

FINAL REPORT

Evaluation of the effect of Seasol Commercial on the growth and yield of potatoes cv. Kestrel

Caloote, South Australia, 2020



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Seasol Potato Demo Trials - (V1 13th Sept 2019)

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SUMMARY

At Caloote, South Australia in 2020, a non-replicated field trial was established to evaluate the effect of Seasol Commercial Seaweed Concentrate on the growth and yield of commercially grown potatoes cv. Kestrel. Seasol Commercial was applied by the grower through the centre pivot during the normal irrigation cycle (fertigation), with the first application on 17/01/20, 6-days after planting, and a further three applications at 21-33-day intervals. A Dosatron injection system was used to add 10 L of Seasol Commercial to each 90 L of irrigation water, applied at a total volume of 100 L/ha.

After planting, ten subplots were marked out in the Seasol Commercial treated areas of the paddock and each was paired with an untreated control subplot. The addition or omission of Seasol Commercial was the only agronomic difference between the two treatments. The trial and commercial crop were banked on 31/01/20, a week before the second Seasol Commercial application, to remove weeds in the inter-row space and bury young weeds along the plant row.

Crop emergence was assessed at 4-weeks after planting (27-days after planting, 27DAP). Crop vigour and normalised difference vegetation index (NDVI) were assessed at 52DAP, two days after the third foliar application of Seasol during mid-tuber bulking and again at 90DAA when king tubers were 65 mm diameter. The trial was harvested on 14/05/20. Prior to harvest, the number of shoots were counted in each subplot. Potatoes were lifted, graded into three weight categories (<110 g, 110-280 g and >280 g), counted, and weighed. A sample of tubers from each treatment was used to determine specific gravity, dry matter, and common scab (*Streptomyces* sp.) incidence.

There were no differences in crop emergence between treatments.

At 90DAP, the Seasol Commercial treated crop was significantly greener and more vigorous than the untreated control.

Prior to harvest, there was an equivalent number of shoots in each treatment. Four applications of Seasol Commercial significantly increased the total weight of tubers harvested and caused a numerical increase in tuber number and weight for each of the weight grades.

Seasol Commercial did not seem to affect specific gravity or dry matter of tubers. Six percent of tubers (by number) had common scab, with less Seasol Commercial tubers affected by weight than in the untreated control.

INTRODUCTION

Aim

- To evaluate the effect of Seasol Commercial on the growth and yield of potatoes cv. Kestrel grown in sandy loam soil.

Disease

Common scab (*Streptomyces scabies*)

MATERIALS AND METHODS

Products

Product name	Active ingredient (ai)	Concentration of active ingredient	Formulation	Batch number
Seasol Commercial Seaweed Concentrate	seaweed concentrate	100% v/v	Liquid	SC-1 9221/66 C 192485

Treatments

No.	Product	Product rate (L/ha)	Application schedule
1	Untreated control (Nil Seasol)	Nil	N/A
2	Seasol Commercial Seaweed Concentrate	10	Four applications of Seasol Commercial at 21-33-day intervals, applied by the grower through the centre pivot during the normal irrigation cycle (fertigation) beginning on 17/01/20, 6-days after planting.

Chronology of events

Date	Days after application timing (DAA#)	Days after planting (DAP)	Crop stage		Event
			BBCH scale	Description	
11/01/20	-6DAAA	0	05	Beginning of root formation	Crop planted
17/01/20	0DAAA	6			Seasol Commercial applied by fertigation (A)
31/01/20	14DAAA	20	14-16	4 to 6 or more leaves of main stem unfolded (> 4cm)	Banking of trial and commercial crop* Sencor 480 SC applied
07/02/20	21DAAA	27	16-19	6 to 9 or more leaves of main stem unfolded (> 4cm)	Potato emergence assessment Seasol Commercial applied by fertigation (B)
01/03/20	23DAAB	50	44	40% of total final tuber mass reached (king tuber 25 mm)	Seasol Commercial applied by fertigation (C)
03/03/20	2DAAC	52		40% of total final tuber mass reached (king tuber 30 mm)	Potato vigour and NDVI assessments
03/04/20	33DAAC	83	47	70% of total final tuber mass reached (king tuber 60 mm)	Seasol Commercial applied by fertigation (D)
10/04/20	7DAAD	90		70% of total final tuber mass reached (king tuber 65 mm)	Potato vigour and NDVI assessments
14/05/20	41DAAD	124	49	Skin set complete	Potato shoot density assessment Trial harvested Tuber yield assessment Specific gravity assessment Common scab assessment

* Potato growers in South Australia use mechanical methods of weed control, involving harrowing at emergence, inter row cultivation and banking or hilling to remove weeds in the inter row space and bury young weeds along the plant row.

