AminoA®
Unlocking the Potential of Plants

The Role of Biostimulants in reducing reliance on fungicides

13 October 2021

About us

AminoA Biostimulants Limited

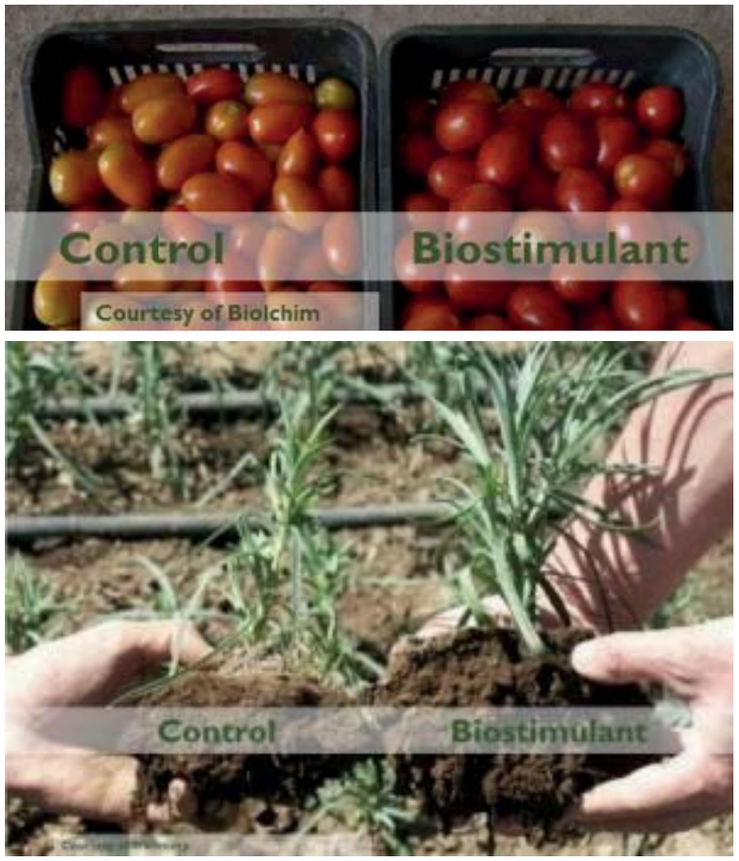
is a British Company which produces high quality crop bio-stimulants, developed from concentrates of totally natural 100% L-α amino acids extracted by enzymatic hydrolysis, which help reducing crop yield limiting factors by:

- Increasing root development
- Improving leaf and bud development
- Stimulating blossom, formation and growth of fruit
- Increasing resistance to stress by cold, heat, drought, and agrochemical phytotoxicity
- Also having a nutritional mode of action which complements the main bio-stimulant effect

EU/UK Biostimulant legislation

- Biostimulants have been a grey area in the market
- Not been regulated unlike fertilisers and agrochemicals
- EU legislation, Fertilising Products Regulation (2019/1009) being introduced
- Products placed on the EU market must demonstrate efficacy and safety from July 2022
- Current UK government proposals are to mirror this from September 2022
- Some debate still about level of safety data required
- Legislation may be delayed but will be implemented

Agricultural Bio-Stimulants



Source: European Biostimulants Industry Council

Agricultural Bio-stimulants include diverse formulations of compounds, substances and micro-organisms that are applied to plants or soils as complemetary to crop nutrition and protection to improve crop vigour, yields, quality and tolerance of abiotic stresses.

Bio-stimulants foster plant growth and development throughout the crop life cycle from seed germination to plant maturity in various ways.

Biostimulant sources

Where are Biostimulants derived from?

- Biostimulants physically comprise a very diverse group of materials
- Live bacteria and mycorrhiza
- Seaweed extracts
- Amino-acids
- Humic and fulvic acids

Today's discussion is focused on amino-acids, fulvic acids and seaweed extracts.

Amino-acids are the building blocks of proteins

- Amino-acids
- Di-peptides
- Poly-peptides
- Proteins

Our bodies are 20% protein!

All plants and animals have to synthesize amino-acids in order to function and grow.

Plants use the naturally occurring nutrients or fertiliser applied to the soil as the substrate from which to synthesize amino-acids.

By applying amino-acids directly to the plant we can short circuit the growth process.

How do our products work?

The TOOLBOX!

- The inter-relationship between the various essential amino acids is extremely complex
- Broad spectrum activity is the **BEST strategy!**
- Using **AminoA Biostimulants** is like throwing the toolbox at the plant!
- *We don't know if you need a saw, a spanner or a hammer today!*

YOU CHOOSE!

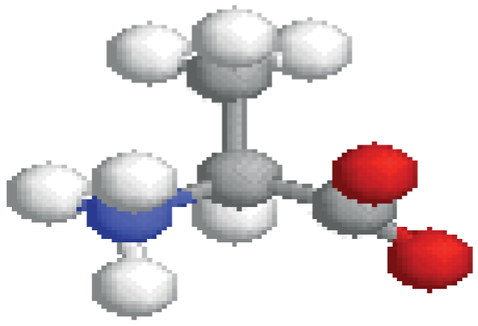
Why enzymatic hydrolysis?

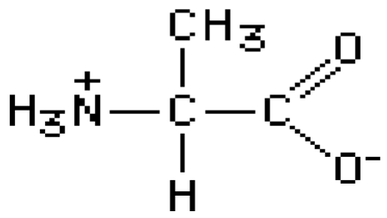
- **AminoA Biostimulants** **ONLY** contain L form amino-acids (and Glycine)
- All our products contain amino-acids that are extracted by enzymes (or manufactured)
- Many manufacturers use acid hydrolysis. Amino-acids are held together by covalent bonds (share electrons)
- These are easily destroyed by acids
- So products produced by acid hydrolysis have a much smaller range of amino-acids
- For example Glutamic acid (GLA) is the precursor of several amino-acids, so the plant still has to perform more processes to be able to use it! This uses more energy.

What type of amino-acids?

