



■ Final Report ■ December 2011

## Evaluating Health foliars versus mainstream products on wine grapes for the 2010 season

M. Kellerman, J. Steenkamp & M. A'Bear  
 Omnia Specialities, PO Box 69888, Bryanston, 2021

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### Abstract

Having had good results with 'Health foliars' (Plus products) on wine grapes in the Robertson and Durbanville areas it was decided to test a combination of products more intensively in the Vredendal region. A Latin square design was used on a block with Chardonnay grapes. Treatments comprised FoliCal 19 Plus™ (weeks 2, 5 after fruit set and veraison at a rate of 5l ha<sup>-1</sup>) & HiYield Plus™ (week 6 after fruit set at a rate of 8l ha<sup>-1</sup>); NutriCal 19™ (weeks 2, 5 after fruit set and veraison at a rate of 5l ha<sup>-1</sup>) & HiYield™ (week 6 after fruit set at a rate of 8l ha<sup>-1</sup>); OMNIGREEN Plus™ (weeks 2, 5 after fruit set at a rate of 2kg ha<sup>-1</sup>) & Fosfitotal Ca + BMo (week 6 after fruit set and at veraison at a rate of 1.5kg ha<sup>-1</sup>); OMNIGREEN™ (weeks 2, 5 after fruit set at a rate of 2kg ha<sup>-1</sup>) & MAGICAL™ (week 6 after fruit set and at veraison at a rate of 5l ha<sup>-1</sup>); FoliCal 19 Plus™ (at fruit set and weeks 2, 6 after fruit set at a rate of 5l ha<sup>-1</sup>) & HiYield Plus™

(week 5 after fruit set at a rate of 8l ha<sup>-1</sup>) and OPTI-K™ (at veraison and again a week later at a rate of 5l ha<sup>-1</sup>).

Whilst no statistical differences were obtained for yield, disease assessments, grape berry or grape bunch information, the disease incidence and damage measured on the 'Plus' products vines was generally lower than for their nutrient counterparts. The lack of results for disease assessments could be explained by the high rate of variability – CV% of 62% for disease incidence and 54% for disease damage rate. The OPTI-K™ treatment had bunches which were more compact when compared to the control ( $P < 0.01$ ). This could be the result of fewer bunches being produced as this treatment had a relatively low yield, but the bunch weight, length and width were better than the rest of the treatments.

## Recommendations

- Don't assume a product will give good responses in all areas if it was not tested in that specific region.
- Investigate the potential of the OMNIGREEN Plus™ and OMNIGREEN™ products further.
- Rather use one product with elicitors on its own rather than in combination with other elicitor containing products – good results were achieved using only one product throughout the season.
- Rather apply products for two or more sprays than alternating them.
- Lack of results can also be due to the change in formulation of the products – The HiYield Plus™ differed from the one we tested at Robertson where we achieved good results.
- Spraying products in succession works better and try to end with a product containing Magnesium, Boron and Molybdenum.

## Introduction

Good results with Health foliar products were achieved in several trials on wine grapes. The products were used on their own in all cases and it was decided to use them in combination as a total recommendation program.

Even though the producer continued with his normal spray program, disease incidence and damage could be detected on the vines in the trial site. All the Plus-products in this trial have elicitors that activate plants' natural defence system to combat fungal- and bacterial infections while the micronutrients combat stress at crucial times. They were developed to try and reduce the number of applications of chemical pesticides that growers would need to make to decrease disease incidence and damage so that the plants still have enough photosynthetic material to produce a high yield.

## Trial Details

TRIAL NO :	Wine Grapes-Health Foliars-MK-2010-08
TITLE :	Evaluating Health foliars versus mainstream products on wine grapes for the 2010 season
OBJECTIVES :	To determine if curly leaf virus and disease pressure in general can be diminished.
CROP :	Grapes (Chardonnay).
TRIAL DESIGN :	Latin square (7 treatments X 7 replications).

TREATMENT LIST :

Spray volume	700L water ha <sup>-1</sup> at fruit set and from then on						
	1 000L water ha <sup>-1</sup>						
Treatment	Product applied	Application rate	Growth stage & Application date				
			Fruit set	2 weeks after fruit set - Pea size	5 weeks after fruit set	6 weeks after fruit set	Veraison
1.	Control	No applications done					
2.	FoliCal 19 Plus™ & HiYield Plus™*	5l ha <sup>-1</sup>		15, 16/11	7, 8/12		5/1
		8l ha <sup>-1</sup>				21/12	
3.	NutriCal 19™** & HiYield™	5l ha <sup>-1</sup>		15, 16/11	7, 8/12		5/1
		8l ha <sup>-1</sup>				21/12	
4.	OMNIGREEN Plus™ & Fosfitotal Ca + BMo	2kg ha <sup>-1</sup>		15, 16/11	7, 8/12		
		1.5kg ha <sup>-1</sup>				21/12	5/1
5.	OMNIGREEN™ & MAGICAL™	2l ha <sup>-1</sup>		15, 16/11	7, 8/12		
		5l ha <sup>-1</sup>				21/12	5/1
6.	FoliCal 19 Plus™ & HiYield Plus™*	5l ha <sup>-1</sup>	28/10	15, 16/11		21/12	
		8l ha <sup>-1</sup>			7, 8/12		
7.	OPTI-K™	8l ha <sup>-1</sup>					5/1
							19/1

\* Note that applications for treatments 2 and 6 are similar, but start of application differs.

\*\* Note that NutriCal 19™ was applied in stead of FoliCal 19™ as the product was not available when treatments had to be applied.

Trial layout :

1.7	6.7	4.7	2.7	5.7	7.7	3.7
4.6	2.6	3.6	5.6	7.6	1.6	6.6
7.5	5.5	1.5	4.5	3.5	6.5	2.5
5.4	1.4	2.4	7.4	6.4	3.4	4.4
2.3	3.3	6.3	1.3	4.3	5.3	7.3
6.2	7.2	5.2	3.2	2.2	4.2	1.2
3.1	4.1	7.1	6.1	1.1	2.1	5.1

Each treatment was repeated seven times to give a trial site of 49 blocks.

Assessments Required :

Action & Parameter	Methods	Timing	Dates
Soil	Non-routine composite soil samples per treatment were taken	At veraison	19 January
Disease rating	Determined the general disease incidence (if plants showed the disease) and rate of damage (disease damage of plants) per plot	One week after fruit set and again 5 days before harvesting	8 November 2010 & 10 February 2011
Yield	Recorded the weight harvested on a "vakkie" per plot using a 2-decimal scale	At harvesting	15 February 2011
Quality – Wine quality and bunch information	Combined samples per treatment were used for wine quality determination at Vinlab (berries from the top, middle and bottom of bunches were used). Bunch information on 4 bunches per plot (weight, length, width, compaction and berry info such as immature, normal, small and rotten amounts of berries/bunch) were determined	Just before harvesting	11 February 2011

Site Details :

District	Farm Name	Cultivar	Rootstock	Block Age	Vines per ha	Row width	Distance between vines	GPS coordinates	Irrigation system
Lutzville	Arbeitsgenot	Chardonnay	Richter 99	2003/2004	2469	2.7m	1.5m	S 31°31.347' EO 18°16.251'	Drippers

Environmental Conditions :

- Normal weather conditions for the Vredendal region were experienced during the growing season.

