	1672.2	100.0
2	Agras	25 kg	10.9	1599.1	95.0
3	Agras	51 kg	12.7	1854.9	109.9
4	Agras	75 kg	12.7	1854.9	115.1
5	Agras	99 kg	12.5	1833.0	116.7
6	Hibrix BB	2.5 L	12.9	1889.6	113.3
7	Hibrix BB Agras	2.5 L 25 kg	12.2	1785.5	106.5
8	Hibrix BB Agras	2.5 L 51 kg	13.6	1992.0	118.2
9	Hibrix BB Agras	2.5 L 75 kg	15.2	2214.9	139.0
10	Hibrix BB Agras	2.5 L 99 kg	12.2	1781.8	112.8
		***P*-value**	**0.8774**	**0.8774**	**0.7379**
		CV	**26.57**	**26.57**	**25.94**
		LSD (*p*=0.05)	**NSD**	**NSD**	**NSD**

Means followed by the same letter are not significantly different (p = 0.10, LSD).
NSD = No significant difference due to a p-value > 0.05.

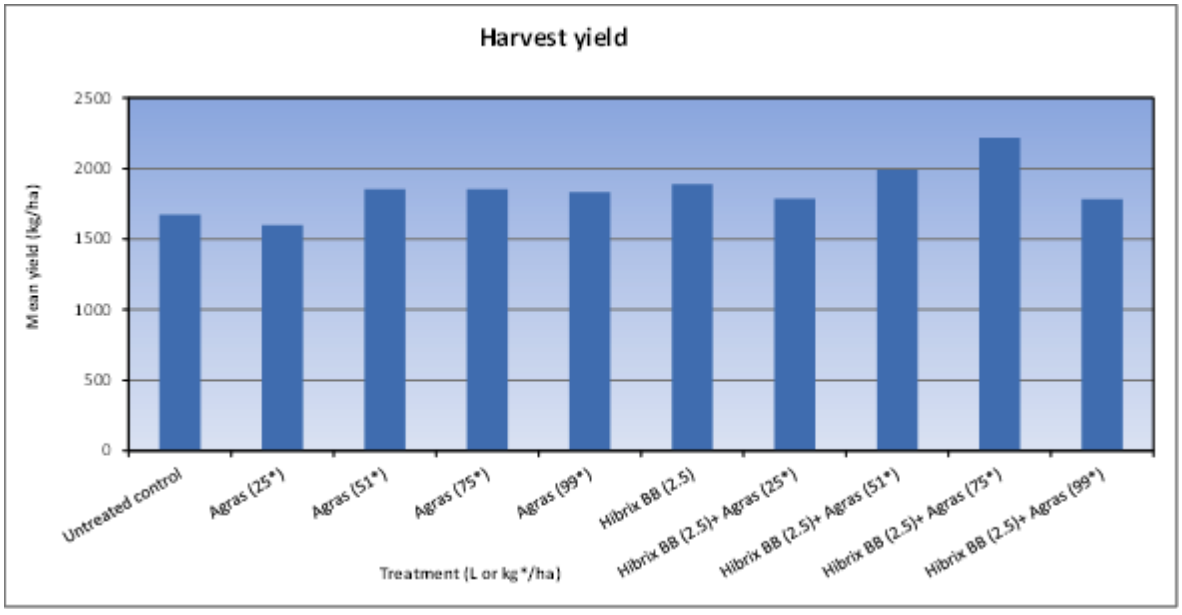

Figure 3: Harvest yield

Factorial analysis – Mean harvest yield (kg/ha)		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	1752.8	1780.9
2.5 L	1932.8	
25 kg		1692.3
51 kg		1923.4
75 kg		2034.9
99 kg		1807.4
***P*-value**	**0.4195**	**0.8523**
LSD (*p*=0.05)	**NSD**	**NSD**
Factorial analysis – Mean harvest yield (% of UTC yield)		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0	107.3	106.6
2.5 L	117.9	
25 kg		100.7
51 kg		114.1
75 kg		127.0
99 kg		114.7
***P*-value**	**0.4335**	**0.7119**
LSD (*p*=0.05)	**NSD**	**NSD**

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
NSD = No significant difference due to a p-value > 0.05

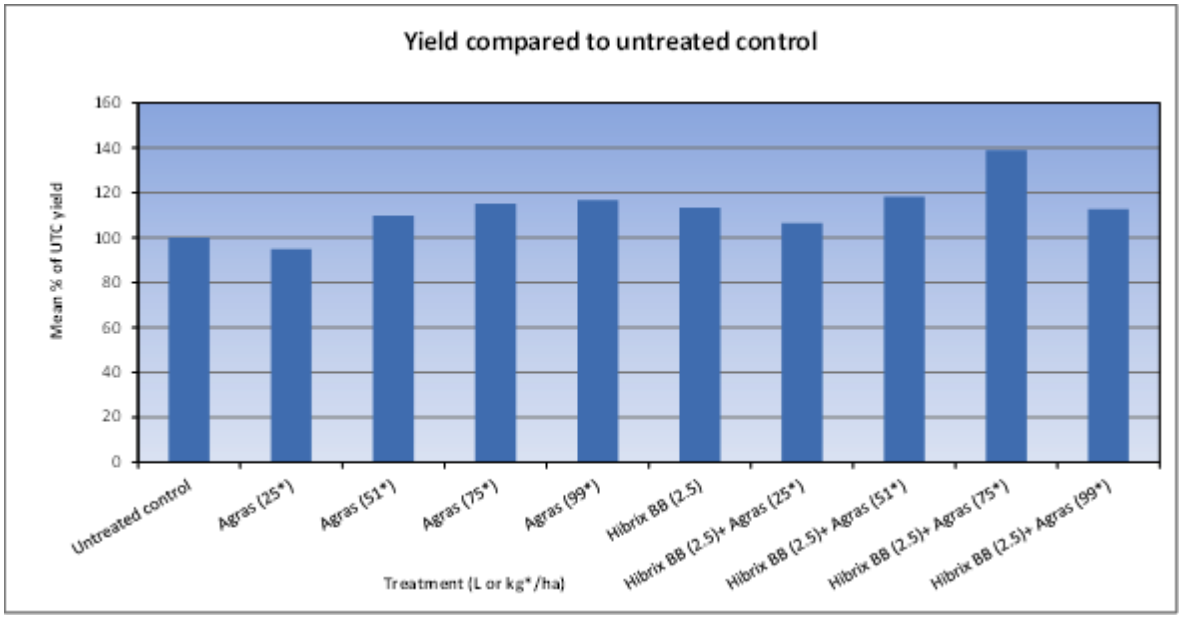

Figure 4: Yield compared to untreated control

Table 4. Grain quality components

No.	Treatment	Rate (L or kg/ha)	Grain quality components at harvest		
			Hectolitre weight (kg/hL)	% screenings (less cracked grain)	% protein (at 11% moisture)
1	Untreated control	-	75.1	2.0	9.2
2	Agras	25 kg	73.7	1.9	9.2
3	Agras	51 kg	75.4	1.6	8.7
4	Agras	75 kg	75.3	2.2	9.0
5	Agras	99 kg	75.1	2.0	9.2
6	Hibrix BB	2.5 L	74.0	1.9	9.3
7	Hibrix BB Agras	2.5 L 25 kg	75.5	1.3	9.0
8	Hibrix BB Agras	2.5 L 51 kg	74.4	2.5	8.7
9	Hibrix BB Agras	2.5 L 75 kg	76.4	2.4	9.1
10	Hibrix BB Agras	2.5 L 99 kg	73.7	2.8	9.4
		***P*-value**	**0.9413**	**0.8519**	**0.5823**
		CV	**3.92**	**58.60**	**5.84**
		LSD (*p*=0.05)	**NSD**	**NSD**	**NSD**

NSD = No significant difference due to a p-value > 0.05
Means within columns followed by the same letter are not significantly different at the 10% level according to least significant difference (LSD) test.

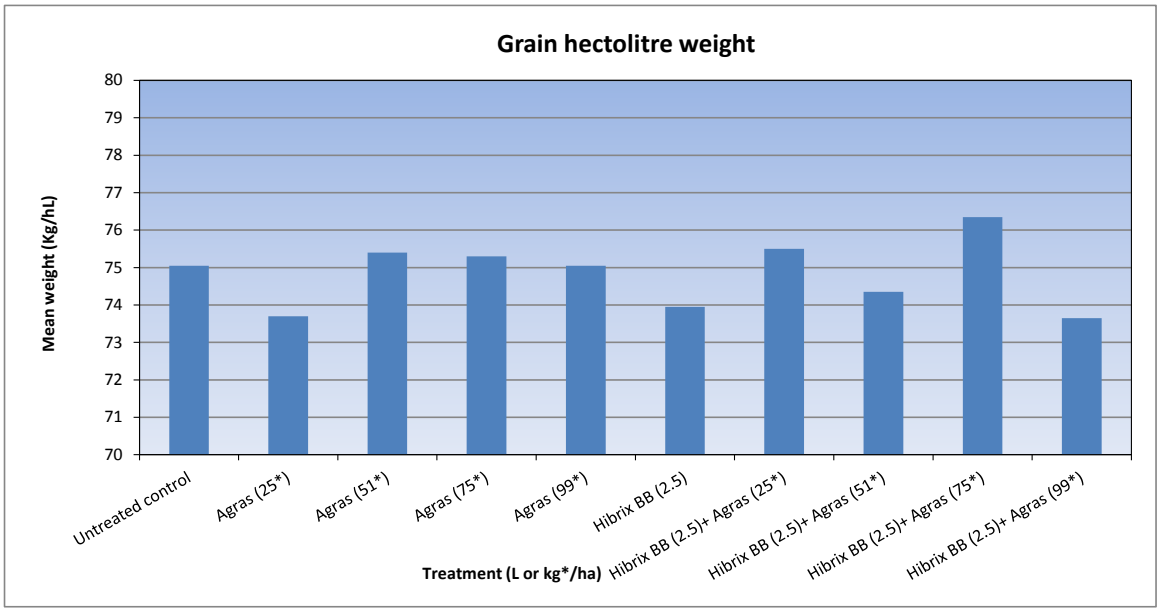

Figure 5: Grain quality - hectolitre weight

Factorial analysis – Hectolitre weight (kg/hL)		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0 L	74.9	74.5
2.5 L	74.8	
25 kg		74.6
51 kg		74.9
75 kg		75.8
99 kg		74.4
***P*-value**	**0.8536**	**0.9330**
LSD (*p*=0.05)	**NSD**	**NSD**
Factorial analysis – % screenings (less cracked grain)		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0 L	1.9	2.0
2.5 L	2.2	
25 kg		1.6
51 kg		2.1
75 kg		2.3
99 kg		2.4
***P*-value**	**0.4165**	**0.7819**
LSD (*p*=0.05)	**NSD**	**NSD**
Factorial analysis – % protein (at 11% moisture)		
Rates	**Formulation**	
L or kg/ha	**Hibrix BB**	**Agras**
0 L	9.0	9.3
2.5 L	9.1	
25 kg		9.1
51 kg		8.7
75 kg		9.0
99 kg		9.3
***P*-value**	**0.6424**	**0.2041**
LSD (*p*=0.05)	**NSD**	**NSD**

