



# Missouri Environment & Garden

## Monitoring, Detection and Management of Lettuce Drop caused by Sclerotinia spp.

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### Biology and life cycle of the lettuce drop fungi

The fungal pathogens in the genus *Sclerotinia* are known to cause diseases that are difficult to deal with on a wide range of crops. Lettuce is affected by two of these species, *S. sclerotiorum* and *S. minor*. Either of the two species may predominate on a given farm at a particular time. Both species may also exist in the same field as long as the prevailing weather favors them and, more importantly, based on the crop histories. *S. minor* is not a common problem of lettuce here in Missouri but *S.*



*Fig. 1. Initial symptom of lettuce drop on variety 'Rex' (left) and sclerotia of Sclerotinia sclerotiorum (right) from heavily diseased high tunnel lettuce grown in Missouri.*

*sclerotiorum* affects many vegetables (including lettuce) as well as grain crops such as soybeans.

On lettuce, the type of damage inflicted by these fungi has two phases depending on when it started: a) the damping-off phase which attacks the seedling stages, and b) the field phase which causes a watery soft rot of lower leaves and crown areas (Fig. 1, left). This is followed by wilting and limping, leading to an obvious symptom commonly referred as DROP. Lettuce drop caused by *Sclerotinia* species is known to be a serious problem of lettuce production worldwide. Both species produce black, hard, seed-like resting bodies called sclerotia (sing. sclerotium) on the lower surface of the leaves touching the soil, around the crown, and on the upper portion of the taproots. Sclerotia may survive in the soil for up to 8-10 years. Occasionally, both pathogens may also survive as active mycelium in diseased or dead lettuce plants. Sclerotia of *S. minor* are small (1/16 to 1/8 inch) and irregular in shape; in contrast, sclerotia of *S. sclerotiorum* which are larger (up to 1/2 to 1 inch) and are oblong to irregular and may appear similar in shape to rodent fecal pellets (Fig.1).

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## What do the symptoms and signs of lettuce drop look like?

The initial symptom of lettuce drop is wilting of the outermost layer of leaves which is usually observed as the crop approaches maturity. This symptom indicates that the crown has become infected. As infection progresses, the crown will develop a brown, soft, watery decay followed by the development of a snowy-white mycelium that eventually destroys the tissue and causes the entire plant to wilt (Figs. 2 and 3). Collapsed plants are unharvestable (Figs. 3 and 4). Typical signs of drop disease include white, fluffy, cottony mycelial growth during cool and moist weather, and the black sclerotial bodies on leaf undersides and crown area (Fig. 4). With *S. minor*, only the white mycelium and small black sclerotia are formed. *S. sclerotiorum* may also produce a mushroom-like structure called



Fig. 2. Challenged by what is killing your lettuce? Check for the initial symptoms on the bottom leaves/crown area and keep a suspect plant in a plastic bag with a paper towel overnight to see the fluffy mycelial growth.



Fig. 3. Typical fluffy mycelium of the lettuce drop and sclerotia of *S. sclerotiorum* seen when the fluffy mass of an infected red oak leaf lettuce plant is removed.



Fig. 4. Contrast of healthy and lettuce drop symptomatic red and green oak leaf lettuce grown in high tunnel.

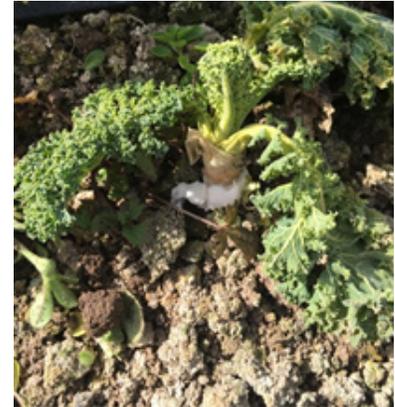


Fig. 5. Signs of the fluffy mycelium of *Sclerotinia* crown and stem rot on high tunnel kale grown in central Missouri.

an apothecium which emerges from the sclerotia and produces ascospores. These ascospores disperse in the air and may cause infections on the tops of lettuce plants.

## Under what conditions does the pathogen thrive?

Sclerotia, the hard bodies produced by both *Sclerotinia* species, allows these lettuce drop pathogens to survive in the soil. Soil moisture that is maintained at saturation for two or more weeks will lead to germination of the sclerotia of *S. sclerotiorum*, the fungus responsible for causing lettuce drop in Missouri. Temperatures between 59 to 71°F are optimal for the growth of *S. sclerotiorum*; therefore, cool, damp conditions favor pathogen growth and disease development. Lettuce is a cool season crop in Missouri. Accordingly, plantings particularly in protected systems (e.g., tunnels and greenhouses) from fall to early spring are highly susceptible to this disease.