Statistical Analysis :

- Statistical analysis using a Two-sampled T-test and an ANOVA were made with the NCSS 2001 program.

## Results and Discussion

Note that the difference between treatment 2 and 6 is the start of applications – treatment 2 began at pea size whilst treatment 6 started at fruit set.

Legend for interpretation of significant differences.

Effect	p < 0.10	p < 0.05
Significant		

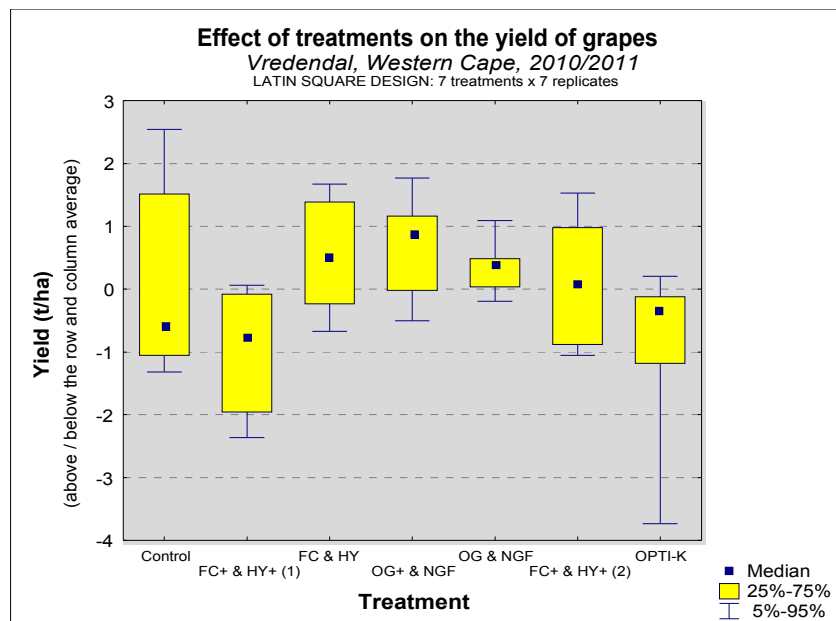
**Table 1** Yield means per treatment.

Treatment	1	2	3	4	5	6	7
n	7	7	7	7	7	7	7
Yield(t/ha)	11.597	10.497	12.091	12.147	11.851	11.682	10.666

**Table 2** ANOVA results reflecting the effect of treatments on yield.

Effect	df	SS	MS	F	p
Treatment	6	18.45	3.076	2.989	0.01600
Error	42	43.22	1.029		
Total	48	61.68			

### Yield Analyses:



Legend	1 – Control	2 – FoliCal 19 Plus™ & HiYield Plus™ (pea size)
	3 – NutriCal 19™ & HiYield™	4 – OMNIGREEN Plus™ & Fosfitotal Ca + BMo
	5 – OMNIGREEN™ & MAGICAL™	6 – FoliCal 19 Plus™ & HiYield Plus™ (fruit set)
	7 – OPTI-K™	

**Figure 1** Yield of wine grapes treated with different Health foliar products.

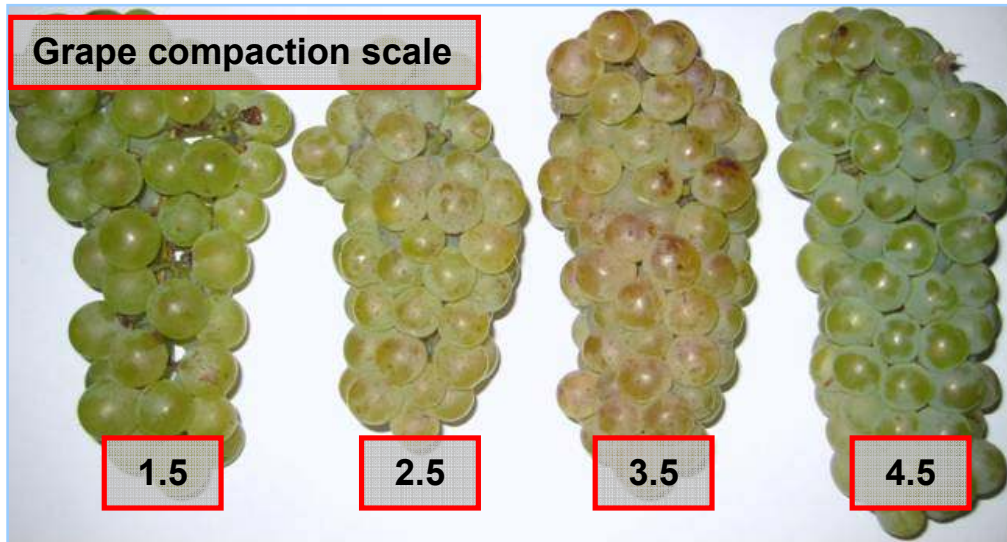
- No statistically different yield results were observed.
- There were statistical significant ( $P \leq 0.05$ ) yield differences between different treatments.
  - Treatments 3 (NutriCal 19™ & HiYield™), 4 (OMNIGREEN Plus™ & Fosfitotal Ca + BMo) and 5 (OMNIGREEN™ & MAGICAL™) had statistically higher yields than treatment 7 (OPTI-K™).
  - Treatments 3 (NutriCal 19™ & HiYield™), 4 (OMNIGREEN Plus™ & Fosfitotal Ca + BMo), 5 (OMNIGREEN™ & MAGICAL™) and 6 (FoliCal 19 Plus™ & HiYield Plus™ – fruit set) had statistically higher yields than treatment 2 (FoliCal 19 Plus™ & HiYield Plus™ – pea size).
- The Fisher's LSD ( $\alpha = 0.05$ ) value for total yield was  $1.094t\ ha^{-1}$ .
  - Whilst not producing statistically significant results, the OMNIGREEN™ product was the most consistent of all products with the OMNIGREEN Plus™ producing the highest yield and the OMNIGREEN™ producing the 3<sup>rd</sup> highest yield.
  - The products without elicitors did not fare worse than the products containing elicitors.
  - The early application (fruit set) of FoliCal 19 Plus™ & HiYield Plus™ (treatment 6) produced a higher yield than the later application (pea size – treatment 2).

**Quality analyses:**

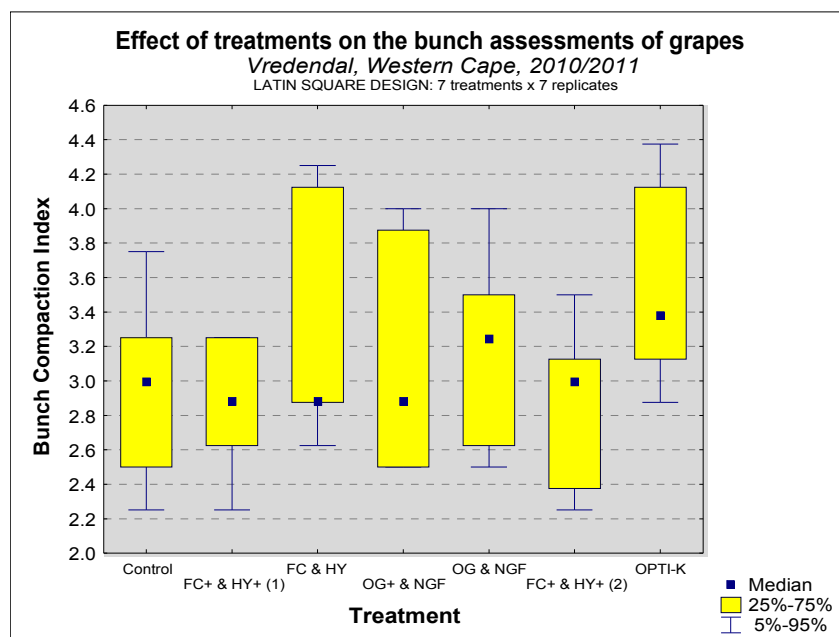
**Table 3** ANOVA results showing the effect of row, column and treatments of different Health foliar treatments on wine grape bunch assessments.

