



## GERANIUM CULTURE FOR HOME GARDENERS

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Geraniums are among the most popular flowering plants. Outdoors they are used as annual bedding plants, in hanging baskets, in pots and in window boxes. Indoors they are cultured as houseplants in sunny locations.

Common geraniums are actually members of the genus *Pelargonium*, while members of the genus *Geranium* include native wildflowers and herbaceous perennials. Major types of common geraniums grown by home gardeners include:

**Common Garden Geraniums or Zonal Geraniums** - *Pelargonium x hortorum* is the common geranium. Sold as bedding plants, they are compact in habit and often have fancy leaves marked by distinct bands or zones of darker pigments, tri-colored leaves or leaves with silver or white markings. Flowers may be single or double, are clustered into heads, and range from red, pink, salmon and white.

**Martha Washington Geranium** - *Pelargonium x domesticum* is sold by florists during the winter as a flowering pot plant. It is not heat tolerant, and will not perform as well outdoors as common geranium.

**Ivy-Leaved Geraniums** - *Pelargonium peltatum* is the ivy-leaved geranium. It has a vinelike growth habit with smooth, leathery leaves and flowers with narrower

petals and less dense flower heads. It is commonly seen in Europe used in window boxes, and is attractive in hanging baskets where it may grow to 3 or more feet in length.

**Scented-Leaved Geraniums** - *Pelargonium graveolens* is the Rose-scented geranium; *P. crispum* is the Lemon-scented geranium; *P. x fragrans* is the Nutmeg geranium; *P. odoratissimum* is the Apple-scented geranium; and *P. tomentosum* is the Peppermint geranium. Plants have a wide range of foliage types and habits; and are used for making potpourris, sachets, and to flavor teas. They make excellent houseplants, and many have soft, finely textured foliage which is pleasing even though the flowers are small and not showy.

**Mosquito Geraniums** - A new plant developed by implanting genes of one species into another is the "Mosquito Plant," a scented *Pelargonium* species with introduced genes which code for production of oil of citronella. The citronella fragrance is released when the leaves are rubbed or crushed. Commercially, oil of citronella is extracted from the tropical grass, *Cymbopogon nardus*, called Citronella grass. The "Mosquito Geranium" is advertised as a natural mosquito repellent, but research has not been conducted to prove the validity of this claim.

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**Cultivars** - Popular bedding plant cultivars of common geranium are 50% seed grown and 50% cuttings-grown. Seed grown cultivars are described below (a "series" is a group of different colored individuals within a cultivar):

'Dynamo' Series - 5 colors, early flowering (90-95 days from seed), small plants (8 - 10 inches) with small leaves.

'Elite' Series - 6 colors, very early flowering (85 - 95 days from seed), profuse blooming, large flowers in well rounded heads held just above the foliage on small plants.

'Multibloom' Series - 8 colors, very early flowering, more flower heads, deeply zonal leaves, small plants, occasional poor field performance.

'Orbit' Series - 17 colors, early flowering, medium sized, dependable plants.

'Pinto' Series - 11 colors, large plants (12 - 14 inches tall), mid-early flowering (110 days from seed), deeply zonal leaves, great garden performance.

'Ringo 2000' Series - 9 colors, earliest blooming (92-97 days from seed), very consistent, fast germination, medium sized plants (10-12 inches tall), very good garden performance.

'Maverick Star' - rose and white bicolor flowers.

'Orange Appeal' - first hybrid seed grown geranium with brilliant orange colored flowers.

'Tetra Scarlet', 'Freckles' - Tetraploid (3 sets of chromosomes instead of normal 2) plants are huskier and bear extra large flowers.

Cuttings-grown cultivars were tested in 1995 at Penn State University, where the following were found to be good performers: 'Evening Glow', 'Julia', 'Lucille', and 'Medallion Dark Red'; the following were fair to good performers: 'Angel', 'Cotton Candy', 'Gypsy', 'Lollipop', 'Melody', 'Morning Mist', 'North Star', 'Peaches', and 'Sassy Dark Red'; 'Red Hots' was judged fair; and the following were

judged poor to fair performers: 'First Kiss', 'Jelly Bean', and 'Love Song'.