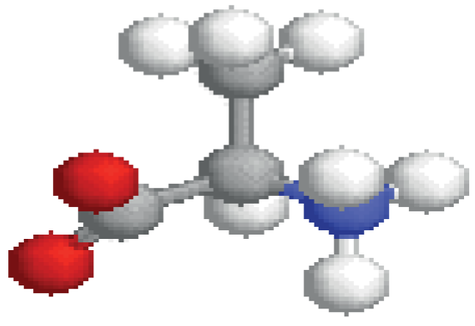
- Amino-acids can be extracted from animal protein, plant protein or manufactured!
- The plant does not make a distinction provided they are in the L form!
- Amino-acids can be in the L or D form. L and D forms contain the same atoms Imagine them as left and right hands!
- Only L forms can be used by the plant (or animal). D forms are used by bacteria

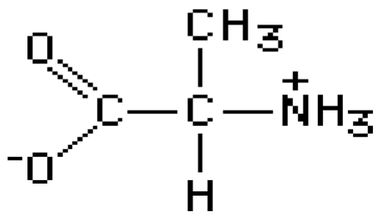
L-alanine





D-alanine





Amino-acids maintain growth in poor climatic conditions

Strawberries maintaining vigorous growth in a cold spring

Crop stress trial wheat

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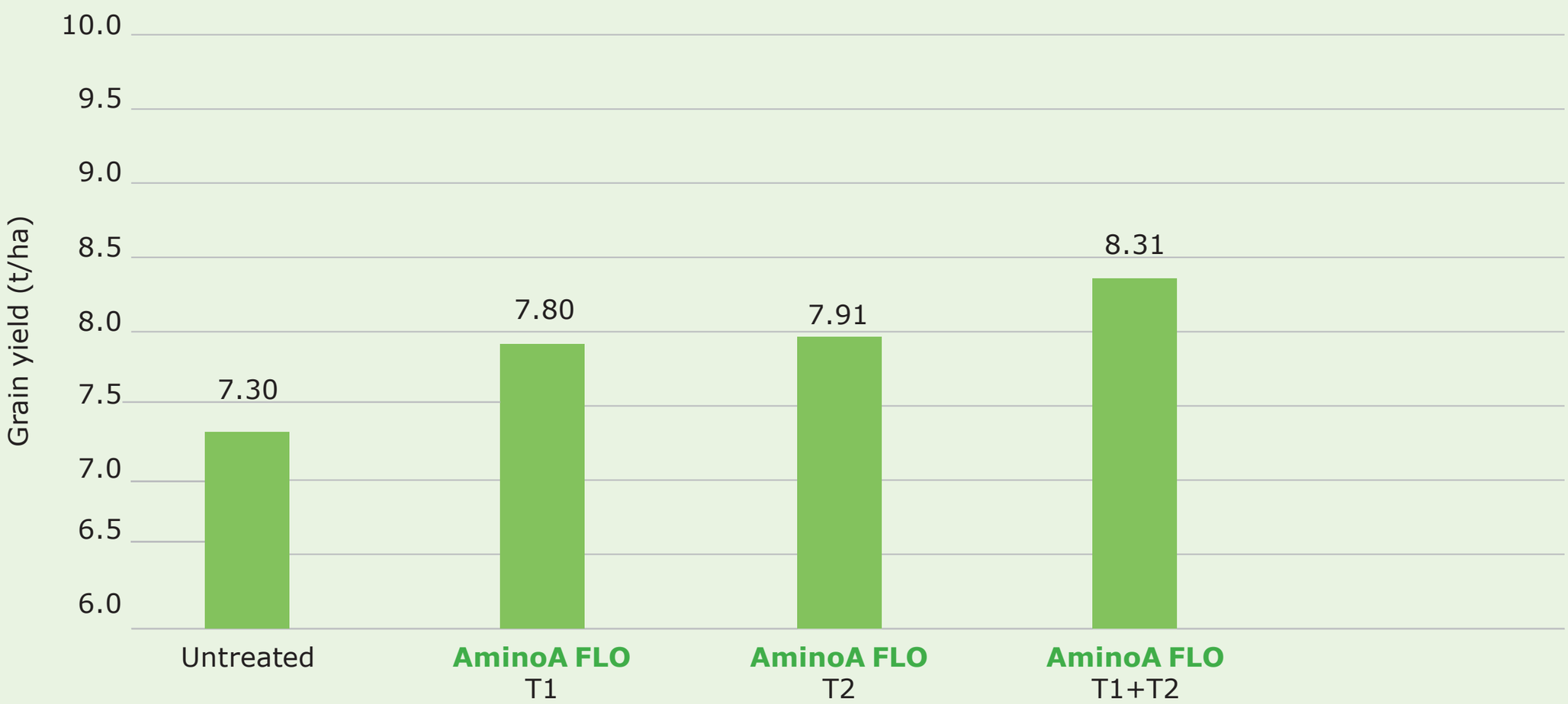
Winter Wheat variety **AminoA FLO** on the grain yield
JB Diego 2018 trial light soil stress



