Missouri Environment & Garden

June 2011 Volume 17, Number 6

Home Lawn Watering Needs...

Eighty percent of the water used around a home during the summer is for outside uses. Watering the lawn is the main outside water use. Water conservation is becoming more and more prevalent across the country and local water authorities may cut off water for outside usage. Measures of this kind are necessary and effective means to reduce water consumption and relieve the strain on city water supplies in many locations.

To avoid severe loss of turf and conserve water, homeowners should manage their lawns each year with water conservation in mind.

This guide offers cultural practices that will reduce the need for irrigation while improving the competitiveness and appearance of your lawn.

Know when to water – look for the signs

Purple-blue wilting leaves, footprints that stay, and folded or rolled leaves are signs that lawns should be thoroughly watered if grasses are to remain green and actively growing.

Turfgrass water use rates are high during sunny and windy days with low relative humidity. Evapotranspiration rate for turfgrasses in July and August, for central Missouri, are around 4-inches each month. In situations where lawns are not replenished with this amount of water by irrigation or rainfall, grasses first show symptoms of wilt and later turn completely brown (dormancy).

When soil lacks moisture, leaves will be folded or rolled lengthwise along the blade, indicating a lack of plant water, presenting a bluish-purple color. Another early sign of insufficient water in the plant occurs when footprints or wheel marks remain in the lawn for several hours. Leaves with plenty of water quickly return to their rigid upright position, while leaves lacking water (turgor) will remain trampled for a period of time.

If high temperatures and dry conditions continue without rain or irrigation, the above-ground portion of grasses will turn entirely brown and senesce. Grasses are said to be dormant during this browned-out stage. Since the lower portion (crown) of the plant usually remains alive but not growing, the plant conserves moisture. Thorough watering, by irrigation or rainfall, will bring lawns out of dormancy and new leaf tissue will resume.

Even though grasses are dormant, watering restrictions that result in extended dry periods can cause large ground cracks, severe soil drying, and excessive loss of turf cover even when watering is resumed later in the summer or early fall. Summer dormancy of grasses is a mechanism that helps a lawn to survive, but it does not guarantee that a lawn will fully recover from the browned-out stage.

Dormant lawns should receive at least 1 inch of water every two or three weeks during summer to prevent complete turf loss. Grasses may not show a noticeable greening, but that amount of irrigation should be sufficient to hydrate the lower plant portions and increase the recovery once adequate moisture is available.

Wet wilt is another type of wilt to look for. Wet wilt occurs when the soil is obviously wet, but the root system is not able to keep pace with the water demands from the atmosphere. The curling of leaves from wet wilt looks very similar to wilt caused by lack of soil moisture. Waterlogged lawns

Continued on page 41

In This Issue

Missouri Environment & Garden newsletter is published by the MU IPM Program of the Division of Plant Sciences Extension. Current and back issues are available on the Web at **http://ppp.missouri.edu/newsletters/megindex.htm**. Mention of any trademark, proprietary product or vendor is not intended as an endorsement by University of Missouri Extension; other products or vendors may also be suitable. Editor: Kate Riley (rileyka@missouri.edu)

Bedding Plant Woes

With their seemingly infinite variety of color and form, bedding plants are a staple of any garden. Bedding plants can add a splash of color to dull landscapes, bland patios, or uninviting entrances. With the unpredictable weather we've had so far this year, it would be no surprise if we experience more 'weird' weather throughout this season. Along with this 'weird' weather we often see several common problems on bedding plant in the home garden including root rots, grey mold, and powdery mildew.

Root Rots

This group of diseases causes plants to have stunted growth, yellowing, weak flower color, dieback of stems, sudden wilting, or a combination of these. The most prevalent culprits, Pythium, Phytophthora, Fusarium, and Rhizoctonia, are encouraged by cool and wet soils. Root rots can be separated into two types. The first type, caused by Pythium and Phytophthora, produce a soft, black to brown rot of outer layer of the roots. The second, resulting from Fusarium and Rhizoctonia, produce a dry rot usually with a pink to red shade. However, proper diagnosis should be obtained since drought and low nitrogen can produce similar symptoms.

Management of these diseases is easier if we prevent rather than attempt to cure, especially since we won't be able to cure a plant infected with root rot. Healthy plants should be planted in sites with good soil drainage. Water management is the most important factor. Improve soil drainage by using raised beds, incorporating sand or organic matter to improve soil structure, and redirecting down spouts away from plantings. By providing proper nutrition and light requirements, we can minimize plant stress and lower the likelihood of root diseases. Excessive fertilization can predispose plants for root diseases.

Grey Mold

Grey Mold (*Botrytis cinerea*) can affect all above ground parts. This pathogen has a wide host range and can survive in soil and plant debris for long periods. This disease is encouraged by overcast, cool, and humid conditions. The disease usually begins on older, fading leaves and flowers. Symptoms begin as soft, tan to brown dead areas that rapidly enlarge under moist conditions. If the humid conditions persist, dense masses of fuzzy spores are produced on infected tissue.

Grey mold can ordinarily be control by using cultural practices. For this pathogen, humidity is crucial for a successful infection. Proper plant spacing allows more air movement around the plants and lowering the humidity. Irrigation, when needed, should be done in the morning so that the foliage will dry more quickly. Sanitation of fading and dead leaves and flowers removes the foothold required to invade healthy tissue. If this disease a persistent problem, all infected and weakened tissue and plants should be removed before a chemical application is applied for control. Fungicides labeled for gray mold control include captan, mancozeb, chlorothalonil, Thiophanate-methyl and copper products. These fungicides are often sold in local garden centers by many different companies such as Ortho, Scott's, Ferti-lome, Bonide, Hi-yield and many others.

