

REPRODUCTION IN PLANTS

In the chapter 'Seeds and their germination' in Class 6, you learned how a plant develops from a seed. But is it true that all plants germinate from seeds?

How do the following plants grow? Discuss with your classmates and write your answer in your exercise book:

mango, potato, banana, tamarind, rose, wheat, rice, besharam, watermelon, doob and radish. (1)

The process by which plants and animals produce young ones and increase their numbers is known as **reproduction**.

As we saw earlier, different plants reproduce in different ways. Some trees and plants sprout from seeds.

Name 10 plants that sprout from seeds. (2)

Some plants do not sprout from seeds but develop in other ways.

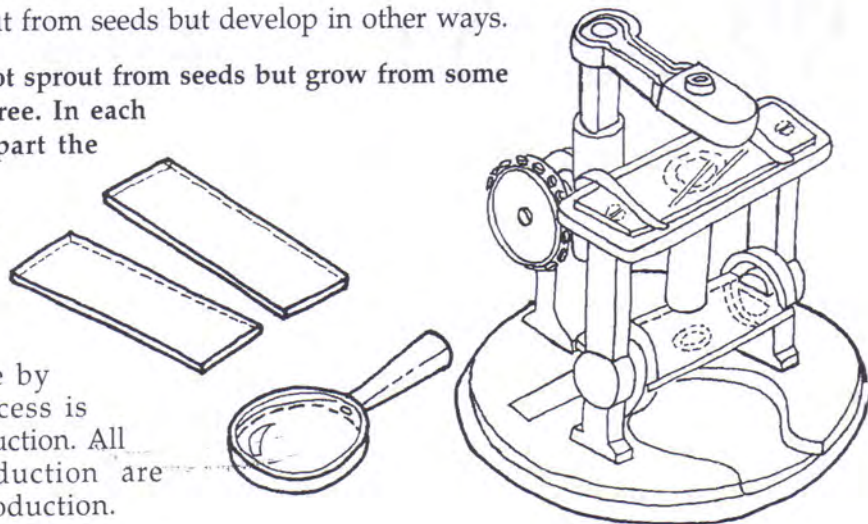
Name 10 plants that do not sprout from seeds but grow from some other part of a plant or tree. In each case, write from which part the new plant develops. (3)

Can you name some plants that develop from seeds as well as in other ways? (4)

When plants reproduce by forming seeds the process is known as **sexual** reproduction. All other ways of reproduction are known as **asexual** reproduction.

Sexual reproduction

The formation of a seed is essential for sexual reproduction. You studied seeds in Class 6. You know that they are found inside the fruit. We shall now try and understand how fruits are produced.



On the basis of your previous experience and knowledge can you say from which part of the plant the fruit develops? (5)

Experiment 1

Comparison of the fruit and flower

In this experiment, we shall compare flowers with fruits and try to understand the relationship between them. To do this, you should first collect flowers and fruits from five different species of plants. For example, if you collect a flower from a ladyfinger (*bhindi*) plant, you must bring a fruit of the plant as well. Get two flowers and two fruits of each species.

Choose the flowers and fruits of any one species. Pluck the sepals, petals and stamen of one flower. Pluck them one by one, taking care not to damage the pistil. Finally, only the pistil remains on the thalamus. You can easily recognise the ovary, style and stigma in the pistil.

Compare the shape and structure of the ovary with the shape and structure of the fruit.

Do you see any similarity between their shape and structure? (6)

Let us first compare their internal structures. Slice the ovary of one flower horizontally and that of the second flower of the same species vertically. You learned how to make a horizontal section in the chapter 'The structure of flowers'. To help you, Figure 1 shows how this is done. The figure also shows you how to make a vertical section.

In the same way, slice one fruit vertically and the second horizontally.

Study the internal structure of the ovary and the fruit using the horizontal and vertical sections. Use a magnifying glass, if necessary.