RESULTS

Table 1. Potato emergence at 27DAP

No.	Treatment	Product rate (L/ha)	Emergence of potatoes cv. Kestrel (number of plants emerged per metre of row*) 27DAP 07/02/20
1	Untreated control	Nil	3.08
2	Seasol Commercial Seaweed Concentrate	10	3.03
<i>P</i> -value (two-tail)			0.6713
t-Statistic			0.4386
Pearson Correlation			0.4635
t-Critical (two-tail)			2.2622
Result ($P \leq 0.05$)			NSD

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

* Based on a 0.27 m spacing between potato plants within a plant row, the maximum theoretical emergence density is 3.7 plants per metre of row

DAP = Days after planting

NSD = No significant difference due a P -value > 0.05

Table 2. Potato crop vigour at 52DAP and 90DAP

No.	Treatment	Product rate (L/ha)	Crop vigour of potatoes cv. Kestrel (1-10*)	
			52DAP 03/03/20	90DAP 10/04/20
1	Untreated control	Nil	9.0	9.1 b
2	Seasol Commercial Seaweed Concentrate	10	9.3	9.8 a
<i>P</i> -value (two-tail)			0.3434	0.0445
t-Statistic			-1.0000	-2.3333
Pearson Correlation			0.2016	0.3887
t-Critical (two-tail)			2.2622	2.2622
Result ($P \leq 0.05$)			NSD	Significant

* 1-10 scale where 1 = complete crop death and 10 = most vigorous plot

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

Means followed by the same letter are not significantly different ($P = 0.05$, LSD)

DAP = Days after planting

NSD = No significant difference due a P -value > 0.05

Table 3. Potato crop NDVI at 52DAP and 90DAP

No.	Treatment	Product rate (L/ha)	Crop normalised difference vegetation index (NDVI) of potatoes cv. Kestrel (0-1)	
			52DAP 03/03/20	90DAP 10/04/20
1	Untreated control	Nil	0.85	0.84 b
2	Seasol Commercial Seaweed Concentrate	10	0.85	0.87 a
<i>P</i> -value (two-tail)			0.4642	0.0128
t-Statistic			-0.7645	-3.0968
Pearson Correlation			0.3394	0.5431
t-Critical (two-tail)			2.2622	2.2622
Result ($P \leq 0.05$)			NSD	Significant

Note, Seasol Commercial was applied at 10 L/ha at each of 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha

Means followed by the same letter are not significantly different ($P = 0.05$, LSD)

DAP = Days after planting

NSD = No significant difference due a P -value > 0.05

Table 4. Potato shoot density at harvest (124DAP)

No.	Treatment	Product rate (L/ha)	Density of potatoes cv. Kestrel shoots (number of shoots per m ²) 124DAP 14/05/20
1	Untreated control	Nil	17.6
2	Seasol Commercial Seaweed Concentrate	10	17.4
<i>P</i> -value (two-tail)			0.8948
t-Statistic			0.1360
Pearson Correlation			0.3083
t-Critical (two-tail)			2.2622
Result ($P \leq 0.05$)			NSD

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

DAP = Days after planting

NSD = No significant difference due a P -value > 0.05

Table 5. Number of potato tubers at harvest (124DAP)

No.	Treatment	Product rate (L/ha)	Number of potato cv. Kestrel tubers at harvest (number of tubers per m ²) 124DAP 14/05/20			
			Small (<110 g)	Medium (110-280 g)	Large (>280 g)	Total
1	Untreated control	Nil	14.4	18.6	2.1	35.3
2	Seasol Commercial Seaweed Concentrate	10	14.5	21.1	2.5	38.0
<i>P</i> -value (two-tail)			0.9761	0.0567	0.2735	0.0885
t-Statistic			-0.0308	-2.1856	-1.1662	-1.9098
Pearson Correlation			0.4198	-0.0553	0.5736	0.3617
t-Critical (two-tail)			2.2622	2.2622	2.2622	2.2622
Result (<i>P</i> ≤ 0.05)			NSD	NSD	NSD	NSD

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

volume of 40 L/ha

* Each subplot was 3 m x 2 rows = 5.4 m²

DAP = Days after planting

NSD = No significant difference due a *P*-value > 0.05

Table 6. Weight of potato tubers at harvest (124DAP)

No.	Treatment	Product rate (L/ha)	Weight of potato cv. Kestrel tubers at harvest (kg of tubers per m ²) 124DAP 14/05/20			
			Small (<110 g)	Medium (110-280 g)	Large (>280 g)	Total
1	Untreated control	Nil	1.07	3.38	0.73	5.18 b
2	Seasol Commercial Seaweed Concentrate	10	1.07	3.78	0.87 [^]	5.72 a
<i>P</i> -value (two-tail)			0.9983	0.0956	0.2521	0.0406
t-Statistic			0.0022	-1.8617	-1.2239	-2.3894
Pearson Correlation			0.5527	-0.1078	0.5607	0.3489
t-Critical (two-tail)			2.2622	2.2622	2.2622	2.2622
Result (<i>P</i> ≤ 0.05)			NSD	NSD	NSD	Significant

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

Means followed by the same letter are not significantly different (*P* = 0.05, LSD)

[^] Included a single 720 g tuber harvested from one 3 m x 2 row (5.4 m²) subplot

DAP = Days after planting

NSD = No significant difference due a *P*-value > 0.05

Table 7. Potato tuber specific gravity and dry matter (124DAP)

No.	Treatment	Product rate (L/ha)	Specific gravity and dry matter of potato cv. Kestrel tubers 124DAP 14/05/20	
			Specific gravity	Dry matter (%)
1	Untreated control	Nil	1.055	16.4
2	Seasol Commercial Seaweed Concentrate	10	1.057	16.8

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

DAP = Days after planting

Table 8. Common scab incidence on potato tubers at harvest (124DAP)

No.	Treatment	Product rate (L/ha)	Common scab (<i>Streptomyces scabies</i>) incidence on potato cv. Kestrel tubers at harvest 124DAP 14/05/20	
			Affected tubers by number assessed (%)	Affected tubers by weight (%)
1	Untreated control	Nil	6	7.6
2	Seasol Commercial Seaweed Concentrate	10	6	6.4

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

DAP = Days after planting

Table 9. Potato value at harvest (124DAP)

No.	Treatment	Rate (L/ha)	Potato value* 124DAP 14/05/20	
			\$/m ²	\$/ha
1	Untreated control	Nil	2.46	24560
2	Seasol Commercial Seaweed Concentrate	10	2.74	27430

Note, Seasol Commercial was applied at 10 L/ha at 6DAP, 27DAP, 50DAP and 83DAP, for a total application volume of 40 L/ha.

