



Trouble Shooting Problems of Bedding Plants in the Southwest

Ursula Schuch



Fig. 1. Vinca showing symptoms of drying plants right next to healthy plants (top), severe chlorosis (lower left), and wilting (lower right). Close up inspection of shoots and roots and possibly laboratory analysis are necessary to identify the cause and implement control treatments.

Annual bedding plants create instant impact with long blooming flowers or colorful foliage. In the desert Southwest, bedding plants are installed twice each year: cool season bedding plants are planted at the beginning of fall and warm season plants at the beginning of spring. Installing new plants twice a year is a considerable investment of time and money. To protect this investment, regular inspections and care are necessary to maintain healthy plants. Regular maintenance tasks include removing weeds and debris, irrigation and fertilization, pruning shoots, and removing spent flowers. Inspection or maintenance frequency can vary from a few days



Fig. 2. Zinnia with symptoms of insect infestation and disease.

during initial establishment, especially during the hot time of year, to every other week once plants are well established.

When a plant is not thriving, the leaves, shoots, flowers, and soil should be examined closely to look for symptoms and determine the cause. Poor color foliage, leaves shriveling or falling off, or evidence of insects or disease on the plant indicate a health problem (Fig. 1 and 2). Small, stunted plants, lack or damage to flowers or flower buds, and plants falling over require close inspection to determine the cause. Soil that is too dry or too wet can be a problem and pulling out the roots of damaged plants can help to diagnose potential root

issues. Following are ten of the most common bedding plant problems encountered in the arid climate of the Southwestern United States. The first five are abiotic problems caused by factors such as drought, wind, freezing or overwatering; the next five are biotic problems, caused by different organisms. When trouble shooting, symptoms such as wilting foliage, yellowing leaves, and stunted growth are non-specific and may result from different causes. Some insects damaging plants may hide in flower buds or on the underside of leaves. Knowing the cultural practices and the history of a site, such as an irrigation system breakdown, flooding, or cold temperatures, can assist in trouble shooting. The origin of a problem should be positively identified before implementing control treatments. This may require laboratory analysis of a fungus or identification of an insect. Early detection may allow for control of an insect or disease problem with a simple spot treatment or by removal of damaged leaves or plants before a large area becomes affected. In all cases, selection of appropriate species for the season and the site, while implementing appropriate maintenance practices will prevent many problems in bedding plants.

1. Root balls of plants in nursery pots or transplants in the soil dry out

The growing medium used in small nursery containers dries fast, especially in a semi-arid environment when temperatures are high and relative humidity is low. Irrigating plants before and right after planting can prevent this. Once dry, root balls are often difficult to rewet. Several irrigation cycles may be necessary to rewet dry root balls of plants in containers. If the drought lasts too long, foliage wilts and eventually dies.

2. Overwatering

Bedding plants growing in excessively wet soil appear wilted even when the soil is wet. Foliage color can fade to light green and yellow and the leaves may drop (Fig. 3). Excessively wet soil not only lacks oxygen in the root zone, but also impedes uptake of nutrients and water by the roots, and can leach nutrients below the root zone. Roots in these conditions become prone to infection by fungal diseases. Appropriate soil drainage and allowing the soil to dry between irrigations will prevent this problem. Irrigation frequency and length of application should match the soil type, plant material, and weather conditions.

3. Physical damage from frost, wind, and excess heat

Foliage can be damaged and turn brown from both freezing and excessive heat. Strong winds can shred or dry out foliage, and blow off or damage flowers. Selecting the correct plants for the season and the microclimate can help avoid these problems. If frost is forecasted, tender plants in pots can be moved under



Fig. 3. Overwatering and poor drainage caused the decline of globe amaranth. Symptoms can also be caused by root diseases.

trees, a covered patio or can be covered temporarily. Flower beds in the open can be covered with frost cloth until the danger of freezing temperatures has passed. Proper watering will minimize damage to plants due to wind and heat by supplying moisture to continue transpiration and photosynthesis when demand for water is high.