Powdery Mildew

Powdery mildew is characterized by patches of white to grayish, dry, dusty growth usually on the upper sides of the leaves. Severe cases can cause leaf distortion and tissue death. Powdery mildew does not usually kill the plant but it can cause the plant to become unattractive. This disease, unlike many others, doesn't require leaves to be wet to infect, only high humidity and warm temperatures (68–86 °F). Although there are several types of powdery mildew pathogens, they all produce similar symptoms on plant parts. These pathogens are very host specific. For example, the powdery mildew on lilac cannot infect geraniums.

Disease-free, healthy plants, should be selected and planted where plant vigor can be maintained (well-drained soil, proper light, adequate spacing). Remove and destroy infected plant parts and all dead leaves that might harbor the fungus. This decreases the likelihood that the fungus can survive the winter in your garden. Fungicide applications may become necessary if the disease becomes severe. Products containing myclobutanil, propiconazole, sulfur, neem oil, potassium bicarbonate These chemicals can be found in products sold locally by companies such as Ortho, Safer, Scott's, Ferti-lome, Bonide, Hi-yield, and many others

If you are in doubt as to what problem is plaguing your garden plants, it is always best to seek advice from your local county extension office or from a plant diagnostic laboratory. Your local county office location can be found at the University of Missouri extension website (http://extension.missouri.edu). Information about the MU Plant Diagnostic Clinic can be found at their website (http://plantclinic.missouri.edu).

Adam J Leonberger
PDC Director
Division of Plant Sciences
LeonbergerA@missouri.edu

View IPM Publications on the web **http://ppp.missouri.edu/ipm/pubs.htm**

that have a shallow root system (from spring rains) are susceptible to wet wilt. Do not add more water when lawns are wilting and soil moisture appears to be adequate; it will only aggravate the problem by starving the root zone of oxygen.

Select a sprinkler that best fits your needs

Automatic irrigation systems with pop-up sprinklers are often associated with excessive irrigation. This is not necessarily true, since properly designed and operated systems supply water uniformly over an entire area without wasted runoff. Missouri soils generally have low water infiltration rates. Automatic controllers can be set to supply several short cycles so that the total amount of water desired is supplied without runoff.

The most common type of watering occurs with hose-end sprinklers. Some studies have shown that the average homeowner applies 2.5 times the amount of water that is required for turf growth when using hose-end sprinklers.

There are several types of hose-end sprinklers. Select one that best fits your size and shape of lawn and then operate it efficiently. All hose-end sprinklers can be attached to inexpensive timers that can be used to shut off unattended sprinklers and avoid over-irrigation.

How much water to apply

Once you have decided on the best sprinkler for your size and shape of lawn, you must decide how long to operate a sprinkler in a certain location. This is best achieved by knowing how many inches of water your method of irrigation puts out in a certain amount of time. To do this, place shallow, straight-sided containers (tuna cans work well) or rain gauges in a grid pattern around the sprinkler. Operate the sprinklers (use overlapping patterns where needed) for a given amount of time and measure the amount of water captured. Then use the following example to determine your water application rate in inches per hour. For example, a sprinkler operated for 30 minutes that delivers a quarter-inch of water has a delivery rate of one-half inch per hour.

Alternative methods would be to measure the area that your sprinkler pattern covers and the length of time it takes to fill a one-gallon container directly from the sprinkler. For example, a sprinkler that covers 235 square feet and takes 1 minute and 15 seconds to discharge one gallon of water has a delivery rate of one-third of an inch per hour.

In the above examples, sprinklers should be operated approximately three hours in each location throughout the week to supply one inch of irrigation water per week.

Most soils in Missouri will infiltrate only about ¼ to ½ inch of water per hour. If your sprinkler system delivers more than that amount, move it to a different location more frequently, after each ¼ to ½ inch of water has been applied. Repeat the process until the total amount of desired water has been applied.

Rotary sprinklers that are set to deliver a quarter or half sprinkler pattern will discharge four or two times the amount of water on a given area. Operate rotary sprinklers with half patterns for half the amount of time and sprinklers with quarter patterns for one-quarter the amount of time.

The utility water meter connected to your home can also be used to check how effectively water is being applied. It accurately measures water in cubic feet. When no other water is being used in the home, water a known area for a set amount of time and use the following conversion factors to determine your water application rate.

- 624 gallons (83.3 cubic feet) of water are required to apply 1 inch of water on 1,000 square feet of lawn.
- 7.48 gallons = one cubic foot of water.

Once the decision has been made that a lawn has sufficiently wilted and irrigation is needed, supply enough water to last a week. Depending on the type of sprinkler and soil water infiltration rate, several sprinkler changes may be required over a two- or three-day period to supply the amount of water desired.

Table 1.
Approximate water requirements for various lawns.

Lawn type	Green Turf[1] inches of water per week	Dormant Turf[2] inches of water per week
Tall fescue Kentucky bluegrass	1.0	0.6
Kentucky bluegrass	1.2	0.7
Tall fescue	0.8	0.5
Zoysia or bermuda	0.5	0.2
Buffalograss	0.3	0.2

[1]Lawn remains green and growing
[2]Lawn may turn brown, but will not die

If no rainfall occurs, continue to irrigate on a weekly schedule. If rainfall occurs, delay the next irrigation until symptoms of wilt is present. Even though water application is discussed on a weekly basis, it is not crucial that water be applied every seven days. Keep the application schedule flexible and irrigate based on the determination of lawn wilting and soil moisture.

Use Table 1 to determine the amount of irrigation that will be needed for your lawn situation.

