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If you need this newsletter in alternative format, please contact Jennifer Schutter at the Adair County Extension Center.

PLANTING A FALL VEGETABLE GARDEN

Most vegetables planted in the garden in the spring are ready to harvest by August. There's nothing better than biting into a big, juicy tomato or vine ripe cantaloupe. Although the gardening season is drawing to a close by late August, there are still vegetables to harvest in early fall like winter squash, sweet potatoes, pumpkins and gourds. Many gardeners preserve their vegetables for eating during the winter months by canning, freezing, or drying. MU Extension has guides available on food preservation. Contact your local Extension office for more information.

Continue to keep an eye out for insect pests such as the squash bug and the striped cucumber beetle, which can feed on and damage vine crops like squash, cucumbers and pumpkins. Their populations are sometimes higher in the fall when there is an abundance of fresh produce to feed on.

Monitor tomato plants for hornworms. These are a three-inch long, green caterpillar with eight curved stripes and a "horn" sticking up from its' backside. It is a voracious eater, being partial to the leaves and fruit of tomatoes, eggplants, and peppers, and has been known to strip a plant overnight if not controlled. Its coloring provides good camouflage, so be diligent in your search for this insect pest. Handpick the worms and drown them in soapy water or smash them. Control the smaller worms with B.t. (*Bacillus thuringiensis*), a biological control. Sometimes hornworms are attacked by a tiny parasitic wasp, which attaches its white cocoons to the outside of the worms. If these are found, leave them be.



The end of July through August are ideal times for planting a fall vegetable garden. Second plantings of cool-season crops like lettuce, peas, radishes, spinach and broccoli can be planted now, provided they are kept well-watered if sufficient rainfall is not received. Planting a fall garden will extend the gardening season so you can continue to harvest fresh produce after earlier crops have finished. The fall harvest can be extended even further by providing protection from early frosts or by planting in cold frames or hotbeds.

Seed leftover from spring planting can be used for fall planting if it has been stored in a cool, dry location or been refrigerated. Before making fall plantings, it is best to refrigerate spinach and lettuce seed, as it will germinate faster when kept cold for a few days before planting. When ready to plant, wet the soil to cool it, and immediately after wetting it, plant the seed and water it again. Seeds of cool-season vegetable plants do not germinate very well in warm soil, so

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keep the seeds well-watered in hot, dry weather. Many cool-season vegetables, such as carrots, parsnips, broccoli, cauliflower, and Brussels sprouts, produce their best flavor and quality when they mature during cool days of fall.

Crops such as green beans and zucchini can produce a nice fall crop when direct seeded in late July or early August. Bush bean varieties recommended for fall planting include Contender, Provider, Derby, Strike, Tema, Tendercrop, Top Crop, and Purple Queen. Sweet corn planted in late July or early August can provide a nice fall crop.

Growing a productive fall vegetable garden requires thoughtful planning and good cultural practices.

TOMATO LEAF ROLLING

Gardeners have reported leaf rolling in tomato plants this summer and are wondering what causes this.

Tomato leaf roll is attributed to physiological conditions. While its exact cause may be unknown, it's believed to be a sort of self-defense mechanism. During excessively cool, moist conditions, leaves may roll upward and become leathery in an effort to repel this excessive moisture. This specific condition occurs around fruit setting time and is most commonly seen on staked and pruned plants.

Curling tomato leaves may also be triggered by just the opposite—uneven watering, high temperatures, and dry spells. Leaves will curl upward to conserve water but they do not take on the leathery-like appearance.

Plum and paste varieties are most commonly affected, but I have seen it in many varieties.

RED-ROOT PIGWEED

Red-Root Pigweed is a major problem in Missouri, especially in agricultural production, because of its resistance to glyphosate. Even the most carefully managed gardens and fields can have Red-Root Pigweed spring up. One plant can produce a million seeds which can build up in soil and be a problem for years to come according to Kelly McGowan, horticulture educator, University of Missouri Extension.

“Once pigweed is established in an area it can be very difficult to control,” said McGowan. Some gardeners have reported that every time they break up the ground, this weed sprouts up in any area left uncovered.

“Hand pulling or using a cultivation tool when the plants are small and applying a pre-emergent herbicide listed for broadleaf weeds can be the most effective for homeowners,” said McGowan.

MU Extension has a good resource about pigweed and plant relatives online at <http://ipm.missouri.edu/MEG/2010/11/Worst-Weeds-2010/>.

