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Efficacy trial evaluation of *Spray-N-Grow with Micronutrients* on yields and quality of a hydroponic greenhouse tomato crop.

May 2009

By Dr Lynette Morgan and Simon Lennard

Efficacy Trial For `*Spray-N-Grow with Micronutrients*' manufactured by Spray-N-Grow Inc, Texas, USA

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Abstract

Hybrid greenhouse tomato cultivar `Libel' (De Ruiter seeds) was grown in a coir media, greenhouse based, hydroponic system for a period of 6 months. Plants were divided into treatment blocks with 4 replications of each treatment. Treatments consisted of *Spray-N-Grow with Micronutrients* applied to the foliage weekly at recommended rates and a control treatment with no application of foliar spray. Total yield, fruit numbers, fruit brix and dry weight assessment was determined for each treatment over the harvest period, along with visible differences in crop development. Application of *Spray-N-Grow with Micronutrients* resulted in significant increases in average fruit fresh weight on four harvest dates, and a significant increase in fruit fresh weight overall. *Spray-N-Grow with Micronutrients* resulted in increased fruit brix readings on two sampling dates and increase in brix overall. Numbers of fruit harvested were higher and total yield peaked earlier in the Spray-N-Grow treated plants. This demonstrates that the *Spray-N-Grow with Micronutrients* was effective in increasing hydroponic tomato fruit yields and quality in accordance with the product claims.

Introduction

Spray-N-Grow with Micronutrients manufactured by Spray-N-Grow Inc, is an organic based micronutrient complex containing iron and zinc, made from naturally occurring elements. Some of the micronutrients contained within this product are not supplied by standard hydroponic nutrient solutions. *Spray-N-Grow with Micronutrients* is a foliar product applied as a fine mist with the addition of a non ionic wetting agent to minimize run off and assist with absorption of the fertilizer solution into plant tissue. The product claims are to increase yields and compositional quality of tomato fruit. The suggested mode of action of this product is uptake via the leaf surface pores, absorption into leaf tissue and potential translocation to other sites and tissues within the plant to boost certain plant biochemical reactions involved with vegetative and reproductive growth and development. With trace element complexes this may be via increased pollen production or viability, plant strengthening, and stimulation of various plant processes such as photosynthesis and mineral uptake.

Background

As early as the 1870's it was reported that dissolved mineral salts are absorbed via leaf surfaces and used in plant metabolism. In the early 1900's many researchers provided scientific evidence that leaves absorb substances. As the third organ of higher plants, after the shoot and root, the leaf is essentially used for photosynthesis and respiration. The leaf blade is flat in shape for this purpose. Most leaves have stomata either only on the underside or on both sides of the leaf which enable gas to be exchanged for photosynthesis and respiration as well as releasing water vapor in stomatal transpiration. The leaf with its epidermis also function as an organ that absorbs and excretes water and substances which may be dissolved in it (Reickenberg and Pritts 1996)

Aqueous solutions are absorbed and excreted not throughout the entire leaf cuticle, but through punctiform areas. If these structures serve to excrete aqueous solutions from the leaf, then they will also carry out the reverse process i.e absorption into the leaf. This has also been demonstrated with the use of radio labeled materials. Since foliar absorption is limited because of the relative barrier of the cuticle it is not possible to solely feed plants via the leaves. For this reason, the most effective use of foliar fertilization is as a rapid and

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effective method of supplying micro nutrients. It can, however also be used to satisfy acute needs with lower concentrations of macronutrients.

In soil and soilless systems such as hydroponics, many nutrient interactions can occur within the root zone which makes it difficult for the plant to absorb certain minerals. Soils and even hydroponic systems can become deficient in nutrients – either because of nutrient depletion, antagonism between certain elements, naturally low levels, and inadequate fertilization or due to elements becoming `bound' and therefore unavailable for plant uptake. Imbalances in the combinations of nutrients, pH levels which are too high or low for maximum plant uptake, and poor physical properties of the media surrounding the root zone, including oxygen starvation are more common in both soil and soilless systems than many growers realize. Further more elements such as iron, as essential trace element, are not only prone to becoming unavailable for plant use at moderate to high pH levels, their uptake by the plant is also severely limited under certain environmental conditions such as cool temperatures. Any situation which damages the root system or restricts its growth, development or physical process such as respiration affects the uptake of minerals. Plant pathogens such as F*usarium*, P*ythium* and P*hytophthora* can not only rapidly destroy a crop, but low, less damaging levels can restrict function of the root system to the point where mineral uptake is affected. While the crop may not show signs of severe infection, mineral and water uptake can be restricted to the point where crop yields and quality are affected. Other plant stress conditions such as anaerobic conditions in the root zone where oxygen is limited, can restrict nutrient uptake, with trace elements such as iron often affected to the greatest degree. Any other condition which stresses the plant – temperatures, high or excessively low humidity levels, lack of light, high radiation levels, high plant densities, presence of pests and diseases, will affect the efficiency of the root system in taking up mineral elements. Many of these conditions are common and occur in commercial production situations without the grower realizing that plant growth and mineral uptake is limited in some way. It is under these types of common situations that foliar feeding has an additional advantage. Since plant stress is dependant on a number of factors – many are environmental, which growers have limited control over, foliar fertilization proves an `insurance policy' against yield and quality loss from limitations in root mineral absorption and transportation.

Most crops have certain growth stages requiring a particular supply of all or of certain nutrients to reach optimum yields. Plant demand is generally at its maximum during the period of exponential growth. During such critical stages, leaves show a particularly high efficacy for absorbing nutrients. Furthermore, at any stage during growth and development, there are times when nutrient uptake by the root system is impeded to such an extent that plant tissues may not receive an adequate supply of nutrients. Examples of this are during drought or high salinity conditions. During times of limited nutrient uptake due to water stress or other conditions, foliar fertilization can be a means by which optimal yield can still be obtained. Furthermore there are a number of scientifically recognized trace minerals, naturally present in soil and water which have been shown to be beneficial for growth and development of many plants, despite not being considered `essential'. These include silica, nickel, titanium and others, the role of which in plant development is not yet fully understood.

If a period during which the plants have difficultly in absorbing nutrients via the root system should coincide with a period when there is a particularly vigorous demand for nutrients, the result will be a significant loss in yield potential, without the grower seeing any visible signs of deficiency. Under such conditions, foliar fertilization with the correct product can give good results.

Foliar fertilization in hydroponic crops

While hydroponic crops may appear to be supplied with optimal nutrition via a well balanced and formulated nutrient solution, these still benefit from the application of foliar fertilizers. Studies have shown that hydroponic crops such as capsicum, treated with a micro nutrient foliar applied solution, had an increase in fruit yield over control plants, and also an increase in the compound capsaicin in the fruit tissue (Padem and Alan, 1994). Hydroponically cultivated potato plants also showed similar results. Potato plants given foliar fertilization treatments not only had a greater tuber harvest, but also higher dry matter of the whole plants. Rockwool grown tomato crops have shown both yield and fruit quality improvements

when given a weekly foliar feed of a micro nutrient complex (Kolota and Osinska 2000, Alan and Padem 1994, Komosa 1984). These results would also be expected in a number of hydroponic crops with similar nutrient requirements and thus the process of foliar fertilization is a cultivation technique that should be considered in any commercial production system.

MATERIALS AND METHODS

Objectives

The objective of this study is to determine the efficacy of *Spray-N-Grow with micronutrients* on increasing yields and quality of a hydroponic, greenhouse tomato crop applied at the manufacturers recommended rates and frequency. This was determined by collecting fruit number, fruit weight, total yield, fruit brix and fruit dry matter data for each treatment over the cropping period.

Treatments

The following treatments were assigned to this trial.

1. *Spray-N-Grow with micronutrients* applied at the recommended rate of 10mls per litre of pH adjusted water (pH 7.1)at 38° C with addition of 0.9 mls of Coco-Wet non ionic surfactant. Applied weekly from the 5 leaf stage until crop completion, as a fine mist spray to run off on all treatment plant surfaces, before 10 am in the morning.

2. Control treatment – no foliar applications.

Experimental design

This trial consisted of 4 replications per treatment, each containing 8 plants. Total number of test plants of a commercial, standard and highly uniform hybrid, was 64. The trial set up consisted of randomized plots and accompanying guard plants. Treatment plants were shielded with plastic screens as required to prevent any cross contamination of treated and untreated plots within the greenhouse.

