Independent Trial

UK Apple Trial Update 2017

Boxford, Suffolk UK	**2017**
Location	Year
Thomson & Joseph Ltd	**Apples**
Conducted by	Crop
Small plot replicated	
Trial Type	

Aim

To evaluate soil nutrient levels when applying BioAg liquid biostimulant *Soil & Seed* to fertiliser regimes. This update follows on from the earlier 2012 – 2013 trial report.

Results

Results from the trial work at Boxford continue to impress with BioAg *Soil and Seed* consistently outperforming control treatments.

Soil & Seed is a biological soil inoculant, which contains primarily fungal based microbes. Graph 1 shows results of the trial work with BioAg *Soil & Seed*.

Total microbial content has been consistently higher on the treated plots. This increase is mostly due to the proliferation of fungal microbes as expected given the nature of the product, although there has been some increase in bacterial levels as well.

Out of the fungi found in soils, the mycorrhizal fungi are of particular interest for plant productivity. Mycorrhizal fungi enhance plant performance through the formation of mutual relationships with the roots of many plant species. The fungi's mycelium has a higher capacity to absorb water and mineral nutrients, which benefits the plant. In return, the fungi receive carbohydrates, including glucose and sucrose, that the plant produces through photosynthesis. The fungi's mycelium increased the plant roots absorptive capacity because of the fungal hyphae, which are both longer and finer than plant root hairs, therefore, having a greater surface area for absorption.

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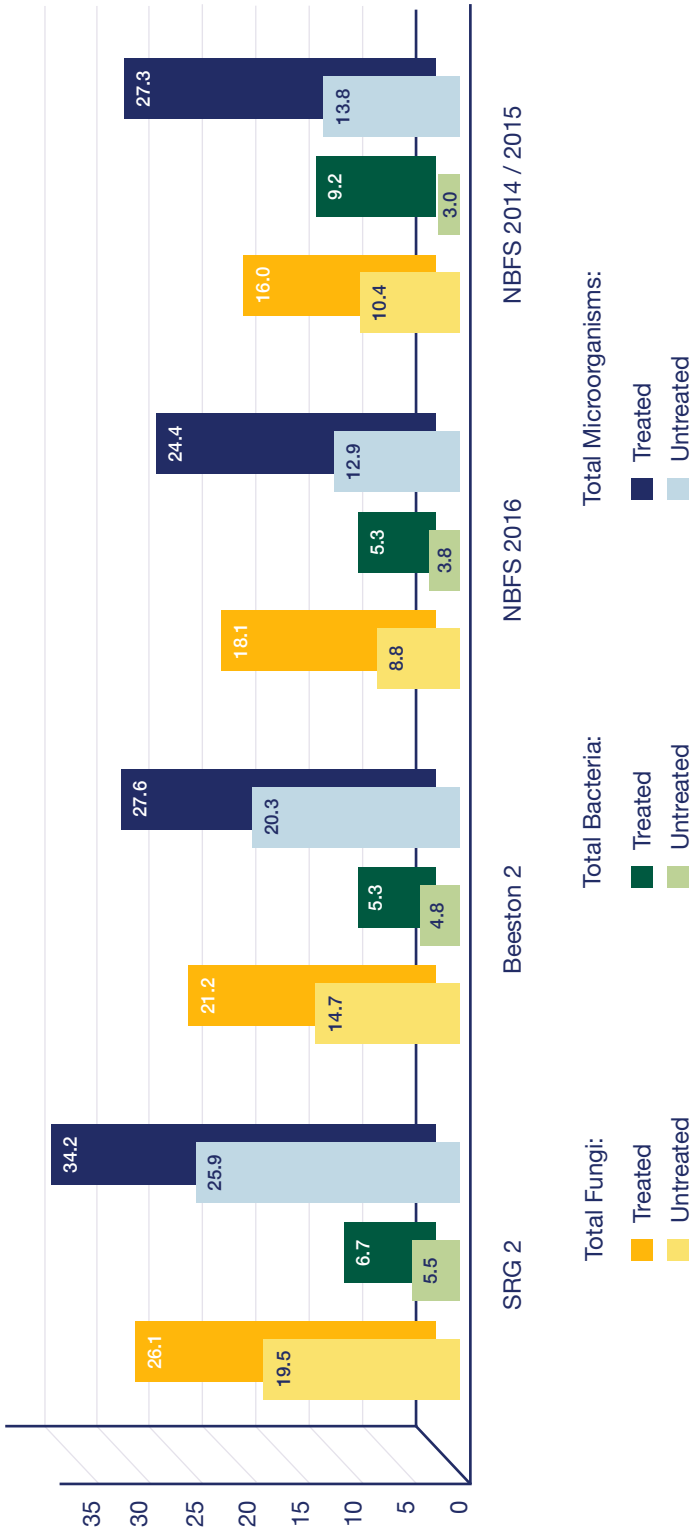
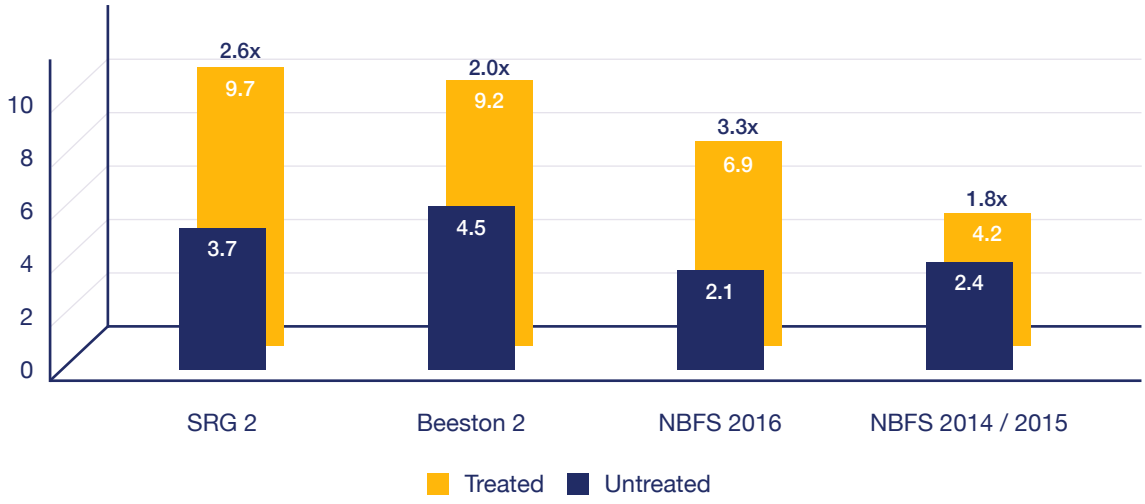
Mycorrhizal fungi are also well known for their ability to fix atmospheric nitrogen and to increase the release of phosphorus from soil reserves.

