

Effects of water temperature on plant growth



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Abstract

Test the affect of microwave water and boiled water on plants. No major difference of the plants growth between boiled and microwave water, shown in the results.

1. 0 Introduction

The following experiment was conducted over a period of 5 weeks testing 2 different plant species on the affects of microwave water, behind the theory of microwave radiation altering the chemical composition of water. Based upon this theory the plants were experimented to see if microwave radiation alters the structure of DNA affecting the growth of plants. [Research Centre, 2006]

Two hydrogen atoms and one oxygen atom is the very simple atomic structure of water. Causing it to have unique electrochemical properties. A slight positive charge on the hydrogen side of the molecule, with a negative charge on the other side. Water is a powerful solvent and is responsible for its string surface tension, as the molecular polarity causes water molecules to arrange themselves in patterns when a physical phase changes in water molecule. Specific heat is the energy amount required to change the temperature of a substance and wast has high specific heat. Large amount of heat energy, before it begins to get hot as its high specific heat. Helps organisms relate their body temperature as it releases energy slower and more effectively when caused to cool. Neither acid or basis with a neutral pH. The pH changes if substances are dissolved in it. Good heat conductor, conducting easily than any other liquid. Uniform vertical temperature profile for large bodies of water is due the easy heat conduction. With a

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temperature range of 0 to 100° Celsius, allows the water molecule to exist in most places around the world. Being able to dissolve many different compounds and chemicals as it's an universal solvent with a high surface tension. Adhesive, elastic and in aggregate drops is what water tends to be. Despite the downward of gravity the phenomenon causes water to stick to the sides of vertical structures. It also allows waves and water droplet formation and for plants to move water dissolving nutrients from their roots to their leaves. [Pidwirny, M. 2006.]

A group of living organism with some 300, 000 different species characterised by their green colour, are plants. Trees, herbs, flowers and ferns are some common groups of plants. Sprout, seedling is the meaning of planta a Latin word in which plant originated form. [R, Conan-Davies. 2009]

Each part of the plant plays a different role. Absorbing from the soil, water and minerals are the roots which act like straws. Extra food for the future is stored and helps anchor the plant, the tiny root hairs assist in the nutrients absorption. Acting like the plumbing system for the plant and supporting it, is the stem. In the form of glucose water and nutrients is conducted from the leaves to different parts of the plant. Being either herbaceous and bendable or woody. The small stalk which attaches the leaf to the plants stem is called the petiole. The leaves are where majority of the plants food is made, through the process of photosynthesis. The leaves are designed to capture sunlight for the photosynthesis process to work. The reproductive section of the plant is the flower. Pollen and ovules are contained in the flower, after the pollen fertilizes the ovule through pollination, fruit develops. Providing seed covering is the fruits role and is also edible to humans and animals. The

seed is the basis of a plant. [Botanical Garden, 2009] Carbon fixation and photosynthesis conducted by plants and algae is the energy and organic material source in all habitats. The earth's 20% composition is changed radically by the plants process. Internal energy which relies on oxygen to move and grow is aerobic organism such as animals. The nutrients of animal and humans rely heavily on plants. [R, Conan-Davies. 2009]

Petunia is scientifically known as; *Petunia x hybrida*. [NC State University, 2010] popular low – lying annuals provide a brilliant display and attractive colours and green foliage in garden beds or containers. Blooming all summer long. Growing best in full sunlight with soil that is peat based which contains vermiculite. Petunias will survive in the shade that at least 6 hours of full sunlight daily. With ranging colours from whites to yellows, petunia's can be the main attraction in a garden bed with minimal maintenance. There are several varieties of petunias. Water the plants prior to planting them and allow for drainage. Fertilising with a liquid fertiliser or soluble one every two weeks will help keep plants healthy. [Garden Guides, 2010 & information page]

