

## 8th Grade: PLANTS (Environmental Adaptation of Plants, Crop Diseases and their Effects)

### Rational of this unit

There are a great multitude of plants growing in various different environments on the face of the Earth, from dry deserts to the fertile waterfronts. Regardless, these plants grow strong and sturdy while adapting themselves to their various environments.

In the first half of this unit, we shall use knowledge of plants from previous studies to observe the characteristics of leaves, stems and roots of the plants growing in these various environments, and build up a conception of how these plants adapt to their environments.

Then the unit's second half will proceed to look at the crop diseases which greatly influence our lives, and the water and land conservation needed to prevent them. One of the goals of this unit is to also cultivate pupils' motivation to put the results of their studies in this regard into practice in their own fields.

### Objectives: what pupils are expected to achieve in this unit

- Be able to discover and record the characteristics of common xerophytes and aquatic plants while at the same time instilling the basics of biological research through observation of such plants.
- Understand the characteristics of plants adapted to their various living environments, such as how xerophytes have thick leaves and fat stems, or how hydrophytes have flat leaves to float on the water surface and flexible stems.
- Understand that many plants are mesophytes, which grow with moderate amounts of water, and that quickly spotting diseases of crops within this group is a method of lessening their effects upon harvest yield and quality.
- Be aware that in order to raise healthy crops, it is important to preserve the quality of environmental resources such as water and soil by limiting use of chemicals and deforestation.

### Interrelation of contents of each grade

\* The order below is as shown in the syllabus.

Grade	What to teach (Plants)
1 <sup>st</sup> Grade	<ul style="list-style-type: none"> <li>• Various plant life inhabiting the region</li> <li>• Main parts of plants</li> <li>• Edible parts of plants</li> </ul>
2 <sup>nd</sup> Grade	<ul style="list-style-type: none"> <li>• Planting seeds</li> <li>• Caring for plants – pulling wild grass and weeds, watering</li> <li>• Various leaves – colour, size, shape and feel</li> </ul>
3 <sup>rd</sup> Grade	<ul style="list-style-type: none"> <li>• Different wild plant life</li> <li>• How plants are useful to man – food, clothing, paper, baskets, furniture, tea, coffee, cocoa, medicine, shade, enclosure and aesthetics</li> </ul>
4 <sup>th</sup> Grade	<ul style="list-style-type: none"> <li>• Varieties of agricultural crops – food crops (grains, pulse, vegetables, fruits, tubers) and crops for profit (farm products used as drinks, fibres and oils taken from grains)</li> <li>• Regional weeds - blackjack, Sodom apples, goosefoot, spiderworts, Mexican marigold and wood sorrel</li> </ul>
5 <sup>th</sup> Grade	<ul style="list-style-type: none"> <li>• Plant classes – green and non-green, flowering and non-flowering plants</li> <li>• Functions of exterior parts of plants – roots, stem, leaves, flowers and fruit</li> <li>• Types of roots – tap roots and fibrous roots</li> </ul>
6 <sup>th</sup> Grade	<ul style="list-style-type: none"> <li>• Parts of the flower</li> <li>• Pollination – meaning and types of transmitters</li> <li>• Fertilisation – meaning and fusion process</li> <li>• Seed parts – monocotyledon seeds and dicotyledon seeds</li> <li>• Seed germination and conditions necessary for germination</li> </ul>
7 <sup>th</sup> Grade	<ul style="list-style-type: none"> <li>• Interdependence between plants – supporting other plants, acting as breeding grounds for other plants and providing shade for other plants</li> <li>• Interdependence between plants and animals – plants as food for animals, oxygen given off by photosynthesis of plants and carbon dioxide given off in animal respiration, plants as shelter for animals from heavy rain, animals that help in pollination, plants as medicine and nourishment for animals, and animal waste products being broken down for nourishment of plants</li> <li>• The food chain – meaning and examples</li> <li>• Agricultural crops and pests - the meaning of pests, types of pests, pests which devastate crops growing in fields, and pests which devastate storehouses</li> <li>• Influence of pests on agricultural crops – decrease in harvest yields, reduced quality of products, transmitting of diseases to crops, and causing sickness in consumers</li> </ul>

	<ul style="list-style-type: none"> <li>• Extermination measures - scaring pests off, setting traps, picking them up, pulling weeds, spraying pesticides, trimming and pruning</li> </ul>
8 <sup>th</sup> Grade (This unit)	<ul style="list-style-type: none"> <li>• Environmental adaptation of plants – arid and damp regions</li> <li>• Indicators of diseased crops - poor growth; discolouration of growing leaves, ears/heads or stalks/stems; dwarfism; withering and appearance of spots or stripes</li> <li>• Crop diseases and their influences – reduced harvest yield and quality</li> </ul>

## Before Starting this Unit

### Current learning status of the pupils

Pupils to this point have learned the structure and functions of the bodies of animals and plants, as well as about pests and the interdependence of plants and animals. However, the first half of this unit is their first time studying how plants and their growth are related to environment, and also how they adapt to their environments.

In addition, although they should already possess a fair amount of experiential knowledge through helping with the crops, pupils will learn in the second half about detection of crop diseases and their effects on harvest yields and quality. Accordingly, teachers should try to conduct the classroom by making use of pupil's experiences.

### Preparatory Notes

- Doing as much of the observation outside as possible is preferable, but for studying in which this may pose problems such as desert and aquatic plants, prepare as many pictures and samples as possible.
- For crop diseases, observations and investigations of nearby crop fields will be included. Also give students an assignment to survey real life past experiences of crop damage beforehand, and make use of reports from this in the classroom.
- When doing observations off campus or on farms, sufficient warming is necessary to avoid danger and avoid damaging crops.

## Objectives to be achieved by competency

### Interest, motivation, and attitude

1. Take an interest in desert and aquatic plants, and willingly investigate and think about the connection between them and their environments.
2. Take an interest in how to raise common crops, and try to discover the indicators of crop diseases.
3. Take an interest in the importance of water and soil as growing environments, and actively consider their conservation.

### Scientific thinking and communication activities

1. Ability to think about the connection between the characteristics of desert and aquatic plants and their environments, present the results and summarise things in a report.
2. Ability to predict the influence of crop diseases observed in the field upon harvests, summarise these predictions in a report and present it.
3. Ability to relate importance of water and soil as growing environments and their conservation to unlimited spreading of pesticides and deforestation.

### Knowledge, understanding, and skills in observation and experimentation

1. Ability to understand the characteristics of xerophytes which grow in the desert and hydrophytes which grow in wet environments, relate them to their respective environments and explain giving examples.
2. Ability to give examples and explain mesophytes, which grow in environments with moderate amounts of water.
3. Ability to give examples and explain plants' adaptations to their environment.
4. Ability to understand the indicators for crop diseases and explain their effects on harvest yields and quality.
5. Ability to explain the connection of the importance of water and soil as growing environments and their conservation to unlimited spreading of pesticides and deforestation.

## Ideas behind the structuring the unit

Content of this unit is broken into three parts. First, based on previous studies of plants teachers will have pupils understand the characteristics of desert and aquatic plants as well as how they live from the perspective of adaptation to environment. Second they will handle the raising and diseases of common crops, and finally made aware of the importance of water and soil as growing environments.

