Production of Ground Covers as Bedding Plants
Michigan State University Extension Service
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Production of Ground Covers as Bedding Plants

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Ground covers are generally low-growing plants that are grown in large groupings to cover an extensive area in the landscape. Ideally, they should be hardy, spread quickly and require little maintenance once established.

From a grower's perspective, a ground cover should be easy to propagate, transplant well, and have few serious disease and insect problems. Though the ideal plant probably does not exist, the ground covers listed below do possess many of these desired characteristics.

This bulletin is intended to aid both new growers just getting started in the business and established growers who wish to expand their product lines to include ground covers.

Ground Covers

Though dozens of species of plants are grown and sold as ground covers, this bulletin will deal with 15 species that are among the most commonly used. This will give the new grower an idea of the range of plant material suitable for use as ground covers in this climatic zone.

Barrenwort *(Epimedium spp.):* Barrenwort species are herbaceous perennials that form a very uniform, 9- to 12-inch high ground cover. The leathery leaves are heart-shaped and shiny, often with red along the veins in early spring. Delicate, drooping flowers

Epimedium spp.

in pink, pale yellow, white or lavender are borne in May and June. Plants spread at a moderate rate, mainly through expanding rhizomes, and do best in partial to heavy shade. They are shallow rooted and do not tolerate drought well.

Bugleweed *(Ajuga reptans):* This semi-evergreen ground cover forms a low mat of dense foliage and sends up 6- to 9-inch

Ajuga reptans

flower spikes in May and June. The foliage may range from bright green to deep bronze, and flowers vary from white to deep blue, depending on the variety. Bugleweed is only moderately invasive but may move into adjacent lawns under ideal growing conditions. Large plantings of individual cultivars might self-seed and revert to the common species type over time. The plants are shallow rooted and may not tolerate drought well, and older plants will occasionally die out at the centers. Crown rot is a problem on a wet site.

Iberis sempervirens

Candytuft *(Iberis sempervirens):* Candytuft forms a dense mound of dark green, evergreen foliage about 8 to 12 inches high. It is a slow to medium grower and is not considered invasive. In early spring, it is covered with white blossoms. Candytuft is excellent as an edging plant along walks or

in the front of perennial borders. A light shearing after blossom time will help promote dense foliage growth. This ground cover prefers full sun but will tolerate partial shade. Candytuft is not seriously affected by insects or diseases.

Thymus serpyllum

Creeping Thyme *(Thymus serpyllum):* This slow-spreading, semi-evergreen grows only 1 to 3 inches tall. Its small leaves and bell-shaped flowers emit a pleasant fragrance. Blossoms are borne in clusters from June to September and are usually dark pink to reddish purple. Creeping thyme grows well in hot, dry conditions in full sun. Heavy fertilization makes it become elongated and weak stemmed.

Daylily *(Hemerocallis spp.):* The daylily is one of the most commonly used herbaceous perennials. Literally thousands of

Hemerocallis spp.

named varieties are available in a wide range of colors, sizes and blooming seasons. The common 'Tawny' and 'Lemon' daylilies are most often used for ground covers because they tend to spread quickly. Like most of the daylilies, neither is bothered significantly by insects or diseases. Daylilies as a group are very useful because they will tolerate a wide range of conditions and a fair amount of neglect while continuing to give a beautiful show.

English Ivy *(Hedera helix):* The common English ivy is a low-growing vine with dark, lustrous, evergreen leaves of moderate texture. It can also climb brick walls and the bark of trees and may become invasive if not kept in bounds. There are both juvenile and adult forms of this plant, each with its own leaf shape, but

Hedera helix

only the adult will bear flowers. It is an excellent plant for shaded areas and will tolerate drought once established on a site. Bacterial leaf spots, aphids and scale are often found on English ivy but are rarely fatal.

Aegopodium podograria

Goutweed *(Aegopodium podograria):* This plant may be an excellent ground cover or an invasive weed, depending on the situation in which it is used. The green-leafed species is very invasive and will cover an area quickly. It will also smother less aggressive small plants and may move into the lawn or adjacent beds. Once it is established, it is very difficult to eradicate. The variegated type is generally preferred because it provides the same 8- to 10-inch high ground cover but is much less invasive. Neither has showy flowers or is bothered significantly by pests.