## How is lettuce drop managed?

1. **Scout for and discard infected plants.** Infected plants need to be detected as early as possible and be discarded before they form sclerotia. Bear in mind that once formed, sclerotia are capable of staying in your soil for up to 8-10 years.
2. **Remove and destroy crop residue.** As much as possible, all litter and infected plant parts from previous crops should be removed and destroyed. Avoid discarding infected material at the field edge as it can blow back into the field.
3. **Avoid planting after other known hosts.** Rotation with non-hosts such as small grains should be practiced where it is feasible. Some possible rotation crops include onion, spinach, small grains or grasses. Other known crop hosts of *Sclerotinia* diseases include beans, cauliflower, celery, endive, escarole, fennel, pepper, radicchio, and tomato. On tomatoes, *S. sclerotiorum* causes a disease called timber rot. Cover crops to avoid include Australian winter pea, mustard, phacelia, and vetch.
4. **Moisture management.** Manage irrigations so as to avoid overly wet soils which may encourage *Sclerotinia* development. The use of sub-surface drip irrigation may reduce lettuce drop severity. Level production fields and provide even distribution of water. In addition, assure good drainage by having beds as high as possible. Flooding the soil when the ground is not in production could also help to reduce survival of sclerotia, particularly that of *S. minor*.
5. **Avoid crowding of plants.** Crowding of lettuce plants in the field, high tunnels, or greenhouses may create a fertile ground for epidemics of the lettuce drop disease. Opening up space randomly throughout the beds during harvesting will improve ventilation and significantly reduce the plant-to-plant contact and hence spread of the disease. In addition, lettuce planted on narrower beds may have lower incidences of drop than lettuce planted on wide beds.
6. **Nutrient management.** Avoid overly succulent growth by keeping the fertilizer level as optimum as possible.
7. **Deep (inversion) plowing.** Inverting and burying the top layers of the soil by using mold board plows may provide adequate control in fields with low sclerotial densities. Some research has shown that deeply buried sclerotia will die over time, or not be able to reach the lettuce plant. This results in reduced inoculum presence.
8. **Soil fumigation.** Soil fumigants are effective in reducing inoculum. However, such treatments are usually not cost-effective, due to a) the high price of fumigants and b) the labor required applying the chemicals. In addition, the accompanying safety regulations due to their toxicity make their feasibility on small scale very difficult.
9. **Resistant varieties.** Breeding efforts are underway and but truly resistant varieties are not yet available. Varieties with upright growth in which the leaves are more or less elevated from the soil may experience less severe lettuce drop.
10. **Biological control.** Contans WG® at 1-4 lbs. per acre, an OMRI (Organic Material Review Institute) approved product, is recommended for many *Sclerotinia* diseases including lettuce drop. It is also widely used for controlling white mold on beans. Contans®, whose active ingredient is the beneficial fungus *Coniothyrium minitans*, is applied with conventional spray equipment directly to the soil surface at planting.

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For more information on the product label follow this link <http://www.cdms.net/ldat/ld5SH001.pdf>. Since the active ingredient of Contans WG® is a biological organism, its efficacy depends on how the product is stored and applied. It has a short shelf life and hence keeping it under cool temperature is critical. Get the area well prepared ahead of time. Effectiveness is dependent on proper timing of the application, optimum soil moisture (too dry soil may hamper efficacy), and thoroughness of the coverage.



Fig. 6. Pilot projects on the use of biofungicide Contans® WG in high-tunnels in Missouri. Left: Ms. Martha O'Connor, Extension Technician at Lincoln University Cooperative Extension, is spraying Contans® WG in a high tunnel (around the time of sunset). Middle: lettuce in a high tunnel with an estimated 25% lettuce drop incidence in April 2014. Right: the same high tunnel after two applications of Contans® WG (2 lb/A) planted with lettuce in November 2014.

11. **Conventional fungicides\***. A significant reduction in lettuce drop was reported by applying fungicides during the rosette stage (approximately 30-40 days before harvest). Split applications of fungicides resulted in even better control. Generally, however, fungicides applied after thinning do not generally reduce lettuce drop caused by *S. sclerotiorum*. The following are recommended (Source: 2016 Midwest Vegetable Production Guide) products (conventional growers) against lettuce drop: Botran 75W® or Botran 5F® (rate varies by application method), Endura 70WG® (8-11 oz. per acre), Fontelis® (16-24 fl. oz. per acre), Merivon® (8-11 fl. oz. per acre) and Switch 62.5WG® (11-14 oz. per acre). Pay attention to the Pre-Harvest Interval (PHI) of each product. \* These are options for non-organic farms. For *S. minor*, fungicides applied immediately after thinning and cultivation (at 4-6 true-leaf stages) have shown a significant reduction in incidence of lettuce drop.