Crop Production system

Seeds of F1 Hybrid commercial beefsteak tomato cultivar `Libel' were sown into rockwool (Grodan) propagation cubes on 11 September 2008 and raised in a heated propagation unit. After development of the first true leaf, the propagation cubes were separated and transplanted into 10 cm rockwool (Grodan) blocks. During this time a standard hydroponic nutrient solution (Appendix one) was applied at an EC of 1.2 $mScm^{-1}$ and pH of 6.0. On October 16 all seedlings were transplanted into a media based, drip irrigated hydroponic system in a naturally ventilated, 140 square meter greenhouse. The first *Spray-N-Grow with Micronutrients* treatment was applied on 17th October, one day after transplanting. One seedling per 10 litre, coconut fiber filled growing container was planted out with nutrient solution applied via an emitter placed onto the top of the rockwool cube. A standard, vegetative hydroponic nutrient solution (Appendix one) was applied at an EC of 2.5 mS cm^{-1} twice per day during the first two weeks of growth. This was increased to 6 irrigations per day as the crop developed and temperatures increased. In mid December 2008, the nutrient solution was changed to a fruiting formulation (Appendix 2) with a higher ratio of potassium to nitrogen to support fruit growth and quality, as is standard practice with hydroponic tomato crops. This gave a 10 – 15% drain off from the growing containers as is standard practice in media based hydroponic systems.

Plants were trained to overhead wires for support and artificial pollination was carried out every second day to ensure maximum fruit set. Plants were stopped after the development of the 6th truss as they had reached the top support wire. Lateral growth was removed weekly. The crop was sprayed as required for pests and diseases, this being to control caterpillar larvae in February (`Mavrik' tau-fluvalinate 9.6g/l) and one fungicide treatment (`Saprol' Triforine 65g/l) to control Botrytis in April. This was carried out 5 days before application of the *Spray-N-Grow with micronutrients* treatment to prevent any carryover effect on uptake of the treatment product.

Temperatures during the production period averaged 25° C day/18° C night during the main growth period. Maximum temperature recorded was 33° C, minimum was 12° C. Light levels were limiting during the early seedling propagation stage up until late October.

All plants receiving Spray-N-Grow with micronutrient treatment were sprayed early in the morning when stomata are expected to be open for nutrient absorption. Spray-N-Grow with Micronutrient treatments were applied weekly until the final harvest date in May 2009.

Preparation of the *Spray-N-Grow with Micronutrients* foliar solution – in accordance with label instructions.
Distilled water used as a carrier for the *Spray-N-Grow with Micronutrients* product was warmed to 100° F (38° C). The pH of this water was adjusted to 7.1 as required. 10 ml of *Spray-N-Grow with micronutrients* along with 3 ml of cocowet surfactant was added to the warmed water and left for 15 minutes. After this time the solution was applied as a fine mist spray onto the treatment plants with use of a hand held pressure sprayer. Care was taken to apply the solution to as much of the upper and lower leaf surfaces as possible for maximum efficiency.

Crop Measurements
The size and development of seedlings during the vegetative stages was noted as was the timing of floral initiation. Foilar samples of the youngest mature leaves from both treatments were collected on two separate assessment dates in December and February and analyzed for levels of Nitrogen, Phosphorus, Potassium, Sulphur, Calcium, Magnesium, Sodium, Iron, Manganese, Zinc, Copper and Boron. This was to confirm that plants from both treatments were within the recommended ranges for macro and micro nutrients. Samples of leachate (nutrient solution draining from the growing containers) for each replication and treatment were collected each month and analyzed for macro nutrients to ensure all plants were receiving suitable nutrition via the hydroponic nutrient formulation.

Data collection
The first harvest took place on 22 January 2009, the final harvest date was 3 May 2009 when the crop was terminated. Individual fruit from each treatment replication were weighed and assessed for marketability. All fruit were harvested at the `vine ripened red' stage of maturity.

Fruit Brix (Total soluble solids levels)
Samples of 15 fruit from each of the 4 replications of each treatment, of a similar size and same degree of ripeness were selected from 4 harvest dates in January, February, March and April. The fruit were left to ripen for a further 3 days under room temperature conditions and then frozen. After 2 weeks the samples were defrosted, processed through a juicer and the remaining extract filtered through laboratory grade filter paper. The clear extract was then placed on the plate of a refractometer (Brix meter) and a reading taken 3 times for each sample. Brix levels are an indication of sugar levels within the fruit and are highly correlated with the `sweetness' variable measured by taste panelists. Fruit with higher Brix readings tend to result in sweeter fruit as can be measured by human tasters. Brix levels in tomato fruit can vary from 3 (low) to up to 8 – 10 (in sweet cocktail varieties) and are influenced by factors such as cultivar, season, nutrition, EC levels and general growth health.

Fruit percentage dry matter
Samples of 15 fruit of a similar size and degree of ripeness were selected from each of the 4 replications of each treatment from 4 harvest dates in January, February, March and April. These fruit were weighted, but into quarters and desiccated on a low heat for 48 hours until no moisture remained. The fruit samples were re weighed and the percentage dry matter determined. Tomato fruit are typically 4 – 7% dry matter depending on season, cultivar and growing conditions.

Statistical analysis
All data was statistically analyzed, giving 95% confidence intervals using the Microsoft Excel, data analysis module for statistical analysis (Appendix two).

RESULTS

Treatment effects on crop growth development

Early vegetative growth in the first few weeks of crop development was similar between treatment plots with no visible differences in height. By mid November all plants were in flower on the first truss with some fruit set seen. At this stage it was visually determined that the *Spray-N-Grow with Micronutrients* treatment plots had advanced flowering by approximately 5 – 7 days compared to the control plants and also set fruit earlier than the non treated plants. This resulted in an earlier yield peak in the Spray-N-Grown with Micronutrients treated plants compared to the control.

Foliar mineral levels and leachate analysis

Foliar mineral and leachate analysis (nutrient drainage from the growing containers) was carried out on each treatment plot throughout the course of the trial. Leachate analysis of macro elements, N, P, K, Mg and Ca showed no unexpected differences in pH, EC or levels of macro elements between treatments. All macro elements were within the ideal range for fruiting tomato crops with no deficiencies noted. Foliar analysis results for levels of N, P, K, S, Ca, Mg, Na, Fe, Mn, Zn, Cu and B were similar between treatments for elements apart from zinc and iron. Iron levels were slightly higher in the *Spray-N-Grow with Micronutrients* treatment plants by approximately 10- 50 mg/Kg. Zinc was found to be at higher levels in the Spray-N-Grow treatment to that of the control treatment at all testing dates. Zinc levels ranged from 20 – 24 mg/Kg in the control treatments and from 49 – 62 mg/kg in the Spray-N-Grow treatment plots. This is an expected result as the *Spray-N-Grow with Micronutrients* product contains zinc and iron which would have been incorporated into the leaf tissue during treatment. Although elevated over the control treatment, zinc levels in the *Spray-N-Grow with Micronutrients* plots were still within the accepted level (20 – 200 mg/kg) for tomato foliage.

Treatment effects on total yield and average fruit weight

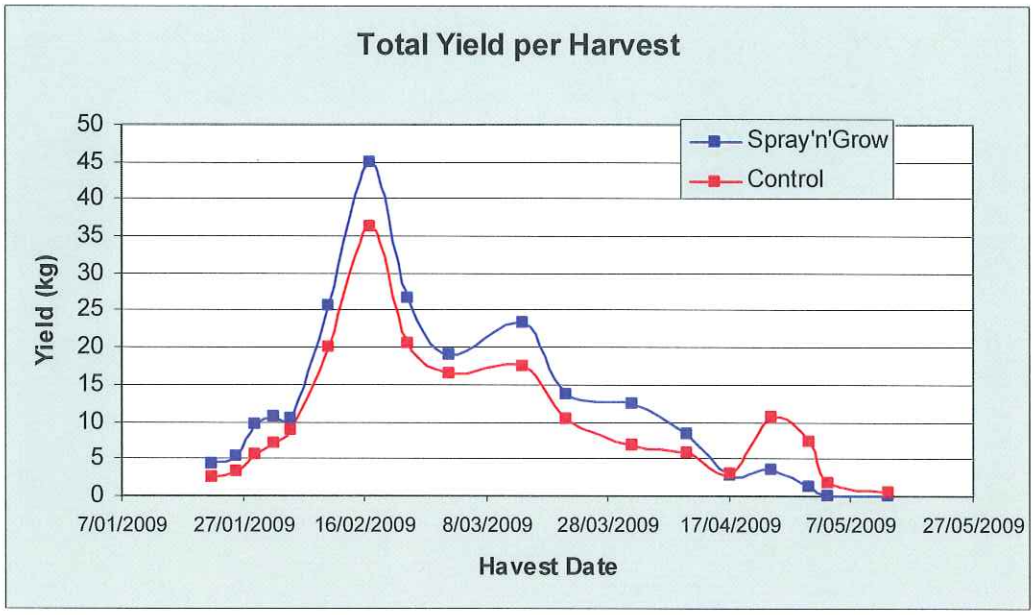
Total yield was higher in the Spray-N-Grow treatment overall which was a combination of increased fruit numbers and average fruit weight (Tables 1 and 2).