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
NSD = No significant difference due to a p-value > 0.05

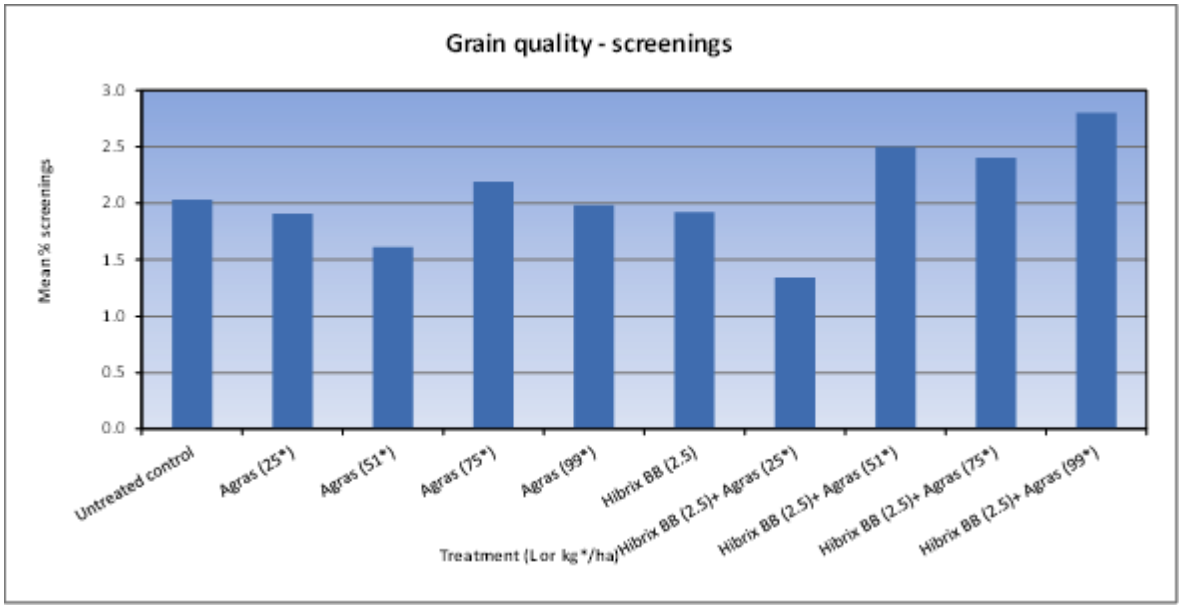

Figure 6: Grain quality - screenings

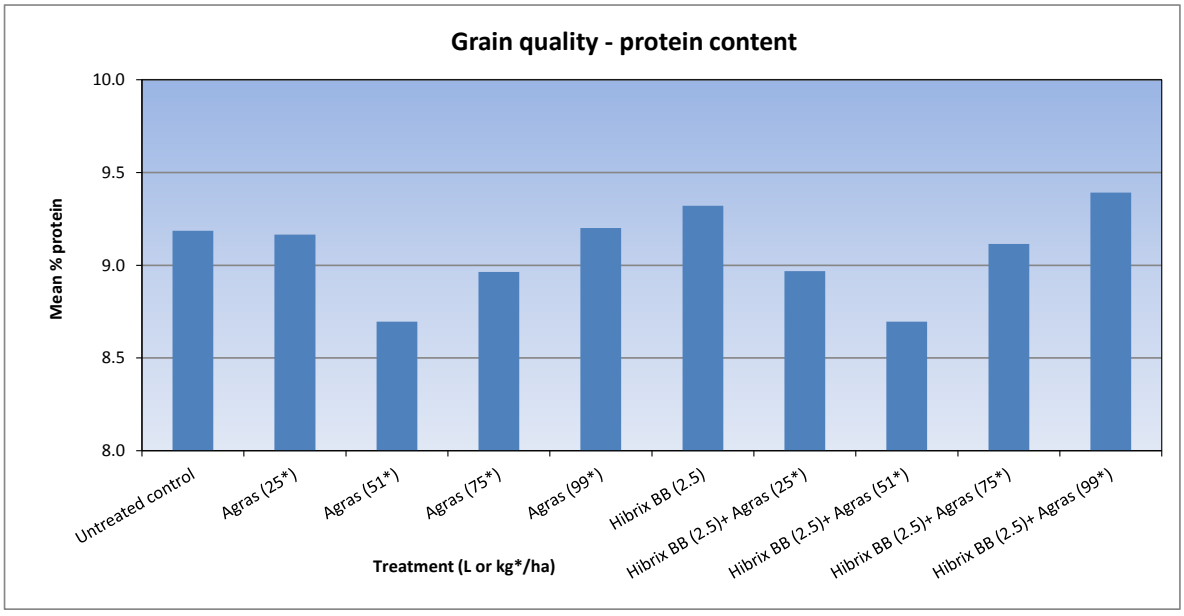

Figure 7: Grain quality - protein content

DISCUSSION

The trial was conducted in a sandy loam paddock following three years of pasture and one year of wheat and was a duplicate of and overlayed on a 2013 trial to show the effects of the Hibrix treatments after two years of treatment. The soil was scarified and the wheat sown using a conventional full cut combine with finger harrows. Agras fertiliser was applied at sowing and banded below the seed at 0, 25, 51, 75 or 99 kg/ha. Hibrix BB treatments were applied as broadcast soil applications two days after sowing.

The trial was sown in mid-May into moist soil, with 35 mm of rain falling for the remainder of the month which would have helped Hibrix incorporation into the soil. Following below average rainfall in June during crop establishment, the remainder of the growing season provided greater than average rainfall and a good finish to the season.

Crop establishment and biomass were observed regularly, with visual biomass assessed at 75, 87, 110 and 147 days after sowing (DAS). There were no differences between treatments at 75 and 87DAS, but by 110DAS there were significant biomass increases with increasing rates of Agras. The factorial analysis shows small increases in biomass with Hibrix compared to non-Hibrix, however the effects were not statistically significant. Crop photosynthetic capacity was measured at 87, 110 and 147DAS using a Normalised Difference Vegetation Index. The results show a significant dose response to increasing rates of Agras at 87DAS. The factorial analysis shows greater NDVI trends using Hibrix compared to non-Hibrix at all three assessment timings, but the effects were not statistically significant.

The untreated control (no Hibrix BB or Agras) yielded 1.67 t/ha with all treatments other than the low rate of Agras (25 kg/ha) with no Hibrix, increasing yield with increases ranging from 6% to 39%. There was a dose response trend to increasing rates of Agras and also to Hibrix compared to non-Hibrix plots. The factorial analysis shows non-Hibrix treatments overall increased yields by 7.3% compared to the untreated control of no Agras and no Hibrix, whilst the Hibrix treatments overall increased yields by 17.9% compared to the untreated control. There were no significant differences between treatments in the harvest grain quality components of hectolitre weight, protein content or screenings.

Full rate Agras (99 kg/ha) without Hibrix yielded 1.833 t/ha which was 16.7% greater than the untreated control. In comparison, half rate Agras (51 kg/ha) plus Hibrix yielded 1.992 t/ha which was 18.2% greater than the untreated control, whilst three quarter rate Agras (75 kg/ha) plus Hibrix yielded 2.215 t/ha which was 39% greater than the untreated control.

There were no visible signs of phytotoxicity or adverse crop effects by any treatment in this trial.

CONCLUSIONS

The trial was conducted for a second consecutive year in a sandy loam paddock with wheat cv. Eradu sown with varying rates of Agras, each with and without Hibrix BB applied two days after sowing. Agras was applied at 25, 51, 75 or 99 kg/ha with Hibrix BB applied at 2.5 L/ha.

The following was concluded:

- There were significant biomass increases with increasing rates of Agras and small increases in biomass with Hibrix compared to non-Hibrix application.
- The untreated control (no Hibrix BB or Agras) yielded 1.67 t/ha with all treatments other than the low rate of Agras (25 kg/ha) with no Hibrix, increasing yield with increases ranging from 6% to 39%.
- There was a dose response trend to increasing rates of Agras and also to Hibrix compared to non-Hibrix plots.
- Overall non-Hibrix treatments increased yields by 7.3% whilst the Hibrix treatments overall increased yields by 17.9% compared to the untreated control.
- There were no differences between treatments in the harvest grain quality components of hectolitre weight, protein content or screenings.
- Full rate Agras (99 kg/ha) without Hibrix yielded 1.833 t/ha which was 16.7% greater than the untreated control. In comparison, half rate Agras (51 kg/ha) plus Hibrix yielded 1.992 t/ha which was 18.2% greater than the untreated control, whilst three quarter rate Agras (75 kg/ha) plus Hibrix yielded 2.215 t/ha which was 39% greater than the untreated control.
- There were no visible signs of phytotoxicity or adverse crop effects by any treatment in this trial.

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APPENDICES

Appendix i. Trial details

Site details

Grower	**Ashley Smith 0429-083152**
Location	Goomalling Road Northam 6401 Western Australia
GPS co-ordinates	-31.565018 116.698985
Paddock name	Fig tree
Paddock history	Pasture in 2010, 2011, 2012, wheat in 2013, 2014
Soil type	Sandy loam
Crop	Wheat
Variety	Eradu
Trial design	Randomised complete block
Replications	4
Plot size	40.2 m x 4.3 m
Sowing date	16/05/14
Harvest date	03/12/14

Trial location map – Fig tree paddock

N➔

Trial plan

← **North**

		Hibrix		Hibrix		Hibrix		Hibrix			
kg/ha	**Block**	1	1	2	2	3	3	4	4	**Block**	kg/ha
99		**48**	**47**	**46**	**45**	**44**	**43**	**42**	**41**		99
75		**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**		75
51		**32**	**31**	**30**	**29**	**28**	**27**	**26**	**25**		51
25		**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**		25
0		**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**		0
99		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**		99
	Block	1	1	2	2	3	3	4	4	**Block**	

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Treatment plan

← **North**

		Hibrix		Hibrix		Hibrix		Hibrix			
kg/ha	**Block**	1	1	2	2	3	3	4	4	**Block**	kg/ha
99		**10**	**5**	**10**	**5**	**10**	**5**	**10**	**5**		99
75		**9**	**4**	**9**	**4**	**9**	**4**	**9**	**4**		75
51		**8**	**3**	**8**	**3**	**8**	**3**	**8**	**3**		51
25		**7**	**2**	**7**	**2**	**7**	**2**	**7**	**2**		25
0		**6**	**1**	**6**	**1**	**6**	**1**	**6**	**1**		0
99		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		99
	Block	1	1	2	2	3	3	4	4	**Block**	

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Sowing details

Sowing details	
Date	16/05/14
Method	Full cut combine
Combine make	Massey Ferguson
Combine configuration	24 row with 7” spacing and finger harrows
Crop	Wheat
Variety	Eradu
Sowing rate (kg/ha)	65
Sowing depth (cm)	4
Fertiliser	Agras
Fertiliser rate (kg/ha)	0, 25, 51, 75, 99
Fertiliser placement	Banded below seed
Soil moisture at surface	Dry
Soil moisture below surface	Moist
Soil moisture during emergence	Moist
Other products applied to site	
Pre-sowing	Trifluralin 480 @ 1 L/ha + Paraquat @ 1 L/ha
Post-emergence	Axial for annual ryegrass control at 2-3 tiller stage. Kamba M (Dicamba + MCPA) for wild radish and emex control at late tillering stage.

