Independent Trial

Hart Field Wheat Trial 2013

Hart Field, South Australia	**2013**
Location	Year
Hart Field-Site Group	**Wheat**
Conducted by	Crop
Small plot non-replicated	
Trial Type	

Aim

To investigate conventional phosphorus fertilisers and alternative sources of phosphorus on the grain yield and quality of wheat.

Introduction

In 2013, a nitrogen and phosphorus supplement and replacement trial was conducted at the Hart Field-Site in South Australia.

The site, consisting of 40 hectares of sandy clay loam soils and an average rainfall of 400mm is the home of the annual Hart Field Day, first held in 1982.

Given the hot dry 2013 spring, yields from the trial were generally below expectations.

Method

Table 1: Summary of Trial Parameters

Crop	Emu Rock wheat @ 70kg/Ha
Seeding date	7th June, 2013
Plot size	1.4m x 10m
Fertiliser	Nitrogen and phosphorus applied as per treatment listed table 2

BioAg

Conventional fertiliser treatments including Urea only and Urea plus DAP (18:20) were included in the trial. The remaining fertiliser treatments were selected based on their suggested ability to improve plant uptake of nitrogen and phosphorus or as a direct nutrient input as seen in table 2.

The initial Colwell soil phosphorus (30th May, 2013) was 59mg/kg and DGT-P of 89µg/L in the top 0 – 10cm. Both phosphorus tests indicate the trial site was above critical limit for yield response.

The phosphorus buffering index (PBI) was 102. Soil available sulphur was measured using KCl at 40°C and measured as 1.6mg/kg which is below the critical limit for this test of 6.5mg/kg. Soil nitrogen level measured for this trial was 65kg N/Ha (0 – 90cm), sampled 30th May, 2013.

Tissue phosphorus and nitrogen were assessed for specific treatments by removing youngest emerging leaf blade (18th September, 2013), oven drying and analysing, completed by Waite Analytical Services.

Plots were assessed each year for grain yield, protein, test weight and screenings (2mm screen).

Table 2: Summary of Products Trialled

Treatment	Addition or replacement	Reason for addition
1. 80kg/Ha urea only	-	Standard grower practice
2. 60kg/Ha urea + 50kg/Ha DAP	-	Standard grower practice
3. 80kg/Ha urea + 15kg S/Ha (as gypsum)	Addition	Sulphur addition
4. 80kg/Ha urea + 30kg S/Ha (as gypsum)	Addition	Sulphur addition
5. 73kg/Ha urea + 15kg S/Ha (as SOA)	Addition	Sulphur addition
6. 66kg/Ha urea + 30kg S/Ha (as SOA)	Addition	Sulphur addition
7. Urea + 80kg/Ha Entec	Replacement	Ammonium stabiliser to limit nitrogen losses
8. 60kg urea + RUM 5L/Ha @ mid-tillering	Addition	Foliar nitrogen (plus other nutrients)
9. 60kg urea + 50kg DAP + Super Strike	Addition	Phosphorus (plus other nutrients) seed treatment
10. 60kg urea + 50kg DAP + Jump Start	Addition	Phosphate inoculant that releases 'bound' soil P
11. 60kg urea + 50kg DAP + *Balance & Grow* 2L/Ha	Addition	Foliar growth nutrient
12. Bounce Back 150kg/Ha	Replacement	Organic fertiliser (3:2:2 N:P:K) and other nutrients
13. 60kg Urea + 50kg/Ha DAP + 50kg/Ha Biochar	Addition	Soil amendment
14. 150kg/Ha Biochar Complete	Replacement	Biochar blended with poultry litter
15. 80kg urea + 2.5L/Ha eNtrench @ 2-3 leaf	Addition	Nitrogen stabiliser
16. 80kg urea + 2.5L/Ha eNtrench @ GS31	Addition	Nitrogen stabiliser

Results

Results for tissue nitrogen ranged from 3.3% – 3.8%. The addition of sulphate of ammonia, Entec urea or eNtrench did not significantly increase tissue nitrogen concentration compared to an application of 80kg/Ha urea as shown in table 3. The same conclusion was drawn from tissue phosphorus concentrations. The addition of Super Strike and Jump Start did not increase tissue phosphorus when added to urea + DAP. Biochar complete maintained tissue phosphorus concentration similar to urea plus DAP. However, given the initial soil phosphorus test was above the critical limit for growth response, soil phosphorus reserves were adequate for plant growth without additional fertiliser.

