Which Type of Water Makes Soybeans Grow the Fastest?

ABSTRACT

Which Type of Water Makes Soybeans Grow the Fastest?

The purpose of the project is to determine which type of water makes soybeans grow the fastest when watering the plants with tap water, calcium water, and distilled water. The hypothesis states that the soybeans watered with calcium water will grow the tallest. The materials needed include soil, soybean seeds, distilled water, tap water, a beaker, and TUMS®. The project was started by putting the soybeans in soil. It is important to water 30 plants, 10 soybean plants for each variable with 30ml mixture of calcium water, distilled water, and municipally treated tap water every other day. The calcium mixture was created by mixing up 1 TUMS® in 250 mls of municipally treated tap water. Next the soybeans were measured every week, then the data was recorded.. The hypothesis was supported, in 5 weeks calcium watered soybeans averaged a height of 35 centimeters, distilled watered soybeans averaged a height of 34 centimeters, and tap watered soybeans averaged a height of 12 centimeters. Even though there were holes for the water to drain the plants were overwatered and died. This experiment will help people know what type of water makes the soybean plant grow the fastest. Also knowing what type of water solution the soybeans need will help the soybeans get more nutrition.

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Purpose

The purpose of the project is to determine which type of water makes soybeans grow the fastest when watering the plants with tap water, calcium water, and distilled water.

Hypothesis

The hypothesis states that the soybeans watered with calcium water will grow the fastest.

Which Type of Water Makes Soybeans Grow Faster?

The history of soybeans goes way back, the plant soybeans started growing in China. It wasn't until between the 11th and 17th century that they were domesticated. In the early 1800's soybeans arrived in America on a ship. Farmers in America still didn't try planting soybeans for their livestock till 1879 (History of Soybeans, n.d.).

Soybeans can grow in many different climates. Soybeans are mostly grown in the midwestern United States and Southern Canada, but they can grow in other climates. Soybeans can grow anywhere with a supply of water rich loose soil and sunlight. This crop is planted when it's 12-15° C. If the temperature is below freezing then soybeans can be damaged. The growing season temperature is between 21-32 ° C (What Is the Best Climate for Growing Soybeans? ,n.d.).

Most plant leaves contain a green chemical called chlorophyll. This traps some of the energy from the sunlight. During photosynthesis, plants spread out their leaves to make a large area of chlorophyll in which the sunlight shines. Once the energy is trapped, it is used to split up water into two chemicals hydrogen and oxygen. The plant uses more energy to join hydrogen with carbon dioxide in the air to make food substances called carbohydrates, mainly sugars and starches. It gives off oxygen in the air (Riley, & Parker, 2009).

Almost all soybeans are processed for their oil. The oil is used for cooking and other edible uses, sold for biodiesel uses, or industrial use. Margarine, salad dressings, and mayonnaise are made with soybean oil. It is also used for it's high protein fiber to feed animals. Soy crayons

made by the Dixon Ticonderoga Company replace the petroleum used in regular crayons with soy oil making them non-toxic. Candles made with soybean oil burn longer but with less smoke. SoyInk is superior to petroleum-based inks because soy ink is non-toxic, renewable and environmentally friendly, and it cleans up easily. Biodiesel fuel for diesel engines can be produced from soybean oil by a simple process called transesterification. This process removes the glycerine from the oil, leaving soy biodiesel. Soy biodiesel is cleaner burning than petroleum-based diesel oil. Its use reduces particulate emissions. Biocomposites are building materials made from recycled newspaper and soybeans. They replace other products traditionally made from wood, such as furniture, flooring, and countertops. Soy oil produces an environmentally friendly solvent that safely and rapidly removes oil from creeks, streams and shorelines without harming people, animals or the environment (Uses of Soybeans, n.d.).

The Chinese crushed soybeans with wheat, salt, bacteria, and other microorganisms. The microorganisms feed on the proteins in the wheat and soybeans. The salt pulls water out of the mixture. The protein rich soy paste that remained was used to flavor foods. The soy sauce you may use today is made in a similar manner (Paddila, 2000). Calcium is important for plants to grow. Calcium helps maintain a chemical balance in the soil. Calcium plays a very important role in helping remove carbohydrates. The vitamin helps neutralize cell acids. If a plant does not have calcium (Calcium Deficiency) a plant will have bulb and fruit abnormalities, severe stunted growth, and short, brown root systems (Anon, 2019).

Distilled water is different from regular water because it is missing chemicals and minerals. Distilled water can help plants because the chemicals in tap water hurts plants (fluoride

and chlorine). Although it can also hurt the plant because it is missing minerals. Tap water has magnesium, calcium, and sodium which plants need to grow (What Effect Does Distilled Water Have on Plants? ,n.d.).