Spring Pea fungicide interaction trial

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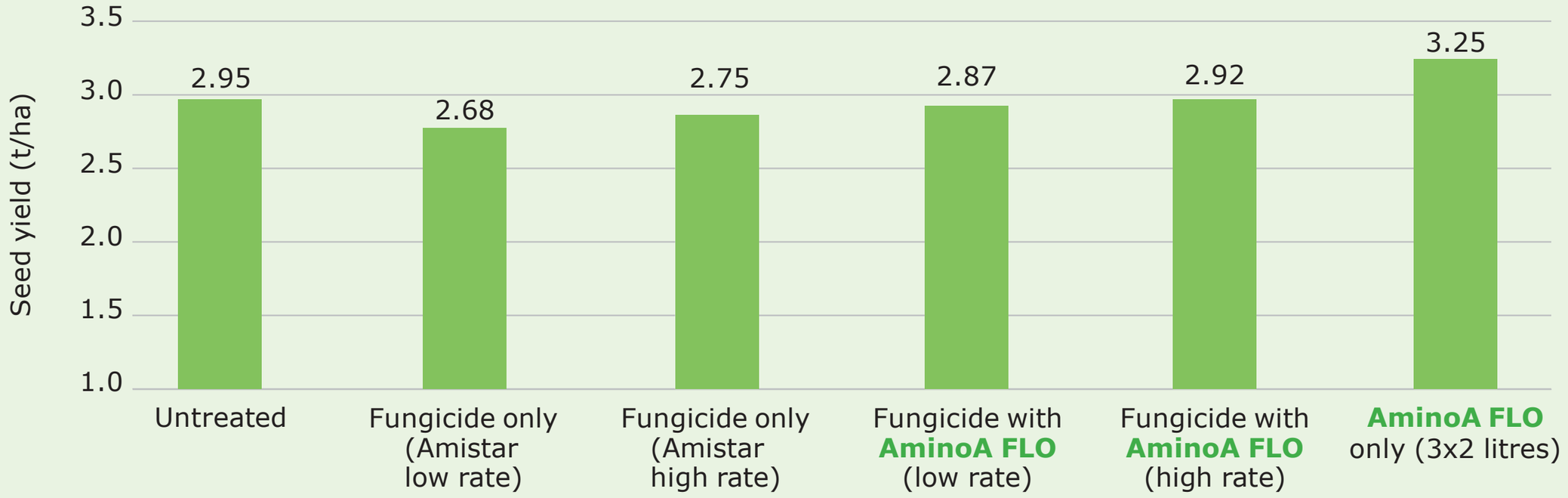
NIAB Spring Peas cv Sakura Sutton Scotney 2020
on the seed yield



Winter Wheat Ears M² averages

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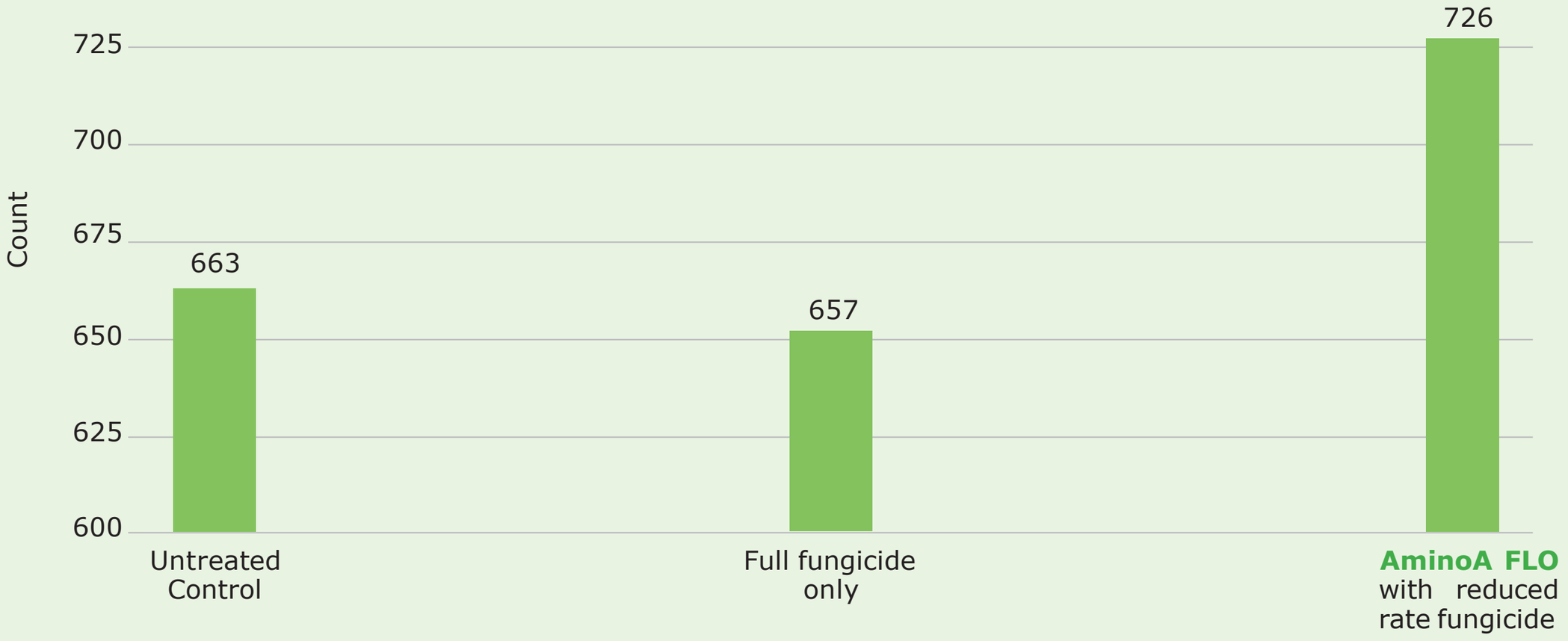
Winter Wheat Ear M²
Average NIAB trials 2020/2021



PGRO Spring Bean trial 2021

- Chocolate spot development in the trial was very low
- The highest level of chocolate spot was observed in the control averaging 1.39% LAI
- Treatment 5 showed a 37.5% reduction in LAI compared to the control
- Chocolate spot was reduced further where Signum had been applied

Mean % leaf area infection with Chocolate spot

Treatment	16/07/21	Treatment
1	1.39a	Untreated
2	0.59bc	Fungicide only
3	0.44c	Seed treatment plus fungicide
4	0.44c	Seed treatment plus fungicide
5	0.87b	Seed treatment no fungicide
Wald χ^2	92.1	
p-value	<0.001	

PGRO Spring Bean trial 2021

- There was a significant pressure from bean rust that developed later in the trial
- An early assessment of rust demonstrated the suppressive effect of Signum but no other treatment effect
- A late assessment of rust showed again the strong suppressive effect offered by Signum
- Treatment 5 also reduced levels of rust infection compared to the control, a reduction of 15% LAI

