

# 7 Plant Growth Substances



## 7.1 Introduction to plant growth substances

You know that air, water, light and minerals are essential for plant growth. It has been discovered that some chemical substances also affect towards plant growth.

Have you ever thought how does a stem of a plant grows upwards and its roots grow downwards after the seed germination? Observe the figures 7.1 a and 7.1 b .

Have you ever thought how does a stem of a plant grows upwards and its roots grow downwards even the plant pot falls down? Let us do the activity 7.1 to study about it.



Figure 7.1 a

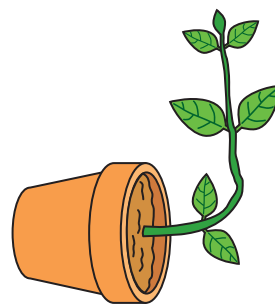


Figure 7.1 b



### Activity 7.1

**You will need:-** Two similar potted plants

**Method:-**

- Cut and remove the apex of one plant. Then, measure the heights of both plants.
- Supply same environmental conditions for both plants and measure their heights daily for a week.

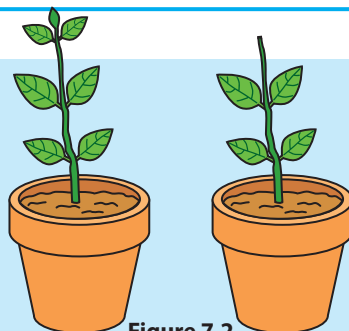


Figure 7.2

You will observe that the plant with the apex grows and its height increases while the height of the plant without the apex does not change. So, we can guess that there is an affect of the apex on plants to increase their height. Let us do the activity 7.2 to find out more about it.

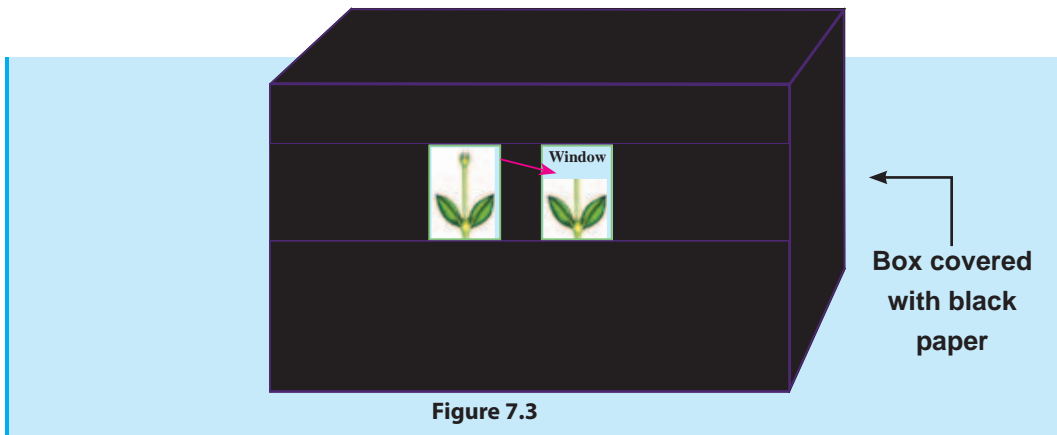


### Activity 7.2

**You will need:-** Two similar potted plants, a box covered with a black paper

**Method:-**

- Cut and remove the apex of one plant.
- Place the two plants inside the box in a way that both plants get light only from one direction.



You will observe that the plant with the apex grows to the direction of the light and the plant without the apex does not turn towards light. Therefore, we can come to a conclusion that there is an affect of the apex on the growth of a plant. The reason is the chemical compounds synthesize in plant apex.

The **chemical compounds which regulate the growth of a plant are known as plant growth substances**. Some growth substances **promote** the growth of a plant while some **inhibit** the growth of a plant.

Some plant growth substances that promote the growth of plants are given below.

- Auxins
- Gibberellins
- Cytokinins

### Auxins

Auxin is a growth promoting hormone in plants which produce in the tips of the shoots and roots. Auxins stimulate cell elongation in stem and root (figure 7.4). Stem apex turn towards light due to dissimilar cell elongation of stem.

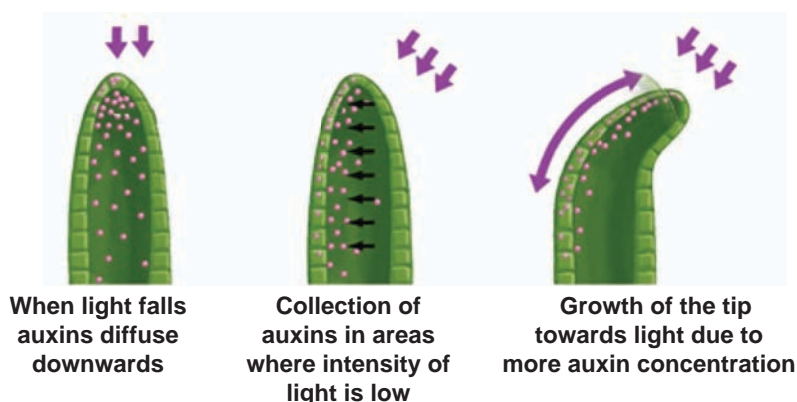


Figure 7.4

Auxins, produced in the apex diffuses downwards. It speeds up the growth of new cells and the shoot of the plant grows upwards. IAA is a natural growth substance found in plants.