12. **Integrated lettuce drop management**. An integrated approach involves the use of the multiple strategies listed above to manage the disease and thereby increase productivity and profitability. Sclerotinia diseases are difficult to deal with. Depending on the season, location and level of inoculum, implementing as many compatible methods as possible is highly recommended. For detailed information on integrated approaches, refer to the publication by Subbarao (1998).

Before applying ANY product, 1) read the label to be sure that the product is labeled for the crop and the disease you intend to control, 2) read and understand the safety precautions and application restrictions, and 3) make sure that the brand name product is listed in your Organic System Plan and approved by your certifier (organic growers).

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Trade names in this publication are used solely for the purpose of providing specific information. Such use herein is not a guarantee or warranty of the products named and does not signify that they are approved to the exclusion of others. Mention of a proprietary product does not constitute an endorsement nor does it imply lack of efficacy of similar products not mentioned. Do not use any of the products unless registered for the given crop in the state.

**References:**

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# Shamrocks: More Than A Bit O'Luck

by Michele Warmund

Do you need a bit of green to boost your good fortune? If so, lucky shamrock plants (*Oxalis regnellii*) with their three triangular leaflets and delicate white flowers might just do the trick. Lucky shamrocks are perennials grown from small bulbs that are sold as houseplants for St. Patrick's Day. These plants thrive in indirect sunlight indoors with daytime temperatures from 70 to 75°F and evening temperatures between 50 to 65°F. Each night the plant's leaflets fold up but reopen in sunlight the following day.

During the summer, plants can be kept indoors or they can tolerate outdoor conditions in partial shade. In late summer, leaves turn brown and drop when the plant enters a rest period. During this time, shamrocks do not require watering. After one to three months, when new green shoots emerge, resume watering and soon the plants will begin flowering once again. If you prefer colored foliage, the purple-leaf shamrock (*Oxalis triangularis*) is also available and has pale pink flowers. Another alternative is the Good-Luck plant (*Oxalis deppei*), which is sold as a four-leaf clover. With all these shamrock plants, take care to avoid overwatering and watch for mites that do not kill the plant, but cause discolored foliage. Also, these plants do not tolerate low temperatures and must be kept indoors during winter.

While these shamrocks are the more showy members of the wood sorrel family, there is also the yellow wood sorrel (*Oxalis stricta*) that grows as a common weed in lawns and disturbed areas. It has three heart-shaped leaflets that grow from rhizomes from May through October. This sorrel produces delicate yellow flowers and three-quarters inch-long capsules tapered at the tip that burst open to disburse its seeds. Historically, yellow wood sorrel was used for medicinal purposes and can be consumed in small portions. These plants contain oxalic acid that gives them a slightly tangy taste.

The official Irish shamrock is not in the wood sorrel family, but is a clover. Some believe the true Irish shamrock is the yellow-flowered clover (*Trifolium dubium*). According to one legend, St. Patrick used a shamrock to symbolize the Christian doctrine of the Holy Trinity to his congregation. Today St. Patrick's Day celebrates the anniversary of his death and the shamrock represents the season of rebirth known as spring. An additional Irish tradition is to include shamrocks in the bride's bouquet and in the groom's boutonniere for good luck.

White clover is also considered a true trifoliate "shamrock". Many an hour has been spent searching for a lucky four-leaf clover, which is a naturally-occurring mutation. However, you have to be truly lucky to find one growing in a lawn as it is estimated that only one four-leaf clover occurs for every 10,000 three leaf clovers. Even rarer is the occasional mutation resulting in a five-leaf clover. A more recent lore, the first, second, third, fourth, and the rare fifth leaflet of a clover represent faith, hope, love, luck, and money, respectively. To increase the odds of growing four-leaf clovers, breeders at the University of Florida began selecting and crossing plants in the late 1980's and eventually released the Legendary Good Luck white clover where 50% of the plants grown from seed have four leaflets with a bit of dark red pigmentation near the center of the leaf.

The four-leaf clover is also become an emblem for 4-H, which is the largest youth development and mentoring program in the United States (Figure 1). Their precursor organizations were boys' and girls' clubs, which had a three-leaf clover as their first emblem in 1907. Each leaflet of the clover had an H, representing head, heart, and hands. Four years later, a fourth leaflet was added to their emblem to symbolize health. In 1924, these clubs became known as 4-H, which is part of our Cooperative Extension Service and the U. S. Department of Agriculture.

