

## Balaklava Wheat Trial 2011

Balaklava, South Australia	2011
Location	Year
Agrisearch Services Pty Ltd	Wheat
Conducted by	Crop

Small plot replicated

Trial Type

### Aim

To evaluate the impact on crop growth and yield in wheat when applying BioAg liquid biostimulants to fertiliser regimes.

### Summary

As part of its continuing research and development program, BioAg commissioned Agrisearch Services Pty Ltd to conduct an independent “evaluation of BioAg biostimulants for improving crop growth and yield in wheat” near Balaklava, South Australia in 2011.

In its summary, the report notes that “All treatments except for the pre-sow soil application of BIOAG 2730652900 significantly increased yield. The mid-tillering application of BioAg *Balance & Grow* did not significantly increase the yield above the increase observed after the mid-tillering application of BioAg *Balance & Grow*.”

Whilst both tillering and crop yield were measured in the trial, the most important benefits were demonstrated in the crop yields.

The key findings from this trial were:

- The application of 3L/ha of *Soil & Seed* at pre-sowing produced a significant increase in crop yield.
- The application of 3L/ha of *Soil & Seed* at pre-sowing plus that of 2L/ha *Balance & Grow* as a foliar treatment at mid-tillering produced the greatest improvement in crop yield.

The observation that BioAg *Fruit & Balance* did not significantly increase the yield above the increase observed after the mid-tillering application of BioAg *Balance & Grow* must be taken in the climatic context at the time.

Whilst the start of the season was favourable in terms of soil moisture, air temperature and rainfall, the later part of August and most of September was quite dry which had a significant impact on plant stress and evapotranspiration rates. Whilst the application of *Balance & Grow* at the mid-tillering stage assisted the crop in dealing with the environmental stresses, by the time the *Fruit & Balance* application occurred in late September the plants were under significant stress and could not absorb or translocate nutrients effectively.

Had this not been a trial with the program pre-set in Autumn, the correct agronomic decision at the 2nd internode elongation stage would have been not to apply *Fruit & Balance* in this situation, as there would be little or no expectation of economic gain from the application.

## Introduction

One small plot replicated field trial was conducted from June to December 2011 to evaluate various BioAg bio-stimulants for improving crop growth and yield in wheat. The trial was conducted near Balaklava in South Australia, Australia.

This report contains the experimental methods used and presents the results obtained. The trial was conducted under Agrisearch project BIOAG/11/02.

## Method

**Table 1: Site Details**

Co-operator	David Carslake
Location	Pt Wakefield – Auburn Rd, Balaklava, South Australia
Crop	Wheat
Variety	Espada
Soil type	Sandy loam
Site history	Barley 2010
Sowing date	21 June 2011
Sowing rate	100kg/ha
Crop management	1L ROUNDUP CT + 800mL TREFLAN pre-sow
Seasonal conditions	The winter cropping season started off well with ideal growing conditions after sowing; however, by late August and all of September conditions turned dry. This coincided with the mid-tillering application timing.
Daily rainfall (mm)	Daily rainfall data as recorded at Bowmans near Balaklava by the Bureau of Meteorology is given in the appendices.

**Table 2: Treatment List**

Treatment	Application timing and method	Rate/Ha
Standard conventional*	At sowing	-
BioAg <i>Soil &amp; Seed</i> *	Pre-sowing ground application	3L
BioAg 2730652900*	Pre-sowing ground application	2L
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> *	Pre-sowing ground application + Foliar applied at mid-tillering	3L + 2L
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> + BioAg <i>Fruit &amp; Balance</i> *	Pre-sowing ground application + Foliar applied at mid-tillering + Foliar at 2nd inter-node elongation	3L + 2L + 2L

\* The standard conventional treatment of 100kg MAP per ha was applied to all treatments.

### Formulations

Standard Conventional – a commercial fertiliser program consisting of 100kg MAP per hectare.

BioAg *Balance & Grow* – a fermented liquid formulation for plant and root development containing organic and non organic products as supplied by BioAg.

BioAg *Fruit & Balance* – a fermented liquid formulation for fruit development containing organic and non organic products as supplied by BioAg.

BioAg *Soil & Seed* – a fermented liquid formulation for soil microbial balance containing organic and non organic products as supplied by BioAg.

