Grower Summary

AHDB Field Vegetable Centres – Brassicas, Scotland – Swede bio-stimulants screen

FV 462

Final report 2021

Project title:	AHDB Field Vegetable Centres – Brassicas, Scotland – Swede bio-stimulants screen
Project number:	FV 462
Project leader:	Angela Huckle, ADAS Horticulture
Report:	Final report, February 2021
Previous report:	Annual report, December 2020
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Date project commenced:	1 April 2020

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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Ewan Gage

Horticultural Consultant

ADAS Horticulture

Signature .....  ..... Date .....12 January 2022.

Report authorised by:

Angela Huckle

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Signature .....  ... Date ..... 11 February 2022

GROWER SUMMARY

Headline

- All treatment programmes in the experiment were safe to use over swedes with no adverse effects observed on the crop.
- By the conclusion of the trial - one month after the third and final biostimulant application – there were no significant differences in biomass measurements between the biostimulant treatments and the untreated control.
- There was good weather throughout the 2021 season and so it is possible that the potential benefits of biostimulant use were overshadowed by strong growth across the treatments and the control.

Background

Field vegetable production is facing a significant number of pressures including reduced availability of actives for pest/disease control, increased need to optimise fertiliser applications and mitigate increased frequency of climate-related stress. One potential route to addressing these influences could be the use of biostimulants, a heterogenous range of products which are reported to improve yields through a synergistic interaction with crop biology. Product ranges in this area have expanded in recent years, with a range of formulations based on different constituents such as seaweed extracts, growth promoting bacteria, phosphites, humic/fulvic acids or analogues of growth hormones – potentially in combination with a range of plant macro or micronutrients. These are widely reported to enhance plant resistance to abiotic and biotic stress, particularly mitigation for drought. For example, products which are reported to drive root growth (e.g. humic and fulvic acids) may improve the ability of the crops to absorb necessary water and nutrients under periods of drought stress. Similarly, foliar application of calcium may reduce the impact of rots (particularly in fruits prone to blossom end rot) under circumstances where the uptake of calcium from the soil is insufficient to meet the demands of crop growth. The relative novelty of many of these products, combined with the lack of on-label recommendations for specific horticultural crops can constrain the uptake of these products in the commercial horticulture sector. The objective of this trial is to compare a number of commercially available biostimulants and evaluate effects on crop growth and biomass of both roots (including the swede) and shoots, as well as any effects on crop health, where possible.

A range of biostimulant products were chosen to trial in discussion with East of Scotland Growers and Kettle Produce and shortlisted to ten programmes.

Summary

Methods

This trial was located in a commercial field of swedes near Kettlehill in Scotland within a crop of the commercially grown variety of swede, Magres, drilled on 29 April. The trial design comprised a fully randomised block design with 10 treatments (Table 4 and 5), including one untreated control and was replicated five times. An area of 11 metres wide gave a total trial area of 11 m x 120 m (1320 m^2). Plots were 10 m of a 2.0 m-wide bed, comprising five rows of swede. Altogether the trial was seven beds wide including guards either side of the trial. A 1 m^2 area across the width of the bed was used for all assessments and excluded the 0.5 m at the end of each plot from the area to be assessed. One half of the plot was used for foliar assessments, while the remaining half was left for destructive assessments.

Table 1. Treatment programmes and timings of applications used in the trial

	Timing 1 – once seedlings established 3-4 leaves 18/6/21		**Timing 2 – approx. 3 weeks after T1 application 15/7/21**		**Timing 3 – approx. 3 weeks after T2 application 12/8/21**	
Trt no	**Product**	**Rate (L/ha or kg/ha)**	**Product**	**Rate (L/ha or kg/ha)**	**Product**	**Rate (L/ha or kg/ha)**
1	Untreated control	-	Untreated control	-	Untreated control	-
2	Biofarmix 'H' Biofarmix 'M' Biofarmix 'A'	25.0 5.0 5.0	Biofarmix 'A'	15.0	Biofarmix 'A'	15.0
3	Kelpak	2.0	Bio 20	2.0	Bio 20	2.0
4	Bioforge	1.0	Stimulante Plus	1.0	Hold	1.5
5	Vit Amino	2.0	Vit Amino	2.0	MDS 602	2.0
6	AF Turret + AF Nurture	0.05 0.032	AF Phosphorous + AF Nurture	5.0 2.0	AF Phosphorous + AF Nurture	5.0 2.0
7	NTS Trio NTS Triple 10	2.0 1.5	NTS Trio NTS Triple 10	2.0 1.5	NTS Trio NTS Triple 10	2.0 1.5
8	TTL+ AF Pulsar	1.0 6.0	TTL+ AF Pulsar	2.5 6.0	TTL+ AF Pulsar	2.5 6.0
9	Yieldon	2.0	Yieldon	2.0	Yieldon	2.0
10	Megafol	3.0	Megafol	3.0	Megafol	3.0

Table 2. The biostimulant product details and constituents from available label data. Coded product not included in the list due to confidentiality.

