Effect of Various Types of Water on The Growth of Radishes (*Raphanus sativus*)

Nicole Bouchard
Kenneth Harmon
Holly Markham
Stacy Vandefifer

Ecology Lab 355L
Stephen Thomas
Emily Morrison
Fall 2007
November 30, 2007

Abstract

While water is a basic component of the growth of plants, does the composition of the water make any difference on that growth and if so, what is the ideal? The answers to these questions could inevitably be helpful to the agriculture industry allowing for more and better harvesting. In our experiment, we intended to see the effects of types of water (rain, tap, fish, or Miracle-Gro™) on the growth of purple plum radishes. We hypothesized that the composition of water would effect plant growth and those formulas (particularly Miracle-Gro™) would be ideal for the development of the radishes. First, each water sample was tested for various nutrients and was reported in the project. Under greenhouse conditions, five radish planted pots for each water tested type was treated for three weeks with their respected water type. The length, weight, and leaf count were all recorded (including comparison of stem and root length) and used to determine which water was most productive. Then they were compared to the nutrient levels to see if they were the cause of the difference. The results indicated that the water type that produces the best plant growth (yield) in both length and weight categories, is that of Miracle-Gro™. Tap water produced heaver plants, while rain water produced taller plants. The water type that produces the smallest and lightest plants is that of fish water. Therefore Miracle-Gro™ is the best water type to use when growing plants.

Introduction

There are three important things that a plant needs in order to grow; sunlight, nutrients and water. If you were to alter any of these necessities in terms of quantity and quality the plant would feel the effects. The uptake of water from the roots, through the xylem and into the rest of the plant is an essential part of a plants ability to photosynthesize. Also, water is necessary to create cell tension, which gives plants their form. Lastly, some minerals, such as calcium, are stored in water and the plant can only access these minerals by up taking water (Graham 2006). Due to the extreme importance of water in the life of a plant, we decided to investigate the effect water quality has on plant growth.

For our research project we compared purple plum radish (*Raphanus sativus*) growth by watering the plants with water of varying quality. Using tap water, rainwater, fish waste water and water mixed with Miracle-Gro™ we investigated which type of water produces the largest radish in terms of weight, length and diameter. Radishes were are choice for testing plant growth for the reasons that they yield a sizable plant and root that can be measured, their comparably fast growth rate, and to allow the testing of a plant that can produce useful conclusions for those who grow them. Some research has been done in the past in testing radish growth for the purpose of maximizing yield. Work done by Wan and Yahou (2005) in North China tested various soil water potential on radishes using a drip irrigation system to determine what amount of soil water and nutrients would produce the best results. The results from this experiment benefit local farmer by telling them what practices will give them a healthy crop. (Wan 2005).

The Wan and Yahou (2005) article was very important describing ways to measure growth. They introduced the idea of dry weighing and market appearance (color/shape) as forms of measuring growth. Another important piece of information gathered from the article was how to properly set up the experiment. Albertson (2007) researched metal exposure to radishes describes what other factors contribute to a healthy radish plant (Albertson 2007) such as adequate lighting, soil, temperature, and atmosphere conditions (Albertson 2007). The articles researched were very helpful in gaining further knowledge about the growth requirements of the radish plant. The articles also gave us a better idea of how to carry out the experiment as well as how to collect and record the data.

There are sixteen elements that are essential for the growth and development of plants (Johnson 2007). Of these sixteen elements that are two groups. One group includes carbon, hydrogen, oxygen, nitrogen, photospheres, potassium, calcium, magnesium, and sulfur; are part of the macronutrients. These macronutrients are required in large amount by the plant. The elements that are required in smaller amount by the plant are the micronutrients and include iron, chlorine, manganese, boron, zinc, copper, and molybdenum. Most growing plants contain ninety percent water (Johnson 2007), and many of these nutrients are carried via the water, this provides yet another reason why water is important in plant growth.

A scientific paper was done on manipulating nitrogen levels in water to see the effects on grassland plants and to see how they handle stress. (Lauenroth 2004). This along with many other papers and our knowledge of water's role in plant growth allow us to conclude that water contains nutrients, such as nitrogen, and that they are extremely

important in plant growth. Tests on the water have be done along with the experiment and will be included in our results to confirm the presence of nutrients and the balances of the nutrients that are present to facilitate an acceptance or to void our prediction.

Based on our knowledge of the growing requirements of a radish, we hypothesize that the plants are affected by the type of water used. Each of the water sources we used on the plants—tap water, rainwater, fish waste water and Miracle-Gro™ --have various nutrients levels and will therefore interact with the plants differently. We hypothesized the differences in nutrient levels would affect the plants size, weight, length and overall appearance of the rootstock as well as the length and color of the foliage.

We predicted that Miracle-Gro™ would have the greatest positive impact on the radishes' growth. Miracle-Gro™ is specifically designed to aid in plant growth, so it makes sense that it should generate the best results. Fish waste water and rainwater could also have positive results on growth due to their nutrient levels; however the levels might not be properly balanced. Too much of a certain nutrient can be just as harmful to a plant as not enough nutrients.