**Bedding Plant Evaluations** - Each year cultivars of geraniums and other bedding plants are evaluated in the annual NC State University Bedding Plant Trial Gardens, a report of which can be viewed at the internet address <<http://www2.ncsu.edu/floriculture/>>

**Indoor Culture** - Geraniums make attractive and interesting houseplants. All types perform and flower best under high light intensity but will survive under moderate light. Temperatures of 65 to 70 degrees F during the day and around 55 degrees F at night are ideal. Grow in a well drained potting mix for houseplants. Fertilize with a water soluble houseplant fertilizer monthly in spring and summer, and every other month during the fall and winter. For more information refer to Horticulture Information Leaflet No. 8554, *Indoor Plant Selection and Care*.

**Outdoor Container Culture** - Geraniums make attractive additions to the landscape when grown in containers at entrances, on decks and patios, or in window boxes. Choose pots at least 8 to 12 inches in diameter, large enough to hold enough substrate for a good root system, and to contain enough water to prevent wilting during hot, dry weather. Plants may need to be repotted into larger containers later in the season if they have grown large and begin to wilt between waterings. Water as often as needed to prevent wilting, because the leaves of wilted plants turn yellow and drop off, resulting in unattractive, leggy plants. Select containers with adequate drainage holes, and do not allow pots to sit in saucers of water. Instead, place the pot on a layer of gravel in the saucer. Avoid overhead watering which wets leaves and flowers, which can encourage development of diseases. Do not use heavy clay garden soils which may not provide sufficient aeration. A mix of equal parts of garden soil, peat moss and perlite makes a good growing medium. Leaf mold, composted pine bark or composted yard waste can be substituted for peat moss. Mix in 1/2 teaspoon of a complete garden fertilizer plus one teaspoon of dolomitic limestone per volume of each 8 inch pot. Commercial potting mixes are ready to use, light in weight, convenient for gardeners and support good growth of geraniums.

**Bedding Plant Culture** - Geraniums should not be planted outdoors until all danger of frost is past and the soil has warmed. Geraniums grow best where they receive at least 6 to 8 hours of sunlight daily. Flowering is reduced and diseases may be more problematic in the shade. Good air circulation is beneficial, but protect from strong winds which can break the brittle branches.

Soil in the flower beds should be well drained. Consult Horticulture Information Leaflet No. 555, *Installation and Maintenance of Landscape Bedding Plants*, for more information.

A soil pH of 6.5 (mildly acid) is ideal, with poor growth occurring below pH 5.5. Submit a soil test to the North Carolina Department of Agriculture, and follow recommendations for addition of lime to raise soil pH.

Proper fertilization of geraniums is of utmost importance. Geraniums respond well to fertilization and are stunted and yellowed in soils lacking a ready source of nitrogen. Make sure that organic matter added is well decomposed, or it may rob nitrogen from the geraniums as it decomposes. A garden fertilizer with a N-P-K analysis of 5-10-5 or 6-12-12 applied at a rate of 2-3 pounds per 100 square feet (one heaping teaspoonful per square foot) is recommended before planting. Through the growing season geraniums require fertilization every 4 to 6 weeks. Apply 10-10-10 or 8-8-8 at the rate of 2 pounds per 100 square feet. Choose a fertilizer with a slow release form of nitrogen to guard against leaching of nitrogen during heavy rains, which may damage ground and surface water quality, and to ensure a steady supply of nitrogen to the growing plants. Consult Horticulture Information Leaflet No. 551, *Bed Preparation and Fertilization Recommendations for Bedding Plants in the Landscape*, for more information.

Transplant geraniums after all danger of late frost is past in your area. Geraniums are easy to transplant and establish quickly after soils are warm in the spring. If bedding plants have a heavy, dense root ball, knock the potting mix out and break up the root ball before planting. Break up or remove peat pots, never letting the peat pot extend above the soil

surface, as this wicks water away from the roots. Plant geraniums at the same level as they were growing in pots--not deeper, and not shallower.

Mulching with pine straw, pine bark chips or shredded hardwood bark mulch is recommended to conserve water in the soil and prevent splashing of soil onto plants during heavy rains, which may spread disease organisms. Apply mulch after the soil warms in the spring. A 1-2 inch layer of mulch is adequate to reduce high soil temperatures during the summer, prevent soil crusting, improve aeration and reduce weed growth.

