GROWING

Flowering Annuals

Home and Garden Bulletin No. 91
U.S. DEPARTMENT OF AGRICULTURE

Growing Flowering Annuals

By Henry M. Cathey, Plant Genetics and Germplasm Institute,
Northeastern Region, Agricultural Research Service

Garden annuals are easy to grow and they do well in all parts of the United States. Among the most popular of the garden annuals are zinnias, marigolds, petunias, and ageratums. Many other kinds also are available.

You can sow annual seeds directly in the beds where the plants are to bloom or you can start early plants indoors and set them out in beds after the weather warms.

You also can buy started plants of many annuals from your local nursery or garden shop. These started plants usually are in bloom when they are offered for sale, which allows you to select the colors you want for your garden. It is an easy task to prepare beds and set out these started plants. The plants provide color from the time they are set out until they are killed by fall frosts.

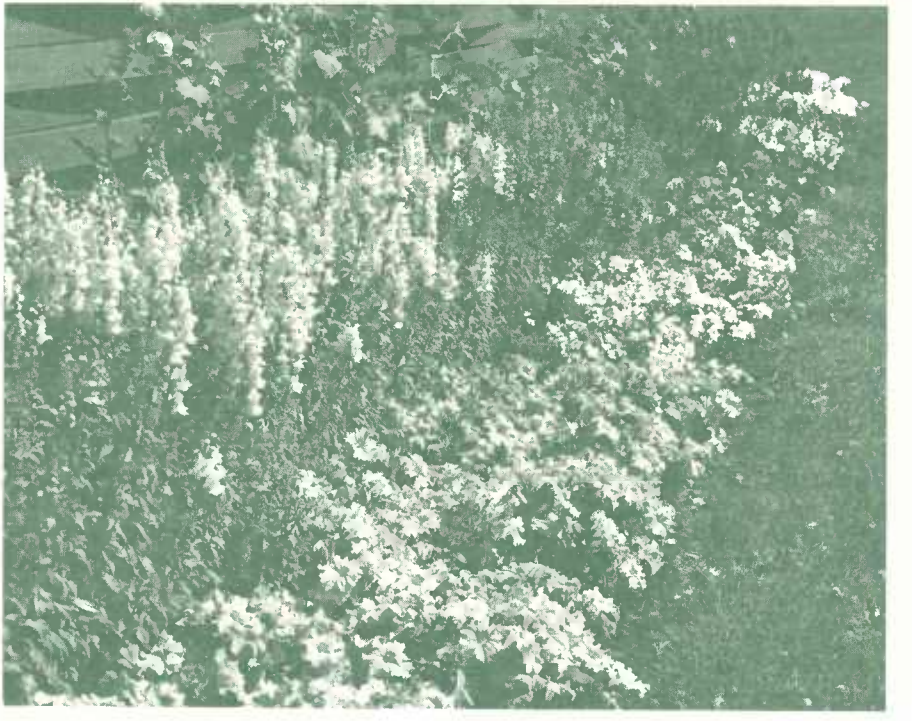
To grow annuals successfully—

- Start with vigorous plants or seeds. The best plan is to buy started plants. Next best is to sow fresh seed where the plants are to grow. Usually, the least satisfactory plan is to start your own plants indoors.
- Prepare soil in the flower beds thoroughly.
- Set out plants or sow seed at the recommended times. Plants set out too early may be killed by frost. Seed sown too early will not germinate until the soil warms—and by that time it may rot.
- Provide the recommended distances between plants when thinning seedlings or setting out started plants. Proper spacing is necessary for fullest development of the plants.

SELECTING ANNUALS

You probably already have decided which kind of annuals you want to grow; annuals are high on everyone's list of favorite flowers. If you have not decided, however, a good plan is to visit other gardens in your area to see which annuals are doing well there and which are most attractive to you.

Perhaps you have a specific purpose in mind for annuals—to provide a mass of color for brightening the dark foliage of background shrubs, to fill in beds until shrubs grow large enough to be decorative in their own right, or to overplant bulb beds to provide color after spring-flowering bulbs have passed. If so, you



BN-17999-X

Annuals provide quick color for your garden. These petunias and snapdragons, seeded in early spring, bloomed from late spring until they were killed by frost.

can choose annuals for your garden by considering their characteristics—shown in table I—and deciding which of the flowers meet your requirements.

Some annuals are best for use as bedding plants, grouped to give large masses of color in the garden. Some are best as border plants. Some are best for low edging around beds and walks. And some—the tall ones—are best used as quick-growing screens.

Most of the annuals are sources of cut flowers. Some of them also are sources of plants for drying—to be used indoors during the winter.

Whatever your requirements for garden flowers, you probably can find an annual flowering plant that is suitable.

BUYING SEED

To get a good start toward raising vigorous plants, buy good seed.

Be sure your seed is fresh. Do not buy it too far in advance of planting time; for best results, allow no more than a 3-month interval.