Hosta *(Hosta spp.):* Also known as plantain lily, hosta is well suited to any shaded area in the landscape. Hundreds of named varieties of hosta are available in a large range of leaf

Hosta spp.

sizes and colors. The plants spread at a moderate rate and are not considered invasive, but some of the large-leafed varieties will fill an area rapidly. Although hostas are grown primarily for their foliage, many varieties also display attractive white to purple flower spikes in mid- to late summer. Some of the blossoms are also quite fragrant. Slugs may be a problem on wet sites.

Lonicera japonica

Japanese Honeysuckle *(Lonicera japonica):* The most common type used for ground cover is 'Hall's Japanese Honeysuckle,' which is an extremely vigorous and adaptive vine. It will grow under a variety of conditions and may become invasive. From June to September, the plants bear fragrant, white flowers that eventually turn yellow. The twisting, deciduous vine will soon spread over an area and may act as a litter collector in the winter. Japanese honeysuckle is bothered by aphids and is susceptible to several diseases.

Pachysandra terminalis

Japanese Spurge *(Pachysandra terminalis):* This has been called one of the best ground covers available for northern climates, especially for shaded sites. Japanese spurge is a vigorous plant that grows to 6 to 10 inches tall and spreads at a moderate rate. In late March to early April, a sparse covering of inconspicuous white flowers may appear. If kept well fed, this plant will present few problems in the landscape.

Lily-of-the-valley *(Convallaria majalis):* This member of the lily family forms a thick carpet of slightly arching, deciduous leaves 4 to 8 inches tall, which often begin to fade and die back by late summer. Its white, fragrant flowers are borne individually on short spikes in mid-May to June. The plants grow well in either sun or partial shade but may be slow to establish after transplanting. It will usually take two to three years to cover an area if planted on 6- to 8-inch centers. Lily-of-the-valley is generally pest free, though spider mites may be a problem during dry, hot summers.

Convallaria majalis

Periwinkle or Creeping Myrtle *(Vinca minor):* Common periwinkle is a trailing, mat-forming evergreen vine that grows to a height of about 6 inches. It is a medium to fast spreader that may be grown in full sun to heavy shade, though the leaves will generally be darker and glossier in the shade. Five-petaled flowers appear in late April to early May and are borne sporadically throughout the summer. Periwinkle must be planted in a well drained site for best results. After planting, it usually takes little care, but may occasionally be bothered by root rot, canker, dieback or blight leaf spot.

Vinca minor

Snow-in-summer *(Cerastium tomentosum):* This rapidly growing evergreen forms a solid mat of silvery foliage that spreads quickly via rhizomes or seeds and may soon move into adjacent spaces. A single plant may cover 2 to 4 square feet of ground after a few years and it may provide such dense cover that few weeds will be able to penetrate. Small, white flowers appear on erect stems during spring and early summer. This plant is not seriously bothered by insects or diseases and is not affected by drought once it is established. Avoid over-fertilization to minimize its spread and to keep the plants compact.

Cerastium tomentosum

Sedum spp.

Stonecrop *(Sedum spp.):* There are hundreds of varieties of sedums and several are excellent ground covers. Many do not bear showy flowers, so the foliage, which comes in numerous colors and textures, is the main feature of this plant. The two-row stonecrops are useful in rock gardens because they form a mat of succulent foliage 3 to 8 inches tall. Generally, sedums need little care and are not bothered seriously by pests or diseases. They prefer full sun and are very tolerant of hot and dry conditions.

Enonymus fortunei

Wintercreeper *(Euonymus fortunei):* Wintercreeper is a commonly used woody vine that does well as a ground cover. It is evergreen and the adult forms bear inconspicuous white flowers in June and July that are followed by red or orange fruits. The vine grows at a moderate rate but may become a little invasive if left unpruned and will begin to climb nearby buildings and fences. A common problem is crown gall, which forms tumorlike growths on roots and stems. Euonymus scale may also cause problems with this plant.

Cultivars

The number and selection of ground cover cultivars available in each species vary greatly. Goutweed has only one or two key varieties, while there are hundreds, even thousands, of daylilies and hostas from which to choose. Each type offers many options of foliage and flower color, plant size and hardiness. It would be impossible to discuss all of the cultivars. The following listing includes many of the more popular varieties commonly available.