Auxin concentrate more in the side of plant where intensity of light falls is low. Then, auxin concentrate less in the other side of the plant. Auxin moves to the darker side of the plant, causing the cells there to grow longer than corresponding cells on the other side of the plant. This causes a curving of the plant stem tip towards the light. This is known as positive phototropic movement. Auxin also inhibits the growth of lateral buds (figure 7.5).

Pruning of plant apex in practised in horticulture to maintain bushy plants.



**Figure 7.5 - Growth of lateral buds in Pomegranate plant**



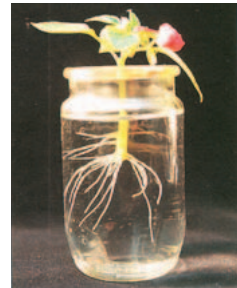
**Figure 7.5 - Growth of Cabbage plant due to gibberellin**

### **Gibberellins**

Gibberellin promotes mainly the elongation of the stem and growth of the fruits.

### **Cytokinins**

Cytokinin accelerate the cell division. So, that the growth of flowers, leaves, fruits and roots get accelerated. They stimulate seed germination delay plant ageing.



**Figure 7.6 - Increase the rate of rooting in plants using Cytokinin**



## **For extra knowledge**

Abscisic acid is a plant growth substance. It is a chemical substance, that cause, closing of stomata when experience shortage of water. Thus decrease transpiration.

Ethene is a simple organic compound which produces low amounts in plants. It is necessary for ripening of fruits. When ripening starch stored in plants converted to sugar. If a plant is damaged, ethene released to the wound area and a new tissue forms to recover the wound.

## What is the reason for falling leaves and fruits when matured?

When you observe a stalk of naturally fallen leaf and a stalk of broken leaf it would be clear to you the naturally fallen leaf stalk has clear **abscission layer**. The reason for making abscission layer is when matured, the amount of growth substances reduces in fruits and leaves. Then, fruit fall and leaf fall take place in plants.

## 7.2 Uses of artificial growth substances

Artificial growth substances are widely used in horticulture and growing ornamental plants. Some of these are given in the table 7.1.

Table 7.1

Artificial growth substances	Uses
<b>2,4 DPA</b> (2,4 Dichloro Phenoxyacetic Acid)	As a broad leaf weedicide for paddy fields
<b>2,4,5 TPA</b> (2,4,5 Trichloro Phenoxyacetic Acid)	
(IAA) Indoleacetic Acid	To induce root formation of stem cuttings, To grow fruits quickly
(IBA) Indolebutric Acid	
(NAA) Naphthaleneacetic Acid	To prevent pre-mature fruit drop, To induce flowering in pine apple in off-seasons
Cytocell	To get mango fruits in the off-season



### Assignment 7.1

- Collect information about the instances that artificial growth substances are used.
- If possible arrange a visit to a plant nursery where artificial growth substances are used.
- Collect information about the use of artificial growth substances and prepare a report.



## Assignment 7.2

Prepare a collection of flower plants using artificial growth substances. Plant them to beautify your school environment.



## Summary

- The organic substances that influence some physiological processes during the growth of a plant are known as growth substances.
- Some growth substances promote the growth while some inhibit the growth of plants.
- Auxin, Gibberellin, Cytokinin are some examples for growth promoting substances.
- Artificial growth substances and inhibitors are used for agricultural purposes.

## Exercise

### 01) Select the correct or most suitable answer.

1. The figure shows the growth of a plant close to a window. What can be seen in the side to which its apex has grown?
  1. light
  2. water
  3. soil
  4. air
2. An artificial growth substance that is used to encourage root formation of a stem cutting is,
  1. Indoleacetic Acid
  2. 2, 4 Dichloro Phenoxyacetic Acid
  3. Naphthaleneacetic Acid
  4. 2, 4, 5 Trichloro Phenoxyacetic Acid
3. Select the **incorrect** statement regarding growth substances
  1. organic substances which control physiological activities in plants
  2. growth substances can be artificially synthesized for use.
  3. some are used for inducing fruit formation
  4. stimulate plant growth only



4. Three artificially synthesized growth hormones are given below.

- Indoleacetic Acid
- Indolebutric Acid
- Napthaleneacetic Acid

Which of these are useful in initiate rooting

- a and b only
- a and c only
- b and c only
- a, b and c

5. What is the hormone used to pre-mature fruit drop and to induce flowering in pine apple in off seasons?

- 2,4 DPA
- IAA
- IBA
- NAA

**02) Chemical substances and their effect for plant growth is mentioned in A and B columns. Match A and B correctly.**

A	B
a. Auxins	cell division
b. Cytokinins	cell elongation
b. Gibberellins	stem elongation

**03) State three instances where artificial growth substances are used in agriculture. Give one example for each.**

## Technical Terms

Plant growth substances	- ஸாக வர்டிக டூவ	- தாவர வளர்ச்சிச்சீராக்கிப் பதார்த்தங்கள்
Growth promoters	- வர்டிக டூவ டீவர்டிக டூவ	- வளர்ச்சி தூண்டிகள்
Growth inhibitors	- வர்டிக டூவ டீவர்டிக டூவ	- வளர்ச்சி நிரோதிகள்
Seed germination	- டீவர்டிக டூவ	- வித்து முளைத்தல்
Plant ageing	- ஸாக டீவர்டிக டூவ	- தாவரங்கள் வயதாதல்
Phototropic movements	- டீவர்டிக டூவ	- ஒளித்திருப்பவசைவு
Stem elongation	- ஸாக டீவர்டிக டூவ	- தண்டு நீட்சியடைதல்
Artificial growth substances	- கார்டிக டூவ	- செயற்கை வளர்ச்சிப் பதார்த்தங்கள்