

Teacher packs in Experimental Science

Bio Pack 6

Pollination in flowering plants

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Curriculum areas covered:

Year 1 Semester 1 Unit 4.2 of the science curriculum for designated Science and Mathematics Colleges of Education, Ghana.

Title: Pollination in flowering plants

Target group: Diploma in Science Education students

Also suitable for: Senior high school students

Learning outcomes:

These are the learning outcomes expected after students have gone through this Pack

1. Knowledge and understanding

KN1 Define Pollination.

KN2 Explain how an agent brings about the transfer of the male gamete on to the stigma

KN3 Describe how flowers are adapted to attract pollinating agents.

2. Cognitive skills

CS1 define / describe pollination

CS2 list features of flowers that attract pollinating agents

CS3 Distinguish between self and cross pollination

CS4 Distinguish flowers pollinated by animal agents from those pollinated by wind.

CS5 describe the features of flowers that promote pollination

CS6 describe the importance of pollination to plants

3. Key Skills

KS1 Observing

KS2 Recording

KS3 Interpreting

4. Practical skills

PS1 follow and observe the activities of pollinating agents

PS2 make an annotated drawing of a flower showing the features that attract pollinating agents

A. Teacher's Guide

Purpose: This pack is to help students investigate pollination, using flowers of *Luffa* species

Sample Assessment Questions

Define pollination.

(Answer: pollination is the transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower of the same species).

How does self-pollination differ from cross-pollination?

(Answer: self pollination is the transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower on the same plant while cross pollination is the transfer of pollen grains from the anther of a flower to the stigma of another flower on another plant of the same species)

What is the biological importance of pollination to flowering plants?

(Answer: pollination is an essential stage in sexual reproduction which ensures continuity of species of flowering plants)

How do man and animals benefit from pollination?

(Answer: pollination benefits society by increasing food security and improving livelihoods and by the role they play in conserving biological diversity in agricultural and natural ecosystems)

What brought about the difference between the bagged (fig 1b) and unbagged (fig 1c) flowers?

(Answer: unbagged flower developed to a fruit because it received pollen from floral visitors (fig 1a) while bagged flower died because it did not receive any pollen)

Notes

Inform students to identify places near the school where luffa or suitable plants can be found and used for the experiment

Caution students to observe the pollinators' visitation at a distance

Students should remember to tag the flowers with either a thread or anything that would help to identify the flowers later.

B. Student Guide

Purpose: This pack is to investigate pollination, using flowers of *Luffa* species or other suitable alternatives.

Background Information

Pollination is an essential stage in sexual reproduction of flowering plants, whereby pollen is transferred from its site of production to the stigma. This leads to the production of new seeds that germinate and grow into new plants. Flowers have male parts called stamens that produce the powdery substances called pollen. Flowers also have a female part called the pistil. At the tip of the pistil is the stigma, which is often sticky. Seeds are made at the base of the pistil, in the ovule.

For pollination to occur, pollen must be transferred from a stamen to the stigma. When pollen from the stamen of a flower is transferred to the stigma of the same flower, it is called self-pollination. When the pollen from the stamen is transferred to a stigma of a different flower, it is called cross-pollination. Cross-pollination produces vigorous plants. The plants must be of the same species.

Pollination occurs in several ways. Usually plants rely on animals or the wind for pollination. Animals such as bees, butterflies, moths, flies, and hummingbirds in their bid to feed, end up pollinating flowers. When feeding, the animals accidentally rub against the stamens and get pollen stuck on their bodies. When they move to another flower to feed, some of the pollen can rub off onto the stigma of this new flower. Flowers that are pollinated by animals are often brightly coloured and have a strong scent to attract the animal pollinators. Another way plants are pollinated is by the wind. The wind picks up pollen from the stamen of one flower and blows it onto the stigma of the same species.

Flowers that are pollinated by wind often have long stamens and pistils. Since they do not need to attract animal pollinators, they usually have dull colouration, they are unscented, and with small or no petals.



Fig 1. Flowers of *Luffa* sp.: female (top left); male (top right); Female bagged with 1mm² nylon mesh (bottom)

a.



b.



c.



Fig 1: An insect visiting a luffa flower (a); un-bagged luffa flower after 2 weeks (b); bagged flower after 1 week (c).

Equipment/ Materials

- Flowers of *Luffa* species
- Nylon bag of mesh size 1mm² (5)
- Ribbon tags (5)
- Hand lens (optional)

Other requirements

A sketch book, Notebook, Pens and pencils for drawing and notes taking, Eraser

Experimental Procedure

- Critically examine flowers of *Luffa*
- Observe the features of male and female flowers
- Draw and label a male and female flower
- Bag 5 female buds which are ready to open with nylon bag of mesh size 1mm² (Fig 1).
- Tag another 5 female buds which are of the same age; leave them uncovered.
- Observe the insects that visit the tagged flowers when they open
- What happened to the bagged and tagged flowers after one week?
- Prepare a table and record your observation.