Once the decision has been made to irrigate, use the above recommendations to guide irrigation scheduling and how much water to supply. Should puddles or runoff occur before the total amount of water is applied, stop irrigating and resume only after the ground has absorbed the free moisture. Lawn areas that are moist, firm and have no visible water are ready for a repeat irrigation cycle. Areas

Continued on page 42

that are soft and produce squashy footprints when walked on are not ready to receive additional irrigation.

Check a few locations in the yard the day after watering to determine how well your irrigation program is distributing water. With a shovel, cut a slender 2-inch wedge 6 to 8 inches deep. This wedge of soil, roots and turf can be replaced easily without damage to the lawn after inspection.

Estimate the moisture content at different depths in the soil profile by pressing together a golf-ball-sized amount of soil. If drops of water can be squeezed from the soil ball, you may be irrigating too much or too often. Soils that hold together without crumbling and appear moist have been irrigated properly. Soils that appear dry, dusty and do not form a ball when squeezed have not received enough irrigation or the water is running off the surface of the lawn and not into the root zone.

Adequate soil moisture at 6 to 8 inches deep is sufficient to maintain grasses during the summer. A foot-long slender screwdriver pushed into the ground in several locations can also give a quick assessment of the moisture condition of the soil. The screwdriver will easily penetrate a soil, which has received sufficient water. The screwdriver test can also be used to determine where and when there is a need for irrigation.

Conserve water with these practices

• The best time to water a lawn is from 6 to 8 a.m. During this time the water pressure is highest, disruption of the water pattern from wind is low, and water lost to the atmosphere by evaporation is negligible. Watering early in the morning also has the advantage of reducing the chance of turfgrass diseases that require extended periods of leaf moisture. Avoid irrigation during mid-day and windy conditions.

• Move sprinklers frequently to avoid puddles and runoff.

• Water only when the plant tells you to. Become familiar with areas of the lawn that wilt first (blue/purple leaves, rolled leaves, foot printing). Water within a day of observing these symptoms.

• Water problem areas by hand to postpone the need for irrigation of the entire lawn. Some areas of a lawn usually wilt before others. These areas, or "hot spots," may be caused by hard soils that take up water slowly, slopes, southern exposures and warmer areas next to driveways and walks. Lawns that have unusual shapes also may require some hand watering to avoid unnecessary watering of paved surfaces, mulched beds and buildings. Soaker hoses that have a narrow pattern and supply water at a slow rate may be useful in these areas.

Summary

Good lawn care practices save water and harden turfgrasses in preparation for dry periods or local watering restrictions. Taller mowing and fall nitrogen fertilization develop a hardy and efficient root system that reduces the need for supplemental irrigation.

Irrigation schedules should be kept flexible and associated with identification of lawn wilting. Choose a sprinkler that best fits your lawn size and shape. The amount of water a sprinkler applies should be determined to accurately water lawns.

Brad Fresenburg
Extension Associate & Research Associate

University of Missouri Extension &
Missouri Turf and Ornamental Council (MoTOC)

bring you the

Turfgrass and Ornamental Field Day
July 26, 2011
MU South Farms, Columbia, MO

Full Schedule and Registration Now Available at
http://motoc.org/fd/

MoTOC 2011 Platinum Advertisers

Cane Creek Sod | Perfect Play | mti distributing | pbi/gordon corporation An Employee-Owned Company

To remove yourself from the MoTOC email and mailing list, please reply to this e-mail message with UNSUBSCRIBE as the subject.

Topics Include

· "Does convenience = acceptable control? Spray vs. granular fungicide applications for control of brown patch in tall fescue." Dr. Lee Miller, Assistant Professor: Turfgrass Pathology
· "Rose Rosette Disease: cause, current status, and management options." Dr. Chris Starbuck, Associate Professor: Woody Ornamentals
· "How to Conduct an Irrigation Audit." Keith Schweiger: John Deere Landscapes
· "Variation of creeping bentgrass cultivars: general performance and disease tolerance." Dr. Xi Xiong, Assistant Professor: Turfgrass Science
· "Synthetic surface updates - what can you expect? Are synthetics just for athletic fields anymore? What are the current facts and stats?" Dr. Brad Fresenburg, Extension Assistant Professor
· "Evaluation of Annual Flower Selections for 2011." Dr. David Trinklein, Associate Professor: Floriculture

Diagnosing Nutrient Deficiencies

Plants need nutrients for growth and production. Seventeen elements are considered essential for plant growth. The essential nutrients for plants are grouped into two categories: macronutrients and micros. Macronutrients (carbon, hydrogen, oxygen, nitrogen, potassium, phosphorus, sulfur, calcium and magnesium) are required in large quantities and micros (zinc, iron, copper, boron, manganese, chlorine, molybdenum and nickel) are required in small quantities. Plants need the right balance of nutrients for growth. If there is a deficiency of any essential element, plants cannot complete their vegetative or reproductive cycles and as result will express deficiency symptoms.

Lack of an essential nutrient element in plants will result in expression of nutrient deficiencies and can be determined from visual symptoms. The correct diagnosis of the deficiency is important to correct the problem. In general initial symptoms of nutrient deficiency is expressed either in the new or older leaves. For immobile nutrients in plants like zinc, iron, copper, manganese, boron, chlorine, nickel, calcium and sulfur, the deficiency symptoms first show up in the younger leaves. Deficiency symptoms for mobile nutrients in plants like nitrogen, phosphorus, potassium and magnesium are first expressed in older leaves. Molybdenum deficiency symptoms in plants first appear between the old and new leaves.

Excess of any nutrient can be toxic to plants. Too much fertilizer can result in salt burn symptoms. These symptoms include marginal browning or necrosis of leaves, separated from green leaf tissue by a slender yellow halo. The symptom begins at the tip and proceeds to the base of the leaf along the edges.