DAP = Days after planting

*calculated based on the following prices, which were current at the time of harvest: Waste \$0/t (none at harvest for this trial), Small \$50/t, Medium \$700/t, Large \$50/t.

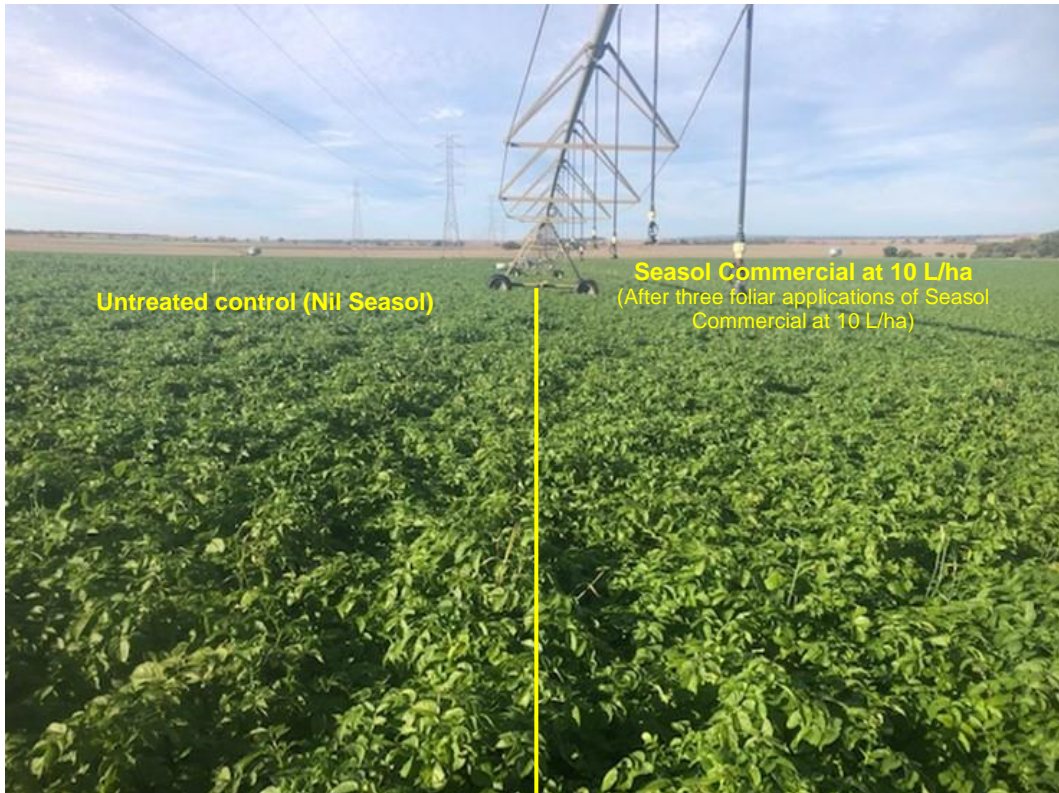
PHOTOGRAPHS



Photograph 1: Trial site with centre pivot irrigator at 27DAP (07/02/20)



Photograph 2: Potato tuber development at 52DAP (03/03/20)
BBCH 44: 40% of total final tuber mass reached (king tuber 30 mm)



Photograph 3: Crop growth at 90DAP (10/04/20)



Photograph 4: Potato tuber development at 90DAP (10/04/20)
BBCH 47: 70% of total final tuber mass reached (king tuber 65 mm)



Photograph 5: Tubers after lifting at 124DAP (14/05/20)



Photograph 6: Examples of tubers in each of the three size groups

DISCUSSION

At Caloote, South Australia in 2020, a non-replicated field trial was established to evaluate the effect of Seasol Commercial Seaweed Concentrate on the growth and yield of commercially grown potatoes cv. Kestrel. Seasol Commercial was applied by the grower through the centre pivot during the normal irrigation cycle (fertigation), with the first application on 17/01/20, 6-days after planting, and a further three applications at 21-33-day intervals. A Dosatron injection system was used to add 10 L of Seasol Commercial to each 90 L of irrigation water, applied at a total volume of 100 L/ha.

After planting, ten subplots were marked out in the Seasol Commercial treated areas of the paddock and each was paired with an untreated control subplot. The addition or omission of Seasol Commercial was the only agronomic difference between the two treatments. The trial and commercial crop were banked on 31/01/20, a week before the second Seasol Commercial application, to remove weeds in the inter row space and bury young weeds along the plant row.

At 4-weeks after planting (27-days after planting, 27DAP), there were no differences in crop emergence between treatments (Table 1).

Crop normalised difference vegetation index (NDVI) as a measure of crop greenness and crop vigour were assessed at 52DAP, two days after the third foliar application of Seasol during mid-tuber bulking and again at 90DAA when king tubers were 65 mm diameter. At 90DAP, the Seasol Commercial treated crop was significantly greener and more vigorous than the untreated control (Tables 2 and 3).