Table 3: Nitrogen and Phosphorus leaf tissue concentrations for selected fertiliser treatments

Treatment	Nitrogen %	Phosphorus mg/kg
1. Urea	3.3	-
4. Gypsum high	3.5	-
7. Entrec urea	3.7	-
15. eNtrench time 1	3.8	-
16. eNtrench time 2	3.4	-
2. Urea + DAP	-	3267
9. Super Strike	-	3200
10. Jump Start	-	3133
14. Biochar complete	-	3167
LSD (P<=0.05)	ns	ns

LSD = Least significant difference
ns = not significant

Grain yield and quality were not significantly improved for any treatment compared to urea only or urea + DAP, yielding 3.88t/Ha and 4.22t/Ha respectively, as shown in table 4. Nitrogen products selected (slow release nitrogen, nitrification inhibitors and foliar additions) did not significantly alter grain yield or protein.

The addition of sulphur through applications of gypsum and sulphate of ammonia did not improve grain yield or quality, indicating adequate soil sulphur levels in this trial.

The initial soil phosphorus level was above the critical limit so it is unlikely that any products would result in a yield response, as observed in this trial. A previous phosphorus rate trial at Hart showed it took five years to run down soil phosphorus reserves before a yield response to phosphorus fertiliser was observed. These results highlight the importance of soil testing as fertiliser will provide a portion of the phosphorus for plant uptake with the majority coming from soil reserves.

The typical results for protein ranged from 10.0% to 10.8%. Their was no significant difference between the results. The treatment with the highest protein was Urea and DAP with BioAg's *Balance & Grow*.

Balance & Grow applied at 2L/ha produced protein of 12.8%.This represents a quality increase from ASW to Prime Hard, or in dollar terms an increase of at least $40/t based on GrainCorp contracted prices for Southern NSW at the end of May.

Balance & Grow also came in with the lowest percentage of screenings.

Table 4: Trial Results

Treatment	Yield (t/ha)	Screenings (%)	Protein (%)	Test wt (kg/hL)
1. Urea	3.88	8.6	1.5	82.6
2. Urea + DAP	4.26	8.1	10.5	82.7
3. Gypsum low	4.24	7.1	11.2	82.6
4. Gypsum high	4.01	8.6	10.4	82.8
5. SOA low	3.99	7.6	9.8	83.3
6. SOA medium	4.41	7.7	10.3	83.1
7. Entec urea	4.53	8.2	10.8	82.5
8. Beaulieu R.U.M	4.14	7.1	11.4	82.3
9. Super Strike	4.29	8.1	10.3	83.0
10. Jump Start	4.27	7.6	10.5	82.7
11. *Balance & Grow*	4.15	7.1	12.8	82.3
12. Bounce Back	3.90	7.8	10.0	82.8
13. Biochar	3.80	8.1	9.8	82.8
14. Biochar Complete	3.87	7.8	10.7	82.7
15. eNtrench time 1	4.17	7.6	11.2	82.3
16. eNtrench time 2	4.11	7.5	10.7	82.5
LSD (P<=0.05)	ns	ns	ns	ns

LSD = Least significant difference

ns = not significant

Table 5: Cost Breakdown

Selling price	Less cost of B&G/ha	Profit/ha	ROI
$166.00	$12.00	$154.00	13.80%

Conclusion

The trial results did not indicate any statistically significant response on yield or quality for the treatments trialled.

This is in part due to the soils having good phosphorus levels prior to the trial and due to the low number of replicates for each treatment (higher replicate numbers improve statistical analysis for small changes in results).

The highest protein was recorded for the treatment including BioAg's *Balance & Grow*. Being more than 10% higher than the next best result for protein and as the single outlier, the result would indicate the treatment delivered a positive response. To validate this as statistically significant additional trials should be performed.

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.

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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.

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