Ground Cover Varieties

Species	Cultivar	Characteristics
Barrenwort *(Epimedium)*		
E. x *rubrum*		Colorful foliage and crimson flowers.
E. alpinum		Grows to 18 inches.
E. x *versicolor*	'Sulphureum'	Flowers have pale yellow inner sepals and bright yellow petals.
E. grandiflorum	'Violaceum'	Light violet flowers.
Bugleweed *(Ajuga reptans)*		
	'Alba'	Light green foliage and white flowers.
	'Burgundy Glow'	Tricolored foliage.
	'Gaiety'	Bronze-purple foliage.
	'Silver Beauty'	Variegated foliage.
	'Metallica Crispa'	Dark bronze foliage and blue flowers.
	'Pyramidalis'	Green foliage and blue flowers. Good in the shade.
Candytuft *(Iberis sempervirens)*		
	'Snowflakes'	Most commonly grown variety. Vigorous grower with excellent flowering.
Creeping Thyme *(Thymus serpyllum)*		
	'Coccineus'	Reddish flowers.
	'Albus'	White flowers.
Daylily *(Hemerocallis spp.)*		
	'Tawny'	Common orange daylily. Thousands of other named varieties available.
English Ivy *(Hedera helix)*		
	'Baltica'	Smaller than the species with glossy leaves.
	'Hedera Girars'	Light-colored foliage with a heavy texture. Withstands cold well.
	'Rumania'	Similar to 'Baltica' but with larger leaves.
	'Wilson'	Very hardy with excellent small-sized leaves.
Goutweed *(Aegopodium podograria)*		
	'Variegata'	Less invasive than the green-leaved species. Preferred for use in the landscape for that reason.
Hosta *(Hosta spp.)*		
H. fortunei	'Marginato-alba'	White leaf margins.
H. lancifolia	'Albo-marginata'	Slender, lanceolate leaves with white margins.
H. sieboldiana		Large leaves with bluish color.
H. undulata		Wavy edged and variegated leaves.
Japanese Honeysuckle *(Lonicera japonica)*		
	'Halliana'	White flowers that turn yellow. Extremely vigorous and invasive.
	'Aureo-reticulata'	Yellow netting effect on the leaves.
	'Henryi'	Hardier and has more fruit than 'Halliana.'

Ground Cover Varieties (Continued)

Species	Cultivar	Characteristics
Japanese Spurge *(Pachysandra terminalis)*		
	'Green Carpet'	Low growing with dark green leaves.
	'Variegata'	Leaves are mottled with white. Not as vigorous or shade tolerant as the green-leaved species.
Lily-of-the Valley *(Convallaria majalis)*		
	'Flora-plena'	Double flowers.
	'Fortins Giant'	Large plants and flowers.
	'Rosea'	Pale pink flowers.
	'Striata'	White stripes on leaves.
Periwinkle *(Vinca minor)*		
	'Alba'	White flowers and light green foliage.
	'Bowles'	Clumping rather than vining growth habit. Vigorous with showy, dark blue flowers and large leaves.
	'Variegata'	Gold-variegated leaves and blue flowers.
Snow-in-Summer *(Cerastium tomentosum)*		The species is the most commonly grown type.
Stonecrop *(Sedum spp.)*		
S. acre		Mat-forming sedums usually less than 3 inches high.
S. spurium	'Dragon's Blood'	Bronze-tinged new foliage that turns red in the fall.
S. spurium	'Album'	Two-row stonecrop with white flowers.
Wintercreeper *(Euonymous fortunei)*		
	'Argento-marginatus'	White markings on the leaf margin.
	'Coloratus'	Purplish-red foliage. A good ground cover.
	'Emerald and Gold'	Yellow leaf margins.

Propagation

Most of the ground covers listed are relatively easy to reproduce following one or more of the most commonly used propagation techniques. For each ground cover one method is often preferred, however, because it gives the most consistent results.

Cuttings: Candytuft, English Ivy, Pachysandra, Japanese Honeysuckle, Stonecrop, Wintercreeper.

Division: Barrenwort, Bugleweed, Creeping Thyme, Daylilies, Goutweed, Hosta, Lily-of-the-Valley, Periwinkle.

The following table indicates the general methods used to propagate the 15 ground covers discussed in this bulletin. The most commonly used method is noted with an asterisk (*).