Shamrocks have much to offer as an ornamental plant with fun folklore and traditions. Whether you are Irish, a devoted 4-H member, or just someone in need of a bit o'luck, a shamrock might be the plant for you this spring.



Figure 1. The shamrock emblem used by 4-H clubs.

# Dormant Seeding of Turfgrass in Late Winter

by Brad Fresenburg and Lee Miller

Seeding of cool-season turfgrasses such as tall fescue and Kentucky bluegrass is recommended in late August – through mid September in Missouri. This timing allows seedlings enough time to germinate and mature prior to the frigid temperatures of winter, and spares them from the brutal heat and disease pressure of the summer. If you have a sparse or bare area that needs renovating, and have missed this window it's probable weeds will soon infest. Now is the time to do something about it.

Dormant seeding is the practice of sowing during temperatures not suitable for germination, in the expectation that germination will occur when temperatures rise to suitable levels in the spring. Field trials at Purdue University (Reicher et al, 2000) demonstrated dormant seeding of Kentucky bluegrass or tall fescue in November, December or March can be effective, and reduced the establishment time compared to seeding in April or May. The idea is to beat the weeds to the punch, and take advantage of the very first opportune environment for turfgrass germination. The weed seeds are there and waiting to germinate in the open space; why shouldn't your desired turfgrass seed be there ready to germinate and compete along with them? In addition, the jump on turfgrass maturity will reap benefits later, as the extra few weeks will allow for greater resistance to turfgrass diseases that can completely wipe out a stand of seedlings in late spring/early summer.

With Missouri's broad temperature swings in late fall and early winter, a late winter timing for dormant seeding may be most appropriate. Soil temperatures will normally remain below the germination range in February or March until it's go-time in the spring, therefore reducing the overall time of dormant seed in the field and minimizing the chances for winterkill. When attempting a dormant seeding, seedbed preparation is still very critical for success. Proper seed/soil contact is a necessity so removing any vegetation with a strong hoe or rake will be necessary.

Crabgrass control is difficult with any dormant seeding, and is even more troublesome with a later spring seeding. If herbicide use is necessary during the spring, a pre-emergent herbicide application may not be possible as most will inhibit seedling germination and cause injury. Dithiopyr has pre-emergent and some early post-emergent activity, and may be applied later in the season when hopefully most turfgrass seedlings have



Photo by Omaha Organics

*Bare areas, like this one, can be dormant seeded in late winter to take advantage of the first available spring germination temperature.*

established. Also, consider alternative pre-emergents such as siduron, or post-emergent applications of quinclorac or mesotrione. As an organic solution, corn gluten meal should be treated with the same care as pre-emergent herbicides and applied as late as possible on a mature turfgrass stand.

Current weather patterns are conducive for dormant seeding as the soil is not frozen, and no snow or heavy freezing events are in the forecast. If you have some sparse areas, take advantage of this period and sow some turfgrass seed to compete with spring weeds.

# New Bedding Plants for 2016

by David Trinklein

Few activities are more inspirational for an avid gardener on a dreary February day than perusing seed catalogs to find the new annual bedding plant releases for the year. Each year brings with it a plethora on new choices for the garden—some probably better suited to our climate than others. Listed below are a number of new cultivars for 2016 that should perform well under Missouri conditions and warrant consideration.

**Begonia BIG Rose Green Leaf** (*Begonia benariensis*). If you have limited time, or are new to gardening, BIG Begonias are for you. They are one of the easiest plants to care for and are consistently winners in university trials across America. BIG Begonias are carefree and thrive in any location in sun or shade. Their huge flowers and naturally glossy foliage give them a manicured look. No matter what your gardening experience level, you will be successful with BIG Begonias.

**Begonia Marshmallow** (*Begonia cultivars*). Lots of two-tone blooms cover this strong-performing, compact begonia. Gardeners will get a high bloom count all summer long. The flowers start out white/cream and mature to a pink/rose hue. This new begonia is excellent for patio containers or hanging baskets.

**Begonia Nonstop™ Joy Yellow** (*Begonia tuberhybrida*). Begonia Nonstop™ Joy is a new type of tuberous begonia that is naturally self-branching and doesn't break open or split in the rain or wind. It is a great choice for shady hanging baskets, pots, or mixed containers. The beautiful, bright yellow double flowers look elegant and clean against the plant's dark green foliage. Nonstop begonias prefer partial to full shade.

