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Fact Sheet

Fact Sheet 753

Producing Anemone as a Cut Flower

Introduction

Anemone are excellent cut flowers for fresh markets, with over 100 existent species. Most species have compound leaves and showy flowers. There are two distinct groups of anemone: fibrous-rooted anemone, which flower in late summer and autumn and include *A. x hybrida*, *A. tomentosa,* and *A. vitifolia;* and tuberous anemone, which has tubers or rhizomes that flower spring to early summer and include *A. blanda*, *A. canadensis*, *A. sylvetris*, *A. coronaria*, and *A. pavonina.*

Poppy anemone, *A. coronaria*, is a cool season crop that can be produced in the field for spring cut flowers or grown in fall, winter, and early spring in the greenhouse. The Japanese anemone, *A. x hybrida,* is an herbaceous perennial that produces long stems with delicate flowers in September and October. These are suitable as cut flowers.

Field Production

Culture

Anemone coronaria, the poppy anemone, can be started from seed or from plugs obtained from plug specialists. However, it is usually started for field production of cut flowers from tubers obtained from seed and plant suppliers, because tubers take less time from planting to harvest.

Soak tubers in water for 12 to 48 hours before planting. Use 1 1/2- to 2-inch (4 to 5 cm) circumference tubers. Since poppy anemone tubers are quite irregular in shape, and not easily measured, use at least 1-year-old tubers to be sure they are sufficiently large.

Choose a full sun site with well-drained soil having a pH of 6 to 7. Plant the tubers 1 inch (2.5 cm) apart and 1 inch (2.5 cm) below the surface. Place the tubers 6 inches (15 cm) apart within the row, with 10 inches (25 cm) between the rows. Keep the soil moist throughout the growing season.

The best time for planting is in the fall in zones 7 to 9, and in early spring further north. The later in spring the tubers are planted, at least in zone 7, the longer it will take for the plants to bloom, the fewer the number of stems from each plant, the shorter the length of the individual flower stems, and the briefer the harvest period.

Poppy anemones are reliably hardy only to zone 6. They can survive in zone 5 if a heavy mulch is applied. Field production is attempted in the U.S. only in those areas with mild winters and cool springs. Cold treatment (*vernalization*) will accelerate flowering and increase the percentage of flowering. Vernalization is accomplished by soaking the tubers in water for 48 hours and storing them at 33 °F for several weeks before planting. Natural vernalization occurs over the winter with fall planting in areas with mild winters or with tubers planted in early spring elsewhere. High temperatures induce dormancy in all areas.

Photoperiod studies are not conclusive, but it appears that short days (SD) accelerate flowering and long days (LD) result in early termination of flowering. Natural SD occur during normal flowering times. While 67 percent shade will increase stem length from 9 to 12 inches (22.8 to 30.5 cm), the number of flowers produced will be unaffected.

Poppy anemones should be treated as annuals when they are grown for cut flower production. The number of stems and individual stem length decreases significantly for individual plants with each additional season that tubers are kept. The survival of tubers in the field can drop from 90 to 20 percent over 3 years.

Poppy anemones started from plugs will often result in a better stand of plants than those started from tubers, even when the tubers are soaked for 12 to 48 hours before planting. There is no effect on the yield and quality of plants started from plugs.

Site Selection and Support

Anemones will respond best in a soil with good fertility, high organic matter, and excellent drainage. The site should have water for irrigation, protection from wind, and ideally, some shade, at least during the hottest and brightest part of the day. An eastern exposure will help to protect plants from the afternoon sun.

A. coronaria rarely needs netting to support the flower stems. *A. x hybrida* grow 4 to 5 feet in height, so one to two layers of plastic netting is desirable to keep the flower stems straight.

Irrigation

Irrigation maintains the soil moisture at an adequate and uniform level so plant growth is not limited by lack of water. During some years irrigation is a necessity and other years it supplements natural moisture through a few critical days or weeks of dry weather to ensure high quality growth.