TABLE 1.—*Characteristics of selected garden annuals*

Plant	Height	Best use	Remarks
	Inches		
Ageratum	6 to 20	Edging	Tall varieties grown for cut flowers. Good rock-garden plant. Pot and bring in house for winter bloom.
Babysbreath	12 to 18	Borders	Source of cut flowers and plants for drying. Filler material in arrangements. Grows well on alkaline soils.
Balsam	20 to 28	Bedding	Good window-garden plant. Will not tolerate wet or cold weather.
Calendula	14 to 18	do	Source of cut flowers; good window-garden plant.
Calliopsis	18 to 24	Bedding, edging.	Source of cut flowers. Blooms quick, lasts all summer.
Candytuft	9 to 12	Edging, bedding.	Rock-garden plant. Filler. Select dwarf ones for bedding.
China-aster	12 to 24	Bedding	Source of cut flowers.
Cockscomb	16 to 40	do	Source of cut flowers and plants for drying.
Coleus	20 to 24	do	Perennial grown for decorative foliage. Good plant for window gardens.
Cornflower	16 to 36	do	Source of cut flowers.
Cosmos	30 to 48	Screen, bedding.	Source of cut flowers. Background.
Dahlia	18 to 40	Bedding, edging.	Source of cut flowers. Blooms early.
Forget-me-not	8 to 12	Bedding, borders.	Source of cut flowers. Does not withstand heat.
Four-o'clock	20 to 24	Bedding.	
Gaillardia	12 to 18	Borders	Source of cut flowers and plants for drying.
Globe-amaranth	18 to 24	do	Do.
Impatiens	10 to 12	Bedding	Perennial grown as annual. Good plant for window gardens. Deep-shade plant.
Larkspur	18 to 48	Screen	Source of cut flowers and plants for drying. Make successive sowings for cut flowers.
Lupine	18 to 24	Borders	Source of cut flowers.
Marigold	6 to 30	Bedding	Source of cut flowers; good window-garden plant.
Morning-glory	See "Remarks."	Screen	Vine; grows 8 to 12 feet tall.
Nasturtium	12	Bedding or edging.	Blooms 1 month after sowing. Needs well-drained soil.

TABLE 1.—*Characteristics of selected garden annuals*—Continued

Plant	Height	Best use	Remarks
	Inches		
Pansy	6 to 10	do	Source of cut flowers. Pot plants after bloom, protect for overwinter. Replace with petunia for summer bloom.
Petunia	8 to 24	Bedding	Good plant for window gardens. Long blooming period.
Phlox	6 to 12	do	Withstands heat. More compact than petunias.
Pink	6 to 16	Edging, borders.	Source of cut flowers.
Poppy	12 to 16	Borders	Source of cut flowers. Successive sowings.
Portulaca	6 to 9	Bedding, edging.	Good plant for rock gardens. Withstands heat.
Rudbeckia	20 to 24	Borders, bedding.	Source of cut flowers. Heat loving.
Salpiglossis	24 to 30	Bedding	Source of cut flowers. Does not withstand heat.
Scabiosa	18 to 36	Borders	Source of cut flowers. Remove dead flowers.
Scarlet sage	14 to 36	Borders, bedding.	Short varieties bloom early; tall varieties bloom late.
Snapdragon	10 to 36	Bedding	Source of cut flowers, good plant for window gardens (dwarf).
Spider plant	30 to 36	Borders, hedges.	Long blooming period.
Stock	24 to 30	Bedding	Source of cut flowers; good plant for window gardens. Overwinters in protected areas.
Strawflower	30 to 40	do	Source of cut flowers and plants for drying.
Summer-cypress	30 to 36	Screen	Grown for foliage.
Sunflower	48 to 84	do	Source of cut flowers.
Sweet alyssum	6 to 10	Edging, borders.	Grow in well-drained soil. Damps off easily. Neat and free flowering. Long blooming period.
Sweetpea	See "Remarks."	Screen	Vine, grows 4 to 8 feet long. Source of cut flowers.
Verbena	9 to 12	Bedding	Source of cut flowers. Covers spots left by spring-flowering bulbs.
Vinca	15 to 18	do	Perennial grown as annual. Good plant for window gardens.
Zinnia	18 to 36	do	Source of cut flowers. Endures heat. Foliage frequently mildews.

Old seed saved from previous years may lose much of its vitality under household conditions. It tends to germinate slowly and to produce poor seedlings.

Keep the seed dry and cool until you plant it. Special instructions for storage are printed on some seed packets. Follow these instructions.

When buying seed, look for new varieties listed as F_1 hybrids. Seed for these hybrids costs more than the seed of the usual inbred varieties, but its superiority makes it worth the extra price.

These F_1 hybrids are produced by crossing selected inbred parents. Plants of F_1 varieties are more uniform in size and more vigorous than plants of inbred varieties and they produce more flowers.