Mean % leaf area infection with Rust

Treatment	16/07/21	02/08/21
1	0.31a	28.5a
2	0.13ab	0.06c
3	0.11ab	0.04c
4	0.15ab	0.02c
5	0.25a	24.3b
Wald χ^2	19.3	265.3
p-value	0.002	<0.001

PGRO Spring Bean trial 2021

- All treatments yielded significantly better than the control but Treatment 5 would have significantly benefitted from a fungicide appliaction

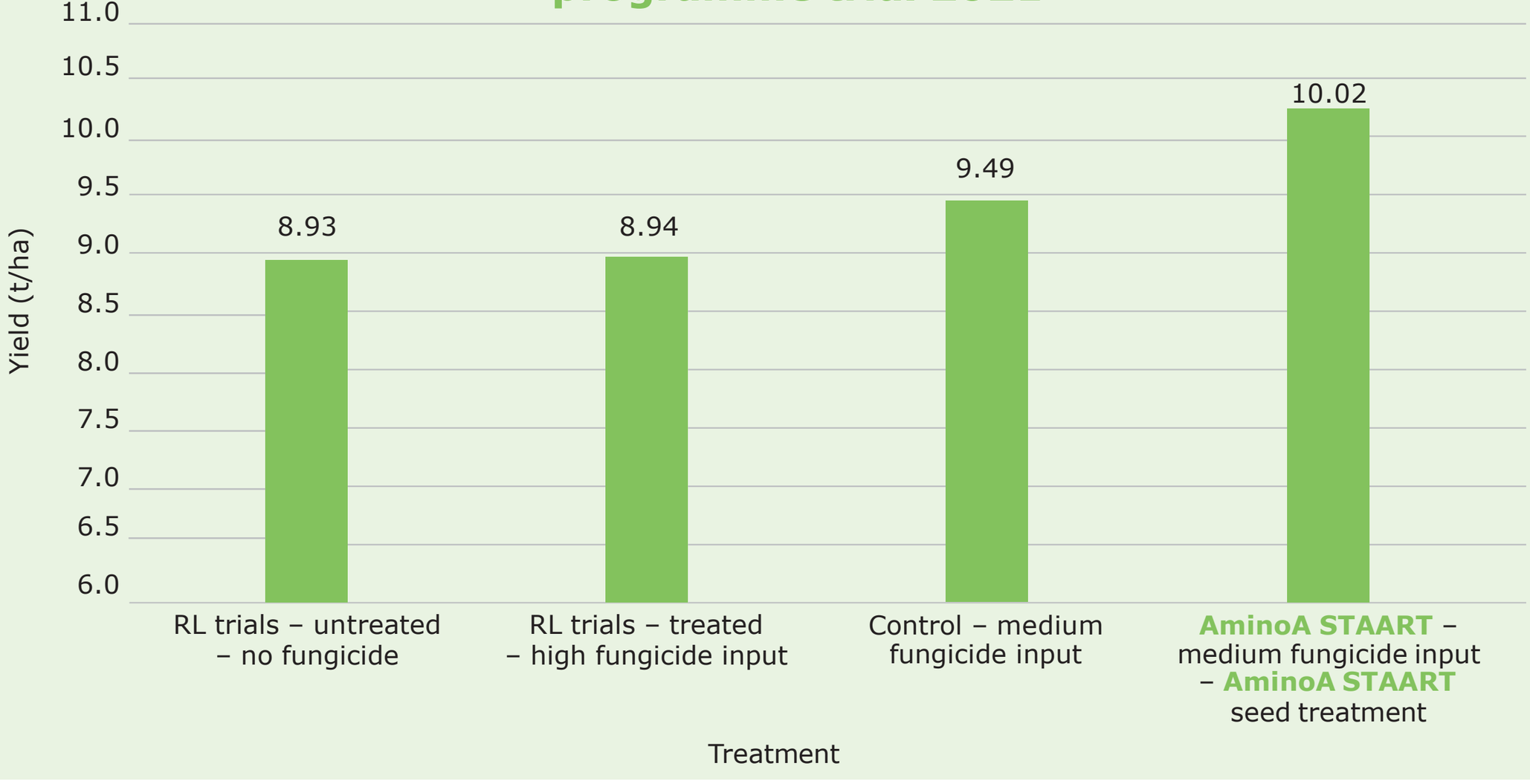
Mean yield (t/ha) at 15% moisture

Treatment	Yield	TGW
1	3.91b	479.5
2	4.93a	529.8
3	5.31a	534.6
4	4.81a	525.3
5	4.80a	464.8
F statistic	9.50	
p-value	<0.001	

