ASSESSMENT OF THE YIELD OF SUGARCANE FOLLOWING TREATMENT WITH LIQUID SEAWEED EXTRACT (SEASOL®)

W. Farnsworth[1] and A. Arioli[2]

[1] Farmsnorth Research, Innisfail, Queensland, Australia.
[2] Seasol International, Bayswater, Victoria, Australia.

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Abstract

The aim of this research is to determine the potential benefits of applying the biostimulant liquid seaweed extract SEASOL® to sugarcane in an Australian production setting.

Two large block sugarcane trials were started at the beginning of the 2014/15 season, in plant and ratoon crops, being commercially grown in far north Queensland, Australia. Both trials consist of two adjacent, irrigated cane blocks (3.5-7.5 ha) with similar soils and identical agronomic inputs. In each trial, both blocks are irrigated/fertigated by sub-surface drip irrigation (SSDI) - one receives ongoing, monthly injections of SEASOL® at 10 L/ha and the other serving as an untreated control.

Crop yield assessments were conducted at each site, by comparing harvested mill tonnages and CCS (commercial cane sugar) values from whole treatment block areas. Results data have been statistically analysed by 1-way ANOVA and means separated to P=0.05.

It is intended the trials should continue, until replanting of the trial crops is deemed to be necessary, according to commercial standards.

Results Summary:
SEASOL® treated blocks yielded between 9.5 - 36% more tonnes of raw cane per hectare and between 11.1 - 37% more tonnes of raw sugar per hectare, compared to the untreated controls. There were no treatment differences in CCS values.

These results support the use of the liquid seaweed extract biostimulant (SEASOL®), as a regular management input, for improving tropical sugarcane production and farm profitability. There is also the potential (pending further research) to show whether lower rates of fertilisers can be used to produce satisfactorily yielding crops.

INTRODUCTION

Sugarcane is an important crop in Australia and the sugar industry is a major generator of business, employment and valuable export income (Australian Sugar Milling Council, 2016).

Recent environmental research has indicated that sugarcane farmers should make greater efforts to prevent sediment and fertilisers leaving their farms and entering the waterways that feed into the coastal lagoons, adjacent to the Great Barrier Reef (Queensland Government, Departments of Environment, Agriculture and Fisheries, 2016; Smartcane Best Management Practice, 2016).
Plant biostimulants have been shown to increase productivity in cultivated plants (Tuhy et al., 2013; da Silveira et al., 2015) and plants treated with the biostimulant SEASOL® appear to have

bigger and healthier root systems (internal research). This characteristic of the seaweed extract biostimulants may make them useful at reducing the loss of farm soil and fertilisers, thereby making sugarcane production more environmentally sustainable.

MATERIALS AND METHODS

Ongoing Large Block Sugarcane Experiments 2014-17

On two separate commercial sugarcane farms in far north Queensland Australia, the following treatments are being evaluated:

a. SEASOL® applied at 10 L/ha per month, via SSDI (sub-surface drip irrigation).
b. Untreated control.

On both farms, treatments were initially allocated at random, to adjacent, separately irrigated blocks, each with similar soil types. Regular monthly applications of SEASOL® are made to each block through SSDI as part of normal irrigation. In each trial, equal amounts of water, fertiliser and registered pesticides are applied to both treatment blocks.

Yield and sugar quality data for each harvest - provided by MSF mill, Lotus Glen - are presented and averaged over the two sites and three seasonal harvests, for each treatment. Treatment yield parameters were compared statistically by one-way ANOVA (P=0.05) using Statistix 10.0.

PLANT TRIAL (S) - Started in plant sugarcane in 2014.

Both treatment blocks are 4.2 hectares and both receive N 145, P 50, K 71, S 23 (kg/ha), in each crop cycle. The first application of SEASOL® was made 12 weeks after planting, 8 weeks after shoot emergence. Dates of Seasol ® applications and crop harvests are shown in Table 1.

Table 1: Application Dates of Seasol ® (10 L/ha via SSDI) & Harvest Dates

First Crop	15/10/14,12/11/14, 11/12/14, 15/1/15, 22/2/15, 25/3/15, 20/4/15, 18/5/15, 22/6/15 & 10/7/15
Second Crop	18/7/15, 16/8/14, 12/9/14, 11/10/15, 14/11/15, 22/1/16*, 25/3/16* & 3/7/16
Third Crop	25/8/16, 5/10/16, 23/11/16, 14/1/17*, 16/2/17, 2/3/17, 11/4/17, 3/5/17 & 30/7/17

* SEASOL® at 20 L/ha – where application delayed due to wet weather

RATOON TRIAL (M) - Started in first ratoon sugarcane in 2014.