Propagation of Common Ground Covers

Common	Prop. method	Time	Rooting or germination temperature (degrees F)	Time to rooting or germination	Comments
Barrenwort *(Epimedium spp.)*	D*	Spring to early summer			
Bugleweed *(Ajuga reptans)*	D* S	Spring or fall	60-70		Seedlings variable in form.
Candytuft *(Iberis sempervirens)*	C* D S	June to August	 55-65	 16-20 days	Seeding is not recommended. Divisions hard to establish. Seedlings variable in form.
Creeping Thyme *(Thymus serpyllum)*	C D* S	Spring Spring or fall	65-70 55-65	2-4 weeks 15-20 days	
Daylily *(Hemerocalis spp.)*	D* S T	Spring or fall	 60-70	 3-7 weeks	1 or more fans per division. 2-3 years to flower from seed. Seedlings variable in form. Refrigerate seeds for 6 weeks.
English Ivy *(Hedera helix)*	C* R S	July to September			
Goutweed *(Aegopodium podograria)*	D*	Spring or fall	60-70		
Hosta or Plantain Lily *(Hosta spp.)*	D* S T	Spring or fall	 70	 15-20 days	Seeds may not be true to type. 2-3 years to flower from seed.
Japanese Honeysuckle *(Lonicera japonica)*	C* D S	Summer			Seeds may need stratification (3 months at 40°F).
Japanese Spurge *(Pachysandra terminalis)*	C* D S	Late June		30 days	No rooting hormone. Seeds may need stratification. Take cuttings after spring flush has hardened.
Lily-of-the-Valley *(Convallaria majalis)*	D*	Early spring	60-70		May be slow to reestablish. Divisions are called "pips."
Periwinkle *(Vinca minor)*	C D* S	Anytime Spring			
Snow-in-Summer *(Cerastium tomentosum)*	C D S	After flowering Spring or fall	 70-75	 5-10 days	Seeds viable in soil for years.
Stonecrop *(Sedum spp.)*	C* D S	Midsummer Summer	65-70 70-80	2-3 weeks 15-30 days	Stem or leaf cuttings.
Wintercreeper *(Euonymus fortunei)*	C* R S	June to August		3-6 weeks	Seeds may need stratification (3-4 mos. at 32°-50°F). Horizontal cuttings tend to form sprawling plants.

*Preferred method of propagation. C = Cuttings D = Division S = Seeds R = Root layering T = Tissue culture

Sanitation: Regardless of the method employed, sanitation is a key factor in the success of commercial plant propagation. Because many pathogens are soil borne, all media must be pasteurized or treated with fungicides before use to prevent damping-off. Equipment and facilities, such as flats, pots, seeders, benches and misters, should be cleaned thoroughly with a chlorine bleach solution (1 part chlorine bleach to 9 parts water) before each crop.

Seedling Variability: Though most of the ground covers may be propagated by seeds, many of them exhibit seedling variability, especially when seed from hybrid plants is used. Because of this lack of consistency in the seedlings, other propagation methods are generally preferred for named varieties of these plants.

Shading: For best results, cuttings should be placed under 30 to 50 percent shading until the root systems are well established.

Sources of Cuttings

Someone getting started in the propagation of plants by cuttings will have to obtain quality stock material. The following sources are commonly used:

Prunings from local landscapers, parks, etc.: This source is generally *not* recommended for commercial growers because it is often impossible to determine the exact cultivar and the health of the plants being used.

Prunings from young nursery plants being grown for sale: This source would allow for propagation of plants of known origin, health and cultivar. The quantity of cuttings may be limited, however, by the need to maintain salable plants.

Stock plants maintained specifically for this purpose: This is the best but the most expensive source of cuttings. Stock plants may be cut back severely and thus produce a large number of cuttings per plant. These plants are also available for pruning when they are in the best physiological state for cuttings to root.

Stock Beds: To maintain a reliable supply of healthy, true-to-name plant material, consider the use of stock beds. The plants will be located in the beds for several years, so you must take care to prepare the soil properly. The site must be well drained and accessible for easy maintenance. Perennial weeds, seeds and pathogens should be eliminated by fumigating the soil in the bed. After the plants are established, weeds may be controlled by the use of mulches, hand weeding or the selective use of herbicides labeled for the specific ground cover.

