

Auxin gravitropism effect on root growth



**ASSIGN
BUSTER**

To investigate how the Auxin gravitropism affects the growth of roots and shoots in seedlings.

Hypothesis:

If gravity affects the direction of growth in seedlings, then the roots will grow towards the direction that gravity is pulling them, and the shoots will grow in the opposite direction of gravity.

Introduction:

Hormones are one of the bodies many and greatest communication systems. Hormone molecules can be released by any of about a dozen glands in the human body. Once released, the molecules travel through the bloodstream until they find a receptor cell that it recognizes. The molecule enters the receptor cell and 'tells' the cell to undergo a certain action. Plants hormones basically work the same way, but travel through the xylem and phloem because plants do not have blood streams. Hormones are involved in many biological processes such as growth, reproduction, and immune function.

Plants and animals both have hormones inside of them to help regulate biological processes such as growth. There are 5 groups of plant hormones: Auxins, Gibberellins, Cytokinins, Ethylene, and Abscisic Acid. Auxins are responsible for stimulating cell division and cell elongation in stems and roots. Auxins also aid in the ripening and dropping of food, as well as cell growth in response to gravity and light.

Gibberellins are responsible for activating stimulating cell division and preventing the ageing of leaves

Cytokinins also stimulate cell division, and also stimulate the germination of seeds.

Ethylenes affect the sweetness of fruit, as well as the texture and colour. It also promotes the ripening of the fruit.

Finally, Abscisic Acid can stop shoot growth, and induce as well as maintain seed dormancy. Finally, this group of hormones promotes stomata closings, in order to overcome situations where water levels are very low.

The effects of hormones on plants are numerous. Hormones can put seeds into dormant states until the environment is well enough for the seed to grow, hormones 'tell' a fruit tree how and when to ripen their fruit, and then when to drop it. In this investigation, we will discuss how the hormone gravitropism affects the growth of shoots and roots in seedlings. This hormone causes roots to grow towards gravity because the roots have a high concentration of gravitropism inside of them. This hormone does not affect the stems as much because less gravitropism is found in them. This is why shoots and stems grow upwards while roots always grow downwards.

Another important hormone is phototropism. It is the hormone responsible for a plant bending towards sunlight. The side of a plant that is in shade has an increased Auxin concentration, resulting in the cells elongating which causes the plant to bend towards the light.

Hormones are very important because, as stated above they are the body's greatest communication system. Hormones tell the different parts of the body how to function and when to change functions. This is important for all

living things, so that all cells know what to do in order for the organism to live, grow and prosper. This is why hormones are so important.

Discussion:

In What Direction did the Majority of the Roots and Stems Grow Once the Corn Kernels (Saplings) Germinated?

The initial upward direction was at 12, and the initial downward direction was 6. Once the seedlings germinated the majority of roots generally grew towards 6 which was downward and towards gravity, and the majority of shoots generally grew towards 12 which was upwards and against gravity.

After rotating the Petri dish, which way did the roots and stems grow? Did they change direction? If yes, then what was their new direction?

After rotating the petri dish on the fourth day, using 3 as the new upwards direction, the direction of root and shoot growth did change. The majority of roots began to clearly grow towards 9 which was the new downward direction. In addition, the majority of the shoots clearly began to grow towards 3 which was the new upwards direction.

Why was it important to place the seeds in a circle?

It was important to place the seeds in a circle so that we could number each seed position like the numbers on a clock. This allowed us to rotate the petri dish and have clearly defined points where up and down were so that we could observe how and if gravitropism affected the shoot and root growth. The numbering system also helped in the observations because it made it possible for the numbers to be used as defined growth directions

a) What is Gravitropism?

Auxin's are plant hormones which affect cell division and elongation in stems and roots. Auxins also regulate cell expansion in plants responses to light and gravity. Finally, Auxins help in the ripening and dropping of roots.

Gravitropism is a type of Auxin. It affects the growth or turning of a plant in regards to the external factor of gravity.

Do roots show a positive or negative Gravitropism? Explain your answer.

Roots show positive gravitropism, which means they always grow towards the pull of gravity. This is observed in all plants, their roots always grow towards the pull of gravity and never away from it. This is necessary so that the roots grow in the soil which is where the roots can uptake nutrients for the plants survival.

Do stems show a positive or negative Gravitropism? Explain your answer.

Stems show negative gravitropism, they grow away from the pull of gravity. This is also observed in all plants and is necessary because the leaves which grow from the shoots need sunlight to undergo photosynthesis which is necessary in a plants survival. Sunlight is only available above ground level, which is why the shoots grow upwards.

Scientists are very interested in how plants will grow in space. Explain why it would be important to know this.

It would be important to know how plant would grow in space so that we could possible use plants as a source of oxygen or as a source of food on a spaceship, space station, or any other enclosed area in space where there

would be a need for oxygen and food. Scientists first need to discover how the many hormones in plants are adjusted to the environmental factors on earth. Gravity is a large factor in this case because the force of gravity on Earth is very high compared to that of space. Through this lab, scientists now know that the lack of gravity in space will result in the shoots and roots growing randomly for the most part. This may result in some plants growing no roots in the soil or no shoots above the ground so that no nutrients can be taken up and no photosynthesis can take place.

Sources of Error:

A source of error that was identified during this lab was that the petri dishes were not big enough to let the roots grow naturally towards a direction. Once a seed got too long, it would start curling up on the side of the petri dish, and once this occurred the direction could not change easily. This caused some error because some roots were stuck in one position for most of the lab. A way to fix this error would be to use a larger petri dish. If the diameter increased by about 6 Cm the roots and shoots would mostly have as much space as they need.

Conclusion:

The hypothesis stated that if gravity affected the direction of growth in seedlings, then the roots would grow towards the direction that gravity was pulling them, and the shoots would grow in the opposite direction of gravity. The observations showed that the root and shoot growth was partially affected by gravity, based on the short observation length, and the tendency of the roots to curl up around the edges of the petri dish

Therefore, the hypothesis was accepted.