Trickle irrigation, which places water into the root zone without wetting the foliage or interfering with the harvest, is the best irrigation method to use. Trickle rowcrop tubes or tapes can be installed at planting time along or between rows and under plastic mulch. For cut flowers on a raised bed or in closely spaced rows, two or three tubes with emitter spacings of 2 to 12 inches can water the planting. Coarse soils require more tubes than fine soils because of reduced lateral movement of the water.

Water frequently to maintain adequate and uniform soil moisture. Use a screen filter of 100-to-140 mesh to prevent clogging and use a pressure regulator set at 8 to 10 psi to ensure the proper operating pressure. Monitor the soil moisture with a sensor such as a tensiometer to learn when to

irrigate. (See **References** for Extension publications on trickle irrigation and soil moisture sensors.)

Nutrition

Soluble fertilizer can be injected into the irrigation water weekly to maintain plant nutrition. Water-driven fertilizer injectors are available to add concentrated dissolved fertilizer into the irrigation water. Use 100 parts per million (ppm) of nitrogen from a complete fertilizer for mineral-based soil in the field. If you do not irrigate, sidedress the plants with 1 pound of a complete fertilizer (10-5-10 or 10-6-4) per 100 square feet of production area.

Cultivars

Anemone coronaria cultivars with good cut flower potential include:

- 'De Caen' hybrids—a single, saucer-shaped flower in pink, red, blue, and white;
- 'St. Brigid' hybrids—semi-double flowers in pink, red, blue, and white; and
- 'St. Prian' hybrids—semi-double flowers in pink, red, blue, and white.

Japanese anemone, *A. x hybrida*, cultivars suitable for cut flower production include:

- 'Alba'—single white flowers, 2 to 3 inches in diameter; plants average 3 feet in height;
- 'Alice'—semi-double, light pink flowers on 2-to-3-foot plants;
- 'Elegantissima'—double flowers on 4-foot plants, very vigorous in growth; and
- 'Whirlwind'—semi-double, pure white flowers, 3 to 4 inches in diameter on 4-to-5-foot plants.

Greenhouse Production

Culture

Poppy anemone can be grown from seed with seed placed on top of the soil at 55 to 65 °F. Germination occurs in 10 to 14 days, but most growers start with tubers planted 0.5 inch deep. Large tubers can be divided into additional plants. Tubers are planted in the greenhouse August through September. Flowers will be produced October through early spring. Maintain greenhouse temperatures at 50 to 55 °F nighttime temperature and under 75 to 80 °F during the day. Shade cloth might be necessary over a greenhouse in spring to keep stem length long and decrease air temperature.

Nutrition

Basic production requires a soluble fertilizer with a 2:1:2 (N:P:K) ratio such as a 20-10-20 at 100-200 ppm N. The fertilizer should be applied at every irrigation *(fertigation).* EC readings for soluble salt levels should not exceed 2.0 mmhos/cm (ds/m).

Cultivars for Greenhouse Production

- 'Mona Lisa' is best for greenhouse production. It has large flowers of white, purple, pink, and red on 10-to-18-inch stems.
- 'De Caen 'has single, saucerlike flowers in pink, red, purple, and white. Generally has shorter stems than 'Mona Lisa.'

Diseases

The most important diseases of anemone cut flower production are *Pythium, Rhizoctonia*, *Botrytis*, and powdery mildew.

Pythium and Rhizoctonia

Several species of the water mold *Pythium* attack anemone. Both cool and warm temperature species are reported. Wet conditions favor *Pythium* diseases. *Pythium* can rot the germinating seed (pre-emergence damping off), or cause root rot that stunts or kills seedlings (post-emergence damping off). *Pythium* produces a tan, water-soaked appearance to roots and stem. The root cortex can slough off leaving the white vascular cylinder of the root exposed, like fine white threads.

The fungus *Rhizoctonia solani* can also cause damping off and seedling blight. Usually *Rhizoctonia* is favored by warm conditions. When compared to *Pythium*, *Rhizoctonia* lesions are tan, sunken, and more defined. Sometimes the light tan, fine "cob web" mycelium of *Rhizoctonia* can be seen growing on blighted plant parts and across the soil surface.

