



## **Irish Seed Savers Association**



### **GERMINATION WORKSHEET 1:**

### **WHAT DO SEEDS NEED IN ORDER TO GROW?**

#### **The Experiment**

Under controlled conditions, students will learn what happens to seedlings when they are deprived of their basic needs and what happens when they are given all their basic needs.

#### **Objective**

- To establish what seeds require when germinating and thriving
- To equip children with this information so they can successfully grow healthy plants now and in the future
- To introduce students to the 'Scientific' method of observation and notation.

#### **What you need**

- Seeds, peas or beans - peas and beans are big seeds therefore they are easy for children to handle and to observe germination. It is preferable to use seeds from the same packet and they must be viable, i.e. they must be alive, so do check the back of the packet to make sure the seeds are 'in date'.

<b>Types</b>	<b>Varieties</b>
Broad Beans	Crimson-Flowered
French Beans	Carol Leenstra's
Runner Beans	Buton, or Scarlet
Peas	Irish Green, Pilot, or Thomas Laxton's

*These varieties can be obtained from the Irish Seed Savers Association at [www.irishseedsavers.ie](http://www.irishseedsavers.ie)*

- Compost, peat-free, if possible, to help preserve our bogs. Peat is a non-renewable resource - once it is taken out of the ground it will not come back.
- Small or medium-sized pots
- Trays to sit pots into and to collect excess water when watering
- Water
- Black material, i.e. black paper to cover the pots that won't receive light
- It will take approximately ten days to two weeks for seedlings to germinate.

### **What to do**

1. Split the class into 4 groups
  - Group 1 – 'warm + moist + light pot'
  - Group 2 – 'warm + moist + dark pot'
  - Group 3 – 'warm + dry + dark pot'

- Group 4 – ‘cold + moist + light pot’.
2. Each group is to fill their pot half way, place seeds in the pot and fill the pot up to the lip. Press compost lightly - do not compress as this will make it difficult for the seeds to germinate. Give a good spacing between the seeds in the pot.
  3. Place your pots on a tray and lightly water the pots that are to be watered.
  4. Label your pot with the date and description of your group.
    - Group 1 – should keep their pot on a sunny windowsill and keep it moist (it is important not to over-water as this can rot the seeds)
    - Group 2 – should keep their pot on a sunny windowsill and keep it moist but cover it with black material
    - Group 3 – should put their pot on a sunny windowsill but not water it
    - Group 4 – should put their pot somewhere cold e.g. on a north-facing windowsill or somewhere cold in the room, and keep it moist.
  5. Leave for two weeks, but check every two days and record what you find.
    - Groups with covered pots should carefully remove the black covering to check their seed and water (if part of their experiment) and replace the covering securely.
    - Groups that are to keep their soil moist should check with their finger each time, but may not need to water at each check.
  6. Each group/pupil (depending on teacher’s goal) should keep a record of their seedling/plant for approximately 1 month. Entries on the record sheet should be made approximately every two days by each group/student as the plants are checked. [Record sheet attached.]

**\*TEACHERS’ NOTE**

Children have a tendency to over-water so it’s important to keep an eye on that as over-watering will rot the seed and kill it. Please explain that ‘moist’ does not mean wet, but should just feel damp to the finger. An easy way to water seeds and keep pots moist is to use a hand-sprayer which you can get in a garden centre.

### **Germination (what you will see)**

- Group 1 - in approximately a week the seeds that have been given the right conditions will produce a sprout which is called **the plumule** in a pea or bean, as this is going on above the soil. Below the soil the root has emerged which is called **the radicle**. This is **germination**.
- Group 2 - seedling may also germinate
- Group 3 - seedling unlikely to will germinate without water
- Group 4 - there is a possibility the seedling will germinate, but it may take longer.

Each group should continue to take care of their seedling as they did before germination occurred.

### **Questions you should ask**

- Did my seed germinate, i.e. sprout into a shoot?
- How long did it take to germinate?
- What does my seedling look like? Describe it.
- Is it green, yellow, shriveled up?
- Is it small?
- Is it big?
- How many leaves does it have?
- Does it continue to grow taller with new leaves?
- What is my seed/seedling being deprived of, e.g. light, water, warmth, nothing?
- Based on what you observed, what do you think are the ideal conditions for a seedling/seed to germinate and thrive in?
- Based on what you observed, what condition will a seed/seedling not germinate in?

### **What you should learn**

- Seeds will do their best to grow as this is their nature
- They have simple needs which are light, moisture, air and warmth
- If they are deprived of any of these needs it will result in a weak seedling or the seedling dying
- Seedlings need a balance of all these needs, for example:
  - if a seedling gets too much sun it will grow too fast and become too tall which can result in a weak seedling
  - if a seedling gets too much water this can end up killing the seedling or the seed rotting as they prefer to be moist and not too wet.

### **Conclusion**

If seedlings' conditions are balanced then they will grow into strong healthy plants.



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[www.irishseedsavers.ie](http://www.irishseedsavers.ie)



## GERMINATION WORKSHEET 2

**Germination** is the awakening of the dormant seed to active life and growth.

### **The experiment**

To demonstrate how easy it is to germinate a seed without using compost or light, by giving them warmth and moisture.

### **The objective**

- To become familiar with the different actively growing parts of a germinating bean seed.
- To demonstrate that a seed will germinate without light if it is kept warm and moist.

### **What you need**

- Soaked beans (soak overnight)

- Paper towels / tissue
- Large plates, one for each group
- Pen and labels
- Water
- Sunny or south-facing windowsill
- A warm dark place, e.g. an airing cupboard or a warm place in the room near a radiator - but ensure that seeds are covered to create darkness.

### **What to do**

- Split the class into two groups
- 1<sup>st</sup> group will germinate their seed on a warm south-facing windowsill
- 2<sup>nd</sup> group will germinate their seed in a warm dark place e.g. an airing cupboard or warm room, with the plate covered with dark material
  
- Place wet tissue on each large plate, covering the whole plate
- Give each child in each group a bean seed to place on a plate, so every child has one to study when the seeds germinate
- Give a good spacing between each seed
- Label the plate with the date and the name of the group
- Place the plates in their appropriate places
- Check each day to ensure tissue is kept moist and whether there are any changes to the seeds
- Keep a record at the same time every day to note any changes that are taking place
- Each group should compare notes after one week.

### **Vocabulary**

radicle, root, plumule, shoot, dicotyledon seeds e.g. beans and peas, side-shoots, root hairs.

### **Observation of a pea / bean seed**

- The **radicle** emerges first (roots)
- The **plumule** emerges later (shoot)

- In the **dicotyledon seeds** (peas and beans) the radicle continues to grow and side-shoots begin to grow out from it
- The radicle also grows a dense covering of **root hairs**
- The plumule will continue to grow, and leaves develop which become green if exposed to light
- The radicle will grow downwards towards the soil
- The plumule will grow upwards towards the light
- After approximately 10 days seedling will start to wilt and turn yellow
- The seedling has used up its own store of nutrients and now needs the help of a nutrient-rich compost or soil
- The leaves will turn green immediately on the seedling that has been exposed to light
- The leaves on the seedling that was not exposed to light will not turn green
- After the plumule produces its leaves, those leaves will have to be exposed to light in order for the plant to function and continue to grow