Reflection on the experiment

Take some time to reflect on the activity carried out. Ensure that you have understood the procedure followed. If clarification is needed, discuss it with your teacher or colleagues.

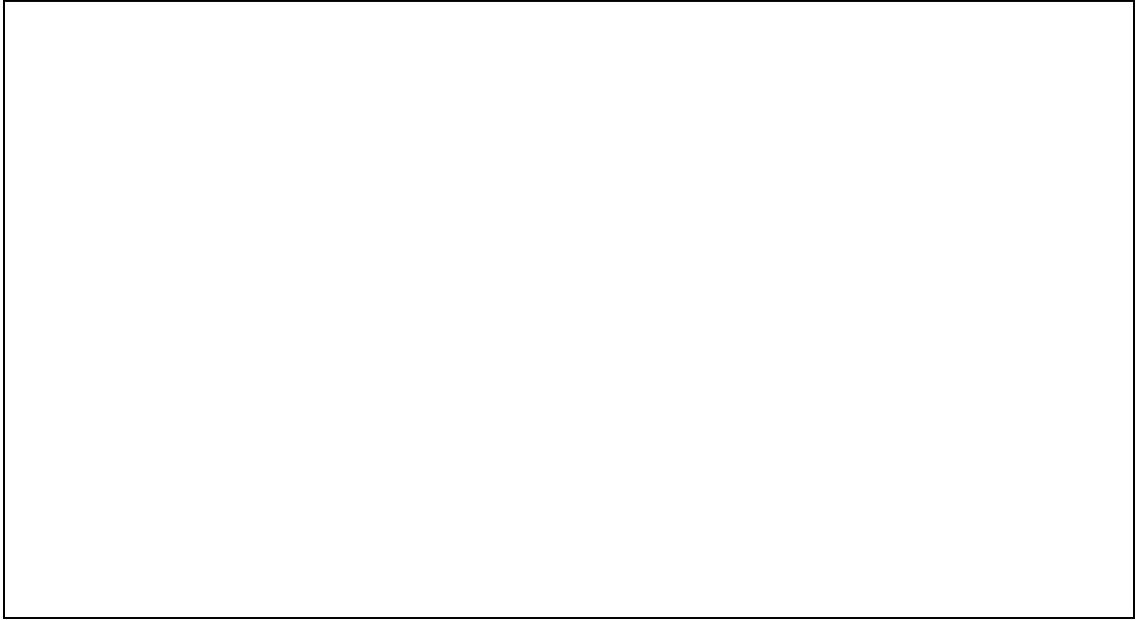
Do you think this activity could be done in a different way? Give reasons for your answer.

C. Assessment – Student’s sheet

On completion of the experiment, you should be able to answer the following questions:

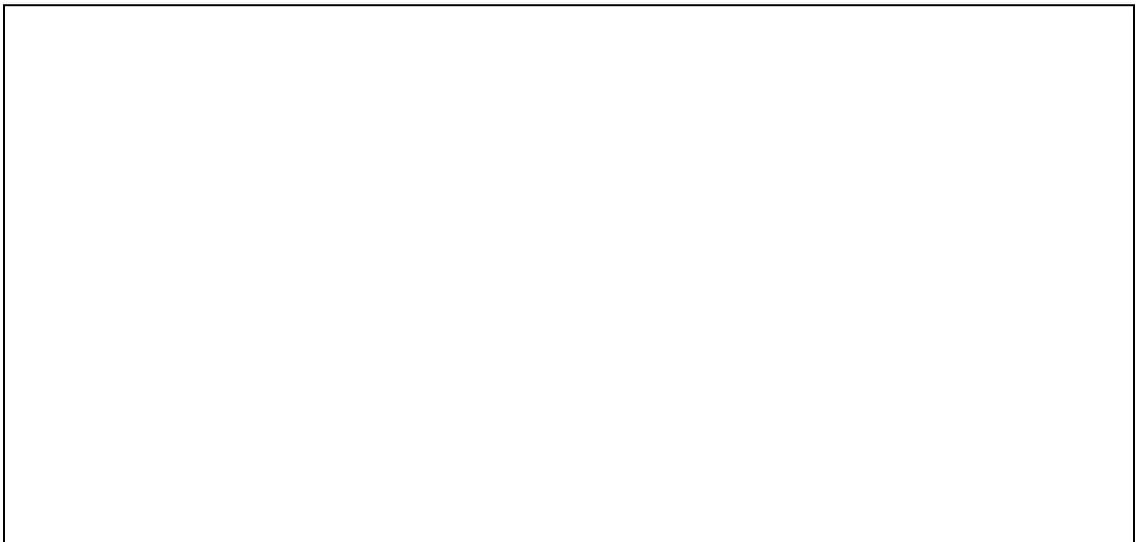
1. Define pollination

(KN1)

