

FINAL REPORT

Evaluation of SOSBio ecoNPK for yield improvement in sweet potato

by

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January 2019

Title of Project: Evaluation of SOSBio ecoNPK for yield improvement in sweet potato.

Project Protocol No. SOSBio ecoNPK-Golbey-2018

Project No. AA-V0009

Report No. AA-V0009-1

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CONTENTS

ABSTRACT	5
INTRODUCTION.....	6
ABBREVIATIONS.....	7
PROTOCOL DEVIATIONS	8
RESULTS	9
Table 1. IPOBA Yield.....	9
Table 2. IPOBA Tuber Number.....	10
Table 3. IPOBA Average Tuber Weight.....	11
Table 4. IPOBA Internal Colour Rating.....	12
PHOTOGRAPHS	13
SOIL DETAILS	14
CONCLUSIONS.....	15
APPENDICES.....	16
Appendix I. Treatment details	16
Appendix II. Site details	19
Appendix III. Statistical analysis.....	23
Appendix IV. Meteorological details.....	31
REFERENCES.....	34

ABSTRACT

A replicated field trial was conducted at a commercial sweet potato property at Windermere (Bundabrg), Queensland in 2018, to evaluate SOSBio ecoNPK for yield improvement in sweet potato (*Ipomoea batatas*) [IPOBA] cv. Eclipse.

Under the condition of this trial, SOSBio ecoNPK significantly improved the IPOBA total, large and medium tuber yield and tuber number and total and large average tuber weight when compared to the GSP.

Key Words

SOSBio ecoNPK, *Ipomoea batatas*, yield (t/ha)

INTRODUCTION

Background

Nutrient management is an important component in the production of sweet potato (*Ipomoea batatas*) [IPOBA], in particular nitrogen (N). Successful production of storage roots requires careful management of soil N availability¹. Under ideal conditions, available soil N is adequate to support the shoot development and photosynthetic activity needed to provide the photoassimilates for the growth of the storage roots. Excessive soil N conditions increases shoot development which becomes a competitive sink to storage roots³, which in turn decreases yield.

Estimated crop removal of macro elements (kg/ha) is:

- 100 kg N
- 90 kg P
- 200 kg K
- 200 kg Ca

A general plant nutrition recommendation for successful sweet potato production is²;

Fertiliser	Planting	4-6 weeks	10-12 weeks
N	50 kg	25 kg	25 kg
P	90 kg		
K	50 kg	75 kg	75 kg
Ca	200 kg		

Objectives

To evaluate SOSBio ecoNPK to grower standard practice for yield improvement in sweet potato.

Methods

A strip field trial was conducted at a commercial sweet potato property at Windermere (Bundaberg), Queensland. Treatments were applied once, using commercial growing equipment at bed formation, prior to transplanting.

Harvestable tubers were harvested and graded according to size and marketability at either 195 or 202 DA-P.

Data was analysed using two sample t-test, with Microsoft Excel, assuming equal variances.

Conclusion

The collected efficacy data reflect the test products efficacy and no external biotic factors have influenced the trial.

Weather conditions during the trial were considered typical for this time of year.

Under the condition of this trial, SOSBio ecoNPK significantly improved the IPOBA total, large and medium tuber yield and tuber number and total and large average tuber weight when compared to the GSP.

ABBREVIATIONS

Short Abbreviation	Expanded Text
IPOBA	<i>Ipomoea batatas</i> cv. Eclipse
N	Nitrogen
P	Phosphorus
K	Potassium
Ca	Calcium
GSP	Grower standard practice
# DA-P	Number of days after planting
ATBEDD	At bed formation
BROSOI	Broadcast soil
°C	Degrees Celsius
KPH	kilometre per hour
CULROT	cultivator - rotary

PROTOCOL DEVIATIONS

All work undertaken followed the test site SOPs. In case of any conflict between the SOPs and the protocol, the protocol took priority.