There are other factors which can complicate the diagnosis of nutrient deficiency in plants. Excessive top growth beyond the capacity of the root system, damage from excess salts (likely in potting plants and greenhouses), pesticide toxicity, damage to the root system by nematodes, insects or disease, or any other condition that can be detrimental for root growth. Common nutrient deficiency symptoms are presented in table 1.

Plant analysis has proved to be an effective diagnostic tool for many years. To determine nutrient deficiencies, most growers rely primarily on visual symptoms, plant tissue analysis and soil analysis. Plant analysis and soil testing go hand in hand. A soil test provides an index of the nutrient that is potentially available for the crop. Plant analysis tells how much of that potentially available nutrient is actually taken up by the plant.

Submitting Plant Samples for Analysis

Do not include plants affected by insects, disease or pesticide damage. Where a deficiency is suspected, take

Continued on page 44

Table 1.

Nutrient	Deficiency Symptoms	Toxicity Symptoms
Nitrogen (N)	Stunted growth and restricted growth of lateral shoots. Plants express general chlorosis of the entire plant to light green and yellowing of older leaves which proceeds to younger leaves. Older leaves become necrotic and defoliate early	Plants are stunted, deep green in color, and secondary shoot development is poor. High N causes vegetative bud formation instead of reproductive bud formation. Ammonium toxicity can cause roots to turn brown, with necrotic root tips; reduce plant growth; necrotic lesions occur on stem and leaves; vascular browning occurs in stems and roots.
Phosphorus (P)	Stunted growth. Purplish coloration of older leaves in some plants. Dark green coloration with tips of leaves dying. Delayed maturity, Poor fruit and seed development.	Excess P in the plant can cause iron and zinc deficiencies.
Potassium (K)	Leaf margins turn chlorotic and then necrotic. Tip and marginal burn starting on mature leaves. Lower leaves turn yellow. Weak stalks and plant lodge easily. Slow growth.	High amounts of K can cause calcium (Ca), magnesium (Mg) and N deficiencies.
Magnesium (Mg)	Interveinal chlorosis on older leaves which proceeds to the younger leaves as the deficiency becomes more severe. The chlorotic interveinal yellow patches usually occur toward the center of the leaf with the margins being the last to turn yellow. Curling of leaves upward along margins.	High Mg can cause Ca deficiency.
Calcium (Ca)	Light green color on uneven chlorosis of young leaves. Brown or black scorching of new leaf tips and die-back of growing points. Growing points of stems and roots cease to develop. Poor root growth and roots short and thickened.	High Ca can cause Mg or Boron (B) deficiencies.
Sulfur (S)	Uniform chlorosis first appearing on new leaves.	
Iron (Fe)	Interveinal chlorosis of new leaves followed by complete chlorosis and or bleaching of new leaves. Stunted growth.	
Zinc (Zn)	Interveinal chlorosis of new leaves with some green next to veins. Short internodes and small leaves. Rosetting or whirling of leaves.	
Manganese (Mn)	Interveinal chlorosis of new leaves with some green next to veins and later with grey or tan necrotic spots in chlorotic areas.	Toxicity symptoms include reduced growth rate and necrosis along the main veins. Toxicity symptoms start on the lower leaves and work up the main stem. The leaves die back to the stem.
Copper (Cu)	Interveinal chlorosis of new leaves with tips and edges green, followed by veinal chlorosis. Leaves at the top of the plant wilt easily followed by chlorotic and necrotic areas in the leaves. Dieback of terminal shoots in trees.	
Boron (B)	Death of terminal buds, causing lateral buds to develop and producing a 'witches broom' effect.	Symptoms develop as a yellow-tinted band around the leaf margins. The chlorotic zone becomes necrotic and gray, while the major portion of the leaf remains green.
Molybdenum (Mo)	Older leaves show interveinal chlorotic blotches, become cupped and thickened. Chlorosis continues upward to younger leaves as deficiency progresses.	

Diagnosing Nutrient Deficiencies

...continued from page 43

samples from normal plants in an adjacent area as well as from the affected area. It is important to take a soil sample from each area. Comparing soil and plant analysis results can greatly assist in the interpretations. Collected plant tissue is very perishable and requires special handling to avoid decomposition. Therefore, fresh plant tissue should be placed in clean paper bags left open; partially air dried if possible or kept in a cool environment during shipment to the laboratory. Wash dusty plants before air-drying. Fresh plant samples should not be placed in closed plastic bags unless the tissue is either air-dried or bag and contents are kept cool. Air-drying of fresh plant tissue can be done by placing the plant tissue in an open, dry environment for 12 to 24 hours. Air died samples can be placed in a clean brown bag or envelope and mailed to the lab. Request a complete analysis of each plant sample including nitrogen, phosphorus, potassium, calcium, magnesium, copper, iron, zinc, manganese and boron. The University of Missouri soil and plant testing lab offers this service for $25 per sample. Information on submitting samples to the lab and sample information forms can be obtained from the lab's website at: http://soilplantlab.missouri.edu/soil/

Manjula V. Nathan,
Director, MU Soil and Plant Diagnostic Service Laboratories
Division of Plant Sciences
NathanM@missouri.edu

White grubs and other lawn insects...