Seed of F_2 petunia varieties also is available. These hybrids are not as vigorous as the F_1 hybrids but usually are better than the inbred varieties. This seed costs less than that for F_1 hybrids.

PREPARING THE SOIL

Satisfactory results in growing annuals depend, to a large extent, on thorough preparation of the soil where the plants are to grow.

You can make a scratch in the soil and plant seeds in the scratch and you will probably have flowers growing there before the season is over. But the plants will be spindly and the flowers sparse.

On the other hand, if you prepare beds for annuals as carefully as you would for bulbs or shrubs —by spading deeply, providing adequate drainage, and lightening heavy soil with sand and organic matter—the flowers grown there are almost certain to be outstanding. Water can enter well-prepared soil easily. Seed germinates readily; the plants grow deep, healthy roots, strong stems, and large and abundant flowers. And the benefits of careful soil preparation carry over from season to season.

It is better to grow a small bed of flowers in well-prepared soil than to attempt to grow great masses of flowers in poorly prepared soil.

If you want to plant annuals in bulb beds after the bulbs have bloomed or in shrub beds for decoration while the shrubs are small, little soil preparation will be needed; bulb beds or shrub beds already should be well prepared. Just scratch a half-inch of peat moss into the soil surface before planting annuals.

If you must prepare new beds, begin soil preparation the fall before planting time.

Before preparing new beds, test the soil to see that it is capable of absorbing water from rainfall. Dig a hole about 10 inches deep and fill the hole with water. The next day, fill the hole with water again and see how long the water remains in the hole. If the water drains away in 8 to 10 hours, the permeability of the soil is sufficient for good growth of annuals.

If an appreciable amount of water remains in the hole after

10 hours, it will be necessary to improve the draininge of the planting site; otherwise, water will collect in your prepared flower bed and prevent proper development of roots on your annuals.

To improve drainage, bed up the soil. Dig furrows along the sides of the bed and add the soil from the furrows to the bed. This raises the level of the bed above the general level of the soil. Excess water can seep from the bed into the furrows.

Raised beds are subject to formation of gullies during heavy rains. You can prevent gullying by surrounding the beds with wooden or masonry walls, making, in effect, raised planters of the beds.

Also, raised beds are more subject to drying than flat beds; little moisture moves up into the bed from the soil below. Be sure to water beds frequently.

After forming the beds, or determining that drainage is satisfactory without bedding, spade the soil to a depth of 8 to 10 inches. Turn the soil over completely. In this spading remove boards, large stones, and building trash, but turn under all leaves, grass, stems, roots, and anything else that will decay easily.

Respade three or four times at weekly intervals. If the soil tends to dry between spadings, water it. If weeds grow, pull them before they set seed.

In spring, just before planting, spade again. At this spading, work peat moss, sand, and fertilizer into the soil. Soils east of the Mississippi River may need to be limed.

For an ordinary garden soil, use a 1- to 2-inch layer of peat moss and a 1-inch layer of unwashed sand—available from building-supply yards.

If your soil is heavy clay, use twice this amount of peat and sand. By adding peat and sand to the soil each year, you can eventually improve even poor subsoil to make a good garden soil.

Add a complete fertilizer at this last spading. Use grade 5–10–5 at a rate of 1½ pounds per 100 square feet. Add ground limestone at a rate of 5 pounds per 100 square feet if needed.

Rake the soil surface smooth. After raking, the soil is ready for seeding or planting with started plants.

PLANTING TIMES

Do not be in a rush to start seeds or to set out started plants. As a general rule, delay sowing seed outdoors or setting out started plants until after the last frost.

Most seeds will not germinate well until the soil warms to about 60°. If they are sowed in soil that is cooler than this, they will remain dormant until the soil warms and may rot before they germinate.

Exceptions to this rule are babysbreath, cornflower, gaillardia, globe-amaranth, phlox, poppy, salpiglossis, cleome, stock, strawflower, summer-cypress, sweet alyssum, and sweetpea.

Seeds of these annuals can be sowed in early spring, as soon as the soil can be worked.

Many annuals can be seeded throughout the growing season for a prolonged display of color. Proper times for seeding most of the common annuals are listed in table 2.

Start seed indoors no sooner than 8 weeks before the average date for the last killing frost in your area. If you start seed earlier than this, the plants will be too large for satisfactory transplanting by the time the weather is warm enough for them to be set outside.

SETTING STARTED PLANTS

By setting started plants in your garden you can have a display of flowers several weeks earlier than if you sow seeds of the plants. Use of started plants is especially helpful for annuals that are slow to germinate or that need several months to bloom. Examples of these slow-to-bloom annuals: Candytuft, gaillardia, lupine, rudbeckia, verbena, and scarlet sage.

You can buy plants of these and many other annuals or you can start your own. (See "Starting plants indoors," p. 14.)

When the time comes to set plants out in the garden, remove them from flats by slicing downward in the soil between the plants. Lift out each plant with a block of soil surrounding its roots and set the soil block in a planting hole.