Clay Sailing, a farmer, was interviewed for this experiment. Clay said that soybeans normally grow for 4-5 months and can range from 46-61 centimeters. He uses different fertilizers in the fall, primarily high calcium lime. He plants a cover crop hairy vetch, balansa, clover, and rye. This is his favorite mix to plow under for green manure before planting, in the spring of the year. This will naturally release heat and nitrogen and it biodegrades making the perfect seed bed. Then foliar feed (spray plants) with a fertilizer mixture. The type of fertilizer is based on the results of the soil samples. The soil sample info tells the land is deficient in, so you order the correct fertilizer according to that conjunction to what the crop needs. Fertilizer has 3 numbers (content) - nitrogen, phosphorus, potassium. (Example 19-19-19, 0-0-60, 10-20-10). Clay said that calcium (high calcium lime) helps break down the soil to get water to the plant roots. It penetrates the soil hardpan to allow roots to grow deeper and this also reduces rain run off. Calcium is needed for all life forms and helps the plant use and absorb other forms of fertilizer and minerals. Calcium is the key to any successful crop. Clay has bought 200 tons in the last 4 years. Acid rain can cause a stunt in growth. The use of high calcium lime and proper amounts of phosphorous will build a healthy strong plant. The correct fertilizer for foliar feeding makes an even stronger plant that will be less app to be affected by acid rain (Sailing personal communication, November 30, 2019).

Experimental Procedure

Materials:

- Municipally Treated Tap Water
- Distilled water
- TUMS®
- Plastic cups
- Ruler
- Notebook
- Camera
- Pen/pencil
- Soil
- Beaker

Procedure:

1. Put the soil in the plastic cups.

2. Put the soybean into the soil.

3. Water the 30 soybean plants, 10 for each variable with 30 ml mixture of Calcium water, Distilled water, and Tap water every other day.

4. To mix the calcium solution by grinding 1 TUMS®

with 250 mls of tap water.

5. Measure soybeans with a ruler every week.

6. Record the data.

Analysis (Results)

The purpose of the project is to determine which type of soybeans grow the fastest when watering the plants with tap water, calcium water, and distilled water. The hypothesis states that the soybeans watered with the calcium solution will grow the fastest. The soybean plants were grown for 5 weeks. Observation during the experiment included, the soybean plants watered with the calcium solution, made the cup white from the calcium in the water. Also even though the cups had holes to drain the water the plants were overwatered and died. The soybean plants water with tap water did not grow as expected. The hypothesis was supported, in 5 weeks calcium watered soybeans averaged a height of 35 centimeters, distilled water soybeans averaged a height of 34 centimeters, and tap water soybeans averaged a height of 12 centimeters.

Tap Water

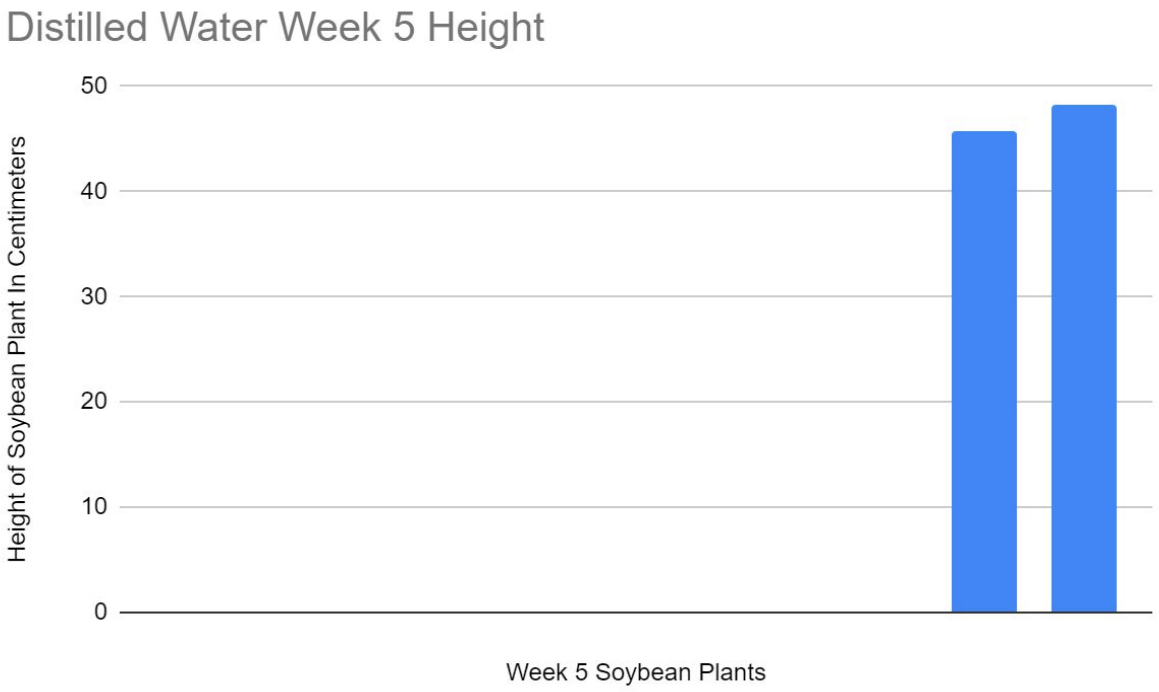
	Trial	1	2	3	4	5	6	7	8	9	10
Week											
1		0	0	0	0	0	0	0	0	0	3.81
2		0	0	0	0	0	0	0	0	0	7.62
3		0	0	0	0	0	0	0	0	0	13.97
4		0	0	0	0	0	0	0	0	0	17.78
5		0	0	0	0	0	0	0	0	0	17.78