Root Media

Seed Germination Media: Use a fine-textured but porous medium, such as a peat-lite mix or fine sphagnum, that will allow for adequate air exchange.

The mixture should have a pH around 6.5.

All media used for germination must be pathogen free to avoid damping-off and other disease problems.

Rooting or Transplant Media: A good medium for rooting cuttings or for growing divisions must provide: support for the cuttings, moisture retention, air penetration to the root zone, and a disease- and insect-free environment.

A typical bedding plant peat-lite mix would include:

50 percent peat/50 percent perlite or vermiculite by volume (11 bushels peat and 11 bushels vermiculite per cubic yard).*

5 pounds fine dolomitic lime

2 pounds superphosphate (0-20-0)

1 pound potassium nitrate

2 pounds Osmocote (14-14-14)

3 ounces wetting agent

4 tablespoons of fritted trace elements or a manufacturer-recommended equivalent amount of a microelement mix

A typical soil-based mix would contain the following:

1/3 cubic yard of loam soil

1/3 cubic yard of sphagnum peat

1/3 cubic yard of perlite

2 pounds of superphosphate (0-20-0)

Add dolomitic limestone to raise the pH to 5.8 to 6.0 or $FeSO_4$ to lower it.

Either mix must provide good aeration, drainage and moisture retention capability. The peat-lite mixes give the most consistent results.

Fertilization

Proper fertilization is important for good growth *once the plants have developed roots.* (See Extension bulletin E-1275, *Chemical Controls for Michigan Commercial Greenhouse and Bedding Plant Production.*)

1. Have a media or soils testing laboratory give a complete analysis of the initial soil mix and make adjustments *before* planting.

2. Use a pH meter and solubridge to spot-check the pH and

*1 cubic yard = 27 cubic feet or 22 bushels. However, 15-20 percent shrinkage occurs in mixing, so you must add an extra 4 bushels for a total of 26 to maintain the proper volume.

soluble salts levels in the medium weekly *before* fertilizing.

3. A desirable range for conductivity of soluble salts in a mixture of 1 part medium and 2 parts distilled water is 0.5 to 0.8 μmhos. If the salts are below 0.3 μmhos, the soil is deficient and should be fertilized. Above 0.8, the soil contains excessive salts and should be leached.

4. Generally, an application of 100 ppm of 15-16-17 is recommended at the first watering after roots appear.

5. Follow with 200 ppm of nitrogen and potassium at each watering. The level of fertilization may need to be adjusted to maintain good color and adequate growth rates. Underfertilized plants will be stunted and yellowish.

Temperatures

1. See Propagation of Common Ground Covers Table for recommended germination temperatures.

2. Ground cover cuttings and divisions generally grow best at cooler temperatures in the 60° to 70°F range.

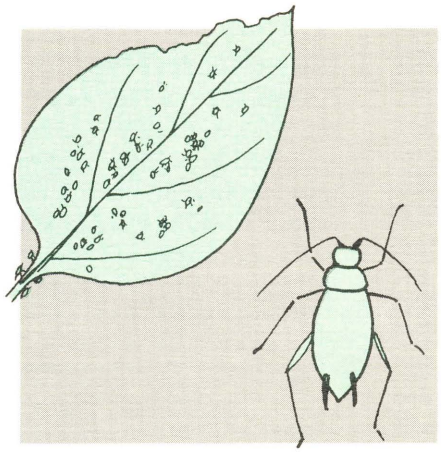
3. To harden off the plants before transplanting outdoors, gradually decrease temperatures to 55°F and maintain the plants at that level for a week or two.

Spacing in Flats or Pots

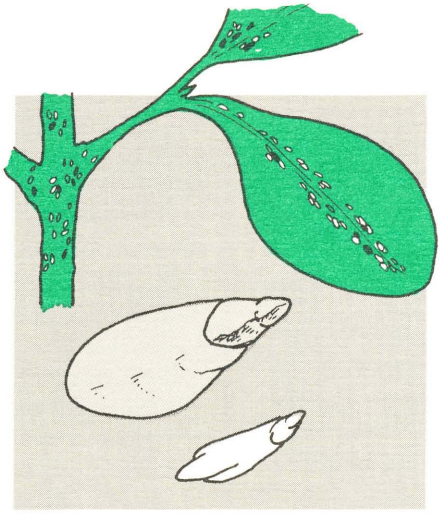
1. Plant spacing and pot size will vary by species. Always take care to allow enough room for adequate air circulation around and between plants to avoid disease problems.