RESULTS

Table 1. IPOBA Yield

Treatment	Rate (kg/ha)	IPOBA Yield (mean t/ha)				
		Total	Large	Medium	Med/Small	Small
1 GSP	--	14.945 a	0.417 a	6.195 a	4.167	1.445
2 SOSBio ecoNPK	500	30.613 b	6.973 b	16.445 b	5.861	1.500
t Stat		-4.709	-3.4165	-3.114	-1.348	-0.097
P(T<=t) one-tail		0.000	0.0033	0.005	0.104	0.462

GSP = Grower Standard Practice

Means followed by same letter do not significantly differ (P=0.05, Two-Sample Assuming Equal Variances)

SOSBio ecoNPK at 500 kg/ha, when evaluated as a large split plot, significantly increased IPOBA marketable yield (total, large and medium) when compared to the GSP. SOSBio ecoNPK numerically increased the average IPOBA yield of medium/small when compared to the GSP

Table 2. IPOBA Tuber Number

Treatment	Rate (kg/ha)	IPOBA Tuber Number (mean tuber number/ha)				
		Total	Large	Medium	Med/Small	Small
1 GSP	--	41668.750 a	55.583 a	15000.75 a	15000.75	11111.667
2 SOSBio ecoNPK	500	53891.583 b	5833.635 b	26112.417 b	16111.75	6667.00
t Stat		-1.943	-2.650	-2.185	-0.293	-1.465
P(T<=t) one-tail		0.040	0.012	0.027	0.388	0.087

GSP = Grower Standard Practice

Means followed by same letter do not significantly differ (P=0.05, Two-Sample Assuming Equal Variances)

SOSBio ecoNPK at 500 kg/ha, when evaluated as a large split plot, significantly increased IPOBA tuber number (total, large and medium) when compared to the GSP. SOSBio ecoNPK numerically increased the average IPOBA tuber number of medium/small and small when compared to the GSP.

Table 3. IPOBA Average Tuber Weight

Treatment	Rate (kg/ha)	IPOBA Tuber Weight (kg/tuber)				
		Total	Large	Medium	Med/Small	Small
1 GSP	--	0.357 a	0.250 a	0.592	0.273	0.130
2 SOSBio ecoNPK	500	0.579 b	1.260 b	0.623	0.363	0.187
t Stat		-3.338	-4.777	-0.122	-2.768	-1.305
P(T<=t) one-tail		0.004	0.000	0.453	0.010	0.110

GSP = Grower Standard Practice

Means followed by same letter do not significantly differ (P=0.05, Two-Sample Assuming Equal Variances)

SOSBio ecoNPK at 500 kg/ha, when evaluated as a large split plot, significantly increased average IPOBA tuber weight (total, and large) when compared to the GSP. SOSBio ecoNPK numerically increased the average IPOBA tuber weight of medium, medium/small and small when compared to the GSP

Table 4. IPOBA Internal Colour Rating

Treatment	Rate (kg/ha)	IPOBA Internal Colour Rating (1 - 10)
		Av
1 GSP	--	5.217
2 SOSBio ecoNPK	500	4.517
t Stat		1.568
P(T<=t) one-tail		0.074

GSP = Grower Standard Practice

Means followed by same letter do not significantly differ (P=0.05, Two-Sample Assuming Equal Variances)

SOSBio ecoNPK at 500 kg/ha, when evaluated as a large split plot, did not numerically or significantly improve the internal tuber colour uniformity when compared to the GSP.