	Treatment Effect		Row Effect		Column Effect		Error	Total	Fisher's LSD at $\alpha=0.05$
	df	p	df	p	df	p			
Bunch Weight (g)	6	0.56652	6	0.22428	6	0.50411	30	48	-
Bunch Length (mm)	6	0.23928	6	0.44602	6	0.72682	30	48	-
Bunch Width (mm)	6	0.68764	6	0.10026	6	0.00514	30	48	-
Bunch Compaction Index	6	0.02042	6	0.08985	6	0.00026	30	48	0.431
% Immature Berries	6	0.31654	6	0.66415	6	0.00000	30	48	-
% Normal Berries	6	0.25837	6	0.00987	6	0.00000	30	48	-
% Small Berries	6	0.43723	6	0.03744	6	0.48842	30	48	-
% Rotten Berries	6	0.10298	6	0.49917	6	0.00025	30	48	-

- None of the results influenced the wine quality – see Addendum B.



**Figure 2** Bunch compaction scale used to evaluate different Health foliar products – (1 = excessively loose, 2 = loose, 3 = moderately loose, 4 = slightly loose, 5 = tightly compacted).



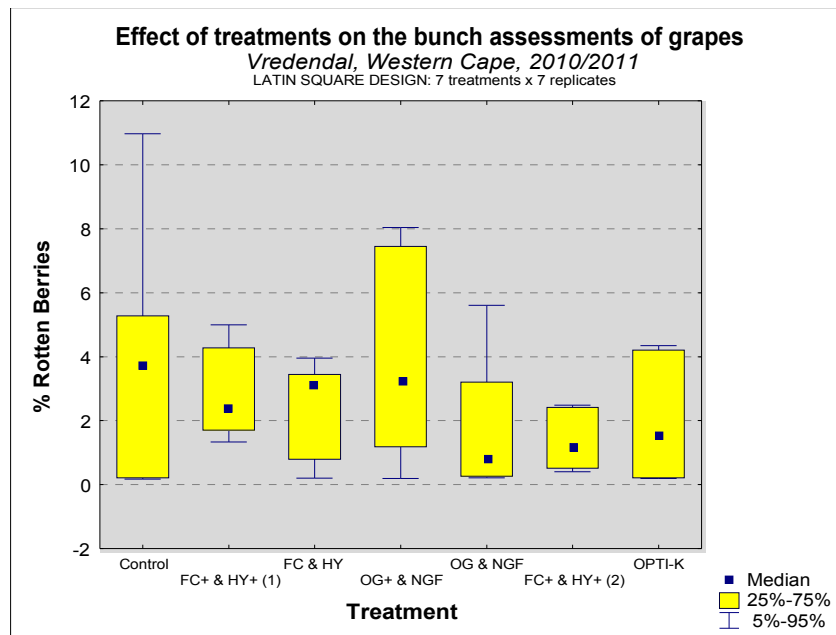
Legend	1 – Control	2 – FoliCal 19 Plus™ & HiYield Plus™ (pea size)
	3 – NutriCal 19™ & HiYield™	4 – OMNIGREEN Plus™ & Fosfitotal Ca + BMo
	5 – OMNIGREEN™ & MAGICAL™	6 – FoliCal 19 Plus™ & HiYield Plus™ (fruit set)
	7 – OPTI-K™	

**Figure 3** Bunch compaction of wine grapes treated with different Health foliar products.

- The OPTI-K™ treatment produced bunches which were statistically more compact when compared to the control ( $P < 0.01$ ).
  - From a marketing point of view the very compact bunches are less desirable as they can be infected by disease more easily because the products applied do not penetrate to berries in the middle to effectively control diseases.
  - The more compact bunches could be the result of fewer bunches being formed as this treatment had heavier, longer and wider bunches than the rest of the treatments but achieved a relatively low yield.
  - The OPTI-K™ treatment also differed statistically ( $P < 0.05$ ) from treatments 2 (FoliCal 19 Plus™ & HiYield Plus™ – pea size), 5 (OMNIGREEN™ & MAGICAL™) and 6 (FoliCal 19 Plus™ & HiYield Plus™ – fruit set).
- The bunches of treatment 3 (NutriCal 19™ & HiYield™) were less compact than those of treatment 2 (FoliCal 19 Plus™ & HiYield Plus™ – pea size) and treatment 6 (FoliCal 19 Plus™ & HiYield Plus™ – fruit set) ( $P < 0.05$ ) and the control ( $P < 0.10$ ).
- Bunch compactness evaluated according to international standards:
  - The scale is the same as in Figure 3.
  - Number of berries per centimetre rachis is evaluated – Brian Hed, et al, 2005.
    - According to this norm, the bunches of treatment 6 (FoliCal 19 Plus™ & HiYield Plus™ – fruit set) were less compact when compared to the control ( $P = 0.08$ ).
    - Hed et al, also compared bunch rot to compactness as more compact bunches are more prone to produce rotten berries – see Table 4 and Figure 4.
    - When the percentages of rotten berries were compared then treatment 6 (FoliCal 19 Plus™ & HiYield Plus™ – fruit set) had fewer rotten berries than the control ( $P = 0.05$ ) which agrees with the assertion above.
    - This treatment also had fewer rotten berries than treatments 2 (FoliCal 19 Plus™ & HiYield Plus™ – pea size), 3 (NutriCal 19™ & HiYield™) and 4 (OMNIGREEN Plus™ & Fosfitotal Ca + BMo;  $P = 0.02$ ).

**Table 4** Treatment means of the bunch assessments.

Treatment	1	2	3	4	5	6	7
n	196	196	196	196	196	196	196
<b>Bunch Weight (g)</b>	102.2	113.5	114.1	109.7	104.7	98.6	119.6
<b>Bunch Length (mm)</b>	10.89	12.04	11.70	10.77	11.43	11.06	12.01
<b>Bunch Width (mm)</b>	5.875	6.299	6.035	6.279	6.078	6.073	5.999
<b>Bunch Compaction Index</b>	2.911	2.857	3.339	3.107	3.125	2.893	3.554
<b>% Immature Berries</b>	16.30	17.39	16.77	11.47	17.82	18.35	18.08
<b>% Normal Berries</b>	69.04	74.23	76.26	79.09	76.11	72.87	74.63
<b>% Small Berries</b>	10.99	5.53	4.72	5.81	4.22	7.43	5.39
<b>% Rotten Berries</b>	3.68	2.85	2.24	3.64	1.85	1.35	1.91



Legend	1 – Control	2 – FoliCal 19 Plus™ & HiYield Plus™ (pea size)
	3 – NutriCal 19™ & HiYield™	4 – OMNIGREEN Plus™ & Fosfitotal Ca + BMo
	5 – OMNIGREEN™ & MAGICAL™	6 – FoliCal 19 Plus™ & HiYield Plus™ (fruit set)
	7 – OPTI-K™	

**Figure 4** Rotten berries on bunches of wine grapes treated with different Health foliar products.

**Disease analyses:**

**Table 5** Treatment means of different Health foliar on wine grape disease assessments.

Treatment	1	2	3	4	5	6	7
n	4	4	4	4	4	4	4
<b>Disease Incidence Rate</b>	13.75	13.75	22.50	16.25	13.75	16.25	6.25
<b>Disease Damage Rate</b>	15.00	11.25	20.00	12.50	15.00	16.25	8.75
<b>Vine Leaf Colour</b>	6.75	7.25	5.25	6.50	7.25	7.13	6.25

- No statistically significant results were observed at either of the two monitoring times.

