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Starting Plants From Seeds

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Plants of many annual flowers and vegetables may be started from seeds indoors. Vigorous plants started indoors flower sooner and produce an earlier harvest. Some, however, are best sown directly outdoors when weather conditions permit and are actually delayed by transplanting.

Growing plants from seeds can be a rewarding hobby and also allows home gardeners to grow varieties that may not be available from local plant growers.

Time for seeding indoors

The proper time for sowing seeds depends upon when plants may normally be moved outdoors. This period may range from four to 10 weeks, depending on the speed with which seedlings grow and the cultural conditions in the home.

Selecting seeds for planting

- **Purity and trueness to type**

Good seeds should not contain seed of other crops or weeds and should be the correct variety. For best results, buy quality seed from a reliable dealer.

- **Packages and storage**

Seeds sold in packages should show crop, variety, germination percentage and chemical seed treatments, if any. Seeds should be kept dry and cool to ensure good germination at planting. Laminated foil packets ensure dry storage. Paper packets are best kept in tightly closed cans or jars until seeds are planted.

- **Hybrid seeds**

Many new vegetable and flower seeds are hybrids. Hybrid seed often costs more than seed of nonhybrid varieties. However, hybrids usually have increased vigor, better uniformity, better production and sometimes specific disease resistance or other unique cultural characteristics. Each gardener must decide whether the added benefit justifies the added cost. It often does.

Containers for sowing seeds

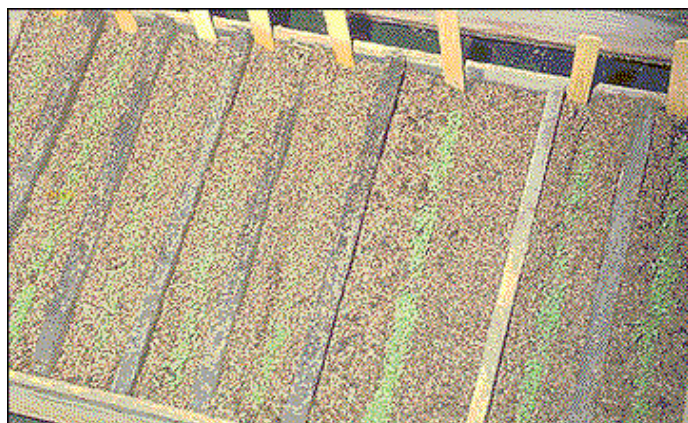


Figure 1

Clean containers are extremely important for good germination and prevention of disease. These petunia seedlings are heavily seeded and will need prompt transplanting soon.



Containers for starting seeds should be clean, sturdy and fit into the space available for growing plants in the home (Figure 1). The proper container helps get seedlings off to a good start and may save work in later stages of development.

- **Wood flats, fiber trays, plastic trays**

Plants that are easy to transplant may be seeded directly in flats or trays for later transplanting into individual pots or wider spacing in flats. Starting seeds in such containers saves space as compared to seeding directly into individual pots. However, when time is more important than space, direct seeding in pots may be preferred.

- **Clay and plastic pots**

Both types can be cleaned and reused and provide excellent growth for transplants. They must be removed from the soil ball carefully at planting time. Seeds may also be planted directly into them.

- **Peat pots**

These popular pots are made from peat or paper waste fibers and may be purchased individually or in strips or blocks. They are porous and provide excellent drainage and air movement. The entire pot can be planted, so there is minimum root disturbance at planting time.

- **Compressed peat pellets**

Expandable peat pellets when dry are about the size of a silver dollar, but somewhat thicker. When placed in water they swell to form a cylindrical container filled with peat moss, ready for seeding or transplanting. They may be planted directly into the garden. Use the pellets in trays so that they are easily watered and held upright.

Soil mixes and other growing media

The medium used for starting seed should be loose, well drained and fine-textured. Prepared mixes are available commercially, or materials can be mixed at home.

- **Vermiculite**

This material when used alone provides good seed germination. It is clean, and if not contaminated during handling, will not need sterilization. If other seeding mixes are used, it is useful for covering seeds since it does not form a crust and provides easy emergence for the seedlings. Vermiculite is available in several size grades. For seeding, a fine grade is best.

- **Synthetic mixtures**

Mixes that contain no soil are available for growing seeds. These contain either a combination of peat moss and vermiculite or peat moss and perlite. They may be purchased ready-made or can be mixed at home. To prepare such a mix, use 4 quarts of vermiculite, 4 quarts of peat moss, 1 tablespoon of superphosphate and 2 tablespoons of pulverized limestone. These mixes, as well as vermiculite used alone, have little fertility. Seedlings must be watered with a diluted fertilizer solution soon after they emerge.