White grubs are the primary insect problem many turf managers and homeowners face annually. Damage is usually noticed in late July to early August, however, damage can still be noticed late in September. Moist soils may extend grub feeding into the fall, but with cooling temperatures feeding may start to subside. The earliest symptoms' of white grub feeding on turfgrass roots are stunted, wilted patches of sod with gradual thinning and weakening of the stand. Damage may progress from sudden wilting of the grass, even with adequate moisture, to patches of dead grass. Small or large patches of dead or dying grass will have roots pruned so that sod can be pulled easily or rolled back like a loose carpet. Numerous C-shaped whitish larvae with a brown head will lay in the upper soil directly below the dead sod. Mammals, such as skunks, raccoons, and armadillos, can cause additional turfgrass damage foraging for grubs.

Adults are scarab beetles - May/June beetle, masked chafer, Japanese beetle, and green June beetle. These are the primary white grub species we see with the May/June beetle and masked chafers being the most common. Identification of white grub species can be made by: time of the year the grub is present, size of the grub and raster patterns on the abdomen of the grub.

May/June Beetles:

Damage is typical wilting and small dead patches of sod. These beetles have a 3-year life cycle. Adult beetles can be damaging to trees and ornamentals. White grubs should be treated during late July to early August to control any newly hatched larvae. However, during the second year of the grub's life cycle, treatments can be made from April through September if threshold levels are met.

Masked Chafer:

Turfgrass infested with this species exhibits the typical white grub damage. Wilting, irregular dead patches of turf are the symptoms. These beetles have a 1-year life cycle. Treat grubs about four weeks after the adult beetles start to emerge, when egg deposits begin to hatch in late July to early August.

Japanese Beetles:

These beetles are now considered to be state-wide in Missouri. Grubs feed on roots of turfgrasses and cause a wilting appearance and gradual thinning, however we generally do not see large amounts of turf damage specific to Japanese beetle grubs. Adult beetles can be damaging to

Continued on page 46

Herbs: Nature's Air Fresheners

Centuries ago, the interior atmosphere of the average home frequently was filled with rather unpleasant odors. Long before the availability of plug-in air fresheners and scented candles, plants were used to help to make homes more livable by masking unpleasant odors. With their aromatic foliage, herbs accomplished that task very well and frequently were strewn over floors. Walking on these plants helped to release their fragrances and make the home more tolerable. Additionally, many herbs were thought to possess medicinal properties, giving rise to their early use as a treatment for various ailments. Today, herbs add zest to our diet as well as fragrance to our lives and are becoming increasingly popular with gardeners.

From a botanical standpoint, an herb is a non-woody plant that dies back to the ground at the end of each growing season. A more functional definition of an herb would be a plant whose leaves, stems or seeds are used for their aromatic, culinary or medicinal properties. This would include plants used for food as well as those used for aesthetic reasons.

Herbs have been used by humans for thousands of years in a number of interesting (sometimes novel) ways. For example, the Romans used dill to crown their heroes as well as to purify the air in their banquet halls. The Chinese considered artemisia to have special charms and in Medieval France babies were rubbed in artemisia juice to protect them from the cold. Ancient Greeks used parsley as a treatment for stomach problems and sweet marjoram as a tonic. Greek athletes crushed mint leaves and used them as a lotion after bathing. Mint was also reported to produce aggressiveness. During the Middle Ages, rosemary was used as a tranquilizing agent and cure for headaches while Scottish highlanders used thyme to impart strength and courage as well as to prevent nightmares.

Early immigrants to the United States brought herbs with them and used them to add pleasant fragrance to their surroundings, help treat their ailments and flavor their food. The latter was important because poor preservation methods of that era often led to foul-tasting food. Although these settlers found many familiar herbs growing in the wild in their new country, herb gardens became an essential part of the pioneer homestead. They were usually located in a sunny spot close to the house for ease of tending and harvesting. While the need for growing one's own herbs declined with the advent of modern merchandising, many gardeners today are rediscovering the satisfaction derived from growing herbs in their gardens.

The Brooklyn Botanic Garden's lists 73 different types of herbs which are classified into one or more of the following categories: 1) culinary herbs, 2) aromatic herbs, 3) ornamental herbs, and 4) medicinal herbs. The culinary herbs (e.g. basil, parsley and chives) probably are of greatest interest to home gardeners since their pungent flavors add flavor and appeal to food.

Aromatic herbs such as lavender, lovage and mint are used to scent linens or clothing as well as for potpourris and sachets. Most of these are members of the Lamiaceae (formerly Labiatae) or mint family and produce strong volatile oils which can last for considerable lengths of time, even after harvesting and drying.

Ornamental herbs such as catmint have brightly colored flowers and/or foliage and are used in the ornamental garden along with other plants. Many of the ornamental herbs can be used for other purposes (e.g. culinary) as well.

Finally, medicinal herbs (e.g. feverfew and angelica) are reported to have therapeutic properties. While modern science has confirmed the "active ingredient" or therapeutic compound for a few of these herbs, many probably are highly overrated relative to their medicinal value. While most of the latter are harmless, a few can be dangerous if consumed. Tyler's Honest Herbal (Routledge Press) remains one of the most frequently referenced guides to the medicinal value and use of herbs.

Most herbs can be grown from seed, but a few (e.g. peppermint) must be vegetatively propagated. As a general rule, herbs will grow in any location suitable for vegetable production and many gardeners make part of their vegetable garden their herb garden, also. Herbs demand well-drained soil for successful production. Incorporating copious amount of well-decomposed organic matter into the soil before planting is very helpful in improving its porosity. Herbs require only modest fertility since high fertility leads to excessive vegetative growth and poor flavor. Most herbs appreciate at least six to eight hours of direct sunlight and adequate amounts of water throughout the growing season. Herbs are troubled by very few diseases and insects; if control measures should become necessary and pesticides are used, it is important that they are labeled for food crops. In addition to traditional production methods, herbs are easily grown in containers as long as the medium is very porous.

