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NebGuide

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Geraniums *(Pelargonium)*

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Geraniums are a popular indoor and outdoor plant. This NebGuide describes how to care for them, including overwintering and treating for diseases.

Geraniums are one of the most popular decorative plants for both indoor and outdoor use. There are two different groups of plants known as geraniums. The showy, flowering geraniums, normally grown as indoor and outdoor plants in Nebraska, are members of the genus *'Pelargonium.'* They are subtropical in origin and are treated as annuals in Nebraska, since they do not overwinter outdoors.

Members of the genus *'Geranium,'* which are winter hardy outdoor plants, are usually called the 'hardy geraniums' or cranebills. They are good additions to the perennial landscape border. Hardy geraniums are often grown as much for their decorative foliage as for their flowers. This NebGuide provides information about the *Pelargonium* geraniums.

Pelargonium geraniums range in height from a few inches to several feet, depending on the cultivar, age and maintenance of the plant. Many forms, types and species are available with great variation in leaf, flower and growth characteristics of geraniums.

Common Garden Geraniums or Zonal Geraniums usually have distinct leaf markings. This category includes selections with tri-colored or silver leaves, leaves with bands or zones of red or white and deeply pleated or frilly foliage. Flower colors range from deep burgundy to red and pink to salmon and white, and they may be single or double petaled. They are usually sold as bedding plants.

Regal or Martha Washington Geraniums are more often sold as indoor plants because they usually are not as heat tolerant as other geraniums. They are noted for their large flowers, attractive foliage and extended flowering time and are usually propagated from cuttings. Other names for this group of geraniums include pansy, fancy or hothouse geraniums. High temperatures can inhibit flower bud formation on regal geraniums.

Ivy-leafed or Trailing Geraniums have ornamental leaves that trail and resemble ivy foliage. The flower color range is similar to that of the common garden geraniums. They are commonly used in hanging baskets and window boxes.

Scented-leafed Geraniums are prized for their foliar aromas. Scents include lemon, rose, peppermint, nutmeg and others. Oils are emitted when the leaves are rubbed or crushed. Many have deeply lobed, soft-textured leaves, often in shades of grey-green. The flowers are usually small and sparse. They are popular in herb gardens and along paths.

Mosquito Geraniums are plants developed by introducing a gene from Citronella grass into a scented *Pelargonium* species. When rubbed or crushed, these geraniums release the citronella oil, which is supposed to repel mosquitoes. The validity of this claim has not been well documented.

When purchasing geranium plants, look for sturdy plants with good leaf color, a bushy habit instead of a single, top-heavy stem and no symptoms of disease or insect problems.

Indoor Care

Pelargonium geraniums make attractive house plants. They can be grown indoors for their ornamental value, as well as to maintain them for re-use in the landscape the following spring. They do best in full sunlight indoors but tolerate moderate light. Indoor temperatures that average 65 to 70°F during the day, and around 55°F at night are considered optimal. Avoid locating them in extremely cold, hot or drafty areas.

Fertilize monthly from March through October and every other month during the fall and winter months. Use one tablespoon of 20-20-20 fertilizer, or two tablespoons of a 10-10-10 fertilizer per gallon of water or a similar formula. If in a low-light area, reduce the rate of fertilization accordingly.

A growing medium that is high in organic material, such as a freely-draining mix for houseplants, is satisfactory for

geraniums. Another good growing mix consists of equal parts garden loam, peat moss and coarse sand or perlite.

Allow the soil to become moderately dry between waterings, and make sure there is one or more drainage holes in the bottom of each container. Good drainage is essential.

Outdoor Care

Pelargonium geraniums enjoy a long growing season and enhance landscaping when planted directly in the ground; in hanging baskets or window boxes; or in containers on decks, patios or entrances. Geraniums should not be planted outdoors until all danger of frost is past. They do best in locations with six to eight hours of sunlight per day. When planted in areas of moderate shade, flowering is reduced. Geranium plants tend to break and wilt in windy locations so protection from strong winds is recommended. The soil should be well drained, using one pound of a 10-20-10 fertilizer, two pounds 6-10-4 formula, or comparable amounts of a similar formula, per 100 square feet. Fertilize once a month. Incorporate the fertilizer into the soil, taking care not to dig so deeply as to damage the roots. Make sure the soil is moist, and keep the fertilizer off the foliage and flowers. Containers for growing geraniums outdoors should be large enough to hold potting media that can be adequately watered to help prevent wilting. Use a good potting soil with enough organic matter, similar to that recommended for indoor plants. Make sure that pots have holes in the bottom of the pot to provide adequate drainage. Overwatering and placing plants in pots without good drainage is the number one problem leading to root rots in geraniums.