- **Soil-vermiculite mix**

Seeds may be started in a mixture of about one-third good garden soil and two-thirds vermiculite. Since good soil contains some fertility, prompt fertilization after germination is not so essential. When garden soil is used, the mix must be sterilized before seeds are planted in it.

- **Soil-peat-sand-mix**

Large seeds or vigorous-growing seeds may be planted in a mix of two parts good garden soil, one part shredded peat moss, and two parts either perlite, vermiculite or sharp sand. Soil sterilization is necessary.

- **Milled sphagnum moss**

This is a ground sphagnum moss sometimes used for starting seeds since it appears to have an ability to inhibit the seedling disease "damping off." It should be well moistened before use. Since it contains no fertility, prompt fertilization is essential after seeds have germinated.

- **Layered mixes**

Another technique used for germinating seeds is to partially fill a flat or pot with a sterilized soil mix and then top it with a layer of vermiculite or milled sphagnum moss in which the seeds are planted. After germination, roots of seedlings move from this top area into the soil mix, which provides fertility, so adding liquid fertilizer is less critical.

Sterilizing mixes and containers

To guard against plant diseases carried in soil and on containers, cleanliness and sterilization of materials is important. Place the moist, but not wet, soil mix in a container that can be covered to keep the soil from drying rapidly. If a cover is not available, cover with aluminum foil, and seal at the edges. The mixes may be sterilized directly in the pots or flats in which they are to be used. In addition to killing disease organisms, many weed seeds are also killed by sterilization.

Pinch a small hole in the center of the foil and insert the bulb end of a meat or candy thermometer into the soil so that the bulb is about at the center of the soil mass. Place the pan in an oven at 200 to 250 degrees Fahrenheit. Keep the soil in the oven until the thermometer shows a temperature of 160 to 180 degrees Fahrenheit. Remove the pan and allow it to cool. Baking soil will give off a strong odor, so some ventilation may be desirable. The length of time necessary for sterilization depends on the volume of soil, as well as its moisture content. Dry soil cannot be sterilized well.

After the soil has been sterilized, make sure that containers, tools and working area are also clean and sterile. Clean soil can be easily reinfected by careless techniques.

In sterile soil, reintroduced disease may spread faster than it would in unsterilized soil
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- **Sterilizing containers**

Wash thoroughly in soapy water all used containers to remove all debris. Don't put wooden flats or plastic containers in the oven. Clean wood and plastic items by rinsing them in a solution of one part chlorine bleach and 10 parts water. Let them dry before filling with soil.

Steps to seeding

- Fill the container up to 3/4 inch from the top with the mixture to be used. It should be moistened before filling if the mixture is dry. Make sure the container has adequate drainage. Before filling, cover holes or cracks in the container with sphagnum moss or broken crockery.
- Level and gently firm the planting medium. A clean, small board may be used for leveling and firming.
- Using a narrow board or large wooden label, make shallow rows about 1 to 2 inches apart in the flat. When different seeds are used in the same container, they are easier to keep track of if planted in rows. If only one type of seed is used, it may be scattered or "broadcast" over the surface.
- Sow the seeds uniformly and thinly in the rows. Many small round seeds may be slowly dropped in the rows by tapping the package as it is held over the rows. Label each row promptly with plant type, variety and date of planting.

Large-seeded vegetables such as cucumber, cantaloupe and watermelon should be planted directly into peat pots. Other seeds may also be handled this way to save transplanting, but sowing is difficult with very small seeds. Some small seeds are now available in "pelletized form" to make handling easier. Plant two seeds per pot and later thin to one plant. This saves later transplanting and means less root damage at planting time.

- Cover the seeds with dry vermiculite or milled sphagnum moss. The depth of covering depends on the size of the seeds. Very fine seeds such as petunia or begonia need not be covered. Moisten the surface with a fine mist, or place the container in a pan of warm water to absorb it from the base. Don't place in water that is deep enough to run over the top of the pot or flat. It may mix seeds or

cover them too deeply. As a general rule, seeds other than the very fine seeds should be covered about two times their diameter.

- Slip the flats or containers into clear plastic bags. Since they retain moisture, no additional watering should be necessary until after seeds have germinated.
- Place seeds in a warm location for germination. Generally, a range from 65 to 75 degrees Fahrenheit is best. A few plants such as larkspur, snapdragon, sweet pea, cabbage, broccoli and cauliflower are best started at about 55 degrees Fahrenheit. Don't place covered containers in direct sunlight.
- Watch daily for germination. Containers should be moved to bright light and the plastic bags removed as soon as germination is well under way. If not all seeds germinate at the same time, cut strips of plastic or cloth, and keep ungerminated rows covered until seedlings appear. Seeds are quickly killed if allowed to dry during germination. Watch closely for development of any disease and control promptly (Figure 2). After germination, those plants listed as preferring cool temperatures should be placed in a cool location.