PHOTOGRAPHS



Photograph 1: Site at Harvest, 195 DA-P



Photograph 2: Colour Uniformity Rating, 195 DA-P

SOIL DETAILS

Soil analysis report no.	B107761-011	B107761-012
Laboratory name	Phosyn Analytical	
Treatment	GSP	SOSBio ecoNPK
NO3-N (ppm)	15	15
NH4-N (ppm)	2	2
Phosphorus [Olsen] (ppm)	33	22
Potassium[Am. Acet.] (meq/100g)	0.27	0.24
Magnesium[Am. Acet.] (meq/100g)	5.04	5.28
Calcium[Am. Acet.] (meq/100g)	2.84	3.02
Sulphur [MCP] (ppm)	63	50
Manganese [DTPA] (ppm)	253.9	220.2
Boron[CaCl2] (ppm)	1.1	0.8
Copper [DTPA] (ppm)	7.1	6.1
Iron [DTPA] (ppm)	74	69
Zinc [DTPA] (ppm)	4.6	3.8
Organic Matter (%)	6.6	6.8
CEC (meq/100g)	9.18	9.7
Ca:Mg Ratio	0.56	0.57
K base saturation (%)	2.9	2.4
Mg base saturation (%)	54.8	54.5
Ca base saturation (%)	30.9	31.1
Na base saturation (%)	10.5	10.1
pH [1:5 CaCl2]	4.8	4.9
pH [1:5 H2O]	5.7	5.8
EC [1:5 H2O] (dS/m)	0.22	0.2
Aluminium[KCl] (meq/100g)	0.08	0.19
Chloride (ppm)	189	183
Sodium[Am. Acet.] (meq/100g)	0.97	0.97
Texture	CLAY	CLAY
Colour	BROWN	BROWN
Al base saturation (%)	0.8	1.9
Potassium (ppm)	104	92
Magnesium (ppm)	604	634
Calcium (ppm)	567	604
Sodium (ppm)	222	224
Aluminium (ppm)	7	17

Soil sample from each treatment area was made immediately after harvest.

CONCLUSIONS

- Under the condition of this trial, SOSBio ecoNPK significantly improved the IPOBA total, large and medium tuber yield and tuber number and total and large average tuber weight when compared to the GSP.

APPENDICES

Appendix I. Treatment details

Products

Product name	Element	Concentration
Grower Standard Practice [GSP]	Nitrogen	8.3 %
	Phosphorous	10.0 %
	Potassium	10.0 %
	Sulphur	4.6 %
	Magnesium	0.3 %
	Calcium	10.5 %
SOSBio ecoNPK	Nitrogen	4.0 %
	Phosphorous	3.0 %
	Potassium	3.0 %
	Carbon	14.0 %
	Magnesium	0.75 %
	Calcium	2.5 %
	Humates	0.13 %
	Iron	0.43 %
	Copper	167 mg/kg
	Zinc	470 mg/kg

Treatments

No.	Product	Rate		Application schedule
		Element (kg/ha N:P:K)	Product (kg/ha)	
1	GSP	41.5:50:50	500	Applied as a band and incorporated via rotary hoe during bed formation
2	SOSBio ecoNPK	20:15:15	500	

Chronology of events

Date	DA-A	Crop stage	Event
26/05/2018	-3 DA-A	- -	Treatment application
29/05/2018	0 DA-A	BBCH 00	Transplant
7/12/2018	195 DA-A	BBCH 79	Yield assessment (T1)
14/12/2018	202 DA-A	BBCH 79	Yield assessment (T2)

Appendix II. Site details

Site details

Location	Bundaberg, Queensland, Australia
GPS co-ordinates	-24.882682° 152.426060°
Soil type	Red Ferrosol
Crop	<i>Ipomoea batatas</i>
Variety	Eclipse
Trial design	t-Test
Replications	6
Plot size	6 m ²
Row spacing	1.5 m
Plant spacing	0.225 m
Plant density	29,631 plants/ha
Irrigation type	Trickle

Trial plan

GSP	R1	R2	R3	R4	R5	R6
SOSBio ecoNPK	R1	R2	R3	R4	R5	R6

↖N

Trial location map



Application details – spray

Application Date:	26/5/2018
Application Method:	INCORP
Application Timing:	ATBEDD
Application Placement:	BROSOI
Applied By:	GROWER
Air Temperature, Unit:	19 °C
% Relative Humidity:	74
Wind Velocity, Unit:	19 KPH
Wind Direction:	SSE
Dew Presence (Y/N):	N
Soil Moisture:	GOOD
% Cloud Cover:	10
Incorporation Equip.:	CULROT

Assessments

IPOBA Yield		
Dates	7/12/2018	14/12/2018
Days after application	195 DA-P	202 DA-P
Method and sample size	Harvestable tubers were harvested and graded according to size and marketability.	
IPOBA Colour		
Dates	7/12/2018	14/12/2018
Days after application	195 DA-P	202 DA-P
Method and sample size	10 randomly selected tuber was cut longitudinally. Internal colour was rates according a 1 – 10 scale, where 1 = uniformly white and 10 = uniformly purple.	