Product	Active ingredient (s)	Company
Biofarmix	H- Humic substances + organic substances + microorganisms M - Microbial consortium (more than 100 species) A - Amino acid complex + organic substances + microorganisms	BioFarmix
Bio 20	Kelp (18.5%) and nutrients – Nitrogen (13.2%), Phosphorous (13.2%), Potassium (13.2%) plus trace elements (Fe, Mn, Cu, Zn, B, Co and Mo)	Omex
TTL Plus	Fulvic and humic acids	Nutrimate
Kelpak	Organic biostimulant from kelp	Omex
Bioforge	Foliar spray with N (2%) and K (3%) along with trace elements (Co and Mo).	Stoller
Stimulante Plus	Foliar spray containing auxins, cytokinins and gibberellins.	Stoller
AF Turret	Starter fertiliser – Nitrogen (8.9%) Phosphorous 13.6%), plus Mg, S, Mn and Zn	Aiva Fertilisers
AF Nurture	Fulvic and humic acids plus Potassium (1.1%), Mg, S, Ca and trace elements (So, Cu, Fe, Mn and Zn)	Aiva Fertilisers
AF Phosphorous	Foliar nutrients inc phosphorous. Nitrogen (7%), Phosphorous (13.8%), and Mg, S and Zn	Aiva Fertilisers
AF Pulsar	Foliar nutrients including N (6%) and trace elements (S, Mg, Mn, Zn, Cu, B, Mo, Co and Na).	Aiva Fertilisers
Hold	Foliar spray containing Ca	Stoller
TTL	Fulvic and humic acids	Nutrimate
MDS 602	Aqua, Ascorbic Acid, Vitamin P, Acetic Acid, Glycerine, Orange Extract, Seaweed extract, Neem Extract, Garlic Extract,	Microbial distribution
Yieldon	Foliar nutrients including N (3%), K (3%) and trace elements (Mn, Mo, Zn)	Valagro
Megafol	Foliar nutrients including N (3%), K (8%) and various vitamins, amino acids and proteins, betaines and growth factors	Valagro

Product	Active ingredient (s)	Company
NTS Trio	Foliar fertiliser based on 13.73% N, 0.1%K and 15.3% Ca with Mg, B and Fe alongside fulvica acid and mannitol derived from kelp.	Nutri-Tech Solutions
NTS Triple 10	A liquid 10-10-10 fertiliser with trace elements and natural growth promoters.	Nutri-Tech Solutions

The swedes were netted for insect exclusion, and the treatments were sprayed through the net as per commercial practice. Treatments were applied using a precision knapsack sprayer with a 2.0 metre boom and 02F110 nozzles at medium quality and 200 litres per hectare water volume. All treatments were applied post-planting at the following timings:

- Timing 1: 18th June –post-emergence, once seedlings are established (4-5 leaves)
- Timing 2: 15th July - 30 cm height foliage – early root formation – 4 cm
- Timing 3: 12th August – 40 cm height foliage – roots expanding – 10-15 cm

The crop growth stage was recorded at each spray application visit.

A single destructive assessment was carried out at harvest to assess yield outputs over two days on 28th and 29th September. All roots were lifted, the plants were dug up and shaken carefully to remove as much soil as possible and to prevent the fine roots from tearing, and all plants in each plot were harvested for assessment. Total and marketable root number and weight was recorded, alongside numbers in specific categories of unmarketability (undersized, cabbage fly rot fly damage, club root presence or rots).

Discussion and Conclusion

All treatment programmes in the experiment were safe to use over swedes with no adverse effects observed on the crop. At harvest, there were no significant differences in total or marketable yields between treatments and the untreated control (Figure *1*, Table *1*). Two treatments (AF Turret + AF Nurture and NTS Trio + NTS Triple 10) showed marginally lower yields compared with the control, whilst three treatments (Kelpak, TTL + AF Pulsar and Megafol) gave yields greater than that of the control – although none of these differences were significant. Similarly, when individual marketable root weight was considered, there were no significant differences between treatments. In terms of unmarketable yield, there were also no significant differences in the causes of unmarketable roots between treatments.

