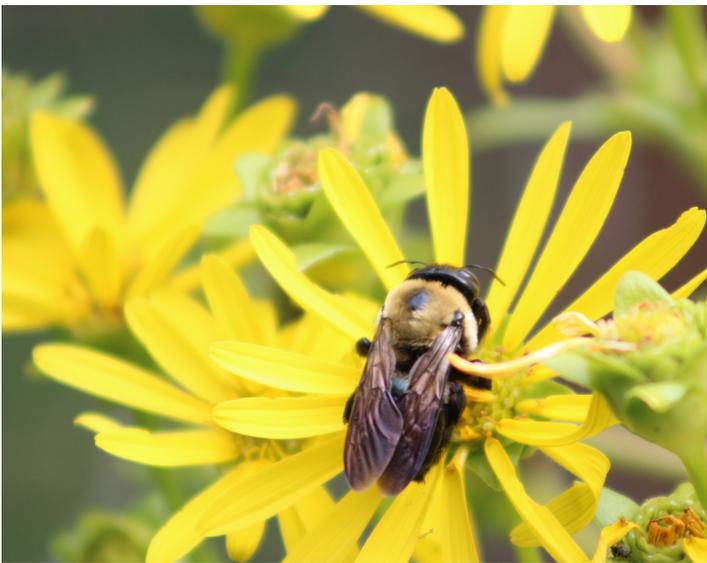


# Homegrown Heroes of Ohio Program



Homegrown Heroes Program Curriculum  
East End Veteran's Memorial Garden

# Acknowledgements

The following curriculum was created to provide guidance and reference to basic horticulture tasks related to gardening for the Veterans participating in the Homegrown Heroes program at the East End Veteran's Memorial Garden in Cincinnati Ohio. Each Participant will take away a copy of the gardening guide to hopefully perpetuate their interest in gardening as a hobby or possible vocation.

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## **Horticulture as a Therapeutic Tool**

*Holly Utrata-Halcomb, HTR*

Long before the science of psychiatry, physicians were prescribing work in the garden as treatment for the physically and mentally ill. Many psychiatric hospitals required patients to work on hospital farms to pay for their treatment. Physicians began to notice that a greater number of patients who worked on the farms improved and went home far sooner than those patients who did not.

Dr. Benjamin Rush was one of the first medical men to recognize the value of the use of horticulture for patients. In 1795, he proclaimed his conviction that gardening activities had a curative effect on the mentally ill. Recognizing the value of this concept, the Quakers, who founded Friends Hospital in 1813, incorporated various kinds of horticulture therapy into its occupational therapy program and still employ it today.

Horticulture has now become an integral part of therapy in many hospitals, nursing homes, special education schools, rehabilitation center and prisons. It uses a living media to awaken and satisfy basic needs in individual who are having problems, mentally or physically, in dealing with their lives. It serves as a positive outlet for tension and hostility as well as an inspiration to seek beauty in a world that may not seem very beautiful at the time.

The National Council for Therapy and Rehabilitation through Horticulture, now known as the American Horticultural Therapy Association (AHTA) - <http://ahta.org/horticultural-therapy> , was established in 1973. "Today, AHTA defines and encourages the pursuit of outstanding standards of practice, disseminates critical knowledge across diverse constituent audiences, and recognizes and promotes excellence in clinical, professional, educational, and research achievement."

The Holden Arboretum in Mentor, Ohio has one of the longest running horticultural Therapy programs in the country. In 1954, Mrs. Warren Corning along with Mr. Lewis Lipp, Arboretum Horticulturalist, began bringing individuals from senior citizens center, retirement homes and rehabilitation facilities to the Arboretum for plant workshops. This program expanded to train the staff and volunteers of social service agencies in the methods of incorporating horticulture into their therapy programs. Basic information on plant growth and care and instruction on developing a 12-month seasonal curriculum were supplied. Due to the inspiration from Holden Arboretum, Ohio has claim to hundreds of therapeutic Horticulture programs.

The following lists illustrate the many benefits that can be derived from a participating in plant activities. These lists are quoted from Diane Hefley as printed in "Horticulture for the Disabled and Disadvantaged", By Damon R. Olszowy.