BioAg 2730652900 – a fermented liquid formulation for soil microbial balance containing organic and non organic products as supplied by BioAg.

**Table 3: Treatment Method**

Equipment	Gas operated back pack sprayer and hand boom
Method	Low volume broadcast
Walking speed	1.5m/sec
Nozzles	11001 air mix, medium spray quality
Nozzle spacing	50cm
Pressure	280kPa
Water volume	100L/ha
Boom height	50cm above target

**Table 4: Sowing Method**

Planting date	21 June 2011
Equipment	Cone seeder
Sowing rate	100kg/ha
Soil surface at planting	Direct drilled into standing barley stubble

**Table 5: Application Details**

Date	Time of day	Temperature (°C)	Relative humidity (%)	Cloud cover (%)	Wind (kph)	Crop growth stage
21-Jun-11	0930	15	49	20	0	Pre-sow
01-Sep-11	1240	13	62	80	2-4 W	Mid tillering
21-Sep-11	1720	16	45	0	0	2nd inter-node elongation

**Table 6: Trial Design**

Design	Randomised complete block
Replicates	4
Plot size	2m x 10m
Buffers	0.5m

**Table 7: Assessments**

Date	Timing	Assessment
21-Jun-11	Pre-sowing	Soil test pre-sowing
21-Sep-11	Late tillering	Plant samples (results not available at time of report writing – results will be supplied separate to this report once available)
15-Oct-11	Flowering	Tiller counts
13-Dec-11	Harvest	Yield
Not yet received	Post-harvest	Grain quality (results not available at time of report writing – results will be supplied separate to this report once available)

### Soil Sample

Prior to sowing at the pre-sowing application timing, soil samples were collected from across the trial site. Samples were collected at 0-15cm depth and sent to BioAg for analysis.

### Plant Samples

At late tillering/early jointing plant samples were cut from each plot. Samples collected were oven dried and despatched to BioAg for analysis. Data were not available at the time of report preparation and will be supplied separate to this report when available to BioAg.

### Tiller Counts

At flowering, the number of tillers per metre of row was determined by counting three randomly selected one lineal metres of row for each replicate. Data were presented as the mean number of tillers per metre of row.

## Yield

Grain yield was assessed by harvesting from each plot using a KEW small plot harvest. Data are presented as mean grain yield in tonnes per hectare.

## Statistical Analysis

Statistical analyses were conducted using GenStat Release 11.1 (PC/Windows 2008 – Lawes Agricultural Trust, Rothamsted Experimental Station). The model includes all treatment effects. Analysis of variance and least significant difference (LSD) procedures were used.

## Results

Results are summarised in Tables 8-9 and are given fully in the appendices.

### Tiller Counts

All treatments appeared to slightly increase the numbers of tillers per metre of row; however the increase was not statistically significant.

**Table 8: Results – Mean Number of Tillers per Metre of Row**

Treatment	Application timing and method	Rate/Ha	Flowering 15-Oct-11
Standard conventional*	At sowing	-	91.6
BioAg <i>Soil &amp; Seed</i> *	Pre-sowing ground application	3L	98.6
BioAg 2730652900*	Pre-sowing ground application	2L	94.7
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> *	Pre-sowing ground application + Foliar applied at mid-tillering	3L + 2L	96.0
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> + BioAg <i>Fruit &amp; Balance</i> *	Pre-sowing ground application + Foliar applied at mid-tillering + Foliar at 2nd inter-node elongation	3L + 2L + 2L	98.3
F probability			0.395
Least significant difference (LSD) 5%			ns

\* The standard conventional treatment of 100kg MAP per ha was applied to all treatments.

ns = not significant

### Yield

All treatments except for the pre-sow soil application of BIOAG 2730652900 significantly increased yield.

The mid-tillering application of BioAg *Balance & Grow* applied as a foliar application provided the greatest improvement in crop yield.

The application of BioAg *Fruit & Balance* at 2nd inter-node elongation did not significantly increase the yield further than the increases already resulted from the mid tillering application of BioAg *Balance & Grow*.