In the first half of the unit, devoted to environmental adaptation of plants, studies will not be confined to outdoor observation, but also make use of actual specimens and video materials so pupils can have a concrete understanding of adaptation.

The second half of the unit, covering crop diseases, will expand upon the results of studies such that they can be used in actual farm work, based on observations of nearby fields and pupils' experiences.

In conclusion, the unit reminds pupils of the importance of environmental conservation with concern to soil and water as growing environments, while also reminding them of material circulation in nature as studied in grade 7.

## Unit teaching plan

### (9 periods + 2 periods for the Final Unit Evaluation Test)

\* The numeric value in parentheses represents the corresponding period (e.g. 1) means the first period).  
 \* (Evaluation: Knowledge and Skills 1). (Evaluation: Interest 1), etc. indicate the points at which teachers can check whether the pupils have attained the goals specified in the section *Objectives based on the viewpoint*.

Sub-Unit	Description
<b>1. Environmental Adaptation of Plants</b> (5 periods)	1) Check what kind of plants grow in dry, arid deserts and on top of rocks as well as their characteristics through observation and materials. (Evaluation: Interest 1) 2) Understand that xerophytes such as the cactus and baobab grow in deserts and on rocks, and that these plants have characteristics adapted to environments with little water. (Evaluation: Thinking and Representation 1, Knowledge and Skills 1) 3) Check what kind of plants can be found in and near water as well as their characteristics through observation and materials. (Evaluation: Interest 1) 4) Understand that hydrophytes such as the water lily and greater duckweed grow in water and very moist soils, and that these plants have characteristics adapted to fertile environments. (Evaluation: Thinking and Representation 1, Knowledge and Skills 1) 5) Understand that plants grow while adapting to their respective environments from observation results and materials. (Evaluation: Knowledge and Skills 2, Knowledge and Skills 3)
Intermediate Review (No time allotted)	Give the "1 <sup>st</sup> Sub-Unit Review Test." (Homework can be given depending on the progress of the class.)
<b>2. Crop Diseases and their Effects</b> (2 periods)	6) Observe the indicators for crop diseases at nearby fields. (Evaluation: Interest 2) 7) Understand that crop diseases can be detected through indicators that appear on leaves, stems and roots. (Evaluation: Knowledge and Skills 4)
<b>3. Effects of Crop Diseases and Environmental Conservation</b> (2 periods)	8) Understand that when crops become diseased, harvest yields and quality will fall. (Evaluation: Thinking and Representation 2, Knowledge and Skills 4) 9) Understand that soil and water are important resources for crops and that conservation is needed through activities such as limiting of deforestation and quantities of pesticides used. (Evaluation: Interest 3, Thinking and Representation 3, Knowledge and Skills 5)
Intermediate Review (No time allotted)	Give the "2 <sup>nd</sup> and 3 <sup>rd</sup> Sub-Unit Review Test." (Homework can be given depending on the progress of the class.)
Unit End Review (2 periods)	10) Give the "1 <sup>st</sup> Final Unit Evaluation Test." 11) Give the "2 <sup>nd</sup> Final Unit Evaluation Test."

## Lesson Plan

### 1. Environmental Adaptation of Plants (5 periods: 1<sup>st</sup> period – 5<sup>th</sup> period)

#### Goals of this sub-unit


- Observe the appearance of plants in the school yard and around the school, and understand that plants in places like sandy areas, rocky areas and near water have different leaves, stems and roots adapted to their environments.
- Understand that plants have characteristics adapted to their living environment to grow up big and strong.

#### Material Preparations

- Recording worksheet, pictures and materials showing adaptation to environment and relation between plants and environment

#### Period 1: Observing Plants Growing in Dry Areas

Introduction	Learning flow and activity	Teaching Hints and Advice
5 minutes	<ul style="list-style-type: none"> <li>Plants grow by pulling up water through their roots and photosynthesizing.</li> <li>However, there are places on the Earth where water is in abundance, and places where it is lacking.</li> </ul>	<ul style="list-style-type: none"> <li>Pass out the worksheet and give various observation points to ensure pupils properly record what they investigate.</li> <li>Indicate what time to return to the classroom.</li> </ul>
Questions	Observe what kind of plants can be seen in dry areas with little water.	
<b>Presentation 1:</b> <b>Observation</b> 25 minutes	<p><i>If observation is possible:</i></p> <ul style="list-style-type: none"> <li>Observe plants growing in dry areas.</li> <li>Look for a dry area.</li> <li>Is there an area that is sandy or nothing but stones?</li> <li>What kinds of plants grow there?</li> <li>Are their leaves and stems the same as normal plants? Look to see if there are any differences.</li> <li>Record results in the worksheet.</li> </ul>	<p>(Refer to pg. 151 regarding worksheet)</p> <ul style="list-style-type: none"> <li>Give thorough safety warnings and go together with the pupils.</li> <li>Give pupils various observation points.</li> <li>Do plants grow even in sandy areas and on stones?</li> <li>Are there any differences between them and other plants?</li> </ul> <p>(Evaluation: Interest 1) Take an interest in desert plants, and willingly investigate and think about the connection between them and their environment.</p>
<b>Presentation 2:</b>	<p><i>If observation is not possible:</i></p> <ul style="list-style-type: none"> <li>Look at pictures and figures of plants growing in the desert or on dry stones.</li> </ul>	<ul style="list-style-type: none"> <li>Have pupils present what they notice looking at the materials.</li> </ul>

<p><b>Material Studies</b> 25 minutes</p>		<ul style="list-style-type: none"> <li>Have them each summarise their own notes on characteristics of arid region plant life while referring to the materials.</li> <li>You can expect pupils to find more varied discoveries through discussion if different materials are prepared for each group.</li> </ul>
<p><b>Summary</b> 5 minutes</p>	<p>Oxford. Science in Action 8 (p.19)</p>	<ul style="list-style-type: none"> <li>Discover the characteristics of plants growing in arid regions from their leaves, stems and overall appearance.</li> <li>Recheck the contents of your worksheet and notes to be sure there are no mistakes.</li> <li>Instruct the pupils to bring their worksheets and notes next period.</li> <li>Having them turn them in is fine, as this will allow you to avoid pupils forgetting their sheets in the next period.</li> </ul>

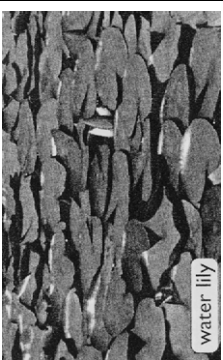
<p><b>Summary</b> 5 minutes</p>	<p>→ Acacia: spreads long roots to obtain water from deep in the soil. It sheds its leaves during dry periods. → Marram grass: prevents water transpiration by curling its leaves.</p>	<p>→ Have you heard what plants that are drought-resistant are called? <i>(Evaluation: Thinking and Representation 1)</i> Ability to think about the connection between the characteristics of desert plants and their environment, present the results and summarise things in a report.</p>
<p><b>Summary</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Plants that grow in dry areas are called xerophytes.</li> <li>These plants have special ways of withstanding a harsh environment.</li> <li>Some examples are the acacia, cactus, baobab, and sisal.</li> </ul>	<ul style="list-style-type: none"> <li>Summarise the types and characteristics of xerophytes while quizzing pupils on the points covered.</li> </ul>
<p><b>Questions</b></p>	<p>Observe what kind of plants grow in water rich areas and what kind of characteristics they have.</p>	<p><i>(Refer to pg. 152 regarding worksheet)</i></p> <ul style="list-style-type: none"> <li>Give thorough safety warnings and go together with the pupils.</li> <li>Give pupils several observation points.</li> <li>→ What kinds of plants grow near lakes and rivers?</li> <li>→ What parts of a water lily's leaves and stem are different from normal plants?</li> </ul>