Statistical analysis	Where applicable, two sample tests were conducted using Microsoft Excel
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Appendix III. Statistical analysis

1. IPOBA Yield

	Subplot	IPOBA Yield (t/ha)				
		Total	Large	Med	Med/Small	Small
GSP	1	17.67	0.00	13.33	3.17	0.33
	2	10.17	0.00	6.00	6.00	1.83
	3	22.33	0.00	8.33	8.33	3.00
	4	22.33	1.83	3.17	3.17	1.00
	5	9.33	0.00	5.00	3.00	1.00
	6	7.83	0.67	1.33	1.33	1.50
SOSBio ecoNPK	1	25.00	8.33	9.50	5.67	1.33
	2	28.17	15.17	9.00	2.67	0.67
	3	32.67	7.00	19.83	5.50	2.00
	4	26.50	4.00	12.83	6.83	3.00
	5	36.34	5.67	23.33	7.00	0.00
	6	35.00	1.67	24.17	7.50	2.00

Total t/ha t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	14.945	30.613
Variance	44.301	22.121
Observations	6.000	6.000
Pooled Variance	33.211	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-4.709	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.001	
t Critical two-tail	2.228	

Large t/ha t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	0.417	6.973
Variance	0.5528	21.5401
Observations	6.0000	6.0000
Pooled Variance	11.0465	
Hypothesized Mean Difference	0.0000	
df	10.0000	
t Stat	-3.4165	
P(T<=t) one-tail	0.0033	
t Critical one-tail	1.8125	
P(T<=t) two-tail	0.0066	
t Critical two-tail	2.2281	

Medium t/ha t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	6.195	16.445
Variance	17.962	47.057
Observations	6.000	6.000
Pooled Variance	32.509	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-3.114	
P(T<=t) one-tail	0.005	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.011	
t Critical two-tail	2.228	

Med/Small t/ha t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	4.167	5.861
Variance	6.423	3.060
Observations	6.000	6.000
Pooled Variance	4.742	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-1.348	
P(T<=t) one-tail	0.104	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.207	
t Critical two-tail	2.228	

Small t/ha t-Test: Two-Sample Assuming Equal Variances

	<i>GSP</i>	<i>SOSBio ecoNPK</i>
Mean	1.445	1.500
Variance	0.841	1.145
Observations	6.000	6.000
Pooled Variance	0.993	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-0.097	
P(T<=t) one-tail	0.462	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.925	
t Critical two-tail	2.228	

2. IPOBA Number

	Subplot	IPOBA Number (# tubers/ha)				
		Total	Large	Med	Med/Small	Small
GSP	1	40002.00	0.00	23334.50	11667.25	5000.25
	2	40002.00	0.00	3333.50	23334.50	13334.00
	3	61669.75	0.00	16667.50	26668.00	18334.25
	4	38335.25	1666.75	23334.50	8333.75	5000.25
	5	31668.25	0.00	11667.25	11667.25	8333.75
	6	38335.25	1666.75	11667.25	8333.75	16667.50
SOSBio ecoNPK	1	40002.00	6667.00	15000.75	15000.75	5000.25
	2	40002.00	15000.75	15000.75	8333.75	3333.50
	3	60003.00	5000.25	31668.25	13334.00	10000.50
	4	56669.50	3333.50	23334.50	20001.00	11667.25
	5	58336.25	3333.50	35001.75	20001.00	0.00
	6	68336.75	1666.75	36668.50	20001.00	10000.50

t-Test Total Number/ha
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	41668.750	53891.583
Variance	105566111.375	131865037.367
Observations	6.000	6.000
Pooled Variance	118715574.371	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-1.943	
P(T<=t) one-tail	0.040	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.081	
t Critical two-tail	2.228	