**Begonia San Francisco™** (*Begonia boliviensis*). Begonia San Francisco™ is the answer for those looking for a plant that produces lots of color but is easy to care for. Its huge,

warm salmon-pink flowers look a lot like a fuchsia, but can handle all the sun and heat that Mother Nature can dish out. The full, lush plants will flower better in full sun, but can also tolerate some shade. It is a great choice for patio pots and baskets.

**Begonia Unbelievable First Kiss** (*Begonia x hybrid*). Big, bright blooms are what make this begonia unforgettable. Deep rose, semi-double flowers are set off against dark green, heavily serrated foliage. A great selection for adding texture and color to containers, baskets and garden beds, Unbelievable First Kiss thrives in the heat and performs well in both sun and shade.

**Calibrachoa Aloha Blue Sky** (*Calibrachoa x hybrid*). Vibrant, cheery flowers open deep blue and fade to lavender as they age, lending a gorgeous multi-toned effect to the plant. Naturally trailing, Aloha Blue Sky is an excellent choice for hanging baskets, or for spilling over the edge of a mixed planter. Its blue tone pairs well with purple, pink, yellow and orange flowers. Aloha thrives in the heat and blooms all summer long, tolerating wind, rain, and cool temperatures.

**Calibrachoa Superbells® Holy Moly!™** (*Calibrachoa hybrid*). This unique pink and yellow bi-color bloom will really add life to containers and hanging baskets. Perfect on its own or in a combination recipe with other similar colors. Easy to grow care for, Superbells Holy Moly! performs well

spring through summer and right into fall with its cool tolerance, and ability to stay strong in heat and humidity too.

**Celosia Arrabona Red** (*Celosia plumosa*). This new celosia produces masses of striking red plumes that will last all summer long! Easy care for, it is drought tolerant and loves the heat. Arrabona's fiery red flowers look gorgeous in both borders and containers.

**Celosia Dragon's Breath** (*Celosia plumosa*). Gardeners will love the unique green-red foliage and blazing-red, long-lasting flowers of Dragon's Breath celosia. Dragon's Breath is great in containers, beds and large landscapes. Dragon's Breath exhibits even redder foliage and flowers when summers get hot and humid.

**Coleus Main Street Granville Street** (*Solenostemon scutellarioides*). Brilliantly bright foliage makes this coleus the center of attention in any planting. A myriad of colors are displayed on large leaves with delicate scalloped edges. Colors range from pale chartreuse to pink to deep burgundy. It combines well with many other colors. Great as a "thriller" in mixed containers or incorporated into garden beds, this coleus is easy to care for both in sun or shade.

**Cosmos Casanova** (*Cosmos bipinnatus*). Casanova is a free-branching series of garden cosmos that will flower until frost. Exhibiting low day-length sensitivity, it flowers in both

## New Bedding Plants for 2016 continued.

long and short day conditions. Available in four colors including a striking red, it should become the new standard for compact garden cosmos.

**Cosmos Xanthos™** (*Cosmos bipinnatus*). Cosmos Xanthos™ is an amazing new cosmos. It has a unique soft-yellow color never seen before in early flowering garden cosmos. It produces nice compact, round flowers with a collarete in a sunning soft yellow with lighter edges.

**Dahlia Miracle Princess** (*Dahlia hybrid*). Miracle Princess bears a decorative-type flower that is both full and perfectly-formed. Blossoms often measure five inches in diameter. The flowers are orchid pink with a soft yellow glow at the center, and are earlier than most dahlias. The sturdy, 35 inch plants rarely need staking, and are a good choice for perennial borders, cutting gardens and large containers.

**Geranium Brocade Fire and Brocade Cherry Night** (*Pelargonium x hortorum*). Brocade geraniums are novelty geraniums prized for their unique, bright foliage. Both Brocade Fire and Brocade Cherry Night can be used as an accent plant in container combinations or as a landscape plant. Their lime green foliage looks great in the shade, or in contrast with dark-leaved plants. Easy to grow and very weather tolerant, these plants will last through throughout the summer. Both are AAS Winners.

**Geranium Survivor Rose Pink** (*Pelargonium x hortorum*). Incredible flower power makes Survivor Rose Pink a must-have for every gardener. It bears large flower-heads in a striking rose hue that are gracefully held above its dark green foliage. These survivors bloom through cold, heat, wind and rain. Plant among a mix of complementary annual flowers for an eye-catching mixed planter or plant alone in the landscape for a bold splash of color.

