SEEDS AND THEIR GERMINATION

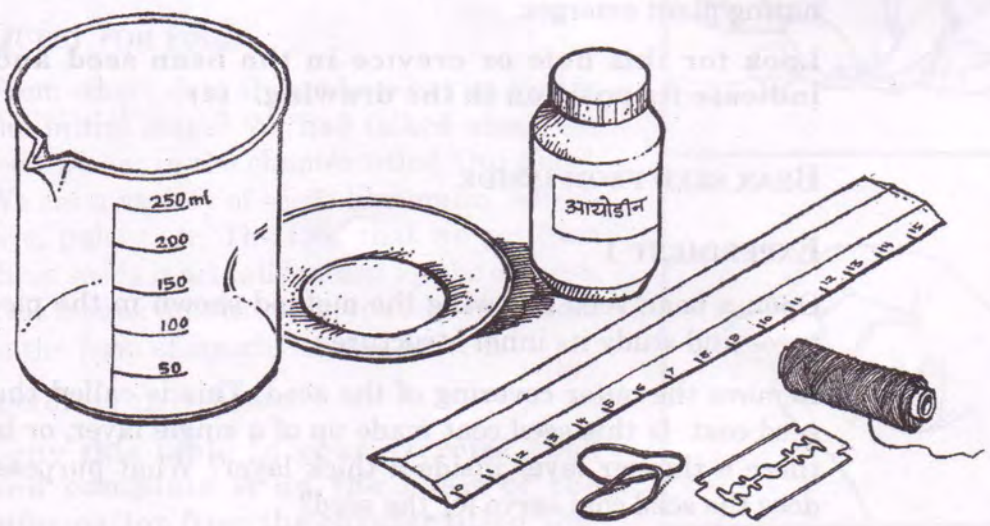
8

We use a variety of seeds every day. Have you noticed how many types of seeds are used in your food?

Make a list of seeds that you are familiar with. The list must contain the names of at least 25 seeds, for example, peanut, aniseed, cuminseed etc. (1)

Have you ever thought about the importance of seeds, apart from their use in our food? Just think what good does the seed do for the plant.

Farmers sow seeds to raise various crops such as wheat, maize, gram etc. A complete plant develops from a single seed. Does this mean that a tiny plant is hidden inside the seed. Have you ever seen this tiny plant inside the seed? Let us study seeds by examining them from the outside as well as inside.



Investigating a seed

We will look for three things in a seed.

(a) First of all, we will hunt for that part of the seed which develops into a plant.

(b) In the initial stage of development of the plant, neither the roots nor the leaves are developed fully. Where does this seedling-like plant get its food from? Is there some provision for food in the seed itself? If there is, then where is this food stored?

(c) A seed gives rise to a new plant. Thus, a plant's lineage is continued by the seed. Is there an arrangement for protecting such an important property?

Soaking the seeds

We will need to make some preparations before trying to find answers to these questions. First of all, we need to soak the seeds. Seeds swell upon soaking and it becomes easier to open them and study them from inside. Soak some maize and bean seeds one or two days before the experiment.

Bean seed from outside

Take a soaked bean seed and, first of all, observe it from outside. Use a hand lens, if necessary.

Make a drawing of this seed. (2)

Indicate in your drawing the spot at which this seed may have been attached to its pod. (3)

Every seed has a hole or a crevice through which the germinating plant emerges.