If the plants are in fiber pots, remove the paper from the outside of the root mass and set the plant in a prepared planting hole.

When setting out plants in peat pots, set the entire pot in the planting hole. The pot will break down in the soil and improve the soil around the plant.

After setting the plants, water them with a starter solution made from one tablespoon of high-phosphate fertilizer—grade 10–52–17—in 1 gallon of water.

SOWING SEED OUTDOORS

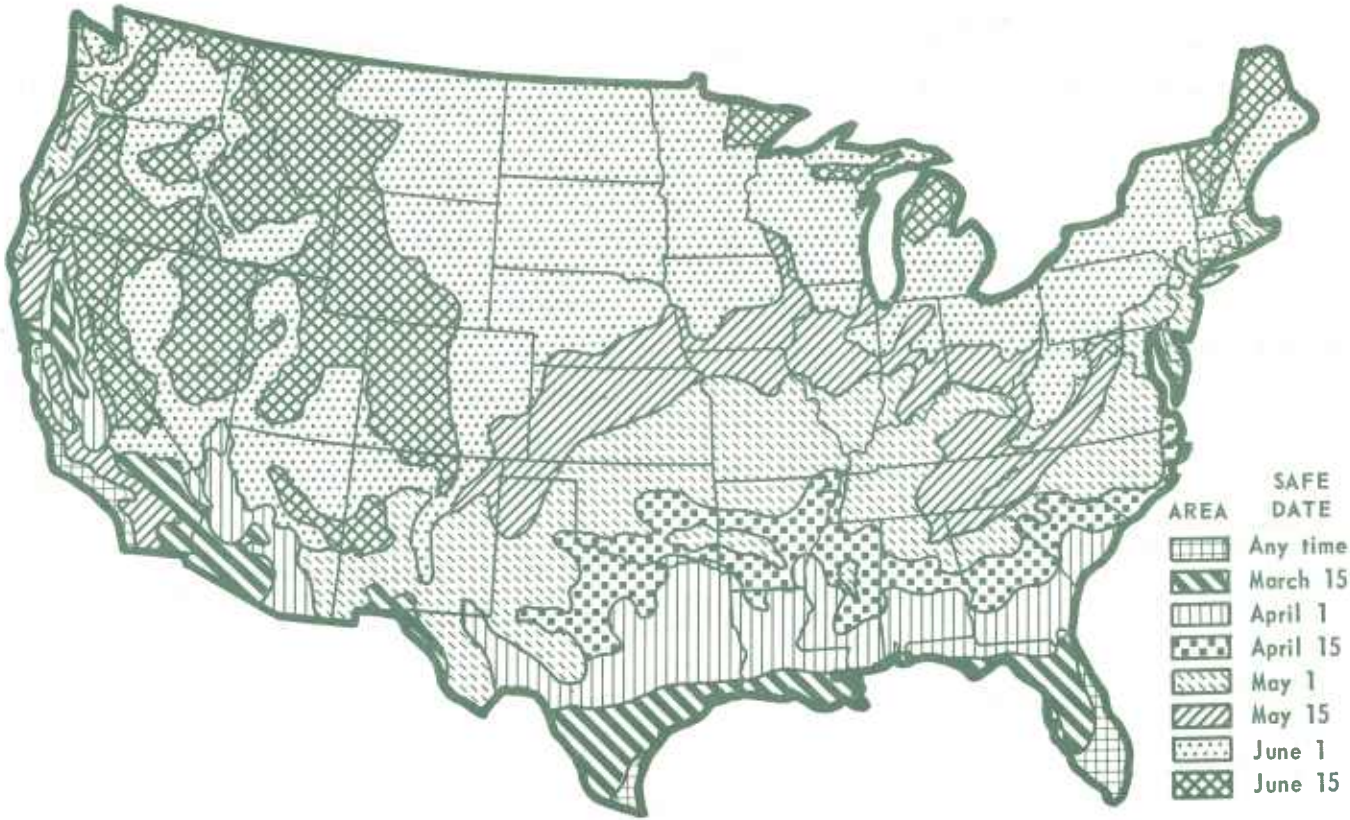
Annuals seeded in the garden frequently fail to germinate properly because the surface of the soil cakes and prevents entry of water. To avoid this, sow the seed in vermiculite-filled furrows.

Make the furrows in the soil about one-half inch deep. After filling them with fine vermiculite, sprinkle them with water.

Then make another shallow furrow in the vermiculite and sow the seed in this furrow. Sow it at the rate recommended on the packet.

Cover the seed with a layer of vermiculite and, using a nozzle adjusted for a fine mist, water the seeded area thoroughly.

To retard water evaporation, cover the seeded area with sheets of newspaper. Support the newspaper on blocks or sticks 1 to 2 inches above the surface of the bed. Remove the paper when seedlings appear.