Application details – spray

Application equipment				
Method	Low volume broadcast boom spraying			
Equipment	Quad bike mounted compressed air boom sprayer			
Nozzles	Agrotop AirMix yellow 11002 flat fan			
Nozzle spacing	50 cm			
Spray volume	100 L/ha			
Pressure	250 kPa			
Ground speed	2.44 m/sec 8.78 kph			
Treatment applications				
Application number	1			
Date	18/05/14			
Days after sowing	2			
Times	10.00 – 10.30			
Treatments applied	6 – 10			
Temperature (°C)	18			
Relative humidity (%)	62			
Cloud cover (%)	20			
Wind direction	NE			
Wind speed (km/h)	3.1			
Soil moisture	Moist			
Timing	PSPE			
Leaf wetness	N/A			
Crop stage - description	seed			
Crop stage – Zadok's	01			

Assessments

Normalised difference vegetation index					
Dates		11/08/14	03/09/14	10/10/14	
Days after sowing		87	110	147	
Sample size	Whole plot				
Method	Readings taken with "Greenseeker" by walking the length of each plot and the average reading recorded as Normalised Difference Vegetation Index (NDVI). The NDVI is a numerical indicator to assess the greenness of a plot. NDVI is directly related to the photosynthetic capacity and hence energy absorption of plant canopies. The index ranges from 0 – 1. The greater the number indicating a higher photosynthetic capacity which visually would appear greener.				
Statistical analysis	Factorial analysis, analysis of variance and comparison of means using LSD test.				
Crop biomass					
Dates	30/07/14	11/08/14	03/09/14	10/10/14	
Days after sowing	75	87	110	147	
Sample size	Whole plot				
Method	Visual assessment using percentage scale relative to best plot (=100%)				
Statistical analysis	Factorial analysis, analysis of variance and comparison of means using LSD test.				
Crop safety					
Dates	30/07/14	11/08/14	03/09/14	10/10/14	
Days after sowing	75	87	110	147	
Sample size	Whole plot				
Method	Visual assessment of each plot. No phytotoxicity or adverse crop effects were observed.				
Statistical analysis	Not applicable				

Harvest yield & grain quality	
Date	03/12/14
Days after sowing	201
Sample size	38 m x 1.8 m = 68.4 m²
Method	A strip 1.8 m wide x 38 m was mechanically harvested from each plot using a small plot harvester and the threshed grain weighed. Harvested grain samples were retained and laboratory tested for the grain quality components hectolitre weight, protein content and screenings.
Statistical analysis	Factorial analysis, analysis of variance and comparison of means using LSD test.

Appendix ii. Statistical analysis

Factorial analysis

Crop Name	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety	ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT
Rating Date	11/08/14	03/09/14	10/10/14	30/07/14	11/08/14	03/09/14
Rating Type	NDVI	NDVI	NDVI	BIOMAS	BIOMAS	BIOMAS
Rating Unit	INDEX	INDEX	INDEX	%REL	%REL	%REL
Sample Size, Unit	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority	BBCH37	BBCH65	BBCH85	BBCH32	BBCH37	BBCH65
SE Group No.	1	3	2	5	4	4
Trt-Eval Interval	85 DA-A	108 DA-A	145 DA-A	73 DA-A	85 DA-A	108 DA-A
Number of Decimals	3	3	3			
Trt Treatment Rate No. Name Rate Unit	1	2	3	4	5	6
TABLE OF R MEANS						
Replicate 1	0.569	0.579	0.239	70.5	80.5	81.0
Replicate 2	0.523	0.524	0.358	83.5	80.5	76.9
Replicate 3	0.538	0.503	0.374	86.5	86.5	77.0
Replicate 4	0.524	0.508	0.297	86.0	88.0	77.5
TABLE OF A (Hibrix) MEANS						
1 Hibrix 0 l/ha	0.519 a	0.504 a	0.315 a	82.0 a	87.0 a	76.7 a
2 Hibrix 2.5 l/ha	0.558 a	0.552 a	0.319 a	81.3 a	80.8 a	79.5 a
TABLE OF B (Agras) MEANS						
1 Agras 0 kg/ha	0.463 b	0.468 a	0.311 a	74.4 a	90.6 a	69.4 c
2 Agras 25 kg/ha	0.509 b	0.498 a	0.357 a	75.6 a	80.6 ab	76.9 b
3 Agras 51 kg/ha	0.534 b	0.500 a	0.336 a	81.3 a	73.1 b	75.6 bc
4 Agras 75 kg/ha	0.649 a	0.600 a	0.322 a	86.9 a	85.0 ab	70.0 bc
5 Agras 99 kg/ha	0.540 b	0.576 a	0.259 a	90.0 a	90.0 a	98.6 a
TABLE OF A (Hibrix) B (Agras) MEANS						
1 Hibrix 0 l/ha 1 Agras 0 kg/ha	0.432 a	0.447 a	0.310 a	78.8 a	92.5 a	70.0 a
2 Hibrix 2.5 l/ha 1 Agras 0 kg/ha	0.494 a	0.490 a	0.312 a	70.0 a	88.8 a	68.8 a
1 Hibrix 0 l/ha 2 Agras 25 kg/ha	0.492 a	0.470 a	0.348 a	76.3 a	85.0 a	73.8 a
2 Hibrix 2.5 l/ha 2 Agras 25 kg/ha	0.526 a	0.526 a	0.366 a	75.0 a	76.3 a	80.0 a
1 Hibrix 0 l/ha 3 Agras 51 kg/ha	0.513 a	0.469 a	0.326 a	80.0 a	80.0 a	75.0 a
2 Hibrix 2.5 l/ha 3 Agras 51 kg/ha	0.555 a	0.531 a	0.346 a	82.5 a	66.3 a	76.3 a
1 Hibrix 0 l/ha 4 Agras 75 kg/ha	0.627 a	0.572 a	0.332 a	86.3 a	88.8 a	67.5 a
2 Hibrix 2.5 l/ha 4 Agras 75 kg/ha	0.670 a	0.628 a	0.313 a	87.5 a	81.3 a	72.5 a
1 Hibrix 0 l/ha 5 Agras 99 kg/ha	0.532 a	0.565 a	0.260 a	88.8 a	88.8 a	97.3 a
2 Hibrix 2.5 l/ha 5 Agras 99 kg/ha	0.547 a	0.587 a	0.257 a	91.3 a	91.3 a	100.0 a

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

Crop Name	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety	ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description	PLOT	PLOT	PLOT	PLOT	WEIGHT	LESS CRACKED
Rating Date	10/10/14	03/12/14	03/12/14	03/12/14	03/12/14	03/12/14
Rating Type	BIOMAS	YIELD	YIELD	YIELD	DENSTY	SCREENINGS
Rating Unit	%REL	kg/plot	kg/ha	%UNCK	kg/hL	%
Sample Size, Unit	1 PLOT	68.4 M2	1 PLOT	68.4 M2	1 PLOT	1 PLOT
Crop Stage Majority	BBCH85	BBCH92	BBCH92	BBCH92	BBCH92	BBCH92
SE Group No.	4	7	8	9	10	11
Trt-Eval Interval	145 DA-A	199 DA-A	199 DA-A	199 DA-A	199 DA-A	199 DA-A
Number of Decimals		1	1	1	1	1
Trt Treatment Rate						
No. Name Rate Unit	7	8	9	10	11	12
TABLE OF R MEANS						
Replicate 1	99.5	13.37	1954.0	91.2	75.2	2.7
Replicate 2	97.0	13.22	1932.7	116.0	75.8	1.3
Replicate 3	95.5	12.26	1791.7	123.8	74.8	1.7
Replicate 4	90.0	11.72	1712.7	119.5	73.5	2.5
TABLE OF A (Hibrix) MEANS						
1 Hibrix 0 l/ha	94.5 a	12.06 a	1762.8 a	107.3 a	74.9 a	1.9 a
2 Hibrix 2.5 l/ha	96.5 a	13.22 a	1932.8 a	117.9 a	74.8 a	2.2 a
TABLE OF B (Agras) MEANS						
1 Agras 0 kg/ha	93.1 c	12.18 a	1780.9 a	106.6 a	74.5 a	2.0 a
2 Agras 25 kg/ha	92.5 c	11.58 a	1692.3 a	100.7 a	74.6 a	1.6 a
3 Agras 51 kg/ha	93.8 bc	13.16 a	1923.4 a	114.1 a	74.9 a	2.1 a
4 Agras 75 kg/ha	98.8 ab	13.92 a	2034.9 a	127.0 a	75.8 a	2.3 a
5 Agras 99 kg/ha	99.4 a	12.36 a	1807.4 a	114.7 a	74.4 a	2.4 a
TABLE OF A (Hibrix) B (Agras) MEANS						
1 Hibrix 0 l/ha 1 Agras 0 kg/ha	90.0 a	11.44 a	1672.2 a	100.0 a	75.1 a	2.0 a
2 Hibrix 2.5 l/ha 1 Agras 0 kg/ha	96.3 a	12.93 a	1889.6 a	113.3 a	74.0 a	1.9 a
1 Hibrix 0 l/ha 2 Agras 25 kg/ha	92.5 a	10.94 a	1599.1 a	95.0 a	73.7 a	1.9 a
2 Hibrix 2.5 l/ha 2 Agras 25 kg/ha	92.5 a	12.21 a	1785.5 a	106.5 a	75.5 a	1.3 a
1 Hibrix 0 l/ha 3 Agras 51 kg/ha	92.5 a	12.69 a	1854.9 a	109.9 a	75.4 a	1.6 a
2 Hibrix 2.5 l/ha 3 Agras 51 kg/ha	95.0 a	13.63 a	1992.0 a	118.2 a	74.4 a	2.5 a
1 Hibrix 0 l/ha 4 Agras 75 kg/ha	97.5 a	12.69 a	1854.9 a	115.1 a	75.3 a	2.2 a
2 Hibrix 2.5 l/ha 4 Agras 75 kg/ha	100.0 a	15.15 a	2214.9 a	139.0 a	76.4 a	2.4 a
1 Hibrix 0 l/ha 5 Agras 99 kg/ha	100.0 a	12.54 a	1833.0 a	116.7 a	75.1 a	2.0 a
2 Hibrix 2.5 l/ha 5 Agras 99 kg/ha	98.8 a	12.19 a	1781.8 a	112.8 a	73.7 a	2.8 a