## Intellectual Benefits

- *Arouse Curiosity* - Plants provide a medium for experimentation.
- *Increase Power of Observation* – This involves a new awareness of the environment and the basic interrelatedness of all living things. This can range from developing the ability to notice small differences in plants to understanding the transitional cycles of compost. Plant activities can also be used to diagnose spatial ability, number concepts in addition to memory and ability to concentrate.
- *Stimulation of Sensory Perception* – All senses are aroused in a horticultural therapy program resulting in increased sensitivity to the immediate environment.
- *Improve Vocabulary and Communication Skills.*

## **Therapeutic Goals for the Veteran's Gardening Program**

Leigh Gaines MD, Medical Director

Substance Abuse Residential Rehabilitation Program

Cincinnati VA Medical Center

The 17 veterans in the Substance Abuse Residential Rehabilitation Treatment Program (SARRTP) are a diverse group of men and women working to overcome addiction. We have had veterans as young as 20 and as old as 74 in the time I have been working on the unit. Many also have psychiatric and medical challenges. As a result of their addiction, the majority are disconnected from their families, friends and work. Often they are homeless. Many of these veterans have lost their way and do not have functional coping skills.

One of the goals of the horticulture therapy program is to reconnect these veterans with not only a sober leisure activity but with the healing potential of the natural world. Having a weekly outing to the East End Veteran's Garden will have different levels of impact on each individual. Some may simply take away from the experience a chance to get out of the hospital and out in the fresh air. Others – and we hope this group comprises the majority – will be exposed to gardening as a new skill, hobby and sober stress management tool that they can turn to as they continue their journey of recovery. A small percentage may be moved to explore gardening/agriculture as a possible job opportunity as they work to rebuild their lives.

The following therapeutic goals are a starting point, and I am confident the expertise of the many individuals in our "Harvesting Heroes" group can translate these into some exciting and meaningful activities for our veterans.

\*Provide exposure to the outdoors and natural world.

\*Learn gardening skills as a sober leisure activity.

\*Learn to use gardening as a stress management tool.

\*Provide a gardening education experience that will cover basic topics and skills that veterans could then recreate on their own or in another venue: Soil, Compost, Use of Raised Beds, Container gardening, Planting, Harvesting, Etc..

\*Pesticide-free/Organic practices.

\*Veterans will be provided with simple hands-on culinary experiences to help them learn how to cook produce harvested from the garden and enjoy the benefits of fresh, unprocessed foods.

\*Crop-specific "tutorials:" ie, how to grow Tomatoes, Lettuces, Beans, Herbs, Flowers, Fall crops etc..

\*Introduction to the concepts of community gardens (volunteering, how to access)

\*Gardening as a vocation

# Horticulture Activities Utilized to Achieve Specific Objectives

By: B.J. Romick, OTR/L & Holly Utrata-Halcomb, HTR

## **SHOULDER EXERCISE**

- Coordination with weight on arms
- Watering with full container
- Mixing soil
- Loosening soil, pulling weeds, watering and harvesting
- Vegetable prep and cooking

## **SMALL COORDINATION (Fine Hand)**

- Counting out seed w/ spoon
- Pincer grip – picking up larger seed and placing on soil. Lightly pressing into soil
- Loosen soil in containers w/ tool
- Tactile I.D. of natural materials
- Vegetable prep, cooking and feeding
- Take cuttings
- Plant cuttings
- Writing labels &/or and tracing
- Seed mosaics
- Sand Designs
- Mounting leaves and pressed flowers
- Assembling dish gardens
- Creating herbal potpourri
- Assembling terrariums
- Vegetable prep i.e. peeling or mashing veg.,
- Stripping herbs from stem
- Flower arrangement

## **BALANCE**

- Stand and work at any task over a table
- Material placement requiring leaning in appropriate direction
- Many outdoor gardening Activities

## **HAND STRENGTHENING EXERCISES**

- Mixing soil
- Watering with a full container
- Chopping and loosening soil around plants
- Pruning

## **COGNITIVE EXERCISE**

- Plant identification
- Researching plant care
- Leaf mix and match
- Assist in planning and staffing a plant sale- setup, pricing tagging, customer interaction
- Entering County Fair
- Arranging for donation of produce to food pantry, Meals on Wheels or other causes
- Researching recipes and preparing food - following directions, sequencing steps.
- Researching plant crafts, following directions and explaining sequence of steps to others

## How to test your stored seed for germination



December 22, 2011

CORVALLIS, Ore. – If you saved seeds from the last growing season and wonder if they will germinate when planted this spring, you can discover the average rate of germination before the planting season begins.

