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Seed Treatments Enhance Germination

Dreary days are a great time to peruse the garden catalogs with their dazzling photographs of vegetables and flowers. In addition to variety descriptions, they also provide a wealth of information about disease resistance and time of planting. The time of seeding is determined by the frost free date for planting outdoors and the type of seed. To produce transplants, cool season crops (broccoli, cabbage, and cauliflower) are seeded 10 weeks before planting in the garden. Tomatoes, eggplant, and peppers require about seven weeks indoors, but cucumber muskmelon, squash, and watermelon need only four weeks indoors before planting outside. When seeding, sterile growing medium should be used for disease prevention. Also, covering seed flats with a thin pane of clear glass or plastic wrap will help retain moisture in the growing medium and enhance germination success.

When seeds of disease resistant varieties are unavailable, disinfectants and protectants are another way to enhance germination and seedling growth. A simple hot water soak is an effective way to disinfect fungi and bacteria from some seeds when equipment is available that precisely controls a constant high temperature. For this type of treatment, seed is placed in a cotton or cheesecloth bag and immersed in water at 100°F for 10 minutes. After this, it is plunged into water at another high temperature (118 to 122°F) for a prescribed length of time. The water temperature and time of immersion varies with the seed type. The following web site provides more detailed disinfestation information: ipm.illinois.edu/diseases/rpds/915.pdf. Microwave, ultraviolet radiation, or bleach soaks can also be used to disinfect seeds, but methods vary for each seed type.

More commonly, seed companies treat their seed before shipping it to customers. A relatively new, organic seed treatment is Natural II, which is composed of microbial products, kelp, yucca, gypsum, and clay. Other organic products, such as Actinovate, RootShield, Mildew Cure, Oxidate, Regalia, etc. are marketed for seedling and/or soil borne disease control. Magenta or blue-colored seeds generally have been treated with more traditional fungicides such as thiram or captan. Seed labels must always list the pesticide applied and any health hazards associated with the treatment.

Some of the common seedling diseases may be fungal, bacterial, or viral and can be found on the seed coat, within the seed, or in the soil. Some of the common fungal pathogens are Pythium, Fusarium, Rhizoctonia, Verticillium, and Phytophthora. Tomato, tobacco, watermelon, and zucchini mosaic viruses may also be problematic. Unfortunately, seeds that resistant to these organisms are not available. Symptoms may include seed rot, damping-off (i.e. seedling wilting and death), and root rot. Several seed catalogs list resistance of seeds to specific disease organisms.

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In This Issue

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Potato: Oft-maligned; Seldom Appreciated

For those who might have resolved to lose a bit of weight, potato (most likely) was one of the first foods eliminated from their diet. After all, everyone knows that "potatoes are fattening". Fortunately, such is not the case. An eight ounce potato (boiled or baked) contains only 100 calories. It is the way we prepare or embellish potatoes that packs on the calories. High in carbohydrates but low in fat, potatoes contains significant amounts of vitamin C and other essential nutrients, making them somewhat of a "health food". Indeed, it has been speculated by some that humans could survive on a diet that included only potatoes and milk. April is a popular month for potato planting in Missouri and a good opportunity to take a closer look at this valuable food staple that (arguably) does not get the respect it deserves.

Potato (Solanum tuberosum) is a member of the Solananceae, or Nightshade, family and native to the Andean region of South America. It was known to be cultivated by the Incas as many as 4000 years ago. There are more than 150 wild species of potato most of which contain significant levels of a glycoalkaloid called solanine, a bitter-tasting, toxic compound associated with the members of the Solananceae family. Today, solanine content still is a concern when developing new potato cultivars.

The Spanish explorer de Leon probably was responsible for introducing potato to Spain from the New World. From there, it was introduced to England and Italy in 1585, to Belgium, Germany and Austria around 1887 and to France around the turn of the 17th century. Wherever it went it was slow to be accepted as a food source because of its association with the poor and the fear that it might be poisonous or cause diseases such as leprosy.

The potato is said to have found its way to Ireland thanks to a Spanish ship carrying potatoes that wrecked off the Irish coast in 1588. Potato thrived in Ireland and, in short order, the Irish became greatly dependent on the potato as food and usually consumed it at every meal. It was estimated that an average Irish laborer of the 1800s consumed 14 pounds of potatoes daily. This dependence on a single source of food was a primary reason for the Great Potato Famine of the 1840s that occurred when late blight (Phytophthora infestans) destroyed most of Ireland's potato crop for several years in succession. It is estimated that Ireland lost 1.5 million people to starvation and related illness during the famine, cutting the country's population in half through starvation and emigration.