**Period 2: Xerophyte Types and Characteristics**

	Learning flow and activity	Teaching Hints and Advice
<p><b>Introduction</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Share worksheets with one another to see what kind of observations you made in the last class.</li> </ul>	<ul style="list-style-type: none"> <li>Check the observation results recorded in worksheets or notes recorded after looking at materials from the last period, giving pupils a chance to present things.</li> </ul>
<p><b>Questions</b></p>	<p>What kind of plants did we see in dry places, like sandy areas and on stones? Present your findings.</p>	<p>Letting pupils discuss in groups and present a summary is acceptable.</p>
<p><b>Presentation</b> 25 minutes</p>	<ul style="list-style-type: none"> <li>Present the results of your observations.</li> <li>→ What kind of plants did you find growing in what kind of places?</li> <li>→ What characteristics did you find that were different from normal plants?</li> <li>What is a xerophyte?</li> <li>→ Plants that grow in areas with little water, such as in deserts, on sandy coastal areas and on stones are called <i>xerophytes</i>.</li> <li>→ These plants have a number of special ways of withstanding dryness.</li> <li>→ Cactus: has small leaves to prevent transpiration, and accumulates water in its thick stem.</li> </ul>	<ul style="list-style-type: none"> <li>Letting pupils discuss in groups and present a summary is acceptable.</li> <li>Summarize the results on the blackboard. Having pupils draw a picture on the board will make things even easier to understand.</li> <li>Check and see how well pupils have recorded the types and characteristics of xerophytes.</li> <li>Also give examples like the following: → Plants whose leaves are covered in hair to prevent transpiration. → Plants which close their stomata during the day to prevent transpiration under direct sunlight.</li> </ul>
<p><b>Questions</b></p>	<p>Observe what kind of plants grow in water rich areas and what kind of characteristics they have.</p>	<p><i>(Refer to pg. 152 regarding worksheet)</i></p> <ul style="list-style-type: none"> <li>Give thorough safety warnings and go together with the pupils.</li> <li>Give pupils several observation points.</li> <li>→ What kinds of plants grow near lakes and rivers?</li> <li>→ Are their leaves and stems the same as normal plants? Are there any differences?</li> <li>Record results in the worksheet.</li> </ul>

**Period 3: Observing Plants Growing Near and In Water**

	Learning flow and activity	Teaching Hints and Advice
<p><b>Introduction</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Until this point, we have been learning about plants that grow in dry regions.</li> <li>→ What about plants that grow in water rich areas?</li> </ul>	<ul style="list-style-type: none"> <li>Pass out the worksheet and instruct pupils to properly record what they investigate.</li> <li>There are great dangers near water, so warn pupils to look after not only themselves, but also to pay attention to the actions of their friends to avoid accidents.</li> <li>Indicate what time to return to the classroom.</li> </ul>
<p><b>Questions</b></p>	<p>Observe what kind of plants grow in water rich areas and what kind of characteristics they have.</p>	<p><i>(Refer to pg. 152 regarding worksheet)</i></p> <ul style="list-style-type: none"> <li>Give thorough safety warnings and go together with the pupils.</li> <li>Give pupils several observation points.</li> <li>→ What kinds of plants grow near lakes and rivers?</li> <li>→ What parts of a water lily's leaves and stem are different from normal plants?</li> </ul>
<p><b>Presentation 1: Observation</b> 25 minutes</p>	<p><i>If observation is possible:</i></p> <ul style="list-style-type: none"> <li>Observe plants growing in water and very moist soil.</li> <li>→ Go to a water rich area.</li> <li>→ What kinds of plants grow near lakes and rivers?</li> <li>→ Are their leaves and stems the same as normal plants? Are there any differences?</li> <li>Record results in the worksheet.</li> </ul>	<p><i>(Refer to pg. 152 regarding worksheet)</i></p> <ul style="list-style-type: none"> <li>Give thorough safety warnings and go together with the pupils.</li> <li>Give pupils several observation points.</li> <li>→ What kinds of plants grow near lakes and rivers?</li> <li>→ What parts of a water lily's leaves and stem are different from normal plants?</li> </ul>

<p><b>Presentation 2:</b> <i>If observation is not possible:</i></p> <p><b>Material Studies</b> 25 minutes</p>	<ul style="list-style-type: none"> <li>Look at pictures and figures depicting plants growing in water and very moist soil.</li> </ul>  <p>Oxford: Science in Action 8 (p.22)</p>	<ul style="list-style-type: none"> <li>Have pupils present what they notice looking at the materials.</li> <li>Have them each summarise their own notes on characteristics of the plants growing in water or near the water while referring to the materials.</li> <li>You can expect pupils to find more varied discoveries through discussion if different materials are prepared for each group.</li> </ul>
<p><b>Summary</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Recheck the contents of your worksheet and notes to be sure there are no mistakes.</li> </ul>	<p><i>(Evaluation: Interest 1)</i> Take an interest in aquatic plants, and willingly investigate and think about the connection between them and their environment.</p> <ul style="list-style-type: none"> <li>Instruct the pupils to bring their worksheets and notes next period.</li> <li>Having them turn them in is fine, as this will allow you to avoid pupils forgetting their sheets in the next period.</li> </ul>

	<p>→ These plants have different characteristics than plants growing in normal areas.</p> <p>→ Water lily: its leaves float on the water surface, and only have stomata on their top surface.</p> <p>→ Water hyacinth: has an air sac and grows floating in water. Also has a flexible stem made not to break due to water current.</p>	<p><i>(Evaluation: Thinking and Representation 1)</i> Ability to think about the connection between the characteristics of aquatic plants and their environment, present the results and summarise things in a report.</p>
<p><b>Summary</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Plants that grow in water rich areas, such as in water or very moist soil, are called <i>hydrophytes</i>.</li> <li>Hydrophytes have also adapted well to live in their water rich environments.</li> <li>They have characteristics like flexible stems and stomata only on the upper surface of leaves.</li> <li>Some examples include the water lily, greater duckweed, water hyacinth and water fern.</li> </ul>	<ul style="list-style-type: none"> <li>Summarise the types and characteristics of hydrophytes while quizzing pupils on the points covered.</li> <li><i>(Evaluation: Knowledge and Skills 1)</i> Ability to understand the characteristics of hydrophytes which grow in wet environments, connect them with their environment and explain giving examples.</li> </ul>