**Gerbera Revolution Bicolor Yellow Orange™** (*Gerbera*

*jamesonii*). This new gerbera offers brilliant shades of yellow and orange with a variable color pattern – some rings around the eye are large, some are smaller, and some flowers have almost a deep red ring around the eye. A great size for small container production, it represents a perfect for gift for others for adding color to interior spaces.

**Gerbera Daisy Bengal™ Red with Eye** (*Gerbera jamesonii*). Bigger, beefier eye-catching blooms are the hallmark of this new gerbera. Strong, vigorous plants produce an abundance of blooms all season long. Bengal is adaptable to both indoor and outdoor decorating. The bright cheery colors are perfect for adding a splash of color to table tops, patio pots or a border's edge.

**Gladiolus Tricolore** (*Gladiolus hybrid*). Gladiolus Tricolore will be the talk of a summer garden and a star attraction in flower arrangements. Each spike features 8-10 inch orchid-like blooms with crimson red petals and a maroon and purple throat. Its flowers have an elegant color combination that is thoroughly modern and totally riveting. Like all gladiolus, the corms are easy to grow in flower gardens, cutting gardens and containers.

**Hibiscus Little Zin** (*Hibiscus acetosella*). This attractive plant with dark burgundy foliage well in combination with other flowering plants in containers. Little Zin loves the heat and holds its color and upright form throughout the summer. Its serrated leaves offer texture and unique appeal in combination containers. Also, Little Zin remains more compact than other hibiscus varieties.

**Impatiens SunPatience® Spreading Clear Orange** (*Impatiens x hybrida*). Garden success has never been simpler with easy-to-grow SunPatience®. Their substantive flowers and tough foliage are less prone to disease than most impatiens; and their strong sturdy plants tolerate heat, humidity, rain and adverse weather

conditions. SunPatience® exceptional outdoor performance has been proven time and again in numerous independent and university trials around the world. SunPatience® are resistant to impatiens downy mildew, which plagues traditional impatiens.

**Marigold, French Chica™ series** (*Tagetes patula*). What's not to like about marigolds? User-friendly, they flower prolifically through the hottest weather and provide color when it is needed most. The Chica™ series produce large flowers for a French marigold; colors available include gold, yellow and orange.

**Melampodium Jackpot** (*Melampodium paludosum*). Melampodium is an underused annual bedding plant. Adaptable, it tolerates cool springs, hot (dry) summers and flowers well into the fall. Melampodium Jackpot will maintain its attractive appearance with very little care all season long. It produces golden-orange flowers about one inch in diameter on plants that achieve a height of between 15-20 inches by summer's end.

**Petunia Easy Wave® Yellow** (*Petunia x hybrida*). This new petunia is the first yellow in the Easy Wave® series. The plants are fast-growing and bloom freely all season in the garden or in hanging baskets and pots. Easy Wave® petunias are an easy way to add color to any outdoor living space. Also new for 2016 is Easy Wave® Pink Passion and Easy Wave® Silver. All mix well with other Easy Wave® varieties to form a spectacular color palette. Alternatively, blend them with any sun-loving flower for a great trailing component in mixed containers.

**Petunia Limbo \*GP\* Blue Veined™** (*Petunia x hybrida*). This new petunia bears large, grandiflora-sized lavender blue flowers with dark blue veining making for a very attractive color combination. The Limbo \*GP\* series of hybrid petunias was bred to be genetically compact in the garden,

## New Bedding Plants for 2016 continued.

so it won't get "stringy" like other petunia varieties in the heat of summer.

**Petunia Picobella™ Cascade Sky Blue** (*Petunia milliflora*). Talk about flower power, this compact new petunia is smothered with a carpet of tiny 2-inch blooms that flower all season long. Eye-catching in the garden in addition to being a superb choice for hanging baskets, it grows 6-10 inches tall and spreads 16-18 inches wide.

**Petunia Potunia® Blueberry Muffin** (*Petunia x hybrida*). This new petunia bears striking star-patterned flowers with colors akin to a buttered blueberry muffin -- pale yellow alongside deep blue and lavender with delicate veining. Potunia® varieties are perfectly mounded and great in mixed containers, hanging baskets or in the landscape as a low groundcover. Top-performing, tough, and blooming from summer to frost, Potunia® adds color and interest to any garden.

**Petunia Sanguna® Patio Pink Morn** (*Petunia x hybrida*). Sanguna® Pink Morn petunia stands out in the garden due to the distinct, vibrant hot pink and white bi-color flower patterns. Plants initially grow upright and mound later; they can be planted in containers, baskets and in the bed or border. Due to its novelty bi-color flowers and controlled growth habit, it is extremely well suited as a combination item for a wide variety of containers.