These findings are comparable to trial results from 2020 which found no significant difference in yield outputs compared with the untreated control. However, conditions in the 2021 season were similarly good compared with 2020 – July was warm but with frequent rainfall, so that it

is unlikely that the crop was subject to any significant stresses. As a result, any differences due to the use of the biostimulant treatments may have been muted compared with the untreated control. However, it is possible that the use of these products under conditions of greater plant stress – especially drought – where the reported abilities of these products may further drive yield performance.

Table 1. Summary figures for assessments taken at harvest from 1 m^2 area.

Treatment		Total Plot Fresh Weight (kg)	Plot Marketable Fresh Weight (kg)	Total Root Number	Marketable Root Number
1	Untreated control	9.2 ± 0.55	8.6 ± 0.63	21.8 ± 0.75	15 ± 1.22
2	Biofarmix 'H', 'M', 'A' program	8.9 ± 0.61	8.2 ± 0.77	23.8 ± 1.11	15 ± 1.15
3	Kelpak fb. Bio20 fb. Calmax Ultra	9.9 ± 0.77	8.9 ± 0.98	23.6 ± 2.5	14.6 ± 2.33
4	Bioforge fb. Stimulante Plus fb. Hold	9.5 ± 0.88	9 ± 0.96	21 ± 0.91	15.4 ± 1.85
5	Vit Amino applied twice then MDS 602	9.1 ± 0.84	8.3 ± 0.79	21.4 ± 1.56	17.6 ± 2.22
6	AF Turret + AF Nurture fb. AF Phosphorous + AF Nurture x 2	8.5 ± 0.59	7.6 ± 0.76	21.8 ± 0.63	14.2 ± 0.95
7	NTS Trio + NTS Triple 10 Applied 3 times	8.7 ± 0.61	7.6 ± 0.72	22.2 ± 0.95	14.6 ± 1.39
8	TTL+ AF Pulsar applied 3 times	10.2 ± 0.9	9.5 ± 0.88	21.6 ± 2.82	16.6 ± 1.94
9	Yieldon applied 3 times	9.6 ± 0.37	9.2 ± 0.43	20.8 ± 1.38	15.6 ± 1.26
10	Megafol applied 3 times	10 ± 0.66	9.3 ± 0.57	20.4 ± 1.39	14.6 ± 1.61

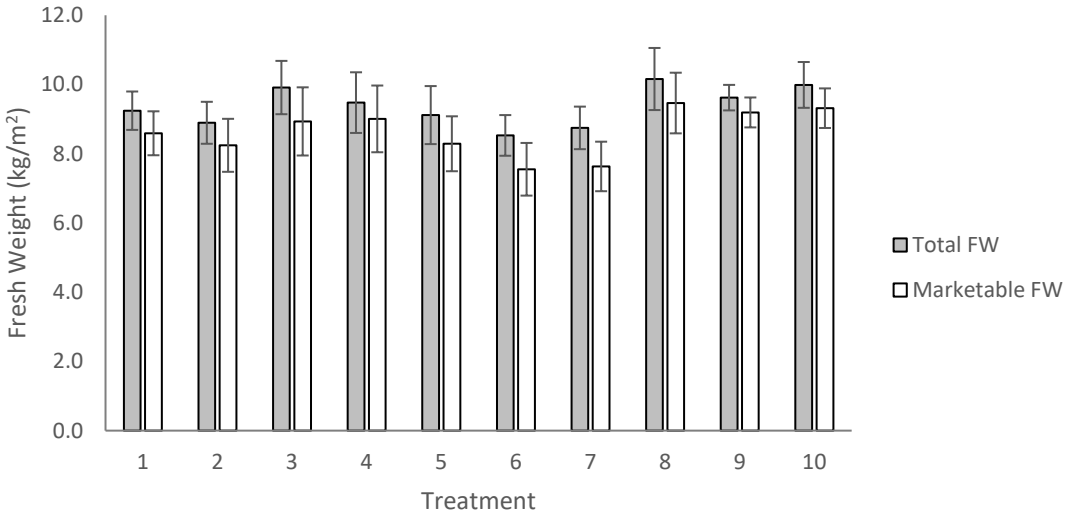

Figure 1. Total and marketable fresh weight yields per plot. For treatment codes see Table 2.

Financial Benefits

It is difficult to confidently determine the financial benefits of the use of biostimulants from this trial as there were no significant conclusions.