#### Period 5: Environmental Adaptation of Plants

	Learning flow and activity	Teaching Hints and Advice
<p><b>Introduction</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Try to recall plants that grow in dry and aquatic regions, and their characteristics.</li> <li>What kinds of plants did you find growing in the desert?</li> <li>What kinds of plants did we see near water?</li> <li>What kinds of plants grow in average environments?</li> </ul>	<ul style="list-style-type: none"> <li>Have pupils look at their worksheets and notes while they try to remember things.</li> </ul>
<p><b>Questions</b> <b>Presentation</b> 25 minutes</p>	<p>Summarise what we found out about plants growing in the various environments.</p> <p><i>Xerophyte types and characteristics</i></p> <p>→ Cacti and baobabs are examples of xerophytes.</p> <p>Possible characteristics include smaller leaves to prevent transpiration, and thick stems to store water. The cactus is an example of a <i>succulent</i>, and is capable of storing large amounts of water.</p> <p><i>Hydrophyte types and characteristics</i></p> <p>→ Water lilies, greater duckweed and water hyacinths are examples of hydrophytes. Possible characteristics include flexible stems and air sacs.</p> <p><i>Mesophyte types and characteristics</i></p>	<ul style="list-style-type: none"> <li>Conduct class by asking pupils questions as much as possible.</li> <li>Also touch on plants that have long roots (ex: acacia) and plants that close their stomata during the day to prevent water transpiration.</li> <li>Show pupils the water lily, whose leaves float on the water's surface and have stomata only on their upper surface. Have them consider why this might be and present their thoughts.</li> </ul>

#### Period 4: Hydrophyte Types and Characteristics

	Learning flow and activity	Teaching Hints and Advice
<p><b>Introduction</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Share worksheets with one another to see what kind of observations you made in the last class.</li> <li>What kind of characteristics do these plants have when compared to plants growing in areas with little water?</li> </ul>	<ul style="list-style-type: none"> <li>Check the observation results recorded in worksheets or notes recorded after looking at materials from the last period, giving pupils a chance to present things.</li> </ul>
<p><b>Questions</b> <b>Presentation</b> 25 minutes</p>	<p>What kinds of plants did we see in the water and very moist soil? Present your findings.</p> <ul style="list-style-type: none"> <li>Present the results of your observations.</li> <li>What kinds of plants grow near lakes and rivers?</li> <li>What kind of plants did you find growing in water?</li> <li>Did you see any characteristics in these plants that differed from those in normal plants?</li> <li>What is a hydrophyte?</li> <li>Plants that grow in water rich areas, such as in water or very moist soil, are called <i>hydrophytes</i>.</li> </ul>	<ul style="list-style-type: none"> <li>Letting pupils discuss in groups and present a summary is acceptable.</li> <li>Summarize the results on the blackboard. Having pupils draw a picture on the board will make things even easier to understand.</li> <li>Check and see how well pupils have recorded the types and characteristics of hydrophytes.</li> </ul>

	<p>→ Plants that grow in regions with moderate amounts of rainfall are called <i>mesophytes</i>. Many common plants and crops are mesophytes.</p> <p><i>Adaptation</i></p> <p>→ Plants have body structures made to withstand environments with little or plentiful water. This feature is called <i>environmental adaptation</i>.</p>	
<p><b>Summary</b> 5 minutes</p>	<ul style="list-style-type: none"> <li>Plants having leaves and stems structured to adapt to their environments is called environmental adaptation.</li> <li>Animal's bodily structures are also adapted to their respective environments. They also live by adapting to their environment.</li> </ul>	<p><i>(Evaluation: Thinking and Representation 1)</i> Ability to think about the connection between the characteristics of desert and aquatic plants and their environments, present the results and summarise things in a report.</p> <ul style="list-style-type: none"> <li>Let pupils think about specific examples of how animals adapt to their environments.</li> <li>Summarise plant's environmental adaptation while quizzing on previous discussion points.</li> </ul> <p><i>(Evaluation: Knowledge and Skills 2)</i> Ability to give examples and explain mesophytes, which grow in environments with moderate amounts of water.</p> <p><i>(Evaluation: Knowledge and Skills 3)</i> Ability to give examples and explain plants' adaptations to their environment.</p>

**[Worksheet]**----- \*To be used in 1<sup>st</sup> – 2<sup>nd</sup> Periods

**Observing Plants Growing in Dry Areas**

**Date:** \_\_\_\_\_ **Class:** \_\_\_\_\_ **Name:** \_\_\_\_\_

1. Write what kinds of plants you saw and the names of the plants observed in dry, sandy areas.

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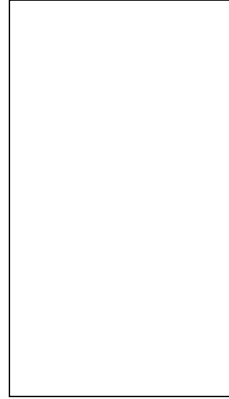
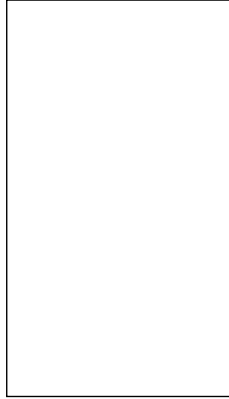
2. What kinds of characteristics did the leaves and stems of these plants have? Write the characteristics.

(Leaf characteristics: )

(Stem characteristics: )

(Other characteristics: )

3. Sketch the characteristics of the plants observed in the boxes below.



\* Keep this worksheet for the next class.

### Observing Plants Growing In Wet Environments

**Date:** \_\_\_\_\_ **Class:** \_\_\_\_\_ **Name:** \_\_\_\_\_

**Warning:** Water can be very dangerous, so follow your teacher's instructions carefully.

1. Write what kinds of plants you saw and the names of the plants observed in water and very moist soil.

( \_\_\_\_\_ ) ( \_\_\_\_\_ )

2. What kinds of characteristics did the leaves and stems of these plants have? Write the characteristics.

(Leaf characteristics: \_\_\_\_\_ )

(Stem characteristics: \_\_\_\_\_ )

(Other characteristics: \_\_\_\_\_ )

3. Sketch the characteristics of the plants observed in the boxes below.

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\* Keep this worksheet for the next class.

### 1<sup>st</sup> Sub-Unit Review Test

\* given after the end of 5<sup>th</sup> Period

**Class:** \_\_\_\_\_ **Name:** \_\_\_\_\_

1. There are many plants growing even in deserts and other areas with little water.

i. What are plants that grow in these kinds of dry regions called? ( **Xerophytes** )

ii. The plant in the figure on the right is one example of a plant that grows in a region with little water. Write the name of this plant. Also, write two features this plant is equipped with to withstand dryness.



Oxford: Science in Action 8 (p.18)

*Name:* \_\_\_\_\_ ( **Cactus** )

*Feature:* ( **It has no leaves in order to reduce amount of transpiration** )

*Feature:* ( **It has a thick stem which can accumulate large amounts of water** )

iii. Write the features of the following plants which allow them to withstand dryness.

*Acacia:* ( **Spreads long roots into the earth and absorbs water from deep in the earth** )

*Tuberose:* ( **Leaves curl up to prevent transpiration** )

2. There are many different hydrophytes growing in rivers and moist soil as well.

1. Write the features equipped on the following plants to adapt to water rich environments.

*Water lily:* ( **Has flat leaves that can float on the water surface, has all stomata on the top side of the leaf, has flexible stem that will not break in water current** )

*Water hyacinth:* ( **The roots have leaves attached to them which can become air sacs and allow it to float on the water surface** )

2. What is it called when plants have these kinds of characteristics appropriate to their environments?

Environmental ( **Adaptation** )

### 2<sup>nd</sup> and 3<sup>rd</sup> Sub-Unit Review Test

\* given after the end of 9<sup>th</sup> Period

Class: \_\_\_\_\_ Name: \_\_\_\_\_

- Crop diseases must be detected quickly when crops are infected.
  - What kinds of indicators can be seen when crops are infected? Give three examples.

