FINAL REPORT

Evaluation of Zeogrow for improving water use efficiency in lettuce

Devonport, Tasmania, 2009

Protocol Number:
James Downey 19/05/09

Client:
A & D Nets and Ropes

Author:
Belinda Ingram B Rur Sc (Hons)

Project Leader:
Phillip Frost B Agr Sc (Hons)
Peracto Pty Ltd

Report Number:
ADN08848

Report Date:
20 August 2009

Peracto Pty Ltd ABN: 97 109 472 559
Head Office: 16 Hillcrest Road, Devonport, Tasmania, 7310 Australia
Telephone: +61 3 6423 2044 Fax: +61 3 6423 4876
reports@peracto.com www.peracto.com

CONTENTS

SUMMARY

At Devonport, Tasmania, in 2009, a trial was conducted to evaluate the efficacy of Zeogrow for improving water use efficiency in leafy lettuce cv. Multi Red. Lettuce were maintained under 4 different soil moisture conditions; 100%, 70%, 50% and 25% of field capacity. Zeogrow was applied to lettuce in a fine spray to the point of run-off at 14 day intervals beginning 3 days after transplanting. Untreated lettuce was grown as a comparison to the Zeogrow treatments under each soil moisture condition.

Lettuce were grown in 8 L pots, 22 cm in diameter containing pink bark based potting mix. Nitrophoska was applied to each pot at 300 kg/ha at transplanting. All pots were watered to field capacity following transplanting and were maintained at this level for 1 week to allow for plant establishment. Treatments requiring less than 100% field capacity were not irrigated until they reached approximately 70% of field capacity. All lettuce were then watered twice weekly with proportionally decreasing water rates as determined by the water use of the plants maintained at 100% of field capacity.

At harvest plant biomass and leaf colour were visually assessed. The above ground fresh weight was assessed, oven dried weight was measured following 48 hours drying and the dry to fresh weight ratio was determined.

Zeogrow increased the growth rate of leafy lettuce maintained at 100, 70, 50 and 25% of field capacity. Increases in fresh weight were greatest for lettuce maintained at 100% of field capacity. The fresh and oven dried weights for lettuce treated with Zeogrow and maintained at 70 and 50% of field capacity were equivalent to untreated lettuce at 100% of field capacity. The interaction between the application of Zeogrow and the soil moisture condition was not significant.

The application of Zeogrow increased the water content of the lettuce, with reduced dry to fresh weight ratios for each soil moisture condition where Zeogrow was applied. Leafy lettuce cv. Multi Red treated with Zeogrow also had a reduced percentage of red colouration on the leaves.

INTRODUCTION

Aims

- To evaluate the effect of regular applications of Zeogrow on the growth of leafy lettuce at four soil moisture conditions; 100%, 70%, 50% and 25% of field capacity.

MATERIALS AND METHODS

Product list

Product name	Active ingredient (ai)		Formulation	Batch number
Zeogrow	CaO-44.1% MgO-2.2% Fe_2O_3-1.2% Al_2O_3-0.7% SiO_2-9.1% SO_4-0.11% Mn-132 mg/kg	Zn-60 mg/kg Cu-22.5 mg/kg Pb-11.5 mg/kg Ni-3.3 mg/kg Cr-3.25 mg/kg Cd-0.8 mg/kg Hg-trace	Soluble Powder	Not supplied

Treatment list

No.	Treatment	Product rate (g/L)	Application schedule
1	100% Field capacity	-	
2	70% Field capacity	-	
3	50% Field capacity	-	
4	25% Field capacity	-	
5	100% Field capacity + Zeogrow	5	Zeogrow applied as a fine spray to the point of run-off at 14 day intervals.
6	70% Field capacity + Zeogrow	5	
7	50% Field capacity + Zeogrow	5	
8	25% Field capacity + Zeogrow	5	