4. Low light

Many bedding plants are labeled as full sun plants, indicating they require at least six hours of direct sun exposure daily. Low light conditions prevent full sun plants from carrying out photosynthesis at rates necessary to produce enough energy for healthy growth. Plants in low light conditions will appear long and spindly due to stretched internodes, canopies will appear thin due to fewer leaves, and leaves are larger and thinner than comparable leaves of plants receiving sufficient light. Leaf color can appear light green. Moving plants to a location with sufficient sunlight or replacing them with shade tolerant plants corrects this situation.

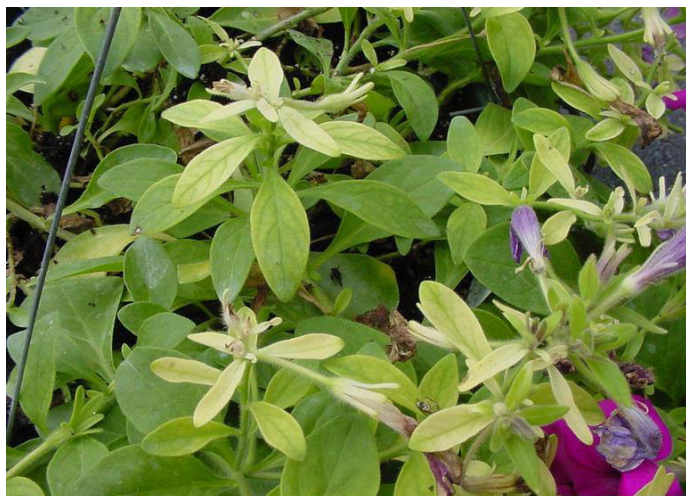


Fig. 4. Young leaves with iron deficiency show symptoms of interveinal chlorosis. Photo credit: Paul Bachi, University of Kentucky Research and Education Center, Bugwood.org

5. Plant nutrition

Nutrient deficiencies in bedding plants are often caused by high pH, low nitrogen, and low levels of micronutrients. High pH between 7.0 and 8.0 or greater is common in desert soils and irrigation water. Optimum conditions for most bedding plants growing in the landscape range from pH 5.5 to 6.5. Higher pH can limit uptake of micronutrients such as iron, manganese, zinc, and copper. Micronutrient deficiencies first appear on younger leaves and symptoms often include interveinal chlorosis where the veins of the leaves have a darker color and the area in between are light green or yellow (Fig. 4). Adding sulfur to the soil before planting will temporarily decrease the pH and can prevent this problem.

If annuals stop blooming or decrease significantly in growth after the first set of flowers has bloomed, lack of several nutrients can be the problem. Adding a complete fertilizer which contains nitrogen, phosphorous and potassium at regular intervals will stimulate more flowers and vegetative growth. Light green foliage starting with older leaves suggests lack of nitrogen and in severe cases the foliage can turn yellow. Regular application of fertilizer will prevent this and foliage should turn green within a couple of days. Other symptoms of nutrient deficiency or excess include smaller, distorted leaves, fewer leaves, weak stems, and discoloration of leaves.

6. Fungal diseases on roots

Several soil fungi attack especially the lower stems, the crown and roots of bedding plants. Fungi survive for many years in the soil or they can be present in the root ball of transplants. *Phytophthora*, *Pythium*, and *Rhizoctonia* fungi can infect a wide range of bedding



Fig. 5. *Rhizoctonia* (top) and *Pythium* (bottom) fungi caused root and stem rot. Photo credit top: R.K. Jones, North Carolina State University, Bugwood.org. Photo credit bottom: Chazz Hesselein, Alabama Cooperative Extension System, Bugwood.org

plants such as petunia, vinca, verbena, snapdragon, stock and others. Symptoms include rotting tissue at or below the soil line followed by wilting and plant death (Fig. 5). Healthy roots are light brown and root tips are white while infected roots turn brown or black with the outer layer easily pulled off. Very young plants are susceptible to damping off; that is seedlings fall over because the fungus damaged the stem tissue at soil level or the roots. Above ground parts are wilted with yellow leaves and stunted growth. Fungal root diseases are favored by overwatering, high temperatures, and soils with high clay content and poor drainage. Soil preparation before planting can improve drainage and prevent severe fungal root problems. Fungicides can be used once the disease causing organisms are identified. Diseased plants should be removed as soon as possible to prevent further spread. Bedding plants benefit when the top layer of the soil is replaced every couple of years to prevent a buildup of disease organisms.