t-Test Large Number/ha
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	555.583	5833.625
Variance	740814.817	23057861.169
Observations	6.000	6.000
Pooled Variance	11899337.993	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-2.650	
P(T<=t) one-tail	0.012	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.024	
t Critical two-tail	2.228	

t-Test Number/ha
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	15000.750	26112.417
Variance	60006000.150	95194703.942
Observations	6.000	6.000
Pooled Variance	77600352.046	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-2.185	
P(T<=t) one-tail	0.027	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.054	
t Critical two-tail	2.228	

t-Test Number/ha
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	15000.750	16111.917
Variance	63339666.825	22965259.317
Observations	6.000	6.000
Pooled Variance	43152463.071	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-0.293	
P(T<=t) one-tail	0.388	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.776	
t Critical two-tail	2.228	

t-Test Number/ha
t-Test: Two-Sample Assuming Equal Variances

	<i>GSP</i>	<i>SOSBio</i> <i>ecoNPK</i>
Mean	11111.667	6667.000
Variance	34077481.567	21113222.275
Observations	6.000	6.000
Pooled Variance	27595351.921	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	1.465	
P(T<=t) one-tail	0.087	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.174	
t Critical two-tail	2.228	

3. IPOBA Average Tuber Weight

		IPOBA Average Tuber Weight (kg)					
		Subplot	Total	Large	Med	Med/Small	Small
GSP	1		0.442	0.000	0.571	0.271	0.067
	2		0.254	0.000	1.800	0.257	0.138
	3		0.362	0.000	0.500	0.313	0.164
	4		0.583	1.100	0.136	0.380	0.200
	5		0.295	0.000	0.429	0.257	0.120
	6		0.204	0.400	0.114	0.160	0.090
SOSBio ecoNPK	1		0.625	1.250	0.633	0.378	0.267
	2		0.704	1.011	0.600	0.320	0.200
	3		0.544	1.400	0.626	0.413	0.200
	4		0.468	1.200	0.550	0.342	0.257
	5		0.623	1.700	0.667	0.350	0.000
	6		0.512	1.000	0.659	0.375	0.200

Total Av Tuber Weight
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	0.357	0.579
Variance	0.019	0.008
Observations	6.000	6.000
Pooled Variance	0.013	
Hypothesized Mean Difference	0.000	
df	10.00	0
t Stat	-3.338	
P(T<=t) one-tail	0.004	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.008	
t Critical two-tail	2.228	

Large Tuber Weight
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	0.250	1.260
Variance	0.199	0.069
Observations	6.000	6.000
Pooled Variance	0.134	
Hypothesized Mean Difference	0.000	
df	10.00	0
t Stat	-4.777	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.001	
t Critical two-tail	2.228	

Med Tuber Weigth
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	0.592	0.623
Variance	0.386	0.002
Observations	6.000	6.000
Pooled Variance	0.194	
Hypothesized Mean Difference	0.000	
df	10.00	0
t Stat	-0.122	
P(T<=t) one-tail	0.453	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.906	
t Critical two-tail	2.228	

Med/Small Tuber Weigth
t-Test: Two-Sample Assuming Equal Variances

	GSP	SOSBio ecoNPK
Mean	0.273	0.363
Variance	0.005	0.001
Observations	6.000	6.000
Pooled Variance	0.003	
Hypothesized Mean Difference	0.000	
df	10.00	0
t Stat	-2.768	
P(T<=t) one-tail	0.010	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.020	
t Critical two-tail	2.228	

Small Tuber Weight
t-Test: Two-Sample Assuming Equal Variances

	<i>GSP</i>	<i>SOSBio ecoNPK</i>
Mean	0.130	0.187
Variance	0.002	0.009
Observations	6.000	6.000
Pooled Variance	0.006	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	-1.305	
P(T<=t) one-tail	0.110	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.221	
t Critical two-tail	2.228	

