

Sample Lab Report 1 - Botany Lab (Score 100/100 in IB Biology HL 2)

11/29/2009

1B

Botany Lab

Title:

Adaptation of plants

Purpose:

To compare the adaptations of plants have acquired which makes them better able to survive in their environments. And compare plants within the same environment to see their similarities/differences. Create a dichotomous key and compare my taxonomy result with the taxonomic scheme on internet (www.itis.gov)

Materials:

#2 pencil, clipboard, 12-15 x A4 blank papers, digital camera

Internet: www.itis.gov

www.wikipedia.com

Hypothesis:

The phenotype, or the appearance of the plants, including the color, shape and quantity of leave, stem, flower and root, will be influenced by the environment in which plant is living. Plants within the same environment will have more similarities than with plants in another environment. The way I divide the plants is largely based on their appearance in detail, such as color of the leave but the taxonomic scheme on official website will be based on basic characteristics such as flowering or non-flowering, or dicots or monocots.

Variables:

Independent variable: Environment of the plant

Dependent variable: Phenotype of the plant

Controlled variable: Temperature (same location)

Procedure: see handout attached**Data: see handouts attached****Result:****Comparison of adaptations: chart attached****Comparison of plants in two different locations:**

- **Plants in Desert Garden (Desert Ecosystem):** Plants in the desert ecosystem get long period of sunlight everyday and the temperature is high. The soil where plants live is dry due to water shortage. Plants have smaller leaves and they grow closely to the ground. Their leaves have wax for protection from dehydration and white hair on some plants also help to reduce the evaporation of water on leaves' surface and reflect sunlight. Leafless plants carry out photosynthesis at their green stem (cactus). Plants like cactus and Ponytail Palm has a cone shaped thick stem to store water. Those characteristics help plants in extreme environment to survive. Plants living in desert ecosystem usually have brown colored stem. The top of the stem is smooth and the end of the stem is rough. It means the water is stored at the top of the stem to supply leaves. The root should be long enough to reach the wet are underground but it couldn't be proved as we couldn't hurt the plants. Most plants are short as they grow slowly and require less energy. They don't make too much food thus they do not lose too much water.

- **Plants in Palm Canyon (Rainforest Ecosystem):** The environment is hot with excess rainfall. The abundance of water can feed plant but can also cause flooding and soil erosion. Plants in rainforest ecosystem grow rapidly and they use up organic material from decomposing animals and plants quickly. This causes the poor quality of soil. The soil is usually wet. The plants have many broad, thick leaves which prevent sunlight from getting in the forest. Some plants (tallest plants) are under sunlight for long period of time and some don't get any sunlight which makes the great amount of diversity in rainforest. Most plants' leave have a drip tips

where the rain can flow to the ground, it is important because excess water can be harmful. Some leaves are covered with wax to be water proof. That's why the leaves and stem of plants in rainforest ecosystem are tending to be smooth. Fibrous root of plants can stabilize the plant in wet, loose soil. Veins around the plant grow upward trying to get sunlight.

Plants within Desert Garden:

- Golden Barrel Cactus and Wolly Cactus have needles instead of leaves. The photosynthesis reaction thus can only happen on the stem. Stem of the cactus is usually green and thick which indicates the location of water storage. Aloe Cameroni and Aloe Bainesii have thick, hard leaves with small needles on them. The water storage and photosynthesis happen on their leaves. Their stems have brownish color. Top of the stem is smooth and the end of the stem is rough. Smooth part of the stem is covered by a wax layer which protects the surface of the plant from losing water. Ponytail Palm has a cone shaped stem attached to the ground. The water storage is at the end of the stem. These plants don't have too many leaves and none of them is tall.

Plants within Palm Canyon:

- Banana tree is the shortest plant. It has fruit but doesn't have too many leaves. Banana tree grows itself without being surrounded by too many plants which makes it unique. This is due to the large amount of water banana needs for its fruit. Elephant's ear is the only plant which has branched vein on its leaves. Its leaves are not long, compared to other plants, but are broad. Its leaves are not completely smooth, indicating it has the worst water proof system. Fan Palm is the highest plant which gets some amount of sunlight. Its leaves are the thinnest and also lack of wax.

Taxonomic scheme on www.itis.gov:

Aloe Cameroni:

Kingdom Plantae -- Planta

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants,

Class Liliopsida -- monocotyledons

Subclass Liliidae

Order Liliales

Family Aloeaceae

Genus Aloe L. – aloe

Aloe Bainesii:

Kingdom Plantae -- Planta

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants,

Class Liliopsida -- monocotyledons

Subclass Liliidae

Order Liliales

Family Aloeaceae

Genus Aloe L. – aloe

Ponytail Palm:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Liliopsida -- monocotyledons

Subclass Arecidae

Order Arecales

Family Arecaceae

Genus Acoelorrhaphe H. Wendl. – palm

Golden Barrel Cactus:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Magnoliopsida -- dicots

Subclass Caryophyllidae

Order Caryophyllales

Family Cactaceae -- cactus

Genus Echinocactus Link & Otto -- barrel cactus

Wolly Cactus:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Magnoliopsida -- dicots

Subclass Caryophyllidae

Order Caryophyllales

Family Cactaceae -- cactus

Genus Mammillaria Haw. -- fishhook cactus, globe cactus, pincushion cactus

Species Mammillaria nivosa Link ex N.E. Pfeiffer -- woolly nipple cactus

Banana:

Kingdom Plantae -- Planta

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Liliopsida -- monocotyledons

Subclass Zingiberidae

Order Zingiberales

Family Musaceae

Genus Musa L. – banana

Fan Palm:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Liliopsida -- monocotyledons

Subclass Arecidae

Order Arecales

Family Arecaceae

Genus Chamaerops L. -- fan palm

Clivia:

Kingdom: Plantae

(unranked): Angiosperms

(unranked): Monocots

Order: Asparagales

Family: Amaryllidaceae

Tribe: Haemantheae

Subtribe: Cliviinae

Genus: Clivia

Elephant's ear:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta -- flowering plants

Class Liliopsida -- monocotyledons

Subclass Arecidae

Order Arales

Family Araceae

Genus Xanthosoma Schott -- elephant's ear

Philoden:

Kingdom Plantae -- Plantae

Subkingdom Tracheobionta -- vascular plants

Division Magnoliophyta --flowering plantsplantes

Class Liliopsida -- monocotyledons

Subclass Arecidae

Order Arales

Family Araceae

Genus Philodendron Schott – philodendron

Conclusion:

The data supports my hypothesis. The phenotype is largely influenced by the environment in which plants are living. Plants in the same environment have more similarities to each other because they need to adapt to the harsh environment. My dichotomous classification key divided the plants based on their difference in appearance but they are not significant. The www.itis.gov website divided the plants based on the basic characteristics which can truly distinguish plants.

Evaluation and improving the future investigation:

The data processing was hard because of the plants I chose in the desert garden were not diverse. Among 5 plants I had two cacti and two aloes. It made the evaluation of adaptation of plant to the harsh environment difficult due to lack of data. For future investigation, I recommend choosing plants which don't belong to the same order. The dichotomous classification key is too shallow. It didn't divide plants based on the phenotype characterized by each group. If there are more plants with same leave color, but with different vein patter, this type of classification (my dichotomous classification key) would provide wrong information. The dichotomous classification key should be made based on characteristics based on the structure of the plant.