These predictions are based off the idea that nitrogen and carbon are macronutrients that the plant requires large amounts of, and that these types of water contain high nitrogen and carbon content; thus those plants receiving Miracle-Gro™ and the fish tank water will grow taller with tubers that are heavier and larger. Tap water is predicted to be the worst of the four samples since chemicals such as chlorine and fluoride, which are micronutrients, are added to the water supply to make it potable. Since and an over abundance of nutrients can be just as harmful as not enough, the added chlorine would cause an over abundance of that particular micronutrient and restrict plant

growth. Rainwater we believe would be somewhere in the middle, growing average-sized radishes.

Methods

Our Purple Plum radishes (*Raphanus sativus*) were planted in the Michigan State University Teaching Greenhouse, and harvested four weeks later. Since this particular breed of radish plants are expected to germinate in seven to fourteen days and mature in twenty to fifty days, we felt that they would give us the opportunity to obtain the necessary results within a reasonable amount of time. We grew the radishes under four different watering conditions: rainwater, standard Michigan State University tap water, water collected from a cycled, stable, healthy home aquarium, and tap water treated with commercial Miracle-Gro ™.

We grew five radish plants per water sample, twenty plants total, each grown in separate containers. Although two seeds were planted into each pot to help ensure sprouting, the second plant was thinned out so that only the largest plant remained in the pot. We needed twenty pots, enough potting soil to fill them, planting tools, radish seeds, and our jugs of water samples. Members of the group provided the samples. The rainwater was collected from a home location in St. Claire, MI. The fish tank water came from a stable, cycled planted aquarium belonging to one of the group members, home to *Danio rerio var. frankei,* that are fed Ocean Nutrition Community Flake food once a day. Miracle-Gro ™ was added at a concentration of fifteen drops per quart of tap water. Recommended concentration is ten to twenty drops per quart. Tap water is standard Michigan State University tap water.

The water samples were tested for pH, ammonia, nitrogen (nitrites and nitrates), phosphate, chloride, carbon dioxide, and sulfates before the seeds were planted. These measurements were measured in units of parts per million, or ppm. Testing for these

nutrients enabled us to determine possible reasons one type of water would be more advantageous for growing plants such as our radishes.

We planted the seeds on Monday October 21, 2007. The plant containers were permanent, so we did not risk hurting a plant by trying to replant from a seedling pot. We watered the plants with eight ounces of each sample water type every other day (Monday, Wednesday, and Friday) until November 2, 2007 when it changed to Monday, Friday watering only four ounces. The measurements however were consistent on Mondays. This way all the plants were measured on one week increments.

The measurements included weekly height measurements; measuring from the base of the steam (where the steam emerges from the soil) to the tip of the longest leaf. These measurements were done in centimeters. After harvesting the length and weight of the vegetable tuber, and green plant were also collected. Plants were harvested November 8, 2007. At this time we counted the number of leaves present on each of the radish plants. We also found the length of the tuber by first measuring from the base of the steam to the tip of the longest leaf, then harvesting the plant and measuring from the tip of the root to the tip of the longest leaf (measured in centimeters). Measuring first the length of the leaf and then the length of the whole plant (root and leaf) allowed for accurate measurements were you take the total plant length and subtract the leaf length to find the length of the root. To find the weight we first, carefully washed the excess soil out of the roots of each plant and placed them into an oven to be dried for one hour. After drying was complete we weighted the radish on a scale using grams.

Our data was averaged together according to water sample, and those averages were used to compare the success of each water sample on plant growth. We utilized excel to calculate our findings and prepare our charts.

In regards to creating linear regression graphs, comparing the correlation between the growth of the stem and the roots of each mean for each water type tested, we first collected the data that contained the length of the roots and stems of each mean of plants. Then we put the data in an Excel worksheet, and used the statistical analysis program to plot it and created a linear graph. The program also calculated an equation for the graph, p value, and the r value. We then organized it on the graphs to create a neat presentable figure, showing the significant relationships.

Results

When evaluating the data collected from this experiment it is clear that various water types do play a role in plant growth. With the four types of water tested for pH, ammonia, nitrate, phosphate, chloride, carbon dioxide and sulfates we found that Miracle-Gro™ had the highest amounts of most nutrients. The water type that had the highest nitrate was that of the fish water. Both fish water and Miracle-Gro™ had pH level at neutral (7.0 pH), with rain water being more acidic (4.5 pH) and tap water more basic (8.0 pH). As shown in Table 1.1, Appendix 1; there was some difference among the various types of water that could result in varying plant growth.