- The high degree of variability could explain the lack of statistical effects for this assessment. The coefficient of variation (CV) for the disease incidence was 62% while the CV for the disease damage rate was 54%.
- The 'Plus' products were measured as having less damage than their nutrient counterparts.

### **Soil analyses:**

- The trial was situated on a sandy soil with a medium pH in which S was generally low; Zn, K, Ca were high and the P, Mg, Mn, Fe and Cu levels were very high.

### **Conclusion**

- No statistically significant results were obtained when comparing the treatment to the control in terms of yield, quality or disease parameters. However the 'Plus' products showed less damage from disease than their nutrient counterparts and the lack of a statistical response is attributed to a high level of variability in the data.
- The OPTI-K™ treatment produced statistically more ( $P < 0.01$ ) compact bunches than the control. This treatment possibly produced fewer bunches because it had a low yield, but the bunch weight, length and width were higher than the rest of the treatments and this could have contributed to the bunches being more compact.

### Reference

HED, B., NGUGI, H.K. & TRAVIS, J.W., 2009. Relationship between cluster compactness and bunch rot in vigneoles grapes. *Plant Disease* 93, 1195-1201.

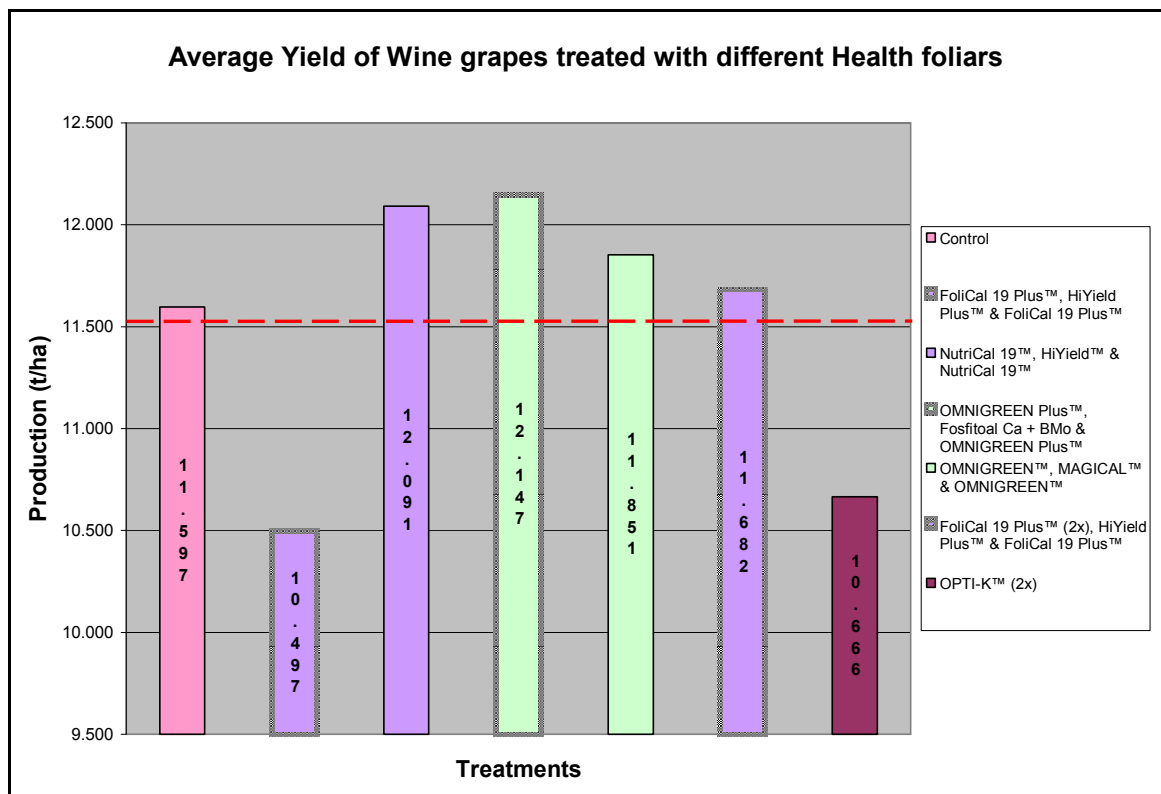
## Addendum A – Yield Data

**Table 6** Fisher's LSD ( $\alpha = 0.05$ ) for pair wise mean comparisons.

Treatment	Yield
	1.094 t/ha

Farm code	Cultivar	Treatment	Yield (t/ha)	Treatment	CV%
AG	Chardonnay	1	11.597	Control	23.757
AG	Chardonnay	2	10.497	FoliCal 19 Plus™, HiYield Plus™ & FoliCal 19 Plus™	11.022
AG	Chardonnay	3	12.091	NutriCal 19™, HiYield™ & NutriCal 19™	8.180
AG	Chardonnay	4	12.147	OMNIGREEN Plus™, Fosfitoal Ca + BMo & OMNIGREEN Plus™	39.939
AG	Chardonnay	5	11.851	OMNIGREEN™, MAGICAL™ & OMNIGREEN™	10.929
AG	Chardonnay	6	11.682	FoliCal 19 Plus™ (2x), HiYield Plus™ & FoliCal 19 Plus™	9.511
AG	Chardonnay	7	10.666	OPTI-K™ (2x)	14.264

