Organisation FERTCARE®

GROW SAFE®

UWA Research Summary

"Response of Wheat to a Multiple Species Microbial Inoculant Compared to Fertiliser Application"

Frontiers in Plant Science

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Original report by Salmabi K. Assainar, Lynette K. Abbott, Bede S. Mickan, Andrew S. Whiteley, Kadambot H. M. Siddique, and Zakaria M. Solaiman

AM FERTILISERS
CREATORS OF GROW SAFE®

Contents

Process 1
Products Tested 2
Application Rates 3
Table 1.0 - Fertiliser Analysis - NPK 3
Outcome 4
Yield Outcome 4
Table 2.0 - Grain Yield expressed as g/pot^{-1} 4
Soil Health 4
Analysis 5

Process

Recently a research experiment was conducted to investigate the effect of microbial inoculant relative to a rock-based mineral fertiliser and a chemical fertiliser on wheat growth and yield, and on microbial diversity in the rhizosphere. This trial was conducted by the University of Western Australia (UWA) as an independent research project.

The project replicated soil, fertiliser and overall conditions on a property in Dowerin, situated in the Western Australian Wheatbelt region. The soil used in the trial was described as 'moderately nutrient-deficient, loamy sand with a pH of 5.7'.

This document is a condensed version of the findings, with reference and interpretation to the products used in the trial. For more information refer to the full Frontiers in Plant Science journal article.

Call us
(08) 9851 7222

Email us
adminofficer1@growsafe.com.au

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Products Tested

The research project included a control plot (no additives), a biological inoculant (Grow Safe® Premium Ag Blend), a mineral fertiliser (Grow Safe® NPK Crop) and a conventional chemical fertilisers.

Biological Inoculant - Microbes

Grow Safe® Premium Ag Blend

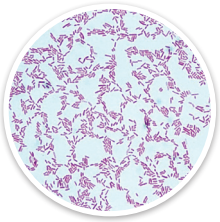
Grow Safe® Premium Ag Blend is a freeze-dried powder containing a concentrated combination of bacteria & fungi to improve soil health and plant performance. There are 120 billion Colony Forming Units (CFU/g) of beneficial microbes including the species Azotobacter, Bacilli, Mycorrhizae, Pseudomonas, Rhizobium and Trichoderma.

Bacillus

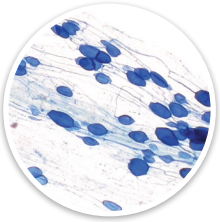
Azotobacter

Trichoderma

Rhizobium



Pseudomonas



Mycorrhizae

Mineral Fertiliser - MF

Grow Safe® NPK Crop

Typical Analysis

%									ppm					Bulk Density
N	P	K	Ca	S	Mg	Fe	Si	Mn	Zn	Cu	B	Ni	Mo	
7.5	7.5	4.5	5.0	8.0	0.9	2.6	6.7	0.4	430	430	17	30	1.5	1.1

Chemical Fertiliser - CF

Standard Practice Fertiliser

Typical Analysis

%							Bulk Density
N	P	K	S	Cu	Zn	Mn	
10.2	13.1	12.0	7.6	0.07	0.14	0.01	1.1

Application Rates

Control

- No soil amendments applied

Microbial Inoculant (Microbes): Grow Safe® Premium Ag Blend

- Freeze-dried powder – seed coating as recommended by Grow Safe®
- Seed coating as recommended by Grow Safe®