Table 1. Total yield and fruit number by treatment.

	Spray-N-Grow	**Control**
Total Yield	222019 Kg	185034 Kg
Total Fruit Number	1266	1158

Total yield by harvest date and treatment is shown in Figure 1

Figure 1, yield by harvest date (Kg per treatment)



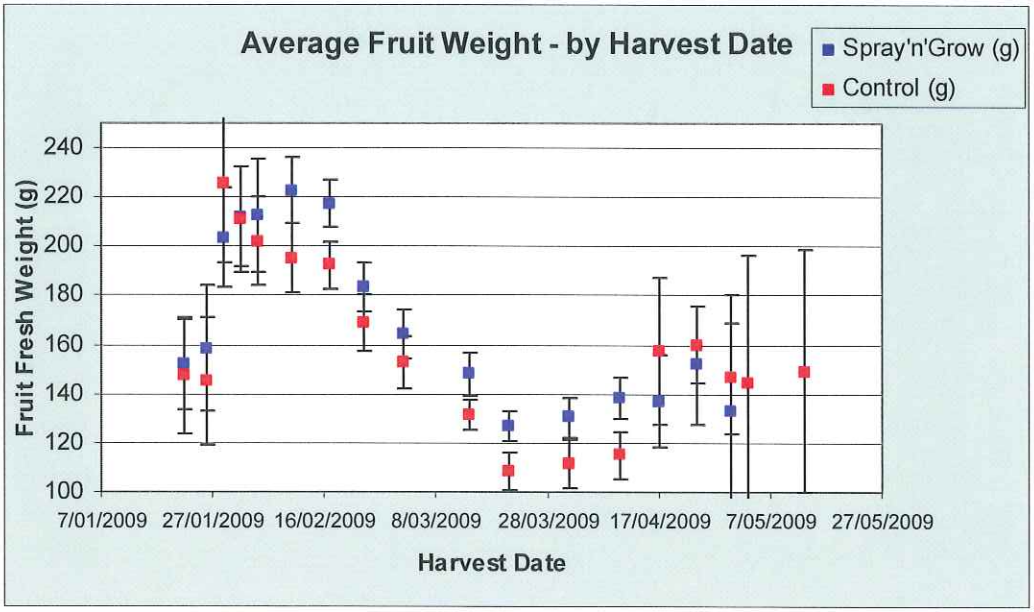
Treatment effects on average fruit weight by harvest is shown in Table 2 and Figure 2, and on overall fruit weight in Table 2a. Application of *Spray-N-Grow with Micronutrients* resulted in significant increases in average fruit fresh weight on four harvest dates, and a significant increase in fruit fresh weight overall (highlighted in Tables below).

Table 2. Average Fruit Weight by Harvest Date

Date	Spray'n'Grow (g)	Control (g)	95% Confidence Interval	
22/01/2009	152	148	18	24
26/01/2009	158	145	26	26
29/01/2009	204	225	20	32
1/02/2009	212	211	20	21
4/02/2009	212	202	23	18
10/02/2009	223	195	13	14
17/02/2009	217	193	9	10
23/02/2009	183	169	10	11
2/03/2009	164	153	10	11
14/03/2009	148	131	9	6
21/03/2009	127	109	6	7
1/04/2009	130	111	8	10
10/04/2009	138	115	9	10
17/04/2009	137	157	19	30
24/04/2009	152	160	24	16
30/04/2009	133	146	48	23
3/05/2009		144		52
13/05/2009		149		49

Table 2a. Average Fruit Weight – All Harvests				
	Spray'n'Grow	Control	95% Confidence Interval	
Fresh Weight (g)	175	160	4	4

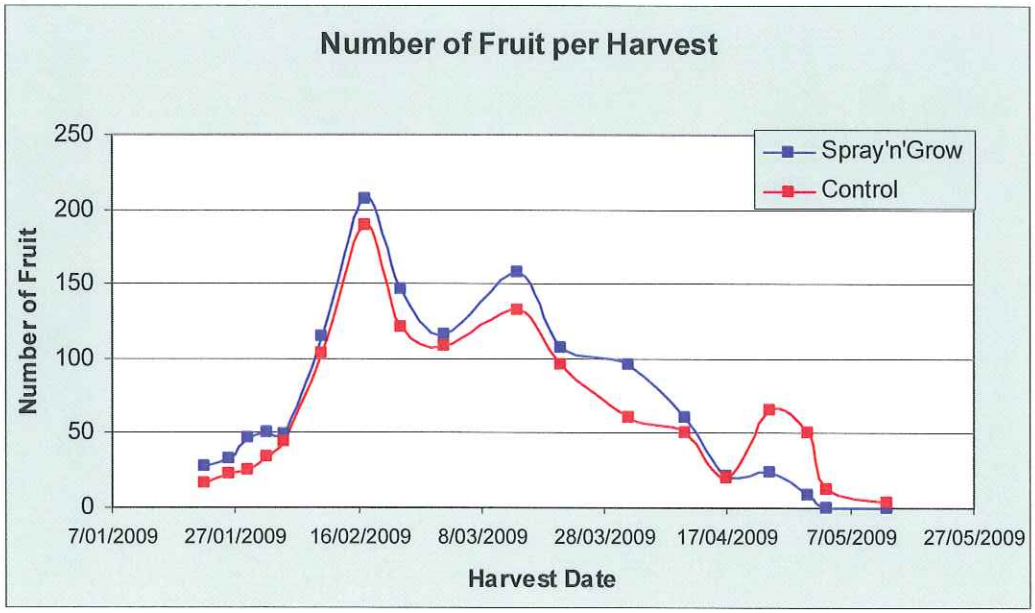
Figure 2 Average fruit weight by harvest date.



Fruit Numbers

Numbers of fruit harvested were higher and total yield peaked earlier in the *Spray-N-Grow with Micronutrients* treated plants as shown in Figure 3.

Figure 3, fruit number per harvest



Fruit Compositional quality

The *Spray-N-Grow with Micronutrients* treatment had a significant increase in brix readings for 2 sampling dates (highlighted in Table 3) and a significant increase in brix overall (Table 3a). There was no significant difference in fruit dry weight % as a result of *Spray-N-Grow with micronutrients* treatment (Figure 3).