Draw diagrams of the horizontal and vertical sections of the ovary. (7)

Show the arrangement of ovules in the ovary. (8)

Similarly, draw diagrams of the horizontal and vertical sections of the fruit, showing the arrangement of seeds in them. (9)

Slice all the remaining samples of flowers and fruits and draw diagrams of their horizontal and vertical sections. (10)

Answer the questions given below:

What similarity do you see between the ovary and fruit of the same species? (11)

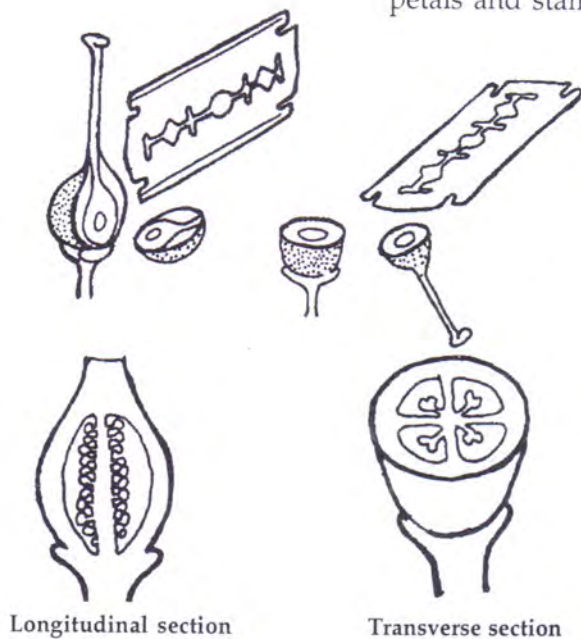


Figure 1

On the basis of the similarity you observe, would it be reasonable to conclude that the fruit develops from the ovary? (12)

From which part of the ovary do you think the seeds develop? (13)

On the basis of your comparison, can you state whether a plant can produce fruit if it bears no flowers? (14)

Before we proceed further

In the chapter "The structure of flowers" you had seen that some plants have two types of flowers. One type has sepals, petals and stamens. These are the **male flowers**. The other type has sepals, petals and a pistil. These are the **female flowers**.

Flowers which only have either the male or the female parts are known as **unisexual flowers**.

Find five plants with unisexual flowers. (15)

On the basis of your observation in Experiment 1, say which kind of flower develops into fruit. (16)

From flower to fruit

You have compared the structure of an ovary and a fruit of the same species and seen that it is reasonable to conclude that an ovary develops into a fruit while the ovules develop into seeds. How can we confirm this?

Can you suggest an experiment for the purpose? Describe your experiment. (17)

Let us accept for the moment that the fruit develops from the ovary and the seeds from the ovules.

Did you notice any difference between the horizontal sections of the ovary and fruit?

Some features are listed in Table 1. Based on these features, compare the ovary of each species of flower with the fruit of the same species. (18)

	Ovary	Fruit
Thickness of wall		
Number of chambers		
Arrangement of ovules/seeds		
Size of ovules/seeds		
Number of ovules/seeds		

Table 1

You will notice that many changes occur during the process of an ovary developing into a fruit.

Can we assume that an ovary develops into a fruit on its own? (19)

The experiment described below might help you answer this question. If possible, try doing the experiment yourself. If you cannot, then read the details of the experiment and then try answering Question 19.

Experiment 2

This experiment can be performed with any flower. But it is easier to do it with unisexual flowers. You know that flowers of the gourd (*lauki*) plant are unisexual, i.e. they are either male or female.

Interestingly, this experiment was actually performed by some school students. They first learned to identify male and female *lauki* flowers.

