

Seeding the Garden¹

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Starting Your Garden with Seeds

For each vegetable you plan to grow in your garden, you will have to decide whether to start it from seed, from transplants, or from plant parts. The main advantage in starting directly from seeds is that you have a wider selection of varieties and sources to choose from compared to buying transplants at a garden center. Furthermore, not all vegetables do well when transplanted, and most vegetables can be grown from seed sown directly in a garden row. This publication provides considerations and best practices for selecting and planting seeds in home and community gardens and is one of many [EDIS publications for gardeners in Florida](#).

What are the types of seed?

Good seed may mean the difference between success and failure in your garden. Obtain seed from a reliable dealer or an experienced seed saver. When seed is purchased from an established seed company, gardeners will also obtain important information about the seed, including production guidelines and the variety's ability to resist specific diseases. Seed companies offer both hybrid seeds and open-pollinated seeds. It's important to read a seed packet carefully to ensure that you're aware of the best practices and potential issues with your chosen seed (Figure 1).

Hybrid seeds are seeds that are created from a male and female parent plant, each parent chosen for the specific, desired characteristics they will pass on to their seed.

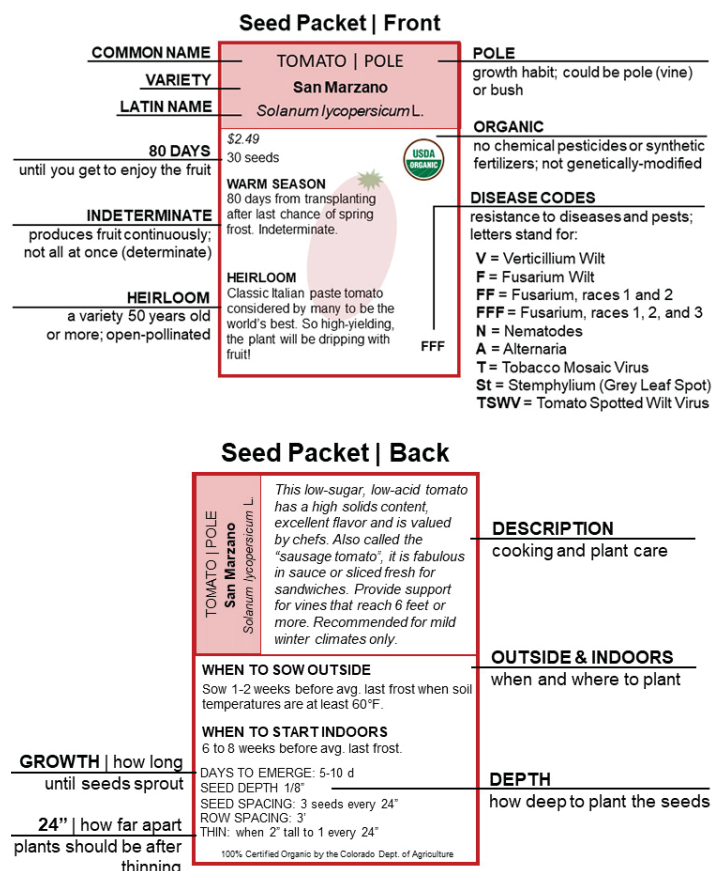


Figure 1. Diagram of information commonly located on the front and back of a seed packet.

Credits: Adapted from Treadwell et al. (2014)

Hybrid seed is value-added, because seed companies invest money and time in research and development to select and breed plants that are resistant to pests, adapted to climate,

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and nutritious, and that produce an abundant harvest. Once the hybrid plant forms mature seed, that seed can be saved and planted. But the second-generation plants will not have the same desired characteristics (i.e., they are not true-to-seed) because the hybrid plants will have hybridized again in the garden. That is why hybrid seed is best purchased each year. It is important to note that it is illegal to save and replant seed that has been patented, such as genetically modified seed.

Open-pollinated seed is seed generated from a male and female parent through natural processes such as insect pollinators or wind. **Heirloom varieties** are open-pollinated varieties that have been successfully grown for many generations. Many gardeners prefer open-pollinated seed because they can save seed each year and get similar results. If you do save seeds, keep in mind that seeds are formed from pollination and that pollen from a close plant relative can result in a cross, or a combination of genes from two closely related but different plants. In that instance, the next generation of plants will have characteristics of two varieties and will not “breed true.” In gardening terms, open-pollinated seed “breeds true” because each generation expresses the same characteristics of its parents. Although open-pollinated seed often lacks resistance to disease compared to hybrid seeds, planting open-pollinated seed helps to preserve rare varieties, increase biodiversity, and add interest to your garden (Figure 2).