The trial was harvested on 14/05/20. Prior to harvest, there was an equivalent number of shoots in each treatment (Table 4). Potatoes were lifted, graded into three weight categories (<110 g, 110-280 g and >280 g), counted, and weighed. Four applications of Seasol Commercial significantly increased the total weight of tubers harvested and caused a numerical increase in tuber number and weight for each of the weight grades (Tables 5 and 6). Potatoes treated with Seasol Commercial yielded \$2870/ha more than the untreated potatoes (Table 9), due to producing slightly heavier medium and large tubers (Table 6).

A sample of tubers from each treatment was used to determine specific gravity, dry matter, and common scab (*Streptomyces scabies*) incidence. Both treatments had a specific gravity of 1.055-1.057 and 16.4-16.8% dry matter (Table 7). Six percent of tubers (by number) in both treatments had common scab while, there was less common scab by weight of Seasol Commercial tubers than in the untreated control.

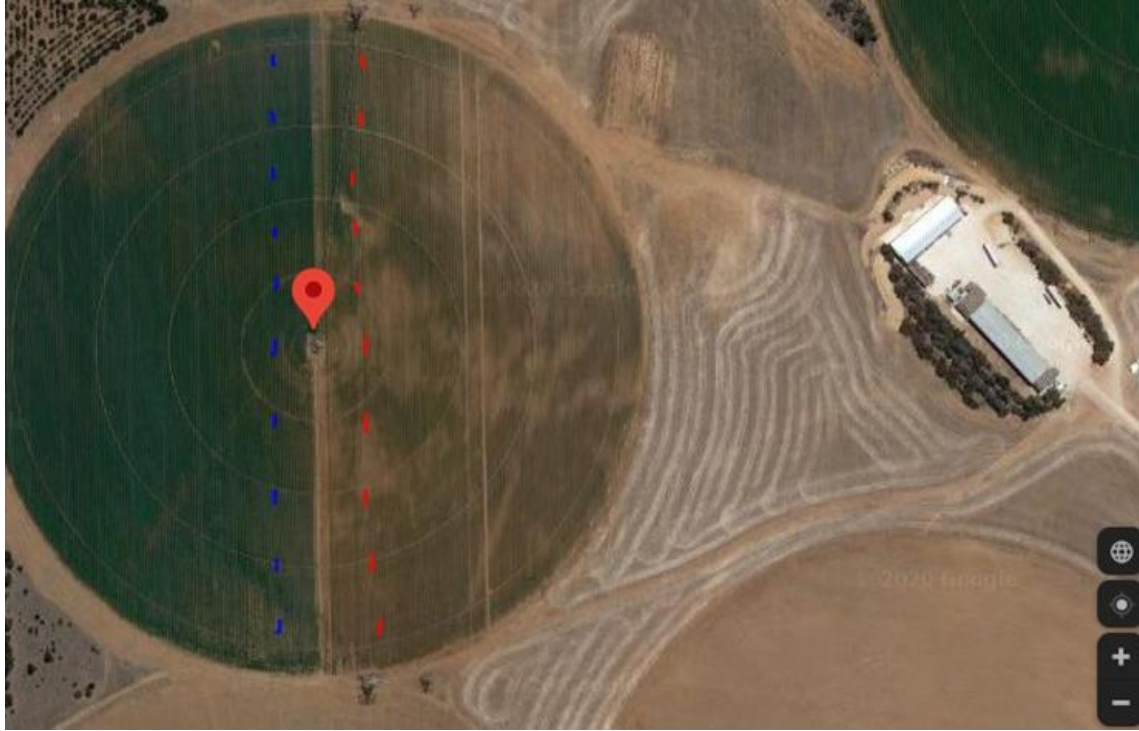
CONCLUSIONS

- There were no differences in crop emergence between treatments.
- The Seasol Commercial treated crop was significantly greener and more vigorous than the untreated control when king tubers were 65 mm diameter (70% final size).
- Prior to harvest, there were the same number of shoots in each treatment.
- Four applications of Seasol Commercial significantly increased the total weight of tubers harvested and caused a numerical increase in tuber number and weight for each of the weight grades.
- Seasol Commercial did not seem to affect specific gravity or dry matter of tubers.

APPENDICES**Appendix i. Trial details****Site details**

Location	Caloote, South Australia, Australia, 5254
GPS co-ordinates	-35.0026, 139.2548 (centre of centre pivot)
Soil type	Sandy loam
Soil texture	Loamy sand
Crop	Potatoes
Variety	Kestrel
Trial design	Non-replicated paddock trial
Replications	1
Number of subplots	10
Subplot size	3 m x 2 rows (5.4 m ²)
Plant spacing	27 cm (3.7 plants per metre of row)
Row spacing	0.9 m
Plant density	41,111 plants per hectare
Planting date	11/01/20
Harvest date	14/05/20
Irrigation type	Centre pivot
Previous crop	Onions

Trial plan



Blue lines are the locations of the 10 untreated control subplots. The paired Seasol Commercial treated subplots are indicated by the red lines. Note, this Google Map image was not taken during the trial period and does not represent the difference between treatments.