Treatment effects on fruit brix levels

Table 3. BRIX

	Spray'n'Grow	Control	95% Confidence Interval	
28/01/2009	4.8625	4.6375	0.296211	0.302877
10/02/2009	5.675	4.9875	0.318347	0.277051
10/03/2009	6.0875	5.7125	0.053578	0.297891
10/04/2009	6.325	5.7875	0.074105	0.22977

Table 3a. BRIX - ALL HARVESTS

Spray'n'Grow	Control	95% Confidence Interval	
5.7375	5.28125	0.223145	0.21131

Figure 2 Treatment effects on fruit brix levels by sampling date

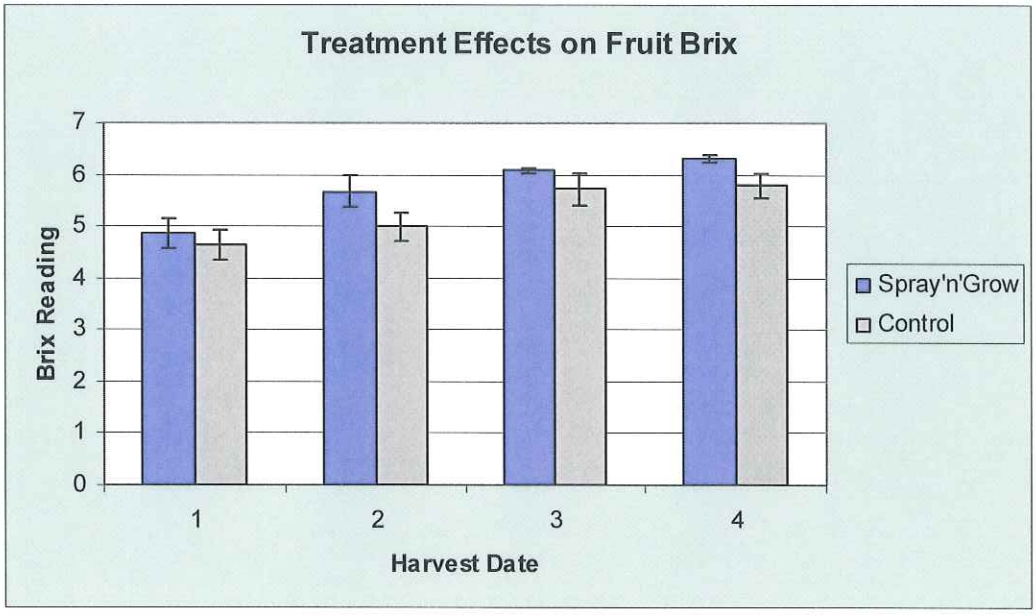
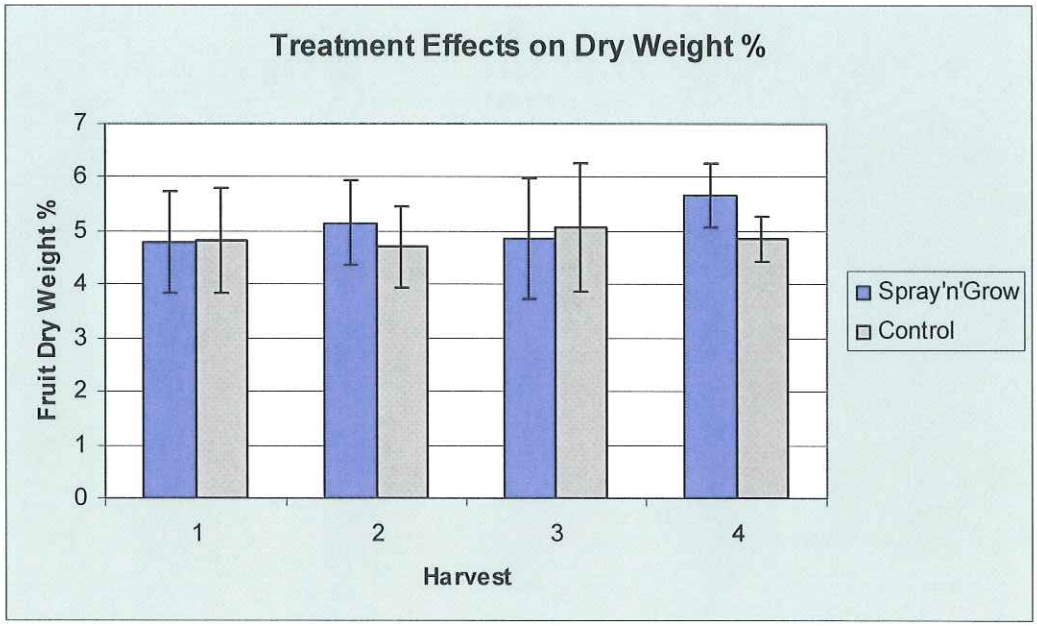


Figure 3 Treatment effects on fruit dry matter percentage by sampling date.



SUMMARY AND CONCLUSIONS

Summary of results

Application of *Spray-N-Grow with Micronutrients* resulted in significant increases in average fruit fresh weight on four harvest dates, and a significant increase in fruit fresh weight overall.

Spray-N-Grow with Micronutrients resulted in a significant increase in fruit brix readings on two sampling dates and a significant increase in brix overall.

Numbers of fruit harvested were higher and total yield peaked earlier in the *Spray-N-Grow with Micronutrients* treated plants.

Spray-N-Grow with micronutrients contains iron, zinc and other micronutrients not typically applied to hydroponic crops via the nutrient solution. Treatment with the *Spray-N-Grow with Micronutrients* foliar applied product boosts the plants foliar levels of zinc and iron – two important trace elements. Zinc is a co-factor in the production of chlorophyll, and is also involved in the formation of the plant hormone auxin. Auxin is implicated in the transport of photosynthates from leaves to developing `sinks' such as fruit and roots. Iron is an integral part of proteins involved in electron transfer across membranes in chloroplasts, unitized in the photosynthetic proves. Optimum levels of available iron enhance photosynthesis by allowing the unimpeded flow of electrons and hence maximize sugar formation in the leaves. It appears that use of a micro nutrient complex not only insures against deficiencies in root uptake, but also has a synergistic effect on many plant processes. Furthermore many other elements commonly found in small quantities in water and soil have been shown to have positive effects on plant growth, pollen production and viability, yield and fruit quality but are not commonly incorporated into hydroponic nutrient solutions. Spray-N-Grow with Micronutrients was shown in this trial to be effective in increasing hydroponic tomato fruit yields and quality in accordance with the product claims. Furthermore, this trial having been

conducted on a highly uniform crop with a hybrid greenhouse cultivar under standard greenhouse conditions would be expected to produce consistent yield and quality improvements in future seasons.

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APPENDIX ONE
Hydroponic Nutrient Formulations – Tomato

1. Vegetative formulation (coconut fibre media)– applied from germination until 50% anthesis on the first truss. Adjusted and applied at an EC of 1.2 – 2.5.

Amount of fertilizer salts dissolved into two, 20 litre stock solution tanks. Diluted one in 100 results in EC of 3.8 and TDS of 2660.

PART A
Calcium Nitrate 5320 g
Potassium Nitrate 402.4 g
Iron Chelate EDTA 100 g

PART B
Potassium Nitrate 402.4 g
MonoPotassium Phosphate 607.7 g
Magnesium sulphate 1431.8 g
Manganese sulphate 16 g
Zinc sulphate 2.2 g
Boric acid 7.8 g
Copper sulphate 0.6 g
Ammonium Molybdate 0.205 g

Diluted 1 in 100 this solution will give the following:

EC = 3.8
TDS = 2660
N = 468 ppm
P = 70 ppm
K = 238 ppm
Mg = 70 ppm
Ca = 534 ppm
S = 93 ppm
Fe = 6.50 ppm
Mn = 2.18 ppm
Zn = 0.39 ppm
B = 0.66 ppm
Cu = 0.07 ppm
Mo = 0.04 ppm

2. Early Fruiting formulation – applied from 50% anthesis on the first truss until. Fruit set on the 4th truss. Adjusted and applied at an EC of 2.0 - 2.5.

Amount of fertilizer salts dissolved into two, 20 litre stock solution tanks. Diluted one in 100 results in EC of 3.0 and TDS of 2100.

PART A
Calcium Nitrate 2675.7 g
Potassium Nitrate 898.5 g
Iron Chelate EDTA 100 g

PART B
Potassium Nitrate 898.5 g
MonoPotassium Phosphate 663.5 g
Magnesium sulphate 1078 g
Manganese sulphate 14.7 g
Zinc sulphate 2.2 g

Boric acid 8.3 g
Copper sulphate 0.6 g
Ammonium Molybdate 0.256 g

Diluted 1 in 100 this solution will give the following:

EC = 3.0
TDS = 2100
N = 329 ppm
P = 76 ppm
K = 434 ppm
Mg = 53 ppm
Ca = 268 ppm
S = 70 ppm
Fe = 6.50 ppm
Mn = 2.00 ppm
Zn = 0.40 ppm
B = 0.70 ppm
Cu = 0.07 ppm
Mo = 0.05 ppm

3. Heavy Fruit Load formulation – applied from fruit set on the 4th truss until crop completion. Adjusted and applied at an EC of 1.2 – 2.5.

Amount of fertilizer salts dissolved into two, 20 litre stock solution tanks. Diluated one in 100 results in EC of 3.8 and TDS of 2660.