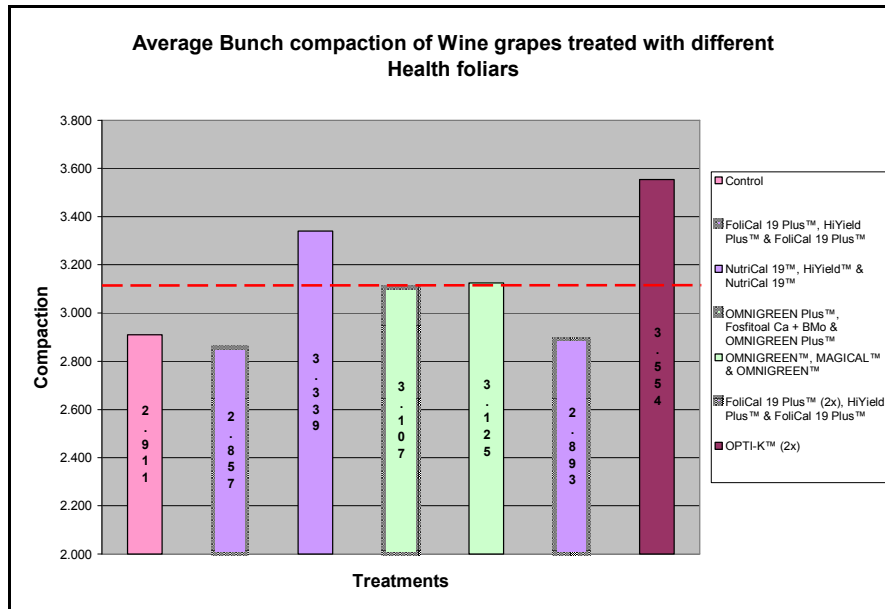
11.505



Farm code	Cultivar	Sample number	Treatment	Repeat	Row	Column	Harvested yield	Yield (t/ha)
AG	Chardonnay	7	1	7	7	1	21.600	8.691
AG	Chardonnay	11	1	4	4	2	23.800	9.777
AG	Chardonnay	19	1	5	5	3	26.200	10.962
AG	Chardonnay	24	1	3	3	4	31.000	13.333
AG	Chardonnay	29	1	1	1	5	35.200	15.407
AG	Chardonnay	41	1	6	6	6	21.600	8.691
AG	Chardonnay	44	1	2	2	7	33.000	14.320
AG	Chardonnay	3	2	3	3	1	22.600	9.185
AG	Chardonnay	13	2	6	6	2	24.800	10.271
AG	Chardonnay	18	2	4	4	3	22.600	9.185
AG	Chardonnay	28	2	7	7	4	25.600	10.666
AG	Chardonnay	30	2	2	2	5	25.400	10.567
AG	Chardonnay	36	2	1	1	6	26.400	11.061
AG	Chardonnay	47	2	5	5	7	29.400	12.543
AG	Chardonnay	1	3	1	1	1	26.800	11.259
AG	Chardonnay	10	3	3	3	2	29.800	12.740
AG	Chardonnay	20	3	6	6	3	28.400	12.049
AG	Chardonnay	23	3	2	2	4	31.800	13.728
AG	Chardonnay	33	3	5	5	5	25.800	10.765
AG	Chardonnay	39	3	4	4	6	27.600	11.654
AG	Chardonnay	49	3	7	7	7	29.200	12.444
AG	Chardonnay	6	4	6	6	1	21.600	8.691
AG	Chardonnay	8	4	1	1	2	29.800	12.740
AG	Chardonnay	21	4	7	7	3	29.800	12.740
AG	Chardonnay	26	4	5	5	4	28.200	11.950
AG	Chardonnay	31	4	3	3	5	29.200	12.444
AG	Chardonnay	37	4	2	2	6	31.400	13.530
AG	Chardonnay	46	4	4	4	7	30.200	12.938
AG	Chardonnay	4	5	4	4	1	25.800	10.765
AG	Chardonnay	12	5	5	5	2	27.600	11.654
AG	Chardonnay	16	5	2	2	3	30.000	12.839
AG	Chardonnay	27	5	6	6	4	26.800	11.259
AG	Chardonnay	35	5	7	7	5	27.000	11.357
AG	Chardonnay	38	5	3	3	6	25.800	10.765
AG	Chardonnay	43	5	1	1	7	33.000	14.320
AG	Chardonnay	2	6	2	2	1	29.400	12.543
AG	Chardonnay	14	6	7	7	2	23.800	9.777
AG	Chardonnay	17	6	3	3	3	27.200	11.456
AG	Chardonnay	22	6	1	1	4	29.000	12.345
AG	Chardonnay	32	6	4	4	5	26.400	11.061
AG	Chardonnay	40	6	5	5	6	27.200	11.456
AG	Chardonnay	48	6	6	6	7	30.600	13.135
AG	Chardonnay	5	7	5	5	1	24.800	10.271
AG	Chardonnay	9	7	2	2	2	29.400	12.543
AG	Chardonnay	15	7	1	1	3	29.200	12.444
AG	Chardonnay	25	7	4	4	4	27.200	11.456
AG	Chardonnay	34	7	6	6	5	23.000	9.382
AG	Chardonnay	42	7	7	7	6	24.200	9.975
AG	Chardonnay	45	7	3	3	7	21.400	8.592

Avg.t/ha **11.505**

## Addendum B – Quality Data



### Wine quality information

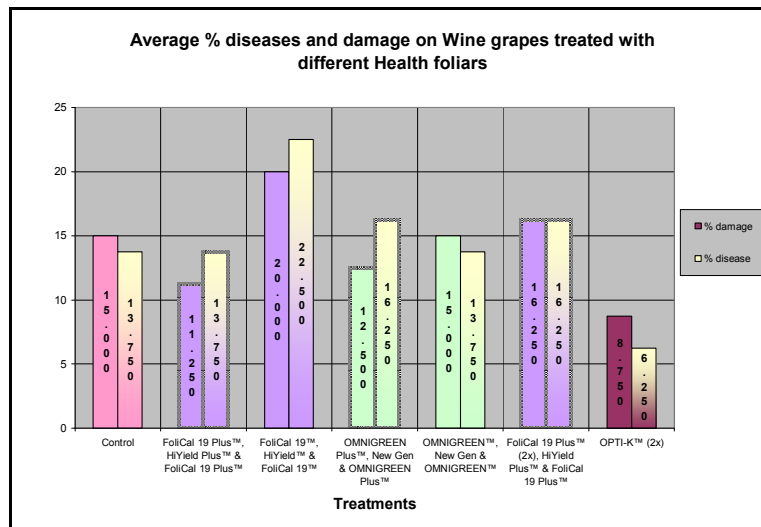
Farm code	Cultivar	Sample number	Treatment	Balling	pH	TA	Malic acid	YAN	Potassium
AG	Chardonnay	WG1	1	21.09	3.52	6.36	3.19	270	1748
AG	Chardonnay	WG2	2	21.01	3.53	6.80	3.47	290	1638
AG	Chardonnay	WG3	3	21.42	3.55	5.84	3.06	250	1586
AG	Chardonnay	WG4	4	21.09	3.50	6.39	3.09	220	1510
AG	Chardonnay	WG5	5	21.20	3.54	6.29	3.23	270	2720
AG	Chardonnay	WG6	6	21.11	3.49	6.70	3.44	280	1642
AG	Chardonnay	WG7	7	21.62	3.52	6.16	3.09	250	1725

## Addendum C – Disease Data

**Table 7** Treatment means of the disease assessments.

Treatment	1	2	3	4	5	6	7
n	4	4	4	4	4	4	4
<b>Disease Incidence Rate</b>	13.75	13.75	22.50	16.25	13.75	16.25	6.25
<b>Disease Damage Rate</b>	15.00	11.25	20.00	12.50	15.00	16.25	8.75
<b>Vine Leaf Colour</b>	6.75	7.25	5.25	6.50	7.25	7.13	6.25