Trial location map



Application details – spray

Application equipment				
Method	Seasol Commercial was applied with a Dosatron injection system through a centre pivot irrigator (fertigation) during the normal irrigation cycle			
Equipment	Dosatron dispenser			
Nozzle type	Rotating sprinkler head			
Application volume (L/ha)	100 L/ha (made up of 10 L Seasol Commercial plus 90 L water)			
Treatment applications				
Application timing	A	B	C	D
Dates	17/01/20	07/02/20	01/03/20	03/04/20
Days after application timing	0DAAA	21DAAA	23DAAB	33DAAC
Days after planting	6DAP	27DAP	50DAP	83DAP
Treatment applied	2	2	2	2
Temperature (°C)	17.8	20.2	18.3	18.0
Relative humidity (%)	58	88	75	74
Cloud cover (%)	60	90	40	40
Wind direction	S	W	N	N
Wind speed (kph)	26	2	17	11
Crop stage description	Beginning of root formation	6 to 9 or more leaves of main stem unfolded (> 4cm)	40% of total final tuber mass reached	70% of total final tuber mass reached
Crop stage (BBCH)	05	16-19	44	47

Soil details

Laboratory name	Australian Precision Ag Laboratory (APAL)
Date soil sampled	30/01/19
Sample depth	15 cm
Soil type at site	Sandy loam
Soil texture	Loamy sand
Organic carbon (OC)	0.61%
Cation exchange capacity (CEC)	17.1
pH (1:5 H ₂ O)	7.98
pH (1:5 CaCl ₂)	7.43
Nitrate nitrogen (NO ₃)	20
Phosphorus – Colwell (P)	62
Phosphorus buffer index (PBI-Col)	34
Potassium- Colwell (K)	450
Potassium (Amm-acet)	443
Calcium (Amm-acet)	2850
Magnesium (Amm-acet)	170
Sodium (Amm-acet)	82
Calcium to magnesium ratio	10.17
Potassium to magnesium ratio	0.81
Sulphate sulphur (KCl)	16
Electrical conductivity (EC)	0.26
Copper (DTPA)	2.9
Zinc (DTPA)	4
Manganese (DTPA)	8.3
Iron (DTPA)	8
Boron (Hot CaCl ₂)	0.61

Assessments

Potato emergence assessment		
Date	07/02/20	
Days after application timing	21DAAA	
Days after planting	27DAP	
Sample size	6 metres of row per subplot	
Method	The number of emerged potato plants in 6 metres of row were counted in each subplot, with results expressed as the mean number of plants emerged per 1 metre of row.	
Potato vigour assessment		
Dates	03/03/20	10/04/20
Days after application timing	2DAAC	7DAAD
Days after planting	52DAP	90DAP
Sample size	Whole subplot	
Method	Potato plants were given a rating of 1-10 on a whole plot basis, where 1 = complete crop death and 10 = most vigorous plot.	
Normalised difference vegetation index (NDVI) assessment		
Dates	03/03/20	10/04/20
Days after application timing	2DAAC	7DAAD
Days after planting	52DAP	90DAP
Sample size	2 passes per subplot	
Method	Crop greenness was measured on the normalised difference vegetation index (NDVI), determined using a hand-held GreenSeeker® crop sensor. The GreenSeeker® was run over the centre of each subplot, with an average measurement taken over the entire length of the plot. Results are expressed as the mean NDVI of both passes.	
Potato shoot density assessment		
Date	14/05/20	
Days after application timing	41DAAD	
Days after planting	124DAP	
Sample size	Whole subplot	
Method	Prior to harvest, the number of potato shoots were counted in each subplot, with results expressed as the mean number of shoots per m ² .	

Tuber yield assessment – number, weight and value	
Date	14/05/20
Days after application timing	41DAAD
Days after planting	124DAP
Sample size	Whole subplot
Method	<p>Potato tubers were hand-dug from each subplot, and graded by size into three categories:</p> <p>Small = <110 g Medium = 110-280 g Large = >280 g</p> <p>The number of tubers in each category were counted and tubers were weighed to determine the number and weight of tubers per plot (5.4 m²). Total tuber number and weight were calculated by adding the data from each of the three categories. Results are expressed as the mean number or weight of tubers per m².</p> <p>The market value of the potatoes was calculated based on local prices at the time of harvest (Waste \$0/t, Small \$50/t, Medium \$700/t, Large \$50/t).</p>
Specific gravity assessment	
Date	14/05/20
Days after application timing	41DAAD
Days after planting	124DAP
Sample size	5 kg of tubers per treatment
Method	<p>Specific gravity was measured on 5 kg of tubers from each of the untreated control and the Seasol Commercial treatment. The weight of tubers in air and in water were measured, and these values were used to calculate specific gravity:</p> <p>Specific gravity = Weight in air / (Weight in air – Weight in water)</p> <p>Dry matter is from Table 1: A ready reckoner for estimating dry matter (DM) in the Agriculture Victoria AgNote number AG0323 "Potatoes: Factors affecting dry matter."</p>
Common scab assessment	
Date	14/05/20
Days after application timing	41DAAD
Days after planting	124DAP
Sample size	50 tubers per treatment (5 tubers from each of 10 subplots)

Method	At harvest, 5 tubers from each subplot were bulked to obtain a total of 50 tubers per treatment and were weighed to determine total weight per 50 tubers. Tubers were cleaned and the number of tubers with common scab (<i>Streptomyces scabies</i>) were counted and weighed. Results were expressed as % scab infection by weight and % infection by tuber number.
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Statistical analysis	Data analysis was conducted using Microsoft Excel's Data Analysis Tool ' <i>t-Test: Paired two sample for Means</i> ' feature, the data from paired subplots in treatment 1 (untreated control) were compared to those in treatment 2 (Seasol Commercial). The null hypothesis that both treatments were the same (hypothesised mean difference = 0) and two-tailed P-value was used to determine treatment differences at the 5% level (alpha level of 0.05).
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Appendix ii. Statistical analysis