4. IPOBA Internal Colour Rating

		IPOBA Internal Colour Score (1 - 10)
	Subplot	Total
GSP	1	6.0
	2	4.7
	3	6.2
	4	4.6
	5	5.0
	6	4.8
SOSBio ecoNPK	1	5.3
	2	4.3
	3	4.1
	4	3.7
	5	5.8
	6	3.9

t-Test: Two-Sample Assuming Equal Variances

	<i>GSP</i>	<i>SOSBio ecoNPK</i>
Mean	5.217	4.517
Variance	0.490	0.706
Observations	6.000	6.000
Pooled Variance	0.598	
Hypothesized Mean Difference	0.000	
df	10.000	
t Stat	1.568	
P(T<=t) one-tail	0.074	
t Critical one-tail	1.812	
P(T<=t) two-tail	0.148	
t Critical two-tail	2.228	

Appendix IV. Meteorological details

Year: 2018

Location: Bundaberg Aero (station 039128), Queensland, Australia

	May 2018				June 2018				July 2018			
		Min °C	Max °C	mm		Min °C	Max °C	mm		Min °C	Max °C	mm
1		20.2	32.9	0		7.5	21.8	0		16.5	20.1	0.2
2		25	32.8	0		5.5	24	0		16.6	24	1.8
3		23.6	33.4	0		5.5	24.1	0		13.4	24.3	1.4
4		23.2	29.7	0		10.9	25.4	0		9.8	23.9	0.2
5		19.3	30.4	10.6		13.2	24.3	0		14	25.4	0.4
6		19.8	28	0		11.3	23.7	0		17.2	25.3	0.4
7		19.1	27	4.2		12.6	23.9	0		16.8	26	1.2
8		19.4	26.1	2		13	25.2	0.6		9.8	20.7	4
9		19.5	29.2	0.6		14.3	23.9	0		8.5	21.5	0
10		19.5	30	0		14	26.2	0		8.6	22.9	0
11		19.5	30.3	0		13	24.8	0		11.7	22.7	0
12		18.7	29.9	0		10.4	24.7	0		11.3	23.4	0.2
13		18.5	30.5	0		10.7	26.7	0		7.3	23.9	0
14		24.9	28.2	0.2		17	23.6	0.2		2.9	20.9	0
15		22.1	29.3	21.2		12.5	26.4	0		2.6	22.4	0
16		23.9	27.6	1.4		9	24.8	0		6.6	23.9	0
17		22.4	29	4		9.2	21.1	0		8.2	25.2	0
18		22.2	31.3	0.6		4.8	19.5	0		4.2	25.2	0
19		23.2	30.9	3		7.2	ND	0		5.1	24	0
20		21.8	31.8	0		7.3	22.2			7.4	24.4	0
21		24.1	33	0		9.6	23.7	0		10.4	23.3	0
22		25.1	33.3	0		11.6	22.5	0		8	23	0
23		21.4	29.3	18		9.1	23.5	0		9.5	23.7	0
24		17.9	29.3	0		6.7	23.8	0		7.8	25.5	0
25		17.5	29.8	0		9.5	22.6	0		9.6	26	0
26	T	18	29.8	0		14.9	20.2	0		11.2	25.4	0.4
27		18.7	30.6	0		15	24.2	1.4		8.3	25.6	0
28		20.3	30.5	0.2		12.5	23.8	0		10.8	26.3	0.2
29	T/P	21.1	31.2	0		10.3	25	0		9.3	26	0
30		21.1	30.5	2.4		14.1	25.3	2		14.8	25.8	0
31		20.3	30.8	0						5.3	25.1	0
Total				68.4				4.2				10.4