With the data taken for plant growth we can clearly see a difference in the plants growth compared to the water type it was given. Miracle-Gro™ produced the largest plant in terms of length with an average stem length of 16.64 centimeters and an average root length of 9.08 centimeters, giving a total average length of 25.72 centimeters (Figure 1.2, Appendix 1). This was 2.7 centimeters longer then our second longest water typed plant which was rain water. The average rain water plants were 1.66 centimeters longer than those of tap water. Likewise, the tap water plants average length was 8.68 centimeters longer than those of fish water. All in all when comparing length of plants Miracle-Gro™ produced the largest plant followed by rain water, tap water, and finally fish water. (To see charts of each individual water type plant lengths refer to the Appendix 2, Figures 1.2-1.5)

The results from the number of leaves present show that there is not much difference between the water types of rain water, tap water and Miracle-Gro™. However, there was a difference with those plants watered with fish water. These results

can be viewed in Figure 2.1, Appendix 1. (For individual water type leaf counts per plant refer to the Appendix 2, Tables 3.1 and 3.2)

Even though the number of leaves did not vary much among the different water types the weight of the plants did. When evaluating our data we found that Miracle-Gro™ produced the heaviest plant, with an average weight of 2.3648 grams. The second heaviest plant was that of tap water yielding an average weight of 1.466 grams. Third was rain water with an average weight of 1.065 grams, and last fish water weighing on average only .3582 grams. These results can be seen in Figure 3.1, Appendix 1. (For each individual water type plant weights refer to the Appendix 2, Figures 3.2-3.5)

Another aspect we compared was the correlation of the stem growth and root growth of each individual in a sample. (In Figures 4.1 and 4.2 you will see the water types that displayed a strong correlation between stem and root growth, all other linear graphs are located in Appendix 2, Figures 4.3 and 4.4)

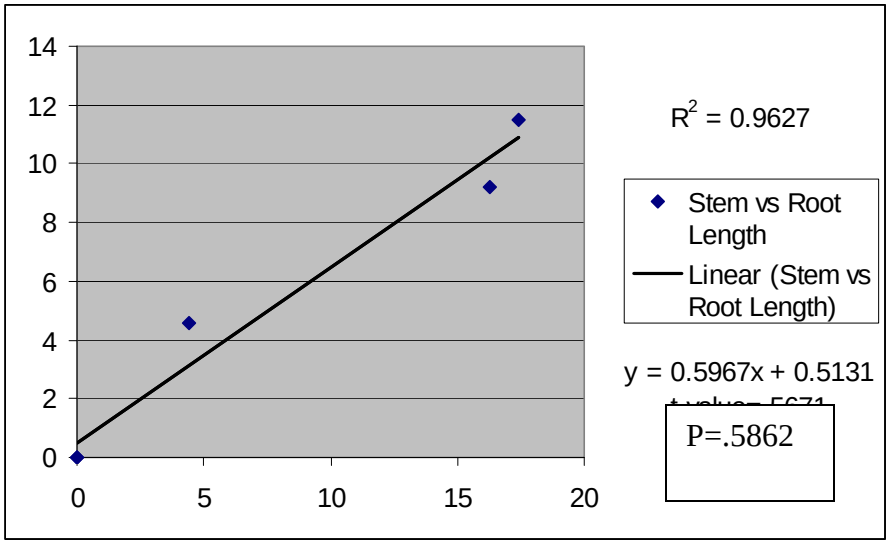

Figure 4.1. The Linear Regression of Stem Length vs. Root Length of Fish Water Treated Samples. The graph compares the root length and stem length of each sample and their probability values.

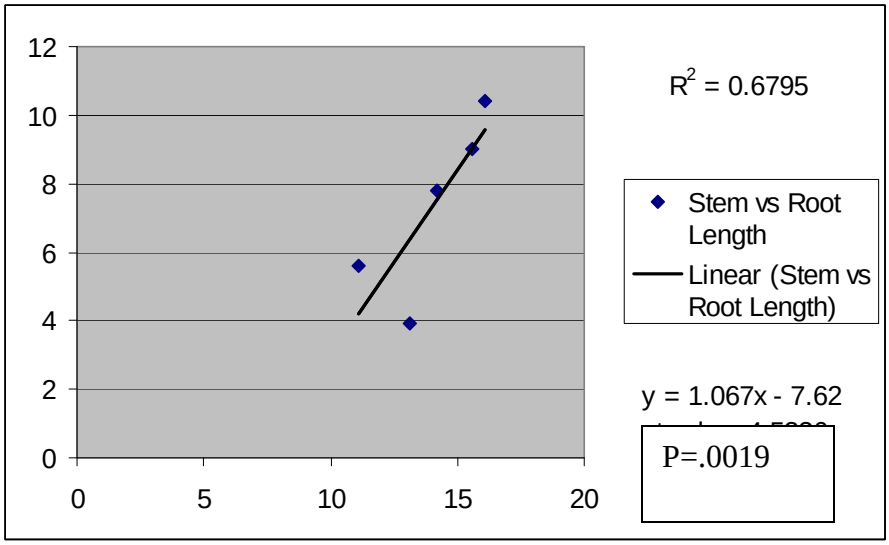

Figure 4.2. The Linear Regression of Stem Length vs. Root Length of Tap Water Treated Samples. The graph compares the root length and stem length of each sample and their probability values.

The linear graphs show the relationship (if there is one) between stem length and root length of the plants. All linear graphs of each water type show a positive relationship, meaning that when the root length increases, so does the stem length. The r-values represent the strength of the relationship. The closer the r-value is to one, the stronger the significance is and the more we can assume (conclude) that there is a correlation. The closer the r-value is to zero, the less there is a relationship and suggests that root growth and stem growth are independent. The r-value of tap water was moderately- strong significant with a value of .6795. Fish water samples have an extremely strong relationship with an r-value of .98117. In the fish and tap water samples there was a strong positive correlation between stem length and root length. Since all water typed plants had a mean that was positive, and two of the types of water tested were either moderately strong or very strong, there is a suggested correlation with stem and root growth.