Calendula officinalis is commonly known as the marigold. [Eco India, 2008] Easy to grow and provide bright large displays in the garden. With a strong unpleasant scent, it's effective for repelling garden pests. Coming in yellow, orange colours, can be planted in pots or gardens. Being able to be grown anywhere in all but cold climates. To help conserve moisture in the plants mulch and fertilise to keep them healthy. Regular water and will bloom throughout the summer and autumn and will keep pests away. [Garden Guides, 2010 & information page]

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The largest component of plants is water. 80 to 90% of water is the growing tissue part of the plant, lower water percentage parts are the woody, between 45 and 60% by weight of the water. Transporting minerals acting as a solvent and carbohydrates dissolved. Excellent solvent due to its unique chemical properties. A reactant in many chemical reactions throughout the plant. Oxygen we breathe everyday is the result of water acting as electron in the reaction of photosynthesis. Maintaining pressure in the plant so the leaves are literally inflated is an important role of water, as wilted plants is a lack of water. The water pressure is necessary for cell enlargement, growth and maintenance. [John Peterson, 2010] The net movement of atoms or ions of a higher concentration to a lower is diffusion. Until a state of equilibrium, diffusion will continue. Temperature, molecule density are the affect in which diffusion's rate is, occurring through the stomata into the atmosphere. Through a semi - permeable membrane, the diffusion of molecules. Pressure can prevent osmosis. The minimum pressure required for the fluid to be prevented from moving due to osmosis is call osmotic potential. Until the osmotic potential is balance fluid will enter the cell via it. To help keep the plant cell turgor, any water gained by osmosis is kept. As a result of water entering the cell's vacuole developing against the wall is turgor pressure. The water potential is made up by the pressure potential combined with the osmotic potential. Water will move from the cell with higher water potential to the cell with lower water potential if there next to each other. Water moves due to the soil's higher water potential than the roots and plant parts. The plant will die if there is no net movement in the plants. The loss of water via osmosis is plasmolysis and the shrinkage of protoplasm. If the cell is placed in fresh water this process can be reversed, as the cell is allowed to

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regain turgor pressure. Permanent damage can occur to the cell. Alive or dead tissue, swelling is imbibition. It can swell to several times their original volume. Minerals, cellulose and starches in suspension, attraction highly polar molecules is due to this. The initial germination of the seeds is this swelling process. Movement energy of substances is active transport. Enzymes and a pump in the plasma membrane are required for this process. ATP molecules energize the process. [Biology online, 2010]

Transpiration is where 90% of water that enters the plant is lost. Through the leaves is the loss of water vapour, this is transpiration. Loss of water through the cuticle is less than 5%. Not just for the pressure reason, vital to plant life is water and the cellular activities that occur in water molecules presence. The internal plants temperature is regulated by water. From the smallest root all the way up to the smallest leaf is the xylem pathway, internal plumbing system paired with phloem. The plants water needs and resources are maintained in the nutrient transportation system or internal plumbing. Columns of water in the plant form as the water molecules adhere to the xylem and tracheids walls and vessels to cohere each other allowing an overall tension. Water that enters the roots via osmosis, water content from the soil travels up these columns. Enough force to transport water through the plant is the water potentials of the soil and the stomata, from bottom to top. External input is the minerals in the soil, affects the growth rate and quality. Hydrogen, carbon, nitrogen, potassium, iron, calcium, cobalt, zinc, sulphur, sodium, manganese, chlorine, oxygen, phosphorus, molybdenum and boron are essential mineral in the plants growth. Minerals vary from plant to plant in which helps them to survive. If the soil is lacking these

nutrients and fertilizer isn't used to compensated, the plant will demonstrate mineral deficiencies symptoms. The ratio of nitrogen, potassium and phosphorus compensate the deficiencies. [Biology online, 2010]

2. 0 Hypothesis

Microwave radiation water will affect the plants growth. Boiled water will have minimal impact on the plants growth.

3. 0 Aim

To investigate the effect of microwave and boiled water on plants.