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

Crop Name	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety	ERADU	ERADU	ERADU	ERADU
Description	PROTEIN CONTENT	CROP INJURY	CROP INJURY	CROP INJURY
Rating Date	03/12/14	30/07/14	11/08/14	03/09/14
Rating Type	PROTEIN	EWRS	EWRS	EWRS
Rating Unit	11%MOIST	1-9	1-9	1-9
Sample Size, Unit	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority	BBCH92	BBCH32	BBCH37	BBCH65
SE Group No.	12	14	14	14
Trt-Eval Interval	199 DA-A	73 DA-A	85 DA-A	108 DA-A
Number of Decimals	1			
Trt Treatment Rate No. Name Rate Unit	13	14	15	16
TABLE OF R MEANS				
Replicate 1	8.9	1.0	1.0	1.0
Replicate 2	9.1	1.0	1.0	1.0
Replicate 3	9.2	1.0	1.0	1.0
Replicate 4	9.1	1.0	1.0	1.0
TABLE OF A (Hibrix) MEANS				
1 Hibrix 0 l/ha	9.0 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha	9.1 a	1.0 a	1.0 a	1.0 a
TABLE OF B (Agras) MEANS				
1 Agras 0 kg/ha	9.3 a	1.0 a	1.0 a	1.0 a
2 Agras 25 kg/ha	9.1 a	1.0 a	1.0 a	1.0 a
3 Agras 51 kg/ha	8.7 a	1.0 a	1.0 a	1.0 a
4 Agras 75 kg/ha	9.0 a	1.0 a	1.0 a	1.0 a
5 Agras 99 kg/ha	9.3 a	1.0 a	1.0 a	1.0 a
TABLE OF A (Hibrix) B (Agras) MEANS				
1 Hibrix 0 l/ha 1 Agras 0 kg/ha	9.2 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha 1 Agras 0 kg/ha	9.3 a	1.0 a	1.0 a	1.0 a
1 Hibrix 0 l/ha 2 Agras 25 kg/ha	9.2 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha 2 Agras 25 kg/ha	9.0 a	1.0 a	1.0 a	1.0 a
1 Hibrix 0 l/ha 3 Agras 51 kg/ha	8.7 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha 3 Agras 51 kg/ha	8.7 a	1.0 a	1.0 a	1.0 a
1 Hibrix 0 l/ha 4 Agras 75 kg/ha	9.0 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha 4 Agras 75 kg/ha	9.1 a	1.0 a	1.0 a	1.0 a
1 Hibrix 0 l/ha 5 Agras 99 kg/ha	9.2 a	1.0 a	1.0 a	1.0 a
2 Hibrix 2.5 l/ha 5 Agras 99 kg/ha	9.4 a	1.0 a	1.0 a	1.0 a

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

Crop Name				WHEAT
Crop Variety				ERADU
Description				CROP INJURY
Rating Date				10/10/14
Rating Type				EWRS
Rating Unit				1-9
Sample Size, Unit				1 PLOT
Crop Stage Majority				BBCH85
SE Group No.				15
Trt-Eval Interval				145 DA-A
Number of Decimals				
Trt No.	Treatment Name	Rate	Rate Unit	17
TABLE OF R MEANS				
Replicate 1				1.0
Replicate 2				1.0
Replicate 3				1.0
Replicate 4				1.0
TABLE OF A (Hibrix) MEANS				
1	Hibrix	0	l/ha	1.0 a
2	Hibrix	2.5	l/ha	1.0 a
TABLE OF B (Agras) MEANS				
1	Agras	0	kg/ha	1.0 a
2	Agras	25	kg/ha	1.0 a
3	Agras	51	kg/ha	1.0 a
4	Agras	75	kg/ha	1.0 a
5	Agras	99	kg/ha	1.0 a
TABLE OF A (Hibrix) B (Agras) MEANS				
1	Hibrix	0	l/ha	1.0 a
1	Agras	0	kg/ha	
2	Hibrix	2.5	l/ha	1.0 a
1	Agras	0	kg/ha	
1	Hibrix	0	l/ha	1.0 a
2	Agras	25	kg/ha	
2	Hibrix	2.5	l/ha	1.0 a
2	Agras	25	kg/ha	
1	Hibrix	0	l/ha	1.0 a
3	Agras	51	kg/ha	
2	Hibrix	2.5	l/ha	1.0 a
3	Agras	51	kg/ha	
1	Hibrix	0	l/ha	1.0 a
4	Agras	75	kg/ha	
2	Hibrix	2.5	l/ha	1.0 a
4	Agras	75	kg/ha	
1	Hibrix	0	l/ha	1.0 a
5	Agras	99	kg/ha	
2	Hibrix	2.5	l/ha	1.0 a
5	Agras	99	kg/ha	

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

Analysis of variance – P = 0.05

Crop Name			WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety			ERADU	ERADU	ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description			PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT
Rating Date			11/08/14	03/09/14	10/10/14	30/07/14	11/08/14	03/09/14	10/10/14	03/12/14
Rating Type			NDVI	NDVI	NDVI	BIOMAS	BIOMAS	BIOMAS	BIOMAS	YIELD
Rating Unit			INDEX	INDEX	INDEX	%REL	%REL	%REL	%REL	kg/plot
Sample Size, Unit			1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	68.4 M2
Crop Stage Majority			BBCH37	BBCH65	BBCH85	BBCH32	BBCH37	BBCH65	BBCH85	BBCH92
SE Group No.			1	3	2	5	4	4	4	7
Trt-Eval Interval			85 DA-A	108 DA-A	145 DA-A	73 DA-A	85 DA-A	108 DA-A	145 DA-A	199 DA-A
Number of Decimals			3	3	3					1
Trt No.	Treatment Name	Rate Unit	1	2	3	4	5	6	7	8
1	Hibrix	0 l/ha	0.432 a	0.447 a	0.310 a	78.8 a	92.5 a	70.0 c	90.0 a	11.4 a
	Agras	0 kg/ha								
2	Hibrix	0 l/ha	0.492 a	0.470 a	0.348 a	76.3 a	85.0 a	73.8 bc	92.5 a	10.9 a
	Agras	25 kg/ha								
3	Hibrix	0 l/ha	0.513 a	0.469 a	0.326 a	80.0 a	80.0 a	75.0 bc	92.5 a	12.7 a
	Agras	51 kg/ha								
4	Hibrix	0 l/ha	0.627 a	0.572 a	0.332 a	86.3 a	88.8 a	67.5 c	97.5 a	12.7 a
	Agras	75 kg/ha								
5	Hibrix	0 l/ha	0.532 a	0.565 a	0.260 a	88.8 a	88.8 a	97.3 a	100.0 a	12.5 a
	Agras	99 kg/ha								
6	Hibrix	2.5 l/ha	0.494 a	0.490 a	0.312 a	70.0 a	88.8 a	68.8 c	96.3 a	12.9 a
	Agras	0 kg/ha								
7	Hibrix	2.5 l/ha	0.526 a	0.526 a	0.366 a	75.0 a	76.3 a	80.0 b	92.5 a	12.2 a
	Agras	25 kg/ha								
8	Hibrix	2.5 l/ha	0.555 a	0.531 a	0.346 a	82.5 a	66.3 a	76.3 bc	95.0 a	13.6 a
	Agras	51 kg/ha								
9	Hibrix	2.5 l/ha	0.670 a	0.628 a	0.313 a	87.5 a	81.3 a	72.5 bc	100.0 a	15.2 a
	Agras	75 kg/ha								
10	Hibrix	2.5 l/ha	0.547 a	0.587 a	0.257 a	91.3 a	91.3 a	100.0 a	98.8 a	12.2 a
	Agras	99 kg/ha								
LSD P=.05			0.1391	0.1511	0.0957	17.97	17.86	9.72	7.13	4.87
Standard Deviation			0.0959	0.1041	0.0660	12.39	12.31	6.70	4.92	3.36
CV			17.8	19.71	20.82	15.17	14.67	8.58	5.15	26.57
Bartlett's X2			0.497	1.607	1.468	10.984	3.083	5.271	8.86	1.363
P(Bartlett's X2)			1.00	0.996	0.997	0.277	0.961	0.728	0.263	0.998
Skewness			0.2655	-0.0068	-0.1626	-1.0127*	-0.4386	0.4962	-1.4402*	0.1975
Kurtosis			-0.5293	-1.2	-0.5579	0.8311	-0.4548	-0.3833	1.1702	-0.8137
Replicate F			0.507	1.120	8.651	3.698	1.028	0.847	6.690	0.551
Replicate Prob(F)			0.6805	0.3582	0.0003	0.0238	0.3960	0.4801	0.0016	0.6515
Treatment F			2.025	1.292	1.169	1.214	1.737	11.662	2.080	0.477
Treatment Prob(F)			0.0758	0.2862	0.3530	0.3274	0.1287	0.0001	0.0683	0.8774