Chronology of events

Date	Days after transplanting (DAT)	Crop stage	Event
26/05/09	0	7-10 leaf	Lettuce transplanted into pots All pots irrigated to FC to allow for plant establishment
29/05/09	3		Zeogrow applied Lettuce irrigated
01/06/09	6		T1 & T5 irrigated to FC
12/06/09	17	9-14 leaf	Zeogrow applied T1 & T5 watered to FC
15/06/09	20		Lettuce irrigated
22/06/09	27	15-25 cm diameter	Lettuce irrigated
26/06/09	31		Zeogrow applied Lettuce irrigated
30/06/09	35		Lettuce irrigated
03/07/09	38		Lettuce irrigated
07/07/09	42	18-30 cm diameter	Lettuce irrigated
10/07/09	45		Zeogrow applied Lettuce irrigated
14/07/09	49		Lettuce irrigated
17/07/09	52		Lettuce irrigated
21/07/09	56	20-30 cm diameter	Lettuce irrigated
24/07/09	59		Zeogrow applied Lettuce irrigated
27/07/09	62		Lettuce irrigated
30/07/09	65		Lettuce harvested. Fresh weights and colour & biomass assessments performed
04/08/09	70	Dried lettuce	Lettuce oven-dry weight assessment

FC = field capacity

RESULTS

Table 1. Fresh and oven dried weights at harvest

No.	Treatment	Rate	Fresh shoot weight (g/plant)	Oven-dried shoot weight (g/plant)	Dry:fresh shoot weight ratio (%)
			30/07/09	04/08/09	04/08/09
1	100% Field Capacity		131.0 b	7.8 b	6.0 bc
5	100% FC + Zeogrow	5 g/l	179.6 a	9.7 a	5.4 d
2	70% Field Capacity		101.4 cde	6.1 cd	6.0 bc
6	70% FC + Zeogrow	5 g/l	124.2 bc	6.9 bc	5.6 cd
3	50% Field Capacity		87.8 def	5.4 cd	6.2 b
7	50% FC + Zeogrow	5 g/l	112.0 bcd	6.9 bc	6.1 bc
4	25% Field Capacity		71.3 f	5.0 d	7.1 a
8	25% FC + Zeogrow	5 g/l	79.3 ef	5.1 d	6.4 b
LSD (P=.05)			28.88	1.54	0.55
Standard Deviation			22.17	1.18	0.42
CV			20.01	17.94	6.91
Treatment Prob(F)			0.0001	0.0001	0.0001
Factorial analysis					
Treatment					
1	Untreated		97.9 b	6.1 b	6.3 b
2	Zeogrow		123.8 a	7.1 a	5.9 a
F-test probability			0.0078	0.0212	0.0424
LSD (P=.05)			14.6	0.8	0.4
Soil moisture condition					
1	100% FC		155.3 a	8.8 a	5.7 c
2	70% FC		112.8 b	6.5 b	5.8 c
3	50% FC		99.9 b	6.1 b	6.2 b
4	25% FC		75.3 c	5.0 c	6.7 a
F-test probability			0.0001	0.0001	0.0002
LSD (P=.05)			21.7	1.1	0.4
Interaction Treatment:Soil moisture condition					
F-test probability			0.2365	0.4143	0.2747

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
FC = Field Capacity

Table 2. Colouration and visual biomass assessments at harvest

No.	Treatment	Rate	Red colouration (%)	Biomass (%Trt 1)
			30/07/09	30/07/09
1	100% Field Capacity		64 Abc	100.0 ab
5	100% FC + Zeogrow	5 g/l	42 D	115.0 a
2	70% Field Capacity		68 Ab	88.0 bcd
6	70% FC + Zeogrow	5 g/l	55 c	95.0 bc
3	50% Field Capacity		69 Ab	78.0 cd
7	50% FC + Zeogrow	5 g/l	60 bc	88.8 bcd
4	25% Field Capacity		74 A	72.5 d
8	25% FC + Zeogrow	5 g/l	66 abc	78.8 cd
LSD (P=.05)			12.32	18.82
Standard Deviation			9.46	14.44
CV			15.19	16.14
Treatment Prob(F)			0.0006	0.0022
Factorial analysis				
Treatment				
1	Untreated		68.7 A	84.6
2	Zeogrow		55.8 b	94.4
F-test probability			0.0355	0.1115
LSD (P=.05)			11.4	N/A
Soil moisture condition				
1	100% FC		53.0 c	107.5 a
2	70% FC		61.5 b	91.5 b
3	50% FC		64.5 ab	83.4 bc
4	25% FC		70.0 A	75.6 c
F-test probability			0.0035	0.0012
LSD (P=.05)			7.8	13.1
Interaction Treatment: Soil moisture condition				
F-test probability			0.2415	0.8751

Means within columns followed by the same letter are not significantly different at the 5% level according to least significant difference (LSD) test.
FC = Field Capacity

DISCUSSION

The growth of leafy lettuce was restricted by the soil moisture conditions, with significantly reduced growth rates as soil moisture levels decreased. The application of Zeogrow to leafy lettuce increased the fresh and oven dried plant weights significantly. The largest increase in fresh weight was for plants maintained at 100% of field capacity, with an increase in plant weight of 48.6 g/plant. There were also non-significant trends for increased fresh and oven dried weights for lettuce treated with Zeogrow and maintained at 70, 50 and 25% of field capacity.