PART A
Calcium Nitrate 2159.4 g
Potassium Nitrate 1027 g
Iron Chelate EDTA 100 g

PART B
Potassium Nitrate 1027 g
MonoPotassium Phosphate 709.6 g
Magnesium sulphate 1353.1 g
Manganese sulphate 14.7 g
Zinc sulphate 2.2 g
Boric acid 8.2 g
Copper sulphate 0.6 g
Ammonium Molybdate 0.256 g

Diluted 1 in 100 this solution will give the following:

EC = 3.0
TDS = 2100
N = 306 ppm
P = 82 ppm
K = 490 ppm
Mg = 66 ppm
Ca = 216 ppm
S = 88 ppm
Fe = 6.50 ppm
Mn = 2.00 ppm
Zn = 0.40 ppm
B = 0.70 ppm
Cu = 0.07 ppm
Mo = 0.05 ppm

APPENDIX TWO – RAW DATA AND DATA ANALYSIS

(also contained in MS Excel spreadsheet files accompanying this report)

Raw Data

Yield by Treatment, Rep and Date

Individual fruit in Grams

Date							
22/01/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
195	175		268	199		134	209
174	185		107	217		113	196
128	139		141	149			148
151	114		166	91			214
130	58		153	96			109
149	175		118	75			172
78	197		114				139
137	215		145				105
240	195		108				143
			96				
26/01/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
117	374	180	194	172	189	205	215
200	265	210	306	226	124	155	219
153	157	98	163	199	101	15	124
165	89	180	121	161	92	104	95
99	112		128	210			101
90	143			142			181
159	91			181			
289	43			25			
211				98			
150							
100							
81							
106							
74							
180							
195							
29/01/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
183	140	263	216	270	237	378	226
212	260	126	278	288	256	306	261
285	263	205	346	291	345	125	225
170	120	360	237	210	236	84	261
120	184	105	184	290	284		112
237	217	236	191	180	168		111
96	156	208	161	212			
139	175	220	116	146			
245	165	330	206	131			
280	184	345	182				
190	135						

206	138
290	82
	185

1/02/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
358	379	334	196	200	283	297	287
237	277	260	387	262	160	225	227
218	131	234	155	223	120	346	259
173	119	199	225	222		274	269
251	156	122	223	160		244	204
170	106	97	233	295		196	238
229	196	220	131	198		157	182
179	180	245	246	122			168
193	245	190	223	128			211
172	290	311	219	91			196
142			201	153			262
122			211				203
214			192				110
164			360				
205			79				

4/02/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
305	310	202	536	243	204	254	264
269	332	119	342	284	221	219	284
173	152	189	264	203	207	293	183
230	168	320	193	300	139	232	239
178	139	180	276	211	131	288	222
161	171	203	179	264	74	196	153
207	240	210	148	306		155	188
148	215	170	313	199		174	264
130	112	206	128	210		179	204
115	243		145	150		114	164
330	211		209			162	284
300	165		226			146	193
	205		208				120
	149						143
	83						135
							95

10/02/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
281	205	239	214	241	148	141	143
244	154	120	170	181	125	258	170
229	316	110	190	238	146	156	188
242	433	230	233	211	156	106	122
216	247	210	286	211	184	208	256
270	287	165	333	234		205	190
189	194	203	419	179		187	290
203	302	215	441	276		203	245

294	135	156	196	253		509	198
272	262	189	381	352		357	151
270	197	113	204	167		314	310
260	217	276	240	151		148	209
276	190	154	114	408		166	347
156	222	208	186	145		164	360
321	299	228	136	187		195	171
249	198	200	356	170		214	113
272	287	151	218	219		219	202
261	212	128	240	163		153	272
247	211	215	292	163		171	250
233	171	430	248	111		201	199
222	145	230	174	178		187	176
192	214	190	182	123		174	200
174	146	260	141	123		121	190
130	139	221	194	106		104	301
122		190	360	112		138	233
121		343	311	125			313
145		287	175	99			216
198		184	141				365
			277				139
			214				170
			191				172
			181				132
			141				215
			214				194
			114				153
							132
							144
							117
							131
							106
							188
							189
							276
							106
							107
							168

17/02/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
164	434	216	334	225	407	320	164
235	220	233	276	165	170	244	176
193	342	340	196	196	129	371	265
212	324	281	249	215	145	363	243
184	289	212	365	167	227	295	188
280	277	244	354	142	186	210	170
211	283	330	239	228	325	255	156
205	167	364	503	319	133	371	143
205	166	172	370	211	108	317	235
264	293	205	228	127	154	257	171
248	252	426	364	200	189	214	158
210	220	252	236	274	122	254	377

247	223	314	288	220	259	234	215
222	229	258	187	246	292	242	201
189	170	222	192	125	298	223	190
211	192	302	229	214	335	219	204
292	221	200	222	173	248	232	201
200	131	178	240	236	333	185	196
167	286	204	193	155	306	194	187
237	269	214	248	208	238	155	189
225	343	221	262	161	260	257	151
285	274	194	355	262	236	121	177
202	203	272	219	254	209	164	173
161	163	218	577	236	277	137	231
204	245	183	239	156	264	199	213
177	323	208	412	138	208	183	332
244	210	176	202	172	155	152	384
229	190	178	190	145	201	140	168
294	159	169	166	158	186	130	165
188	190	179	222	152	200	139	190
188	220	162	215	146	126	123	215
215	226	175	187	108	172	126	200
178	250	170	182	124	133	122	149
195	200	144	287	124	196	127	132
257	220	159	202	127	126		140
184	183	159	208	135	199	160	134
194	219	135	182	113	103	122	259
260	148	143	158	190	161	122	247
169	218	115	197	190	162	76	178
165	166	102	153	214	182	68	445
154	179	207	153	180	182	45	129
152	190	179	132	174	193	110	138
183	152	220	239	206	141	76	168
175	176		224	212			158
161	124		138	140			171
153	129		202	161			172
159	113			160			145
152	149			146			130
157	127			157			155
137	212			156			123
158	204			99			136
146	143			141			143
124	223			89			114
131	208			103			138
143	216						122
219	140			81			132
217				65			91
164							82
238							
168							132
226							75
235							88
							74
							62

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
367	214	273	272	146	266	375	506
357	204	280	205	233	257	339	386
211	232	386	141	200	245	187	207
221	303	296	283	219	110	230	214
216	174	229	256	176	273	162	254
156	232	352	284	164	258	186	194
192	187	222	215	185	201	183	172
167	139	209	252	141	232	195	183
184	271	244	168	179	232	166	160
182	199	344	226	145	205	207	181
186	301	186	264	175	213	225	163
132	214	321	203	154	181	226	136
167	257	218	218	163	190	213	156
145	186	157	193	203	162	153	134
148	194	174	180	179	186	193	199
176	182	180	137	149	162	189	161
142	209	177	199	144	154	260	181
132	165	233	179	155	173	223	161
123	207	156	153	161	150	144	159
121	167	168	161	132	171	127	145
117	162	121	139	152	160	110	149
107	165	179	159	137	142	101	148
115	164	146	160	136	125	95	178
108	196	175	164	108	166	95	135
112	189	157	132	116	128	99	127
100	215	148	117	131	117	72	109
150	163	126	141	117	88		124
170	185	186	161	117	98	179	105
290	179	137	132	97	117	130	107
	182	149	136		87		114
	134	136	124	104	100		102
	161	117	100	170	113		84
	149	142	113	121	103		89
	170	132	117	81			
	139	134	112				219
	133	118	85				109
	145	113	125				69
	182	134					76
		183					69
		206					72
		199					
		180					
		91					
		117					

2/03/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
252	225	276	355	130	279	148	295
199	285	112	369	201	268	167	223
226	226	212	259	119	192	386	255

153	210	214	196	120	168	217	339
190	219	183	148	144	273	170	194
179	330	232	187	137	174	222	156
161	167	277	185	151	196	216	193
127	163	170	168	157	192	156	182
146	172	225	154	216	186	165	180
131	131	150	177	167	189	145	174
182	159	264	170	162	195	145	166
176	205	163	180	172	195	178	161
192	150	161	144	166	196	207	163
178	192	160	130	148	148	125	170
140	192	141	160	175	138	117	163
128	165	129	143	132	161	121	150
169	154	130	137	121	198	133	156
130	140	172	124	126	135	130	139
160	117	124	109	117	138	130	137
180	139	134	105	96	131	116	140
179	148	149	163	115	110	113	97
159	122	148	100	94	126	135	92
125	123	112		88	112	94	85
122	104	134		75	107	92	96
108	103	119		94	103	96	129
120	106	145		74	98	85	
114	95	123			93	88	
152	95	141		95		79	
142	69	201		91		54	
99		200		84		59	
92		156		101			
162				102			
156				68			
106							
155							