The following list describes 10 of the most popular herbs today:

1. **Basil** (*Ocimum basilicum*) was known as the "Herb of Kings" by the Greeks and was said to have been harvested only by royalty using a golden sickle. Although it had early medicinal uses, today it is an important culinary herb with a rich, spicy flavor. A tender annual, basil's pungency is used to flavor pesto sauce and many Mediterranean dishes. It also complements garlic nicely in flavor. Basil leaves should be picked when young, before the plant blooms. It

Continued on page 47

about 400 host plants of both turf and ornamentals. Adult females will lay about 200 eggs per season, throughout the summer months. Therefore, we do not have a single egg laying time frame. Using a long-term residual product will work best to cover multiple egg laying episodes. Adult beetles can be treated at any time. If large numbers of adult beetles are noticed defoliating trees and shrubs, a preventative long-term residual product may be warranted; however it is difficult to predict damage on lawns since the adult beetles are so mobile. Controlling grubs may not protect landscape plants and because you see adult beetles in the landscape does not mean you need to treat your lawn.

Green June Beetles:

Feeding activity of these grubs rarely causes severe turf damage. Rather, the damage to a lawn generally is mechanical in nature. The grubs burrow in and out of the turf, which produces mounds. These beetles are attracted to soils with high organic materials. The decaying organic matter in the soil is the primary food for this grub. This white grub is large, 1 ½ inches in length.

Control of white grubs

The major factor influencing white grub density in turfgrass appears to be soil moisture; that is, in years with normal or above normal precipitation, grub populations tend to increase. This is because all white grub species require moist soil for their eggs to hatch. Young grubs are very susceptible to desiccation. Irrigated lawns and turfgrass areas become more susceptible due to soils remaining moist. This dependence on soil moisture by white grubs can be exploited as a type of cultural control option. In areas where turfgrasses can stand some moisture stress, do not water as much when adults are laying eggs and young grubs are present.

Cedar oil is a known deterrent of feeding by white grubs. Other organic products would include neem oil and garlic juice. More distributors and garden centers are now carrying a line of organic products for lawn care purposes.

In recent years, several strains of insect parasitic nematodes in the genera Steinernema and Heterorhabtitis have offered somewhat effective biological control of white grubs. For these beneficial organisms to be most effective in managing white grub populations, it is critical that the labeled application instructions are followed exactly (e.g., time of day, soil moisture, size of grub, rates).

Because damaging white grub populations tend to be sporadic from year to year, preventative chemical control applications are not really justifiable. But in areas where moderate to damaging levels of grubs have been perennial, preventative applications made in late May or June may be warranted. Some products that have extended activity are imidacloprid (e.g., Merit), and halofenozide (e.g., Mach 2).

Insecticides that have shorter residual periods (3 weeks or less) or must be ingested (preferably by small grubs) to be most effective are best used in a curative control program. The successful use of these materials depends to a large degree on the proper timing of the applications. These products must be applied shortly after egg hatch when the grubs are small and actively feeding. Remember, the smaller (younger) the grub, the easier it is to control. As a general rule, the recommended time to treat for grubs is about 4 weeks after the adult beetles start to emerge, the time when the eggs begin to hatch. For the Masked Chafer, this period is around late July to early August. Because emergence of May/June Beetle adults can last for several weeks, chemical treatment for May/June Beetle grubs is also recommended during late July to early August. Insecticides that appear to be effective as curative treatments include trichlorfon (e.g., Dylox), halofenozide (e.g., Mach 2), and carbaryl (e.g., Sevin).

Chemical applications can be rendered useless if the material has not been thoroughly watered-in (0.5-inch). The water not only moves the chemical down to the thatch layer (the final destination for most of the chemical), but it will often stimulate grub movement upward in the soil, closer to the insecticide. However, if the thatch layer is 0.75 inch to 1 inch thick, grubs may not come into contact with lethal doses of the insecticide. It may be necessary to remove some of the thatch before a chemical application.

To determine if a chemical treatment is necessary, a sampling of the grub population is necessary. To do this, cut a 1 square foot piece of sod in several areas of the lawn, pull it back, count the number of grubs, and inspect their rastral patterns to identify the species. Replace the sod squares back on the soil. If you have on average more than 10 Masked Chafer grubs or more than 5 May/June beetle grubs per square foot, then a chemical treatment is recommended. Remember, it is not unusual to have more than one species of white grub infesting the same lawn.

OTHER LAWN INSECTS…

Fall Armyworm:

Fall armyworms can be a major concern in lawns since this pest (in large numbers) feeds on the entire aboveground portion of turfgrasses. Their large numbers make them appear like a massive army moving from one food source to another.

Continued on page 48

is quite productive and easy to grow in pots indoors.

2. **Chives** (*Allium schoenoprasum*) was first used as a condiment by the Chinese nearly 4000 years ago. This perennial species has a mild, garlic-like flavor and is used to flavor salads, soups and other dishes. Chives can be incorporated into butter or cream cheese for use as a bread spread. Harvest when leaves are mature leaving about two inches for regrowth. Chives can be grown indoors.

3. **Cilantro** (*Coriandrum sativum*) has been cultivated as a medicinal and culinary herb for nearly 3000 years. The seeds of this plant are known as coriander and are used to flavor soups, salads and vegetable dishes whereas the fresh leaves are known as cilantro. The latter adds interest to salads, stews, sauces or can be used as a garnish. Leaves can be harvested at any time; wait until seeds have matured before harvesting them.

4. **Lavender** (*Lavendula spp.*) is used more for its unique fragrance than its culinary virtue. It can be used as a strewing herb or dried for use in sachets. It also is quite decorative as a garden plant. Lavender oil is distilled from the plant commercially and has a number of uses including adding fragrance to soaps and cosmetics. Leaves can be harvested at any time; flowering stems destined for drying should be harvested as the flowers just begin to open.

