



*Healthy seedlings at just three weeks old, these chili peppers, basil, and spearmint sprouted from seed in Jiffy Pots.*

## Introduction

A seed contains all the genetic characteristics of a plant. Seeds are the result of sexual propagation and contain genes from each parent, male and female. Some plants, known as hermaphrodites, bear both male and female flowers on the same plant. The genes within a seed dictate a plant's size; disease and pest resistance; root, stem, leaf, and flower production; and many other traits. The genetic makeup of a seed is the single most important factor dictating how well a plant will grow under artificial light or natural sunlight and the quality of its flowers or produce.

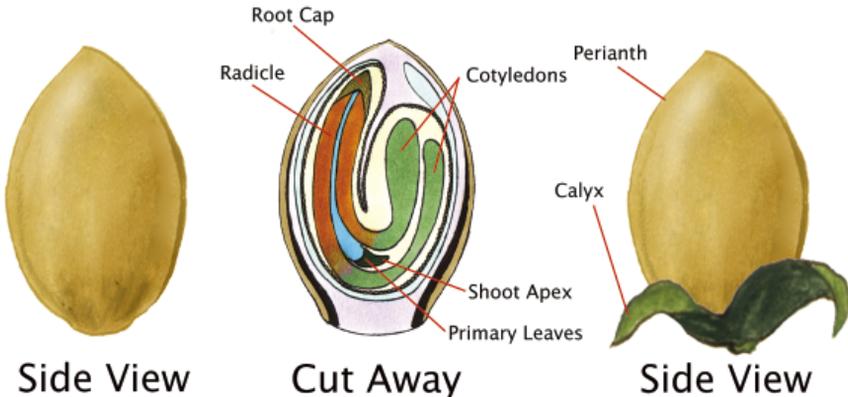
## Seeds

Careful seed selection can make the difference between a successful garden and complete failure. Certain seed varieties are better adapted to grow under certain conditions than others. For example, the early-maturing, cold-tolerant 'Oregon Spring' tomato grows in cool weather, setting flowers and fruit well before the larger beefsteak varieties. If you live in a cool region with a short growing season, selecting 'Oregon Spring' rather than a

late-maturing beefsteak variety such as 'Brandywine' will make a fruitful harvest almost certain. If you love broccoli but live in a warm climate, planting heat-tolerant 'Premium Crop' rather than 'Green Valiant' will prolong the harvest.

Many vegetable seed varieties available today are developed for agriculture. They are bred for qualities such as long shelf life, uniformity, disease resistance, and the ability to withstand mechanical harvesting with little damage. Taste is usually the last quality considered. Eating carefully selected varieties with superior taste, rather than tough vegetables that were developed for mechanized handling, is one of the rewards of indoor gardening.

Open-pollinated seeds, also referred to as heirloom seed varieties, are the products of parents selected at random by nature. You can produce these seeds yourself and save them to sow the following year. They will produce plants very similar to their parents. Some open-pollinated seeds are very popular today, such as the 'Kentucky Wonder' pole bean. But since the advent of hybrids, many varieties have become difficult to find, even extinct. Several groups have been organized to preserve



The cutaway drawing in the center shows how the seed will develop into different plant parts.

the heirloom varieties. The Seed Savers Exchange is the largest.

The introduction of hybrid or F<sup>1</sup> hybrid seed has revolutionized modern agriculture and gardening. Hybrid seed is the product of crossing true-breeding parents that have desirable characteristics. The resulting seed is known as an F<sup>1</sup> hybrid. The F<sup>1</sup> hybrid has *hybrid vigor*, the ability to grow stronger and faster than its parents. The greater the vigor, the more obstacles, such as pests and diseases, it can overcome to produce a better plant. Hybrids are usually uniform in shape and size and become ripe at the same time. Even though the seeds are often more expensive, they are an excellent value. Carefully selecting hybrid seed for such qualities as taste, disease and pest resistance, cold and heat tolerance, and conditions that prevail both indoors and outdoors in your climate will help make your garden a success.

Today, modern seed production has largely replaced the older method of open field pollination. But this technology also has disadvantages. The growing of one variety on a very large scale can be dangerous. With no genetic diversification, it can be wiped out if attacked by pests or diseases. Diversify. Grow more than one variety, and it will help overcome unchecked diseases and pests.

When selecting seed, you may notice that some carry the label “All-American Selection” or “AAS Winner.” Seed varieties that were chosen as AAS winners have demonstrated superior growth characteristics in a wide variety of climates across America. Such AAS winners are easy to spot on seed racks and are a good choice for indoor gardens.

### Timeline for germinating seeds

At 55–72 hours

Water is absorbed  
Root tip (radicle) is visible

At 10–14 days

First roots become visible

At 21–30 days

At least half of seeds are rooted by day 21.  
Seeds not rooted by day 30 will probably grow slowly

Once seeds are rooted, cell growth accelerates; stem, foliage, and roots develop quickly. Seedlings develop into full vegetative growth within four to six weeks of germination.

Some seed is treated with a fungicide to prevent such diseases as damping-off, which causes seedlings to rot at the soil line. Typically, the fungicide is color-coded, and some seed companies state in their catalogs or on their seed packets that it is treated. Some seed is available with a coating of fungicide. The most common fungicide in use is Captan (Carbaryl), known to be carcinogenic. At least one major seed producer is using naturally occurring diatomaceous earth to protect seed.

Typically, a gardener buys seeds from a reputable company. Once germinated, the seeds are carefully planted and grown to adults. For example, if 100 seeds are planted, some will be weak and grow poorly; others may fall victim to insect or fungal attacks, and a percentage will grow into strong adults.

Strong, healthy parents and proper care yield strong seeds that germinate well.

Strong seeds produce healthy plants and heavy harvests. Seeds stored too long will germinate slowly and have a high rate of failure. Vigorous seeds initiate growth within seven days. Seeds that take longer than a month to germinate could always be slow and produce less. However, some seeds take longer to germinate even under the best conditions.

The cask, or outer protective shell, on some seeds never properly seals, which allows moisture and air to penetrate. It also causes hormone concentrations to dissipate, making seeds less viable. Permeable seeds signal diseases and pests to move in. Such seeds are immature, white, fragile, and crush easily with slight pressure between finger and thumb. These are weak seeds and do not have enough strength to grow well.



*Sowing seeds directly in moist growing medium will signal the outer shell to open.*

A simple picture of a seed reveals an embryo containing the genes and a supply of food wrapped in a protective outer coating. Mature seeds are generally hard, beige to dark brown, and spotted or

mottled and have the highest germination rate. Soft, pale, or green seeds are usually immature and should be avoided. Immature seeds germinate poorly and often produce sickly plants. Fresh, dry, mature seeds less than a year old sprout quickly and grow robust plants.



*The seed above is shown before germination. The seed on the right has a brand new delicate taproot and is ready to be planted.*

### Germination

Seeds need only water, heat, and air to germinate. They do not need extra hormones to germinate. Seeds sprout without light in a wide range of temperatures. Properly nurtured seeds germinate in two to seven days, in temperatures from 70–80°F (21–27°C). Temperatures above 90°F (32°C) impair germination. At germination, the outside protective shell of the seed splits, and a tiny, white sprout (radicle) pops out. This sprout is the root or taproot. Cotyledons, or seed leaves, emerge from within the shell as they push upward in search of light.