14/03/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
120	212	127	215	110	149	130	196
125	176	73	321	150	125	100	154
155	226	189	182	123	168	143	208
158	301	86	125	154	178	166	109
148	106	83	157	160	165	110	172
193	80	248	103	135	233	173	169
155	129	193	178	98	114	186	122
84	311	148	288	80	147	132	182
281	206	106	203	154	188	131	130
204	334	262	180	103	156	168	128
125	164	182	102	130	203	94	155
191	200	164	119	135	91	189	165
158	97	147	155	118	70	181	124
100	164	159	179	111	107	80	117
98	134	199	91	50	165	143	102
239	121	183	217	85	172	145	138
70	124	181	89	151	142	131	115

110	149	161	168	212	132	133	70
154	152	112	123	124	161	157	118
143	70	120	121	114	124	175	172
144	70	168	178	86	88	90	183
196	115	99	183		116	123	163
326	117	114	132		117	141	104
90	172	77	161		122	151	196
173	138	114	160		146	189	121
112	101	231	133		154	136	140
136	208	159	181		164	110	86
163	193	182	211		143	138	84
97	142	192	165		90	81	92
65	70	153	163		108	91	135
110	126	129	125		112	112	155
	147	103	106		87	123	134
63	157	159	66		145	117	
80	98	106	148		151	87	
	241	112	148		149	114	
	135	122	98		143	61	
	132	149	163		77	88	
	120		143		71	59	
	121		164			92	
	95		55			61	
	105		126			71	
	77		75			151	
	59		136				
	113		99			78	
			84				
			53				

21/03/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
123	175	131	189	113	102	142	132
145	110	117	208	116	149	180	125
144	135	167	199	94	80	104	141
178	133	146	83	131	77	111	99
68	154	127	150	112	166	131	206
103	121	144	140	105	110	120	69
101	191	141	158	168	70	166	128
79	140	132	125	154	127	145	92
121	189	126	90	153	135	146	164
147	102	132	145	94	142	125	205
116	110	130	118	118	116	126	136
144	125	163	150	123	140	137	146
113	126	170	145	120	154	83	115
85	152	170	134	76	142	116	134
131	160	113	136	127	109	82	121
152	91	124	133	78	126	83	155
196	129	123	124	72	97	62	123
91	117	127	109	63	81	110	112
129	133	105	120	87	19	71	107
195	120	129	159	100	80	73	95
130	109	80	143	70	62	38	112

129	84	84	140	99	51		85
54	74	109	126	70	47		80
	104	95	90	87			
	43	98	89	80			
	174	98		16			
	177	78		54			
	78	72		76			
	76	133		54			
	109						

1/04/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
149	110	164	196	89	104	218	125
140	137	141	101	88	141	191	174
178	137	120	83	111	140	148	119
156	104	120	175	112	100	168	116
143	143	151	100	133	182	173	82
182	139	99	96	123	120	111	94
137	182	185	190	111	117	84	174
141	122	113	177	84	220	112	110
150	126	201	141	93	112		143
111	116	115	119	90	119	25	108
108	84	95	64	105	137		95
140	76	90	84	69	85		142
227	101	94	94	81	92		98
129	150	107	94	71	58		78
107	100	173	104	85	48		117
102	101	189	103	65			96
136	120	94	70	103			77
80	110	113	167	43			82
192	221	120	146				62
88		102	134				59
103			110				
93			191				
127							
111							
150							
162							
124							
309							
135							
102							
131							
112							
136							
111							
97							

10/04/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
140	204	128	103	141	122	125	193
192	160	138	138	133	160	78	128

134	166	159	192	172	123	125	168
164	100	140	125	127	125	107	112
209	136	148	143	149	103	68	160
157	110	143	139	141	98	80	132
131	139	121	156	161	79	123	167
128	91	159	111	99	60	87	103
111	194	122	116	156	59	113	141
125	127	112	88	127	64	68	120
137	88	117	118	130			150
	93	178	143	110			139
	101	185	168	97			85
	85		124				84
	106		151				71
	117		123				54
			168				84
			77				74
			200				
			223				

17/04/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
160	133	184	204	213	157	237	239
136	94	186	110	175	121	204	149
132	206	140	102	215	83	298	203
87	194	175	70	147	103		62
98	126	135		165	83		
	91	116		102	94		
					98		

24/04/2009

Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
220	90	230	204	245	160	237	249
160	98	214	121	260	185	290	169
130	140	298	161	180	216	210	203
132		244	145	200	281	180	62
70		180		165	260	222	160
120		162		130	70	90	210
		90		145	105	180	220
65		98		218	132	166	240
		110		213	72	160	261
		101		70	160	140	180
		122			202	190	70
				95		201	74
				110		159	94
						189	102
						136	106
						138	189
						112	199
						123	201
						157	100
						170	75
						70	65

						54	45
							35
						65	

30/04/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
260	110		100	260	110	230	222
220	94		124	180	100	261	180
90				184	94	340	196
94			110	180	201	300	146
101				110	184	160	150
				101	160	90	200
				190	154	210	110
				94	206	154	101
				34	190	120	90
				32	169	125	245
				30	70	130	360
					74	42	80
					30	28	28
						28	
							26

3/05/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
						265	110
						210	121
						90	124
						46	240
							280
							85
							96
							64

13/05/2009							
Spray'n'Grow				Control			
Rep 1	Rep 2	Rep 3	Rep 4	Rep 1	Rep 2	Rep 3	Rep 4
					194		
					139		
					141		
					123		

FRUIT
BRIX

Date	Spray'n'Grow Rep 1	Rep 2
28/01/2009	5.2	5
	5.1	5
10/02/2009	6	5.1
	6	5.2
10/03/2009	6	6.1
	6	6.1
10/04/2009	6.4	6.3
	6.5	6.3
28/01/2009	5.2	5
	5.1	5
	5	4.3
	5	4.3
	4.3	4.3
	4.3	4.3
	5	5
	5	4.9
10/02/2009	6	5
	6	5
	5.1	4.5
	5.2	4.5
	6	5.4
	6	5.3
	5.5	5.1
	5.6	5.1
10/03/2009	6	6
	6	6
	6.1	5.2
	6.1	5.1
	6.1	5.8
	6.1	5.8
	6.1	5.9
	6.2	5.9
10/04/2009	6.4	6
	6.5	6
	6.3	5.3
	6.3	5.4
	6.3	5.9
	6.3	5.9
	6.2	5.9
	6.3	5.9

DRY WEIGHT %

	Spray'n'Grow Rep 1	Rep 2
FW1	699	610
DW1	39	29
FW2	665	556
DW2	38	26
FW3	665	658
DW3	30	33
FW4	640	601
DW4	36	35
DW%1	5.579399142	4.754098
DW%2	5.714285714	4.676259
DW%3	4.511278195	5.015198
DW%4	5.625	5.823627

	Spray'n'Grow	Control
1	5.579399142	5.13308
	4.754098361	3.880071
	4.626865672	5.141844
	4.141104294	5.113636
2	5.714285714	4.672897
	4.676258993	4.144144
	5.393586006	5.315615
	4.79338843	4.663212
3	4.511278195	4.3257
	5.015197568	4.504505
	4.136690647	5.587669
	5.76	5.825243
4	5.625	5.123675
	5.823627288	4.914934
	5.166666667	4.915254
	6.046511628	4.492512