Farm code	Cultivar	Sample number	Treatment	Repeat	Row	Column	% disease	% damage	Vine leaf colour	
AG	Chardonnay	7	1	7	7	1	15.000	20.000	6.000	
AG	Chardonnay	19	1	5	5	3	10.000	20.000	8.000	
AG	Chardonnay	29	1	1	1	5	5.000	5.000	7.000	
AG	Chardonnay	44	1	2	2	7	25.000	15.000	6.000	
AG	Chardonnay	3	2	3	3	1	10.000	5.000	8.000	
AG	Chardonnay	18	2	4	4	3	30.000	25.000	7.000	
AG	Chardonnay	30	2	2	2	5	5.000	5.000	7.000	
AG	Chardonnay	47	2	5	5	7	10.000	10.000	7.000	
AG	Chardonnay	1	3	1	1	1	35.000	15.000	4.000	
AG	Chardonnay	20	3	6	6	3	10.000	10.000	7.000	
AG	Chardonnay	33	3	5	5	5	25.000	25.000	6.000	
AG	Chardonnay	49	3	7	7	7	20.000	30.000	4.000	
AG	Chardonnay	6	4	6	6	1	5.000	10.000	8.000	
AG	Chardonnay	21	4	7	7	3	25.000	15.000	4.000	
AG	Chardonnay	31	4	3	3	5	10.000	5.000	8.000	
AG	Chardonnay	46	4	4	4	7	25.000	20.000	6.000	
AG	Chardonnay	4	5	4	4	1	10.000	10.000	8.500	
AG	Chardonnay	16	5	2	2	3	5.000	15.000	5.500	
AG	Chardonnay	35	5	7	7	5	15.000	10.000	7.500	
AG	Chardonnay	43	5	1	1	7	25.000	25.000	7.500	
AG	Chardonnay	2	6	2	2	1	15.000	15.000	6.000	
AG	Chardonnay	17	6	3	3	3	5.000	5.000	8.500	
AG	Chardonnay	32	6	4	4	5	25.000	25.000	7.500	
AG	Chardonnay	48	6	6	6	7	20.000	20.000	6.500	
AG	Chardonnay	5	7	5	5	1	5.000	10.000	5.500	
AG	Chardonnay	15	7	1	1	3	5.000	5.000	8.000	
AG	Chardonnay	34	7	6	6	5	5.000	5.000	4.000	
AG	Chardonnay	45	7	3	3	7	10.000	15.000	7.500	
							<b>14.643</b>	<b>14.107</b>	<b>6.625</b>	
							<b>CV%</b>	<b>62.293</b>	<b>53.755</b>	<b>21.010</b>



### Addendum D – Soil Data

Farm code	Cultivar	Sample number	Treatment	Soil depth	Bulk density	pH (KCl)	Exchangeable acidity	Acid saturation	S (%)	P (mg/kg)	K (mg/kg)	Ca (mg/kg)	Mg (mg/kg)	Na (mg/kg)	ECEC (pH 7) cmol(+)/kg
AG	Chardonnay	WG1	1	Topsoil	1229	5.23	NVT	0	55.5	61	66	434	105	28.0	3.3
AG	Chardonnay	WG2	2	Topsoil	1072	5.48	NVT	0	33.3	58	83	709	143	31.0	5.1
AG	Chardonnay	WG3	3	Topsoil	1186	5.44	NVT	0	33.3	51	84	517	129	33.0	4.0
AG	Chardonnay	WG4	4	Topsoil	1175	5.81	NVT	0	22.2	44	79	650	139	32.0	4.7
AG	Chardonnay	WG5	5	Topsoil	1131	5.85	NVT	0	99.9	56	89	689	140	30.0	5.0
AG	Chardonnay	WG6	6	Topsoil	1070	5.54	NVT	0	77.7	71	67	532	117	37.0	4.0
AG	Chardonnay	WG7	7	Topsoil	1095	4.61	NVT	0	66.6	6	85	196	37	13.0	1.6

Farm code	Cultivar	Sample number	Treatment	Soil depth	Ca / Mg	Mg / K	(Ca + Mg) / K	Sand %	Slik %	Klei %	Organic C %	Zn (mg/kg)	Mn (mg/kg)	Fe (mg/kg)	Cu (mg/kg)	B (mg/kg)
AG	Chardonnay	WG1	1	Topsoil	2.5	5.1	18.0	0	0	0	0.00	6.10	56.19	79.30	1.90	0.00
AG	Chardonnay	WG2	2	Topsoil	3.0	5.5	22.2	0	0	0	0.00	1.30	14.49	18.40	1.80	0.00
AG	Chardonnay	WG3	3	Topsoil	2.4	4.9	17.0	0	0	0	0.00	1.00	3.57	37.90	1.40	0.00
AG	Chardonnay	WG4	4	Topsoil	2.9	5.6	21.7	0	0	0	0.00	0.90	3.45	56.70	1.40	0.00
AG	Chardonnay	WG5	5	Topsoil	3.0	5.0	20.2	0	0	0	0.00	1.10	4.93	46.20	1.80	0.00
AG	Chardonnay	WG6	6	Topsoil	2.8	5.6	21.1	0	0	0	0.00	1.50	4.01	45.00	1.80	0.00
AG	Chardonnay	WG7	7	Topsoil	3.2	1.4	5.9	0	0	0	0.00	1.20	13.53	36.10	1.70	0.00

### Addendum E – Water Data

Treatment	Date	Water info			Dissolved product info		
		pH	EC mS cm <sup>-1</sup>	ppm	pH	EC mS cm <sup>-1</sup>	ppm
1	15-16/11/2010	7.5	0.31	200	N/A	N/A	N/A
2					6.8	5.32	3650
3					8.0	6.42	4470
4					5.6	2.62	1790
5					9.3	2.45	1690
6 (HiYield Plus™)	N/A	N/A	N/A	N/A	6.8	5.32	3650
7					N/A	N/A	N/A

Note: Readings of 1000 L water ha<sup>-1</sup> spray volume

Treatment	Date	Water info			Dissolved product info		
		pH	EC mS cm <sup>-1</sup>	ppm	pH	EC mS cm <sup>-1</sup>	ppm
1	21/12/2010	8.3	0.17	120	N/A	N/A	N/A
2					7.3	3.85	2650
3					7.1	4.09	2840
4					5.2	1.24	860
5					5.7	3.91	4490
6 (FoliCal Plus™)	19/01/2011	8.1	0.59	310	7.3	6.24	4290
7					8.4	1.84	1050

Note: Readings of 1000 L water ha<sup>-1</sup> spray volume

## Addendum F – Statistical Data

**Table 8** ANOVA results of the effect of rows, columns and treatments on yield of wine grapes.

Effect	df	SS	MS	F	p
Treatment	6	18.45	3.076	2.135	0.07839
Row	6	37.85	6.308	4.378	0.00273
Column	6	25.05	4.175	2.898	0.02384
Error	30	43.22	1.441		
Total	48	124.6			

**Yield information**

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-1.008	0.9084057	0.3433451	-1.848135	-0.1678648
Treatment=3	7	0.5865715	0.8676645	0.3279463	-0.2158844	1.389027
Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=3) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-1.594571	0.8882687	0.4747996	-2.629071	-0.5600719
Unequal	11.97	-1.594571	1.256202	0.4747996	-2.629312	-0.5598307
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1793						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-3.3584	0.005691	Reject Ho	0.868687	0.624316	
Difference < 0	-3.3584	0.002845	Reject Ho	0.935209	0.741029	
Difference > 0	-3.3584	0.997155	Accept Ho	0.000001	0.000000	
Difference: (Treatment=2)-(Treatment=3)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-1.008	0.9084057	0.3433451	-1.848135	-0.1678648
Treatment=4	7	0.6431429	0.806083	0.3046708	-0.1023596	1.388645
Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=4) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-1.651143	0.8587697	0.4590317	-2.651287	-0.6509987
Unequal	11.83	-1.651143	1.214484	0.4590317	-2.652858	-0.6494272
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1822						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-3.5970	0.003666	Reject Ho	0.909448	0.698129	
Difference < 0	-3.5970	0.001833	Reject Ho	0.959005	0.803762	
Difference > 0	-3.5970	0.998167	Accept Ho	0.000000	0.000000	
Difference: (Treatment=2)-(Treatment=4)						