Potato emergence at 27DAP

t-Test: Paired Two Sample for Means Plant emergence per 1 m of row (07/02/20, 27DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	3.08	3.03
Variance	0.156	0.073
Observations	10	10
Pearson Correlation	0.4635	
Hypothesized Mean Difference	0	
df	9	
t Stat	0.4386	
P(T<=t) one-tail	0.3356	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.6713	
t Critical two-tail	2.2622	

Crop vigour at 52DAP and 90DAP

t-Test: Paired Two Sample for Means Crop vigour (1-10 scale) at 03/03/20, 52DAP		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	9.0	9.3
Variance	0.67	0.46
Observations	10	10
Pearson Correlation	0.2016	
Hypothesized Mean Difference	0	
df	9	
t Stat	-1.0000	
P(T<=t) one-tail	0.1717	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.3434	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Crop vigour (1-10 scale) at 10/04/20, 90DAP		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	9.1	9.8
Variance	0.99	0.40
Observations	10	10
Pearson Correlation	0.3887	
Hypothesized Mean Difference	0	
df	9	
t Stat	-2.3333	
P(T<=t) one-tail	0.0223	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0445	
t Critical two-tail	2.2622	

Potato crop NDVI at 52DAP and 90DAP

t-Test: Paired Two Sample for Means Normalised difference vegetation index (NDVI) (03/03/20, 52DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	0.85	0.85
Variance	0.000105556	5.13889E-05
Observations	10	10
Pearson Correlation	0.3394	
Hypothesized Mean Difference	0	
df	9	
t Stat	-0.7645	
P(T<=t) one-tail	0.2321	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.4642	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Normalised difference vegetation index (NDVI) (10/04/20, 90DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	0.84	0.87
Variance	0.001423333	0.000155556
Observations	10	10
Pearson Correlation	0.5431	
Hypothesized Mean Difference	0	
df	9	
t Stat	-3.0968	
P(T<=t) one-tail	0.0064	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0128	
t Critical two-tail	2.2622	

Potato shoot density at harvest (124DAP)

t-Test: Paired Two Sample for Means Number of potato shoots per m2 (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	17.6	17.4
Variance	5.59	7.48
Observations	10	10
Pearson Correlation	0.3083	
Hypothesized Mean Difference	0	
df	9	
t Stat	0.1360	
P(T<=t) one-tail	0.4474	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.8948	
t Critical two-tail	2.2622	

Number of potato tubers at harvest (124DAP)

t-Test: Paired Two Sample for Means Number of small (<110 g) tubers per m2 (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	14.4	14.5
Variance	16.89	5.96
Observations	10	10
Pearson Correlation	0.4198	
Hypothesized Mean Difference	0	
df	9	
t Stat	-0.0308	
P(T<=t) one-tail	0.4880	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.9761	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Number of medium (110-280 g) tubers per m2 (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	18.6	21.1
Variance	4.61	6.90
Observations	10	10
Pearson Correlation	-0.0553	
Hypothesized Mean Difference	0	
df	9	
t Stat	-2.1856	
P(T<=t) one-tail	0.0283	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0567	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Number of large (>280 g) tubers per m2 (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	2.1	2.5
Variance	0.93	1.18
Observations	10	10
Pearson Correlation	0.5736	
Hypothesized Mean Difference	0	
df	9	
t Stat	-1.1662	
P(T<=t) one-tail	0.1368	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.2735	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Total number of tubers per m2 (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	35.3	38.0
Variance	11.72	19.55
Observations	10	10
Pearson Correlation	0.3617	
Hypothesized Mean Difference	0	
df	9	
t Stat	-1.9098	
P(T<=t) one-tail	0.0442	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0885	
t Critical two-tail	2.2622	

Weight of potato tubers at harvest (124DAP)

t-Test: Paired Two Sample for Means Weight of small (<110 g) tubers per m2 (kg) (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	1.07	1.07
Variance	0.039	0.104
Observations	10	10
Pearson Correlation	0.5527	
Hypothesized Mean Difference	0	
df	9	
t Stat	0.0022	
P(T<=t) one-tail	0.4992	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.9983	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Weight of medium (110-280 g) tubers per m2 (kg) (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	3.38	3.78
Variance	0.186	0.241
Observations	10	10
Pearson Correlation	-0.1078	
Hypothesized Mean Difference	0	
df	9	
t Stat	-1.8617	
P(T<=t) one-tail	0.0478	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0956	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Weight of large (>280 g) tubers per m2 (kg) (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	0.73	0.87
Variance	0.132	0.148
Observations	10	10
Pearson Correlation	0.5607	
Hypothesized Mean Difference	0	
df	9	
t Stat	-1.2239	
P(T<=t) one-tail	0.1260	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.2521	
t Critical two-tail	2.2622	

t-Test: Paired Two Sample for Means Total weight of tubers per m2 (kg) (14/05/20, 124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Mean	5.18	5.72
Variance	0.390	0.395
Observations	10	10
Pearson Correlation	0.3489	
Hypothesized Mean Difference	0	
df	9	
t Stat	-2.3894	
P(T<=t) one-tail	0.0203	
t Critical one-tail	1.8331	
P(T<=t) two-tail	0.0406	
t Critical two-tail	2.2622	

Appendix iii. Plot data**Potato emergence at 27DAP**

Plant emergence per 1 m of row (07/02/20, 27DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	3.17	3.33
2	3.67	2.83
3	2.83	3.00
4	3.00	3.00
5	3.17	2.83
6	3.67	3.50
7	2.67	2.83
8	3.33	3.33
9	2.50	3.00
10	2.83	2.67
Total	30.84	30.32
Mean	3.08	3.03