4. 0 Materials Used

- Gardening spade
- 4 black P. E. T pots
- Searle's real premium potting mix
- Microwave Oven
- Boiling jug/kettle
- 2 petunia x hybrid
- 2 Calendula officinalis
- Pen and Paper
- Ruler
- Gloves
- 2 measuring jugs

5. 0 Method

Potting Plants:

Group names and plant type experiment were labelled on the pot.

Pot was half filled with potting mixed.

Plant was removed from seedling tray.

Root's of the plant were spread out.

Plant was placed into the pot.

Pot was then filled with soil surrounding the plant and compacted.

Steps 1 to 7 were repeated for each plant.

Measuring Plants:

Plant height was measured from the base to the highest point and recorded.

Number of flowers and buds on the plant were counted and recorded.

Stems of the plant were counted and recorded.

Heating Water:

Measuring jugs were labelled, boiling water and microwave water.

Kettle was filled with tap water and boiled.

Glass proof jug was filled with tap water.

Jug was placed in microwave for approximately 2 to 5 minutes on high.

Water was left to cool.

500ml of both boiled and microwave water were measured out.

1 of both the boiled and microwave experiment plants was watered.

Steps 6 and 7 were repeated for the remaining 2 plants.

Each week the method of heating the water measuring were carried out recording the plants development and growth.

6. 0 Discussion

The results of the experiment showed the aim's outcome. Two plants *Calendula officinalis* and *petunia x hybrid* were tested for the affect that boiling water or microwaving it had up it. The stimulus was that microwaving water altered the DNA affecting plants. The water travel up the transport system of the plants, known as the xylem like a circulatory system. This is how the water and the dissolved nutrients throughout it is dispersed throughout the plant. If microwaving water alters it's DNA and affects the nutrients which dissolve itself from the soil, the reason it affects the whole plant is due to its transport system. The plants weren't affected that much by the two different waters, although the microwave marigold wilted and died. However there shouldn't be much difference between the boiled and microwave water.

The hypothesis was based upon the stimulus of the experiment stating, ' microwave radiation water will affect the plants growth. Boiled water will have minimal impact on the plants growth.' Although the results didn't support the hypothesis, as there wasn't any major difference between the boiled and microwave petunias and marigolds. Although the microwave marigold welted in our experiment other groups may have had boiled plants that welted. The variables would have been the reason as to why we

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received the results we did. As there was no fertiliser added to the plants and some of them demonstrated the characteristics of lacking nutrients, as fertiliser can assist in this and supply the plant with the nutrients to help it's deterioration the plant's weren't helped. The dying plant could've have been easily prevented if a substitute nutrient like fertiliser was given to it.

Many errors throughout the experiment can be improved. When potting the plants the soil could have been compacted more so there were no air pockets and the water soaked in more. It also would've prevented the plants to die. Measuring the data, could have been more accurate by having more than 3 standard measurements, things such as the plants width could have been measured and the plants weight. The standard error ranges which mean the way in which every group maintained their plant was different and play a major affect on them. Such as accidentally pouring the wrong water into the incorrect plant would have affected the outcome even though there shouldn't be much of a difference between microwave and boiled water. The environment in which the plants were in also affected them as they were open and exposed to rain and bad weathers. Many things of the experiment could have been improved to get a more accurate result.

7. 0 Conclusion

The hypothesis wasn't supported nor was it wrong as there wasn't a massive difference between the microwave water and boiled water results, it seems that the microwave water plants were growing better than the boiled plants, although only by a minimal amount. The results can lead to further experimentation upon humans and wether microwaving makes us susceptible to cancers and harmful diseases. Tests on animals and if over a <https://assignbuster.com/effects-of-water-temperature-on-plant-growth/>

period of time that microwave radiation can affect you and deteriorate the body. Does microwave radiation alter foods DNA and prevent our bodies from registering it. The experiment has answered the hypothesis and reached the aim, it has also left many further possible investigations about microwave radiation and it's affects.

8. 0 Acknowledgements

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