To differentiate *Pythium* from *Rhizoctonia*, use an Alert on-site diagnostic kit. This will permit you to select the correct fungicide for control.

Basic good horticultural practices, sanitation, and optimum conditions for seed germination and seedling growth can prevent most damping off diseases. Select a well draining media and water early in the day so soil drains well before nightfall to help control *Pythium*. A biological fungicide, SoilGard, can be added to media for control of both *Pythium* and *Rhizoctonia*. The fungus *Tricoderma* spp. (RootShield) has been reported to provide a level of protection from *Rhizoctonia* and *Pythium* root rots. The fungicides Banrot and Subdue control *Pythium*. Many fungicides are registered for *Rhizoctonia* control, including Medallion, Cleary's 3336, Terraguard, and Chipco 26019.

Botrytis Blights

Botrytis can attack seedlings, but it is especially damaging when it spots and blights flowers. High humidity and a film of water on plant surfaces are necessary for *Botrytis* to infect plant tissues. Thus, any cultural practice that reduces periods of leaf wetness (trickle irrigation, plant spacing to improve air circulation, use of horizontal air flow fans in greenhouses) will reduce the risk of *Botrytis*.

Botrytis produces a small defined spot that can rapidly enlarge to blight the flower, leaf, or stem. Weak plant tissues, such as yellowing senescent foliage, flower petals, and wounds are easily invaded by *Botrytis*. Under humid conditions a gray mold forms on blighted tissues and is diagnostic for *Botrytis*. Look for this aerial gray mold early in the morning or incubate damaged tissues in a moist chamber overnight to promote sporulation.

The *Botrytis* fungus has developed resistance to several major classes of chemical fungicides, including the benzimidazoles (e.g., Cleary's 3336 and Domain) and the dicarboximides (Chipco 26019), making chemical control difficult. When extended periods of wet, overcast weather occur, it might be helpful to spray with Mancozeb or use Exotherm Termil smoke in the greenhouse. The fungicide Medallion (Fludioxonil) is labeled for *Botrytis* in greenhouses, but anemone has not yet been tested for phytotoxicity. The copper fungicide Phyton 27 is also registered for *Botrytis* control on flowers.

Powdery Mildew

Some anemone cultivars are susceptible to powdery mildew caused by the fungus, *Erysiphe* sp. Symptoms include twisted and distorted foliage and white spots and patches on foliage, stems, and buds. Flower buds can fail to open and flowers can be distorted and unsalable. Weather conditions that favor powdery mildew are sunny, warm, dry days, and cool nights.

Several systemic fungicides (e.g., Funginex, Terraguard, Strike, Banner) and summer oil sprays all provide good control of powdery mildew. Some anemone cultivars are less susceptible. Keep good records of disease incidence on each cultivar; you can then select resistant cultivars.

Insects

Several aphid species and two whitefly species are generally the major pests of anemones.

Aphids

Aphids can rapidly become a major pest in anemone plantings if the population is left unchecked. Large populations of aphids will result in noticeable honeydew accumulations on foliage and flowers. Sooty mold fungus will grow on the honeydew. Since aphids feed on plant phloem, they compete with the plant for nutrients. Heavy populations can measurably reduce plant growth and vigor.

Identify the species of aphid before you attempt to control them. Samples can be submitted to your local Cooperative Extension office for identification. Next, familiarize yourself with the biology of the aphid on a particular crop. Note how fast they reproduce, whether they have a preference for feeding on only certain parts of the plant, or if there is a preference for feeding on certain species or cultivars of plants. One species of aphid commonly found on

anemone is the green peach aphid, *Myzus persica*. This aphid species is very difficult to control with chemical applications.