**Table 9: Results – Mean Grain Yield (t/ha)**

Treatment	Application timing and method	Rate/Ha	Crop maturity 13-Dec-11
Standard conventional*	At sowing	-	1.568 c
BioAg <i>Soil &amp; Seed</i> *	Pre-sowing ground application	3L	1.830 b
BioAg 2730652900*	Pre-sowing ground application	2L	1.699 bc
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> *	Pre-sowing ground application + Foliar applied at mid-tillering	3L + 2L	2.178 a
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> + BioAg <i>Fruit &amp; Balance</i> *	Pre-sowing ground application + Foliar applied at mid-tillering + Foliar at 2nd inter-node elongation	3L + 2L + 2L	2.180 a
F probability			<0.001
Least significant difference (LSD) 5%			0.2

\* The standard conventional treatment of 100kg MAP per ha was applied to all treatments.

ns = not significant

### Soil, Plant, and Grain Samples

The soil sample results are included in the appendices, while the plant samples and grain sample results will be supplied to BioAg when available.

### Conclusion

The plots treated with BioAg *Soil & Seed*, BioAg *Balance & Grow*, and with and without BioAg *Fruit & Balance* delivered a statistically significant increase in yield (tonnes per hectare) over the standard practice of starter fertiliser.

The treatment with BioAg *Soil & Seed* and a mid-tillering application of BioAg *Balance & Grow* applied as a foliar provided the greatest improvement in crop yield.

The treatment including an application of BioAg *Fruit & Balance* did not significantly increase the yield above the that of BioAg *Soil & Seed* with BioAg *Balance & Grow*. The application of BioAg *Fruit & Balance* coincided with drier seasonal conditions and a natural reduction in crop growth.

All treatments appeared to slightly increase the number of tillers per meter of row; however the increase observed was not statistically significant.



## Additional Background – About BioAg

BioAg is an Australian manufacturer of liquid biostimulants and natural phosphate fertilisers. BioAg's liquid biostimulant are a range of proprietary microbial cultures, specifically formulated to support different plant growth stages by improving plant and soil performance.

### Each culture / product contains a:

- Balanced food supply of carbohydrates, amino acids, enzymes, vitamins, essential nutrients and growth promoters, that feed both plants and beneficial micro-organisms
- Large and diverse population of beneficial micro-organisms, including fungi, bacteria, yeast and protozoa.

### Each product has been developed to:

- Stimulate soil biology and plant processes
- Feed soil biology to ensure it is active and able to interact with the plant
- Improve the balance of beneficial microorganisms in soils, and
- Provides microbial food and microorganisms into soils that are low in microbial activity or diversity due to factors such as, stress (cold, heat or water logging), lack of plant activity (fallow) and/or due to a lack of plant diversity (monoculture).

### Applying the appropriate product at the requisite growth stage will support and enhance:

- Structured vegetative growth and enhance root development
- Nutrient cycling and improved plant availability of nutrients
  - Chelation of nutrients, via amino bonds
  - Conversion of in-organic nutrients into a microbial form (becomes part of the biomass)
  - Helps to unlock nutrients previously bound in soil complexes
  - Improves the flow of nutrients through the plant
- Water retention and uptake, and
- Plant vigour and tolerance to abiotic stresses.

The benefits of biostimulants can be depleted with time. In addition, as plants develop reach their next growth stage the nutritional needs of the plant also change. Applying the appropriate biostimulant, soil inoculant or foliar application, at the right time is a key attribute of any program.

BioAg's three core biostimulant products are:

1. *Soil & Seed* is a broad-spectrum microbial inoculant that assists; nutrient accessibility, nutrient solubilisation, nutrient cycling, enhanced seed germination, root development, disease and drought resistance and residue breakdown.



2. *Balance & Grow* is a broad-spectrum source of foods and stimulants for balanced plant functions, plant health, and vegetative growth including; calcium and phosphate, vitamins, minerals, proteins, enzymes, amino acids and carbohydrates.
3. *Fruit & Balance* is formulated to increase flowering, fruit set and soil microbial activity. It delivers a rich source of plant-available phosphate when the plant is under peak load, stimulating strong fruiting and enhancing yield potential. *Fruit & Balance* contains a rich source of vitamins, minerals, proteins, enzymes, amino acids, carbohydrates, and growth promoters.

Each product is also available as an organic variant.