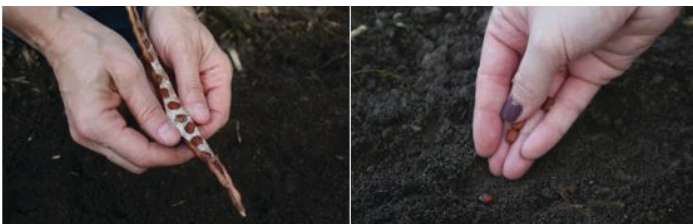


Figure 2. Seeding open-pollinated peas in prepared garden soil. Credits: D. Treadwell and T. Petri, UF/IFAS

Genetically modified organisms, or GMOs, are products, including seed, that have been engineered to have specific traits by rearranging or adding new genetic material using technology. Genetically modified seed is not readily available for home gardens. Only two vegetables, sweetcorn and squash, have patented engineered varieties that are available to US farmers and sold in grocery stores, but these seeds are not marketed to home gardeners. Sweetcorn is engineered to be resistant to *Bacillus thuringiensis* (Bt), a biological insecticide, and summer squash (zucchini, yellow crook, and straight neck) has been engineered for resistance to mosaic virus.

Which variety is best for my garden?

How many of you spend hours gazing at glossy seed catalogs dreaming about all the wonderful plants you can grow, only to realize that they won't do well in Florida's hot and humid climate? It is important to plant varieties of vegetables that have been tested and originate from or have been found to be adapted to your area. Vegetables resistant to pests and tolerant of adverse climate conditions are much easier to grow successfully than those that are not. The *Florida Vegetable Gardening Guide* (<https://edis.ifas.ufl.edu/vh021>), EDIS document SP 103, lists the varieties that are best suited to your county. Additional information about sourcing recommended varieties is in EDIS document ENH1225, *Seed Sources for Florida Homegrown Vegetables* (<https://edis.ifas.ufl.edu/ep486>).

Gardeners enjoy trying varieties that have proven themselves elsewhere and that may do well in their gardens. However, many gardeners are cheating themselves of the best possible results by continuing to grow inferior varieties without ever testing the suggested varieties. We encourage gardeners to try new recommended varieties to increase the chance of success and add diversity to your garden.

What are seed treatments?

Many seeds from commercial seedstocks are treated with chemicals to reduce injury and decay caused by insects and diseases. The chemicals are often colored with a dye so gardeners can easily identify the seeds as treated. These chemicals are poisonous and should be handled with care, preferably with gloved hands. Treated seeds are not to be eaten under any circumstances. Keep them out of the reach of children.

Most open-pollinated and heirloom seeds from commercial sources, and nearly all seeds from seed-saver groups, are untreated. If you see evidence of mold, seeds can be treated with solutions such as diluted bleach, white vinegar, or hot water (MacKenzie and Grabowski 2018; Treadwell et al. 2014). A bleach treatment involves creating a solution of one part bleach (5.25% sodium hypochlorite) and four parts water, plus a few drops of dish soap. Set the seeds in the solution for one minute, and make sure all surfaces of the seed get coated. Finally, strain the seeds from the solution and rinse seeds with cool water for 5 minutes. Treated seeds can then be directly planted or dried and then stored if needed. For a hot-water treatment, soak seeds in water heated to 100°F for 10 minutes, then move seeds to water heated to 122°F for 25 minutes. Next, strain the seeds

from the water and rinse with cool water for 5 minutes. Seeds can then be directly transplanted or dried and stored. Bleach treatments can be used on any kind of seed but are not as effective at reducing infection as hot water. Because the required temperatures for the hot-water treatment varies by species, be sure to double-check the appropriate temperatures before trying this treatment (MacKenzie and Grabowski 2018). Also, be aware that storing seeds after treating may result in new contamination, and these treatments may reduce germination of old or weak seeds.

What is inoculated seed?