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Crop Name			WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety			ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description			PLOT	PLOT	WEIGHT	LESS CRACKED	PROTEIN CONTENT	CROP INJURY
Rating Date			03/12/14	03/12/14	03/12/14	03/12/14	03/12/14	30/07/14
Rating Type			YIELD	YIELD	DENSTY	SCREENINGS	PROTEIN	EWRS
Rating Unit			kg/ha	%UNCK	kg/hL	%	11%MOIST	1-9
Sample Size, Unit			1 PLOT	68.4 M2	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority			BBCH92	BBCH92	BBCH92	BBCH92	BBCH92	BBCH32
SE Group No.			8	9	10	11	12	14
Trt-Eval Interval			199 DA-A	199 DA-A	199 DA-A	199 DA-A	199 DA-A	73 DA-A
Number of Decimals			1	1	1	1	1	
Trt No.	Treatment Name	Rate	Rate Unit	9	10	11	12	13	14
1	Hibrix	0	l/ha	1672.2 a	100.0 a	75.1 a	2.0 a	9.2 a	1.0 a
	Agras	0	kg/ha						
2	Hibrix	0	l/ha	1599.1 a	95.0 a	73.7 a	1.9 a	9.2 a	1.0 a
	Agras	25	kg/ha						
3	Hibrix	0	l/ha	1854.9 a	109.9 a	75.4 a	1.6 a	8.7 a	1.0 a
	Agras	51	kg/ha						
4	Hibrix	0	l/ha	1854.9 a	115.1 a	75.3 a	2.2 a	9.0 a	1.0 a
	Agras	75	kg/ha						
5	Hibrix	0	l/ha	1833.0 a	116.7 a	75.1 a	2.0 a	9.2 a	1.0 a
	Agras	99	kg/ha						
6	Hibrix	2.5	l/ha	1889.6 a	113.3 a	74.0 a	1.9 a	9.3 a	1.0 a
	Agras	0	kg/ha						
7	Hibrix	2.5	l/ha	1785.5 a	106.5 a	75.5 a	1.3 a	9.0 a	1.0 a
	Agras	25	kg/ha						
8	Hibrix	2.5	l/ha	1992.0 a	118.2 a	74.4 a	2.5 a	8.7 a	1.0 a
	Agras	51	kg/ha						
9	Hibrix	2.5	l/ha	2214.9 a	139.0 a	76.4 a	2.4 a	9.1 a	1.0 a
	Agras	75	kg/ha						
10	Hibrix	2.5	l/ha	1781.8 a	112.8 a	73.7 a	2.8 a	9.4 a	1.0 a
	Agras	99	kg/ha						
LSD P=.05				712.42	42.39	4.25	1.76	0.77	0.00
Standard Deviation				490.99	29.21	2.93	1.21	0.53	0.00
CV				26.57	25.94	3.92	58.6	5.84	0.0
Bartlett's X2				1.363	16.684	20.829	11.484	16.953	0.0
P(Bartlett's X2)				0.998	0.034*	0.013*	0.244	0.049*	.
Skewness				0.1975	0.3683	-1.6087*	1.1501*	0.1496	.
Kurtosis				-0.8137	0.0938	3.3344*	1.8332*	-0.2439	.
Replicate F				0.551	2.507	1.145	3.056	0.272	0.000
Replicate Prob(F)				0.6515	0.0802	0.3490	0.0453	0.8448	1.0000
Treatment F				0.477	0.659	0.366	0.513	0.845	0.000
Treatment Prob(F)				0.8774	0.7379	0.9413	0.8519	0.5823	1.0000

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Crop Name				WHEAT	WHEAT	WHEAT
Crop Variety				ERADU	ERADU	ERADU
Description				CROP INJURY	CROP INJURY	CROP INJURY
Rating Date				11/08/14	03/09/14	10/10/14
Rating Type				EWRS	EWRS	EWRS
Rating Unit				1-9	1-9	1-9
Sample Size, Unit				1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority				BBCH37	BBCH65	BBCH85
SE Group No.				14	14	15
Trt-Eval Interval				85 DA-A	108 DA-A	145 DA-A
Number of Decimals						
Trt No.	Treatment Name	Rate	Rate Unit	15	16	17
1	Hibrix	0	l/ha	1.0 a	1.0 a	1.0 a
	Agras	0	kg/ha			
2	Hibrix	0	l/ha	1.0 a	1.0 a	1.0 a
	Agras	25	kg/ha			
3	Hibrix	0	l/ha	1.0 a	1.0 a	1.0 a
	Agras	51	kg/ha			
4	Hibrix	0	l/ha	1.0 a	1.0 a	1.0 a
	Agras	75	kg/ha			
5	Hibrix	0	l/ha	1.0 a	1.0 a	1.0 a
	Agras	99	kg/ha			
6	Hibrix	2.5	l/ha	1.0 a	1.0 a	1.0 a
	Agras	0	kg/ha			
7	Hibrix	2.5	l/ha	1.0 a	1.0 a	1.0 a
	Agras	25	kg/ha			
8	Hibrix	2.5	l/ha	1.0 a	1.0 a	1.0 a
	Agras	51	kg/ha			
9	Hibrix	2.5	l/ha	1.0 a	1.0 a	1.0 a
	Agras	75	kg/ha			
10	Hibrix	2.5	l/ha	1.0 a	1.0 a	1.0 a
	Agras	99	kg/ha			
LSD P=.05				0.00	0.00	0.00
Standard Deviation				0.00	0.00	0.00
CV				0.0	0.0	0.0
Bartlett's X2				0.0	0.0	0.0
P(Bartlett's X2)				.	.	.
Skewness				.	.	.
Kurtosis				.	.	.
Replicate F				0.000	0.000	0.000
Replicate Prob(F)				1.0000	1.0000	1.0000
Treatment F				0.000	0.000	0.000
Treatment Prob(F)				1.0000	1.0000	1.0000

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Analysis of variance – P = 0.10

Trt No.	Treatment Name	Rate	Rate Unit	1	7
	Crop Name			WHEAT	WHEAT
	Crop Variety			ERADU	ERADU
	Description			PLOT	PLOT
	Rating Date			11/08/14	10/10/14
	Rating Type			NDVI	BIOMAS
	Rating Unit			INDEX	%REL
	Sample Size, Unit			1 PLOT	1 PLOT
	Crop Stage Majority			BBCH37	BBCH85
	SE Group No.			1	4
	Trt-Eval Interval			85 DA-A	145 DA-A
	Number of Decimals			3	
1	Hibrix	0	l/ha	0.432 d	90.0 c
	Agras	0	kg/ha		
2	Hibrix	0	l/ha	0.492 cd	92.5 bc
	Agras	25	kg/ha		
3	Hibrix	0	l/ha	0.513 bcd	92.5 bc
	Agras	51	kg/ha		
4	Hibrix	0	l/ha	0.627 ab	97.5 ab
	Agras	75	kg/ha		
5	Hibrix	0	l/ha	0.532 bcd	100.0 a
	Agras	99	kg/ha		
6	Hibrix	2.5	l/ha	0.494 cd	96.3 ab
	Agras	0	kg/ha		
7	Hibrix	2.5	l/ha	0.526 bcd	92.5 bc
	Agras	25	kg/ha		
8	Hibrix	2.5	l/ha	0.555 abc	95.0 abc
	Agras	51	kg/ha		
9	Hibrix	2.5	l/ha	0.670 a	100.0 a
	Agras	75	kg/ha		
10	Hibrix	2.5	l/ha	0.547 bcd	98.8 a
	Agras	99	kg/ha		
	LSD P=.10			0.1155	5.92
	Standard Deviation			0.0959	4.92
	CV			17.8	5.15
	Bartlett's X2			0.497	8.86
	P(Bartlett's X2)			1.00	0.263
	Skewness			0.2655	-1.4402*
	Kurtosis			-0.5293	1.1702
	Replicate F			0.507	6.690
	Replicate Prob(F)			0.6805	0.0016
	Treatment F			2.025	2.080
	Treatment Prob(F)			0.0758	0.0683

Appendix iii. Raw data

Crop Name					WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety					ERADU	ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description					PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT
Rating Date					11/08/14	03/09/14	10/10/14	30/07/14	11/08/14	03/09/14	10/10/14
Rating Type					NDVI	NDVI	NDVI	BIOMAS	BIOMAS	BIOMAS	BIOMAS
Rating Unit					INDEX	INDEX	INDEX	%REL	%REL	%REL	%REL
Sample Size, Unit					1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority					BBCH37	BBCH65	BBCH85	BBCH32	BBCH37	BBCH65	BBCH85
SE Group No.					1	3	2	5	4	4	4
Trt-Eval Interval					85 DA-A	108 DA-A	145 DA-A	73 DA-A	85 DA-A	108 DA-A	145 DA-A
Number of Decimals					3	3	3				
Trt No.	Treatment Name	Rate	Rate Unit	Plot	1	2	3	4	5	6	7
1	Hibrix	0	l/ha	15	0.563	0.596	0.179	70.0	75.0	80.0	95.0
	Agras	0	kg/ha	13	0.372	0.396	0.366	80.0	100.0	75.0	95.0
				11	0.417	0.383	0.390	85.0	95.0	55.0	90.0
				9	0.375	0.411	0.303	80.0	100.0	70.0	80.0
				Mean =	0.432	0.447	0.310	78.8	92.5	70.0	90.0
2	Hibrix	0	l/ha	18	0.574	0.646	0.215	55.0	70.0	75.0	100.0
	Agras	25	kg/ha	20	0.411	0.443	0.345	85.0	85.0	80.0	90.0
				22	0.591	0.438	0.506	80.0	85.0	70.0	90.0
				24	0.392	0.353	0.327	85.0	100.0	70.0	90.0
				Mean =	0.492	0.470	0.348	76.3	85.0	73.8	92.5
3	Hibrix	0	l/ha	31	0.651	0.648	0.195	55.0	60.0	85.0	100.0
	Agras	51	kg/ha	29	0.499	0.390	0.370	80.0	80.0	65.0	100.0
				27	0.485	0.421	0.398	100.0	80.0	75.0	90.0
				25	0.415	0.417	0.340	85.0	100.0	75.0	80.0
				Mean =	0.513	0.469	0.326	80.0	80.0	75.0	92.5
4	Hibrix	0	l/ha	40	0.624	0.571	0.315	80.0	95.0	70.0	100.0
	Agras	75	kg/ha	38	0.568	0.567	0.427	85.0	80.0	60.0	95.0
				36	0.554	0.494	0.371	95.0	100.0	60.0	95.0
				34	0.763	0.655	0.213	85.0	80.0	80.0	100.0
				Mean =	0.627	0.572	0.332	86.3	88.8	67.5	97.5
5	Hibrix	0	l/ha	8	0.458	0.464	0.245	100.0	95.0	100.0	100.0
	Agras	99	kg/ha	6	0.519	0.541	0.339	85.0	75.0	99.0	100.0
				4	0.480	0.534	0.294	90.0	100.0	100.0	100.0
				2	0.671	0.719	0.162	80.0	85.0	90.0	100.0
				Mean =	0.532	0.565	0.260	88.8	88.8	97.3	100.0
6	Hibrix	2.5	l/ha	16	0.595	0.617	0.187	45.0	80.0	75.0	100.0
	Agras	0	kg/ha	14	0.515	0.537	0.303	70.0	75.0	70.0	100.0
				12	0.431	0.449	0.386	70.0	100.0	70.0	95.0
				10	0.434	0.358	0.371	95.0	100.0	60.0	90.0
				Mean =	0.494	0.490	0.312	70.0	88.8	68.8	96.3
7	Hibrix	2.5	l/ha	17	0.620	0.629	0.260	55.0	90.0	80.0	100.0
	Agras	25	kg/ha	19	0.547	0.594	0.355	80.0	70.0	75.0	95.0
				21	0.548	0.527	0.452	80.0	75.0	80.0	95.0
				23	0.388	0.353	0.397	85.0	70.0	85.0	80.0
				Mean =	0.526	0.526	0.366	75.0	76.3	80.0	92.5
8	Hibrix	2.5	l/ha	32	0.629	0.643	0.221	50.0	85.0	80.0	100.0
	Agras	51	kg/ha	30	0.593	0.582	0.364	100.0	50.0	75.0	100.0
				28	0.548	0.468	0.412	85.0	70.0	80.0	100.0
				26	0.450	0.430	0.386	95.0	60.0	70.0	80.0
				Mean =	0.555	0.531	0.346	82.5	66.3	76.3	95.0
9	Hibrix	2.5	l/ha	39	0.553	0.504	0.315	100.0	70.0	65.0	100.0
	Agras	75	kg/ha	37	0.672	0.606	0.399	85.0	100.0	70.0	100.0
				35	0.774	0.696	0.229	80.0	70.0	80.0	100.0
				33	0.680	0.704	0.309	85.0	85.0	75.0	100.0
				Mean =	0.670	0.628	0.313	87.5	81.3	72.5	100.0
10	Hibrix	2.5	l/ha	7	0.427	0.470	0.260	95.0	85.0	100.0	100.0
	Agras	99	kg/ha	5	0.534	0.582	0.308	85.0	90.0	100.0	95.0
				3	0.553	0.619	0.297	100.0	90.0	100.0	100.0
				1	0.674	0.676	0.163	85.0	100.0	100.0	100.0
				Mean =	0.547	0.587	0.257	91.3	91.3	100.0	98.8