"It's easy to check vegetable and flower seed viability, and it can save you time later when the gardening season begins," said Ross Penhallegon, horticulturist with the Oregon State University Extension Service. "Some seeds remain viable for a year and others for three or more years."

To find out whether a variety of seed will germinate and grow, Penhallegon suggests the following test:

- Place 10 seeds an even distance apart on a damp paper towel. Roll up the towel and place in a plastic bag.
- Leave the damp, rolled towel in a warm spot in the kitchen for two to five days. The location's lighting doesn't matter.
- After the two-to-five days, check the paper towel to see which seeds have germinated.

"The percentage of seed germinating in the towel will give you a fairly good idea how the same seed will do in the garden," he said. "If half the seed did well in the towel, half of the same batch of seed will probably do well in the garden."

Some seed types last longer than others. For example, seed from sweet corn, parsnips, Swiss chard and spinach generally keep well under normal household conditions for only a year. On the other hand, beans, carrots, cole crops, collards, squashes, tomatoes and turnips are good for at least three years.

Seed is best stored through the winter at 50 degrees with 50 percent humidity. Another good way to store unused seed packets is to place seeds in a sealed jar with a desiccant or powdered milk at the bottom to absorb moisture. Store the jar in a cool room or refrigerator over the winter.

To learn more about storing seed, see OSU Extension's "[Collecting and Storing Seeds from Your Garden](#)," FS 220, online.

To learn about propagating plants from seed, see the OSU Extension's PNW 170 "[Propagating Plants from Seed](#)" online.

You can search the [OSU Extension catalog](#) for more than 1,200 items, including publications, books, videos and other educational media.

**Author:** Judy Scott

**Source:** [Ross Penhallegon](#)



# Garden calendar

## Tip Sheet

### January

- ✓ Order seed catalogues or visit seed websites.
- ✓ Plan garden space. Sketch garden plans on paper; include plants you want to grow, their spacing requirements, arrangement and number of plants needs. Remember, the ideal spot needs to have six to eight hours of direct sunlight daily. The ideal garden location has a north-south layout, is level, close to water, and not in competition with the roots of trees and shrubs.

### February

- ✓ Test germination of any leftover seeds. Place 10 seeds between a moist paper towel and cover with a thin layer of soil. Keep seeds warm and moist. If less than six seeds germinate, fresh seed should be purchased.
- ✓ Order seeds.

### March

- ✓ Prepare supply list for garden, including fertilizer, tools, transplants, materials for staking, and mulch.
- ✓ Take a soil sample for a [soil test](#) as soon as it has thawed.

### April

- ✓ Prepare soil when it is dry enough. Take a handful of soil and squeeze. If the soil crumbles when you open your hand, it is ready for planting.
- ✓ Fertilize based on soil test recommendations.
- ✓ Plant cool season crops; onion, beets, lettuce, spinach, carrots and radishes.

### May

- ✓ Plant seeds of cool weather crops for the second and third times, approximately two weeks apart.
- ✓ Thin seedlings of crops planted earlier to their proper spacing.
- ✓ Harden off transplants by setting them outdoors during the day for seven to 14 days before you intend to plant them. Plants should be in shade and protected from wind for a few days during this process. Maintain soil moisture so transplants do not wilt.
- ✓ Plant warm season seeds after the danger of frost is past ([link to frost dates table](#)), including cucumbers, squash, pumpkins and melons.
- ✓ Plant the hardened-off transplants of peppers, tomatoes and eggplant.
- ✓ Harvest early plantings of radishes, spinach and lettuce.
- ✓ For succession plantings, plant warm season crops where cool season crops have been harvested.
- ✓ Mulch around plants and in rows to keep soil moist and reduce soil compaction.
- ✓ Monitor crops for insect and disease problems regularly. If you discover a problem, identify its source and take control measures if needed. Contact your [local Extension office](#).