The application of Zeogrow increased the water content of the lettuce with lower dry to fresh weight ratios for each soil moisture condition where Zeogrow was applied, however, differences were only significant at 100 and 25% of field capacity.

There was no significant interaction between the application of Zeogrow and the soil moisture condition. However, the fresh and oven dried weights for lettuce treated with Zeogrow and maintained at 70 and 50% of field capacity were equivalent to untreated lettuce maintained at 100% of field capacity.

The application of Zeogrow tended to decrease the red colouration of lettuce, however, the effect was only significant for lettuce maintained at 100% and 70% of field capacity with the percentage of red leaf area reduced from 64 to 42% in Zeogrow treated lettuce when maintained at 100% of field capacity.

PHOTOGRAPHS

Photograph 1. L to R. Untreated (T1) and Zeogrow treated (T5) lettuce irrigated to 100% field capacity

Photograph 2. L to R. Untreated (T2) and Zeogrow treated (T6) lettuce maintained at 70% of field capacity

Photograph 3: L to R. Untreated (T3) and Zeogrow treated (T7) lettuce maintained at 50% of field capacity

Photograph 4. L to R. Untreated (T4) and Zeogrow treated (T8) lettuce maintained at 25% of Field capacity

Photograph 5: L to R. Zeogrow treated lettuce and untreated lettuce showing different amounts of reddening

CONCLUSIONS

- Zeogrow increased the growth rate of leafy lettuce irrigated at 100, 70, 50 and 25% of field capacity compared with untreated lettuce irrigated at equivalent levels.
- Increases in fresh weight were greatest for lettuce irrigated at 100% of field capacity.
- The fresh and oven dried weights for lettuce treated with Zeogrow and maintained at 70 and 50% of field capacity were equivalent to untreated lettuce irrigated at 100% of field capacity
- The interaction between the application of Zeogrow and the soil moisture condition was not significant.
- The application of Zeogrow increased the water content of the lettuce with reduced dry to fresh weight ratios for each soil moisture condition where Zeogrow was applied
- The application of Zeogrow reduced the red colouration of leafy lettuce cv. Multi red.

APPENDICES

Appendix i. Trial details

Site details

Grower	Peracto Pty Ltd
Location	Department of Primary Industries Glasshouse Stoney Rise Road, Devonport, Tasmania
GPS Coordinates	S 41.19143, E 146.32325
Soil type	Potting mix
Crop	Leafy lettuce
Variety	Multi red
Trial design	Randomised complete block
Replications	5
Plot size	1 x 8 L pot
Transplanting date	26/05/09
Harvest date	30/07/09
Irrigation type	Irrigated by hand

Trial plan

6	2	8	7	3	5	1	4	**Block 5**
1	7	5	6	4	8	3	2	**Block 4**
8	3	2	5	7	6	4	1	**Block 3**
4	5	6	8	1	3	2	7	**Block 2**
2	1	3	4	6	7	8	5	**Block 1**

↑N

Trial location map

↑N

Application details - spray

Application equipment					
Equipment	CO_2 pressurised backpack sprayer fitted with a hand lance				
Nozzles	TX-8 Hollow cone				
Spray volume	Run-off				
Pressure	500 kPa				
Method	Spray to point of run-off				
Treatment applications					
Application number	1	2	3	4	5
Dates	29/05/09	12/06/09	26/06/09	10/07/09	24/07/09
Days after transplanting	3	17	31	45	59
Times	3:00 pm	12:00 pm	11:30 am	4:00 pm	2:45 pm
Treatments applied	5-8	5-8	5-8	5-8	5-8
Temperature (°C)		19	18	17	14
Relative humidity (%)		83	92	67	83
Cloud cover (%)	100	100	100	100	70
Soil moisture	moist	moist	moist	dry	moist
Leaf wetness	dry	dry	dry	dry	dry
Crop stage	7-10 leaf	9-14 leaf	15-25 cm diameter	18-30 cm diameter	20-30 cm diameter