Crop Name				WHEAT	WHEAT	WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety				ERADU	ERADU	ERADU	ERADU	ERADU	ERADU
Description				PLOT	PLOT	PLOT	WEIGHT	LESS CRACKED	PROTEIN CONTENT
Rating Date				03/12/14	03/12/14	03/12/14	03/12/14	03/12/14	03/12/14
Rating Type				YIELD	YIELD	YIELD	DENSTY	SCREENINGS	PROTEIN
Rating Unit				kg/plot	kg/ha	%UNCK	kg/hL	%	11%MOIST
Sample Size, Unit				68.4 M2	1 PLOT	68.4 M2	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority				BBCH92	BBCH92	BBCH92	BBCH92	BBCH92	BBCH92
SE Group No.				7	8	9	10	11	12
Trt-Eval Interval				199 DA-A	199 DA-A	199 DA-A	199 DA-A	199 DA-A	199 DA-A
Number of Decimals				1	1	1	1	1	1
Trt No.	Treatment Name	Rate	Rate Unit	Plot	8	9	10	11	12	13
1	Hibrix	0	l/ha	15	14.7	2141.8	100.0	75.6	2.1	8.7
	Agras	0	kg/ha	13	11.4	1666.7	100.0	77.8	0.5	9.7
				11	9.9	1447.4	100.0	73.8	2.7	8.9
				9	9.8	1432.7	100.0	73.0	2.8	9.5
			Mean =		11.4	1672.2	100.0	75.1	2.0	9.2
2	Hibrix	0	l/ha	18	14.7	2141.8	100.0	74.8	4.2	9.1
	Agras	25	kg/ha	20	11.3	1644.7	98.7	74.2	0.5	8.9
				22	9.4	1367.0	94.4	73.2	1.6	9.4
				24	8.5	1242.7	86.7	72.6	1.3	9.2
			Mean =		10.9	1599.1	95.0	73.7	1.9	9.2
3	Hibrix	0	l/ha	31	17.9	2617.0	122.2	78.0	1.5	8.6
	Agras	51	kg/ha	29	11.7	1710.5	102.6	75.0	1.2	8.8
				27	11.5	1674.0	115.7	74.2	1.2	8.9
				25	9.7	1418.1	99.0	74.4	2.5	8.4
			Mean =		12.7	1854.9	109.9	75.4	1.6	8.7
4	Hibrix	0	l/ha	40	12.0	1754.4	81.9	75.6	1.6	8.5
	Agras	75	kg/ha	38	11.1	1615.5	96.9	74.6	2.1	9.1
				36	10.7	1564.3	108.1	74.6	2.7	9.7
				34	17.0	2485.4	173.5	76.4	2.3	8.5
			Mean =		12.7	1854.9	115.1	75.3	2.2	9.0
5	Hibrix	0	l/ha	8	8.1	1184.2	55.3	73.4	3.6	9.2
	Agras	99	kg/ha	6	11.5	1681.3	100.9	75.4	0.8	9.1
				4	12.9	1886.0	130.3	75.6	1.8	9.2
				2	17.7	2580.4	180.1	75.8	1.7	9.2
			Mean =		12.5	1833.0	116.7	75.1	2.0	9.2
6	Hibrix	2.5	l/ha	16	15.1	2200.3	102.7	78.4	2.0	8.7
	Agras	0	kg/ha	14	15.6	2280.7	136.8	77.8	2.3	9.2
				12	12.0	1754.4	121.2	73.0	2.6	9.6
				10	9.1	1323.1	92.3	66.6	0.8	9.8
			Mean =		12.9	1889.6	113.3	74.0	1.9	9.3
7	Hibrix	2.5	l/ha	17	15.3	2236.8	104.4	77.6	0.9	8.1
	Agras	25	kg/ha	19	13.7	2002.9	120.2	77.2	0.5	8.8
				21	12.9	1886.0	130.3	75.6	0.5	9.2
				23	7.0	1016.1	70.9	71.6	3.4	9.7
			Mean =		12.2	1785.5	106.5	75.5	1.3	9.0
8	Hibrix	2.5	l/ha	32	18.1	2638.9	123.2	76.2	2.9	8.3
	Agras	51	kg/ha	30	14.7	2141.8	128.5	76.8	0.5	8.2
				28	12.5	1827.5	126.3	74.6	1.5	9.1
				26	9.3	1359.6	94.9	69.8	5.1	9.1
			Mean =		13.6	1992.0	118.2	74.4	2.5	8.7
9	Hibrix	2.5	l/ha	39	10.1	1476.6	68.9	76.8	2.6	9.9
	Agras	75	kg/ha	37	18.7	2726.6	163.6	74.6	2.0	9.3
				35	16.5	2405.0	166.2	76.8	1.7	8.3
				33	15.4	2251.5	157.1	77.2	3.4	8.9
			Mean =		15.2	2214.9	139.0	76.4	2.4	9.1
10	Hibrix	2.5	l/ha	7	7.9	1147.7	53.6	66.0	6.0	10.3
	Agras	99	kg/ha	5	12.7	1856.7	111.4	74.4	2.5	9.5
				3	14.4	2105.3	145.5	77.0	1.1	9.2
				1	13.8	2017.5	140.8	77.2	1.6	8.5
			Mean =		12.2	1781.8	112.8	73.7	2.8	9.4

Crop Name					WHEAT	WHEAT	WHEAT	WHEAT
Crop Variety					ERADU	ERADU	ERADU	ERADU
Description					CROP INJURY	CROP INJURY	CROP INJURY	CROP INJURY
Rating Date					30/07/14	11/08/14	03/09/14	10/10/14
Rating Type					EWRS	EWRS	EWRS	EWRS
Rating Unit					1-9	1-9	1-9	1-9
Sample Size, Unit					1 PLOT	1 PLOT	1 PLOT	1 PLOT
Crop Stage Majority					BBCH32	BBCH37	BBCH65	BBCH85
SE Group No.					14	14	14	15
Trt-Eval Interval					73 DA-A	85 DA-A	108 DA-A	145 DA-A
Number of Decimals								
Trt No.	Treatment Name	Rate	Rate Unit	Plot	14	15	16	17
1	Hibrix	0	l/ha	15	1.0	1.0	1.0	1.0
	Agras	0	kg/ha	13	1.0	1.0	1.0	1.0
				11	1.0	1.0	1.0	1.0
				9	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
2	Hibrix	0	l/ha	18	1.0	1.0	1.0	1.0
	Agras	25	kg/ha	20	1.0	1.0	1.0	1.0
				22	1.0	1.0	1.0	1.0
				24	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
3	Hibrix	0	l/ha	31	1.0	1.0	1.0	1.0
	Agras	51	kg/ha	29	1.0	1.0	1.0	1.0
				27	1.0	1.0	1.0	1.0
				25	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
4	Hibrix	0	l/ha	40	1.0	1.0	1.0	1.0
	Agras	75	kg/ha	38	1.0	1.0	1.0	1.0
				36	1.0	1.0	1.0	1.0
				34	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
5	Hibrix	0	l/ha	8	1.0	1.0	1.0	1.0
	Agras	99	kg/ha	6	1.0	1.0	1.0	1.0
				4	1.0	1.0	1.0	1.0
				2	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
6	Hibrix	2.5	l/ha	16	1.0	1.0	1.0	1.0
	Agras	0	kg/ha	14	1.0	1.0	1.0	1.0
				12	1.0	1.0	1.0	1.0
				10	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
7	Hibrix	2.5	l/ha	17	1.0	1.0	1.0	1.0
	Agras	25	kg/ha	19	1.0	1.0	1.0	1.0
				21	1.0	1.0	1.0	1.0
				23	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
8	Hibrix	2.5	l/ha	32	1.0	1.0	1.0	1.0
	Agras	51	kg/ha	30	1.0	1.0	1.0	1.0
				28	1.0	1.0	1.0	1.0
				26	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
9	Hibrix	2.5	l/ha	39	1.0	1.0	1.0	1.0
	Agras	75	kg/ha	37	1.0	1.0	1.0	1.0
				35	1.0	1.0	1.0	1.0
				33	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0
10	Hibrix	2.5	l/ha	7	1.0	1.0	1.0	1.0
	Agras	99	kg/ha	5	1.0	1.0	1.0	1.0
				3	1.0	1.0	1.0	1.0
				1	1.0	1.0	1.0	1.0
				Mean =	1.0	1.0	1.0	1.0