Water geraniums when the soil becomes moderately dry. Never allow the plants to dry out to the point of wilting or the leaves will turn yellow and drop off. Give the soil a good soaking at each watering, and avoid frequent light waterings. Apply water to the base of the plants to keep water off the foliage, since moist foliage favors the development of disease. A 1- to 2-inch deep layer of organic mulch is most desirable for most summer annuals, including geraniums. Weeds are best controlled by hand pulling and mulching. Herbicides can be used according to label directions.

Removing dried or faded flowers from the geranium plants promotes more bloom and makes the plants more attractive. Pinch tall plants occasionally to encourage stocky, well branched, growth.

Geranium plants used outdoors are often overwintered indoors. However, it is often easier to buy new plants each spring. There are three basic methods of overwintering geraniums: dry (soil-less) storage, potted or cuttings. To overwinter your favorites using dry storage, carefully dig whole plants before frost, tie them in bundles, shake off the soil and hang them by the root ends in a cool basement or moist area for the winter. Storage temperature should be between 35 and 45°F, and the humidity should be 80 percent or higher. If plants dry out too much, occasionally take them down and soak the roots in water overnight. The plants can be cut back to about one-third of their original height and planted outdoors in May, or potted indoors in late winter. Plants to be overwintered in containers should be dug in the fall before the first frost, taking as much of the root system as possible. Use a container large enough to accommodate the root system, cut back to a height of 6 inches, place in a sunny window and water and fertilize as needed to promote healthy growth and encourage blooms.

Propagation

Geraniums can also be overwintered by taking cuttings from outdoor plants during late summer or early fall, before the first killing frost. This is one method of vegetative propagation, necessary to maintain the distinct markings, habit or shape and scent of many geraniums. Some geranium selections do not propagate easily from cuttings; these types are best purchased as new plants each year.

To propagate geraniums from cuttings, first select containers 3 to 4 inches deep and fill them with moist (not overly wet) planting medium. Satisfactory rooting media include coarse sand, perlite, vermiculite or a mixture of these. Sterile commercial mixes are also available. Cut off shoot tips 3 to 5 inches in length and remove the leaves on the lower part of the stem. The use of a rooting hormone is recommended to stimulate the rooting process. This product is available at most garden centers. Dip the bottom 1/2 inch of each cutting in the rooting medium. Insert the cuttings to a depth of 1-1/4 inches to 1-1/2 inches. Firm the medium around the cuttings.

Avoid crowding the cuttings so there will be some air movement to help prevent disease. Cover the container with a plastic bag. This helps prevent excessive moisture loss, decreases wilting and increases rooting potential. Place the container in a warm location that receives bright, but indirect sun. Avoid excessive heat buildup in the bag by occasionally opening the top.

Check the moistness of the rooting medium every week. If properly chosen and prepared, it will usually stay fairly moist for several weeks before additional water is needed.

To determine when the cuttings have rooted, gently tug on the stem. If it resists being pulled from the rooting medium, roots have probably developed to a length of 1/2 inch to 1 inch, and the cuttings can be planted in small individual containers. Fill these containers with a coarse, well-drained growing mix, and pot the cuttings at the same depth as the original rooting medium. Gradually move the plants into more direct light and continue to water. Fertilization will not be needed until the cuttings show new top growth.