Look for this hole or crevice in the bean seed and indicate its position in the drawing. (4)

Bean seed from inside

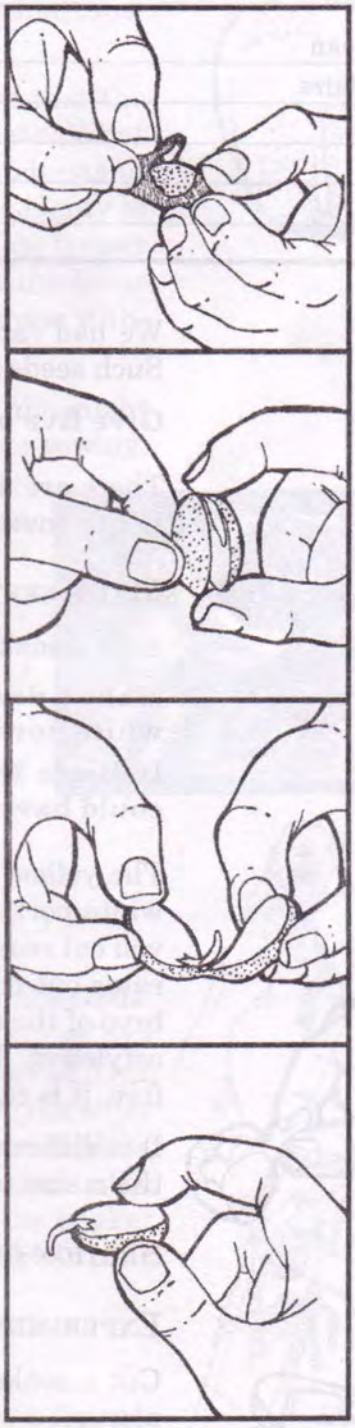
Experiment 1

Open a bean seed following the method shown in the pictures and study its inner structure :

Remove the outer covering of the seed. This is called the seed coat. Is this seed coat made up of a single layer, or is there a thinner layer inside a thick layer? What purpose does the seed coat serve for the seed?

Make a drawing of the seed after removing the seed coat. (5)

Hold the seed from which you have removed the coat and press it gently with your fingers. How many parts does the seed divide into? A bean seed is made up of two fleshy and almost identical looking halves. These two halves are the cotyledons of the seed.



Separate the cotyledons from each other and observe them with a hand lens. Do you see a special structure attached to one of the cotyledons? This is the axis.

Observe the axis and the cotyledons with a hand lens and make a drawing of them. (6)

Cotyledons are always attached to the axis. One end of the axis is leaf-like and the other end is pointed. Identify these two ends in the picture. Can you guess which end of the axis will become the root and which will develop into the shoot? The end of the axis which becomes the root is called the radicle and the other end, which gives rise to stem, leaves etc is called the plumule.

Label the radicle and plumule in your drawing of the seed. (7)

The axis and the cotyledons are together called the embryo.

QUEST FOR FOOD

From where does the embryo get its food in the initial stage? We had talked about the food we eat in the chapter titled 'Our Food'. We eat a variety of seeds like maize, wheat, rice, pulses etc. The food that we get from these seeds is actually meant for the embryo. This means that the embryo's food is present in the form of starch, fat and protein.

A table is given below.

Copy this table in your exercise book and complete it on the basis of the information from the chapter titled 'Our Food'. (8)

You had tested a bean seed for the presence of starch, fat and protein in that chapter.

In what form is the food for the axis of the seed present in the bean seed? (9)

TABLE 1

No.	Name of the seed	Starch Yes/No	Protein Yes/No	Fat Yes/No
1.	Bean			
2.	Maize			
3.				
4.				
5.				

We had earlier studied a seed which had two cotyledons. Such seeds are called dicot seeds.

Give five other examples of dicot seeds. (10)

There are also some seeds which have only one cotyledon. Let us investigate an example of one such monocot seed.

MAIZE SEED

Take a soaked maize seed.

Make a drawing of this seed, indicating its yellow and white portion. (11)

Indicate in your drawing the spot at which the seed could have been attached to the cob. (12)

The yellow portion of the seed is the endosperm, and the white portion is the embryo. Have you noticed that when you eat roasted corn, many a times a tiny white thing separates out from the gram. This tiny white thing is the embryo of the maize. This part contains both the axis and the cotyledon. The maize seed has only one cotyledon. Therefore, it is called a monocot seed.