Crop vigour at 52DAP and 90DAP

Crop vigour (1-10 scale) at 03/03/20, 52DAP		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	8	9
2	9	8
3	9	9
4	9	10
5	8	9
6	8	10
7	10	9
8	10	10
9	9	9
10	10	10
Total	90	93
Mean	9.0	9.3

Crop vigour (1-10 scale) at 10/04/20, 90DAP		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	9	10
2	8	8
3	9	10
4	10	10
5	7	10
6	9	10
7	9	10
8	10	10
9	10	10
10	10	10
Total	91	98
Mean	9.1	9.8

Potato crop NDVI at 52DAP and 90DAP

Normalised difference vegetation index (NDVI) (03/03/20, 52DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	0.83	0.85
2	0.84	0.84
3	0.84	0.84
4	0.85	0.86
5	0.84	0.85
6	0.84	0.86
7	0.86	0.85
8	0.86	0.86
9	0.85	0.84
10	0.86	0.85
Total	8.45	8.48
Mean	0.85	0.85

Normalised difference vegetation index (NDVI) (10/04/20, 90DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	0.83	0.87
2	0.83	0.84
3	0.83	0.88
4	0.88	0.88
5	0.75	0.86
6	0.82	0.87
7	0.86	0.88
8	0.86	0.88
9	0.88	0.88
10	0.87	0.88
Total	8.38	8.70
Mean	0.84	0.87

Potato shoot density at harvest (124DAP)

Number of potato shoots per m2 (14/05/20, 124DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	21	15
2	19	19
3	19	18
4	19	17
5	17	18
6	17	18
7	18	20
8	18	19
9	13	11
10	14	20
Total	176	174
Mean	17.6	17.4

Number of potato tubers at harvest (124DAP)

Number of small (<110 g) tubers per m ² (14/05/20, 124DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	18	14
2	10	14
3	11	9
4	15	13
5	14	13
6	14	16
7	14	13
8	18	20
9	16	11
10	16	22
Total	145	144
Mean	14.5	14.4

Number of medium (110-280 g) tubers per m ² (14/05/20, 124DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	20	21
2	19	20
3	17	21
4	16	25
5	15	21
6	20	25
7	21	23
8	20	20
9	18	17
10	20	18
Total	186	211
Mean	18.6	21.1

Number of large (>280 g) tubers per m ² (14/05/20, 124DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	1	1
2	2	4
3	3	4
4	4	3
5	1	1
6	2	2
7	2	3
8	1	1
9	3	2
10	2	4
Total	21	25
Mean	2.1	2.5

Total number of tubers per m ² (14/05/20, 124DAP)		
Plot	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
1	39	36
2	31	37
3	31	34
4	35	41
5	30	36
6	36	43
7	37	39
8	39	41
9	36	30
10	38	44
Total	353	380
Mean	35.3	38.0

Weight of potato tubers at harvest (124DAP)

Weight of small (<110 g) tubers per m ² (kg) (14/05/20, 124DAP)			
Plot	<i>Untreated control (Nil Seasol)</i>		<i>Seasol Commercial (10 L/ha)</i>
1	1.24		0.98
2	0.75		0.96
3	0.96		0.68
4	0.94		0.93
5	0.89		0.96
6	1.00		1.07
7	1.05		0.96
8	1.36		1.66
9	1.27		0.84
10	1.23		1.64
Total	10.68		10.68
Mean	1.07		1.07

Weight of medium (110-280 g) tubers per m ² (kg) (14/05/20, 124DAP)			
Plot	<i>Untreated control (Nil Seasol)</i>		<i>Seasol Commercial (10 L/ha)</i>
1	3.43		3.80
2	3.61		3.59
3	3.17		3.67
4	2.94		4.76
5	2.44		3.66
6	3.59		4.21
7	3.89		4.16
8	3.77		3.63
9	3.35		3.12
10	3.57		3.19
Total	33.76		37.80
Mean	3.38		3.78

Weight of large (>280 g) tubers per m ² (kg) (14/05/20, 124DAP)			
Plot	<i>Untreated control (Nil Seasol)</i>		<i>Seasol Commercial (10 L/ha)</i>
1	0.49		0.42
2	0.65		1.16
3	0.95		1.37
4	1.54		1.10
5	0.21		0.49
6	0.56		0.69
7	0.73		1.11
8	0.48		0.37
9	0.95		0.64
10	0.77		1.33
Total	7.33		8.69
Mean	0.73		0.87

Total weight of tubers per m ² (kg) (14/05/20, 124DAP)			
Plot	<i>Untreated control (Nil Seasol)</i>		<i>Seasol Commercial (10 L/ha)</i>
1	5.15		5.20
2	5.01		5.71
3	5.08		5.72
4	5.42		6.79
5	3.54		5.11
6	5.15		5.98
7	5.68		6.24
8	5.61		5.66
9	5.56		4.60
10	5.57		6.16
Total	51.77		57.17
Mean	5.18		5.72

Potato tuber specific gravity and dry matter (124DAP)

Potato tuber specific gravity and dry matter (124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Number of tubers	26	26
Weight of tubers in air (kg)	5.00	5.00
Weight of tubers in water (kg)	0.26	0.27
Specific gravity	1.055	1.057
Dry matter (%)	16.4	16.8

Specific gravity = Weight in air / (weight in air - weight in water)

Dry matter calculated from Agriculture Victoria AgNote AG0323 Potatoes: Factors affecting dry matter

Common scab incidence on potato tubers at harvest (124DAP)