**Petunia Sanguna® Radiant Blue** (*Petunia x hybrida*). This stunning new hybrid petunia packs a punch. With a bicolor flower pattern, Sanguna® Radiant Blue gracefully adds beauty to any container. While creating stand-out pots for porches and decks, it also performs well in garden beds. The versatility of this flower will provide many options to decorate garden spaces.

**Petunia SuperCal® Light Yellow** (*Petchoa hybrid*). Known for its large, vibrant flowers and superior outdoor performance, SuperCal® combines in one plant the desirable traits of both

petunia and calibrachoa. SuperCal® offers exceptional garden performance under all kinds of weather -- from unexpected late frosts, to rainy cycles and even through the heat of summer.

**Petunia Trilogy Deep Purple** (*Petunia x hybrida*). Trilogy Deep Purple is a mounding, spreading petunia that is covered with vibrant, dark-purple flowers all season long. Trilogy petunias can be used in containers or in the garden and will spread up to 30 inches by season's end and achieve a mature height of between 10-20 inches.

**Salvia Black and Bloom** (*Salvia guarantica*). This new salvia boasts vibrant dark blue and black flowers that last all season. It's a magnet for hummingbirds and butterflies. It is an outstanding garden performer that thrives in heat, drought and humidity. Its blue flower color against a nearly black stem stands out in every landscape or container.

**Salvia Grandstand Red™** (*Salvia splendens*). *Salvia Grandstand* is humidity and heat tolerant for outstanding performance in all regions. The plant will continue to produce new flower spikes all season long, instead of flowering in cycles as some salvias are prone to do. *Salvia Grandstand* is an ideal plant for container gardens and in the landscape creating some height and dramatic color as combination or stand-alone plant.

**Salvia Summer Jewel™ Lavender** (*Salvia coccinea*). This new salvia flowers very early and continues blooming until frost. Naturally compact, it grows to be no more than 18 inches when mature. Summer Jewel Lavender is the first lavender colored form of *Salvia coccinea*. An AAS Regional Winner.

**Sunflower Golden Bear** (*Helianthus annuus*). Sunflower Golden Bear boasts plants 10 feet tall that bear single headed, bright golden yellow triple-full flower sunflower. Maturing in about 90 days, Golden Bear is a tall version of

Teddy Bear, a popular dwarf sunflower. Because of its size it should be planted in the back of garden borders. Its highly ornate flowers are beautiful in large bouquets.

**Sunflower Helios Flame** (*Helianthus annuus*). This new sunflower's attractive golden yellow/mahogany flowers with clean, pollen-free dark disks create a perfect mid-to-late summer theme. Sunflower Helios Flame grows to a mature height of about four feet and is perfect for the back of garden borders or for use in cut flower arrangements.

**Trifolium Limerick Estelle** (*Trifolium repens*). *Trifolium Limerick* offers a unique option when looking for a foliage plant to serve as a "spiller" in combination plantings. It bears trifoliate, "shamrock-like" foliage that has bold patterns and is available in three varieties: Estelle, Isabella and Jessica.

**Verbena Lanai® Blue Eyes** (*Verbena hybrida*). Lanai® Blue Eyes verbena stands out because of its outstanding sky blue flower color which are accented by white eyes in the flower centers. It grows vigorously and performs well under hot and sunny conditions in large baskets, containers, and as ground cover. It is equally attractive when planted alone or combined with other plants in containers. As an added benefit, exhibits very high tolerance to powdery mildew.

**Zinnia Zinderella Peach** (*Zinnia elegans*). *Zinnia Zinderella Peach* bears novelty, scabiosa (pincushion flower) type blooms 2-2 ½ inches in diameter. About 80 percent of its blooms are fully double, semi-double with the remaining 20 percent being single flowers. Its flowers are a unique salmon color with cream to rose petals and a distinct dark eye. This new zinnia is a unique accent flower for bed, borders or used as a cut flower in bouquets.

