



UK Manufacturers of High Quality Seaweed Extract

Trial bulletin No.2.

A Programme of Biostimulants Increases Yield by up to 40% in Maincrop Potatoes

Introduction

The Crop Smith Ltd produces high quality seaweed extracts and biostimulant products. The aim of this on-farm demonstration trial was to examine the effect of a combination of seaweed extracts and beneficial microbes on growth and yield in potato cropping.

The Crop Smith Ltd. carried out scientific trials in 2021 on potatoes cv. 'Charlotte' which demonstrated a 13.93% increase in mean tuber weight and a 7.82% increase in yield per plant. The following work in Norfolk builds on those previous results, working with its UK distributor, Croptek Bio Ltd.

Crop: *Solanum tuberosum* 'Russet Burbank'

S. tuberosum 'Russet Burbank' is a maincrop variety which produces medium to large tubers which are long, cylindrical, and oblong in shape with a slightly flattened appearance. The skin contains faint spots of light and dark brown and is covered in russetting, which is a fine, sandpaper-like, rough, outer texture. Russets generally have few, shallow eyes. The flesh is pale white, firm, dense, and floury and this cultivar is commonly grown for the frying / chipping industry in the UK.

Trial Location

Norfolk, Eastern England.

Application Programme

Treatment 1: Control = Standard Practice

Treatment 2: Standard Practice + Microbial application pre-planting and at tuber initiation + SeaPhyte seaweed extract at 1 litre / ha at the 'hook' stage and again at tuber initiation. This was followed by SeaFol at 1 litre/ha with every blight spray 10-14 days, or less, depending on the severity of the blight.

Both areas were irrigated throughout.

Interim Results

An interim assessment was performed in June 2022, at an early stage in the crop, to assess visible differences between the untreated and the treated plants in the field. Assessment of the foliage revealed a clear difference whereby the treated foliage appeared darker and denser than the untreated foliage. See Fig 1. This suggests a higher leaf area index and an increased level of chlorophyll in the leaves of the treated plants.

Fig. 1 Visual assessment of foliage



Further investigation of the roots revealed that the untreated plants were at the hookstage, but the treated plants were beginning to form small tubers. This suggests that the treatment had advanced the physiological stage of the crop. See Fig 2. In principle, this should lead to the development of more tubers that are larger and heavier as tuber development will occur over a longer period in the crop cycle. A visual comparison was made with the final tubers at harvest and a clear difference was apparent. See Fig.3.

Fig 2. Interim rooting assessment

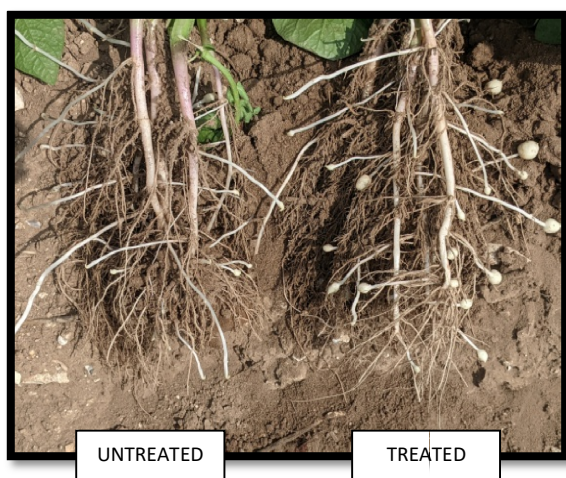
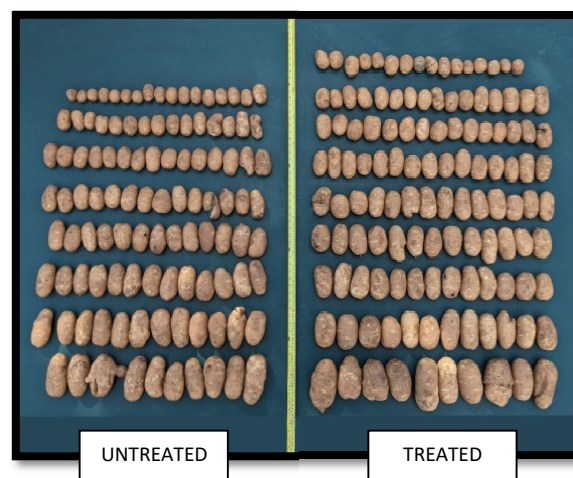


Fig. 3. Tuber sample comparison at harvest



Final Results

Randomised, replicated samples were taken from the trial areas prior to harvest in late September 2022. The results demonstrated a 13.76% increase in tuber numbers and a 27.83% increase in mean tuber weight which delivered an overall increase in yield of 40.42%. This extrapolates to an increase from 24 t/ha-1 to 34 t/ha-1. Statistical analysis of the data confirmed the yield increase as highly significant.

No. tubers / plant	Control Plants	12.11	
	Treated Plants	13.77	<u>13.8%</u> INCREASE
Ave. tuber weight	Control Plants	196g	
	Treated Plants	250g	<u>27.8%</u> INCREASE
Total yield	Control Plants	24 t/ha⁻¹	
	Treated Plants	34 t/ha⁻¹	<u>40.4%</u> INCREASE

Soil Biomass Assessment

Immediately prior to harvest soil samples from the untreated and treated plots were taken and sent to an independent laboratory to ascertain differences in soil biomass. Increases in moisture content, bacteria, fungi and hyphal diameter were observed. See Table 1.

Table 1. Soil biomass assessment

			RESULT - ORGANISM BIOMASS		
Analysis	Units	Guideline	CONTROL SOIL	TREATED SOIL	% increase
Moisture content	%	15 - 55	10	11	10.00
Active Bacteria	µg/g	30 - 60	17.1	21.9	28.07
Total Bacteria	µg/g	200 - 400	406	437	7.64
Active Fungi	µg/g	30 - 60	9.2	19.6	113.04
Total Fungi	µg/g	200 - 400	119	433	263.87
Hyphal Diameter	µm	>2.5	2.77	3.29	18.77



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Conclusion

The application of beneficial microbes, plus regular applications of SeaPhyte and SeaFol resulted in an increase in yield in maincrop potatoes. In this case a highly significant yield increase of 40% was observed. It is probable that this result was also influenced by local climatic conditions and the physical and chemical condition of the soil, meaning that results will differ from trial to trial as soil-plant biology is complex.

However, it is a known fact that foliar seaweed extract applications increase chlorophyll content and photosynthesis, and also the level of exudates issued into the soil via the plant roots. Through this mechanism seaweed extract application affects soil biology at the soil root zone by increasing total microbial count and available soil nitrogen and impacting microbial community diversity with an increase in microbial families linked to soil health.

A deeper understanding of the effects of seaweed extract on the plant-soil ecosystem is required in order to improve future methodologies in sustainable food production.

Further Work

The Crop Smith Ltd will continue to evaluate the beneficial outcomes of seaweed extracts and other biostimulant products in crop cultivation. In 2023 further trial work will be conducted by independent researchers examining the effects of CS1(SeaFol) and microbial soil amendments in maincrop potatoes and other important UK crops.

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