Graph 1: Microbe Summary (Biomass mg/kg)



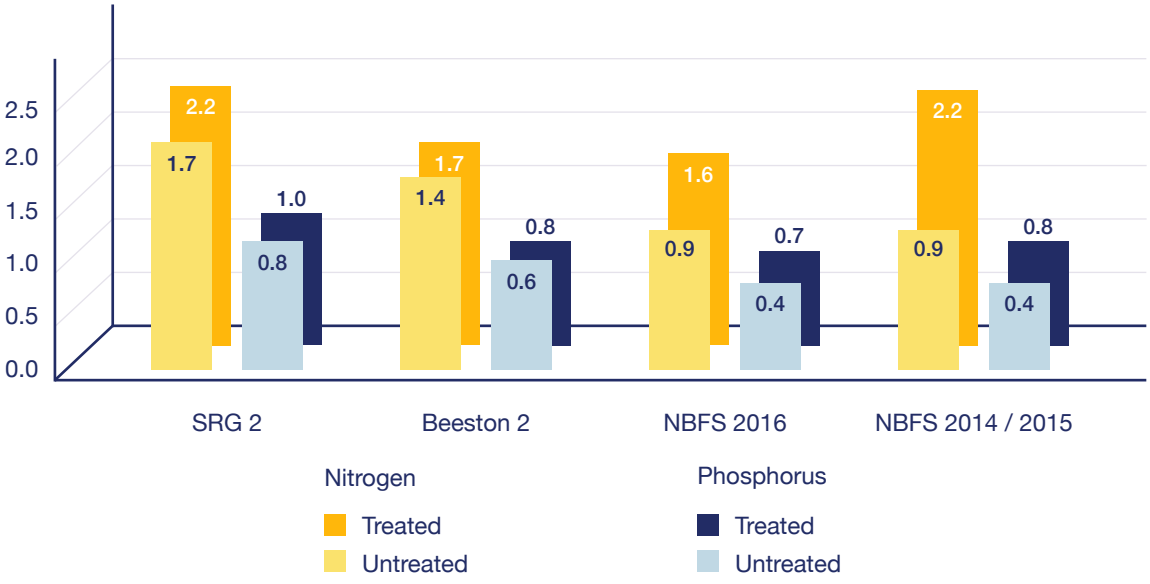
Graph 2 displays the mycorrhizal fungi content of the soil samples we received. It is clear to see that soil that received the *Soil and Seed* biological inoculant has a far greater mycorrhizal population (up to 3.3x) than the corresponding control plots. It is also clear that the benefit increases with multiple years of application (NBFS: 2015 1.8x, 2016 3.3x).