Water geraniums sufficiently to prevent wilting in the landscape, at least once per week if rainfall is not adequate. Soaker hoses and drip irrigation are preferred for water conservation and to keep water off of the foliage, which contributes to disease problems. If using overhead irrigation, water early enough in the day to allow leaves and flowers to dry before nightfall, which will help prevent disease problems.

**Propagation** - Most geraniums root easily from stem cuttings, and many cultivars must be vegetatively propagated to maintain desired flower and/or leaf color, shape and scent. Propagate in the fall, allowing for 3-4 weeks of frost-free weather for rooting to take place. Take cuttings from September (Mountains) to October (Coastal Plain) from healthy mother plants which have been kept rather dry for several weeks. Take cuttings 3 to 4 inches in length from the growing tips of branches. Trim off the leaves from the base of the cutting, stick them into a coarse, sandy medium in small pots or flats, and water well. Provide indirect light and do not allow the cuttings to dry out. After roots are formed, place cuttings in full sun and water only enough to keep the cuttings from shriveling. Keep the surface soil dry to reduce diseases. Fertilize with a water soluble fertilizer every two weeks.

Many bedding geraniums are seed grown. Geranium seeds have a very hard seed coat which can inhibit germination, so home gardeners often scarify seeds (scratch to break the seed coat) to allow water to enter. Sow seeds in winter approximately 3 months before the last frost date. Sow in a flat in commercial seed starting medium, spacing seeds  $\frac{1}{4}$  inch apart in a row,

with 1 to 2 inches between rows, covering lightly and maintaining the flats at 72°F. Keep the medium moist but not overly wet by misting. A plastic “greenhouse top” or plastic wrap draped over the flat will ensure high humidity, but don’t forget to vent the flats if placed in direct sunlight. Germination usually occurs in 7 to 14 days, but may be delayed and irregular. After germination, reduce the humidity, keep seedlings well ventilated and somewhat dry, but never allow the seedlings to dry out completely. The young seedlings must be carefully pricked out and transplanted into larger containers, such as 4 inch pots. Grow the young geraniums with 72° F days and 65°F nights. Supply supplemental light from fluorescent tubes to give 14 to 18 hours of light per day. Fertilize every two weeks with a water soluble plant food from the time of germination until planting outdoors. Most geraniums will flower in 95 to 110 days from germination.

**Overwintering Geraniums** - Although geraniums can be overwintered, this can result in carry-over of diseases and insect pests from year to year; so it may be best to purchase new plants each spring. Gardeners wishing to overwinter their geraniums can try several techniques: Take cuttings in the fall and keep the small, potted plants on a windowsill with a bright, sunny southern exposure during the winter. Large geraniums can be dug from the garden before the first frost and planted in pots large enough to accommodate their root system. Cut the top of the plant back to 6 inches in height, and place in a sunny area such as a heated porch. An old method of overwintering geraniums is to dig the plants before the first frost, knock the soil from their roots, and hang the plants upside down in a cool, moist basement with 80% humidity and temperatures between 35-45 degrees F where they will not freeze. If plants begin to dry out, periodically take them down and soak the roots in water. In spring, take the plants down, cut off 1/2 to 3/4 of the top growth, and replant outdoors.

**Disease Problems** - For current disease control recommendations consult the county Agricultural Extension Agent, or consult the *N. C. Agricultural Chemicals Manual* on the internet at <<http://ipmwww.ncsu.edu/agchem/agchem.html>> and always follow label directions.

**-Bacterial Leaf Spot/Blight** (*Xanthomonas campestris* pv. *pelargonii*) causes spotting of the leaves, leaf drop and black rot of the stems. The disease is favored by warm, humid weather, crowding of plants and planting infected stock. To control, pick off and discard all leaves with spots. Avoid splashing water around plants. Watering by soaker hose to keep plants dry, watering in the morning so foliage can dry off, and sprays of copper fungicides are effective.

**-Alternaria Leaf Spot** (*Alternaria tenuis*) is a fungal leaf spot resembling bacterial leaf spot. The control measures are the same as for bacterial leaf spot.