AminoA STAART Spring barley trial

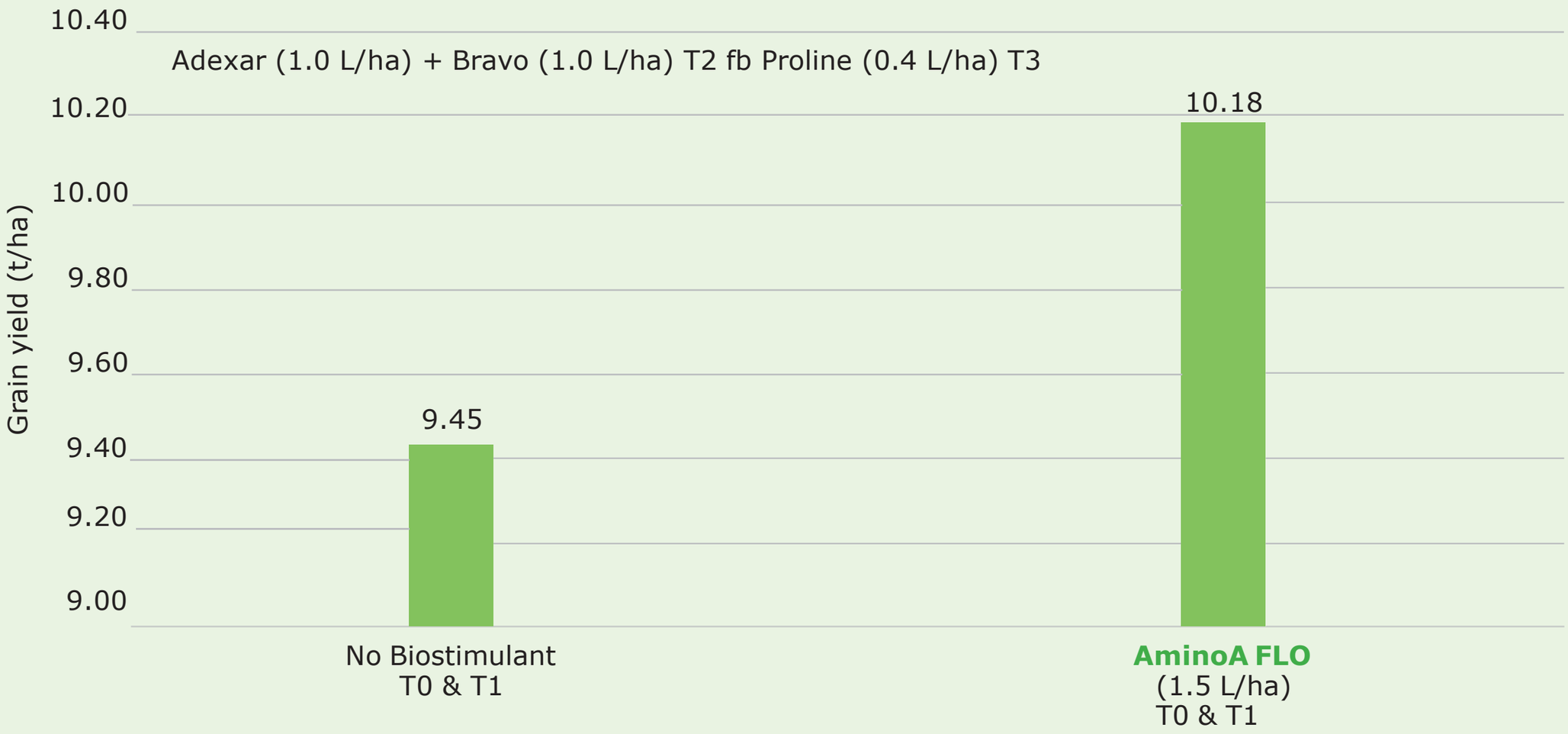
Scottish Agronomy Ltd

Central spring barley (var. Laureate) AminoA STAART programme trial 2021



AminoA FLO Winter Wheat trial

Trial 9177 – effect of AminoA FLO on the grain yield of Winter Wheat at NIAB, Callow (2018– 2019)



AminoA FLO Winter Wheat trial 2020

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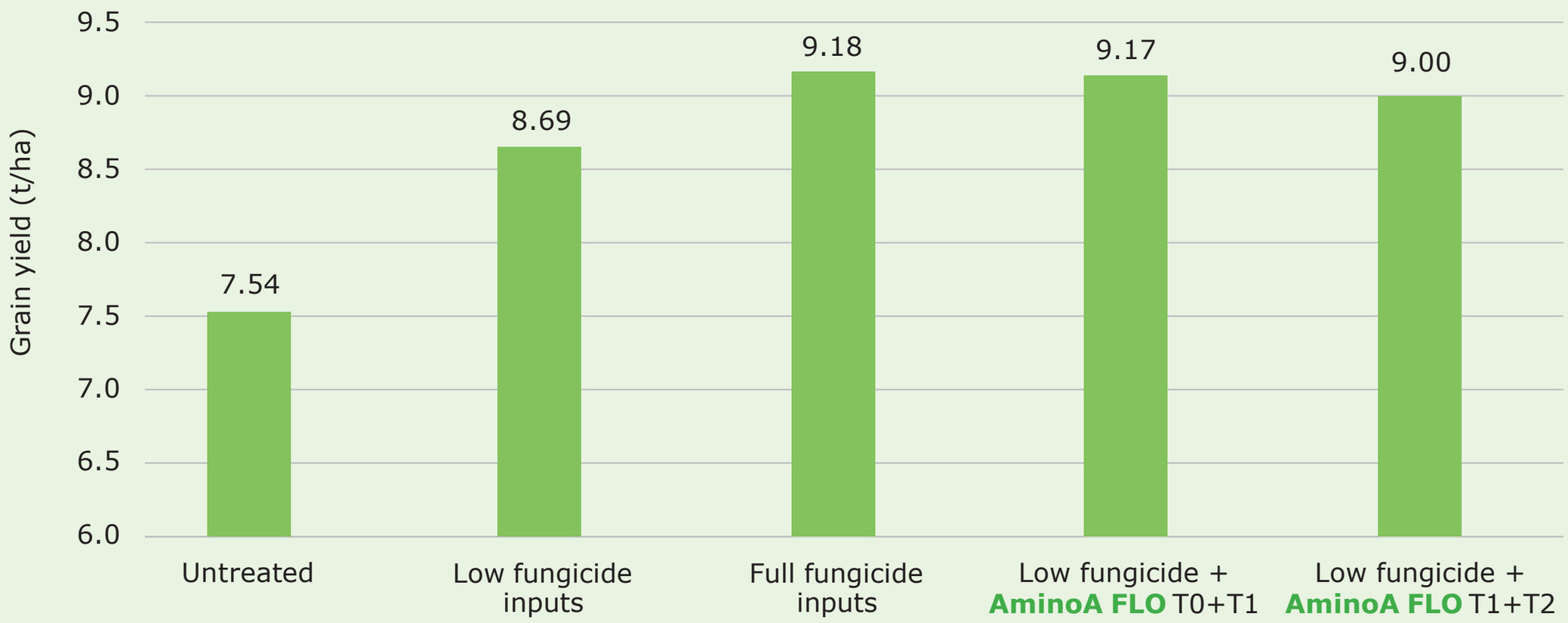
Trial WW20-9203 Effect of **AminoA FLO** on the grain yield of winter wheat (Skyfall) at Cirencester 2019-2020