5. **Mint** (*Mentha spp.*) includes a number of different perennial species that have been used since biblical times for their zesty fragrance. Although first used as a strewing herb to mask odors, mint is used today primarily as a culinary herb to add flavor to drinks, sauces, jellies and syrups. Mint is quite invasive and should be contained in the garden to keep it from becoming a nuisance. Harvest leaves just before the plant flowers.

6. **Parsley** (*Petroselium crispum*) was used symbolically by the Greeks to crown their victors and as a culinary herb by the Romans who consumed large quantities of it. Rich in vitamins and minerals, parsley also saw medicinal use in antiquity. Today, this annual herb mainly is used as a garnish or chopped finely and added to soups, salads and sandwiches to add a unique flavor once described as "the summation of all things green". Outer leaves of parsley should be harvest first. Parsley dries readily for future use.

7. **Rosemary** (*Rosmarinus officinalis*) is said by many to exhibit the true essence of an herb garden and has been used for ages both symbolically and as a culinary herb. During the Middle Ages this perennial herb was used medicinally to "purify the air" and was thought to have disease-preventative properties. Today, rosemary is used in a variety of ways. As a culinary herb rosemary can be added to meat dishes or used to flavor vegetables and bread spreads. Because of its pungency, it still is used as an aromatic herb in potpourris to add fragrance to rooms. Additionally it said to stimulate blood flow when used as an additive to bath water or a facial steam. Harvest rosemary leaves before the plant flowers for best quality. Rosemary also makes an attractive garden plant and can be sheared when used for topiaries. It appreciates moist (but not wet) soil.

8. **Sage** (*Salvia officinalis*) has been associated throughout history with longevity of life. Indeed the genus to which it belongs comes from a Latin word salvere meaning "to cure" or "to save". A perennial in nature, salvia is used today primarily as a culinary herb where it has been described as "the prima donna in the grand opera of cooking". However, there are variegated forms of sage which make attractive garden plants as well. Sage should be harvested just before the plant flowers. Leaves dry readily and most often are used in the dried form.

9. **Tarragon** (*Artemisia dracunculus*) was associated with dragons in antiquity as evidenced by its specific epithet. Tarragon and other "dragon herbs" were believed by ancients to cure the bite of venomous creatures including serpents. The most popular tarragon today is French tarragon which is a fairly long-lived perennial in the garden used primarily for culinary purposes. It can be used sparingly to infuse a subtle, warm flavor to a variety of dishes including meats, soups and salads. Also, it can be incorporated into bread spreads or infused in vinegar. Tarragon can be harvested at any time, removing no more than two-thirds of the total growth of the plant. For best quality, tarragon should be divided about every third year in the garden.

10. **Thyme** (*Thymus vulgaris*) has inspired poets to praise its virtues for many centuries. It was used as an aromatic herb by the Greeks and Romans and later as a medicinal herb. Ancient Egyptians used thyme in their embalming procedure and it is still considered today to contain both antiseptic and preservative properties. Today thyme is used for aromatic, medicinal and culinary purposes. Thyme often is added to sauces, stuffings and soups to impart flavor and aid in the digestion of fatty foods. Harvest thyme when the leaves are mature and the plant is in bloom. Leaves dry easily for future use.

Dave Trinklein,
Associate Professor
Division of Plant Sciences
TrinkleinD@missouri.edu

Larvae are marked with green, orange or tan colored stripes. Their head has a Y-shaped marking (white) that serves as a key identifying characteristic. Larvae feed aggressively when small. Adult moths are mainly active at night with females laying 3 to 5 clusters of 1000 eggs each. Several generations can occur per season with new generations developing every 23 to 28 days.

Control of fall armyworm

Early scouting is best when thinning or yellowing of the lawn begins. A soap drench of liquid dishwashing soap (a few tablespoons) in 4 to 5 gallons of water poured over an area will bring larvae to the surface. One larva per square yard will cause sufficient damage to treat. Liquid applications of insecticides (Sevin and Mach2) are best when applied to foliage and left to dry. Avoid irrigation and mowing. Spot treatment on an "as needed basis" is acceptable.

Sod Webworm:

Sod webworm larvae are buff-colored with pairs of brown spots on each body segment. Adult moths resemble slender slivers of wood about ¾ inches in length. Females drop eggs over turf in flight and lay several 100 eggs. Life cycles are complete in 6 to 10 weeks; therefore 2 to 3 generations can occur per season.

Look for chewed leaf blades, as this insect does not consume the entire plant as the fall armyworm does. Larvae can be found in retreats that are silken-lined with dead grass or frass. Entries are pencil-sized opening in the surface of the soil. The soap test can also be used to determine a threshold count. Threshold levels of 10 to 15 larvae per square yard can cause economic damage and justifies treatment.

Control of sod webworm

Several of the natural pyrethroids as well as Sevin and Mach2 are effective in control. Liquid applications of insecticides are best when applied in mid-afternoon to foliage and left to dry. Avoid irrigation and mowing.

Hunting Billbug:

Eggs of this insect are deposited in leaf sheaths or in feeding punctures on stems. Heavy feeding by larvae produces brown frass piles near the crown of the plant. Egg laying usually occurs in late spring to early summer, and only one generation occurs per year. Larvae are of the white grub type, but very small (3/16"). Adults are about ¼" in length, grayish, and have a pointed snout for piercing and feeding. Adults usually play "dead" for a short period of time when disturbed. Turfgrasses (mainly zoysiagrass) begins to turn yellow then dead brown as liquid flow through plant stems is disrupted. A "tug" test can be performed to see if stems have been fed upon. Pull the affected stems upward. If the stem breaks easily at the crown and is hollowed out with frass present, then billbugs are the likely suspect.