DATA ANALYSIS

FRESH WEIGHT	Spray'n'Grow	Control	DATE
Parameter			
			22/01/2009
Mean	151.8214286	147.5882	
Standard Error	8.968353174	11.26161	
Median	147	143	
Mode	195	#N/A	
Standard Deviation	47.45606434	46.43283	
Sample Variance	2252.078042	2156.007	
Kurtosis	0.30641416	-1.27079	
Skewness	0.403159053	0.171619	
Range	210	142	
Minimum	58	75	
Maximum	268	217	
Sum	4251	2509	
Count	28	17	
Confidence Level(95.0%)	18.4015284	23.87355	
			26/01/2009
Mean	158.2727273	144.9565	
Standard Error	12.62252621	12.45965	
Median	153	155	
Mode	180	181	
Standard Deviation	72.5108926	59.75441	
Sample Variance	5257.829545	3570.589	
Kurtosis	1.427286854	-0.33473	
Skewness	1.101985496	-0.56449	
Range	331	211	
Minimum	43	15	
Maximum	374	226	
Sum	5223	3334	
Count	33	23	
Confidence Level(95.0%)	25.71122276	25.83977	
			29/01/2009
Mean	203.6595745	225.32	
Standard Error	9.933836466	15.41825	
Median	191	236	
Mode	184	261	
Standard Deviation	68.10295167	77.09124	
Sample Variance	4638.012026	5943.06	
Kurtosis	-0.215585272	-0.63854	
Skewness	0.47102103	-0.13782	
Range	278	294	
Minimum	82	84	
Maximum	360	378	
Sum	9572	5633	
Count	47	25	
Confidence Level(95.0%)	19.99575658	31.8217	
			1/02/2009
Mean	211.98	210.9412	
Standard Error	10.0832247	10.50116	

Median	208	207.5	
Mode	122	262	
Standard Deviation	71.29916564	61.23177	
Sample Variance	5083.57102	3749.33	
Kurtosis	0.379680855	-0.52013	
Skewness	0.629956063	-0.01568	
Range	308	255	
Minimum	79	91	
Maximum	387	346	
Sum	10599	7172	
Count	50	34	
Confidence Level(95.0%)	20.26298638	21.36479	
			4/02/2009
Mean	212.3877551	202.1136	
Standard Error	11.49215261	8.917476	
Median	203	203.5	
Mode	148	284	
Standard Deviation	80.4450683	59.15184	
Sample Variance	6471.409014	3498.94	
Kurtosis	4.090574691	-0.7369	
Skewness	1.512099614	-0.03397	
Range	453	232	
Minimum	83	74	
Maximum	536	306	
Sum	10407	8893	
Count	49	44	
Confidence Level(95.0%)	23.10650795	17.98379	
			10/02/2009
Mean	222.8173913	195.1748	
Standard Error	6.631519662	7.260071	
Median	214	181	
Mode	190	106	
Standard Deviation	71.11512567	73.68167	
Sample Variance	5057.361098	5428.989	
Kurtosis	1.014710952	2.92683	
Skewness	0.9028672	1.470437	
Range	331	410	
Minimum	110	99	
Maximum	441	509	
Sum	25624	20103	
Count	115	103	
Confidence Level(95.0%)	13.13699501	14.40031	
			17/02/2009
Mean	217.468599	192.5132	
Standard Error	4.757531497	4.82612	
Median	207	178	
Mode	220	155	
Standard Deviation	68.44895859	66.34818	
Sample Variance	4685.259932	4402.081	
Kurtosis	4.903264169	1.511845	
Skewness	1.711193611	1.184049	
Range	475	363	
Minimum	102	82	
Maximum	577	445	

Sum	45016	36385	
Count	207	189	
Confidence Level(95.0%)	9.379701922	9.520304	
			23/02/2009
Mean	183.3767123	169.0661	
Standard Error	4.884873361	5.775062	
Median	174	161	
Mode	132	117	
Standard Deviation	59.0241494	63.52568	
Sample Variance	3483.850213	4035.512	
Kurtosis	1.42229489	7.143263	
Skewness	1.186303314	1.985023	
Range	301	434	
Minimum	85	72	
Maximum	386	506	
Sum	26773	20457	
Count	146	121	
Confidence Level(95.0%)	9.654753464	11.43421	
			2/03/2009
Mean	164.3189655	152.9815	
Standard Error	4.866394864	5.366895	
Median	156	146.5	
Mode	192	130	
Standard Deviation	52.41267672	55.77441	
Sample Variance	2747.088681	3110.785	
Kurtosis	3.058525675	3.00031	
Skewness	1.452514578	1.281603	
Range	300	332	
Minimum	69	54	
Maximum	369	386	
Sum	19061	16522	
Count	116	108	
Confidence Level(95.0%)	9.639387556	10.63925	
			14/03/2009
Mean	148.0696203	131.188	
Standard Error	4.421588039	3.159127	
Median	143.5	131	
Mode	125	154	
Standard Deviation	55.57849984	36.43283	
Sample Variance	3088.969644	1327.351	
Kurtosis	1.462288856	-0.34353	
Skewness	1.016171449	0.107121	
Range	281	183	
Minimum	53	50	
Maximum	334	233	
Sum	23395	17448	
Count	158	133	
Confidence Level(95.0%)	8.733479004	6.249057	
			21/03/2009
Mean	126.9345794	108.5938	
Standard Error	3.191536568	3.752005	
Median	127	111.5	
Mode	129	80	
Standard Deviation	33.01351096	36.76199	

Sample Variance	1089.891906	1351.444	
Kurtosis	-0.024427488	0.125274	
Skewness	0.117599414	0.051501	
Range	165	190	
Minimum	43	16	
Maximum	208	206	
Sum	13582	10425	
Count	107	96	
Confidence Level(95.0%)	6.327535311	7.448666	
			1/04/2009
Mean	130.2395833	111.2623	
Standard Error	4.025078859	4.950128	
Median	120	108	
Mode	120	111	
Standard Deviation	39.43755752	38.66174	
Sample Variance	1555.320943	1494.73	
Kurtosis	3.442253981	0.756942	
Skewness	1.380132226	0.879127	
Range	245	177	
Minimum	64	43	
Maximum	309	220	
Sum	12503	6787	
Count	96	61	
Confidence Level(95.0%)	7.990786125	9.901728	
			10/04/2009
Mean	138.35	115.1961	
Standard Error	4.321332252	4.799756	
Median	136.5	122	
Mode	143	141	
Standard Deviation	33.47289569	34.27712	
Sample Variance	1120.434746	1174.921	
Kurtosis	-0.159800651	-0.77711	
Skewness	0.507008383	0.054332	
Range	146	139	
Minimum	77	54	
Maximum	223	193	
Sum	8301	5875	
Count	60	51	
Confidence Level(95.0%)	8.64697496	9.640599	
			17/04/2009
Mean	137.0952381	157.4	
Standard Error	9.014249239	14.42246	
Median	133	153	
Mode	#N/A	83	
Standard Deviation	41.30847947	64.4992	
Sample Variance	1706.390476	4160.147	
Kurtosis	-1.070818645	-0.62723	
Skewness	0.280656974	0.404219	
Range	136	236	
Minimum	70	62	
Maximum	206	298	
Sum	2879	3148	
Count	21	20	
Confidence Level(95.0%)	18.80338568	30.18657	

			24/04/2009
Mean	151.6666667	159.8788	
Standard Error	11.78255076	7.915743	
Median	136	165.5	
Mode	90	180	
Standard Deviation	57.72247446	64.3078	
Sample Variance	3331.884058	4135.493	
Kurtosis	0.209740807	-0.84844	
Skewness	0.863067152	-0.10585	
Range	228	255	
Minimum	70	35	
Maximum	298	290	
Sum	3640	10552	
Count	24	66	
Confidence Level(95.0%)	24.37403012	15.80882	
			30/04/2009
Mean	132.5555556	146.3333	
Standard Error	20.85339775	11.32219	
Median	101	150	
Mode	94	180	
Standard Deviation	62.56019324	80.85658	
Sample Variance	3913.777778	6537.787	
Kurtosis	1.240369562	0.066983	
Skewness	1.620546821	0.493426	
Range	170	332	
Minimum	90	28	
Maximum	260	360	
Sum	1193	7463	
Count	9	51	
Confidence Level(95.0%)	48.08805253	22.74129	
			3/05/2009
Mean	0	144.25	
Standard Error	0	23.59671	
Median	0	115.5	
Mode	0	#N/A	
Standard Deviation	0	81.74142	
Sample Variance	0	6681.659	
Kurtosis	0	-1.14676	
Skewness	0	0.682712	
Range	0	234	
Minimum	0	46	
Maximum	0	280	
Sum	0	1731	
Count	0	12	
Confidence Level(95.0%)	0	51.93604	
			13/05/2009
Mean	0	149.25	
Standard Error	0	15.45086	
Median	0	140	
Mode	0	#N/A	
Standard Deviation	0	30.90173	
Sample Variance	0	954.9167	
Kurtosis	0	2.952473	
Skewness	0	1.578939	