AminoA FLO Winter Wheat trial 2020

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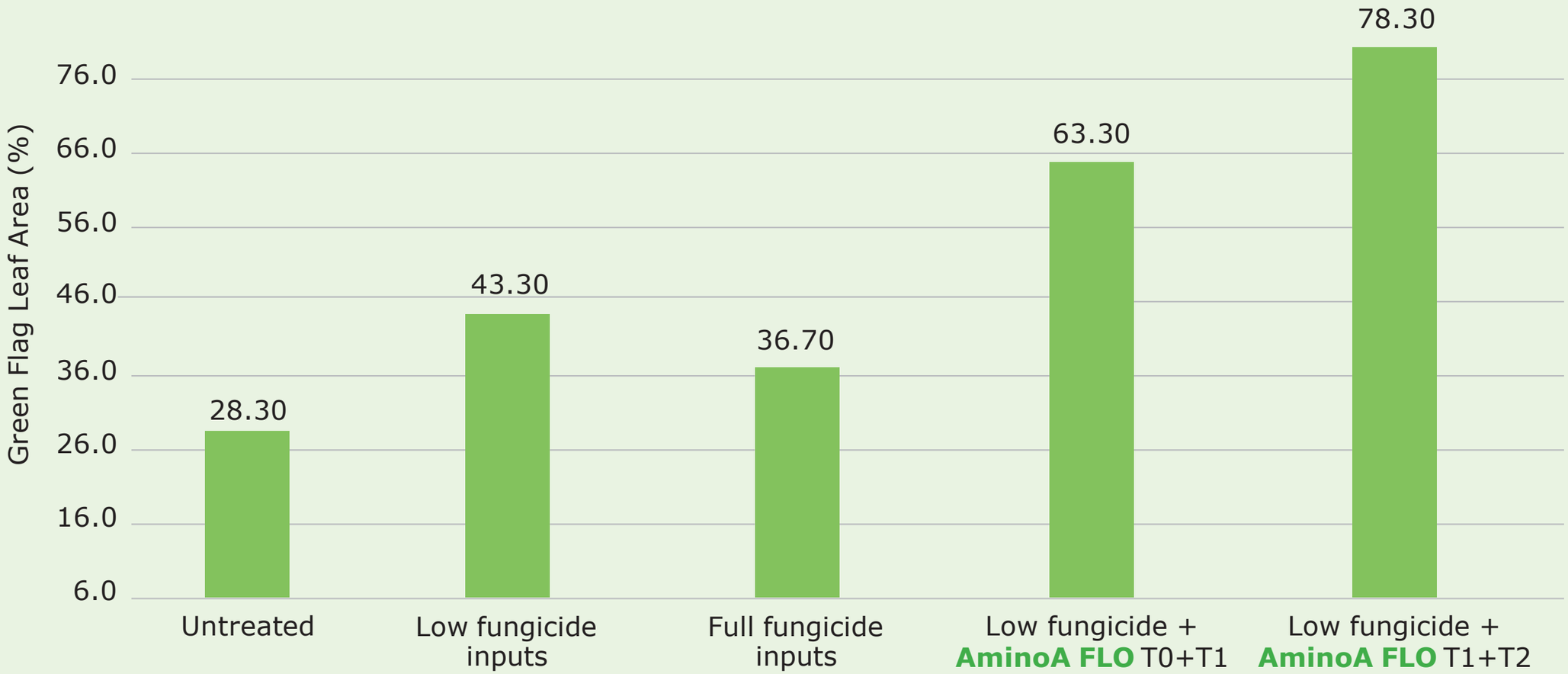
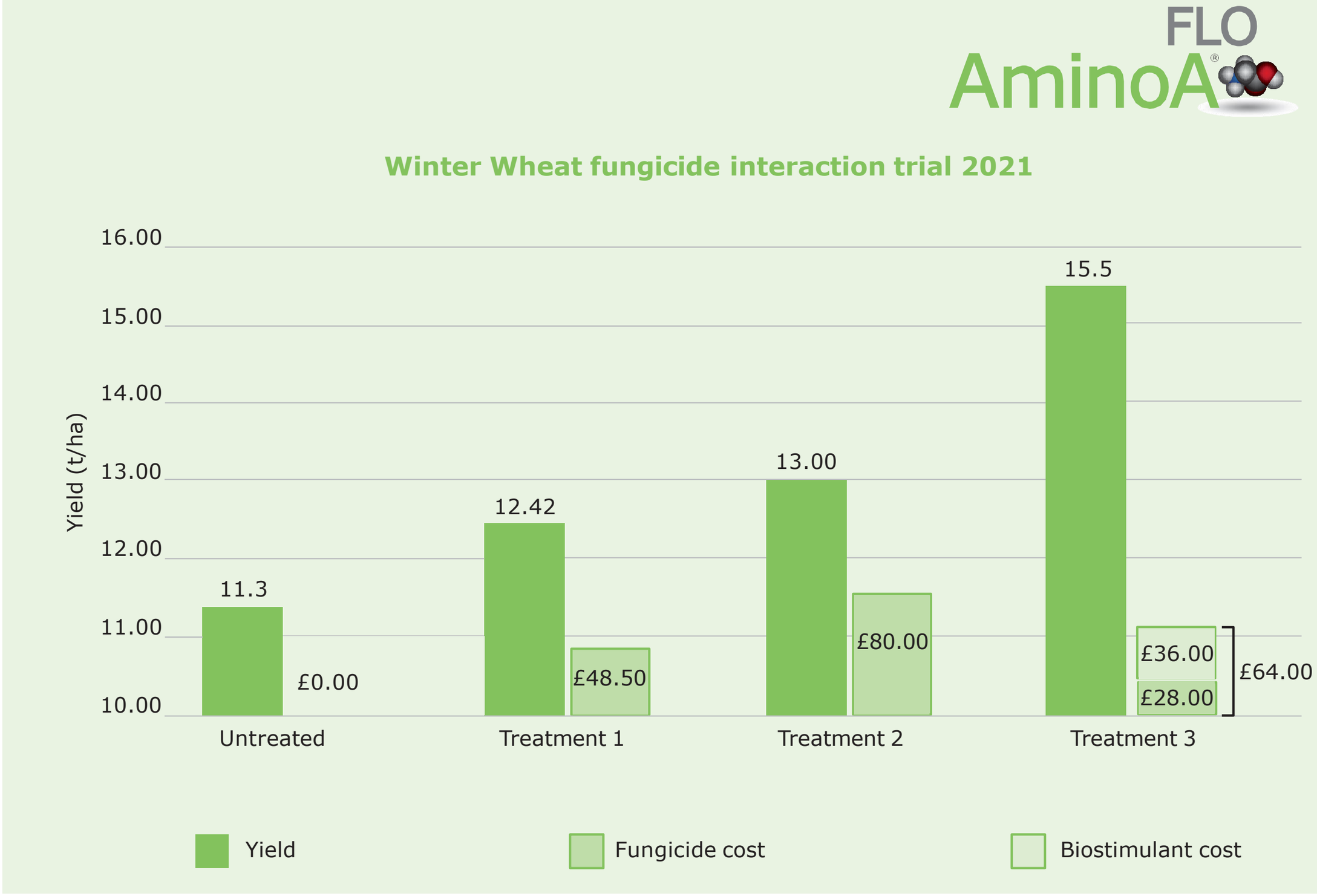
FLO AminoA®