Biological control of aphids. Aphid populations can be controlled by naturally occurring parasites and predators. If aphids are detected at the early stage of development, you can use beneficial insects to control aphid populations. *Aphidoletes aphidimyza*, a midge insect in the order Diptera can be used for controlling aphids that are difficult to control with chemicals, such as the green peach aphid. This midge lives an average of 10 days and lays eggs close to aphid colonies. The resulting orange midge larvae can kill aphids by biting them at the knee joint and injecting a paralyzing toxin. They mature over a 3-to-5-day period. They will kill from 4 to 60 aphids each, depending on the aphid density. The midge will reproduce in the field. If aphid populations are extremely high, apply either 2 percent horticultural oil or 2 percent insecticidal soap 1 or 2 days before you release the midges. The release rate for low aphid populations is 1 midge per 10 square feet. For higher infestations of aphids, release at 1 midge per 5 square feet of growing area.

Chemical control of aphids. Horticultural oils, insecticidal soaps, and neem are three biorational chemicals that suppress aphid populations. Biorational chemicals are materials that have short residuals and minimal impact on beneficial insects and nontarget organisms. Because these chemicals have no long-term residual effects, regular monitoring of aphid populations is recommended. Repeated applications of the chemicals might be necessary.

Two systemic insecticides that give good control of aphids are acephate (Orthene) and imidichloprid (Merit). Once a systemic has been absorbed by the plant, the effect on beneficial arthropods should be minimal. Insect growth regulators such as Enstar II and Precision are effective when applied to immature aphids.

Whiteflies

Two whitefly species are most common and cause the majority of problems to anemone crops: the silverleaf whitefly, *Bemisia argentifolia* (also known as strain B of the sweet potato whitefly, *B. tabaci*), and the greenhouse whitefly, *Trialeurodes vaporariorum*.

Identification. All whitefly lifestages are almost always found on the lower surfaces of leaves. Adult whiteflies are small (1 to 2 mm), white, fly-like insects. The white appearance of the adults comes from the wax secreted from the abdomen with which they cover their bodies. Whitefly eggs are very tiny and spindle-shaped. They usually stand vertically on the leaf surface, and are attached to the leaf by a tiny pedicel or "stalk" at the base of the egg. The crawler and other nymphal stages of the most common species are oval, greatly flattened, and somewhat translucent with a white, light-green or light-yellow cast. The four nymphal stages are identified by their relative sizes; length and width increase with each successive molt.

Biology. The life cycles of the two whitefly species are generally similar. Eggs are deposited on the underside of leaves, sometimes in a circle or crescent-shaped pattern. The eggs hatch in about 10 days for greenhouse whitefly and 12 days for silverleaf whitefly. The tiny first nymphal stage (crawler) hatches from the egg, crawls a short distance (a few millimeters), and settles down to feed. They pass through three more nymphal stages and do not move from this spot before emerging as adults. The pupal stage (i.e., when the red eye spots of the developing adult are visible through the pupal case) lasts 5 days for both species. A female can begin to lay eggs from 1 to 4 days after emerging as an adult.

Monitoring. Whitefly infestations can be monitored using a combination of yellow sticky traps and foliage inspection. The location and relative numbers of adults can be monitored with yellow sticky traps, while nymphs must be monitored by frequent foliage inspection. The older lifestages are often found on older foliage; eggs and younger lifestages are usually on younger

leaves. Inspection of whitefly nymphs several days after a foliar insecticide application can aid in determining whether the spray was effective. Dead whitefly nymphs appear to be flattened and are very dry.

Biological control of whiteflies. Certain tiny wasps are specialized parasitoids of whiteflies. These wasps attack whitefly nymphs, killing them in one of two ways. The female wasp can use her needle-like ovipositor to lay an egg within or beneath a whitefly nymph. The egg hatches and the parasitoid maggot feeds on the nymph. Pupation occurs within the nymph. When the adult wasp emerges from the whitefly pupa, it chews a round exit hole through the cuticle at one end of the whitefly pupa. Or secondly, the female wasp punctures the whitefly nymph with her ovipositor, killing the nymph, and feeds from the fluids that exude from the wound, a phenomenon called host-feeding.