Graph 2: Mycorrhizal Fungi (Biomass mg/kg)



Due to the increased mycorrhizal fungi content, it is unsurprising that microbial nutrient levels are also performing well in the treated soils. In graph 3 and 4 below we can see that there have been significant increases in nitrogen, phosphorus and carbon in the treated vs the untreated plots.

Graph 3: Nitrogen and Phosphorus in Microbes (mg/kg)



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Graph 4: Carbon in Microbes (mg/kg)

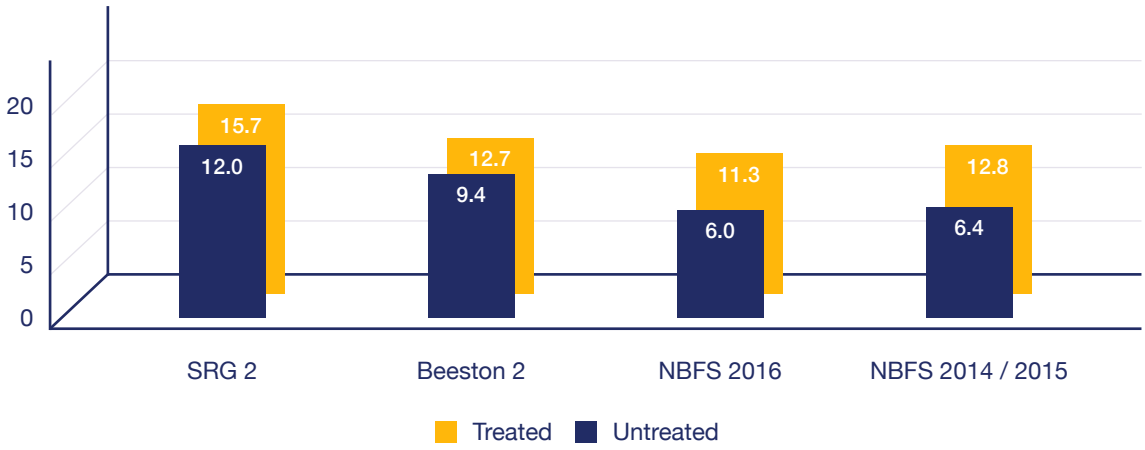

Table 1 summarises differences between the averages of all treated and untreated results. Key performance points of interest include an increase of 80% or more in the Mycorrhizal fungi, Calcium and Magnesium parameters. However, it is important to state that all parameters increased by at least 39%, with the majority over 50% higher in treated soils.

Table 1: Analysis of Results

	Control	Guide	Mean Untreated (U)	Mean Treated (T)	Difference T vs U	Increase vs Control
Total	Microorganisms	50.00	19.80	29.89	+10.09	+50.96%
	Bacteria	15.00	4.14	6.34	+2.20	+53.03%
	Fungi	33.80	14.77	22.30	+7.53	+50.97%
Bacteria	Pseudimonas	1.00	0.58	0.89	+0.32	+55.33%
	Actinomycetes	1.00	0.59	1.04	+0.45	+75.84%
	Gram Positive	4.00	1.90	2.65	+0.75	+39.60%
	Gram Negative	11.00	2.24	3.69	+1.45	+64.79%
Eukaryotes	Protozoa	1.30	0.90	1.24	+0.34	+37.43%
	Mycorrhizal Fungi	10.00	3.45	6.51	+3.07	+88.96%
Nutrients in Microbes	Nitrogen (N)	3.45	1.30	1.95	+0.66	+50.71%
	Phosphorus (P)	1.50	0.59	0.90	+0.30	+50.95%
	Potassium (K)	0.50	0.20	0.30	+0.10	+50.96%
	Sulphur (S)	0.50	0.20	0.30	+0.10	+50.96%
	Calcium (Ca)	0.25	0.14	0.26	+0.12	+81.73%
	Magnesium (Mg)	0.25	0.14	0.26	+0.12	+81.73%
	Carbon (C)	22.69	9.16	13.82	+4.66	+50.92%

Conclusion

The data from the past three years suggests that BioAg *Soil & Seed* is performing well, with analysis showing treated soils consistently outperforming untreated counterparts. Treated soils provide plants with a more significant beneficial microbial population, allowing greater access to and absorption of essential nutrients and water. These factors benefit the plants within the treated plots and should increase future health and productive potential compared to those situated in the untreated counterparts.

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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