Trial WW20-9203 Effect of **AminoA FLO** on the green flag leaf area of winter wheat (Skyfall) at Cirencester 2019-2020 – Assessed on 26th June 2020



Green Leaf area

Winter Wheat fungicide interaction trial 2021



Stress reduction Winter Wheat

AminoA FLO

Competitor product

Stress reduction Soya Beans

AminoA FLO Treated

Untreated

Amino-acids build thicker stem walls

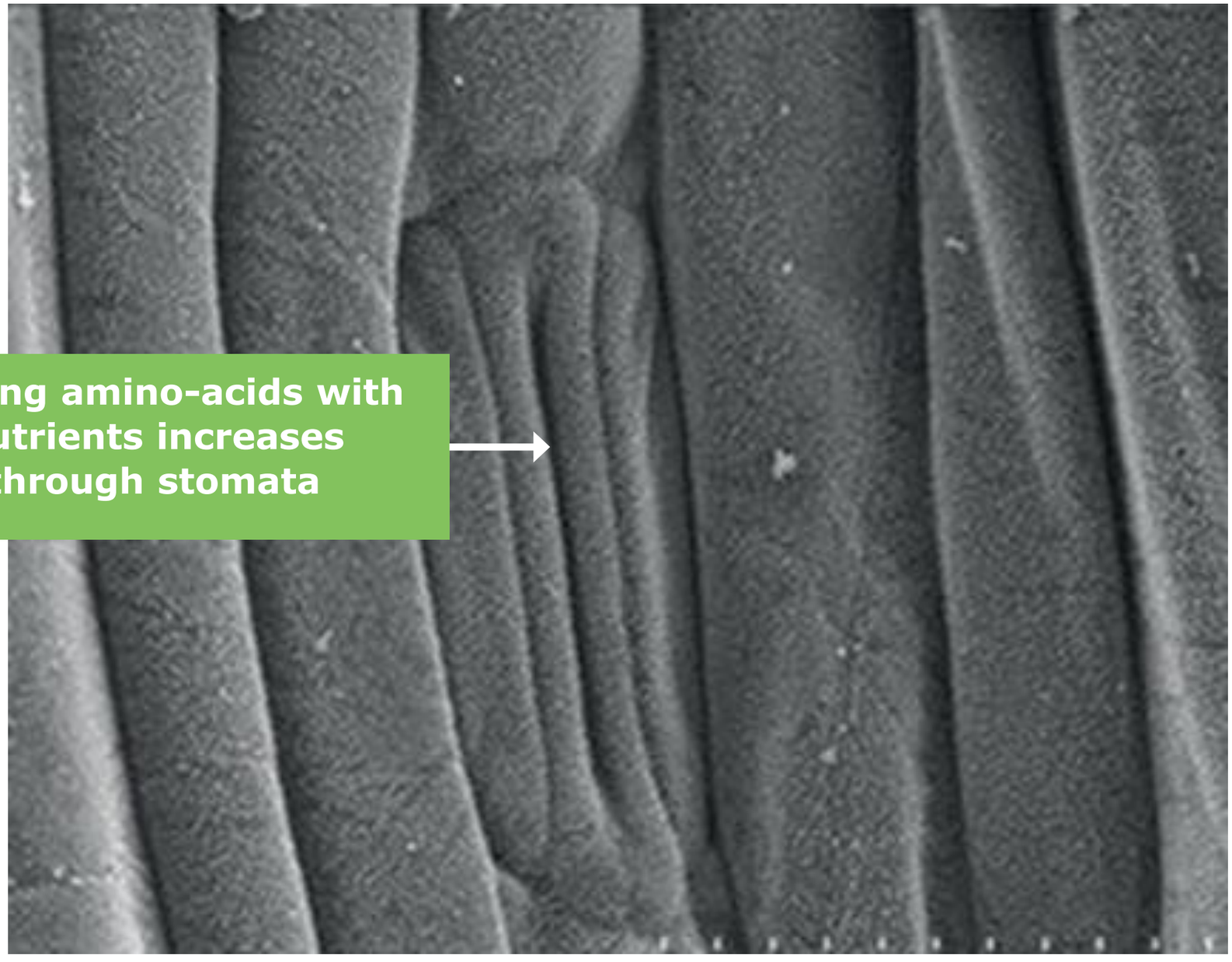
Spring Beans

AminoA STAART seed treatment white Lupin

Untreated Treated

Untreated Treated

‘Smuggling’ effect of amino-acids



Combining amino-acids with micro nutrients increases uptake through stomata

Fungicide mode of action

Fungicides are generally accepted to have three basic modes of action:

- **CONTACT**
- **TRANSLAMINAR** (will move from one leaf surface to the opposite side)
- **TRANSLOCATED** (move upwards in the plant through the Xylem system, from oldest to youngest leaves)

It appears that amino-acid based products can enhance fungicide uptake and efficacy in the Xylem system.