BN–21042

Frost-safe dates for setting started plants in the garden. Seeds should be started indoors no sooner than 8 weeks before this date.

TABLE 2.—*Planting and culture of selected garden annuals*

Plant	When to plant seed	Exposure	Germination time	Plant spacing	Remarks
			Days	*Inches*	
Ageratum	After last frost	Semishade or full sun.	5	10 to 12	Pinch tips of plants to encourage branching. Remove dead flowers.
Babysbreath	Early spring or summer.	Sun	10	10 to 12	Make successive sowings for prolonged blooming period. Shade summer plantings.
Balsam	After last frost	do	10	12 to 14	
Calendula	Early spring or late fall	Shade or sun	10	8 to 10	
Calliopsis	After last frost	do	8	10 to 14	
Candytuft	Early spring or late fall	do	20	8 to 12	
China-aster	After last frost	do	8	10 to 12	For best plants start early, grow in coldframe. Make successive sowings for prolonged bloom.
Cockscomb	do	do	10	10 to 12	
Coleus	Sow indoors anytime; outdoors after last frost.	Sun or partial shade.	10	10 to 12	
Cornflower	Early spring	Partial shade	5	12 to 14	
Cosmos	After last frost	Sun	5	10 to 12	
Dahlia	do	do	5	12 to 14	For maximum bloom, sow several weeks before other annuals.
Forget-me-not	Spring or summer; shade in summer.	Partial shade	10	10 to 12	
Four-o'clock	After last frost	Sun	5	12 to 14	Store roots, plant next year.
Gaillardia	Early spring through summer; shade in summer.	do	20	10 to 12	
Globe-amaranth	Early spring	do	15	10 to 12	
Impatiens	Indoors anytime. Set out after last frost.	Partial shade or deep shade.	15	10 to 12	
Larkspur	Late fall in South, early spring in North.	Sun	20	6 to 8	Difficult to transplant; grow in peat pots.
Lupine	Early spring or late fall	do	20	6 to 8	Soak seed before planting. Guard against damping-off.

Marigold	After last frost	do	5	10 to 14	High fertility delays bloom.
Morning-glory	do	do	5	24 to 36	Reseeds itself.
Nasturtium	do	do	8	8 to 12	For best flowers, grow in soil of low fertility.
Pansy	Spring or summer; shade in summer.	Sun or shade	10	6 to 8	Does best in cool season.
Petunia	Late fall (in South)	Sun	10	12 to 14	Start early in spring indoors. Keep cool.
Phlox	Early spring	do	10	6 to 8	Make successive plantings for prolonged bloom.
Pink	Early spring, spring or summer; shade in summer.	do	5	8 to 12	Start early in spring indoors. Keep cool. Remove dead flowers.
Poppy	Early spring through summer; shade in summer.	do	10	6 to 10	Difficult to transplant; start in peat pots. Make successive plantings.
Portulaca	After last frost or in late fall.	do	10	10 to 12	
Rudbeckia	Spring or summer; shade in summer.	Sun or partial shade.	20	10 to 14	Perennial grown as annual. Blooms first year.
Salpiglossis	Early spring	Sun	15	10 to 12	Needs support. Avoid cold, heavy soil.
Scabiosa	Spring or summer; shade in summer.	do	10	12 to 14	Keep old flowers removed.
Scarlet sage	do	do	15	8 to 12	
Snapdragon	Spring or late fall	do	15	6 to 10	Start cool, pinch tips to encourage branching.
Spider plant	Early spring; spring, or fall.	do	10	12 to 14	Reseeds freely. Pinch to keep plant short. Water and fertilize freely.
Stock		do	5	6 to 10	
Strawflower	Early spring	do	5	10 to 12	
Summer-cypress	do	do	15	18 to 24	
Sunflower	After last frost	do	5	12 to 14	
Sweet alyssum	Early spring	do	5	10 to 12	Damps off easily. Sow in hills, do not thin.
Sweetpea	Early spring or late summer through late fall.	do	15	6 to 8	Select heat-resistant types.
Verbena	After last frost	do	20	18 to 24	Pinch tips often to encourage branching.
Vinca	do	do	15	10 to 12	Avoid overwatering.
Zinnia	do	do	5	8 to 12	Thin after plants begin to bloom; remove poor-flowering plants.

THINNING

When the most outdoor-grown annuals develop two true leaves, they should be thinned to the recommended spacing (table 2). This recommended spacing allows the plants to have enough light, water, nutrients, and space for them to develop fully. If they have been seeded in vermiculite-filled furrows, the excess seedlings can be transplanted to another spot without injury.

Zinnias are an exception to this rule of thinning. In every variety of zinnias will appear plants with undesirable flowers of the "Mexican-hat" type. The only way to avoid having these undesirable flowers in your garden is to wait until the plants have bloomed for the first time before you thin them to their final spacing.

The recommended spacing for zinnias is 8 to 12 inches. When the plants develop two true leaves, thin them to 4 to 6 inches, transplanting the extra plants.