*Continued on page 2*

## June

- ✓ Thin vegetables seeded in May to proper spacing.
- ✓ Plant successive crops of beans every two weeks until the end of the month.
- ✓ Continue to harvest frequently as crops mature.
- ✓ Remove cool season crops as they bolt (form seed stalks). Additional plantings may be made of lettuce, spinach, radishes; they need some shade and cooler temperatures so planting them under taller crops will extend the harvest.
- ✓ Stake tomatoes for improved health and easier harvest. Remove suckers (branches that form where the leaf joins the stem) when they are one inch to 1.5 inches long.
- ✓ Weed the garden. Weeds compete with vegetable plants for nutrients and moisture.
- ✓ Monitor regularly for insect and disease problems and take needed control measures to limit damage.

## July

- ✓ Continue to thin seedlings as seed package directs.
- ✓ Water during dry conditions.
- ✓ Harvest crops regularly to encourage further production.
- ✓ Cover potato tubers, carrot shoulders and onion bulbs with soil to prevent development of green color. Soil or mulch may be used to keep them covered.
- ✓ After harvesting central heads of broccoli, allow the plants to produce side heads for an extended harvest.
- ✓ Garden crops can be given nitrogen fertilizer at the beginning of July. Wait until tomatoes, peppers and eggplant have set some fruit before you fertilize them. Work fertilizer into soil a few inches away from the plants, then water. Do not allow the fertilizer to touch the plant stems.
- ✓ Continue to harvest frequently as crops mature.
- ✓ Keep the garden weeded.

## August

- ✓ Harvest crops frequently as they ripen for maximum flavor and continuing harvest.
- ✓ Plant cool crops for fall harvest; radish, spinach, lettuce, broccoli, cauliflower and Brussels sprouts.
- ✓ Don't forget to thin seedlings as directed on seed packages.
- ✓ Continue to monitor regularly for insect and disease problems.
- ✓ Water during dry conditions.
- ✓ Keep the garden weeded.

## September

- ✓ Harvest onions and garlic after the tops yellow and fall, then cure them in a warm, dry, well-ventilated area for storage. Their necks should be free of moisture when fully cured in approximately one week.
- ✓ Harvest potatoes after the plant tops yellow and die. Potatoes also need to be cured before storage.
- ✓ Thin fall crops that were planted last month.
- ✓ Pay attention to weather; first killing frost usually happens this month. Cover warm season crops with newspapers, sheets, or some other material that will trap heat overnight. Remove these covers once the sun is up the next morning.
- ✓ Cole crops (broccoli, cauliflower, cabbage, Brussels sprouts), carrots, parsnips, lettuce and spinach tolerate some frost.
- ✓ When harvesting pumpkins, gourds and winter squash, cut fruit from vine leaving a portion of stem attached. This will improve the storage life of the fruit.
- ✓ As harvest ends, clean up plants and add them to the composting pile. Do not compost plants suffering from disease.
- ✓ Store leftover garden seed in a cool, dry place. A sealable jar with a layer of silica gel or powdered milk in the bottom works well.

## October

- ✓ Complete final harvest of tender crops when cold temperatures become frequent. Partially ripe tomatoes can be picked and ripened indoors.
- ✓ Harvest gourds when stems begin to brown and dry. Cure at 70-80°F for two to four weeks in dry, well ventilated location.
- ✓ Cole crops and root crops taste better after a freeze.
- ✓ Harvest Brussels sprouts as they develop along the stem.
- ✓ Harvest pumpkins and winter squash when rind is hard and fully colored. Store in cool location until ready to use.
- ✓ After a killing frost, clean up vegetable beds and add plant material to compost pile. This will reduce amount of overwintering pests and diseases.
- ✓ Before the ground freezes, plant rhubarb,

asparagus, garlic and shallots.

- ✓ Soil may be prepared for spring planting by removing weeds and adding organic matter (compost, leaves).
- ✓ Evaluate your garden and make notes to help plan next year's effort. Note favorite varieties for flavor, disease resistance, and performance. Note location of insect, disease and weed problems. Planting crops in different locations in consecutive years can reduce these problems.
- ✓ Carve your Halloween jack-o-lantern.

## November

- ✓ This is an excellent time to have your soil tested because the soil lab is not as busy this time of year.

## December

- ✓ Enjoy stored, frozen or canned crops from your garden.

## Notes:

# Planning the Perfect Vegetable Garden Layout

The ever-important vegetable garden layout is on the minds of many gardeners now that spring is officially here. There are many things to consider when planning your vegetable garden.