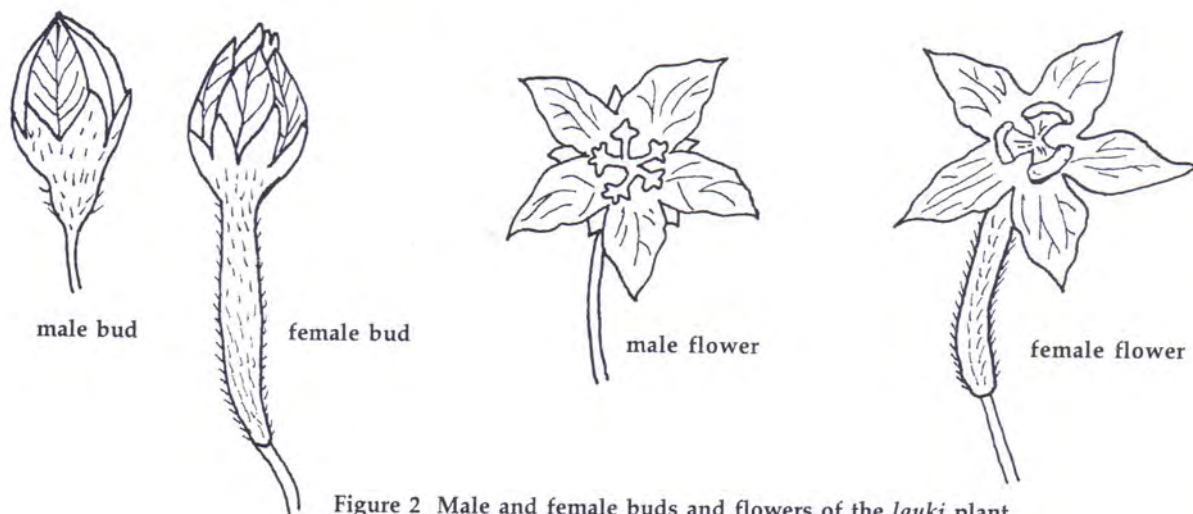


Figure 2 Male and female buds and flowers of the *lauki* plant

Can you identify the male and female *lauki* flowers after having looked at the diagrams in Figure 2. What differences do you see between them? (20)

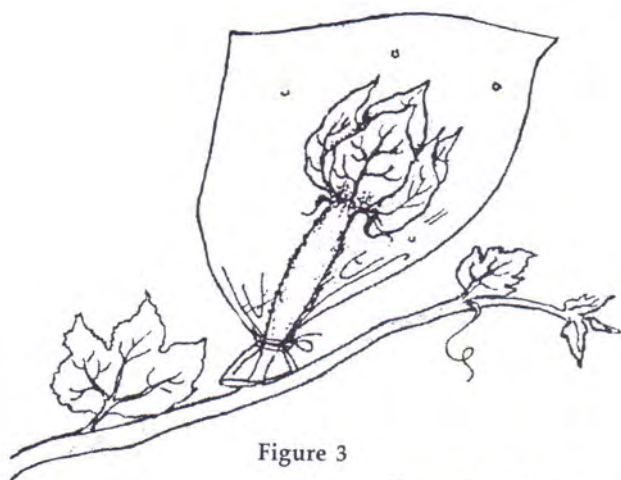


Figure 3

The students went to a garden and selected 10 female buds that they felt would bloom in a day or two. The petals of these buds were closed when the experiment began. The students covered each bud with a polythene bag, loosely tying the bag on the stalk (Figure 3). They noted the date the experiment began (August 2, 2002) on slips of paper and put a slip inside each bag. The teacher instructed them to make tiny holes in the bags with the help of a pin.

Why did the teacher ask them to make holes in the bags? (21)

Two days later, on August 4, the students observed the plants again. They found that most of the female buds they had covered with bags were blooming. Their teacher told them to collect and brush pollen grains on the stigma of five of these female flowers.

The students chose four or five male flowers to collect pollen.