Assessments

1. Shoot weight assessment	
Date	30/07/09
Days after transplant	65
Sample size	1 lettuce per pot
Method	Lettuce were cut at soil level and fresh shoot weight was recorded, then plants were oven dried for 48 hours in paper bags and dry weights were measured and the dry to fresh shoot weight ratio was determined.
Statistical analysis	Analysis of variance (ANOVA) test, Fischer's least significant difference (LSD) test and a complete factorial analysis were conducted using ARM7.
2. Biomass assessment	
Date	30/07/09
Days after transplant	65
Sample size	1 lettuce per pot
Method	The biomass of each lettuce was assessed visually and expressed as a percentage of the biomass of treatment 1, the untreated control maintained at 100% field capacity.
Statistical analysis	Analysis of variance (ANOVA) test, Fischer's least significant difference (LSD) test and a complete factorial analysis were conducted using ARM7.
3. Colour assessment	
Date	30/07/09
Days after transplant	65
Sample size	1 lettuce per pot
Method	The colouring of the lettuce was assessed and expressed as the percentage of total leaf area that was red, with the remainder of the leaf area being green
Statistical analysis	Analysis of variance (ANOVA) test, Fischer's least significant difference (LSD) test and a complete factorial analysis were conducted using ARM7.

Appendix ii. Raw data

Harvest assessment

Crop Name				Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Description				% red colouration	Biomass (%T1)	Fresh shoot wt	Oven dried wt	Dry:fresh wt ratio
Rating Date				30/07/09	30/07/09	30/07/09	04/07/09	04/07/09
Rating Unit				%	%UNCK	/plant	/plant	%
ARM Action Codes								T1
Trt No.	Treatment Name	Rate Unit	Plot	1	2	3	4	5
1	Untreated		104	65.0	100.0	124.0	7.2	5.8
	100% FC		207	65.0	100.0	127.0	7.7	6.1
			306	60.0	100.0	141.0	8.6	6.1
			405	80.0	100.0	91.0	6.0	6.6
			501	50.0	100.0	172.0	9.7	5.6
			Mean =	**64.0**	**100.0**	**131.0**	**7.8**	**6.0**
2	Untreated		103	70.0	100.0	131.0	8.1	6.2
	70% FC		202	65.0	85.0	92.0	5.7	6.2
			303	60.0	95.0	113.0	6.1	5.4
			406	70.0	90.0	77.0	4.6	6.0
			502	75.0	70.0	94.0	6.0	6.4
			Mean =	**68.0**	**88.0**	**101.4**	**6.1**	**6.0**
3	Untreated		108	80.0	65.0	74.0	4.9	6.6
	50% FC		205	75.0	40.0	37.0	2.4	6.5
			301	50.0	85.0	104.0	6.1	5.9
			407	70.0	110.0	106.0	6.4	6.0
			503	70.0	90.0	118.0	7.0	5.9
			Mean =	**69.0**	**78.0**	**87.8**	**5.4**	**6.2**
4	Untreated		105	80.0	70.0	63.0	4.8	7.6
	25% FC		208	80.0	50.0	49.0	3.8	7.8
			304	60.0	70.0	91.0	5.7	6.3
			403	75.0	100.0	82.0	5.5	6.7
			504					.
			Mean =	**73.8**	**72.5**	**71.3**	**5.0**	**7.1**
5	Zeogrow		107	50.0	120.0	189.0	10.1	5.3
	100% FC		204	40.0	115.0	163.0	8.7	5.3
			302	40.0	100.0	166.0	8.9	5.4
			408	40.0	120.0	171.0	9.0	5.3
			505	40.0	120.0	209.0	11.6	5.6
			Mean =	**42.0**	**115.0**	**179.6**	**9.7**	**5.4**
6	Zeogrow		102	65.0	95.0	108.0	6.1	5.6
	70% FC		203	60.0	80.0	74.0	4.2	5.7
			307	40.0	90.0	163.0	7.9	4.8
			401	40.0	120.0	149.0	8.5	5.7
			506	70.0	90.0	127.0	7.8	6.1
			Mean =	**55.0**	**95.0**	**124.2**	**6.9**	**5.6**
7	Zeogrow		106					.
	50% FC		201	50.0	95.0	97.0	5.8	6.0
			308	70.0	65.0	105.0	6.8	6.5
			402	60.0	110.0	121.0	7.2	6.0
			507	60.0	85.0	125.0	7.6	6.1
			Mean =	**60.0**	**88.8**	**112.0**	**6.9**	**6.1**
8	Zeogrow		101	75.0	50.0	59.0	3.5	5.9
	25% FC		206					.
			305	70.0	75.0	78.0	5.5	7.1
			404	50.0	110.0	97.0	6.1	6.3
			508	70.0	80.0	83.0	5.2	6.3
			Mean =	**66.3**	**78.8**	**79.3**	**5.1**	**6.4**