However, fungicides apart from phosphites, are not translocated through the phloem system.

But we know that our amino-acid based products are very active in the phloem system. Applying them even 2 weeks after an application of HRAC Mode of Action B herbicides (ALS Inhibitors) can prevent them working even after they have been translocated in the plant through the phloem.

Interaction with glyphosate

AminoA FLO applied immediately after an application of glyphosate will normally stop it working.

However when applied about five days after spraying glyphosate will improve kill.

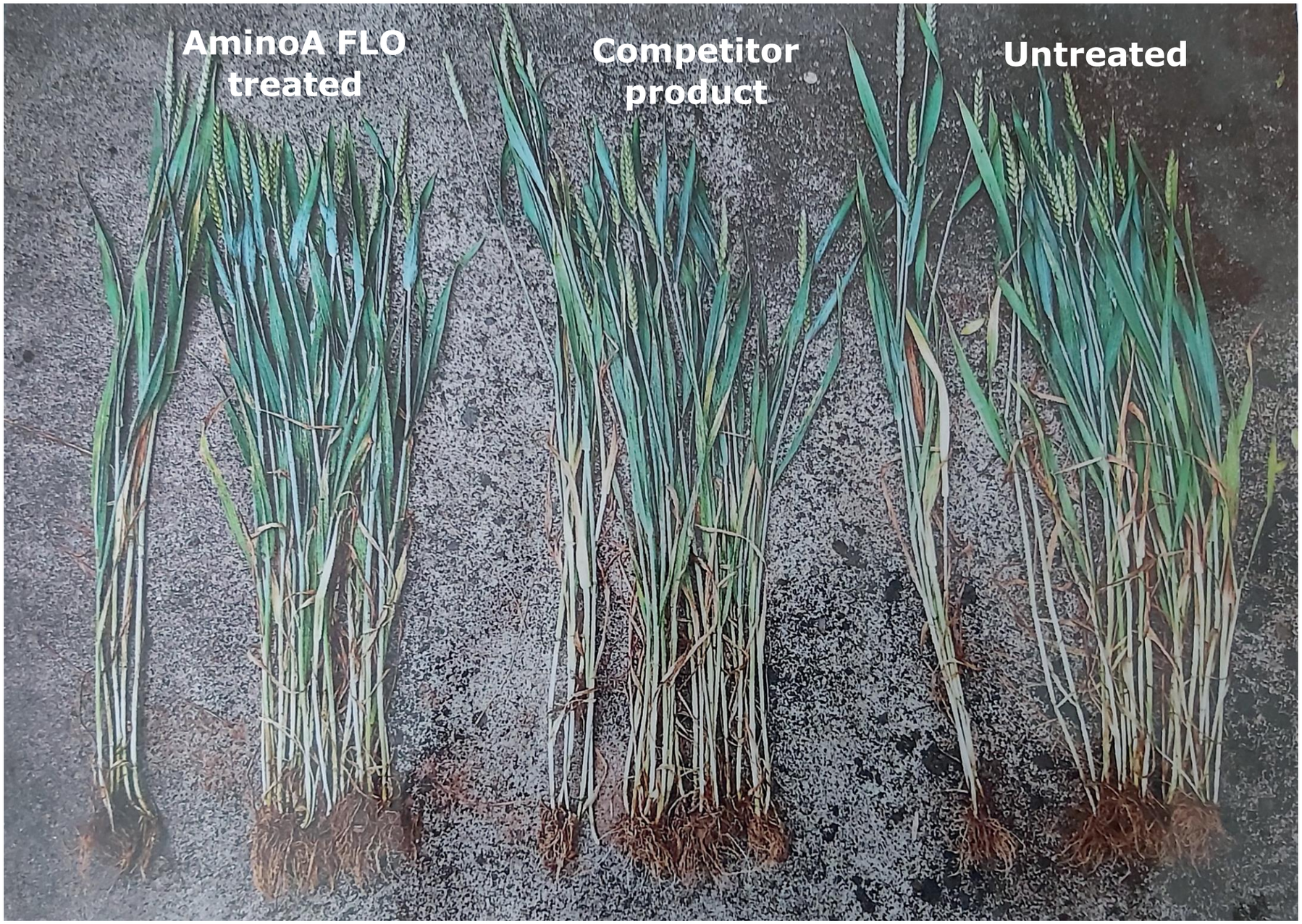
1	2	3	4	5
Treated **AminoA FLO** **after 1 day**	Treated **AminoA FLO** **after 2 days**	Treated **AminoA FLO** **after 3 days**	Treated **AminoA FLO** **after 4 days**	Treated **AminoA FLO** **after 5 days**

Photograph taken 7 days after final biostimulant application

Sunflower Trial Normandy France 2018

Fertileader **AminoA FLO** **Control**

Winter Wheat trial France 2018



AminoA FLO reduces apicial dominance

Conclusion

- Biostimulants becoming mainstream inputs and being regulated worldwide
- Increasing pressure worldwide to reduce maximum residue levels in foods
- Properly formulated Biostimulants can reduce growers costs and improve profits as well as reducing the environmental impact of agrochemicals
- In some areas, for example seed treatments in beans, there are no other alternatives
- Biostimulants are not fungicides, but they do enable the plants own defences to resist low levels of disease and are a stepping stone to allow the reduction of fungicide rates
- Fungicides used appropriately with Biostimulants can give excellent outcome.
- Fungicides used under low disease pressure situations can be toxic to the plant and actually reduce yields
- For too long farmers have routinely blanket sprayed petrochemical based agrochemicals, without regard for all the environmental consequence.
- In the coming years we need a much more considered approach and to use inputs appropriate to crop needs. Biostimulants will have a significant role to play in this approach

Contact

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