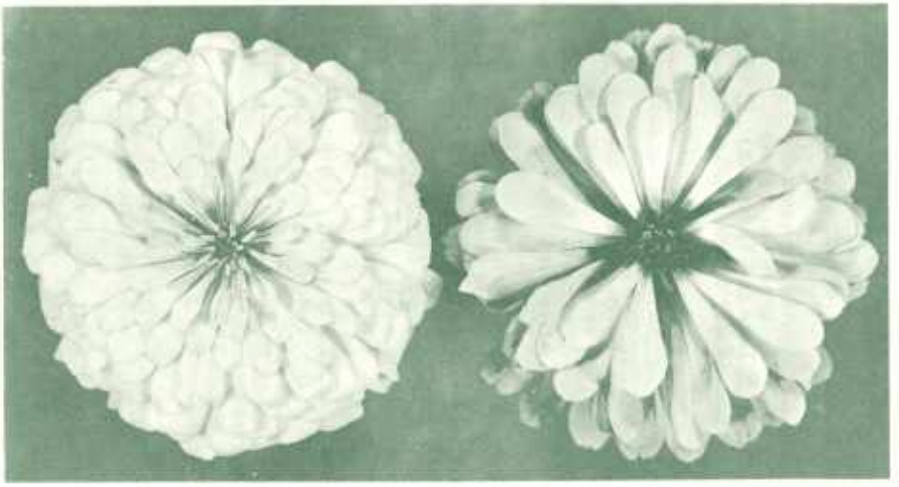
Then when they bloom—they will still be quite small—pull and destroy plants having the undesirable flowers. Then thin the remaining plants to the 8- to 12-inch spacing.

Another exception to the rule for thinning is sweet alyssum. This annual is particularly susceptible to damping-off. To insure a good stand of plants, sow the seed in hills and do not bother to thin the seedlings.

WATERING

Do not rely on summer rainfall to keep your flower beds watered. Plan to irrigate them from the beginning.

When you water, moisten the entire bed thoroughly, but do not water so heavily that the soil be-



BN–17998–X

Zinnia flowers: *Left,* Desirable type of fully double flowers; *right,* semidouble "Mexican-hat" flowers.

comes soggy. After watering, allow the soil to dry moderately before watering again.

A canvas soaker hose is excellent for watering beds. Water from the soaker hose seeps directly into the soil without waste. The slow-moving water does not disturb the soil or reduce its capacity to absorb water.

Sprinklers are not as effective as soaker hoses. Water from sprinklers wets the flowers and foliage making them susceptible to diseases. Structure of the soil may be destroyed by impact of water drops falling on its surface; the soil may puddle or crust, preventing free entry of water.

The least effective method for watering is with a hand-held nozzle. Watering with a nozzle has all the objections of watering with a sprinkler. In addition, gardeners seldom are patient enough to do a thorough job of watering with a nozzle; not enough water is applied, and the water that is applied usually is poorly distributed over the bed.

MULCHING

Mulches help to keep the soil surface from crusting, aid in preventing growth of weeds, and add organic matter to the soil. Grass clippings make a good mulch for annuals.

Sheet plastics or aluminum foil also may be spread over the soil surface to retard evaporation of water and to prevent growth of weeds. However, these materials are unsightly for use in the flower garden.

CULTIVATING

After plants are set out or are thinned, cultivate only to break crusts on the surface of the soil. When the plants begin to grow, stop cultivating. Pull weeds by hand. As annual plants grow, feeder roots spread out between the plants; cultivation is likely to injure these roots. In addition, cultivation stirs the soil and uncovers other weed seeds that then germinate.

REMOVING OLD FLOWERS

To maintain vigorous growth of plants, remove mature flowers and seed pods. This step is particularly desirable if you are growing ageratum, calendula, cosmos, marigold, pansy, rudbeckia, scabiosa, or zinnia.

INSECT PESTS

Do not apply an insecticide unless it is necessary to prevent damage to your flowers or shrubs. Most of the insect pests in your garden will not cause appreciable damage if you protect their predators and parasites by avoiding unnecessary applications of insecticides. However, if you have a pest that usually causes serious damage unless an insecticide is used, apply the insecticide when the infestation first appears.

Watch for such insect pests as spider mites, aphids, Japanese weevils and other weevils, lacebugs and thrips; these are some

of the insects most likely to need prompt treatment with insecticides. Do not treat for soil insects unless you find numbers of cutworms, white grubs, or wireworms when preparing the soil for planting.

For aid in identifying insect pests consult your county agricultural agent, the agricultural college or experiment station, or your local garden supply store.

When using a pesticide be certain that the pest and the flower or shrub are indicated on the label. Read and follow all directions for use, including precautions, shown on the label.

If pesticides are handled, applied, or disposed of improperly, they may be injurious to human beings, desirable plants, or flowers and beneficial insects. Use pesticides only when needed and handle them with care.