It is difficult to see the cotyledon and the axis separately in the maize seed.

SECTION OF A MAIZE SEED:

EXPERIMENT 2

Cut a soaked maize seed into two halves as shown in the picture.

Observe the cut portion with a hand lens and make a drawing of it. (13)

On the basis of Table 1, say in which form food is stored inside a maize seed? (14)

We have seen in the two seeds we examined, the tiny plant or the axis which develops into an entire plant. The seed also contains food for this axis. Even small seeds like mustard contain the axis and its food supply.

However, inspite of all these provisions, why is it that the seeds stored in homes or godowns do not germinate? What does a seed need to germinate? Let us try and understand this. Seeds stored in the home or in godowns get plenty of air. But if these seeds are sowed in the field, would the farmer leave his field dry? Of course not; he will irrigate the fields after sowing. This means that seeds cannot germinate without water.

But would seeds germinate if they get only water? You might have heard that if it continues to rain heavily after sowing, the seeds rot instead of germinating. It is obvious that the seeds get plenty of water. Then what else is lacking?

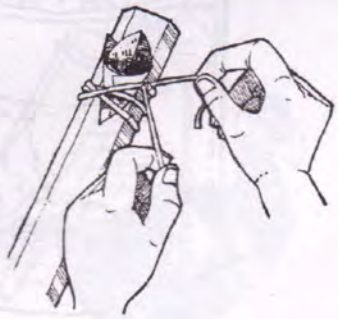
Have you eaten germinated lentils (for example, *moong*)? What needs to be done to germinate the *moong* seeds? If we drown them in a vessel full of water will they germinate?

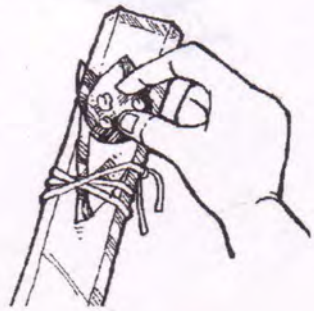
Let us try to understand this by performing an experiment :

When do seeds germinate

Experiment 3

Take at least 9 bean, cow pea (*chawla*), gram or maize seeds. Make three small paper cones (like the ones peanut sellers make). Tie these cones to a plastic scale with a thread. One cone should be tied at the centre of the scale while the other two cones should be at the two ends. Put two-three seeds of one type in each cone. Now place the scale in a beaker in the manner shown in the picture on page 58. Fill the beaker with water to the extent that the seeds in the middle cone are half immersed.



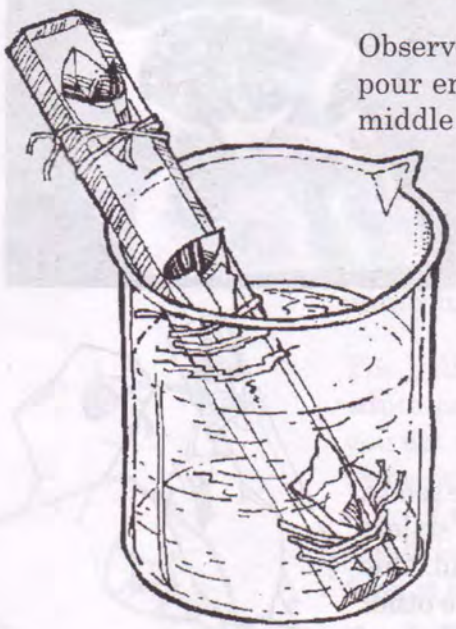


Precautions

1. The cones should be made of paper that does not disinte-

grate in water. Also, ensure that no hole remains in the bottom of the cones, otherwise the seeds may drop out through these holes.

2. If a scale is not available, then a strip of any other material can be used, provided water does not rise on it. Otherwise, water would reach the seeds in the top cone too.



Observe the seeds every day and if the water level goes down, pour enough water to again half immerse the seeds in the middle cone.