Follow these tips to enjoy a beautiful and productive garden this year.



*Photo via Creative Commons/Ruth Hartnup*

## Location

The location of your vegetable garden is the most vital decision you'll make. The perfect spot will not only grow the best vegetables, but make maintenance much easier for you, the gardener.

## Vegetable garden placement

- Full sun, 6-8 hours at a minimum
- Soil should be fertile and drain well.
- Incorporate organic matter each year and have soil fertility checked every five years. Contact Hamilton County Soil and Water Conservation District for a testing kit. Amend soil as needed before planting.

## Garden Lay Out

- Plan out the garden before doing any digging or planting.
- Situating the vegetable garden close to the house will make it easier to care for. Consider distance from the hose for ease of watering.
- The width of each bed should not be greater than 4 feet for ease of weeding and harvest.

## Positioning your plants for optimal growth

- Observe sun patterns and plan accordingly.
  - Plants that grow to enormous sizes should be placed so that they won't overshadow shorter crops. Large plants like corn, should be positioned on the north side of the garden so as not to cast shadows on the rest of the garden. If

you're planning to train climbers up trellises, such as squash and melons, these can be situated on the northern end as well.

- Large sprawling crops should be situated in the center of the garden. Broccoli, cabbage, and of course, the squash and melons mentioned previously, as long as they aren't trained to climb.
- Smaller, short crops can go on the south side of the garden. Lettuce, carrots, radishes and onions fall into this category.



*Photo via Creative Commons/Jon Bennett*

- Companion planting – For better plant health. Planting beans, squash and corn together in a three sisters garden will benefit all three plants. Planting lettuce underneath a cucumber trellis or towering tomato plant can help keep the delicate leaves from getting sun scorched.
- Another option is staggering planting. Planting early crops with late crops is like getting a 2-for-1 deal! For instance, short season crops like radishes can be planted in the same spot as long season crops like squash. The radishes will grow to harvest in just a month and can be pulled before their roots are disruptive to the squash. This is a great way to grow a large amount of food in a small space.

## Containers

- A special note needs to be made for invasive crops. Grow them separately in containers to keep them from overtaking your garden. Horseradish, mint and strawberries are good examples of invasive plants. They spread quickly, like weeds, and are hard to contain once they get started.
- These plants can grow well in a container and can be placed in their own separate garden, or grow in bottomless pots sunk into the ground.

Which Veggies for Which Season go to <http://bonnieplants.com/library/which-veggies-for-which-season/>

Holly Utrata-Halcomb, Administrator, Hamilton County SWCD 2015

## Seed Catalogs and Resources

- ✚ Burpee Seed -W. Atlee Burpee & Co. 300 Park Avenue, Warminster, PA 18974  
1 (800) 888-1447  
<http://www.burpee.com/gygg/growingCalendarNoZipCode.jsp>
- ✚ Park Seed - Park Seed Co., 3507 Cokesbury Road, Hodges, SC 29653 - 1-800-845-3369 [info@parkseed.com](mailto:info@parkseed.com)
- ✚ Stokes Seed - PO Box 548, Buffalo NY 14240-0548 1-800-396-9238 <http://www.stokeseeds.com/pages/contact>  
[stokes@stokeseeds.com](mailto:stokes@stokeseeds.com)
- ✚ Tomato Seed Grower Supply Company - <http://www.tomatogrowers.com> P.O. Box 60015 Fort Myers, FL 33906 1-888-478-7333
- ✚ Ask your friends and family to suggest their favorite seed company. Google Seed Companies!



# Planting vegetables Tip Sheet

## When to plant

Most vegetables are either cool season or warm season crops. **Cool season vegetables** grow best during the cooler temperatures of spring or fall and can withstand some frost or freezing temperatures, particularly when plants are young. Some cool season vegetables such as onions, peas and spinach, are very hardy and can be planted as soon as the ground can be worked in the spring. This is usually late March or early April in southern Michigan and one to three weeks later further north. Fall garden planning should be made in July through maybe September.