2. The American Standard for Nursery Stock of the American Association of Nurserymen recommends that "Ground covers supplied in pots or similar containers shall be thrifty, well balanced plants, well established in the containers." They suggest the following specifications:

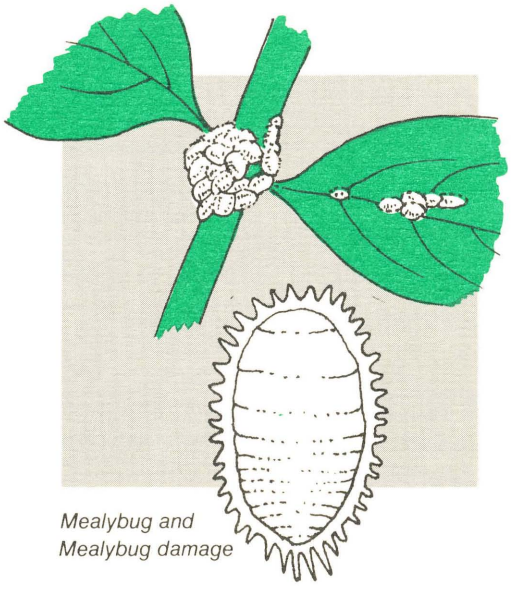
Variety	Size of Pot	Min. no. of runners	Min. length of runners
Ajuga reptans & cultivars	2¼ in	—	—
	4 in	—	—
	gal	—	—
Euonymus fortunei & cultivars	2¼ in	2	8 in
	3 in	3	10 in
	4 in	4	10 in
	gal	6	12 in
Hedera helix & cultivars	2¼ in	1	8 in
	3 in	2	10 in
	4 in	3	10 in
	gal	4	10 in
Lonicera japonica 'Halliana'	2¼ in	2	4 in
	3 in	3	6 in
	4 in	4	8 in
Pachysandra terminalis	2¼ in	—	—
	3 in	—	—
	4 in	—	—
Vinca minor & cultivars	2¼ in	3 to 6	6 to 8 in
	3 in	6 to 8	8 to 10 in
	4 in	10 to 12 in	8 to 10 in



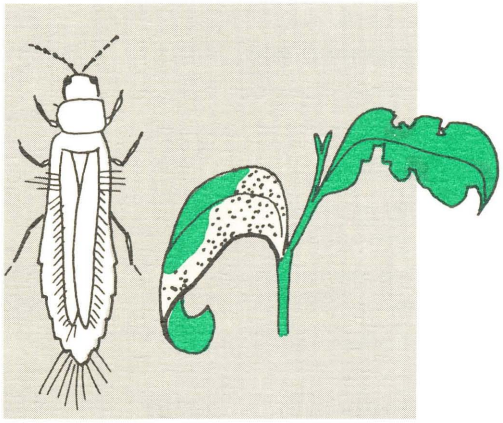
Aphid and Aphid damage



Scales and Scale damage



Mealybug and Mealybug damage



Thrip and Thrip damage

Insects

The following insects may be problems on the ground covers listed:

Aphids: Light-colored, crawling insects that suck plant juices and cause stunted growth or a general decline in plant vigor. They often appear on growing tips or under leaves and secrete sticky honeydew which may support sooty mold growth. Warmer temperatures speed their life cycle and magnify the problem.

Mealybugs: Small, sucking, pinkish insects that produce a white, cottony mass often found in the leaf axils. They secrete sticky honeydew that may support sooty mold growth. Mealybug infestations may produce distorted growth and premature leaf drop.

Nematodes: Microscopic worms that may attack roots and, occasionally, other plant parts. The best control is good sanitation, especially the use of sterile root media.

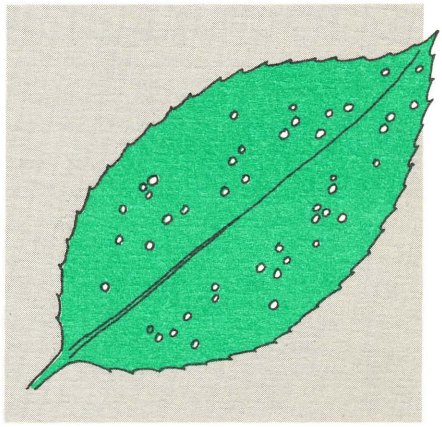
Scales: Sucking insects that cover themselves with a white, brown or black waxy substance and secrete sticky honeydew that may support sooty mold growth.