The potato was first introduced into what is now the United States in 1621. It was introduced on several other occasions throughout the 17th century but was slow to gain acceptance. Indeed, as late as the mid-1800s most people considered potatoes more fit for animal than human consumption. A quote from the Farmer's Manual at that time stated that potatoes should "be grown near the hog pens as a convenience towards feeding the hogs". The potato became more accepted as a human food source toward the latter half of the 1800s and it was during that period that vast improvements in potatoes were made in both productivity and table quality. Today, the United States produces nearly 46 billion pounds of potatoes and the average American consumes about 140 pounds of them each year.

Perhaps the primary challenge to successful potato production in Missouri revolves around the weather. Potato is a cool-season crop that has an optimum (air) temperature for tuber formation of 78 degrees F. Missouri is notorious for its quick transitions from springtime to hot summer temperatures. As a result, gardeners often plant their potatoes early in an attempt to subject them to cooler temperatures for a longer period of time. Unfortunately, early planting can lead to crop loss from late spring freezes or seed piece decay due to wet, cool soil. Waiting to plant until soil temperatures warm to 50 degrees F is advisable.

Potato prefers a sunny location in a well-drained garden loam high in organic matter. The ideal soil pH is relatively low (5.3-6.0), since scab, a troublesome disease of potato, favors soil with a high pH. Areas to be planted in potato should be tilled 8 to 12 inches deep. After tilling, level the soil so that furrows can be made for planting.

Liberal amounts of fertilizer are required for good potato yields. Soil testing prior to planting will help to determine the amount of fertilizer to be added. Normally, application of about 2-3 pounds per 100 square feet of a fertilizer with higher amounts of phosphorus and potas-

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sium than nitrogen (e.g. 5-10-10) is sufficient initially. Banding the fertilizer about 6 inches deep and 2 to 3 on either side where the seed pieces will be placed is helpful. Later, when tubers begin to form, side-dressing once or twice with a garden fertilizer at the rate of about 1 pound per 25 feet of row will help boost yields.

Genetically, potato is a tetraploid and, as such, is highly sterile. Therefore, instead of planting seeds, seed pieces are used to start potato. Seed pieces are made by dividing certified (disease free) potato tubers so that each piece has at least two "eyes" (dormant nodes) remaining. It is best to cut seed pieces the day prior to planting to allow cut surfaces to dry. Plant the seed pieces 9 to 12 inches apart in shallow trenches about four inches deep and cover with an inch or two of soil. Rows should be spaced 28 to 34 inches apart.

After potato plants emerge, mulching with an organic form of mulch will help to control weeds, conserve moisture and cool the soil. If natural rainfall is insufficient, potato should be irrigated to provide uniform moisture. Erratic moisture supply often results in undesirable, "knobby" tuber growth. Maximum water use occurs during active plant growth and early tuber development. The amount of water supplied should be reduced when plants begin to die back in order to prevent tubers from decaying.

Major insect pests of potato include Colorado potato beetles, flea beetles, leafhoppers and aphids. Wireworms, white grubs and other soil insects can damage potato tubers. These insects are most likely to occur if sod was tuned under before planting the area. Scab, early blight and late blight can be problematic foliar diseases. Fortunately, the climate in Missouri is not conducive for the latter to develop on a regular basis. If weed control is necessary, it should be accomplished by shallow cultivation since deep cultivation may injure tubers.

Unless mulch has been applied, when plants are 6 to 8 inches tall, begin to mound soil around the bases of the plants to form a ridge or hill. By the end of the production season, the ridges should be 4 to 5 inches high. This practice not only helps to control weeds but is necessary to prevent greening of shallow tubers. Green skins are caused by exposing potato tubers to light. Since the green portion tends to develop the previously-mentioned toxin solanine, it should be cut off before cooking, or (better) green-skinned potatoes should be discarded totally.

New potatoes can be harvested as soon as they reach a useable size. Potatoes destined for storage should be dug about two weeks after the plants have naturally died back. This allows the skins to mature and reduces peeling and bruising during harvest. The latter tends to lead to storage rot. Place tubers in a dark place immediately after harvesting. As previously mentioned, tubers exposed to sun (and high temperatures) tend to turn green.

Potatoes can be stored for several months if the tubers are cured properly. The latter involves placing them in a dark place for about 10 days at a temperature of from 60 to 65 degrees F and a relative humidity of at least 85 percent. After the tubers are cured, store them in a cool (40 to 45 degrees F), dark location with high relative humidity. Those having the luxury of an extra refrigerator can store potatoes for many months. However, under refrigerated storage potato tubers tend to convert their starch into sugar, decreasing their table quality. This can be reversed by taking potatoes out of refrigerated storage several weeks before they are used.