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**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-1.008	0.9084057	0.3433451	-1.848135	-0.1678648
Treatment=5	7	0.3465714	0.4098174	0.1548964	-3.244643E-02	0.7255893

Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=5) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-1.354571	0.7046812	0.376668	-2.17526	-0.5338824
Unequal	8.35	-1.354571	0.9965698	0.376668	-2.216955	-0.4921876

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2895

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	-3.5962	0.003671	Reject Ho	0.909327	0.697888
Difference < 0	-3.5962	0.001836	Reject Ho	0.958938	0.803564
Difference > 0	-3.5962	0.998164	Accept Ho	0.000000	0.000000

Difference: (Treatment=2)-(Treatment=5)

**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-1.008	0.9084057	0.3433451	-1.848135	-0.1678648
Treatment=6	7	0.1774286	0.93973	0.3551846	-0.6916768	1.046534

Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=6) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-1.185429	0.9242007	0.494006	-2.261775	-0.1090819
Unequal	11.99	-1.185429	1.307017	0.494006	-2.261912	-0.1089448

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1791

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	-2.3996	0.033542	Reject Ho	0.596937	0.308554
Difference < 0	-2.3996	0.016771	Reject Ho	0.731142	0.422635
Difference > 0	-2.3996	0.983229	Accept Ho	0.000044	0.000004

Difference: (Treatment=2)-(Treatment=6)

**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=3	7	0.5865715	0.8676645	0.3279463	-0.2158844	1.389027
Treatment=7	7	-0.8384286	1.346529	0.5089402	-2.08376	0.4069031

Note: T-alpha (Treatment=3) = 2.4469, T-alpha (Treatment=7) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.425	1.132692	0.6054493	0.1058392	2.744161
Unequal	10.25	1.425	1.601868	0.6054493	8.041941E-02	2.769581

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2208

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	2.3536	0.036472	Reject Ho	0.580578	0.294834
Difference < 0	2.3536	0.981764	Accept Ho	0.000053	0.000004
Difference > 0	2.3536	0.018236	Reject Ho	0.716698	0.406842

Difference: (Treatment=3)-(Treatment=7)

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=4	7	0.6431429	0.806083	0.3046708	-0.1023596	1.388645
Treatment=7	7	-0.8384286	1.346529	0.5089402	-2.08376	0.4069031
Note: T-alpha (Treatment=4) = 2.4469, T-alpha (Treatment=7) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.481571	1.10971	0.5931647	0.1891766	2.773966
Unequal	9.81	1.481571	1.569366	0.5931647	0.1564584	2.806684
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2340						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	2.4977	0.028031	Reject Ho	0.631227	0.338688	
Difference < 0	2.4977	0.985984	Accept Ho	0.000030	0.000002	
Difference > 0	2.4977	0.014016	Reject Ho	0.760659	0.456692	
Difference: (Treatment=4)-(Treatment=7)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=5	7	0.3465714	0.4098174	0.1548964	-3.244643E-02	0.7255893
Treatment=7	7	-0.8384286	1.346529	0.5089402	-2.08376	0.4069031
Note: T-alpha (Treatment=5) = 2.4469, T-alpha (Treatment=7) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.185	0.9952615	0.5319896	2.589413E-02	2.344106
Unequal	7.10	1.185	1.407512	0.5319896	-6.929895E-02	2.439299
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.3578						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	2.2275	0.045817	Reject Ho	0.535070	0.258706	
Difference < 0	2.2275	0.977091	Accept Ho	0.000086	0.000007	
Difference > 0	2.2275	0.022909	Reject Ho	0.675281	0.364351	
Difference: (Treatment=5)-(Treatment=7)						

### Compaction information

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=1	7	-0.2015714	0.2995473	0.1132183	-0.4786065	7.546367E-02
Treatment=3	7	0.227	0.4717143	0.1782912	-0.2092629	0.6632629
Note: T-alpha (Treatment=1) = 2.4469, T-alpha (Treatment=3) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.4285714	0.3951221	0.2112017	-0.8887403	3.159743E-02
Unequal	10.16	-0.4285714	0.558787	0.2112017	-0.898142	4.099919E-02
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2233						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-2.0292	0.065220	Accept Ho	0.462796	0.206852	
Difference < 0	-2.0292	0.032610	Reject Ho	0.605712	0.300900	
Difference > 0	-2.0292	0.967390	Accept Ho	0.000180	0.000016	
Difference: (Treatment=1)-(Treatment=3)						

**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=1	7	-0.2015714	0.2995473	0.1132183	-0.4786065	7.546367E-02
Treatment=7	7	0.4412857	0.2527045	9.551333E-02	0.207573	0.6749984

Note: T-alpha (Treatment=1) = 2.4469, T-alpha (Treatment=7) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.6428571	0.2771175	0.1481255	-0.9655949	-0.3201194
Unequal	11.67	-0.6428571	0.3919033	0.1481255	-0.9666133	-0.319101

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1857

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	-4.3399	0.000962	Reject Ho	0.977898	0.874089
Difference < 0	-4.3399	0.000481	Reject Ho	0.992540	0.933529
Difference > 0	-4.3399	0.999519	Accept Ho	0.000000	0.000000

Difference: (Treatment=1)-(Treatment=7)

**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-0.2551429	0.4906592	0.1854518	-0.708927	0.1986412
Treatment=3	7	0.227	0.4717143	0.1782912	-0.2092629	0.6632629

Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=3) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.4821429	0.48128	0.257255	-1.042653	7.836755E-02
Unequal	11.98	-0.4821429	0.6806327	0.257255	-1.04275	7.846386E-02

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1792

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	-1.8742	0.085450	Accept Ho	0.406998	0.170918
Difference < 0	-1.8742	0.042725	Reject Ho	0.548699	0.255022
Difference > 0	-1.8742	0.957275	Accept Ho	0.000312	0.000030

Difference: (Treatment=2)-(Treatment=3)

**Descriptive Statistics Section**

Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	-0.2551429	0.4906592	0.1854518	-0.708927	0.1986412
Treatment=7	7	0.4412857	0.2527045	9.551333E-02	0.207573	0.6749984

Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=7) = 2.4469

**Confidence-Limits of Difference Section**

Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.6964286	0.3902602	0.2086028	-1.150935	-0.241922
Unequal	8.97	-0.6964286	0.5519113	0.2086028	-1.168531	-0.2243263

Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2632

**Equal-Variance T-Test Section**

Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)
Difference <> 0	-3.3385	0.005904	Reject Ho	0.864794	0.617903
Difference < 0	-3.3385	0.002952	Reject Ho	0.932821	0.735369
Difference > 0	-3.3385	0.997048	Accept Ho	0.000001	0.000000

Difference: (Treatment=2)-(Treatment=7)