A second method of propagating geraniums is by seed. There are many excellent selections that can be propagated from seed. Seed should be sown in late January or early February in seed flats. Since geranium seed germination may be inhibited by a hard seed coat, speed the process by nicking the seed coat with a pair of nail clippers or a file or soak it overnight in a moist paper towel. Most commercial potting soil mixes can be used as a germinating media. Avoid very coarse medias with large particles, as they tend to dry out rapidly. Cover the seeds with 1/8 inch of media. Keep the media moist, but not saturated, and maintain the media

temperature between 72 and 77°F. Seeds normally germinate in 10 days to two weeks. High intensity light will be required once germination occurs and until plants can be planted outdoors. When the seedlings are 1/2 inch to 1 inch tall, transplant them to individual containers. Maintain daytime temperatures of 60 to 70°F and slightly cooler night temperatures to produce stocky plants.

Insects

Insects and pests that can occasionally be a problem on geraniums include aphids, spider mites, slugs, tobacoo bud worm, and caterpillars. If necessary, insecticides and related products may need to be used to eliminate the insect problem.

Diseases of Geranium

One of the main problems encountered in production of geraniums is plant diseases *(Table II)*. Plant diseases will impact both commercial growers and home gardeners. An integrated pest management (IPM) approach should be used to manage the disease problems associated with geraniums. Maintaining good plant health with adequate fertility and good soil drainage in pots with openings in the bottom to avoid saturated soil mix in the root zone will eliminate many disease problems in geraniums.

Sanitation is the most important cultural management tool a gardener or commercial grower has to manage many of the diseases affecting geraniums. Thorough sanitation and cleaning of greenhouse space is critical between production seasons. For the homeowner, rotation of geranium beds is the most practical preventive disease control measure. Allow at least three years before a site is planted to geraniums again when you encounter root associated disease problems. Rotation combined with thorough sanitation will result in high quality geraniums in most cases. However, fungicides may be necessary, particularly in commercial production *(Table I)*. Commercial growers should be familiar with the common geranium diseases so that they can act quickly when a disease outbreak occurs.

Commercial growers should use proper bench and plant spacing to allow for air circulation. This will aid in managing many foliar disease problems including losses due to *Botrytis*. Good air movement will allow for foliage to dry more quickly than in a crowded situation with limited air movement. When propagating plants, growers should be cautious not to spread disease by using disinfectant solutions for cutting tools or by snapping cuttings so that contact with new cuts does not occur.

Table I. Fungicides for use on geranium and diseases managed.

Fungicide[a]	*Treatment*[b]	*Labeled Use*[c]	*Pythium spp. damping off and Black leg*	*Damping off (Fusarium, Rhizoctonia)*	*Leaf Spots (Fungal)*	*Bacterial Blight*	*Botrytis Blight*	*Rust*
Banol	S	G, L	X[d]					
Cleary's 3336 F, G, WP	F, S	G, L		X	X			
Daconil Ultrex, Weatherstik	F	G, L			X		X	X
Dithane	F	G, L						X
Protect T/O	F	G, L			X		X	X
Phyton 27	F	G, L				X	X	
Subdue GR, Maxx	S	G, L	X					
Truban 30WP	S	G, L	X					
Banrot 8G, 40WP	S	H, G, L	X	X				
Daconil 2787	F	H			X		X	X
Fertilome Liquid Systemic Fungicide	F	H			X		X	X
Immunox	F	H			X		X	X

[a]Product list intended for information purposes only. No criticism is intended for products not listed nor endorsement for products listed. Always read and follow label directions when applying any pesticide.
[b]F = foliar treatment; S = soil treatment as drench or granular product incorporation.
[c]Labeled for use in (G) commercial greenhouse, (L) comercial landscape, or (H) homeowner product.
[d]X = product active against disease.

Table II. Common diseases of geraniums.