ARM Action Codes
T1 = [Column 4]/[Column 3]*100

Appendix iii. Statistical analysis

Crop Code			LACSA	LACSA	LACSA	LACSA	LACSA
BBCH Scale			BVNH	BVNH	BVNH	BVNH	BVNH
Crop Name			Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Description			% red	Biomass (%T1)	Fresh shoot weight	Oven dried weight	Dry:fresh wt ratio
Rating Date			30/07/09	30/07/09	30/07/09	04/08/09	04/08/09
Rating Data Type			COLOR		WEIFRE		
Rating Unit			%	%UNCK	/plant		%
ARM Action Codes							T1
Number of Decimals							1
Trt No.	Treatment Name	Rate Unit	1	2	3	4	5
1	Untreated 100% FC		64.0 abc	100.0 ab	131.0 b	7.8 b	6.0 bc
2	Untreated 70% FC		68.0 ab	88.0 bcd	101.4 cde	6.1 cd	6.0 bc
3	Untreated 50% FC		69.0 ab	78.0 cd	87.8 def	5.4 cd	6.2 b
4	Untreated 25% FC		73.8 a	72.5 d	71.3 f	5.0 d	7.1 a
5	Zeogrow 100% FC		42.0 d	115.0 a	179.6 a	9.7 a	5.4 d
6	Zeogrow 70% FC		55.0 c	95.0 bc	124.2 bc	6.9 bc	5.6 cd
7	Zeogrow 50% FC		60.0 bc	88.8 bcd	112.0 bcd	6.9 bc	6.1 bc
8	Zeogrow 25% FC		66.3 abc	78.8 cd	79.3 ef	5.1 d	6.4 b
LSD (P=.05)			12.32	18.82	28.88	1.54	0.55
Standard Deviation			9.46	14.44	22.17	1.18	0.42
CV			15.19	16.14	20.01	17.94	6.91
Bartlett's X2			6.19	6.136	5.307	3.78	10.768
P(Bartlett's X2)			0.518	0.408	0.623	0.805	0.149
Replicate F			1.680	4.205	3.009	3.311	0.634
Replicate Prob(F)			0.1862	0.0097	0.0372	0.0262	0.6432
Treatment F			5.570	4.556	12.352	9.137	7.421
Treatment Prob(F)			0.0006	0.0022	0.0001	0.0001	0.0001

Means followed by same letter do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

ARM Action Codes
T1 = [Column 4]/[Column 3]*100

Crop Code	LACSA	LACSA	LACSA	LACSA	LACSA
BBCH Scale	BVNH	BVNH	BVNH	BVNH	BVNH
Crop Name	Lettuce	Lettuce	Lettuce	Lettuce	Lettuce
Description	% red	Biomass (%T1)	Fresh shoot weight	Oven dried weight	Dry:fresh wt ratio
Rating Date	30/07/09	30/07/09	30/07/09	04/08/09	04/08/09
Rating Data Type	COLOR		WEIFRE		
Rating Unit	%	%UNCK	/plant		%
ARM Action Codes					T1
Number of Decimals					1
Trt No. Treatment Name / Rate Unit	1	2	3	4	5
TABLE OF R MEANS					
Replicate 1	68.1	86.1	107.5	6.4	6.2
Replicate 2	62.7	80.5	89.8	5.4	6.2
Replicate 3	56.3	85.0	120.1	7.0	5.9
Replicate 4	60.6	107.5	111.8	6.7	6.1
Replicate 5	63.6	88.4	124.9	7.5	6.1
TABLE OF A MEANS					
1 Untreated	68.7	84.6	97.9	6.1	6.3
2 Zeogrow	55.8	94.4	123.8	7.1	5.9
TABLE OF B MEANS					
1 100% FC	53.0	107.5	155.3	8.8	5.7
2 70% FC	61.5	91.5	112.8	6.5	5.8
3 50% FC	64.5	83.4	99.9	6.1	6.2
4 25% FC	70.0	75.6	75.3	5.0	6.7
TABLE OF AB MEANS					
1 Untreated 1 100% FC	64.0	100.0	131.0	7.8	6.0
2 Zeogrow 1 100% FC	42.0	115.0	179.6	9.7	5.4
1 Untreated 2 70% FC	68.0	88.0	101.4	6.1	6.0
2 Zeogrow 2 70% FC	55.0	95.0	124.2	6.9	5.6
1 Untreated 3 50% FC	69.0	78.0	87.8	5.4	6.2
2 Zeogrow 3 50% FC	60.0	88.8	112.0	6.9	6.1
1 Untreated 4 25% FC	73.8	72.5	71.3	5.0	7.1
2 Zeogrow 4 25% FC	66.3	78.8	79.3	5.1	6.4