CUTTING FLOWERS

Grow plants for cut flowers in a section of the garden by themselves. Do not mix them with border plants.

Early in the season, when the plants first begin to bloom, whole plants can be removed and used in flower arrangements. Let the remaining plants in the beds develop. Remove all old flowers and promote formation of new shoots and flowers by watering and fertilizing.

Later flowers have longer stems than the early flowers. They can be removed from the plants for use in flower arrangements.

DRYING FLOWERS

As for cut flowers, grow plants for drying in a section of the garden by themselves. Remove whole plants for drying at the following times:

Plant	*Time to cut*
Babysbreath	When flowers are well formed.
Cockscomb	When in color but before seed sheds.
Gaillardia	When in full color but before petals dry.
Globe-amaranth	When mature.
Larkspur	When oldest floret matures; plant forms a spike.
Strawflower	When buds begin to open.
Zinnia	When in full color but before petals begin to dry.

After cutting, hang the plants upside down in a shady place to dry. Use them in flower arrangements during the winter.

STARTING PLANTS INDOORS

Unless you are willing to invest in special lighting equipment and to devote considerable care to starting plants indoors, it usually is best to buy plants or to sow seed of annuals directly in the garden. Home-started plants seldom are as satisfactory for setting out as those bought from nurserymen. And they seldom grow as well or bloom as prolifically as those planted directly in the garden.

Home-started seedlings frequently are attacked by a fungus disease—damping-off. Those seed-

lings that escape the disease usually are weak and spindling and never become good garden plants; conditions of light, temperature, and humidity normally found in the home are not favorable for plant growth.

Damping-Off

Damping-off causes seeds to rot and seedlings to collapse and die. The disease is carried in soil and may be present on planting containers and tools. Soil moisture and temperature necessary for germination of seeds also are ideal for development of damping-off.

Once the disease appears in a seed flat, it may travel quickly through the flat and kill all seedlings planted there.

This can be prevented.

Before planting, treat the seed with a fungicide. Sterilize the soil, and use sterile containers.

Treat the seed with thiram. Tear off the corner of the seed packet and, through the hole in the packet, insert about as much fungicide dust as you can pick up on the tip of the small blade of a penknife. Close the hole by folding over the corner of the packet, then shake the seed thoroughly to coat it with the fungicide dust.

Sterilize the soil in an oven. Fill a container—a pan or metal tray—with moist—but not wet—soil, bury a raw potato in the center of the soil, and bake the container of soil in a medium oven.

When the potato is cooked, the soil should be sterile.

To avoid introducing the damping-off organism on containers, use fiber seed flats or peat pots. These containers are sterile, inexpensive, and easily obtainable from garden shops.

Fiber flats are light and strong. They cost so little that they can be thrown away after one use.

Peat pots can be set out in the garden along with the plants they contain; roots of the plants grow through the walls of the pots. Plants grown in peat pots suffer no setback when they are transplanted to the garden. Larkspur and poppy, which ordinarily do not tolerate transplanting, can be grown in peat pots satisfactorily.

If you use wooden boxes or clay flower pots for soil containers, clean them well. Soak clay pots in water and scrub them well to remove all of the white fertilizer crust from the outside.

Sterilize clay pots and boxes by baking them in the oven when you are sterilizing the soil mixture. Or swab the pots and boxes with a solution of 1 part chlorine bleach to 10 parts water. Allow the containers to dry thoroughly before filling them with soil.

If, despite your precautions, damping-off appears in your seedlings, it is best to discard the containers and soil and start over.

Starting Seeds

The best soil for starting seeds is loose, well drained, fine textured, and low in nutrients. To prepare a soil having these properties, mix equal parts of garden

BN-21036

BN-21035

BN-21033

BN-21041

BN-23911

BN-21034

STARTING SEEDS

A. Use sterile containers and planting medium—sterilized soil or vermiculite. B. Press the moist planting medium firmly in the container. C. Tap the seed packet with your forefinger to distribute the seed at the rate recommended on the label. D. Cover large seeds with a layer of fine vermiculite. Leave small seeds uncovered. E. Wet the seeded container until water runs out of the bottom. F. Place the seeded container in a polyethylene bag and keep it in a warm place until the seeds germinate. Then remove the bag and begin watering and fertilizing the seedlings.

BN-21032

BN-21039

BN-21043

BN-21038

BN-21040

BN-21037

TRANSPLANTING

A. When seedlings have developed two true leaves (left), transplant them to another container. The plants on the right have been allowed to get too large before transplanting. B. Using a knife blade, carefully lift seedlings from the planting container. C. Make a slit with the knife blade in the vermiculite in the new container and set the seedling in the slit. Firm the vermiculite around the roots with your forefingers, taking care not to crush the seedling. D. Fertilize seedlings twice a week. Seedlings on the left were not fertilized; those on the right, the same age, were fertilized twice weekly. E. Seedlings, 8 weeks old, ready to be transplanted to the garden. Note roots growing through the walls of the peat pot. F. The petunia seedling on the left is about the right size for setting in the garden. The plant on the right is too large.

soil, sand, and sphagnum peat moss.