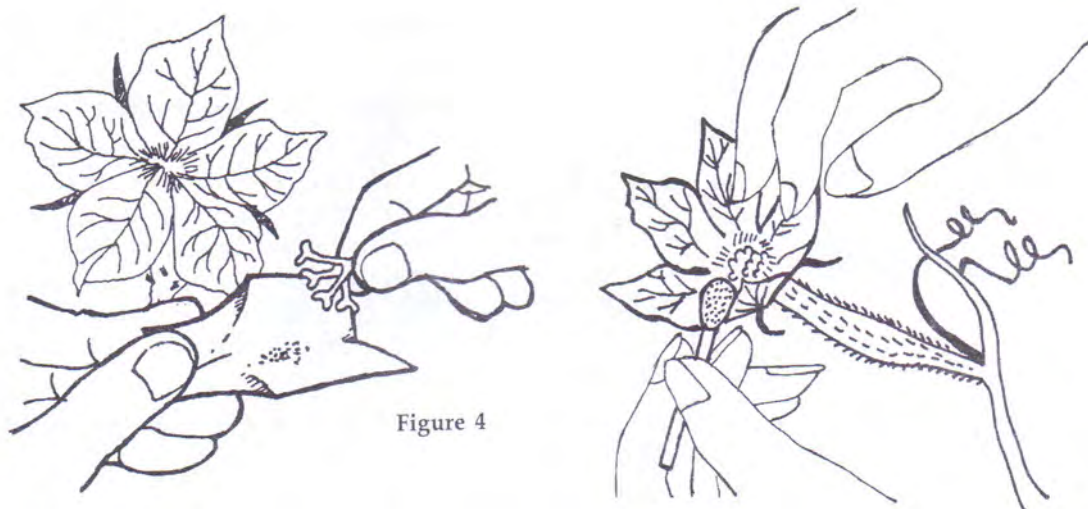


Figure 4

They plucked the stamens of these flowers and shook loose the pollen grains onto a sheet of paper. They made a brush by twisting cottonwool over the tip of a matchstick and used this brush to collect the pollen grains.

They removed the bags from five of the ten female flowers. They applied pollen to the stigma of these flowers with the brush (Figure 4). The pollen grains stuck to the stigma. They noted the date on which they had applied the pollen (August 4, 2002) on slips of paper, put a slip into each bag and covered the flowers again.

Their teacher told them that the process of pollen grains reaching the stigma is known as **pollination**. A flower that receives pollen is called a **pollinated flower**. Flowers that are not pollinated are called **unpollinated flowers**.

Did the students pollinate all the female flowers? (22)

The students returned to the garden on August 10 and checked all the 10 covered flowers. They made the following observations:

Table 2

	Number of flowers	Number that survived	Number that bore fruit
Pollinated flowers	5	4	4
Unpollinated flowers	5	5	0

Answer the following questions:

Why was it necessary to begin this experiment with buds in which the petals are closed? (23)

Why were the buds enclosed in polythene bags? (24)

Why were 4 or 5 buds selected? Couldn't the experiment have been done with a single bud? (25)

Why were the unpollinated flowers also covered with polythene bags? (26)

Which of the flowers bore fruit? Study the table before you answer. (27)

On the basis of this experiment, describe the role of male flowers in the formation of fruit. (28)

Pollination in nature

In the experiment we have just described, a brush was used to transfer pollen to the female flower. This is known as **artificial pollination**. We know that pollination is essential for a flower to develop into a fruit and for seeds to form. So how does this process take place in nature?

There are many ways in which pollen grains from the stamens reach the stigma.

When the stamens ripen, they begin to shed pollen grains. The pollen grains are light. They are carried by the wind in all directions. Some pollen grains are carried to the stigma of other flowers by the wind.

Insects and birds are other agents of pollination. You may have seen honeybees, beetles and a variety of birds hovering over flowers. They usually suck the nectar from flowers. But while doing so, pollen grains from the stamen stick to their wings, legs, stomach, etc. When they go to another flower these pollen grains are transferred to the stigma of that flower. Thus pollination takes place.

Name some flowers on which you have seen insects hovering or sitting? (29)

Do these flowers have any special features that attract insects? (30)

After pollination

Pollen grains reach the stigma by pollination. What happens to them after this? Let us perform an experiment to find out.

Experiment 3

Do this experiment with the pollen grains of *besharam* or periwinkle (*sada bahar*) flowers. Take two glass slides. Put 2 to 4 drops of water on each slide. Add 1 or 2 grains of sugar to the water on one slide.

Sprinkle a few pollen grains from the stamen of the flower you have selected in the water on both the slides. Let the slides stand for 30 minutes.

Observe both slides through a microscope. Cover the drops of water on the slides with a piece of polythene before placing them under the microscope. This will prevent the water from touching the lens.