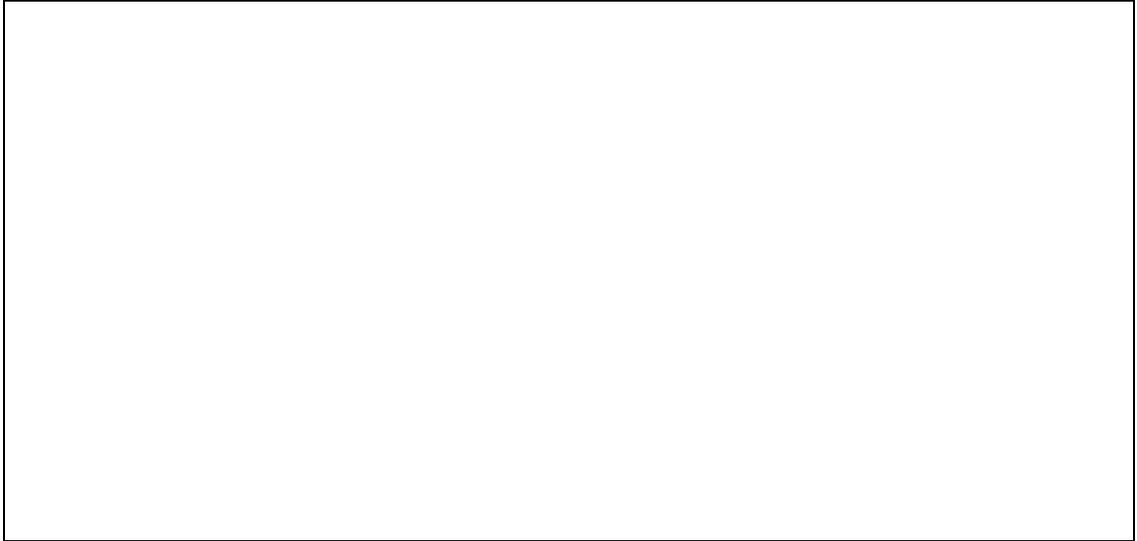


2. How does self-pollination differ from cross-pollination?

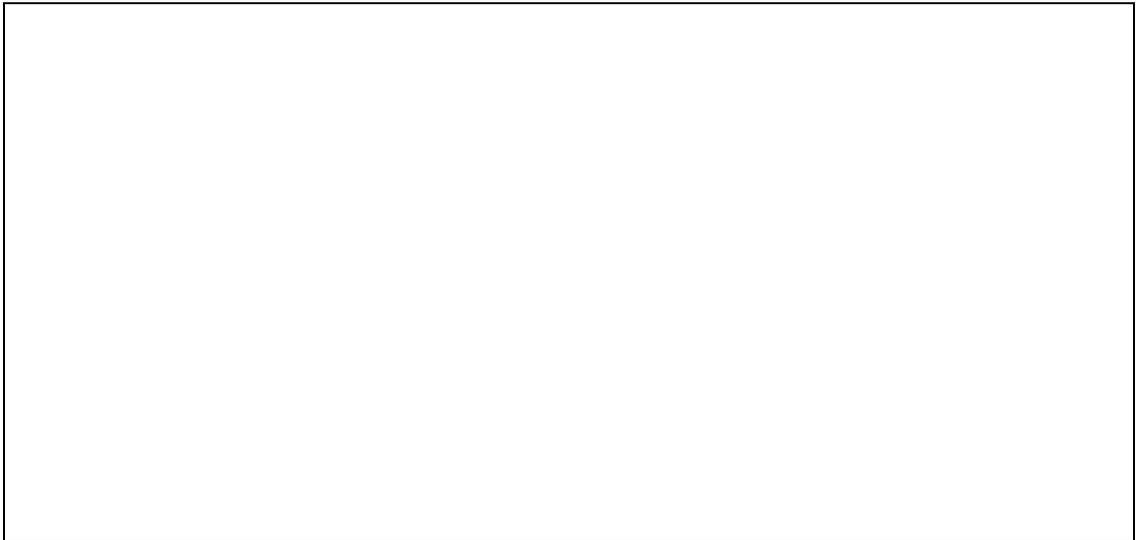
(CS3)



3. What is the biological importance of pollination to flowering plants? (CS6)



4. Make annotated drawing to show the adaptive features for pollination (CS5)



D. Extensions to experiment

- Examining flower structure
- The formation of fruit

E. Useful links

Mensah, B.A. & Kudom, A.A. 2010. Relating bee activity to pollination of *Luffa aegyptiaca* Mill. in Ghana. *Journal of Apicultural Research and Bee World* **42(2)**:192-196.

F. Health and Safety

- Wear nose mask to prevent inhalation of pollen
- Wash hands with soap after experiment

G. Evaluation

- Were the learning outcomes achieved?
- How did you like the pack?