Figure 2

Watch for fungi growth and treat the spots promptly to prevent spread.

Table 1

Guide to sowing vegetable seeds in the home

Vegetables	Time for seeding ¹	Comments
Cool-season crops (broccoli, cabbage, cauliflower, head lettuce)	Late February	Grow cool, tolerate light frost outdoors after hardening
Warm-season crops (tomato, eggplant, pepper)	Late March	Keep warm. Do not subject to frost
Vine crops (cucumber, cantaloupe, squash, watermelon)	Late April	Sow directly in peat pots. Keep warm at all times.

¹Approximate time for seeding is listed for mid-Missouri (Zone 6). In the Bootheel area (Zone 7), sow about two weeks earlier. In northern Missouri (Zone 5), sow about one week later.

Table 2

Guide to sowing common annual flower seeds in the home

Time of seeding	Plant types	Germination time	Growth rate	Cold and frost tolerance after hardening
Early to mid-January	Begonia	10 to 12 days	Slow	None
Early to mid-January	Pansy	6 to 10 days	Medium	Good
Early to mid-January	Viola	6 to 10 days	Medium	Good
Early February	Lobelia	15 to 20 days	Slow	None

Early February	Stocks	10 to 14 days	Medium	Good
Mid-February	Black-eyed Susan vine	10 to 12 days	Slow - medium	None
Mid-February	Impatiens	15 to 18 days	Medium	None
Mid-February	Torenia	10 to 15 days	Medium	Medium
Late February	Petunia	6 to 12 days	Slow - medium	Slight
Early March	Ageratum	5 to 8 days	Medium	None
Early March	Scabiosa	8 to 12 days	Medium	Slight
Early March	Snapdragon	7 to 12 days	Medium	Medium
Early March	Verbena	12 to 20 days	Medium	Slight
Mid-March	Bells of Ireland	21 days	Medium	Medium
Mid-March	Dianthus	5 to 7 days	Medium	Medium
Mid-March	Salpiglossis (Painted tongue)	8 to 10 days	Medium	None
Mid-March	Vinca (Periwinkle)	10 to 15 days	Medium	None
Mid-March	Scarlet sage (Salvia)	12 to 15 days	Medium	None
Mid-March	Statice	15 to 20 days	Medium	Slight
Late March	Nicotiana	10 to 15 days	Medium - fast	Slight
Late March	Nierembergia	10 to 15 days	Medium	Slight
Late March	Phlox, annual	6 to 10 days	Medium - fast	None
Late March	Sweet alyssum	4 to 8 days	Fast	Slight
Early April	Aster	8 to 10 days	Medium	Slight
Early April	Balsam	6 to 8 days	Medium - fast	None
Early April	Celosia (Cockscomb)	6 to 10 days	Fast	None
Early April	Cornflower	6 to 10 days	Fast	Good
Early April	Marigold	5 to 7 days	Fast	None
Early April	Portulaca	6 to 10 days	Fast	None
Mid-April	Cosmos	5 days	Fast	None
Mid-April	Zinnia	5 to 7 days	Fast	None

Damping off

When seedlings fall over at the ground line, they are being attacked by a fungus disease known as "damping off." If only a few seedlings are attacked, dig out and discard the infected plants and soil. Drench the entire soil mass with a fungicide if the disease is scattered throughout the flat or pot. This may not provide complete control. High temperature, poor light or excess moisture stimulate spread of the disease by weakening plants to make them more susceptible to it. Best control is cleanliness and prompt

action when the disease appears.

Growing seedlings

After seeds have germinated, they must be promptly given the best possible growing conditions to ensure stocky vigorous plants for outdoor planting. Cultural requirements must be considered carefully.

- **Light**

Seedlings must receive bright light promptly after germination. Place them in a bright south window if possible. If a large, bright window is not available, place the flats under fluorescent lights. A fixture containing two 40-watt fluorescent tubes is adequate. Place the seedlings about 6 inches from the tubes and keep lights on for 14 to 16 hours each day. As seedlings grow, the lights may need to be raised to prevent leaf burn as seedlings touch the tubes. Plants need some red and infrared radiation. Since this is not supplied by common fluorescent tubes, additional light from incandescent lamps or windows is necessary. If this cannot be given, use a fluorescent tube specially designed for plant growing. These are available under a variety of trade names.

- **Temperature**

Most annual plants and vegetables prefer night temperatures between 60 and 65 degrees Fahrenheit. Day temperatures may run about 10 degrees higher. If temperatures are warmer than this, leggy plants result. Cool-season vegetable crops and a few flowers already listed prefer night temperatures no higher than 55 degrees Fahrenheit and day temperatures near 65 degrees Fahrenheit. An unused bedroom, basement or sun porch is often a good location.