Common scab incidence on potato tubers at harvest (124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
Incidence by number (%)	6	7.6
Incidence by weight (%)	6	6.4

Potato value at harvest (124DAP)

Potato value at harvest (124DAP)		
	<i>Untreated control (Nil Seasol)</i>	<i>Seasol Commercial (10 L/ha)</i>
\$/m ²	2.46	24560
\$/ha	2.74	27430

Appendix iv. Meteorological details

Year: 2020

Location: Murray Bridge (Pallamana aerodrome), South Australia, Australia

	January 2020			February 2020			March 2020					
	Min °C	Max °C	mm	Min °C	Max °C	mm	Min °C	Max °C	mm			
1	8.9	28.2	0	19.2	19.8	13.0	Seasol C	11.5	32.6	0		
2	9.1	33.0	0	11.5	24.4	2.8		13.5	22.0	1.4		
3	9.3	42.9	0	14.5	21.6	0	Assess	9.0	22.3	0		
4	19.1	24.0	0	8.3	24.8	0.2		12.5	22.4	0		
5	12.6	16.2	0.4	10.7	25.5	0		14.8	22.2	1.2		
6	9.1	26.0	1.2	12.3	29.8	0		14.1	25.9	0		
7	13.8	32.4	0	Assess Seasol B	16.8	30.4	0		11.1	23.8	0	
8	15.7	36.0	0		18.4	32.3	8		9.7	24.5	0	
9	14.4	41.5	0		17.1	31.9	0		11.1	25.1	0	
10	22.2	24.7	0		18.4	31.9	0.2		11.6	31.0	0	
11	Plant	13.1	22.7	1.0		17.3	24.2	0		10.9	35.7	0
12		9.8	28.6	0.2		16.2	26.0	0		14.2	35.4	0
13		10.9	36.1	0		17.6	31.7	0		15.7	21.5	0
14		17.0	34.7	0		17.8	29.1	0		7.7	21.2	0
15		17.1	25.7	0		16.5	22.6	0.2		7.5	24.2	0
16		15.7	23.9	0		16.1	24.0	0		7.0	28.8	0
17	Seasol A	9.0	23.4	0		12.8	32.1	0		11.6	34.5	0
18		11.0	28.7	0		15.6	25.6	0		16.1	34.7	0
19		14.7	23.7	0		14.0	22.6	0		18.1	34.4	0
20		15.0	19.7	14.6		10.0	22.6	0		12.8	25.0	0
21		14.9	29.7	2.0		13.0	24.3	0		8.6	25.6	0
22		15.8	29.4	0		9.4	27.2	0		12.7	21.7	0
23		14.6	22.8	0.6		12.2	34.3	0		8.0	22.2	0
24		10.0	25.5	0		13.6	34.2	0		12.0	20.7	0
25		12.6	29.4	0		15.9	27.7	0		9.1	20.9	0
26		17.3	28.0	0		13.0	21.2	0		5.7	24.0	0
27		11.8	27.7	0		9.3	24.4	0		8.1	28.3	0
28		10.1	31.6	0		14.6	24.7	NR		5.7	33.5	0
29		12.2	39.4	0		13.1	31.0	0		14.6	28.7	0
30		13.2	45.8	0						8.5	24.2	0
31		29.8	39.4	0						6.7	25.4	0
Total			20.0				24.4				2.6	

NR = Not recorded

The trial site was situated at Caloote, 7 km from the Murray Bridge (Pallamana aerodrome) (BOM 024584) weather station.

Year: 2020

Location: Murray Bridge (Pallamana aerodrome), South Australia, Australia

	April 2020				May 2020			
		Min °C	Max °C	mm		Min °C	Max °C	mm
1		11.0	17.1	0		8.3	17.2	6.6
2		9.7	24.3	6.0		13.2	18.1	0.8
3	Seasol D	12.8	27.3	0		10.5	15.2	1.0
4		12.4	20.6	4.4		11.4	17.6	0
5		10.0	21.6	0		3.5	20.3	0
6		11.6	19.3	0		5.9	22.9	0
7		12.1	20.2	0		9.3	22.1	0
8		11.4	20.7	0		9.9	19.6	1.6
9		8.1	22.7	0		9.1	15.6	10.8
10	Assess	7.0	24.3	0		7.3	17.2	0
11		14.6	19.7	0		5.2	18.7	0
12		11.3	19.2	0		7.0	19.5	0
13		3.1	26.1	0		8.7	14.7	5.2
14		8.3	31.5	0	Harvest Assess	8.8	15.1	0
15		7.7	30.9	0		1.8	15.6	0
16		13.5	22.2	0		1.3	19.3	0
17		6.6	20.7	0		1.9	19.8	0
18		8.6	19.5	0		2.7	21.9	0
19		7.1	23.3	1.2		4.6	23.0	0
20		13.2	21.6	0.4		5.1	16.5	0.2
21		8.2	25.0	0		7.4	14.7	5.8
22		9.2	24.3	0		8.8	15.5	0
23		8.1	22.8	0		11.7	15.3	4.8
24		7.5	23.4	3.8		10.2	14.1	2.8
25		9.3	27.5	0.2		6.7	14.0	0
26		14.5	19.3	20.8		3.7	16.6	0
27		7.0	19.2	0		7.8	18.3	0.4
28		8.3	20.0	0		4.6	18.1	0
29		12.6	16.0	1.6		2.2	19.7	0
30		8.4	14.9	15.4		4.0	22.1	0
31						6.8	16.2	0
Total				53.8				40.0