**-Black Leg** (*Fusarium* sp.) and **Black Stem Rot** (*Pythium splendens*) occur on cuttings and occasionally on full grown plants. The rot starts at the base of the cutting and progresses upward, blackening the stem and defoliating the plant. To control, take cuttings only from healthy plants which have been kept dry, root in sterilized rooting medium, and employ sanitation with a bleach solution to sterilize cutting tools and flats. Fungicidal drenches may help control the spread from plant to plant.

**-Botrytis Gray Mold, Leaf Spot and Blossom Blight** (*Botrytis cinerea*) is very common during cool, moist weather. Water soaked lesions occur first, which later dry out and are covered with a grayish brown mass of fungal growth. When the petals are infected they become discolored, wilt and fall off. To control, remove old flowers and do not crowd plants in the landscape to insure good air circulation. Plant in full sunlight, keep plants on the dry side, and use fungicidal sprays if the disease is severe.

**-Rust** (*Puccinia pelargonii-zonalis*) causes powdery, golden brown pustules on the leaves, petioles and stems. The leaves turn yellow and drop prematurely. To control, avoid purchasing infected plants, and spray with fungicides if the disease is found in the landscape.

**-Virus diseases** can be transmitted from infected mother plants to cuttings made from these stock

plants. Although at one time of commercial importance, virus-indexing has removed viruses from stock plants and viruses are no longer commonly seen. To control, discard any plants with virus-like symptoms such as mosaic, distortion or leaf spots, and practice sanitation when propagating cuttings.

**-Root knot nematodes** may cause galls and swellings on the roots, with stunted plant growth and death. To control, destroy infested plants, rotate planting areas and never re-plant in known infested areas. Plant geraniums in pots of sterilized soil if the infestation is severe.

**-The physiological problem oedema or dropsy** occurs during the winter, when plants are over-watered indoors. Water soaked lesions develop when later become corky and rust colored. Reduce watering and increase the light levels to control this problem.

**Insect Pests** - For current insect control recommendations consult the county Agricultural Extension Agent, or consult the *N. C. Agricultural Chemicals Manual* on the internet at <<http://ipmwww.ncsu.edu/agchem/agchem.html>> and always follow label directions.

**-Aphids** frequently infest geraniums. Encourage beneficial predators such as lady bugs and syrphid flies; spray with horticultural oils such as Sunspray oil; spray with insecticidal soap such as M-Pede.

**-Various caterpillars** such as the cabbage looper, the fall cankerworm, leaf rollers and leaf tiers may infest geraniums. Caterpillars can be controlled with sprays of *Bacillus thuringiensis* (Dipel, Bt).

**-Greenhouse whitefly** is very problematic and may come into the garden on infested plants. Infested leaves turn yellow and fall; small, snowy white flies are seen on the undersides of the leaves; and a black sooty mold may be seen growing on the sugary whitefly excrement on the upper leaf surface. Control with sprays of insecticidal soap, horticultural oils or currently recommended insecticides. Never purchase plants with whitefly infestations.

**-Mites** can cause young leaves to appear scorched, then curl and drop off. Control with sprays of insecticidal soap, horticultural oils and currently recommended miticides.

**-Subterranean termites** may attack landscape or pot grown geraniums, where they tunnel through the stems and cause the plants to wilt, turn yellow and die. Clean out infested pots or planting beds, destroy any visible termite tunnels, and treat the soil with a recommended insecticide to kill the termites. Check for termite tunnels on the foundation of the house, and take care that termites do not travel from foundation plantings into the structure of the house.

**-Slugs** may be problematic; they can be trapped with saucers of stale beer.

**Herbicide Tolerance** - For current weed control recommendations consult the county Agricultural Extension Agent, and always follow label directions. Geraniums are tolerant to the herbicides bensulide (Betasan), DCPA (Dacthal), napropamide (Devrinol) and oryzalin (Surflan) when applied over the top of established plants for **pre-emergence** control of broadleaf and grassy weeds. For **post emergence** control of grassy weeds, fluazifop (Fusilade DX) and sethoxydim (Vantage) can be applied over the top of established geraniums in the landscape.