- **Moisture**

Good humidity is an asset for producing good plants. A humidifier may be used, or shallow pans of gravel filled with water may be placed as close to the growing area as possible. Flats should be kept moist at all times but never soggy. Allow drying between waterings, but don't allow seedlings to wilt at any time.

- **Fertilization**

Seedlings will need some fertilization for best development. Those in totally artificial mixes need prompt and regular fertilization. Use a soluble houseplant fertilizer as sold in garden centers, nurseries or on plant supply counters. Young, tender seedlings are easily damaged by too much fertilizer. Apply fertilizer at about half the recommended strength a few days after seedlings have germinated. After that, fertilize at two-week intervals with the dilution recommended by the manufacturer. Water and fertilize carefully.

Transplanting

As soon as seedlings have developed at least one set of true leaves and are large enough to handle, they should be transplanted to individual pots or spaced out in flats (Figure 3). Failure to transplant promptly results in crowded, spindly seedlings that may not be able to develop properly. If a hotbed is available, seedlings may be transferred directly to it. Artificial mixes may be used or a soil mix of one part soil, one part peat and one part sand works well for transplants.



Figure 3

These begonia seedlings have been transplanted into individual sections of a tray for development until they can be moved directly to the garden



To transplant, carefully dig up the small plants with a knife, spatula or wooden label. Let the group of seedlings fall apart and pick out individual plants.

Occasionally if seedlings have been too close, they are difficult to separate. Gently ease them apart in small groups, which will make it easier to separate individual plants. Avoid tearing roots in the process. Handle small seedlings by their leaves; small thin stems break easily.

Poke a hole in the soil into which the seedling will be planted. Make it deep enough so the seedling can be put at the same depth it was growing in the seed flat. Small plants or slow growers may be placed 1 inch apart. Rapid-growing, large seedlings should be planted about 2 inches apart. After planting, firm the soil and water gently. If seeds were sown in individual peat pots or pellets, thin them to one seedling at this time.

Keep newly transplanted seedlings in the shade for a few days, or place them under fluorescent lights. Keep them away from heat sources. Continue watering and fertilizing as was done in the seed flats.

Vegetables easily transplanted include broccoli, cabbage, brussels sprouts, lettuce and tomato. Those with a little slower root development include cauliflower, celery, eggplant, onion and pepper. They may be successfully transplanted, however. Plants that do not transplant well and therefore are seeded in individual pots include cucumber, muskmelon, squash and watermelon.

Most flowers normally grown indoors transplant well, but a few that are difficult to transplant include poppy, larkspur, lupine, sweet pea and cornflower. These are generally seeded outdoors, but to start them indoors, place them directly into individual pots.

Moving plants outdoors

- **Hardening**

Plants that have been growing indoors can't be planted abruptly into the garden without injury. To prevent any damage, they should be "hardened" before planting outdoors.

This process should be started at least two weeks before planting in the garden. If possible, plants should be moved to cooler temperatures outdoors in a shady location. A coldframe is excellent for this purpose. When first put outdoors, keep in the shade, but gradually move plants into sunlight for short periods each day. Gradually increase the length of exposure. Don't put tender seedlings outdoors on windy days or when temperatures are below 45 degrees Fahrenheit. Reduce the frequency of watering to slow growth but don't allow plants to wilt. Even cold-hardy plants such as cabbage and pansy will be hurt if exposed to freezing temperatures before they have been hardened. After proper hardening, however, they can be planted outdoors, and light frosts will not damage them.

- **Planting into the garden**

When plants have grown large enough to handle easily and hardening is complete, they may be planted into the garden if weather conditions permit.

Carefully remove plants from the growing flats, leaving as much soil mix as possible around the roots. Dig the hole about twice as large as the soil mass around the roots. Set the plants at about the same level they have been growing in the pots. A few plants such as tomato and marigold are able to develop roots along the stem. If they have become leggy, they may be planted deeper than they were previously growing. Place soil loosely around the roots and apply about 1 cup of a starter solution. This solution is made by dissolving 1 tablespoon of high-phosphorus fertilizer in 1 gallon of water. A 10-52-17 or similar analysis is satisfactory.

Plants grown in clay and plastic pots must be removed from them before planting. Those grown in peat pots or peat pellets can be planted intact. Breaking the base of the peat pot often helps improve root

penetration and drainage. Make sure the top edges of the pot are thoroughly covered. If not covered, it may act as a wick and evaporate moisture around the root ball. This delays root penetration or even causes the plant to dry up on hot, sunny days.

Transplant on cloudy days if possible. In warm, sunny weather, cover the newly planted seedlings with newspaper tents or some other type of shading for two or three days until they are well established. Keep plants watered as necessary.

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Related MU Extension publications

- G6560, Home Propagation of Houseplants
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