( **Withering leaves** ) ( **Curling leaves** ) ( **Stunted growth** )

\* **Other possibilities include getting spots or streaks, warps and deformities, or discoloration.**

- What happens to **1) harvest yields** and **2) quality** when crops are infected with disease?

1) ( **they are reduced** )

2) ( **they get worse** )

- When quality is effected as given in **2) above**, how does the price change when taken to market?

( **they get cheaper** )

- Field soil and river water must be well preserved in order for crops to grow properly.

- Write down specific examples of what should be done to make this happen. Explain using the following terms.

*Garbage and wastewater:* ( **Refrain from carelessly throwing away garbage and draining water using improper water treatment** )

*Forests:* ( **Refrain from cutting down forests without limit** )

*Chemical Fertiliser:* ( **Refrain from overusing chemical fertilisers** )

*Pesticides:* ( **Refrain from overusing pesticides** )

### 1<sup>st</sup> Final Unit Evaluation Test

\*Done at Unit End

Class: \_\_\_\_\_ Name: \_\_\_\_\_

- Based on relation to water, plant life growing on the Earth is divided into the following three categories.
  - What kinds of plants are these? Explain the characteristics of each.

*Xerophytes:* ( **Can grow in dry lands, have features such as long roots and water storage** )

*Hydrophytes:* ( **Can grow in water or very moist soil, have air sacs and flexible stems** )

*Mesophytes:* ( **Plants that grow in land with moderate amounts of water. Many crops belong to this group.** )

- Give two or more specific examples of plants in the groups above.

*Xerophytes:* ( **Acacia, prickly pear, baobab, sisal, etc.** )

*Hydrophytes:* ( **Water lily, water hyacinth, duckweed, etc.** )

*Mesophytes:* ( **Maize, beans, potatoes, bananas, etc.** )

- Answer these questions about the plant in the picture on the right.



Oxford: Science in Action 8 (p.22)

- What is this plant called?

( **Water lily** )

- Where do these plants grow?

( **In lakes and swamps** )

- What characteristics has this plant developed in adaptation to where it grows? Give two examples.

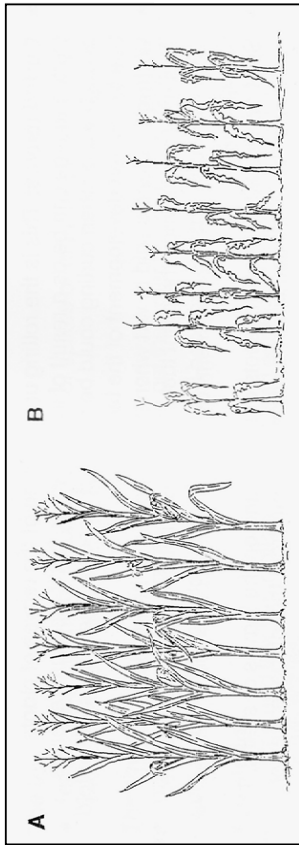
( **Flat leaves that can float in water** )

( **Stem is flexible so it will not break in the current** )

\* **Other examples include only having stomata on the top side of leaves, etc.**



3. The figure below depicts maize growing separately in two different fields.



MACMILLAN Primary Science 8 (p.23)

- i. Which of the crops is growing properly, A or B? ( **A** )
- ii. Write your reasoning for your answer in **i. above**. ( **B's plants are short, the stems are thin, and the leaves are withering** )
- iii. In what ways are crops not bred properly an inconvenience to us? ( **Harvest yields, quality, and prices at market all lower** )

## 2<sup>nd</sup> Final Unit Evaluation Test

\*Done at Unit End

Class: \_\_\_\_\_ Name: \_\_\_\_\_

- 1. Plants adapt to live in their growing environments.
  - i. Explain the meaning of the word *adapt*. ( **When the plant's body is made to fit its environment, or its growth adjusts to its environment** )
  - ii. Explain what body features the cactus has adapted to its environment, the desert. ( **The leaves have turned into needles to reduce transpiration, and the stem is thick to allow storage of water** )
- 2. When crops are infected with a disease, changes can be seen in the leaves and stem.
  - i. Give what changes can be seen in the following parts of infected crops.
    - Leaves: ( **Wither and curl** )
    - Stems: ( **Get black and brown spots, get deformed, and look weak overall** )
    - Roots: ( **Change colour and weaken, with some portions rotting** )
  - ii. Crop diseases can greatly affect a harvest. Write down what kind of effects you can expect. ( **Harvest yields decrease quality falls, making market prices fall** )
- 3. If the natural environment is not taken care of, it can also have various negative effects on food production.
  - i. Which of the following are considered hindrances to food production? ( **A, C** )
    - A. Large-scale deforestation
    - B. Field development along contour lines
    - C. Large-scale spreading of pesticides
    - D. Moderate use of chemical fertilisers
    - E. Maintaining agricultural irrigation
  - ii. What kinds of adverse effects does overuse of pesticides have? Explain. ( **It will kill insects and birds that help in pollination. It can have adverse effects on people eating harvested crops with pesticides still on them.** )

### Student Questionnaires

#### 1. What kinds of studying have you done in the past for the above test problems?

- 0. None at all                      This was done 10% of the time for all problems.
- 1. No                                      This was done 30% of the time for all problems.
- 2. Average                              This was done 50% of the time for all problems.
- 3. Yes                                      This was done 70% of the time for all problems.
- 4. Absolutely yes                      This was done over 90% of the time for all problems.

#### Answering Questions using Pictures and Diagrams in the Textbook or Illustrations Drawn on the

##### Blackboard

- 1. The Students answered the questions by walking up to the board and drawing diagrams or writing words.                                      0. 1. 2. 3. 4.
- 2. The teacher asked and answered the questions by drawing diagrams or writing words on the board.                                      0. 1. 2. 3. 4.
- 3. Questions were answered using pictures and diagrams in the textbook.                                      0. 1. 2. 3. 4.

##### Experiments

- 1. Did the students conduct any experiments or observations?                                      0. 1. 2. 3. 4.
- 2. The teacher conducted the experiments.                                      0. 1. 2. 3. 4.
- 3. The students conducted the experiments by following the teacher's instructions.                                      0. 1. 2. 3. 4.

##### Discussion and Thinking

- 4. We talked with friends in the class and thought about the problems.                                      0. 1. 2. 3. 4.
- 5. We thought about the problems carefully with friends and stated our ideas logically.                                      0. 1. 2. 3. 4.

- 6. We thought about the problems carefully when coming up with a hypothesis and after the experiment.                                      0. 1. 2. 3. 4.

##### Understanding Ideas

- 7. I was able to understand new ideas.                                      0. 1. 2. 3. 4.
- 8. I was able to see new viewpoint of looking at and thinking about science.                                      0. 1. 2. 3. 4.
- 9. I was able to grasp the principles hidden beneath the facts.                                      0. 1. 2. 3. 4.