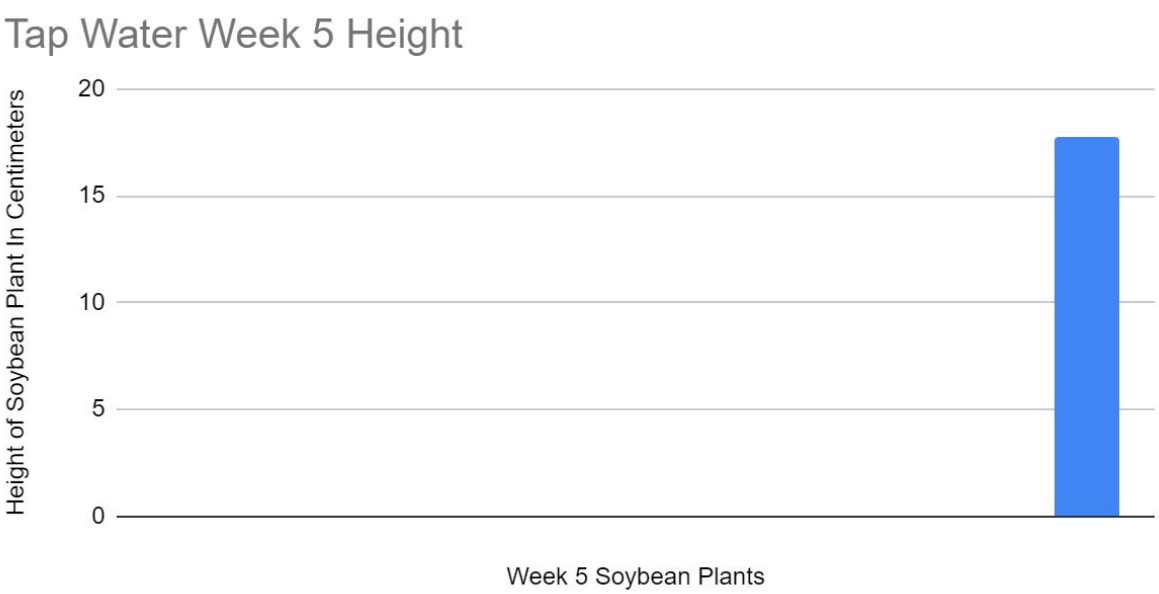
Distilled Water

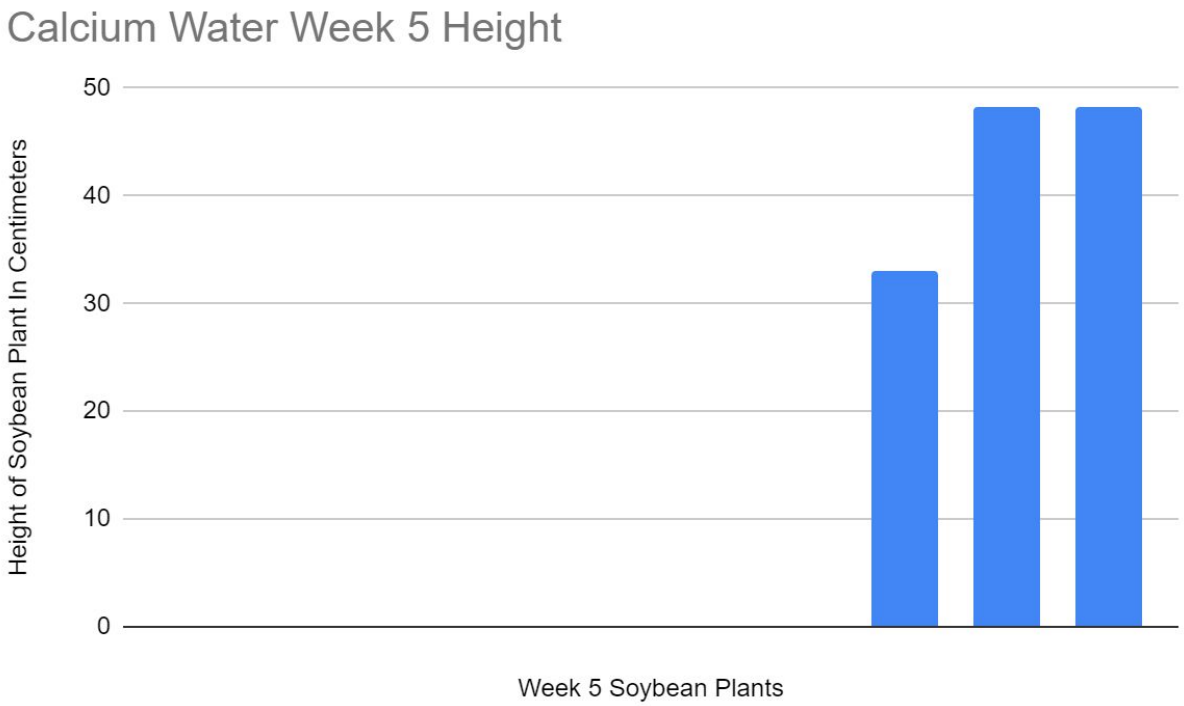
	Trial	1	2	3	4	5	6	7	8	9	10
Week											
1		0	0	0	0	0	0	0	0	2.54	11.43
2		0	0	0	0	0	0	0	0	30.48	24.13
3		0	0	0	0	0	0	0	0	38.1	43.18
4		0	0	0	0	0	0	0	0	45.72	48.26
5		0	0	0	0	0	0	0	0	45.72	48.26

Calcium Water Averages

	Trial	1	2	3	4	5	6	7	8	9	10
Week											
1		0	0	0	0	0	0	0	0	12.7	12.7
2		0	0	0	0	0	0	0	0	33.02	33.03
3		0	0	0	0	0	0	0	27.94	43.18	45.72
4		0	0	0	0	0		0	33.02	48.26	48.26
5		0	0	0	0	0	0	0	33.02	48.26	48.26


Distilled Water Week 5 Height
Height of Soybean Plant In Centimeters
50
40
30
20
10
0
Week 5 Soybean Plants


Tap Water Week 5 Height
Height of Soybean Plant In Centimeters
20
15
10
5
0
Week 5 Soybean Plants


Calcium Water Week 5 Height
Height of Soybean Plant In Centimeters
50
40
30
20
10
0
Week 5 Soybean Plants

Conclusion

The purpose of the project is to determine which type of soybeans grow the fastest when watering the plants with tap water, calcium water, and distilled water. The hypothesis predicts that the soybeans watered with the calcium solution will grow the fastest. In 5 weeks calcium water soybeans were average height of 35 centimeters, distilled water soybeans were average height of 34 centimeters, and tap water soybeans had an average height of 12 centimeters. So in conclusion the hypothesis was supported.

Application

This experiment will help people know what type of water makes the soybean plant grow the tallest. Also knowing what type of water solution the soybeans need will help the soybeans get more nutrition and grow taller.

References

Anon, (2019). [online] Available at: http://www.tetrachemicals.com/Products/Agriculture/The_Importance_of_Calcium.aqf. [Accessed 29 Nov. 2019].

C. Sailing personal communication, November 30, 2019)

History of soybeans. (n.d.). Retrieved from https://www.soya.be/history-of-soybeans.php.

Paddila, M. J., Cyr, M., & Miaoulis, I. (2000). From bacteria to plants. Massachusetts: Prentice Hall.

Riley, P. D., & Parker, S. (2009). Plants. Broomall, PA: MC Publishers.

Uses of Soybeans. (n.d.). Retrieved from https://ncsoy.org/media-resources/uses-of-soybeans/.

What Effect Does Distilled Water Have on Plants? (n.d.). Retrieved from https://www.hunker.com/12150299/what-effect-does-distilled-water-have-on-plants.

What Is the Best Climate for Growing Soybeans? (n.d.). Retrieved from https://www.hunker.com/12437296/what-is-the-best-climate-for-growing-soybeans.