Slugs and Snails: Soft-bodied, crawling pests that feed at night, leaving a trail of slime and large holes in the leaves. They are more prevalent under high moisture conditions.

Spider mites: Members of the spider family that suck plant juices and reproduce more rapidly at higher temperatures.

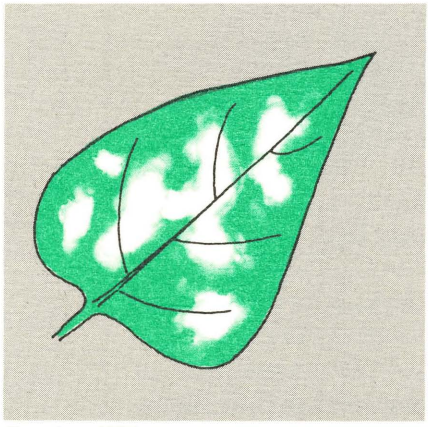
Thrips: Extremely small insects that are difficult to see without a hand lens. They feed on unfolding leaves, flowers and flower buds and leave irregular white spots that give plants a silvery appearance.

(See Extension bulletin E-1276, *Insect Controls for Michigan Commercial Greenhouse and Bedding Plant Production,* for chemical control measures.)



Leaf Spot

Leaf Blight



Powdery Mildew

Diseases

The following diseases may be problems on ground covers during propagation:

Bacterial Leaf Spot: Spots are light green and water-soaked at first, then turn brown or black with reddish margins. It is promoted by high temperatures and excessive moisture on foliage. This is a common problem on *Hedera helix.*

Damping-off: Causes sudden death of young seedlings and spreads in a circular pattern in the seed tray. It is often caused by *Rhizoctonia* or *Pythium* fungi and may be controlled by use of pasteurized media or fungicide treatment of media *before* seeding.

Crown Rot: This fungus attacks the base of the stem and progresses upward on the plant. It may be prevented by using a well drained medium and not overcrowding plants.

Leaf Blight: Small specks or spots develop on the leaves, followed by yellowing and withering of the plant. Remove and destroy infected leaves.

Powdery Mildew: Gray, fuzzy-looking, superficial growth that appears on leaves and stems. The problem is more serious under high humidity and cloudy conditions. Use fungicides and increased air circulation for control.

Stem Rot: This disease causes stunted growth and decay of plant parts. Avoid it by maintaining good aeration and not overfertilizing with high nitrogen fertilizers.

(See Extension bulletin E-1275, *Chemical Controls for Michigan Commercial Greenhouse and Bedding Plant Production,* for specific control recommendations.)

The Cooperative Extension Service has many other publications on bedding plants, flowers and related subjects. Call or write your county Cooperative Extension Service office for a catalog of available publications, or write to:
MSU Bulletin Office
Michigan State University
P.O. Box 6640
E. Lansing, MI 48826-6640

Following is a partial listing of some of the items available at your county Extension office:

E-1275 *Chemical Controls for Michigan Commercial Greenhouse/Bedding Plant Production* (12 pp.) $.55
E-1276 *Insect Controls for Michigan Commercial Greenhouse/Bedding Plant Production* (2 pp.) $.55
E-1375 *Producing Petunias for Profit* (4 pp.) free
E-1400 *Identifying Major Pests of Greenhouse Bedding Plants* (4 pp.) $.45
E-1443 *Producing Marigolds for Profit* (4 pp.) free
E-1579 *Growing Fibrous Begonias for Profit* (4 pp.) free
E-1580 *Producing Impatiens for Profit* (4 pp.) free
E-1663 *Growing Salvia for Profit* (6 pp.) $.30
E-1664 *Producing Coleus for Profit* (4 pp.) free
E-1996 *Producing Seed Geraniums for Profit* (12 pp.) $.40
E-2014 *Insect and Mite Management in Commercial Greenhouses* (80 pp.) $2.00

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New-9:88-10M-KMF-SPD, $1.00, For sale only.
FILE 26.2 Flowers & Plants/Comm.