WHITE MOLD IN GREEN BEANS

Several gardeners have reported green bean issues this summer. White mold growth on the stems and leaves was reported. This could be the fungal disease called “white mold”. White mold is caused by the fungus *Sclerotinia sclerotiorum* and develops as a white cottony growth on the stem, stem branches and pods of bean plants. The fungus also produces black, hard mats of mycelium (called sclerotia) near these cottony growths. Sclerotia allow the organism to survive adverse (winter) conditions.

The disease cycle starts when the leaf canopy covers the row spaces and when the soil surface is cool but moist enough for the sclerotia to germinate. Soil conditions of near field water holding capacity for ten to fourteen days and temperatures between 59-65 degrees F favor sclerotia germination. Upon germination, small mushroom-like bodies called apothecia appear on the soil surface. Spores are produced by the apothecia and infect wilted flowers or other dead plant tissue, later spreading to living plant tissue. Infection kills some plants and severely reduces the yield of plants with pod infections. High humidity and plant canopy temperatures between 68 and 76 degrees F favor the spread of this disease.

Crop rotation helps prevent build-up of inoculum. A rotation of three to four years between susceptible crops is necessary to accomplish this. Sunflower, potato, canola, mustard, and soybeans should not be grown in close rotation with edible beans because they are susceptible. Small grains and corn are recommended in a rotation with edible beans because they are not susceptible. The use of bean varieties with an upright growth habit in wide rows and the use of recommended fertility and seeding rates will alleviate the disease pressure. Careful irrigation management is also important because disease development is worse when there is excess moisture in the plant canopy. Infection is reduced by a dry soil surface ten days prior to bloom to early pod fill. Timely applications of fungicides provide good control of white mold. A single banded application or two broadcast applications are effective. Follow label directions for timing, rates and application method.

Source: <http://www.extension.umn.edu/garden/yard-garden/vegetables/edible-bean-disease-and-disorder-identification/>

THE DANGERS OF DROUGHT ON FRUIT CROPS

This growing season has been abnormally dry in many parts of Missouri, which is especially damaging to non-irrigated fruit plantings. Moisture deficits at different times of the season will result in varying plant responses depending on the type of fruit. During plant establishment, the availability of water is always critical due to the small size of the root system after planting. Lack of water generally reduces plant growth, affects fruit size during the growing season, and can reduce fruit set the following year.

Small fruit plants, such as strawberries and blueberries, have shallow root systems and are particularly susceptible to extended drought. When strawberry plants are severely water-stressed from the beginning of the growing season, total fruit production can be decreased by about 80%. Also, drought stress before strawberry harvest accelerates ripening and reduces fruit size substantially. When strawberry plants are stressed after harvest, runner production in matted-row fields is delayed during the current season and results in yield loss the following year. When drought occurs at renovation, it may be helpful to throw a half-inch of soil over non-irrigated plants at that time to promote higher rooting on the crowns of older plants and enhanced fruiting the next season.

Blueberry plants are very susceptible to drought because most of their roots are in the upper 8 to 12 inches of the soil. While blueberry roots lack root hairs, which are used by other plants to maximize the uptake of soil moisture and nutrients, endomycorrhizal fungi associated with roots perform these functions. However, severe drought conditions for 20 to 30 days can lead to blueberry fruit loss and/or plant mortality.

For blackberry, raspberry, and elderberry, droughty conditions just before harvest cause the fruit to shrivel or completely dry up. After harvest, the primocane growth of June-bearing blackberries or raspberries will be stunted during a prolonged drought, resulting in reduced fruit yield in the subsequent growing season.

Moisture is also critical for the production of high quality stone fruits. Early season thinning of peaches, leaving at least six inches between each fruit, promotes large fruit. Also, in the three weeks before harvest, fruit size is greatly increased with the uptake of water and is called the period of final fruit swell. Late season drought stress reduces flower bud development of peaches and can lead to fruit defects, such as “doubles” or “triples” where fruit are fused together the following growing season. When drought is prolonged, scaffold branches of peach trees may be cut back severely (e.g., dehorned) to prevent tree mortality. De-

horned trees can take two or more subsequent growing seasons to recover.

For apple, fruit buds for the following season are generally initiated about the first 50 days after bloom. Thus, heavy crop load due to lack of fruit thinning and early season drought stress results in poor cropping the subsequent season. Early-season water stress also restricts fruit cell division, contributing to small fruit during the current season and reduces starch accumulation, which shortens the storage life of the fruit after harvest. Because drought is often associated with abnormally high temperatures, red apples fail to color properly under these conditions and are brownish in color and are prone to pre-harvest fruit drop.