Inoculated seed are seeds that have microbial (bacteria or mycorrhizae) coatings to improve germination, crop growth, and soil health. Inoculation is predominantly used for beans, peas, and legumes because it increases the nitrogen-fixing properties of these species. For more information see EDIS document SS-AGR-154, *Inoculation of Agronomic and Forage Crop Legumes* (<https://edis.ifas.ufl.edu/aa126>). By planting seeds coated or mixed with a beneficial symbiotic organism, you are utilizing a preexisting relationship between plant and bacteria or mycorrhizae that allows the plants' roots to better process nutrients in the soil and that acts as a biocontrol for other organisms that might be detrimental to plant development (Erker, Brick, and Schwartz 2014).

This is an alternative to seed coating and may have positive long-term effects because the bacteria and mycorrhizae remain in the soil and can improve future crop performance. Another technique is to inoculate the soil. Finally, if you would like to create an environment that is conducive to beneficial bacteria and mycorrhizae without adding them directly, there is a congruent positive relationship between the level of organic matter in soil and microbial action, which can boost seed performance (Fenton, Albers, and Ketterings 2008).

What is the best method to plant seeds?

The soil contains water and food that are crucial for the growth of plants. Seeds that are planted too shallow may not have access to these resources, may be washed away with the first rain, or may be exposed to birds and rodents. However, seeds can be planted so deep the young plants cannot reach the top of the ground.

Sow small seeds, such as carrots, $\frac{1}{4}$ inch deep in the soil. Medium seeds, like cucumber, about $\frac{3}{4}$ inch deep. Large seeds, such as beans and corn, can be planted 1 to 1.5

inches deep. Because larger seeds make stronger young plants, they can be planted deeper than small seeds.

When sowing small seed, cut or tear off a corner of the packet and scatter seed in the furrow while tapping gently with your index finger. For best results, make a planting furrow with your finger or the handle of a hoe or rake drawn along the cord. Alternatively, you may broadcast the seeds over the soil surface and cover by sprinkling soil. Some gardeners use a cloth cover, such as burlap. Small seeds are planted shallow and fairly close together. They help each other break through the soil. However, seedlings must later be thinned to prevent crowding.

For larger seed, open a deeper planting furrow with a hoe. The young plants from larger seed can grow farther to reach the soil surface. Larger seeds are also planted farther apart. They do not need to help each other break through the soil surface. Space larger seed evenly and drop by hand, then thin to the proper stand.

Plant in straight rows, triangles, hexagons, or staggered rows. Straight rows allow for easier hoeing or cultivation. Rows should be marked off. Use a string or a cord stretched between two stakes (Figure 3 and 4). Other row patterns allow for greater coverage and interplanting of different types of vegetables. One example of this is the three sisters of corn, beans, and pumpkin planted in triangles. Pumpkin is planted at the center, then triangular rows of corn and beans are planted around it. The pumpkin vine runs throughout the bed as a ground cover, the corn offers structure for the beans to grow up, and the beans are a nitrogen-fixing legume that helps improve soil quality. Other shapes, such as hexagons or pentagons, help provide clumps of vegetables that interlock and provide more coverage and diversity to reduce the impact of disease and pests. For square-foot or wide-row gardening, broadcast seeds in a broader pattern, usually crosswise on a prepared raised bed. After the seed is dropped or placed in the furrow, use the hoe, the rake, or your hands to cover the seed. Fill the seed furrow with soil. Leave the ground level or slightly mounded above the seed. Finally, when planting, think about sun delineation, the growth pattern of what you are planting, and how the plants will grow together.



Figure 3. A garden bed with string marking rows for even planting.
Credits: T. Jones, UF/IFAS



Figure 4. A garden bed planted in rows for easy cultivation and space to grow.
Credits: T. Petri, UF/IFAS

How should I water and fertilize my seeds?

Add mature compost and mix it into the top 12 inches of the soil thoroughly before seeding. If you don't have compost and are using store-bought fertilizer, apply no more than 50% of the total fertilizer you need for the season before seeding, and mix it into the soil well. Fertilizer that is left on the soil surface may run off and contaminate Florida's water supply, and fertilizer placed in the seed furrow may "burn" young plants, causing them to turn yellow and die. See the *Florida Vegetable Gardening Guide* for more information on fertilizing the garden. Also, when planting in the ground, be careful not to put too much good peat, compost, or manure into garden beds. The spongy soils in the garden bed can cause wicking from the sandy soils around the bed, leading to very wet soil in the garden beds, which can rot the roots of the vegetables.