Several species of whitefly parasitoids occur naturally in the U.S., and these can migrate into unsprayed greenhouses or fields and attack whiteflies. However, the degree of control provided by these parasitoids is usually insufficient for various reasons. Augmentative releases of commercially reared parasitoids are typically more effective. The following describes two such parasitoid species:

- ***Encarsia formosa*** is a very tiny wasp (0.6 mm), with a black head and thorax and pale yellow abdomen. Greenhouse whitefly pupae that have been parasitized by *Encarsia formosa* turn black; silverleaf whitefly pupae turn amber-brown. The adult wasps are rarely noticed. This parasitoid is widely used for biological control of greenhouse whitefly on greenhouse vegetables.
- ***Eretmocerus eremicus (=californicus)*** (Arizona strain) is an equally tiny wasp, but differs from *Encarsia formosa* in that the adult is entirely yellow. They have green eyes and clubbed antennae. Parasitized whitefly nymphs appear beige in color.

Pathogens to control whiteflies. Several fungal pathogens will infect whiteflies. *Beauveria bassiana*, an entomopathogenic fungus that attacks insects, but is harmless to humans and other animals, is sold under the name BotaniGard (Mycotech Company) and Naturalis-O (Troy Bioscience Company). Whitefly nymphs infected with this pathogen will often appear reddish, pinkish, or orangeish, especially if humidity is not high. This can be a very effective biological control in humid conditions.

Weed Control

Weed management in cut flowers is a task that is by no means impossible, but does require a year-round effort to achieve success. Controlling weeds in anemones is particularly difficult because of the relatively few herbicides labeled to control weeds in this crop. Thus, an integrated approach should be used. Cultural practices along with mulches and preemergent herbicides will reduce problems with weed competition on the present crop and will help to reduce the number of weed seed in your production fields. This will make future production a little easier.

The use of an organic mulch, either over a plastic mulch (2-to-4-ml thickness), or alone, will help to suppress weed growth, moderate soil temperature, and hold moisture. A plastic mulch alone can cause soil temperatures to rise too high, which will adversely affect the crop. A pre-emergent herbicide can be applied to provide additional control, prior to mulching.

Factor (Prodiamine) and Pendulum (pendimethalin) are both labeled for field grown anemones. These products must be used according to the label recommendations and will not control emerged weeds. Other chemical options include nonselective control of emerged weeds with a product like glyphosate (sold under several brand names including Roundup) or soil fumigation with a product like Basimid (Dazomet).

Basamid is a granular formulation of soil fumigant that controls weeds, nematodes, and diseases in the soil. Prior planning is required when applying this product to allow ample time between application and planting.

Regardless of the method of weed control selected, weeds must not be allowed to go seed. Weeds like lambsquarters and pigweed will produce thousands of seeds that can live in the soil for years waiting for an opportunity to germinate. Also, hand pulling and cultivation will be much easier and more effective if the weeds are small.

It is very important to read and understand the label before making an application, if the choice is made to use an herbicide.

Harvest

- Anemones should be harvested when flowers have just started to open.
- Harvest when the petals begin to separate from the center of the flower, but are not all the way open.
- If cut flowers are transferred between containers of water, re-cut the stem, preferably with an underwater cutter.

Post Harvest

Postproduction Factors for Anemone

- **Development at harvest.** Preferred handling is to harvest after allowing the flower to open and close once.
- **Lasting qualities.** Vase life up to 6 days and sometimes longer.
- **Benefits of preservatives.** Floral preservatives increase the shelf-life of anemones up to 50 percent.
- **Chemicals.** Flowers are sensitive to ethylene gas, which will shorten vase life. Anemones should not be mixed with narcissus stems because exudate from narcissus causes limp stems in anemones. Test several floral preservatives to determine which is most effective for your operation.

Retail Handling of Anemone

- **Handling and preparation.** Important to recut stems upon arrival.
- **Hydration.** Place flowers in warm water with a pH of 3.5.
- **Preservative handling.** Place stems in a preservative solution, with no more than 2 percent sugar, at 80 to 100 °F. It is important to loosen bunches to help flowers open.

Consumer Care of Anemone

Recut stems and place in preservative solution to maximize shelf-life. Flowers are particularly sensitive to temperature extremes, particularly high temperatures (75 to 85 °F) and direct air blowing from air vents on flowers.

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