Miracle-Gro™ has the most optimal potential for good plant growth. Nutrient levels in tap water come in second due to the fact that its nutrient levels are that which are closest in relation to Miracle-Gro™. The next water type that has "normal" nutrient levels would be rain water, with the last type of water being fish water. Fish water would be ranked last due to the fact that is has the most significantly different values of nutrients. (Table 1.1, Appendix 1)

We examined two components of plant growth: length and weight (Figures 1.1, and Figure 3.1, Appendix 1). Miracle-Gro™ produced the largest plant in both categories of root and stem. The second largest plant in reference to root and stem length is that of rain water, followed closely by tap water. The type of water that produced the smallest plant was the fish water.

When evaluating the weight of each plant it was found that Miracle-Gro™ produced the heaviest plant with a large difference of 1.2998 grams to that of the second heaviest plants produced by using tap water. The third heaviest plants were produced by rain water and lastly the fish water produced the lightest plants.

These results show that the water type that produces the best plant growth (yield) is that of Miracle-Gro™. Then the second and third placed water types are dependent on that of which you're looking for. If length is you goal then rain water is best, but if weight is the goal then tap water is most advantageous. Finally fish water gives the least benefits to the plant. (To view all data collection tables and figures aiding in results found refer to Appendix 1 and 2)

Discussion

After carrying out the experiment we found that the growth of radish plants was affected by water quality. The plants watered with fish water performed the least well, with the smallest average root length, stem length, leaf count, and weight. We can conclude from our water testing that the reason the plants did not grow so well when watered with fish water is because the fish water had more than twice as many nitrates as the other types of water, and significantly less carbon. These factors, combined with a lack of ammonia, and nitrogen contributed to slower growth in the radish plants. Johnson (2007) states that nitrogen is an essential nutrient for plant growth, where a deficiency can stunt a plants growth. Furthermore, only three out of the five seeds watered with fish water germinated. This was the lowest germination rate of any of the experimental groups.

The plants grown with rain water had the second largest average stem and root length, and the third heaviest average total weight. There was a small positive correlation between root and stem length for the plants treated with rain water, however it was not as significant as found in the other radish plants. The average weight of the rain water plants was ranked third in relation to the other plants watered with Miracle-Gro™ and tap water. Overall, the radishes treated with rain water did fairly well, having the second largest root and stem length out of the four types of water. Looking at the water testing data, one piece of information that sticks out is the low pH of the rainwater. The pH of the rain water indicates that it may have been possible that is was too acidic for the radishes to grow to their utmost potential.

Radishes grown under the tap water this treatment had the second largest average weight. The radishes in the tap water group had the third largest average root and stem length. These lengths are comparable, though slightly less than the lengths of the radishes watered with rain water. In terms of water quality, tap water had no ammonia but high levels of nitrates and carbon compared to the overall average. This may be the reason behind the differences in rain water plants and tap water plants.

The final group that performed the best was the radishes treated with Miracle-Gro™ Houseplant food, which had the longest average lengths and weights. The reason why the radishes watered with Miracle-Gro™ were the largest is most likely due to the high levels of nitrogen, chloride, and carbon (all of which are vital nutrients that aid in the plants growth).

After analyzing the results from the experiment, our original prediction that plants treated with Miracle-Gro™ would do the best was supported. This was based on the fact that commercial houseplant food has been specially designed and mixed for optimum plant growth. However, one limitation to this experiment is that the plants were not fully matured when we harvested them, due to our limitations of time. Had we had the opportunity to wait until they were fully mature, it is possible that the other plants could have continued to develop and given us more concrete results about the nutrient effectiveness of the water samples. It is unclear whether the early harvesting of the plants affected our final results. If the experiment were to be carried out again, one way to improve it would be to allow enough time for the radishes to be fully mature before harvest.

From our study we can conclude that using Miracle-Gro™ on plants will encourage rapid and more robust growth. This is important information for farmers and hobby gardeners who are interested in growing larger plants. However, often there are many other factors that are also of interest to a farmer or gardener besides plant size. These factors include but are not limited to the cost of growing, taste, appearance and how much energy is needed to grow them (i.e. does this plant require a lot of weeding or does it need extra watering). If this experiment were to be added onto in the future, all of these aspects could be tested. This would provide people with a more holistic data set, which they could use to match their needs. For example, if a person is interested in growing radishes for personal consumption but does not have any extra money to buy fertilizers, they may want to consider using rain water to moisten their plants. However another person, who does have extra money and is growing for market sale, may want to use Miracle-Gro™. While our experiment does allow us to conclude that Miracle-Gro™ causes larger growth of plants, it does not allow us to conclude that which is the best alternative to use for growing plants since there are many other factors that we have not yet investigated regarding its use.