Fig. 6. Symptoms of powdery mildew (top) and rust (bottom). Photo credit top: Mary Ann Hansen, Virginia Polytechnic Institute and State University, Bugwood.org. Photo credit bottom: Penn State Dept. Plant Pathology & Environmental Microbiology Archives, Penn State University, Bugwood.org

7. Fungal diseases on leaves and shoots

Powdery mildew and rust are fungal diseases found on the leaves, stems, flowers, and fruit of bedding plants (Fig. 6). Powdery mildew appears as white or gray powdery spots on the upper leaf surface and other above ground parts of the plant. Conditions favoring the disease are warm day temperatures and cool nights, moderate to high humidity, low light intensity, and poor air flow. Zinnias are very susceptible to powdery mildew. The best approach for prevention is to use resistant plant species or cultivars, thin dense growth to increase air flow, and plant only in appropriate light conditions. Fungicides and other compounds can prevent or control powdery mildew.

Rust is a fungal disease that can be diagnosed through the spores that appear on the lower leaf surface. Color of the spores varies from yellow and orange to brown. Snapdragon, sunflower, geranium and other plants



Fig. 7. Aphids (top) and adult whiteflies (bottom) feed on leaves and stems. Credit for both photos: Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

are susceptible to rust. Rust infects plants under moist conditions. Keeping plant foliage dry and promoting good air circulation can reduce infection. Fungicides and neem oil can be used to control rust. It is best to plant resistant species or cultivars whenever possible.

8. Aphids and whiteflies

These insects are a problem when populations build up and damage plants by sucking sap from foliage and stems. Aphids prefer soft shoot tips and whiteflies are found on the underside of leaves (Fig. 7).

Aphids and whiteflies excrete sticky honeydew which stays on the leaves and is often colonized by sooty mold. This black-colored fungus feeds off the honeydew and is unsightly, but does not damage the plant tissue. Damage from aphids and whiteflies feeding on plants varies depending on the number of insects, but leaves may turn yellow and can die and shoot growth may be stunted. Besides the primary damage from feeding, these insects also transmit disease causing organisms such as viruses when feeding first on infected plants and then on healthy plants.

Aphids and whiteflies are best controlled when present in small numbers and regularly hosed off with a strong stream of water. Reduce the application of nitrogen fertilizer which stimulates growth of tender shoot tips that are attractive to aphids. Natural enemies can manage whiteflies and aphids but usually are not sufficient to permanently reduce large populations. Insecticidal soaps, horticultural oil, and insecticides are available to manage aphids and whiteflies.

9. Slugs and snails

Moist conditions and dense vegetation favor slugs and snails. Holes in foliage and flowers and shiny, slimy trails indicate the presence of these mollusks. Certain bedding plants such as geraniums, lantana, and some plants with stiff leaves and fragrant foliage are often not attacked by slugs and snails. Slugs and snails can be controlled with bait. Removing daytime hiding spots makes the area less inviting.

10. Vertebrate Pests

Rabbits can be desirable wildlife, but they can also cause damage feeding on plants and chewing through exposed irrigation lines. Rabbits are most active in the evening and early morning hours. Protecting flower beds with chicken wire or similar material will guard against rabbits. Burying the bottom 6 inches or more of a 4 foot tall fence into the ground will prevent rabbits from digging underneath. There are some chemical repellents that can be sprayed on plants, but they are usually effective for only a short period of time, they may require repeat applications, and animals may continue to feed if alternative foods are not available. Ground squirrels are active during daylight hours and are often found in gardens or landscapes that border the desert. They are excellent climbers and are not deterred by fencing unless

it covers an entire area. Control methods are difficult and include trapping and baiting. Woodrats or packrats are nocturnal and are also excellent climbers. Barriers and trapping are effective for managing woodrats. Gophers are burrowing rodents that can disturb and consume plants. Trapping and baiting are the most effective management strategies. See your local Cooperative Extension Office for additional information.

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**THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE AND LIFE SCIENCES
TUCSON, ARIZONA 85721**

URSULA SCHUCH

Professor and Specialist, Horticulture

CONTACT:

URSULA SCHUCH

uschuch@email.arizona.edu

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