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May Gardening Calendar

Ornamentals

- **Weeks 1-4:** Apples, crabapples and hawthorns susceptible to rust disease should have protective fungicidal sprays applied beginning when these trees bloom.
- **Weeks 1-4:** Pinch azaleas and rhododendron blossoms as they fade. Double flowered azaleas need no pinching.
- **Weeks 1-4:** If spring rains have been sparse, begin irrigating, especially plants growing in full sun.
- **Weeks 1-4:** Fertilize azaleas after bloom. Use a formulation which has an acid reaction.
- **Weeks 1-2:** Canker worms (inch worms) rarely cause permanent damage to ornamentals. Use Bt if control is deemed necessary.
- **Weeks 1-2:** Don't remove spring bulb foliage prematurely or next year's flower production will decline.
- **Week 1:** Continue monitoring pines, especially Scotch and mugo, for sawfly activity on new shoots.
- **Week 1:** Begin planting gladiolus bulbs as the ground warms. Continue at 2-week intervals.
- **Week 1:** Plant hardy water lilies in tubs or garden pools.
- **Weeks 2-4:** Scale crawlers are active now. Infested pines and euonymus should be treated at this time.
- **Weeks 2-3:** Plant summer bulbs such as caladiums, dahlias, cannas and elephant ears.
- **Week 2:** Begin planting warm-season annuals.
- **Weeks 3-4:** Begin fertilizing annuals. Continue at regular intervals.
- **Weeks 3-4:** Trees with a history of borer problems should receive their first spray now. Repeat twice at 3-week intervals.
- **Weeks 3-4:** Bulbs can be moved or divided as the foliage dies.
- **Week 4:** Pinch back mums to promote bushy growth.

Lawns

- **Weeks 1-4:** Keep bluegrass cut at 1.5 to 2.5 inch height. Mow tall fescue at 2 to 3.5 inch height.
- **Weeks 2-4:** Mow zoysia lawns at 1.5 inch height. Remove no more than one-half inch at each mowing.
- **Weeks 2-4:** Apply post-emergence broadleaf weed controls now if needed.
- **Weeks 3-4:** Zoysia lawns may be fertilized now. Apply no more than 1 pound of actual nitrogen per 1000 square feet.
- **Week 4:** Watch for sod webworms emerging now.

Vegetables

- **Weeks 1-4:** Place cutworm collars around young transplants. Collars are easily made from cardboard strips.
- **Weeks 1-4:** Growing lettuce under screening materials will slow bolting and extend harvests into hot weather.
- **Weeks 1-4:** Slugs will hide during the daytime beneath a board placed over damp ground. Check each morning and destroy any slugs that have gathered on the underside of the board.
- **Weeks 1-2:** Plant dill to use when making pickles.
- **Week 1:** Keep asparagus harvested for continued spear production. Control asparagus beetles as needed.
- **Week 1:** Begin planting sweet corn as soon as white oak leaves are as big as squirrel ears.
- **Week 1:** Isolate sweet, super sweet and popcorn varieties of corn to prevent crossing.
- **Week 1:** Thin plantings of carrots and beets to avoid overcrowding.
- **Week 1:** Control caterpillars on broccoli and cabbage plants by handpicking or use biological sprays such as B.t.
- **Week 1:** Set out tomato plants as soils warm. Place support stakes alongside at planting time.
- **Weeks 2-3:** Place a stake by seeds of squash and cucumbers when planting in hills to locate the root zone watering site after the vines have run.

May Gardening Calendar

Vegetables *(cont'd)*

- **Weeks 2-3:** Remove rhubarb seed stalks as they appear.
- **Week 2:** Watch for striped and spotted cucumber beetles now. Both may spread wilt and mosaic diseases to squash and cucumber plants.
- **Weeks 3-4:** Set out peppers and eggplants after soils have warmed. Plant sweet potatoes now.
- **Week 4:** Make new sowings of warm-season vegetables after harvesting early crops.

Fruits

- **Weeks 1-4:** Mulch blueberries with pine needles or sawdust.
- **Week 1:** Don't spray any fruits while in bloom. Refer to local Extension publications for fruit spray schedule.
- **Week 4:** Prune unwanted shoots as they appear on fruit trees.

Miscellaneous

- **Weeks 1-4:** Birds eat many insect pests. Attract them to your garden by providing good nesting habitats.
- **Weeks 2-4:** Herbs planted in average soils need no extra fertilizer. Too much may reduce flavor and pungency at harvest.
- **Weeks 3-4:** Take houseplants outdoors when nights will remain above 50 degrees. Most prefer only direct morning sun.
- **Weeks 3-4:** Watch for fireflies on warm nights. Both adults and larvae are important predators. Collecting may reduce this benefit.
- **Weeks 3-4:** Sink houseplants up to their rims in soil or mulch to conserve moisture. Fertilize regularly.

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)