##### Application of Knowledge

- 10. I was able to apply the new knowledge that I learned in school in my daily life.                                      0. 1. 2. 3. 4.
- 11. The teacher has explained that the new knowledge things the students are learning in school are connected with actual life.                                      0. 1. 2. 3. 4.
- 12. I was able to learn that the new principles and viewpoints toward science can be applied to a variety of different phenomena.                                      0. 1. 2. 3. 4.

##### Pursuing Knowledge through Problem Solving

- 13. We were first given a problem and then were to solve that problem.                                      0. 1. 2. 3. 4.
- 14. We made predictions, put then to the test, formulate scientific explanations, and put them to practical use.                                      0. 1. 2. 3. 4.
- 15. The students were asked to verify through the experiment that they had created a hypothesis as well as a plan for the observation.                                      0. 1. 2. 3. 4.

**2. When you learned each unit for the above test problems, did you become interested in the material?**

- 0. None at all
  - 1. No
  - 2. Average
  - 3. Yes
  - 4. Absolutely yes
- This was true 10% of the time for all problems.
- This was true 30% of the time for all problems.
- This was true 50% of the time for all problems.
- This was true 70% of the time for all problems.
- This was true over 90% of the time for all problems.

**Interest and Motivation**

- 1. I was very interested in science lessons.
  - 2. I became more motivated to learn.
  - 3. I was interested in what we were learning from start to finish.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

**Concentration and Involvement**

- 4. I was actively engaged in learning the topic.
  - 5. I enjoyed learning the topic so much I lost track of time.
  - 6. I was very focused on learning topic material but at the same time, I was also very excited and enjoyed myself.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

**Cooperation and Collaboration**

- 7. I enjoyed the learning process while collaborating with friends.
  - 8. I was able to learn through cooperation and mutual support with my friends.
  - 9. I shared my experiments and ideas with my friends and we all had a fun time learning together.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

**Level of Earnestness and Enjoyment during Experiments**

- 10. The experiments were very enjoyable.
  - 11. Since experiments need five senses, I carefully moved my hands and eyes when collecting the data.
  - 12. During the experiments, I recorded my observations accurately and carefully.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

**Spirit of Inquiry**

- 13. I began to have more an inquiring mind toward new discoveries.
  - 14. I became very excited and curious about challenging the unknown.
  - 15. I made a strong effort to learn what is known by trying to find examples, drawing illustrations, and through discussions and experiments.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

**Logic and Objectivity**

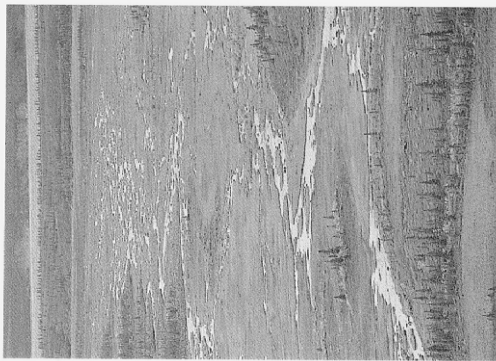
- 16. I attempted to find plenty of evidence and facts to check whether my hypothesis held true.
  - 17. I was able to confirm that the principles and concepts were true by applying them to actual life.
  - 18. The explanations were very convincing and easy to understand for the entire class. I was very satisfied with the interpretations which were logical and accorded with the truth.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.
0. 1. 2. 3. 4.

## Appendix

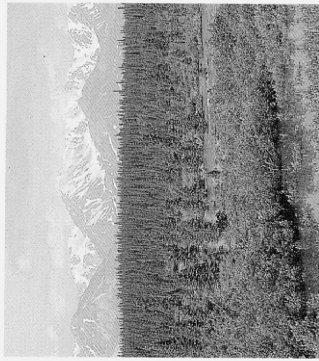
### Water and Plant Communities

Plant varieties and community makeup will vary greatly depending on the amount of precipitation.

Tokyo Shoski HS Biology IB, 1998 version (frontispiece)



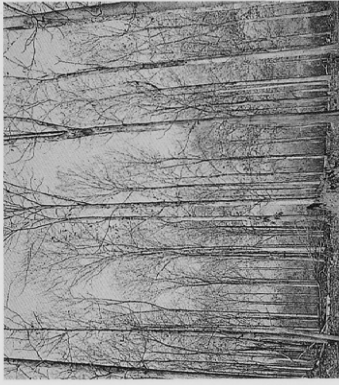
Tundra in the summer (Alaska)



Coniferous woodlands (Canada)



Tropical rainforest (Amazon)



Rain-green forest teak (Northern Thailand)



Steppes (Kenya)



Savannah (South Africa)



Desert cacti (Mexico)

### Appendix

Examples of assessment questions which are used in Kenyan text books

Some signs of unhealthy plants are listed below. Which one is **not**?

- A. A leaf with brown patches on the leaf surface.
- B. A thin tall plant with yellow leaves.
- C. A plant with curled leaves.
- D. A short looking plant with broad green leaves.

Which one of the following is **not** a possible effect of crop diseases?

- A. A farmer has low or no crop harvest.
- B. A farmer harvests poor quality.
- C. A farmer cannot sell the harvest due to poor market prices.
- D. A farmer has financial problems because crop yields are low.

A Standard 8 pupil was walking home from school and saw plants with the following features. Broad leaves, long stems, buttress roots and aerial roots. In what kind of environment do you think the pupil was walking along?

- A. Hot dry area
- B. Cold wet area
- C. Very cold area
- D. Wet area

(Oxford; Science in Action 8 P.27)

Explain the following terms:

- (a) Adaptations
- (b) Xerophytes
- (c) Hydrophytes
- (d) Succulent
- (e) Sunken stomata
- (f) Deciduous plants
- (g) Dormancy
- (h) Aquatic plants

Name three examples of plants that can withstand long periods of drought.

Name three examples of hydrophytes.

State the characteristic that protects some desert plants from being browsed by desert animals.

How do the following characteristics help desert plants to survive long periods of drought?

- (a) Losing leaves
- (b) Needle-like leaves (spines)
- (c) Folding leaves
- (d) Silvery (shiny) hairs
- (e) Thick waxy cuticle
- (f) Long roots
- (g) Sunken stomata
- (h) Stomata closure
- (i) Being succulent
- (j) Dormancy

(KLB; Primary Science Pupil's Book for Standard Eight P.44)

Describe three adaptations of plants to dry areas.

A plant had all its leaves fall at a certain time of the year. When it rained new ones started growing. Which one of the following best describes this adaptation?

- A. The leaves were succulent
- B. The plant was deciduous.
- C. The process of guttation was taking place
- D. The leaves had hydathodes

What type of plants are called succulent plants?

(JKF; Primary Science Education Foundation Science 8 P.34)

Which one of the following is a sign of an unhealthy crop?

- A. deep green colouration in the leaves.
- B. discolouration on the growing stem.
- C. widespread and deep rooted root system.
- D. large surface area of leaves that are exposed to sunlight.

(Longhom; Understanding Science, Pupil's Book 8 P.23)

Which one of the following is not a characteristic of healthy crops?