ND = No Data

T = Treat

T/P = Transplant

	Aug 2018			Sep 2018			Oct 2018		
	Min °C	Max °C	mm	Min °C	Max °C	mm	Min °C	Max °C	mm
1	6.6	24.3	0	12.6	25	0	17.9	27.1	0
2	7.4	24.3	0	11.8	25.8	0	19.7	22.3	0
3	10.4	25	0	11.6	26.5	0	18.4	24.7	238.8
4	9.7	27.3	0	14.2	27.5	0	20.2	28.2	2.6
5	10.9	26.1	0	16.4	28.9	0	18.4	29.9	0
6	12.1	25.5	0.2	9.1	28.7	0	20.3	29.9	0
7	17.4	23	0.8	6.4	28.2	0	19.9	29.4	0
8	3.5	23.6	0	8.3	28.2	0	19.3	28.4	0
9	4.1	23.9	0	6.2	27.3	0	19.3	29.1	0
10	9.4	24.6	0	13.1	25.5	0	20.9	31.3	0
11	11.8	25.2	0	10.7	26.4	0	20.8	29.1	0
12	9.7	26.8	0	12.2	27	0	22.1	29.5	0
13	7.9	23.4	0	15.7	27.2	0	22.1	28.2	0.4
14	7.6	24.2	0	17.7	26	0	18.3	23.8	18
15	6.2	25.1	0	5.6	24.4	0	17.6	24.8	3.8
16	7.8	26.6	0	11	26	0	18.5	21.9	41.8
17	10.2	29.5	0.2	10.9	27.7	0	18.9	22.8	104
18	7.9	30.4	0	14.6	26.1	0	20.5	24.5	110.4
19	10.5	26.2	0	10.8	27.5	0	19.5	26.9	13.2
20	9.2	21.1	0	14.4	30.8	0	16.4	27.1	0
21	5.4	22.9	0	17.5	28.2	0	17.1	24.3	0
22	3	25.2	0	16.8	28.8	0	16.1	25.6	14
23	3.9	25.9	0	17.6	28.8	0	16.2	26.4	5.2
24	10.4	25.2	0	18.5	28.3	0	15.4	ND	5.8
25	11.6	24	0	18.4	28.6	0	15.5	27	ND
26	16	26.5	3.2	18.8	29.7	0	16.7	27.9	0
27	11.8	26	13	18.5	28.1	0	19.4	32.2	0
28	10.6	24.6	0	20.3	28.6	0	19.4	29.2	0.2
29	9.8	26.3	0	17.8	33.7	0	21.1	28.6	0
30	7.4	25	0	17.9	34.1	0	22.2	29.7	0
31	9	25.2	0				18.3	30.7	0
Total			17.4			0			558.2

ND = No Data

	Nov 2018			Dec 2018			
	Min °C	Max °C	mm	Min °C	Max °C	mm	
1	18.9	27.5	0	20.2	32.9	0	
2	17.6	28.8	0	25	32.8	0	
3	17.6	29.2	0	23.6	33.4	0	
4	17.8	30	0	23.2	29.7	0	
5	18.3	29.3	0	19.3	30.4	10.6	
6	19.4	29.2	0	19.8	28	0	
7	19.6	30.7	0	19.1	27	4.2	
8	18.4	26.9	38.6	19.4	26.1	2	
9	15.8	26	0.6	A	19.5	29.2	0.6
10	15.6	26.2	0		19.5	30	0
11	16	27.2	0		19.5	30.3	0
12	14.9	26.9	0		18.7	29.9	0
13	16.7	27	2.6		18.5	30.5	0
14	16.8	26.4	0	A	24.9	28.2	0.2
15	17.7	26.5	0.6		22.1	29.3	21.2
16	16.4	27.8	0		23.9	27.6	1.4
17	16.5	27.4	0		22.4	29	4
18	18	24.4	4.6		22.2	31.3	0.6
19	15.4	26.9	21.8		23.2	30.9	3
20	16.7	26.7	0.4		21.8	31.8	0
21	16	26.1	2.2		24.1	33	0
22	17.1	25.6	0.4		25.1	33.3	0
23	16	27.6	6.8		21.4	29.3	18
24	17.2	29.5	0		17.9	29.3	0
25	19.1	29.3	0		17.5	29.8	0
26	19.8	29.7	0		18	29.8	0
27	19.7	29.5	0.6		18.7	30.6	0
28	19.4	29.9	0		20.3	30.5	0.2
29	21	27.7	0		21.1	31.2	0
30	20.7	ND	18.4		21.1	30.5	2.4
31					20.3	30.8	0
Total			97.6				68.4

ND = No Data
A = Assess

The trial site was situated at Windermere, 10.6 km NNE of BOM 039128.

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