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=3	7	0.227	0.4717143	0.1782912	-0.2092629	0.6632629
Treatment=6	7	-0.2194286	0.3331971	0.1259367	-0.5275844	8.872732E-02
Note: T-alpha (Treatment=3) = 2.4469, T-alpha (Treatment=6) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	0.4464286	0.4083715	0.2182838	-0.0291709	0.9220281
Unequal	10.79	0.4464286	0.5775245	0.2182838	-3.513259E-02	0.9279897
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2061						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	2.0452	0.063409	Accept Ho	0.468604	0.210790	
Difference < 0	2.0452	0.968295	Accept Ho	0.000170	0.000015	
Difference > 0	2.0452	0.031705	Reject Ho	0.611479	0.305827	
Difference: (Treatment=3)-(Treatment=6)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=4	7	-5.142857E-03	0.5084255	0.1921668	-0.475358	0.4650723
Treatment=7	7	0.4412857	0.2527045	9.551333E-02	0.207573	0.6749984
Note: T-alpha (Treatment=4) = 2.4469, T-alpha (Treatment=7) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.4464286	0.4014698	0.2145946	-0.9139901	2.113301E-02
Unequal	8.79	-0.4464286	0.5677641	0.2145946	-0.9336144	4.075731E-02
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2703						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-2.0803	0.059588	Accept Ho	0.481414	0.219609	
Difference < 0	-2.0803	0.029794	Reject Ho	0.624087	0.316797	
Difference > 0	-2.0803	0.970206	Accept Ho	0.000149	0.000013	
Difference: (Treatment=4)-(Treatment=7)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=5	7	1.271429E-02	0.3336434	0.1261053	-0.2958544	0.321283
Treatment=7	7	0.4412857	0.2527045	9.551333E-02	0.207573	0.6749984
Note: T-alpha (Treatment=5) = 2.4469, T-alpha (Treatment=7) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.4285714	0.295954	0.158194	-0.7732466	-8.389623E-02
Unequal	11.18	-0.4285714	0.4185421	0.158194	-0.7760734	-8.106948E-02
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1967						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-2.7092	0.018985	Reject Ho	0.701323	0.406909	
Difference < 0	-2.7092	0.009493	Reject Ho	0.817770	0.530754	
Difference > 0	-2.7092	0.990507	Accept Ho	0.000013	0.000001	
Difference: (Treatment=5)-(Treatment=7)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=6	7	-0.2194286	0.3331971	0.1259367	-0.5275844	8.872732E-02
Treatment=7	7	0.4412857	0.2527045	9.551333E-02	0.207573	0.6749984
Note: T-alpha (Treatment=6) = 2.4469, T-alpha (Treatment=7) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	-0.6607143	0.2957024	0.1580596	-1.005097	-0.316332
Unequal	11.19	-0.6607143	0.4181864	0.1580596	-1.007895	-0.3135337
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1965						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	-4.1802	0.001276	Reject Ho	0.969062	0.844095	
Difference < 0	-4.1802	0.000638	Reject Ho	0.988841	0.913655	
Difference > 0	-4.1802	0.999362	Accept Ho	0.000000	0.000000	
Difference: (Treatment=6)-(Treatment=7)						

### Cluster compactness information

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
Treatment=1	7	0.4682857	0.6380067	0.2411439	-0.1217721	1.058344
Treatment=6	7	-0.2891428	0.826106	0.3122387	-1.053164	0.4748778
Note: T-alpha (Treatment=1) = 2.4469, T-alpha (Treatment=6) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95.0% LCL Difference	95.0% UCL Difference
Equal	12	0.7574286	0.7380731	0.3945166	-0.1021494	1.617007
Unequal	11.28	0.7574286	1.043793	0.3945166	-0.1082805	1.623138
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1944						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.050)	Power (Alpha=.010)	
Difference <> 0	1.9199	0.078956	No	0.423307	0.181077	
Difference < 0	1.9199	0.960522	No	0.000266	0.000025	
Difference > 0	1.9199	0.039478	Yes	0.565672	0.268164	
Difference: (Treatment=1)-(Treatment=6)						

### Rotten berries information

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=1	7	0.8418571	2.072975	0.7835111	-1.075325	2.75904
Treatment=6	7	-1.086714	1.034351	0.390948	-2.043329	-0.1300991
Note: T-alpha (Treatment=1) = 2.4469, T-alpha (Treatment=6) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.928571	1.638156	0.8756312	2.073498E-02	3.836408
Unequal	8.81	1.928571	2.316702	0.8756312	-5.866019E-02	3.915803
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2695						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	2.2025	0.047922	Reject Ho	0.525976	0.251824	
Difference < 0	2.2025	0.976039	Accept Ho	0.000095	0.000008	
Difference > 0	2.2025	0.023961	Reject Ho	0.666786	0.356103	
Difference: (Treatment=1)-(Treatment=6)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=2	7	0.6275714	2.095849	0.7921566	-1.310766	2.565909
Treatment=6	7	-1.086714	1.034351	0.390948	-2.043329	-0.1300991
Note: T-alpha (Treatment=2) = 2.4469, T-alpha (Treatment=6) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.714286	1.652644	0.8833756	-0.2104243	3.638996
Unequal	8.76	1.714286	2.337192	0.8833756	-0.2924578	3.721029
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2717						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	1.9406	0.076163	Accept Ho	0.430745	0.185803	
Difference < 0	1.9406	0.961918	Accept Ho	0.000247	0.000023	
Difference > 0	1.9406	0.038082	Reject Ho	0.573327	0.274230	
Difference: (Treatment=2)-(Treatment=6)						

Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=3	7	-0.1581428	0.8103358	0.3062781	-0.9075785	0.5912928
Treatment=6	7	-1.086714	1.034351	0.390948	-2.043329	-0.1300991
Note: T-alpha (Treatment=3) = 2.4469, T-alpha (Treatment=6) = 2.4469						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	0.9285714	0.9291196	0.4966353	-0.1535039	2.010647
Unequal	11.35	0.9285714	1.313974	0.4966353	-0.1604192	2.017562
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.1927						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	1.8697	0.086109	Accept Ho	0.405415	0.169947	
Difference < 0	1.8697	0.956945	Accept Ho	0.000317	0.000030	
Difference > 0	1.8697	0.043055	Reject Ho	0.547038	0.253758	
Difference: (Treatment=3)-(Treatment=6)						

<b>Descriptive Statistics Section</b>						
Variable	Count	Mean	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Treatment=4	7	0.7704286	1.554376	0.5874989	-0.6671294	2.207987
Treatment=6	7	-1.086714	1.034351	0.390948	-2.043329	-0.1300991
Note: T-alpha (Treatment=4) = 2.4469, T-alpha (Treatment=6) = 2.4469						
<b>Confidence-Limits of Difference Section</b>						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95% LCL of Mean	95% UCL of Mean
Equal	12	1.857143	1.320221	0.7056878	0.3195812	3.394705
Unequal	10.44	1.857143	1.867074	0.7056878	0.2937603	3.420525
Note: T-alpha (Equal) = 2.1788, T-alpha (Unequal) = 2.2154						
<b>Equal-Variance T-Test Section</b>						
Alternative Hypothesis	T-Value	Prob Level	Decision (5%)	Power (Alpha=.05)	Power (Alpha=.01)	
Difference <> 0	2.6317	0.021908	Reject Ho	0.676331	0.381469	
Difference < 0	2.6317	0.989046	Accept Ho	0.000017	0.000001	
Difference > 0	2.6317	0.010954	Reject Ho	0.797910	0.503614	
Difference: (Treatment=4)-(Treatment=6)						

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