Acknowledgements

First we would like to acknowledge our Teaching Assistant Emily Morris for giving us the freedom to perform the experiment on our own; with the necessary guidance. We would also like to thank all of our class mates for aiding in the editing of our research paper, you all had great input for us to improve upon. If it were not for the facilities here at Michigan State University this experiment would not have been possible. Therefore we owe credit to those who are in charge of the Michigan State University Teaching Greenhouses. Also an acknowledgment goes out to each one of the members involved with this project, Nicole Bouchard, Kenneth Harmon, Holly Markham, and Stacy Vandefifer. Thank you to all who made this experiment possible.

Appendix 1

Table 1.1. Water Test Table for Each Water Type Used. The chart shows the levels of various nutrients in each water sample. The levels in bold are ones that vary with the rest of the samples. The * indicates the sample that has the highest level.

	Rain Water	Fish Water	Miracle-Gro	Tap Water
Ammonia	3 ppm	0 ppm	7 ppm *	0 ppm
Chloride	44 ppm	68 ppm	80 ppm *	56 ppm
Carbon Dioxide	13 ppm	**6 ppm**	27-28 ppm *	25-30 ppm *
Nitrate	.44 ppm	**1.1 ppm ***	.44 ppm	.44 ppm
Phosphate	.1 ppm	.1 ppm	**.8-1 ppm ***	.1 ppm
pH	**4.5**	7.0	7.0	8.0 *
Sulfide	0	0	.1 *	0

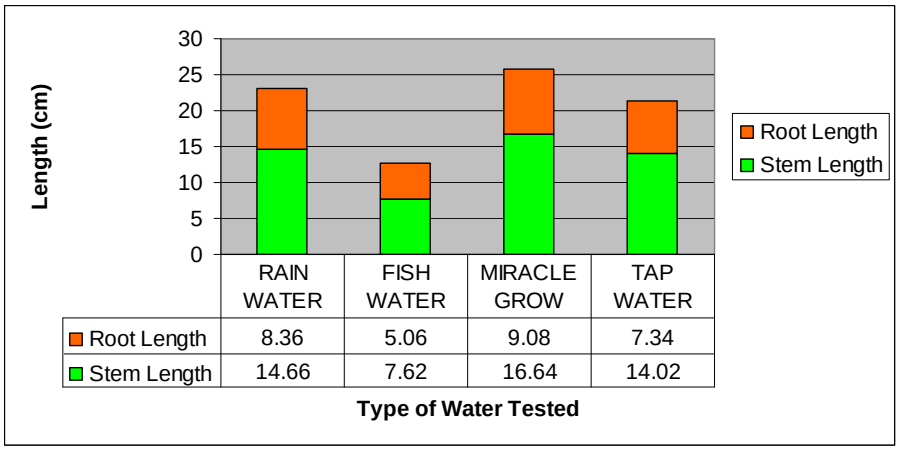

Figure 1.1. Average Length of Water Tested Samples. The graph shows root, stem, and total length of the average of each water type tested sample for a show of comparison.

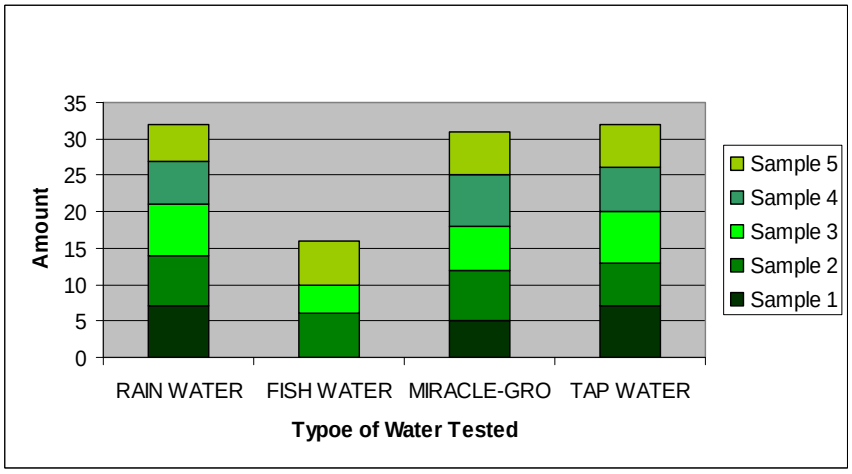

Figure 2.1. Total Amount of Leaves of Water Tested Samples. The graph shows the total amount of leaves in each type of water tested sample, as well as each individual sample's count within the bar.

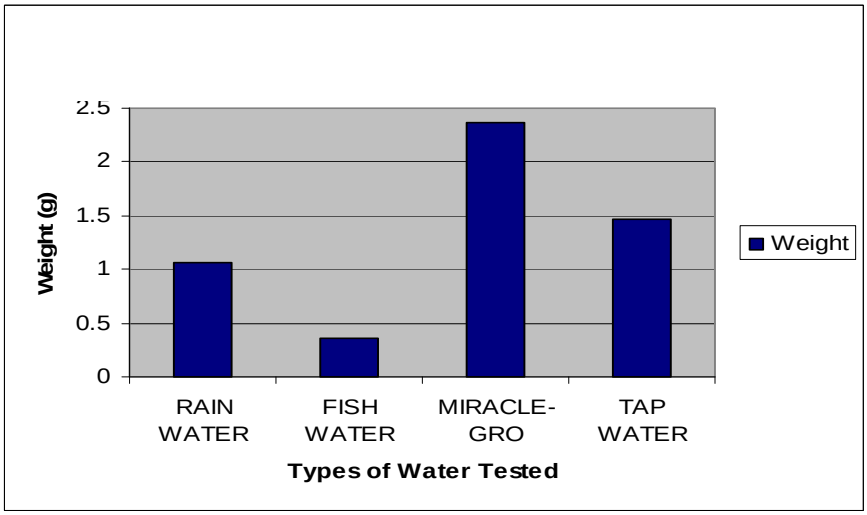

Figure 3.1. Average Weight of Water Tested Samples. The graph shows the average weight in grams of each water tested sample to show comparison.

