

# Germination

**Germination** : Germination in plants is the process by which a dormant seed begins to sprout and grow into a seedling under the right growing conditions.

or

**Germination**: is the ability of a seed to produce an embryonic root and stem within a specified period of time.

The process of seed germination includes the following five steps:

(1) Imbibition.

(2) Respiration.

(3) Effect of Light on Seed Germination.

(4) Mobilization of Reserves during Seed Germination and Role of Growth Regulators.

(5) Development of Embryo Axis into Seedling.

## Imbibition:

The first step in the seed germination is imbibition i.e. absorption of water by the dry seed. Imbibition results in swelling of the seed as the cellular constituents get rehydrated. The swelling takes place with a great force. It ruptures (tear)the seed coats and enables the radicle to come out in the form of primary root.

# Seed Germination

Plants come from seeds. This happens when the seeds are planted in the ground and sprout (begin to grow). Before a seed can sprout, it must go through a process called germination. The process of germination happens inside the seed. To learn more about the process of germination, let's take a look inside a seed...



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## The parts of a seed

Before we look at the inside of a seed, let's talk about the outside of the seed. The outside of a seed is called the seed coat. The seed coat is the hard outer layer of the seed. It is the part we see and hold in our hands before we plant them in the ground or a pot of soil.

Not all seed coats are alike, though. Some are hard (corn, beans, peas, okra, morning glories). Other seeds have soft seed coats (marigolds, tomatoes, zinnias, peppers, cucumbers).



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The inside of a seed has four main parts. The four main parts of the inside of a seed are:

- The Epicotyl
- The Hypocotyl
- The Radicle
- The Cotyledon

Now let's look at what each of these parts becomes once the seed becomes a plant.

**The Epicotyl** are the parts of the seed that become the first leaves of a plant.

**The Hypocotyl** is the stem of the plant.

**The Radicle** is the first root the plant has.

**The Cotyledon** is the inner protective layer of the seed that stores food for the seed to use during the process of germination and until the seed comes through the soil and has leaves that can be used for photosynthesis.



### **The process of germination**

If you have ever planted a seed, you know how exciting it is to see the plant that comes from that seed break through the soil. Have you ever thought about how it happens? Let's find out!

When you plant seeds in some soil, it is important to keep the soil watered (not too much). The reason this is so important is because the seeds you plant need to be able to take in oxygen and minerals from the soil and water through the seed coat's tiny pores (holes) to give the inside of the seed the food it needs to break open and make its way through the soil so it can grow into a plant.



When the seed is full enough, it pops open. The first parts of the seed to come through the seed coat are the cotyledon and the radicle (root). The root takes hold of the soil and starts to take in food from the soil. But because it is still so small, the cotyledon is still the main source of food for the seed.



The next part of the seed that appears is the hypocotyl. The hypocotyl is sometimes called the understem because it first appears under the cotyledon. The hypocotyl continues to grow upward with the epicotyl. The epicotyl becomes the first leaves of the new plant.



By the time the epicotyl are showing, the plant is now above the ground. When this happens, the cotyledon (which is sometimes called the seed leaves and looks like thin, dried brownish-white skin) has finished its job. Because their job is done, they fall off the plant and become part of the soil.

Once the cotyledon are gone, the plant's tiny leaves take over the job of supplying food to the new plant. And that is the process called germination.



### **All seeds are not alike**

If you look at different kinds of seeds, you can easily see that they are not all alike. Seeds come in different sizes, shapes and colors. And like you've already learned, some seeds have softer seed coats than others. All these differences mean that seeds germinate differently.

Seeds with hard seed coats usually germinate slower than seeds with soft seed coats. Why do you think this is?

The reason seeds with hard seed coats take longer to germinate is that

it takes longer for the seed to drink enough water to soften the seed coat enough that the inside parts of the seed can break through.



There are also other reasons some seeds take longer to germinate than others. Here are a few of them:

- The amount of sunshine. Seeds don't see the sun, but the sun heats the soil to make it warm and cozy—which is just what a seed needs to germinate.
- The amount of water in the ground. If the soil is too dry, the seed cannot get the water it needs. If it is too wet, the ground will not have enough oxygen in it to give the seed what it needs to germinate.
- Planting the seed too deep. If you plant a seed too deep, it will use all the energy and food stored in the cotyledon before it can break through the ground so the leaves can come out and take over feeding the plant.
- The seasons. Most seeds will not germinate in the fall or winter. The ground is too cold during these two seasons for a seed to germinate. Instead, the seeds sleep until spring. When a seed sleeps, it is dormant.