Water the newly seeded area gently with just enough water to moisten the top several inches of soil, and supplement rainfall with added water so the seedbed stays moist (but not wet) in the top three inches of the soil until the seeds have germinated. Once the root system is established (i.e., once a gentle tug does not pull the young seedling out of the soil), water daily or twice daily. Provide enough water so the soil is moist to the depth of the roots, and allow the soil to dry a bit between waterings. Frequent light irrigation is best for young plants. Avoid standing water, soil that drips water when squeezed, and very dry soil. The timing of when you water is also very important. Early mornings are best; when watering in the middle of the day, there is a great deal of evaporation, and when watering in the evening, the plants stay wet overnight, which can increase the occurrence of moisture-conducive disease.

Why did my seed die?

1. Seeds may be weak. Germination means the ability to sprout; however, vigor is also important. Vigor refers to the strength of that sprouting and the ability of the seedling to grow stronger.
2. Conditions for sprouting may not be ideal. Seeds need aeration, moisture, and the right temperature. With a few exceptions, such as lettuce, vegetable seeds do not require light to germinate. However, do not plant them too deeply.
3. Rots, decays, insects, birds, and other animals sometimes destroy seeds.
4. Do not put seeds directly in the fertilizer band, or "burning" injury will occur. Plant seeds at least 2 to 3 inches away from the fertilizer band.
5. Some seeds have hard seed coats or other physiological needs, such as dormancy breakage.
6. Hormones in the roots of some plants may cause seeds of other plants not to sprout, a process known as allelopathy. Lettuce seeds are affected this way by celery roots. See EDIS document HS944, *Allelopathy: How Plants Suppress Other Plants* (<https://edis.ifas.ufl.edu/hs186>).

How do I save seeds?

Many gardeners prefer to purchase seed every year. EDIS document ENH1225, *Seed Sources for Florida Homegrown Vegetables* (<https://edis.ifas.ufl.edu/ep486>), lists some retail outlets for varieties recommended for Florida gardens. However, saving seeds from hard-to-find varieties or from

Carefully selected plants helps to ensure the vigor and heritage of the variety. Saving seeds from your own plants requires selecting suitable plants to collect from, harvesting seeds at an appropriate time, and storing seeds properly over winter.

Seeds should be stored in a cool, dry place, preferably indoors. If you have leftover seeds from sowing, they can be stored in the original packets. A tightly sealed jar placed in the refrigerator at 32°F–50°F works well (MacKenzie and Grabowski 2018). Most garden vegetable seeds may be stored in the freezer, but storage there is generally no better than in the refrigerator. But be careful—seeds must be very dry (5%–10% internal moisture) before freezing, or they can be killed. Garden seeds can last two to ten years when properly stored.

If collecting and storing dry seeds from your garden (e.g., bean pods), or seeds not extracted from a fruit, then allow the seeds to fully ripen before spreading them out to dry for 1 to 2 weeks (Carolina Farm Stewardship Association 2012). If desired seeds are wet (e.g., tomatoes), or harvested from inside a fruiting body, be sure to rinse and clean the seeds well, spread the seeds into a thin layer, and allow to dry completely (usually for around 3 weeks) before storing (Carolina Farm Stewardship Association 2012). A small amount of desiccant, such as silica gel or powdered milk, can be added to storage containers to absorb moisture and keep seeds dry (MacKenzie and Grabowski 2018).

Be sure to collect seeds from the plants with the most desirable traits (e.g., best-tasting fruit, least pests) (MacKenzie and Grabowski 2018). Label saved seeds with their name, variety, and date. Seeds should ideally be used within 1 year, because older seeds have lower germination and vigor (MacKenzie and Grabowski 2018). See Table 1 for storage life of several vegetable seeds. Information on seed priming and typical germination rates for garden vegetables can be found in EDIS document HS713, *Seed Quality and Seeding Technology* (<https://edis.ifas.ufl.edu/cv103>).

Table 1. Relative seed storage life for common garden crops.

Short-lived	Medium-lived	Long-lived
Onion	Beans	Cucumber
Corn	Carrot	Radish
Okra	Peas	Eggplant
Parsnip	Tomato	Squash

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