Mineral Fertiliser (MF): Grow Safe® NPK Crop

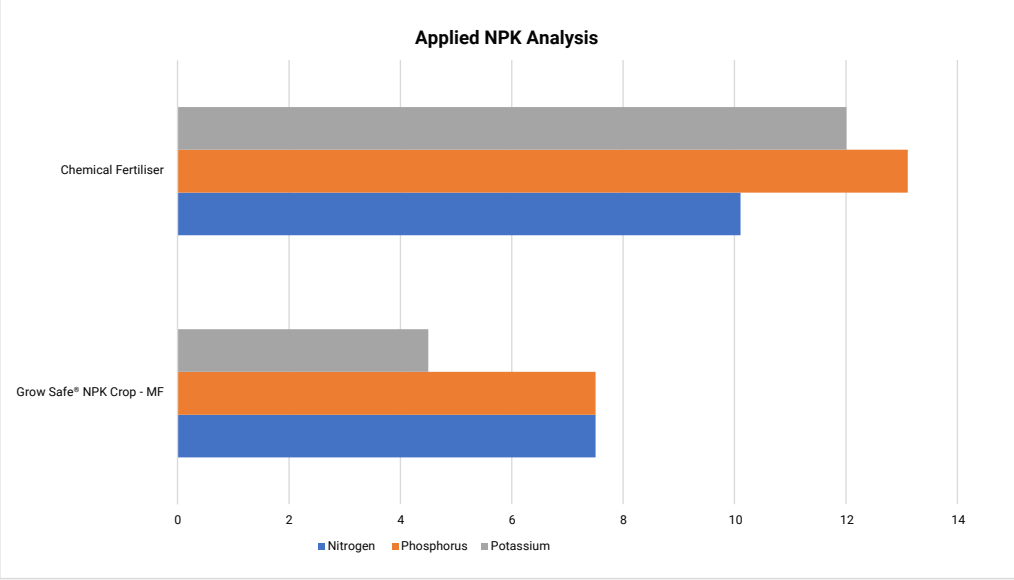
- Applied Rates:
- MF: 75kg per/ha

Chemical Fertiliser (CF) - Standard Practice Fertiliser Products

- Recommended rate for on-farm use by chemical fertiliser manufacturer (CF1)
- Applied Rates:
  - CF1: 75kg per/ha
  - CF2: 55kg per/h
  - CF3: 43kg per/ha
  - The chemical fertiliser was applied at three different rates. The lower rates (CF2 & CF3) were to match the N and P content of the mineral fertiliser (MF).

Based on current market pricing (2021), the price-per-tonne of the Grow Safe® mineral fertiliser is comparable to the chemical fertiliser tested (<$20/tonne variance).

Table 1.0 - Fertiliser Analysis - NPK



Outcome

Yield - Mineral Fertiliser

'For grain yield, the mineral fertiliser was as effective as all of the chemical fertiliser treatments'

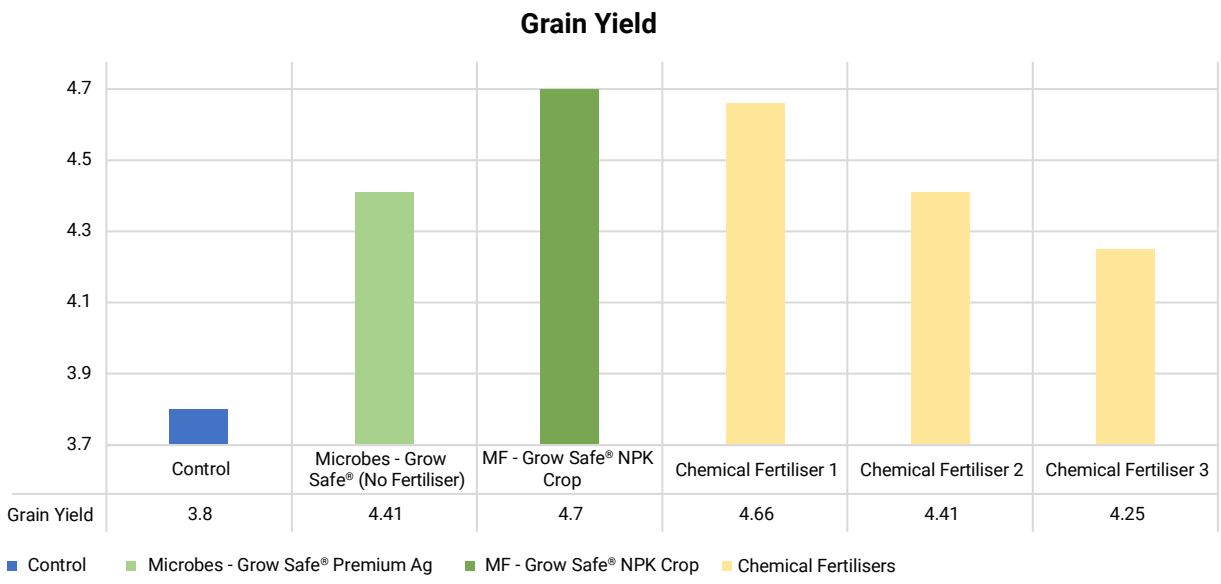
As is expressed in Table 2.0. This result is particularly polarising given the mineral fertiliser (MF - Grow Safe® NPK Crop) had an NPK analysis of N:7.5 P:7.5 K:4.5 consisting of both mineral and soluble nutrients, compared to the chemical fertiliser at N:10.2 P:13.1 K:12. Similar yield was achieved with Grow Safe® NPK Crop, with 36% less nitrogen, 75% less phosphorus and 167% less potassium content than the chemical Fertiliser. The nutrient comparison is expressed in table 1.0 and both fertilisers were applied at the same rate of 75kg/ha.