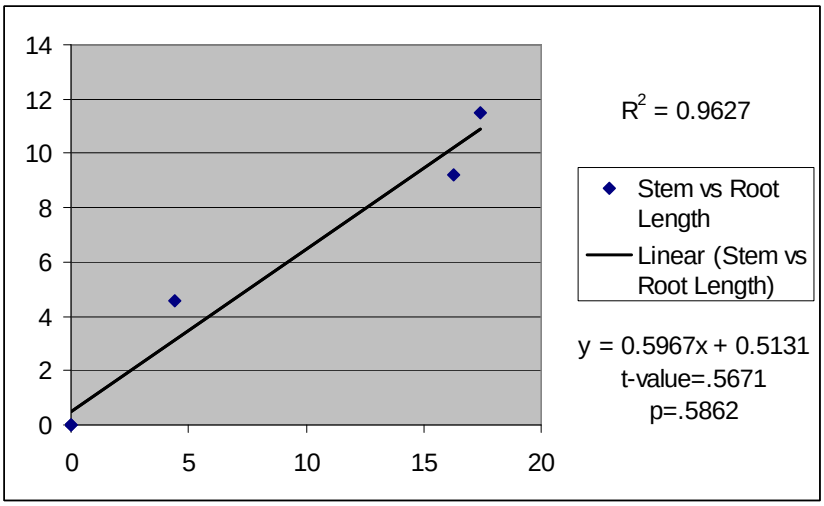

Figure 4.1. The Linear Regression of Stem Length vs. Root Length of Fish Water Treated Samples. The graph compares the root length and stem length of each sample and their probability values.

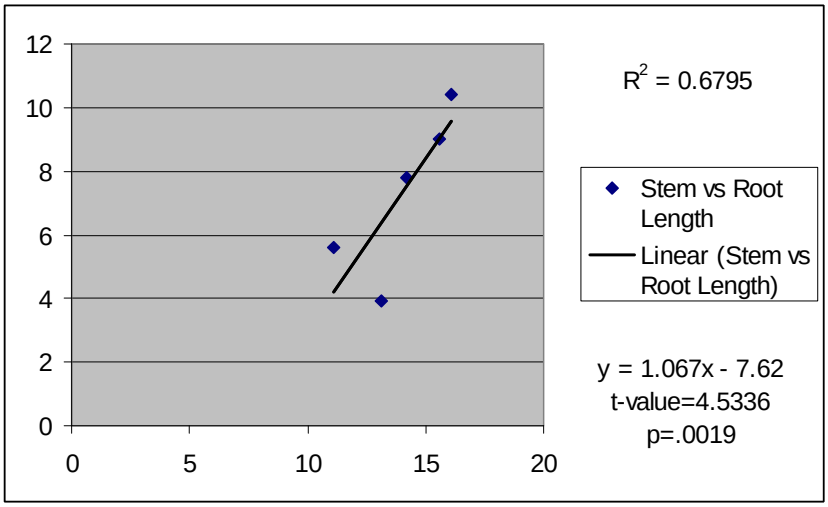

Figure 4.2. The Linear Regression of Stem Length vs. Root Length of Tap Water Treated Samples. The graph compares the root length and stem length of each sample and their probability values.

Appendix 2

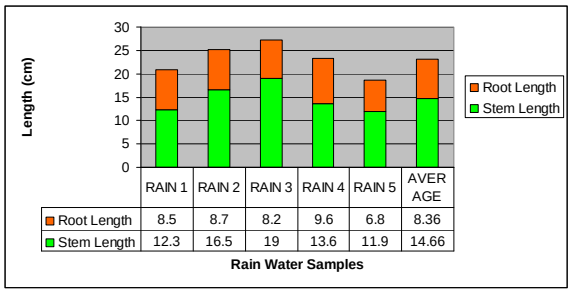

Figure 1.2.
Total Length of Rain Water Tested Samples.
The graph shows root, stem, and total length of each rain water tested sample and the average of the five samples.

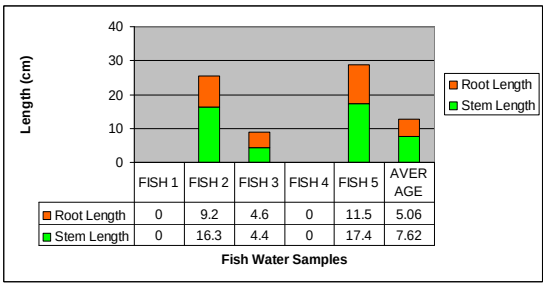

Figure 1.3.
Total Length of Fish Water Tested Samples.
The graph shows root, stem, and total length of each fish water tested sample and the average of the five samples.

