

15. Living in a 'Desert'

Aim	Pupils identify characteristics common to cacti and other drought-resistant plants which enable them to survive in a hot, dry desert habitat. They also observe the plot for the cacti and drought-resistant plants in the school and evaluate how well these conditions simulate a desert/dry habitat.
Recommended for	Primary 5-6
Subject Links	Science: adaptations, physical characteristics (Primary 6)
Horticultural Skills	Cacti and drought resistant plants (succulents)
Process Skills	Observing, measuring and evaluating
Equipment/Materials	Data loggers from school (with temperature and light sensors)
Duration	1-2 hour/s
Preparation	Photocopy the handouts and obtain the materials
Safety	Brief the pupils on 'Garden Nasties' (see page 4). Look out for pupils who may be allergic to pollen in the air or plant sap. Warn pupils about the spines and thorns of cacti and some drought- tolerant plants.

Procedure

1. Introduce cacti and other drought tolerant plants:
 - They are also known as 'succulents'
 - They are mainly from the plant family Euphorbiaceae. These plants are adapted to living and reproducing in deserts with little rainfall, scorching sunlight and high temperatures. They can even survive long periods of drought and in very dry places!
2. Distribute the handout and explain the activity - pupils go to the cacti plot in the school garden to identify characteristics common to cacti and/or drought-tolerant that enable them to survive in a hot, dry desert habitat.
3. They then observe soil conditions and take measurements of the physical parameters in the plot to evaluate if these plants meet suitable conditions for their growth.
4. Get the teams of pupils to present their findings to you and the class, after they have completed the activity.
5. Encourage pupils to post pictures of their cacti, your cacti plot and/or their reflections on your school blog or the NParks Gardening blog 'Young Gardeners' (http://www.nparks.gov.sg/blogs/young_gardeners/).

Debrief/Background Knowledge

Characteristics common to cacti and drought-tolerant plants (adaptations for living in a desert):

1. Swollen green stems

Their stems have taken over the function of leaves and are the main photosynthetic parts of the plants. Inside the swollen stems are special water storage cells (tissue). During the rainy season, the stems swell as water is stored while, during the dry months, the stems slowly contract as water is used up.



Activity 15



Activity 15

2. Few or no leaves, presence of thorns

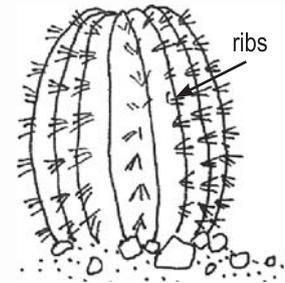
In many cacti, leaves are reduced to thorns or spines! This helps the plant to save water by lowering the rate of evaporation (which is highest through leaves). Cacti with thorns have an extra protection against plant eaters (herbivores).

3. Waxy surface of stems and leaves

There is a waxy cuticle coating on the upper-most layer of cells. This helps reduce water loss through evaporation.

4. Ribs or tubercles (areoles)

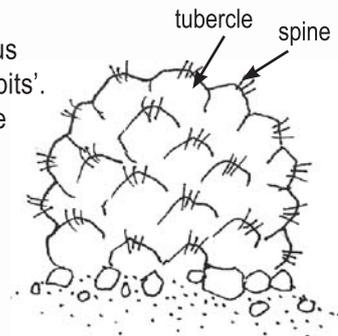
Some cacti stems have 'lumps' of cacti tissue called tubercles where the spines grow from. Other cacti have ribs. These features allow the stem section to swell or shrink without damaging the tissue on the surface.



Features which may not be apparent:

5. Shallow, extensive roots – these quickly soak up water after a shower of rain. Some cacti have additional deep penetrating roots to reach ground water

6. Sunken stomata – if you cut a cross section of a cactus stem, you can see that the stomata are found in small 'pits'. These are called 'sunken stomata' and they help reduce further loss of water.



Are the conditions at the plot suitable for the cacti and drought-resistant plants in your school garden?

• Location of light levels at your cacti plot

A cacti plot should be located in an area where it receives the maximum of sunlight (i.e. not shaded by a building or tree). Hence the light levels you should be recording on a sunny day should be at least 1000 lux and above.

• Substrate

Soil should be sandy or rocky (not loamy or clay-based). This allows ample drainage. Cacti plants are prone to rotting if the soil around them collects water and becomes water-logged. A raised cacti bed also increases drainage.

• Temperature

Temperature is linked to the amount of sunlight the plot receives. This reading is usually 1-2° Celsius higher than that in a shaded area.

• Water

Cacti need very little watering.

§ Ask pupils to evaluate if the school's cacti and drought-tolerant plants are in an area that meets these conditions. If they are not, ask pupils how the conditions for these plants can be improved. Encourage them to be actively involved in caring for the cacti and drought-tolerant plants.

§ Ask pupils what they have learnt through this activity. Alternatively, you could ask them to fill in the reflection sheet in Annex 3 and discuss their reflections.





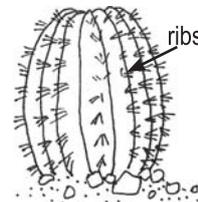
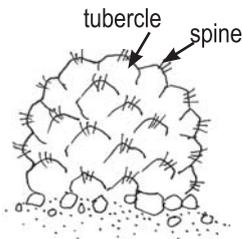
Name :

Members of your team :

15. Living in a 'Desert'

Go to the cacti plot or plot with drought resistant plants.

Observe the plants and record the common characteristics of cacti and drought-tolerant plants (adaptations for living in a desert):



1	
2	
3	
4	
5	

Observe and record the following physical characteristics.

Location of the cacti plot:

Physical Characteristics	Reading/Observation
Substrate Describe the type of soil in the plot	
Temperature <ul style="list-style-type: none"> Record the temperature and Time of day: Is this temperature reflective of a tropical climate or the conditions in a desert? 	
Light levels <ul style="list-style-type: none"> Record the light level and weather condition (e.g. sunny, cloudy etc.) Is this amount of light reflective of the conditions in a desert? 	
Watering <ul style="list-style-type: none"> How much water do cacti and drought-resistant plants need? Are they being over-watered? 	

- Are the conditions at the plot suitable for the cacti and drought resistant plants in your school garden?