Control of hunting billbug

Pitfall traps (metal cans insert into the soil with the top edge flush with the soil surface, then filled half way with water) can be used to monitor numbers of adult or simply count adults as they move across sidewalks and driveways.

Several of the natural pyrethroids as well as some combination products (Allectus and Aloft) are effective in control. Steinernema carpocapsae nematodes have also proven effective as a natural control.

Chinch Bug:

Chinch bugs are a sucking type insect that removes plant juices from leaf sheaths and stems. These insects are about 3/8 inch long with white wings that have triangular black markings. Females lay 20 eggs per day for 2 to 3 weeks and 1 to 2 generations can occur per season. Damage tends to occur in shaded areas first and most damage in Missouri has occurred in zoysiagrass.

Control of chinch bug

Pitfall traps can be used to monitor chinch bug numbers. Usually 20 to 25 nymphs per square foot justify treatment. If cool, wet springs exist; avoid insecticide treatments; since these conditions reduce numbers. Several of the natural pyrethroids as well as Sevin are effective in control of chinch bug.

All insecticide information is presented with the understanding that no endorsement of named products is intended, nor criticism implied of similar products that are not mentioned.

Before using any insecticide please read the label carefully for directions on application procedures, appropriate rate, first aid, storage and disposal. Make sure that the insecticide is properly registered for the intended use.

Brad Fresenburg
Extension Associate & Research Associate
Division of Plant Sciences
FresenburgB@missouri.edu

July Gardening Calendar

Ornamentals

- **Weeks 1-4:** Provide water in the garden for the birds, especially during dry weather.
- **Weeks 1-4:** Remove infected leaves from roses. Pick up fallen leaves. Continue fungicidal sprays as needed.
- **Weeks 1-4:** While spraying roses with fungicides, mix extra and spray hardy phlox to prevent powdery mildew.
- **Weeks 1-4:** Newly planted trees and shrubs should continue to be watered thoroughly, once a week.
- **Weeks 1-4:** Fertilize container plants every 2 weeks with a water soluble solution.
- **Weeks 1-4:** Keep weeds from making seeds now. This will mean less weeding next year.
- **Weeks 1-4:** Keep deadheading spent annual flowers for continued bloom.
- **Weeks 1-4:** Perennials that have finished blooming should be deadheaded. Cut back the foliage some to encourage tidier appearance.
- **Weeks 1-2:** Plant zinnia seed by July 4th for late bloom in annual border.
- **Weeks 1-2:** Spray hollies for leaf miner control.
- **Weeks 1-2:** Prune climbing roses and rambler roses after bloom.
- **Weeks 1-2:** Apply final treatment for borers on hardwood trees.
- **Weeks 1-2:** Apply no fertilizers to trees and shrubs after July 4th. Fertilizing late may cause lush growth that is apt to winter kill.
- **Week 1:** Hot, dry weather is ideal for spider mite development. Damage may be present even before webs are noticed.
- **Week 1:** With spider mite damage, leaves may be speckled above and yellowed below. Evergreen needles appear dull gray-green to yellow or brown.
- **Weeks 2-3:** Fall webworms begin nest building near the ends of branches of infested trees. Prune off webs. Spray with B.T. if defoliation becomes severe.
- **Week 2:** Divide and reset oriental poppies after flowering as the foliage dies.
- **Weeks 3-4:** Semi-hardwood cuttings of spring flowering shrubs can be made now.
- **Weeks 3-4:** Summer pruning of shade trees can be done now.
- **Week 3:** Powdery mildew is unsightly on lilacs, but rarely harmful. Shrubs grown in full sun are less prone to this disease.
- **Week 4:** Divide bearded iris now.

Don't pinch mums after mid-July or you may delay flowering.

Lawns

- **Weeks 1-4:** Water frequently enough to prevent wilting. Early morning irrigation allows turf to dry before nightfall and will reduce the chance of disease.
- **Weeks 3-4:** Monitor lawns for newly hatched white grubs. If damage is occurring, apply appropriate controls, following product label directions.

Vegetables

- **Weeks 1-4:** Blossom-end rot of tomato and peppers occurs when soil moisture is uneven. Water when soils begin to dry; maintain a 2-3 inch layer of mulch.
- **Week 1:** To minimize insect damage to squash and cucumber plants, try covering them with lightweight floating row covers. Remove covers once plants flower.
- **Week 2:** Dig potatoes when the tops die. Plant fall potatoes by the 15th.
- **Weeks 3-4:** For the fall garden, sow seeds of collards, kale, sweet corn and summer squash as earlier crops are harvested.
- **Weeks 3-4:** Set out broccoli, cabbage, and cauliflower transplants for the fall garden.
- **Week 3:** Sweet corn is ripe when the silks turn brown.
- **Week 3:** Keep cukes well watered. Drought conditions will cause bitter fruit.
- **Week 3:** Harvest onions and garlic when the tops turn brown.

Sow seeds of carrots, beets, turnips, and winter radish for fall harvest.

Fruits

- **Weeks 1-4:** Cover grape clusters loosely with paper sacks to provide some protection from marauding birds.
- **Week 1:** Prune out and destroy old fruiting canes of raspberries after harvest is complete.
- **Week 1:** Blackberries are ripening now.
- **Weeks 2-3:** Apply second spray to trunks of peach trees for peach borers.
- **Weeks 3-4:** Early peach varieties ripen now.
- **Week 4:** Thornless blackberries ripen now.

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)