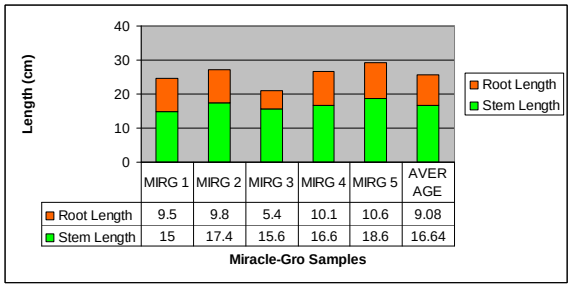

Figure 1.4.
Total Length of Miracle-Gro Tested Samples.
The graph shows root, stem, and total length of each Miracle-Gro tested sample and the average of the five samples.

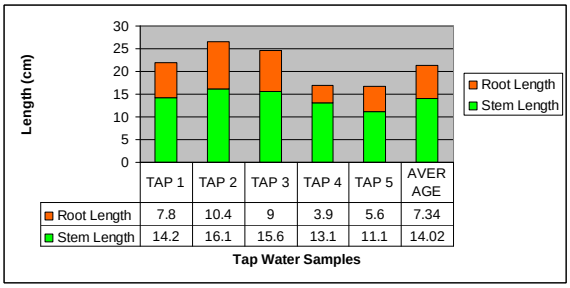

Figure 1.5.
Total Length of Miracle-Gro Tested Samples.
The graph shows root, stem, and total length of each Miracle-Gro tested sample and the average of the five samples.

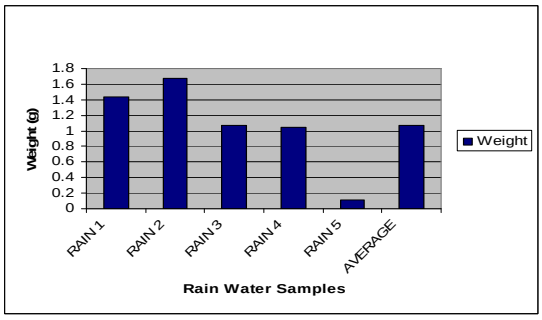

Figure 3.2.
Weight of Rain Water Tested Samples.
The graph shows weight in grams of each rain water tested sample and the average of the five samples.

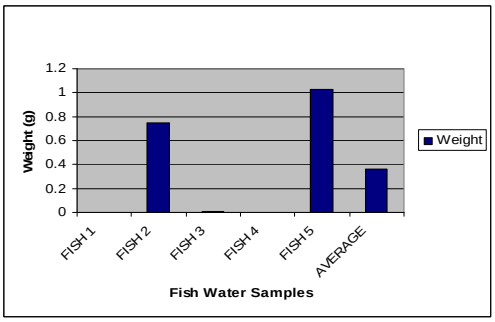

Figure 3.3.
Weight of Fish Water Tested Samples.
The graph shows weight in grams of each fish water tested sample and the average of the five samples.

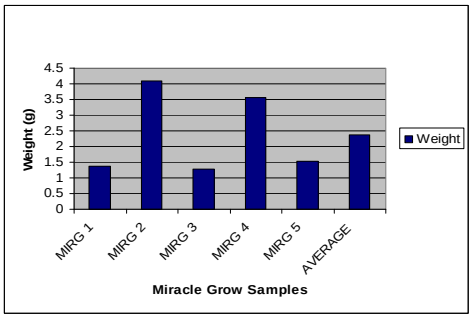

Figure 3.4.
Weight of Miracle-Gro Tested Samples.
The graph shows weight in grams of each Miracle-Gro tested sample and the average of the five samples.

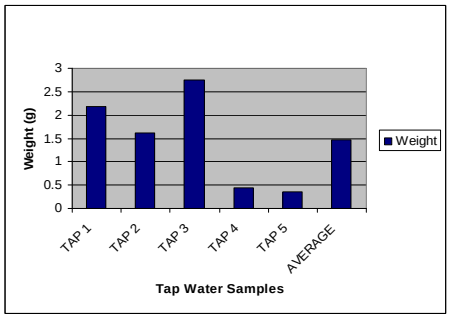

Figure 3.5.
Weight of Tap Water Tested Samples.
The graph shows weight in grams of each tap water tested sample and the average of the five samples.

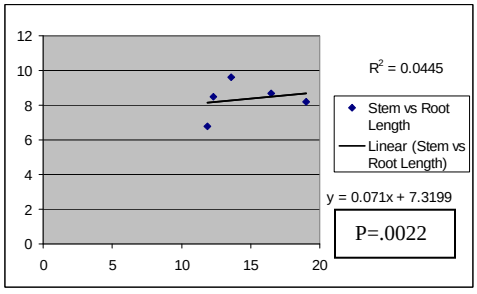

Figure 4.3.
Linear Regression of Stem Length vs. Root Length of Rain Water Treated Samples.
The graph compares the root length and stem length of each sample and their probability values.