- A. They grow fast.
- B. They have a high yield.
- C. They have spots and streaks.
- D. Their shoots are strong and grow upright.

(Longhom; Understanding Science, Pupil's Book 8 P.23)



Marathon is a location in North Eastern province. Its day temperatures are an average of 35 °C with no clouds at any time. Plants growing in such a place are likely to be \_\_\_\_\_.

- (A) succulent and deciduous plants
- (B) succulent and aquatic plants
- (C) deciduous and aquatic plants
- (D) leguminous and aquatic plants

An example of a plant found in wet areas is the \_\_\_\_\_.

- (A) arrow roots
- (B) acacia
- (C) euphorbia
- (D) cactus

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.29)

## Appendix

Examples of materials which are used in Kenyan text books

Adaptations of plants that grow in dry areas

- (i) Deep and widespread root system.
- (ii) Stems that store water.
- (iii) Reduced size of leaves.
- (iv) Few and small leaves.
- (v) Shedding leaves during the dry season.
- (vi) Folding up leaves.

(Longhorn; Understanding Science, Pupil's Book 8 P.17)

Long roots

**1. Long roots:** These can enable the plant to obtain water deep down in soil. Do you know of any such plant?

The cactus and the kei apple below are examples of plants with long roots



(JKF; Primary Science Education Foundation Science 8 P.30)

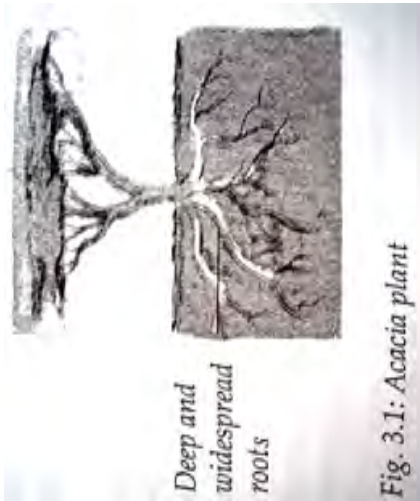


Fig. 3.1: Acacia plant

(Longhorn; Understanding Science, Pupil's Book 8 P.17)

Stems that can store water

□



Fig. 3.2: Cactus

(Longhorn; Understanding Science, Pupil's Book 8 P.18)

### Reduced leaves

#### Adaptations of plants in dry areas

The following are the adaptations of plants found in dry areas.

(a) They have **small leaves** that help them to prevent loss of water through the leaves. Plants lose water through the leaves by a process called **transpiration**. The small leaves reduce the surface area from which water is lost. There are plants which have **few stomata** (small openings on the leaves), or have their stomata open only at night when it is not hot. This reduces the rate of transpiration. Some plants have their leaves reduced to **thorns**. The thorns in these plants are also a form of protection or defence against animals that may want to eat them.



(Oxford; Science in Action 8 P.18)

Leaves may be reduced to become needle-like or thorns. This also helps the plant to lose less water.

The pine, cactus and acacia have such leaves.



(JKF; Primary Science Education Foundation Science 8 P.30)



(JKF; Primary Science Education Foundation Science 8 P.31)



Plants like the casuarina have narrow and thin leaves which reduce loss of water.



(Longhorn; Understanding Science, Pupil's Book 8 P.18)

Shedding leaves during the dry season

There are plants that shed their leaves during the dry season to reduce the loss of water. Fresh leaves grow when the rains begin. Examples of such plants are the baobab and the thorn tree. These plants are known as **deciduous** plants.



Figure 4.2: Deciduous plants

(Oxford; Science in Action 8 P.18)



Fig. 3.4: Shedding of leaves

(Longhorn; Understanding Science, Pupil's Book 8 P.19)

Succulent stems and leaves

Many plants found in the desert such as aloe vera, cactus, sisal, candelabra and euphorbia have **fleshy (succulent) stems and leaves**. These succulent stems and leaves store water and food for use by the plants during the dry season.

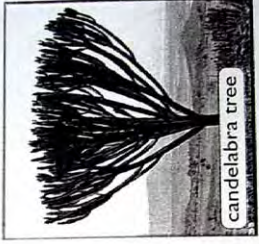


Figure 4.3: Plants with succulent stems and leaves

(Oxford; Science in Action 8 P.19)

**Root adaptations**

The roots of plants that grow in dry environments such as in deserts or semi-deserts show the following adaptations:

- They are deep to get underground water far beneath the ground, for example the eucalyptus plant.
- The root systems are large to cover a wide area underneath the soil, from which they harvest all available water, for example the roots of the eucalyptus plant.
- Some plants may develop underground tubers not only to store food, but also to store water for future use, for example the cassava.

**The stem**

The stems of plants in dry and hot environments may show the following adaptations:

- May be swollen and fleshy in order to store water, for example the cactus and euphorbia. Such stems are said to be succulent.
- The stems have no leaves. This enables them to avoid transpiration through the leaves thus reducing water loss. Instead the stems are green to ensure that they carry out photosynthesis.
- They are covered with thick waxy cuticle to reduce loss of water by transpiration.
- The stems may have thick porous barks that allow for exchange of air but reduce water loss because the bark is impermeable.

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.11)



**The leaves**

The leaves of plants in dry and hot environments may show the following adaptations:

- The plant may not have any leaves on its branches or even on its stem, for example euphorbia.
- If present the leaves may be in the form of thorns or spikes instead of ordinary leaves in order to reduce the amount of water lost through transpiration, for example the cactus tree.
- Some drought-resistant plants have small leaves that reduce the transpiration rate, for example casuarina.
- The leaves may fall off just like in the Nandi flame tree. Such plants are deciduous because they shed their leaves during the hot or dry season to reduce water loss by transpiration.
- Have a thick, waxy waterproof layer on the leaves, as seen in the sisal. The layer reduces water loss, hence helping to conserve water.
- Many of these plants also keep their stomata closed during the day to prevent too much water loss in the hot sun. They open the stomata only at night or when the weather is cool.

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.22)

Adaptations of plants growing in wet areas

Plants that are able to survive in water or very moist soils are called hydrophytes. Examples of hydrophytes are water lily, buttercup, water lettuce, duck weed and aquatic ferns. Hydrophytes may have their roots attached to the soil or freely floating in water. One great problem faced by hydrophytes is obtaining enough oxygen in water.



Fig. 3.6: Hydrophytes are able to survive in water or very moist soils

(KLB; Primary Science Pupil's Book for Standard Eight P.37)

**Adaptations of plants in water**

Plants that are found in water are adapted to their environment in different ways. The following are some of their adaptations.

- (a) Some plants that grow in water have broad leaves which help them to float on the water. These leaves are called **floating leaves**. They allow for maximum possible water loss through transpiration, since they have more stomata exposed to sunlight. Some examples of such plants are the **water lily** and the **hyacinth**.



(Oxford; Science in Action 8 P.22)

- (b) The stems, roots and lower leaves of some water plants have spongy parts that help them to float. The air spaces in the spongy parts store oxygen produced during photosynthesis.



(Oxford; Science in Action 8 P.22)

- (c) The flowers of some plants are found above the water surface so that pollination can take.



Figure 4.11: Mangrove trees

- (d) Some plants such as the **mangrove** have roots that help them to anchor in the ground. These are called **prop roots**. Some roots appear above the ground so that they can enable the plant to breathe. These are called **breathing roots**.