Shoots on young and mature apple trees usually grow for about 100 and 50 days, respectively. Thus, inadequate moisture during May and June can severely reduce vegetative growth of young trees. Drought during late summer and fall adversely affects trunk enlargement and root growth. For trees on dwarfing rootstocks, which tend to have relatively small root systems, water stress is particularly harmful. It is essential that dwarf trees develop a good root system for adequate tree anchorage and uptake of nutrients. Because calcium uptake by roots requires adequate moisture, this nutrient is often deficient during dry seasons, resulting in fruit disorders such as corkspot and bitterpit. Images of these disorders are available at: <http://ohioline.osu.edu/factsheet/plpath-fru-01>.

During drought, the best way to prevent reduced fruit yield, tree growth, and mortality is have a properly installed irrigation system in a commercial orchard or access to water for hand-watering in a backyard planting. Maintenance of a vegetation-free strip down the planting row or around the base of individual fruit trees will help conserve soil moisture. Weeds also compete with fruit plants for soil moisture, so weed control is especially important during droughty periods. In berry plantings, sawdust or bark mulch will reduce weeds and retard soil moisture loss. Additionally, effective control of defoliating insect pests and diseases will promote leaf retention, thereby enhancing photosynthesis and carbohydrate production for better drought resistance during stressful periods.

By: **Dr. Michele Warmund**, University of Missouri, Division of Plant Sciences

AUGUST GARDENING TIPS

Ornamentals

- Deadhead annuals and perennials as needed.
- Continue spraying roses that are susceptible to black spot and other fungal diseases.
- Roses should receive no further nitrogen fertilizer after August 15th.
- Divide bearded iris now. Replant so tops of rhizomes are just above ground level.
- Prune to shape hedges for the last time this season.
- Evergreens can be planted or transplanted now to ensure good rooting before winter arrives. Water both the plant and the planting site several days before moving.
- Soak shrubs periodically during dry spells with enough water to moisten the soil to a depth of 8-10 inches.
- Once bagworms reach full size, insecticides are ineffective. Pruning off and burning large bags provides better control.
- Spray black locust trees to protect against damage by the locust borer.
- Watch Scotch and Austrian pines for Zimmerman pine moth damage. Yellowing or browning of branch tips and presence of pitch tubes near leaf whorls are indicative. Prune and destroy infected parts.
- Hummingbirds are migrating through gardens now.
- Monitor plants for spider mite activity. Hose these pests off with a forceful spray of water.
- Second generation pine needle scale crawlers may be present on Mugo pine now.

Vegetables

- Compost or till under residues from harvested crops.
- Broccoli, cabbage, and cauliflower transplants should be set out now for the fall garden.
- Cure onions in a warm, dry place for 2 weeks before storing.
- Sow seeds of beans, beets, spinach, and turnips now for the fall garden. Spinach may germinate better if seeds are refrigerated for one week before planting.
- Begin planting lettuce and radishes for fall the last 2 weeks of August.
- Pinch the growing tips of gourds once adequate fruit set is achieved. This directs energy into ripening fruits, rather than vine production.

Fruit

- Prop up branches of fruit trees that are threatening to break under the weight of a heavy crop.
- Thornless blackberries are ripening during the first week of August.
- Spray peach and other stone fruits now to protect against peach tree borers. Sprays will be necessary to protect late peaches from oriental fruit moth damage.
- Cultivate strawberries. Weed preventers can be applied immediately after fertilizing.
- Watch for fall webworm activity now.

Turfgrass

- Apply insecticides now for grub control on lawns.
- Lawns scheduled for renovation this fall should be killed with Roundup. Have soil tested to determine fertility needs.
- During the last week in August, dormant lawns should be soaked to encourage strong fall growth.

-Missouri Botanical Garden-

UPCOMING EVENTS

August 11-21: Missouri State Fair, Sedalia.

August 24-November 9: Master Gardener training in Macon, Wednesdays, 1-4 pm., Macon County Extension Center. Call the Adair County Extension at 660-665-9866 for more information and a registration form.

August 25-November 10: Master Gardener training in Mexico, Thursdays, 6-9 pm., Audrain 4-H Center. The deadline to register is August 18. Call the Audrain County Extension Center at 573-581-3231 for more information and a registration form. Registration deadline August 12.

August 28: Online Master Gardener training begins. The enrollment deadline is August 19. Enroll at <http://extension.missouri.edu/mg/home.aspx>.

September 1: Tomato Fest, 4 pm, MU Bradford Research Farm, Columbia.

September 16-18: State Master Gardener Conference, Kansas City. Registration is open. Register at <http://www.mggkconf.com/>.

July 10-14, 2017: International Master Gardener Conference, Portland, OR. See the gardens of the Pacific northwest.

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