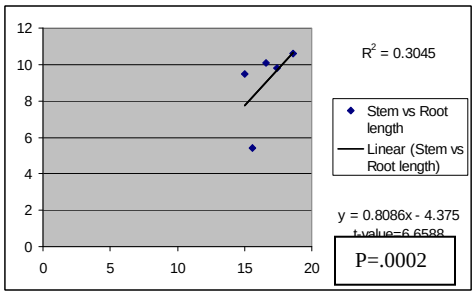

Figure 4.4.
Linear Regression of Stem Length vs. Root Length of Miracle-Gro Treated Samples.
The graph compares the root length and stem length of each sample and their probability values.

Table 2.1. Weekly Stem Measurements of Radish Plants Growing in Various Types of Water. This table shows the growth of the radish plants.

	Week 1 Oct. 15	Week 2 Oct. 22	Week 3 Oct. 29	Week 4 Nov. 5
Rain Water 1	0	6.1 cm	9 cm	11 cm
Rain Water 2	0	6.5 cm	9.9 cm	15.1 cm
Rain Water 3	0	7.0 cm	13.5 cm	18.4 cm
Rain Water 4	0	5.5 cm	8.5 cm	13 cm
Rain Water 5	0	1 cm	6.6 cm	10.2 cm
Fish Water 1	0	NA	NA	NA
Fish Water 2	0	7.0 cm	10.5 cm	15.5 cm
Fish Water 3	0	1 cm	2.5 cm	3.8 cm
Fish Water 4	0	NA	NA	NA
Fish Water 5	0	6.3 cm	11 cm	15.8 cm
Miracle-Gro™ 1	0	3.6 cm	8 cm	13.5 cm
Miracle-Gro™ 2	0	6.4 cm	10.4 cm	16.8 cm
Miracle-Gro™ 3	0	3.4 cm	8.0 cm	13.6 cm
Miracle-Gro™ 4	0	6.5 cm	11.3 cm	15.4 cm
Miracle-Gro™ 5	0	5.8 cm	11.5 cm	16.9 cm
Tap Water 1	0	5.8 cm	11.4 cm	12.8 cm
Tap Water 2	0	4.9 cm	9.6 cm	15.3 cm
Tap Water 3	0	6 cm	11.4 cm	14.9 cm
Tap Water 4	0	NA	6.0 cm	11.8 cm
Tap Water 5	0	1 cm	4.2 cm	10.3 cm

Table 2.2. Average Weekly Stem Measurements of Radish Plants Growing in Various Types of Water. This table shows the average growth of the radish plants.

	Week 1 Oct. 15	Week 2 Oct. 22	Week 3 Oct. 29	Week 4 Nov. 5	Total Average
Rain Water	0	5.22 cm	9.5 cm	13.54 cm	9.42 cm
Fish Water	0	2.86 cm	4.8 cm	7.02 cm	4.8933 cm
Miracle-Gro™	0	5.02 cm	9.84 cm	15.24 cm	10.033 cm
Tap Water	0	3.54 cm	8.52 cm	13.02 cm	8.36 cm

Table 3.1. Harvesting Measurements . This table shows the stem length, root length, total length, weight and leaf count that was found on day of harvesting (November 8, 2007).

	Stem Length (cm)	Root Length (cm)	Total Length (cm)	Weight (grams)	Leaf Count
Rain Water 1	12.3	8.5	20.8	1.43	7
Rain Water 2	16.5	8.7	25.2	1.671	7
Rain Water 3	19.0	8.2	27.2	1.07	7
Rain Water 4	13.6	9.6	23.2	1.046	6
Rain Water 5	11.9	6.8	18.7	.108	5
Fish Water 1	0.0	0.0	0.0	0.0	0
Fish Water 2	16.3	9.2	25.5	.75	6
Fish Water 3	4.4	4.6	9.0	.011	4
Fish Water 4	0.0	0.0	0.0	0.0	0
Fish Water 5	17.4	11.5	28.9	1.03	6
Miracle-Gro™ 1	15.0	9.5	24.5	1.38	5
Miracle-Gro™ 2	17.4	9.8	27.2	4.087	7
Miracle-Gro™ 3	15.6	5.4	21.0	1.267	6
Miracle-Gro™ 4	16.6	10.1	26.7	3.57	7
Miracle-Gro™ 5	18.6	10.6	29.2	1.52	6
Tap Water 1	14.2	7.8	22.0	2.18	7
Tap Water 2	16.1	10.4	26.5	1.61	6
Tap Water 3	15.6	9.0	24.6	2.74	7
Tap Water 4	13.1	3.9	17.0	.445	6
Tap Water 5	11.1	5.6	16.7	.355	6

Table 3.2. Harvesting Measurement Averages . This table shows the average stem length, root length, total length, weight and leaf count that was found on day of harvesting (November 8, 2007). * Indicates that which is the largest.

	Average Stem Length (cm)	Average Root Length (cm)	Average Total Length (cm)	Average Weight (grams)	Average Leaf Count
Rain Water	14.66	8.36	23.02	1.065	6.4 *
Fish Water	7.62	5.06	12.68	.3582	3.2
Miracle-Gro™	16.64 *	9.08 *	25.72 *	2.3648 *	6.2
Tap Water	14.02	7.34	21.36	1.466	6.4 *

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