Fill soil containers about two-thirds full with this mixture. Level the soil and soak it thoroughly. Then sift more of the soil mixture through window screening to form a layer that fills one-fourth to one-half of the remaining depth of the container.

Make a furrow one-fourth of an inch deep in the fine soil. Sow large-seeded plants—cosmos, zinnia, marigold, nasturtium, cornflower, sweetpea, morning-glory, or four-o'clock—directly in the bottom of the furrow. Before sowing small-seeded plants, fill the furrow with vermiculite; sow small seeds on the surface of the vermiculite.

Sow seeds in flats at the rate recommended on the seed packet. If you are growing large-seeded plants in peat pots, sow two to four seeds in each pot.

After you have sowed the seeds, cover all furrows with a thin layer of vermiculite, then water with a fine mist.

Place a sheet of polyethylene plastic over the seeded containers and set them in the basement or some other location where they can be kept at a temperature between 60° and 75°.

The containers need no further water until after the seeds have germinated. Nor do they need light. Under no circumstances should the plastic-covered containers be placed in sunlight; heat buildup under the plastic could kill emerging seedlings.

Raising Seedlings

SUPPLYING LIGHT.—As soon as the seed has germinated, remove the plastic sheeting and place the seedlings in the light.

Many gardeners supply light to the seedlings by placing the containers on a window sill. This practice usually is unsatisfactory; light on a window sill usually is diffused, it comes from only one direction, and the period of strong daylight varies from day to day. In addition, the air surrounding plants on a window sill is too dry and the temperature is too high.

For best results, seedlings should be raised under lighting conditions that can be closely controlled as to intensity and duration.

Use a fluorescent tube as the light source. For proper intensity, place the containers 6 inches below the tube. Control the duration of lighting by connecting the fluorescent fixture to a timer such as is used for controlling refrigerators or air conditioners.

Some plants develop best for setting out if they are grown under short-day conditions—10 to 12 hours of light each day. Under these conditions they produce compact plants that flower only after they are set outside. These plants usually do best also if the temperature is kept between 60° and 65°. Grow the following seedlings on short days:

Calliopsis	Petunia
China-aster	Phlox
Cornflower	Poppy
Gaillardia	Portulaca
Globe-amaranth	Rudbeckia

Salpiglossis	Snapdragon
Scabiosa	Verbena

Most plants need longer days—18 hours of light each day. If they are started on short days they soon begin to form flowers, and they never produce good bedding plants. Grow the following seedlings with a day length of 18 hours and a temperature of 65°:

Cockscomb	Morning-glory
Cosmos	Scarlet sage
Dahlia	Sunflower
Marigold	Zinnia

If your plants are on neither of these lists, grow them with a day length of 18 to 20 hours.

Day length is not important for plants grown at temperatures of 50° to 55°. However, seedlings grown at these low temperatures develop more slowly than those grown at 60°.

WATERING AND FERTILIZING.—After the plastic is removed from the container, the new plants must be watered frequently, and they must be fertilized. You can do both of these jobs at one time by using a solution made by mixing 1 tablespon of soluble fertilizer in 1 gallon of water.

When you use this solution, moisten the soil thoroughly. And be careful not to wash out the seedlings when you water them. To avoid this, use a rubber-bulb syringe—available from garden stores—to apply the solution as a fine mist.

If you do not have a syringe, you can place the solution in a container that is somewhat larger than the seed containers and submerge the pots or flats up to their rims in the solution. This waters the plants from the bottom. Remove the pots or flats from the solution as soon as the soil is thoroughly moistened.

You also can water flats without disturbing the soil if you sink a small flower pot in the center of the flat and pour the water in the pot.

Transplanting

When seedlings develop two true leaves, thin those in peat pots to one seedling per pot. Transplant those in flats to other flats.

Using a knife or spatula, dig deeply under the seedlings in the flats, lifting a group of the seedlings. Let the group of seedlings fall apart and pick out individual plants from the group. Handle the seedlings as little as necessary. Don't pinch them.

Set the seedlings in new flats that contain the same soil mixtures as was used for starting the seed. Space the seedlings about 1½ inches apart in the flats.

Water thoroughly and replace the seedlings under the fluorescent lights. Continue watering and fertilizing the plants until time for setting them out.

If you must hold seedlings indoors longer than 8 weeks after sowing, transplant them to a flat containing pure sphagnum moss. Do not fertilize them. For best results, however, plan ahead so that it is unnecessary to hold seedlings longer than 8 weeks.

Washington, D.C. Revised October 1975

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 35 cents
Stock Number 001-000-03411-1
Cat. No. A.1.77:91/6

☆ U.S. GOVERNMENT PRINTING OFFICE: 1975 O—570-866