Draw diagrams of the pollen grains placed on each of the two slides. (31)

Do you see any difference between the pollen grains on the two slides? If so, what is the difference? (32)

Pollen grains undergo the same process when placed on a stigma. There are substances present on the stigma which cause pollen grains to germinate. During germination a tube develops from the pollen grain. This tube ultimately reaches the ovary through the style.

The experiment described above can also be done with the juice of a crushed style instead of sugar grains.

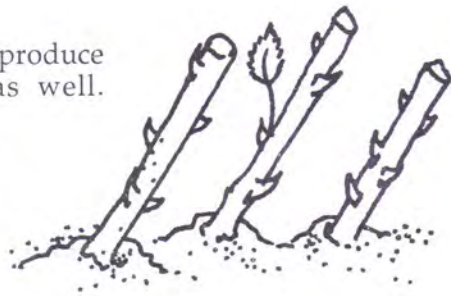
Describe in your own words what you have learnt about the process by which a flower develops into a fruit. (33)

The flowering of a plant, the formation of fruit and seed from the flower, the development of a new plant from a germinating seed – this is the life cycle of a plant. This cycle is completed through sexual reproduction.

Asexual reproduction

In the beginning of the chapter you saw that plants reproduce not only through seeds but by other processes as well. Reproduction by any process other than seed formation is known as asexual reproduction. We shall now examine the different ways in which asexual reproduction takes place in plants.

In the chapter "Getting to know leaves" in Class 6, you learned about the leaves of the bryophyllum plant (*patharchatta*, *ajoo* or *khatumara*). You may have also seen this plant.



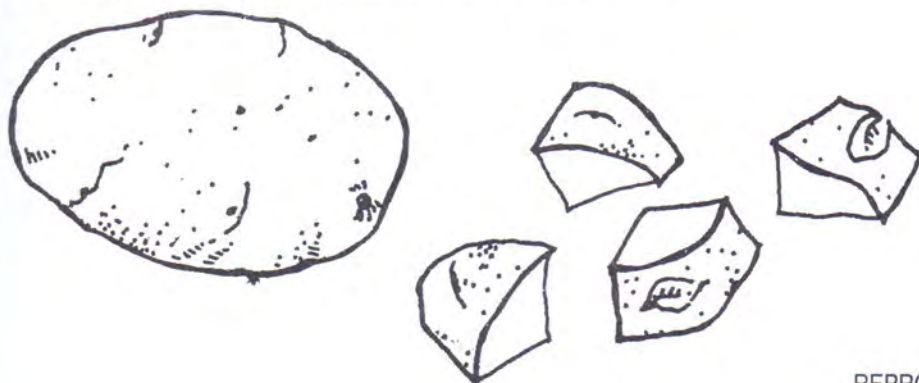
Can we say that the bryophyllum plant reproduces asexually through its leaves? (34)

Do you know any other example in which a whole new plant develops from the leaves?

How does a new plant develop from potato, sugarcane, ginger and *naagphani*? (35)

Reproduction in the potato plant

Take a potato. Look at it carefully. A new potato plant can develop from this potato. Farmers call it the potato seed.



On the basis of what you **have learnt** about the relationship between flowers, fruits and **seeds do you think** it is correct to call a potato a seed? (36)

Experiment 4

The potato has a number of **small depressions** on its surface. These are known as eyes. Cut a **potato into pieces**, making sure there is an eye in each piece. **Remove the eyes** from some of these pieces. Fill two cups or *kulhads* (earthenware cups) with soil. Plant the pieces with eyes in **one cup** and those without eyes in the other. Water both cups **daily** and observe what happens.

In which cup do potato plants sprout? (37)

Find out how the following plants reproduce and which part of each plant is involved: banana, sugarcane, ginger, seedless lime and grapes. (38)

Questions for revision

1. From what you have learnt in this chapter, describe in your own words the difference between sexual and asexual reproduction.
2. You may have eaten bananas. Have you ever thought about how a new banana plant develops? Find out and describe the process in your own words.

New words

Reproduction	Sexual	Asexual
Unisexual	Pollination	Artificial pollination