Range	0	71
Minimum	0	123
Maximum	0	194
Sum	0	597
Count	0	4
Confidence Level(95.0%)	0	49.17159

Fruit number per harvest

	SNG	Control	SE	SE
22/01/09 to 4/02/09	41	29	4	5
10/02/09 to 1/04/09	135	115	14	15
10/04/09 to 13/05/09	19	34	9	10

Mean	19	Mean	34
Standard Error	9.186947	Standard Error	10.29887
Median	15	Median	35.5
Mode	0	Mode	51
Standard Deviation	22.50333	Standard Deviation	25.22697
Sample Variance	506.4	Sample Variance	636.4
Kurtosis	2.203918	Kurtosis	-2.2777
Skewness	1.430436	Skewness	0.041147
Range	60	Range	62
Minimum	0	Minimum	4
Maximum	60	Maximum	66
Sum	114	Sum	204
Count	6	Count	6
Confidence Level(95.0%)	23.61576	Confidence Level(95.0%)	26.47404

SPRAY 'N'GROW
Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Rep 1	338	57334	169.6272	3500.169
Rep 2	323	55488	171.7895	4469.459
Rep 3	295	52022	176.3458	4308.928
Rep 4	317	57856	182.511	6350.27

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	31499.92	3	10499.97	2.261361	**0.079648**	2.611912
Within Groups	5892233	1269	4643.209			
Total	5923733	1272				

CONTROL
Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Rep 1	303	45693	150.802	3628.444
Rep 2	247	38418	155.5385	4019.835
Rep 3	281	45269	161.0996	5648.776
Rep 4	364	59156	162.5165	4674.025

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	27257.56	3	9085.853	2.017762	**0.109657**	2.612374
Within Groups	5362998	1191	4502.937			
Total	5390255	1194				

BRIX

28/01/2009	Spray'n'Grow	Control
Mean	4.8625	4.6375
Standard Error	0.125267571	0.128086885
Median	5	4.6
Mode	5	4.3
Standard Deviation	0.354310195	0.362284419
Sample Variance	0.125535714	0.13125
Kurtosis	-0.161288847	-2.74155102
Skewness	-1.257828471	0.028917033
Range	0.9	0.7
Minimum	4.3	4.3
Maximum	5.2	5
Sum	38.9	37.1
Count	8	8
Confidence Level(95.0%)	0.296210524	0.302877137
10/02/2009		
Mean	5.675	4.9875
Standard Error	0.13462912	0.117165176
Median	5.8	5.05
Mode	6	5
Standard Deviation	0.380788655	0.331393163
Sample Variance	0.145	0.109821429
Kurtosis	-1.543740445	-0.585518144
Skewness	-0.571797471	-0.670733278
Range	0.9	0.9
Minimum	5.1	4.5
Maximum	6	5.4
Sum	45.4	39.9
Count	8	8
Confidence Level(95.0%)	0.318347055	0.277051419
10/03/2009		
Mean	6.0875	5.7125
Standard Error	0.022658174	0.125978314
Median	6.1	5.85
Mode	6.1	6
Standard Deviation	0.064086994	0.356320482
Sample Variance	0.004107143	0.126964286
Kurtosis	0.741020794	-0.093517777
Skewness	0.067842565	-1.272973408
Range	0.2	0.9
Minimum	6	5.1
Maximum	6.2	6
Sum	48.7	45.7
Count	8	8
Confidence Level(95.0%)	0.05357803	0.297891164

10/04/2009		
Mean	6.325	5.7875
Standard Error	0.031339159	0.09716977
Median	6.3	5.9
Mode	6.3	5.9
Standard Deviation	0.088640526	0.274837614
Sample Variance	0.007857143	0.075535714
Kurtosis	1.851239669	0.132387707
Skewness	1.025592863	-1.368527857
Range	0.3	0.7
Minimum	6.2	5.3
Maximum	6.5	6
Sum	50.6	46.3
Count	8	8
Confidence Level(95.0%)	0.074105281	0.229769831

BRIX ALL HARVESTS		
Mean	5.7375	5.28125
Standard Error	0.109410996	0.103608045
Median	6	5.25
Mode	6	5.9
Standard Deviation	0.61892206	0.58609561
Sample Variance	0.383064516	0.343508065
Kurtosis	-0.255413516	-1.123325365
Skewness	-0.902948486	-0.295464694
Range	2.2	1.7
Minimum	4.3	4.3
Maximum	6.5	6
Sum	183.6	169
Count	32	32
Confidence Level(95.0%)	0.223145323	0.211310119

DRY WEIGHT

	1	Spray'n'Grow	Control
Mean		4.775366867	4.817158
Standard Error		0.298783905	0.312418
Median		4.690482016	5.123358
Mode		#N/A	#N/A
Standard Deviation		0.59756781	0.624836
Sample Variance		0.357087288	0.39042
Kurtosis		1.668422251	3.992827
Skewness		0.81649325	-1.99787
Range		1.438294847	1.261773
Minimum		4.141104294	3.880071
Maximum		5.579399142	5.141844
Sum		19.10146747	19.26863
Count		4	4
Confidence Level(95.0%)		0.950864627	0.994254

	2		
Mean		5.144379786	4.698967
Standard Error		0.246513779	0.239799
Median		5.093487218	4.668055
Mode		#N/A	#N/A
Standard Deviation		0.493027557	0.479597
Sample Variance		0.243076172	0.230014
Kurtosis		-3.76587281	1.58037
Skewness		0.304592225	0.384533
Range		1.038026721	1.17147
Minimum		4.676258993	4.144144
Maximum		5.714285714	5.315615
Sum		20.57751914	18.79587
Count		4	4
Confidence Level(95.0%)		0.7845176	0.763147

	3		
Mean		4.855791603	5.060779
Standard Error		0.351045909	0.37769
Median		4.763237882	5.046087
Mode		#N/A	#N/A
Standard Deviation		0.702091817	0.755381
Sample Variance		0.49293292	0.5706
Kurtosis		-0.459441	-5.24489
Skewness		0.636806889	0.036657
Range		1.623309353	1.499543
Minimum		4.136690647	4.3257
Maximum		5.76	5.825243
Sum		19.42316641	20.24312
Count		4	4
Confidence Level(95.0%)		1.117185803	1.20198

	4		
Mean		5.665451396	4.861594

Standard Error	0.187227365	0.132487
Median	5.724313644	4.915094
Mode	#N/A	#N/A
Standard Deviation	0.37445473	0.264973
Sample Variance	0.140216345	0.070211
Kurtosis	0.675250556	2.248852
Skewness	-0.82363305	-1.1456
Range	0.879844961	0.631162
Minimum	5.166666667	4.492512
Maximum	6.046511628	5.123675
Sum	22.66180558	19.44638
Count	4	4
Confidence Level(95.0%)	0.595841595	0.421632

DRY WEIGHT % ALL HARVESTS

Mean	5.110247413	4.859624
Standard Error	0.153367411	0.130001
Median	5.090932118	4.915094
Mode	#N/A	#N/A
Standard Deviation	0.613469644	0.520004
Sample Variance	0.376345004	0.270404
Kurtosis	-1.25415415	-0.28128
Skewness	-0.12519584	-0.0583
Range	1.90982098	1.945172
Minimum	4.136690647	3.880071
Maximum	6.046511628	5.825243
Sum	81.7639586	77.75399
Count	16	16
Confidence Level(95.0%)	0.326895099	0.277091

BRIX
All
harvests

	Spray'n'Grow	Control		
28/01/2009	4.8625	4.6375	0.296211	0.302877
10/02/2009	5.675	4.9875	0.318347	0.277051
10/03/2009	6.0875	5.7125	0.053578	0.297891
10/04/2009	6.325	5.7875	0.074105	0.22977

BRIX - ALL HARVESTS

Spray'n'Grow	Control		
5.7375	5.28125	0.223145	0.21131

DRY WEIGHT %
All Harvests

	Spray'n'Grow	Control	CI	CI
1	4.775366867	4.817157682	0.950865	0.994254
2	5.144379786	4.698967098	0.784518	0.763147
3	4.855791603	5.06077889	1.117186	1.20198
4	5.665451396	4.861593866	0.595842	0.421632

DRY WEIGHT % ALL HARVESTS

Spray'n'Grow	Control	CI	CI
5.110247413	4.859624384	0.326895	0.277091