Yield - Microbes

'The microbial inoculant significantly increased grain yield without increasing shoot growth'.

This is a desirable grain outcome that is likely attributed to the improved nutrient transfer facilitated by the soil microbes. The Grow Safe® soil microbes are also known to enhance Nutrient Use Efficiency, and will divert energy to where the plant requires it most – in this case towards grain production rather than excessive leafy growth, which can be a side-effect of excessive nitrogen during the early stages of plant development.

Table 2.0 - Grain Yield expressed as g/pot^{-1}



Outcome

Soil Health

'Mycorrhizal colonization of roots increased with application of the microbial inoculant at an early stage of plant growth (tillering) where benefits to the plant could be expected'.

The inoculant used - Grow Safe® Premium Ag Blend - contains mycorrhizae fungi (Rhizophagus irregularis) to enhance soil colonisation, as well as a range of additional beneficial species. Mycorrhizae fungi assist mineral uptake and nutrient recycling processes in plants, including locked-up or in-soluble elements.

'The chemical fertiliser decreased mycorrhizal colonization, which could reduce potential benefits compared to plants with higher AM fungal colonisation'.

This statement highlights some of the detrimental effects chemical fertilisers can have upon soil biology. Grow Safe® mineral fertilisers use select soluble nutrients based upon their biological compatibility and Nutrient Use Efficiency, rather than selection based on total N, P or K. Biology can also act as a buffer during periods of plant stress, therefore maintaining good soil health is an important function of modern agriculture.

Analysis

In their conclusion, UWA researchers were surprised at how well the mineral fertiliser performed given its lower analysis and less soluble characteristics, as well as the response the microbial inoculant had upon wheat yield. The performance of Grow Safe® products have been independently verified for over twenty years and this project represents yet another independent example.

The research clearly identifies;

- Increased grain yield with the Grow Safe® Premium Ag Blend microbial inoculant.
- Highest grain yield with Grow Safe® fertiliser yet substantially less applied nitrogen, phosphorus and potassium.
- Superior microbial and soil health outcomes with the Grow Safe® mineral fertiliser in comparison to the equivalent chemical fertiliser.

In summary, the combination of both the Grow Safe® Premium Ag Blend (microbial inoculant) and the Grow Safe® NPK Crop (mineral fertiliser) are the logical choice for crop production - improving the yield, creating a healthier soil outcome and greater utilisation of soluble nutrients. The supplementary benefits of a Grow Safe® program go beyond yield and soil health. On a cropping system these can include building soil carbon, a reduced requirement for chemical intervention, nutrient density for marketability, improved natural plant immunity and cell structure to resist pest, disease and instances of frost. These benefits can also be achieved in other agricultural programs such as horticulture, viticulture and pasture operations. A Grow Safe® mineral and microbial program is one designed to sustain and improve performance through soil health.

For more information and current pricing for products tested in this trial, please get in touch with your local field advisor or visit growsafe.com.au.