COMPLETE FACTORIAL AOV For LACSA BVNH Lettuce % red 30/07/09 COLOR % (Data Column 1)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)	LSD (.05)
Total	39	6325.625000				
R	4	601.015625	150.253906	2.266	0.1224	8.9
A	1	1657.656250	1657.656250	9.748	0.0355	11.4
RA	4	680.234375	170.058594	2.565	0.0924	12.5
B	3	1512.500000	504.166667	7.955	0.0035	7.8
RB	12	760.546875	63.378906	0.956	0.5306	17.7
AB	3	317.968750	105.989583	1.598	0.2415	11.2
RAB	12	795.703125	66.308594			

COMPLETE FACTORIAL AOV For LACSA BVNH Lettuce biomass (%T1) 30/07/09 %UNCK (Data Column 2)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)	LSD (.05)
Total	39	15374.375000				
R	4	3508.359375	877.089844	4.961	0.0136	14.5
A	1	950.625000	950.625000	4.143	0.1115	13.3
RA	4	917.734375	229.433594	1.298	0.3253	20.5
B	3	5580.312500	1860.104167	10.264	0.0012	13.1
RB	12	2174.765625	181.230469	1.025	0.4833	29.0
AB	3	120.937500	40.312500	0.228	0.8751	18.3
RAB	12	2121.640625	176.803385			

COMPLETE FACTORIAL AOV For LACSA BVNH Lettuce Fresh shoot weight (30/07/09 WEIFRE /plant (Data Column 3)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)	LSD (.05)
Total	39	60700.718750				
R	4	5916.171875	1479.042969	3.392	0.0447	22.8
A	1	6708.100000	6708.100000	24.396	0.0078	14.6
RA	4	1099.853125	274.963281	0.631	0.6501	32.2
B	3	33668.618750	11222.872917	22.618	0.0001	21.7
RB	12	5954.365625	496.197135	1.138	0.4133	45.5
AB	3	2120.500000	706.833333	1.621	0.2365	28.8
RAB	12	5233.109375	436.092448			

COMPLETE FACTORIAL AOV For LACSA BVNH Lettuce oven dried wt 04/07/09 (Data Column 4)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)	LSD (.05)
Total	39	142.927981				
R	4	18.520564	4.630141	3.356	0.0461	1.3
A	1	11.209511	11.209511	13.531	0.0212	0.8
RA	4	3.313687	0.828422	0.600	0.6695	1.8
B	3	73.974173	24.658058	19.605	0.0001	1.1
RB	12	15.092938	1.257745	0.912	0.5624	2.6
AB	3	4.260793	1.420264	1.029	0.4143	1.6
RAB	12	16.556316	1.379693			

COMPLETE FACTORIAL AOV For LACSA BVNH Lettuce dry:fresh ratio 04/07/09 % T1 1 (Data Column 5)

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F	Prob(F)	LSD (.05)
Total	39	14.141474				
R	4	0.450928	0.112732	0.766	0.5673	0.4
A	1	2.166275	2.166275	8.643	0.0424	0.4
RA	4	1.002550	0.250638	1.703	0.2137	0.6
B	3	6.431855	2.143952	15.318	0.0002	0.4
RB	12	1.679532	0.139961	0.951	0.5339	0.8
AB	3	0.644510	0.214837	1.460	0.2747	0.5
RAB	12	1.765824	0.147152			

ARM Action Codes

T1 = [Column 4]/[Column 3]*100