Field plot no.	Block	Trial plot	Treatment	Protein (%)	Moisture content (%)	Protein (%) dry	**Protein (%) as at 11% moisture**	H/Litre weight (grams)	Screenings below 2.5mm (grams)	Visual cracked grain %	**Specific weight (kg/hL)**	Screenings (%)	**Screenings less cracked grain (%)**
1	1	0	0	8.6	10.4	9.6	8.5	386	15.8	60	77.2	4.09	1.64
2	1	0	0	9.3	10.4	10.4	9.2	379	26.1	75	75.8	6.89	1.72
3	2	0	0	9.3	10.3	10.4	9.2	385	20.8	80	77.0	5.40	1.08
4	2	0	0	9.3	10.2	10.4	9.2	378	27.3	75	75.6	7.22	1.81
5	3	0	0	9.6	10.3	10.7	9.5	372	23.4	60	74.4	6.29	2.52
6	3	0	0	9.2	10.3	10.3	9.1	377	29.3	90	75.4	7.77	0.78
7	4	0	0	10.2	11.6	11.5	10.3	330	39.4	50	66.0	11.94	5.97
8	4	0	0	9.3	10.2	10.4	9.2	367	29.5	55	73.4	8.04	3.62
9	4	1	1	8.8	10.1	9.8	8.7	392	16.0	50	78.4	4.08	2.04
10	4	2	6	8.8	10.1	9.8	8.7	378	27.0	70	75.6	7.15	2.14
11	3	3	1	9.3	10.1	10.3	9.2	389	25.2	65	77.8	6.48	2.27
12	3	4	6	9.8	10.1	10.9	9.7	389	37.9	95	77.8	9.74	0.49
13	2	5	1	9.7	10.2	10.8	9.6	365	47.3	80	73.0	12.96	2.59
14	2	6	6	8.9	10.5	9.9	8.9	369	50.4	80	73.8	13.66	2.73
15	1	7	1	9.5	13.3	11.0	9.8	333	52.6	95	66.6	15.80	0.79
16	1	8	6	9.5	10.8	10.7	9.5	365	40.3	75	73.0	11.04	2.76
17	1	9	7	8.2	10.3	9.1	8.1	388	36.2	90	77.6	9.33	0.93
18	1	10	2	9.2	10.2	10.2	9.1	374	52.6	70	74.8	14.06	4.22
19	2	11	7	8.9	10.2	9.9	8.8	386	38.8	95	77.2	10.05	0.50
20	2	12	2	9.0	10.3	10.0	8.9	371	36.6	95	74.2	9.86	0.49
21	3	13	7	9.3	10.4	10.4	9.2	378	39.5	95	75.6	10.45	0.52
22	3	14	2	9.5	10.1	10.6	9.4	366	39.5	85	73.2	10.79	1.62
23	4	15	7	9.7	10.8	10.9	9.7	358	48.8	75	71.6	13.63	3.41
24	4	16	2	9.3	10.1	10.3	9.2	363	47.3	90	72.6	13.03	1.30
25	4	17	3	8.4	10.3	9.4	8.3	381	54.3	80	76.2	14.25	2.85
26	4	18	8	8.7	10.2	9.7	8.6	390	29.0	80	78.0	7.44	1.49
27	3	19	3	8.3	10.2	9.2	8.2	384	37.4	95	76.8	9.74	0.49
28	3	20	8	8.9	10.2	9.9	8.8	375	45.1	90	75.0	12.03	1.20
29	2	21	3	9.2	10.1	10.2	9.1	373	37.9	85	74.6	10.16	1.52
30	2	22	8	9.0	10.1	10.	8.9	371	44.9	90	74.2	12.10	1.21

						0							
31	1	23	3	9.2	10.2	10.2	9.1	349	44.9	60	69.8	12.87	5.15
32	1	24	8	8.5	10.3	9.5	8.4	372	47.3	80	74.4	12.72	2.54
33	4	25	9	9.0	10.3	10.0	8.9	386	52.0	75	77.2	13.47	3.37
34	4	26	4	8.6	10.2	9.6	8.5	382	43.5	80	76.4	11.39	2.28
35	3	27	9	8.4	10.3	9.4	8.3	384	42.4	85	76.8	11.04	1.66
36	3	28	4	9.8	10.1	10.9	9.7	373	40.9	75	74.6	10.95	2.74
37	2	29	9	9.4	10.3	10.5	9.3	373	50.1	85	74.6	13.43	2.01
38	2	30	4	9.2	10.1	10.2	9.1	373	53.0	85	74.6	14.21	2.13
39	1	31	9	9.9	10.7	11.1	9.9	384	49.5	80	76.8	12.89	2.58
40	1	32	4	8.6	10.2	9.6	8.5	378	61.0	90	75.6	16.14	1.61
41	1	33	5	9.9	10.6	11.1	9.9	388	47.1	80	77.6	12.14	2.43
42	1	34	10	8.7	10.2	9.7	8.6	390	36.0	90	78.0	9.22	0.92
43	2	35	5	8.8	10.2	9.8	8.7	383	58.1	85	76.6	15.17	2.28
44	2	36	10	10.3	10.1	11.5	10.2	378	49.0	95	75.6	12.97	0.65
45	3	37	5	9.9	10.1	11.0	9.8	374	41.4	95	74.8	11.07	0.55
46	3	38	10	9.1	10.1	10.1	9.0	376	54.9	98	75.2	14.59	0.29
47	4	39	5	9.9	10.1	11.0	9.8	368	51.7	90	73.6	14.05	1.40
48	4	40	10	9.1	10.1	10.1	9.0	375	42.5	85	75.0	11.33	1.70

Appendix iv. Meteorological details

Year: **2014** **Location**: **Northam, Western Australia**

	January 2014				February 2014				March 2014			
		Min °C	Max °C	mm		Min °C	Max °C	mm		Min °C	Max °C	mm
1		16.2	29.9	0.0		20.7	34.7	0.6		14.4	37.2	0.0
2		12.1	27.6	0.0		19.9	30.7	0.0		13.9	39.7	0.0
3		13.7	29.3	0.0		16.3	32.9	0.0		18.3	40.3	0.0
4		14	32.0	0.0		20.2	37.7	0.0		18.4	31.1	0.0
5		14.8	32.5	0.0		20.7	40.1	0.0		15.6	31.6	0.0
6		17.8	41.8	0.0		20.1	35.8	0.0		15.7	34.9	0.0
7		21.6	34.5	0.0		18.0	34.2	0.0		20.0	40.7	0.0
8		16.7	35.0	0.0		14.2	30.0	0.0		17.8	29.4	0.0
9		17.7	36.5	0.0		13.6	32.9	0.0		13.5	28.4	0.0
10		17.7	37.8	0.0		18.8	38.0	0.0		12.8	31.4	0.0
11		20.4	43.0	0.0		18.1	31.0	0.0			33.1	0.0
12		27.0	46.3	0.0		18.1	32.1	1.8		17.9	37.3	0.0
13		20.4	35	0.0		19.5	33.4	0.0		21.1	32.1	0.4
14		15.8	31.8	0.0		17.5	35.3	0.0		15.5	28.2	0.0
15		15.8	30.6	0.0		19.8	37.9	0.0		10.6	27.6	0.0
16		15.3	29.4	0.0		18.4	37.3	0.0		12.9	31.0	0.0
17		15.1	33.0	0.0		18.4	34.2	0.0		15.4	32.4	0.0
18		18.0	38.2	0.0		16.2	34.0	0.0		16.6	32.5	0.0
19		20.6	38.8	0.0		15.3	35.4	0.0		17.5	34.8	0.0
20		17.9	36.7	0.0		19.8	35.2	0.0		17.2	29.6	0.0
21		17.4	37.3	0.0		17.7	31.9	0.0		15.8	26.6	0.0
22		23.1	34.2	0.0		22.2	34.2	0.0		17.5	31.4	0.0
23		21.2	33.6	0.0		17.4	36.3	0.0		18.5	32.7	0.0
24		22.1	30.7	0.0		16.2	38.7	0.0		18.2	36.5	0.0
25		22.8	37.7	0.0		17.6	30.4	0.0		20.2	33.2	0.0
26		24.1	38.8	0.6		14.2	29.1	0.0		20.7	33.1	0.0
27		19.0	32.4	0.0		15.2	32.8	0.0		19.2	30.9	0.0
28		15.7	30.0	0.0		15.4	35.0	0.0		16.5	33.9	0.0
29		15.1	34.8	0.0						19.2	25.9	0.0
30		21.7	40.5	0.0						13.2	22.7	0.2
31		25.1	36.9	0.6						8.9	25.0	0.0
Total				**1.2**				**2.4**				**0.6**

Year: **2014** **Location**: **Northam, Western Australia**

	April 2014				May 2014				June 2014			
		Min °C	Max °C	mm		Min °C	Max °C	mm		Min °C	Max °C	mm
1		14.0	23.5	0.0		6.8	19.8	0.0		9.3	21.6	0.0
2		9.3	24.7	0.0		5.2	18.7	0.0		8.9	19.2	0.0
3		10.7	26.9	0.0		6.5	21.6	0.0		7.6	20.1	0.4
4		8.6	30.1	0.0		12.2	21.0	0.0		7.1	21.0	0.0
5		12.9	30.6	0.0		13.8	17.9	1.4		5.2	23.0	0.0
6		12.8	28.3	2.0		14.4	20.5	1.8		3.9	22.2	0.0
7		16.4	25.0	0.0			21.1	0.2		4.0	19.4	0.0
8		13.0	29.0	0.0		13.0	19.0	36.2		8.1	20.0	0.0
9		13.1	28.7	0.0		10.4	22.3	1.2		10.4	21.3	0.0
10		16.4	30.0	0.8		10.4	21.3	0.6		9.9	17.6	5.4
11		16.3	32.6	0.0		12.0	23.9	0.2		4.1	16.3	1.8
12		13.8	35.9	0.0		9.6	23.2	0.0		4.4	14.2	0.0
13		18.3	35.0	0.0		13.7	22.5	0.0		0.9	15.9	0.0
14		16.7	36.0	0.0		8.8	21.0	0.0		-0.5	16.5	0.0
15		16.4	29.0	0.0		10.5	22.7	0.0		4.1	18.0	0.0
16		14.1	28.3	0.0	Sow	10.1	22.1	0.0		-0.7	20.3	0.0
17		10.6	25.9	0.0		9.8	23.1	0.2		0.6	20.0	0.0
18		13.9	28.8	0.0		10.0	22.2	0.0		9.2	17.0	28.4
19		11.8	29.7	0.0		11.1	23.3	0.0		5.1	18.0	0.6
20		13.3	26.2	0.0		14.0	23.7	0.2		8.8	20.0	1.8
21		11.7	22.6	0.0		10.5	22.6	0.4		3.8	20.1	6.2
22		5.0	25.1	0.0		12.5	20.8	0.4		4.0	15.7	0.6
23		9.6	25.9	0.0		12.9	20.6	25.4		0.3	13.9	0.0
24		14.1	25.0	0.0		13.0	19.5	2.4		0.1	15.4	0.0
25		16.2	25.0	0.8		10.0	18.8	2.0		0.3	17.5	0.0
26		16.6	22.5	0.0		12.7	18.9	3.2		1.7	19.1	0.0
27		17.1	23.5	41.2		12.3	22.0	0.2		3.6	16.6	0.0
28		12.1	18.4	3.6		9.9	18.0	1.2		-0.5	13.5	0.0
29		6.0	19.9	0.4		8.2	18.2	0.0		1.0	14.9	0.0
30		6.8	20.5	0.0		4.1	15.4	0.0		5.7	19.8	0.0
31						4.3	16.1	0.0				
Total				**48.8**				**77.2**				**45.2**