## Appendices

**Table 10: Full Results – Number of Tillers per Metre of Row**

Treatment	Application timing and method	Rate/Ha	Rep	Flowering 15-Oct-11
Standard conventional*	At sowing	-	1	77.0
			2	86.3
			3	91.0
			4	112.0
			mean	91.6
BioAg Soil & Seed*	Pre-sowing ground application	3L	1	95.2
			2	100.3
			3	95.2
			4	103.6
			mean	98.6
BioAg 2730652900*	Pre-sowing ground application	2L	1	95.2
			2	80.6
			3	105.0
			4	98.0
			mean	94.7
BioAg Soil & Seed + BioAg Balance & Grow*	Pre-sowing ground application + Foliar applied at mid-tillering	3L + 2L	1	113.2
			2	90.0
			3	91.0
			4	89.6
			mean	96.0
BioAg Soil & Seed + BioAg Balance & Grow + BioAg Fruit & Balance*	Pre-sowing ground application + Foliar applied at mid-tillering + Foliar at 2nd inter-node elongation	3L + 2L + 2L	1	95.2
			2	99.3
			3	95.2
			4	103.6
			mean	98.3

\* The standard conventional treatment of 100kg MAP per ha was applied to all treatments.

**Table 11: Full Results – Grain Yield (t/ha)**

Treatment	Application timing and method	Rate/Ha	Rep	Crop maturity 13-Dec-11
Standard conventional*	At sowing	-	1	1.74
			2	1.39
			3	1.57
			4	1.57
			mean	1.57
BioAg <i>Soil &amp; Seed</i> *	Pre-sowing ground application	3L	1	1.74
			2	1.74
			3	2.09
			4	1.74
			mean	1.83
BioAg 2730652900*	Pre-sowing ground application	2L	1	1.92
			2	1.57
			3	1.74
			4	1.57
			mean	1.70
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> *	Pre-sowing ground application + Foliar applied at mid-tillering	3L + 2L	1	2.27
			2	2.27
			3	2.09
			4	2.09
			mean	2.18
BioAg <i>Soil &amp; Seed</i> + BioAg <i>Balance &amp; Grow</i> + BioAg <i>Fruit &amp; Balance</i> *	Pre-sowing ground application + Foliar applied at mid-tillering + Foliar at 2nd inter-node elongation	3L + 2L + 2L	1	2.27
			2	2.10
			3	2.09
			4	2.27
			mean	2.18

\* The standard conventional treatment of 100kg MAP per ha was applied to all treatments.



## Rainfall Data

Rainfall data observations for Balaklava, South Australia recorded by Bureau of Meteorology station number 021112 (Bowmans, Pigeldee) approximately 5km from the trial site.

*Table 12: Rainfall Data*

Month Day	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
1	0	0.4	0	0	16.6	0	0
2	0	1.2	0	0	0	0	0
3	0.4	3.2	0	0	0	0	0
4	2.6	0	4.2	0.2	0	0	0
5	0.8	8.4	10.8	0	8.6	0	0
6	0	1		0	0	0.8	0
7	0	8.4	4.2	0	0	0	0
8	0	0.6	2.2	0	0	7.2	0
9	0	1.8	0	0	0	0	2
10	0		0	0	0	1.4	0.8
11	0	2.8	2.4	1	0	0	0
12	0	0	0.2	0	0	0	0
13	0	0.2	0	0	0	0	0.6
14	0	0	0.2	0	0	0	0
15	0	0	0	0	5.2	0	0
16	0	0	3.6	0	0	0	0
17	1.2		11.6	0	0	0	0
18	0	0.8	0.4	0	0	0	11.6
19	1.4	0.3	0.4	0	0	0	1.2
20	0	0	0	0	0	0	0
21	5.8	0.2	0	0	3.4	0	0
22	0.6	0	0	0	2	0	0
23	1	0	0	0	0	0	0
24	0	0	0	0	0.6	0	0
25	0	0	0	0	0	3.2	0
26	0	0	0	0	0	1	0
27	0	0	0	0	0	0	0
28	0	0	0	3.4	0	0	0
29	0	0	0	7.4	7.8	0	0
30	0	3.2	0	2.2	0	1.6	0
31		0	0		0		0