Continue this experiment for 3-4 days and answer the following questions:

Do the seeds in the lowest cone get air? (15)

Do the seeds in the top cone get water? (16)

Which seeds get both air and water? (17)

In which cone do the seeds germinate? (18)

What is required for germination? Write your answer in your own words. (19)

Why is it necessary to first soak *moong* seeds in water and then keep them wrapped in a wet cloth so that they can germinate? (20)

SEED GERMINATION AND SEED COAT

For a seed to germinate, it is essential that it should be free from any disease or infestation and should be mature.

For example, a maize seed taken from an unripe cob, if sown, will not germinate.

Germination of seeds is a very interesting phenomenon. Just imagine! A new plant begins to develop as soon as a seed

germinates. The seeds must have some means of protecting themselves. This protection is provided by the seed coat.

Seeds lie around in the open.They would dessicate or break into two pieces if they had no seed coat. Many a times seeds are eaten by animals. Yet they pass undamaged through the guts of the animal because of the seed coat. You would be surprised to learn that even the seeds of soft and succulent fruits, such as melons and tomatoes, are so hard that we cannot digest them. Tomato seeds pass through our guts undamaged. The same is true of melon seeds. Of course, it is a different matter if we remove the seed coat before eating them.

The seed coat protects the seed in many ways. It does not permit the seed to germinate until conditions are favourable. If the seed germinates at a time when conditions are not favourable, the plant will die.

There are many plants whose seeds do not germinate for months or years, even if they get air and water. Their seed coat is so hard that it does not soften after light rain. Only after very heavy rain does the seed coat soften and then water enters the seed and germination begins. The coriander seed is an example of such seeds.

You must have heard about the teak (*sagon*) tree. Seeds of this tree lie on the ground for many years. The seed coat softens slightly during each rainy season, and the embryo emerges only when the seed coat has softened sufficiently. If we want the seed to germinate earlier, it has to be soaked in acid for some time. Acid softens the seed coat.

Before sowing, cotton seeds are embeded and pressed in cow dung for a few days in order to soften their seed coats.

There are many seeds which do not germinate till they are eaten by birds and then excreted. Some examples of such seeds are *peepal*, banyan. The seed coats of these seeds soften inside the guts of birds.

In this context, there is a well known story about the relationship between a tree and a bird. A certain type of tree used to grow in Mauritius. Its seeds would not germinate unless a bird called the dodo ate and excreted them. Human beings used to hunt the dodo to such an extent that they soon became extinct. Not a single dodo was left on the island. After this, the seeds of this tree also stopped germinating. Fortunately, scientists have now found a method of germinating these seeds artificially.

There is another aspect about germination that needs to be noted. Cotyledons of some seeds emerge above the ground during germination. However, there are many seeds whose cotyledons remain underground. Can you make a list of seeds whose cotyledons emerge above the ground during germination? You might have noticed that *imli* (tamarind) seeds germinate in this way.

Find out more examples of this type of seed and write their names. (21)

Questions for revision

1. Soak some seeds like mustard, black mustard, peanut, gram and pea for a day. Following the method you learned is this chapter, remove their seed coats and draw pictures of their embryos (cotyledons and axis). You may need a hand lens for this.
2. Do all seeds look alike? Are they similar in colour, shape, texture etc? Doesn't seem that way, does it! So, group these seeds in different ways according to characteristics like round seeds, long seeds, seeds of different colours, smooth seeds, fragrant seeds etc. You can also do this exercise at home.
3. Sheela soaked gram seeds to germinate them but forgot to remove them from the water. The gram seeds lay there for many days.They did not germinate and began to rot. Explain why this happened.
4. In the chapter we saw that a new plant develops from a seed, However, there are plants which grow without seeds. For example, banana. Enumerate more examples of this kind.

New words

cotyledons	axis	radicle	plumule
embryo	endosperm	seed coat	