- (e) Some seaweeds have leaves modified into thread-like straws to increase the surface area for absorption of sunlight.

(Oxford; Science in Action 8 P.22)



Water plants or aquatic plants have the following adaptations.

**Roots**

The roots of plants in wet environments may show the following adaptations:

- Some have no roots or the roots are not fully developed. The plant called bladder-wort for example does not have roots.
- Where the roots are present in aquatic plants, they are used for holding the plants in one place so that the plants are not moved about by waves. Water lilies have roots for anchoring the plants in the mud but not for absorbing water. Water lettuce has roots hanging loosely in the water. Water hyacinth have roots that are intertwined to hold them together like a mat on top of the water.

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.23)

**Leaves**

The leaves of plants in wet environments may show the following adaptations:

- The leaves of water plants are large and broad to help them float on water. Some leaves like those of the arrow root are broad in order to lose excess water by transpiration.
- The leaves of water plants have stomata on the upper side since the lower side is in contact with the water. Having stomata on the upper side enables them to lose excess water by transpiration.
- Some plants have leaves that absorb water.

**Stems**

The stems of plants in wet environments may show the following adaptations:

- The stems of water plants are flexible to allow them to sway with the waves
- Water plants such as water lily and water hyacinth have very long stems that raise the leaves out of water.
- The leafy stems of water hyacinth are spongy to hold air, which makes the plant float on water rather than sink.

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.24)

Plants that grow in poor soils



(Oxford; Science in Action 8 P.23)

Crops that grow under normal soil and water conditions

Find out whether there are plants growing within your locality that survive in water or in very wet soils. You are likely to find such plants growing in water sources or along river banks. How are these plants adapted to survive in wet areas?

Another group of plants are mesophytes. These are the crops that grow under normal soil and water conditions. These include plants such as maize, beans, potatoes, bananas and many other plants you see growing in your local environment. They require an average amount of water:



(KLB; Primary Science Pupil's Book for Standard Eight P.38)

Signs of unhealthy crops

▶ **Signs of unhealthy crops**

Plants need water and nutrients to be healthy and productive. They obtain these nutrients from the soil. If the soil is lacking in one or more nutrients, the plants growing in it become unhealthy and weak. The signs of unhealthy plants include:

- (a) leaves turning yellow or brown and dropping prematurely.
- (b) apexes and margins of the leaves turning brown, then the leaves withering and dying.
- (c) edges of the leaves having small brown-yellow spots.
- (d) curling up or rolling up of the leaves.

(Oxford; Science in Action 8 P.24)

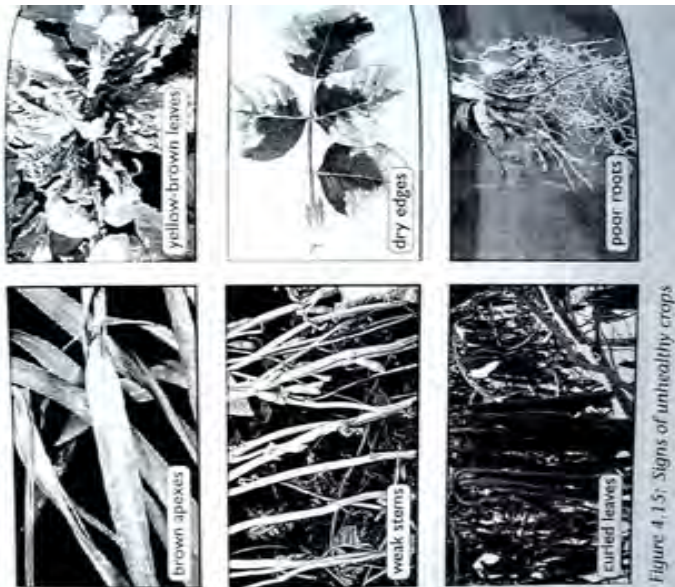


Figure 4.15: Signs of unhealthy crops

(Oxford; Science in Action 8 P.24)



Fig. 3.10: Maize plant wilting

(Longhom; Understanding Science, Pupil's Book 8 P.22)



Fig. 3.11: Spots

(Longhom; Understanding Science, Pupil's Book 8 P.22)

Curled leaves are a sign of unhealthy crops.

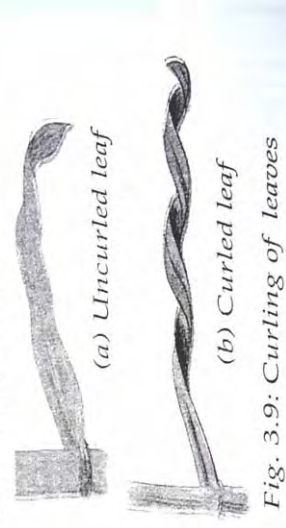


Fig. 3.9: Curling of leaves

(Longhom; Understanding Science, Pupil's Book 8 P.22)



Which crops do you consider healthy? Which ones do you consider unhealthy? Write your reasons in your exercise book. Compare your observations with the characteristic of healthy and unhealthy crops shown in Table 3.1.

Table 3.1: Characteristics of healthy and unhealthy crops

Characteristics of healthy crops	Characteristics of unhealthy crops
Plants have leaves with dark green colour	Plants leaves may be discoloured from green to purple or yellow
Plants grow to normal healthy size	Plants are not their normal size, we say they have stunted growth
The leaves are flat, broad and fleshy or succulent	The leaves may fold at the edges. This is called <b>curling</b> . They may also become brittle and hard
The leaves are uniformly dark green all over	Plants leaves may be green but with spots or lines of other colours, such as yellow. Such lines are called <b>streaks</b>
The whole plant looks healthy and well spread out	The whole plant may look weak. The plant may droop even if enough water is provided

(Macmillan; Macmillan Primary Science, Pupil's book 8 P.25)

### Important Terms

- Plants grow in different areas depending on how they are adapted.
- In dry areas, plants may suffer water shortage. However, some plants are able to withstand the dry weather condition by conserving the little water that may be available.
- Plants that are able to survive in dry areas are called **xerophytes**. An example of a xerophyte is **cactus**.
- Other examples of plants that are able to withstand long periods of drought include acacia, euphorbia, baobab tree, sisal, marram grass, prickly pear and desert shrubs.
- The survival mechanisms that make plants survive in their habitats are called **adaptations**.
- Some adaptations of xerophytes include shedding of leaves, reduced size of leaf, folding of leaves, leaves covered with shiny hairs, thick waxy cuticle, succulency (ability to store water in tissues), stomatal closure, reduced number of stomata, sunken stomata and long deep roots.
- Plants that are able to survive in water or very moist soils are called hydrophytes.
- Some adaptations of hydrophytes include thin cuticle, increased number of stomata on the upper surface of the leaf, flexible stems, large flat leaves with air sacs for floating, leaves with a waxy or hairy surface, small roots and floating flowers that are raised above the water surface.
- Some signs of unhealthy plants include stunted growth, discolouration of plant parts, curled leaves, wilting, spots or streaks, and distortion or malformation of plant parts.
- Crop pests and diseases lead to reduced yields and production of low quality produce.

(KLB; Primary Science Pupil's Book for Standard Eight P.43)