The SEASOL® treatment block is 7.5 hectares and the Untreated block is 3.5 hectares. In each crop cycle, both blocks receive N 180, P 36, K 90 (kg/ha). The first application of Seasol® was made 10 days after harvest of the previous plant crop, prior to ratoon shoot emergence. Dates of Seasol ® applications and crop harvests are shown in Table 2.

Table 2: Application Dates of Seasol ® (10 L/ha via SSDI) & Harvest Dates

First Crop	7/11/14,5/12/14, 2/1/15, 21/2/15, 25/3/15, 25/4/15, 24/5/15, 23/6/15, 26/7/15, 31/8/15 & 26/9/15
Second Crop	11/10/15, 28/11/15*, 17/1/16, 3/4/16*, 8/5/15, 19/6/16, 30/7/16, 23/8/16 & 24/9/16
Third Crop	1/10/16, 11/12/16, 22/2/17*, 19/3/17, 15/5/17*, 12/7/17*, 3/9/17 & 8/11/17

* SEASOL® at 20 L/ha – where application delayed due to wet weather

RESULTS AND DISCUSSION

Yield results

Table 3: Raw Cane Yield (tonnes per hectare) & Percent Increase in Seasol© vs Untreated Control.

	Trial S (Plant Crop 2014)			Trial M (Ratoon Crop 2014)		
Year harvested >	*2015*	*2016*	*2017*	*2015*	*2016*	*2017*
Seasol© 10 L/ha	135.6 *+16.9%*	132.1 *+15.5%*	100.4 *+36.0%*	138.9 *+19.6%*	150.9 *+24.1%*	131.0 *+9.5%*
Untreated Control	116.0	114.4	73.8	116.1	121.6	119.6

Table 4: CCS (Commercial Cane Sugar).

	Trial S (Plant Crop 2014)			Trial M (Ratoon Crop 2014)		
Year harvested >	*2015*	*2016*	*2017*	*2015*	*2016*	*2017*
Seasol© 10 L/ha	15.6	13.5	14.0	13.6	13.8	14.0
Untreated Control	15.1	13.7	13.9	14.1	14.0	13.8

Table 5: Sugar Yield (tonnes per hectare) & Percent Increase in Seasol© vs Untreated Control.

	Trial S (Plant Crop 2014)			Trial M (Ratoon Crop 2014)		
Year harvested >	*2015*	*2016*	*2017*	*2015*	*2016*	*2017*
Seasol© 10 L/ha	21.2 *+20.8%*	17.8 *+13.8%*	14.1 *+37.0%*	18.9 *+15.4%*	20.8 *+22.3%*	18.3 *+11.1%*
Untreated Control	17.5	15.7	10.3	16.4	17.0	16.5

Table 6: Average Yield of Harvested Cane, CCS, Milled Sugar and Percent Increase due to Seasol©

	Average of 6 Harvests (3 crops x 2 Sites)			Average Percent Increase due to Seasol©		
	Cane t/ha	CCS%	Sugar t/ha	Cane t/ha	CCS%	Sugar t/ha
Seasol© 10 L/ha	137.7 a	14.1	19.4 a	20.3	0.0	20.1
Untreated Control	117.5 b	14.1	16.6 b			
FProb (95%)*	0.001	0.965 nsd	0.006			
SE mean	2.699	0.267	0.525			
CV %	4.73	4.62	6.53			

* 1-way ANOVA; means with same letter are not significantly different (P=0.05)

Discussion

At two sites over three crop harvests, Seasol® treated crops yielded, between 9.5 - 36% more tonnes of raw cane per hectare and between 11.1 - 37% more tonnes of raw sugar per hectare, compared to the untreated controls. Seasol® treated crops yielded on average, 20.3% more harvested cane and 20.1% more milled sugar per hectare, compared with the Untreated control crops. These yield differences were significant (P=0.05). Yields over time and differences between Seasol® and Untreated yields were fairly consistent, as indicated by relatively low Coefficients of Variation. There were no significant treatment differences in CCS (commercial cane sugar) results, however, because sugarcane growers are paid on tonnages of cane delivered and on tonnages of milled sugar, these results are encouraging for commercial usage.

CONCLUSIONS

The following conclusions can be drawn from this research:

SEASOL applied through sub-surface drip irrigation produced significant increases in yield of harvested cane and of milled sugar. These yield increases - in the light of known benefits to root growth - conferred by seaweed plant biostimulants (like Seasol®), are encouraging for their use in sustainable sugarcane farming.

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