**Credit: National Garden Bureau**

# FEBRUARY GARDENING CALENDAR

Category	Week				Activity
	1	2	3	4	
Ornamentals	x	x	x	x	Winter aconite ( <i>Eranthis</i> sp.) and snowdrops ( <i>Galanthus</i> sp.) are hardy bulbs for shady gardens that frequently push up through snow to bloom now.
	x	x	x	x	Water evergreens if the soil is dry and unfrozen.
	x	x	x	x	Inspect summer bulbs in storage to be sure none are drying out. Discard any that show signs of rot.
	x	x	x	x	Enjoy the fragrant blooms of the Ozark Witch Hazel flowering in shrub borders or wooded areas on warm sunny days.
	x	x	x	x	Take geranium cuttings now. Keep the foliage dry to avoid leaf and stem diseases.
		x	x	x	Sow seeds of larkspur, sweet peas, Shirley poppies and snapdragons where they are to grow outdoors now. To bloom best, these plants must sprout and begin growth well before warm weather arrives.
		x	x		Seeds of slow-growing annuals like ageratum, verbena, petunias, geraniums, coleus, impatiens and salvia may be started indoors now.
				x	Dormant sprays can be applied to ornamental trees and shrubs now. Do this on a mild day while temperatures are above freezing.
				x	Start tuberous begonias indoors now. "Non-stop" varieties perform well in this climate.
	Vegetables	x	x	x	x
x		x	x	x	Start onion seeds indoors now.
x		x	x	x	Run a germination test on seeds stored from previous years to see if they will still sprout.
x		x	x	x	Don't work garden soils if they are wet. Squeeze a handful of soil. It should form a ball that will crumble easily. If it is sticky, allow the soil to dry further before tilling or spading.
		x	x	x	Sow celery and celeriac seeds indoors now.
			x	x	Sow seeds of broccoli, cauliflower, Brussels sprouts and cabbage indoors now for transplanting into the garden later this spring.
			x	x	If soil conditions allow, take a chance sowing peas, lettuce, spinach and radish. If the weather obliges, you will be rewarded with extra early harvests.
Fruits		x	x	x	x
	x	x			Collect scion wood now for grafting of fruit trees later in spring. Wrap bundled scions with plastic and store them in the refrigerator.
			x	x	Grapes and bramble fruits may be pruned now.
			x	x	Begin pruning fruit trees. Start with apples and pears first. Peaches and nectarines should be pruned just before they bloom.

# FEBRUARY GARDENING CALENDAR

Category	Week				Activity
	1	2	3	4	
Fruits cont.			x	x	When pruning diseased branches, sterilize tools with a one part bleach, nine parts water solution in between cuts. Dry your tools at day's end and rub them lightly with oil to prevent rusting.
				x	Established fruit trees can be fertilized once frost leaves the ground. Use about one-half pound of 12-12-12 per tree, per year of age, up to a maximum of 10 pounds fertilizer per tree. Broadcast fertilizers over the root zone staying at least one foot from the tree trunk.
Miscellaneous	x	x	x	x	To avoid injury to lawns, keep foot traffic to a minimum when soils are wet or frozen.
	x	x	x	x	When sowing seeds indoors, be sure to use sterile soil mediums to prevent diseases. As soon as seeds sprout, provide ample light to encourage stocky growth.
	x	x	x	x	Repot any root-bound house plants now before vigorous growth occurs. Choose a new container that is only 1 or 2 inches larger in diameter than the old pot.
	x	x	x	x	To extend the vase life of cut flowers you should: 1. - Recut stems underwater with a sharp knife. 2. - Remove any stem foliage that would be underwater. 3. - Use a commercial flower preservative. 4. - Display flowers in a cool spot, away from direct sunlight.
	x	x			Now is a good time to learn to identify trees by their winter twigs and buds.
	x	x			Branches of pussy willow, quince, crabapple, forsythia, pear and flowering cherry may be forced indoors. Place cut stems in a vase of water and change the water every 4 days.
		x	x	x	Watch for squirrels feeding on the tender, swollen buds of Elms, Hickories, Oaks and other trees as spring approaches.
		x	x	x	Maple sugaring time is here! Freezing nights and mild days make the sap flow.
		x	x	x	Begin to fertilize house plants as they show signs of new growth. Plants that are still resting should receive no fertilizers yet.
			x	x	Now is a good time to apply appropriate sprays for the control of lawn weeds such as chickweed and dandelion.
			x	x	Tall and leggy house plants such as dracaena, dieffenbachia and rubber plants may be air layered now.
			x	x	Save grape vine prunings for making into attractive wreaths and other craft objects.
				x	Late winter storms often bury birds' natural food supplies and a well stocked feeding station will provide a life-giving haven for our feathered friends.
				x	Encourage birds to nest in your yard by providing water and by putting up bird houses. Planting suitable shrubs, trees, vines and evergreens will provide wild food sources and nesting habitat.

Gardening Calendar supplied by the staff of the William T. Kemper Center for Home Gardening located at the Missouri Botanical Garden in St. Louis, Missouri. (www.GardeningHelp.org)