Disease	*Symptoms*	*Conditions that favor disease*	*Control*
Botrytis Blight *Botrytis cinerea*	*Blossom blight*: premature fading and drying of petals; petals turn dark at margins, then wilt. *Leaf spot*: irregular, brown water-soaked spots at leaf margins; spots often covered with gray-brown mold. *Stem rot*: light to dark brown rot of stem cuttings.	Primarily a greenhouse problem where relative humidity is high and air circulation is poor; disease more severe on crowded benches with overhead irrigation.	Remove and destroy infected foliage and sterilize cutting benches; lower greenhouse relative humidity; space plants sufficiently to allow air circulation around individual plants; avoid splashing water onto foliage; apply a foliar fungicide.
Rust *Puccinia pelargonii-zonalis*	Small yellow spots up to 1/4 inch (.6 cm) in diameter form on under-side of leaves; rust-colored pustules develop within the spots on lower leaf surface; later small pustules form as a circular zone around the first pustule; leaves yellow and drop prematurely.	Moderate temperatures and 6 to 8 hours of free moisture on foliage; occurs on both garden and greenhouse geraniums; rust spores spread by wind and air currents in greenhouse.	Avoid splashing water on foliage; remove and destroy infected foliage; isolate imported plants; apply a fungicide every 10 days as a preventative; dip cuttings into fungicide solution.
Alternaria Leaf Spot *Alternaria alternata*	Small brown spots with alternating light and dark bands; most evident on lower surface of older leaves.	Occurs on garden geraniums during cool, wet weather; fungus rarely sporulates on attached leaves but does so readily on fallen leaves.	Remove and destroy infected foliage; apply foliar fungicide at first appearance of disease.
Bacterial Blight *Xanthomonas campestris pv. pelargonii*	*Leaf symptoms*: small, sunken, water-soaked spots on under-surface of leaves; rapid necrosis and wilting of affected leaves; infected areas turn brown to black; leaves may wilt at margins followed by angular necrosis; limp condition of leaf associated with bacterial blight; affected leaves may droop or fall from the plant. *Vascular wilt symptoms*: infected stems turn dark brown to black and leaves on affected branch wilt; stems shrivel into a dry rot; infected cuttings rot from base upward.	Symptoms most prominent at temperatures of 70° to 85° F (21° to 29°C); bacteria spread through cuttings, contaminated tools, cutting benches, soil, plant-to-plant contact and white flies.	Follow strict sanitary measures when establishing cuttings; use disease free cuttings; keep geraniums from different sources separate; separate seed and cutting geraniums; avoid placing hanging ivy geraniums above seedling or cutting geraniums; avoid overhead irrigation; rogue out symptomatic plants; control insect pests.
Southern Bacterial Wilt *Ralstonia solanacearum*	General wilting of lower leaves; V-shaped, chlorotic, areas on leaves similar to bacterial blight; brown discoloration of vascular system and roots often black or brown; plants collapse and die; no leaf spots as with bacterial blight.	Symptoms most prominent at temperatures of 75° to 100°F (25° to 38° C); bacteria spread through cuttings, contaminated tools, cutting benches, soil, and plant-to-plant contact.	Use management recommended for bacterial blight.
Verticillium Wilt *Verticillium albo-atrum*	Upper and middle leaves of infected plants yellow and drop prematurely; older leaves unaffected; plants suddenly wilt and die.	Pathogen spread by contaminated soil and cuttings.	Destroy infected plants; take only tip cuttings; grown varieties known to be resistant rotate beds.
Blackleg *Pythium spp.*	Brown water-soaked discoloration on roots near base of cuttings; base of stem turns a shiny black; blackening of petioles; affected cuttings and seedlings wilt and die rapidly.	A disease of cuttings and young greenhouse plants; spread by contaminated cutting benches and tools and potting soil mix.	Sterilize cutting medium, potting mix, cutting bench tools, etc.; soil drench with fungicides at planting.
Pelargonium Flower Break *Pelargonium flower break virus* **(PFBV)**	Symptoms range from mild, chlorotic mottle to ringspot patterns in leaves; plants may be stunted; white-streaking on the backs of petals (color-breaking).	PFBV is mechanically transmitted. Diseased mother plants used for propagation favor spread.	Sanitation: Use disease-free, virus-indexed cuttings; remove and destroy any symptomatic plants; cautious handling of suspect disease plants.
Tomato Spotted Wilt *Tomato spotted wilt virus* **(TSWV)**	Symptoms range from stunting, ringspots, sunken purple-brown lesions on leaves and petioles.	TSWV is transmitted by thrips. Conditions that favor thrips will favor spread of the virus.	In addition to control suggested for PFBV, begin an intensive management program to control thrips.
Oedema Abiotic Disorder	Rupturing of tissue on leaves produces raised water-soaked spots that become corky.	Odema is likely to occur when the soil is moist and warm and the air is moist and cool.	Remove affected leaves; avoid over-watering during cool, humid weather; avoid large temperature changes.

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