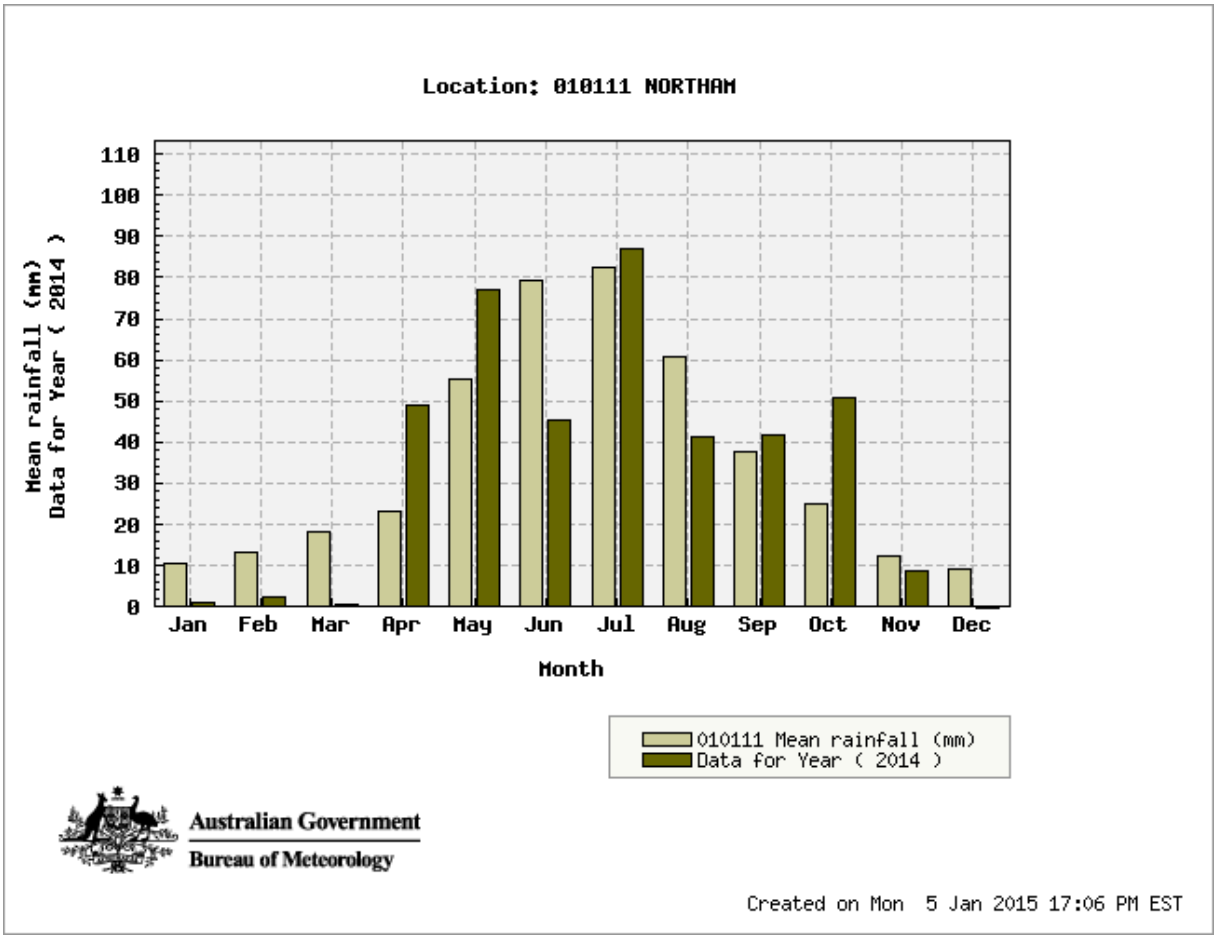
Year: **2014** **Location**: **Northam, Western Australia**

	July 2014				August 2014				September 2014			
		Min °C	Max °C	mm		Min °C	Max °C	mm		Min °C	Max °C	mm
1		5.2	22.4	0.0		2.0	16.0	0.0		6.6	17.3	0.0
2		10.0	18.8	0.2		1.2	18.9	0.0		10.0	18.1	0.0
3		0.7	13.7	11.6		2.5	17.5	0.0		9.6	18.0	0.4
4		1.1	19.9	0.0		1.6	19.1	0.0		6.9	19.6	0.0
5		5.1	21.0	0.4		0.5	21.2	0.0		11.5	25.5	0.4
6		9.0	22.0	0.0		1.5	24.0	0.0		12.0	23.8	0.0
7		5.9	17.2	11.2		6.0	18.0	0.6		11.0	18.2	5.8
8		7.0	14.3	10.8		12.0	21.3	1.0		9.8	17.5	11.8
9		1.8	12.1	0.6		7.8	18.0	0.0		10.3	19.0	1.0
10		2.3	16.5	0.0			22.5	0.0		12.5	21.1	0.0
11		3.2	16.0	0.0		11.5	21.5	0.0		6.6	21.3	0.0
12		6.0	16.5	0.0		11.0	18.8	0.0		6.1	24.5	0.0
13		5.5	17.5	0.0		11.5	21.0	0.0		6.5	21.5	0.0
14		4.0	16.4	9.6		12.0	21.0	0.0		4.9	21.9	0.0
15		5.0	17.6	1.0		11.5	20.2	0.0		7.3	22.7	16.0
16		6.6	15.5	1.4		3.5	22.0	23.0		8.7	24.0	0.0
17		1.6	15.0	0.0		5.8		0.0		11.0	27.2	0.0
18		2.0	18.0	0.0			26.2	0.0		9.1	27.4	0.0
19		2.9	18.5	0.0		10.1	19.4	0.0		7.6	24.7	0.0
20		6.0	16.0	6.8		10.7	18.5	0.2		8.0	33.6	0.0
21		5.3	17.1	0.2		11.5	20.8	3.2		9.5	26.4	0.0
22		8.8	14.5	23.8		8.6	19.1	2.2		8.5	18.0	0.0
23		2.7	15.0	0.4		3.0	21.0	0.0		3.1	18.8	0.0
24		5.6	18.0	1.0		3.4	22.6	0.0		4.1	24.0	0.0
25		7.9	19.6	0.0		5.4	23.9	0.0		5.8	26.9	0.0
26		8.0	20.2	0.0		8.3	22.0	0.0		8.4		0.0
27		6.6	17.9	6.4		7.5	22.7	0.0		12.2	21.4	0.0
28		8.1	19.3	1.4		8.3	25.4	0.0		9.5	20.5	6.0
29		8.6	18.0	0.2		9.9	23.5	0.0		10.1	22.0	0.4
30		11.7	17.0	0.0		13.5	19.2	11.0		4.7	23.6	0.0
31		7.8	13.2	0.0		9.6	17.0	0.0				
Total				**87.0**				**41.2**				**41.8**

Year: **2014** **Location**: **Northam, Western Australia**

	October 2014				November 2014				December 2014			
		Min °C	Max °C	mm		Min °C	Max °C	mm		Min °C	Max °C	mm
1		10.7	29.8	0.0		11.5	30.2	0.0		15.6	26.2	0.0
2		12.2	28.2	0.0		11.0	30.0	0.0		13.9	27.6	0.0
3		10.9	24.4	0.0		11.3	25.9	0.0		15.1	33.0	0.0
4		9.0	26.0	0.0		11.6	31.0	0.0		13.2	30.3	0.0
5		9.0	20.0	2.0		11.3	35.4	0.0		14.6	29.5	0.0
6		5.5	20.0	2.8		10.1	26.2	0.0		13.5	32.5	0.0
7		2.9	26.0	0.0		13.1	23.5	0.0		16.5	35.0	0.0
8		5.1	25.6	0.0		11.0	28.4	0.0		16.1	30.0	0.0
9		9.5	23.9	0.2		17.0	38.5	0.0		11.7	26.5	0.0
10		8.6	27.0	0.0		17.5	32.0	0.0		11.5	27.3	0.0
11		8.4	24.5	0.0		11.2	27.5	0.0		14.7	34.5	0.0
12		9.0	22.4	0.0		15.0	23.1	0.0		17.5	33.0	0.0
13		6.8	27.0	0.0		9.1	21.4	0.0		12.5	30.0	0.0
14		7.2	31.9	0.0		6.5	22.5	0.0		14.5	33.9	0.0
15		9.1	37.0	0.0		9.0	27.2	0.0		12.3	27.0	0.0
16		14.3	32.6	0.0		11.5	33.5	0.0		11.5	30.0	0.0
17		11.0	28.4	0.0		13.1	33.0	0.0		11.5	29.7	0.0
18		14.5	22.8	0.0		15.5	34.2	0.0		13.7	34.0	0.0
19		12.0	18.0	27.0		14.9	27.9	0.0		17.3	40.5	0.0
20		10.6	22.0	18.0		10.3	27.4	0.0		24.5	33.0	0.0
21		7.6	27.4	0.0		9.2	24.8	0.0		15.0	29.2	0.0
22		14.4	35.0	0.0		12.5	25.4	6.0		14.5	31.6	0.0
23		12.8	25.2	0.8		9.5	25.8	0.0		14.1	33.4	0.0
24		12.0	29.2	0.0		10.1	28.5	0.0		14.6	33.1	0.0
25		11.5	24.5	0.0		12.1	34.1	0.0		13.0	30.5	0.0
26		11.5	25.0	0.0		17.6	34.8	0.0		12.8	32.3	0.0
27		10.8	28.9	0.0		18.2	29.4	6.8		16.5	35.9	0.0
28		12.5	32.1	0.0		17.0	28.5	1.2		17.4	34.8	0.0
29		19.2	32.0	0.0		15.5	30.5	0.0		19.1	36.6	0.0
30		14.1	25.8	0.0		15.0	33.8	0.0		22.8	44.6	0.0
31		13.7	25.5	0.0						18.0	35.8	0.0
Total				**50.8**				**14.0**				**0.0**

Data collected approximately 12 km from trial site.


Location: 010111 NORTHAM
Mean rainfall (mm)
Data for Year (2014)
110
100
90
80
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
010111 Mean rainfall (mm)
Data for Year (2014)
Australian Government
Bureau of Meteorology
Created on Mon 5 Jan 2015 17:06 PM EST