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# A HOME COURSE IN AGRICULTURE

## 1.—How a Seed Starts to Grow

By C. V. GREGORY

Agricultural Division Iowa State College

**A** SEED is a simple thing to look at. It might as well be a pebble or a grain of sand for all there seems to be to it. Only a bean, you say, yet there's a great deal more to that bean than you ever dreamed of.

Take a bean—just an ordinary white bean cut of the pantry—and look at it. The smooth white outer covering is the seed coat. It is almost water tight and is a protection for the parts that lie within. On one side you will notice a very conspicuous spot. This is the seed scar and is the place where the little stem that fastened the bean to the pod was attached. Near one end of the seed scar, or hilum, as the botanists call it, is a small round hole, the micropyle. If you put a bean in water it will soon begin to swell because of the water which it absorbs through the micropyle.

Now, take a bean that has been soaked for a few hours. The seed coat will come off easily. The part of the bean that is inside is found to be split in two lengthwise. These two halves are called cotyledons, which is only another name for seed leaves. Spread the cotyledons apart carefully. If you look closely you can see a little plant tucked snugly away between them. Just to one side of the middle is a small stem, the caulicle. Fastened to it is the plumule, a tiny bunch of leaves so small that you may have difficulty in making them out. Farther on, at the end of the bean, is the stubby root, or radicle. These different parts are found in every seed, no matter how small.

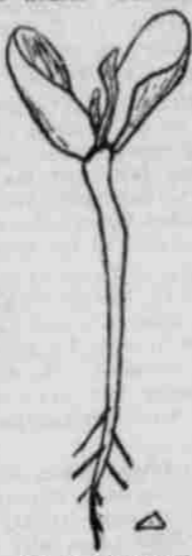


FIG. 1.—A LITTLE BEAN PLANT.

Now that you have seen what is in the bean, examine a pumpkin seed in the same way. It is much the same inside as the bean, only fatter. The hilum is at the pointed end, and the plumule is so small that you may not be able to see it at all. In these two seeds there are only two main parts, the seed coat and the little plant. By far the greater part of the room inside the seed coat is taken up by the fleshy seed leaves.

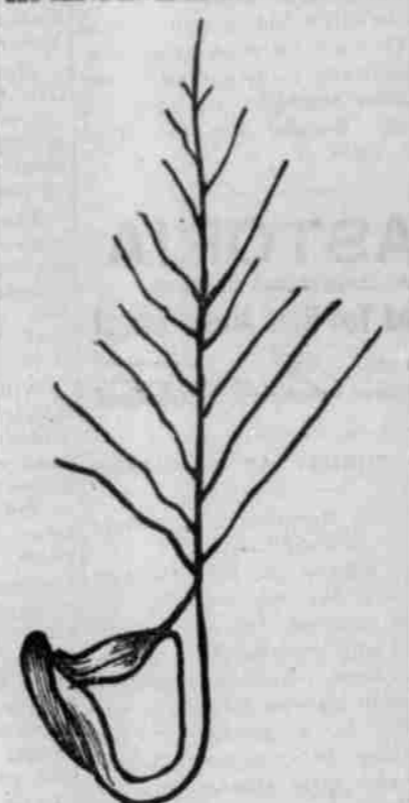
Look at the cut section of the germ carefully. The little plant can be made out very plainly. The little pointed stem which points upward and outward is the cotyledon. There is only one cotyledon in corn instead of two, as in the other seeds you have examined. If you will take a cotyledon of a corn plant that has been left in a warm place until it has commenced to grow and cut it in two lengthwise you will see that the inside is packed with layers of tiny leaves ready to unfold as soon as their turn comes. This is the plumule. The other parts of the little corn plant will be able to make out with little trouble.

You have doubtless been wondering what the rest of the kernel, the part back of the germ, is for. While it is not a part of the plant itself, it is of very great use to it, as we shall see. The little plant when it begins to grow must have food. At first it has no roots to get this food from the soil, so it must get its nourishment from some other source. This source is the part of the kernel outside of the germ itself, or the endosperm. In the pumpkin seed and the bean the endosperm, and the cotyledons are the same—the food material is stored in the large, fleshy seed leaves.

This food material consists largely of starch and oil. Neither of these can be used by the developing plant without first being changed to a liquid form. This is one of the reasons why seeds will not germinate without water. The other reason is that the water is needed to soften the seed coat so the plant can get out. But this starch and oil will not dissolve in water without first being changed to a soluble form. This is accomplished by means of ferments called enzymes. If you will put a piece of starch on your tongue for a moment you will find that it will begin to taste sweet. This is because the ferments in the saliva are changing it to sugar. The enzymes in the endosperm work in much the same way, changing the starch and oil to sugar and other soluble substances. These are dissolved by the water and go to feed the growing plant.

These enzymes cannot work without air and warmth. You already know that a seed will not germinate in cold ground, and if you will put some beans in a glass of water and leave

them for several days you will find that they will not germinate, no matter how warm they are kept, because they cannot get air. The reason is that they are in a germinating position and they will not take up oxygen from the air until they have broken through the seed coat and are in contact with the soil. This is why you cannot get food of any kind for the plant until it has broken through the seed coat and is in contact with the soil. The process of germination is delayed in a seed until it is in contact with the soil. As long as we are in contact with the soil, the higher temperature of the soil through which the air passes is warmer than the air that surrounds it. The result is that the seed gets warm up quickly and germination begins. This is why we can get so much more out of a seed in the spring than in the fall. The rapidity with which the soil warms up in the spring is the reason why we can get so much more out of a seed in the spring than in the fall. The rapidity with which the soil warms up in the spring is the reason why we can get so much more out of a seed in the spring than in the fall.



The most important factor of all is the temperature of the soil. A cold soil may have plenty of moisture and air in exactly the right proportion, but if the temperature is low the seed will not germinate. The most important factor of all is the temperature of the soil. A cold soil may have plenty of moisture and air in exactly the right proportion, but if the temperature is low the seed will not germinate.

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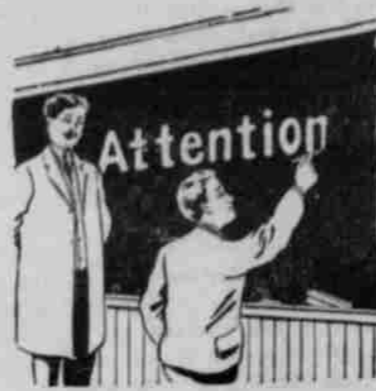
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