**Warm season vegetables**, such as cucumbers, melons, squash, peppers and tomatoes are sensitive to cool temperatures and will be killed by frost. They cannot be safely planted outdoors until the **danger of frost** is past unless they are placed under hot caps, tents or covers. Seeds of warm season crops germinate poorly in cool soil and may rot in wet soil if planted too early. Early varieties of sweet corn can usually be planted a couple of weeks ahead of other warm season vegetables since they aren't quite as tender, and seedlings are protected by the surrounding soil until they emerge from the ground.

## Planting from seed

Starting plants from seeds is economical and fun for gardeners of all ages. With seeds, there is an incredible variety of choices not found in transplants. Whether purchased online from specialty nurseries, catalogs, or at local garden centers, seed packets offer heirloom plants, rare and unusual cultivars, and tempting varieties of veggies even the diehard non-vegetarian will enjoy. Some examples of vegetables easy-to-grow from seed include radish, lettuce, peas, and carrots.

## Keys for success

- ✓ Prepare only the soil you intend to plant within a few days so weeds don't get a head start.
- ✓ Check the soil temperature. Some seeds, like certain extra-sweet corn cultivars, will not germinate well unless the soil temperature at planting depth exceeds 60°F. Beets, carrots, radishes and turnips, on the other hand, will germinate at a minimum of 40°F.
- ✓ For a neat, easy-to-care-for garden, plant straight rows. Rows help you to tell the vegetables from the weeds. Rows of onions, parsnips and beets may be marked by planting a few radishes in the row; radishes grow faster. Place a stake at each end of a row, and tie a taut string from one to another. Create straight furrows by pulling a hoe along the string from one stake to the other.
- ✓ Planting depth depends on seed size. As a general rule, plant seeds no deeper than twice their diameter. For more specific information, read the back of the seed packet.

## Importance of good varieties

Using superior varieties is a first step toward successful gardening. Varieties vary in such characteristics as adaptability, earliness, color, shape and size. They also vary in disease, insect or nematode resistance or tolerance. Good seeds of superior, adapted varieties will be inexpensive in the long run. Poor seeds of inferior or poorly adapted varieties will be expensive at any price.

- ✓ Cover the seed and tamp gently with the flatside of a hoe blade.
- ✓ Water lightly to insure that seeds get a good start.
- ✓ Remember to read the back of the seed packet. It has a wealth of information to help you be successful: planting, thinning, and growing instructions specific to each type of plant.
- ✓ When directions recommend planting the seeds in "hills," this means groups of seeds, not actual hills of soil. Squash, melon, and cucumbers are frequently planted in hills. (When the seedlings are up and growing, thin out the weakest seedlings in the hill.)
- ✓ To produce good, sturdy plants, you need 12 to 14 hours of daylight. Unless you have a greenhouse, you'll need to put your plant under a grow light or fluorescent lighting along with sunlight.
- ✓ Start your seeds in any container that has proper drainage about six to eight weeks before you want to move plants to the garden.
- ✓ Select a potting mixture rich with nutrients. It should contain approximately equal amounts of sphagnum peat, potting soil and vermiculite.
- ✓ Fertilize lightly, but often with liquid fertilizer to keep young seedlings growing vigorously.
- ✓ Place young seedlings outdoors in the shade for a few days to a week, to harden them off before planting them in direct sunlight.

## Planting from transplants

### Growing your own

Many vegetables do best when started indoors rather than being planted directly into garden soil. Seedlings started in containers indoors can be transplanted to the garden as soon as danger of frost is past. If you chose to grow your own transplants, follow these tips:

- ✓ Buy disease-resistant seed varieties recommended for growing in Michigan's climate.

### Buying transplants

Some gardeners have neither the time nor the space to raise their own transplants.

Select young, stocky plants with lots of leaves, but without flowers or fruit.

Plants should have good green color and no pests on them.

	Beginner or patio gardener	Beginner or small garden	Any gardener or general garden	Experienced gardener	Avid gardener
<b>Cool season crops</b>	Lettuce (leaf and bibb) Onions	Carrots Peas Radishes	Beets Broccoli Brussels sprouts Cabbage Cauliflower Parsnip Spinach Swiss chard Turnip	Celeriac Chinese Cabbage Chives Collards Dill Kale Kohlrabi Lettuce (head) Parsley Potatoes Rutabaga	Asparagus (perennial) Celery Garlic Horseradish Mustard Rhubarb (perennial) Salsify
<b>Warm season crops</b>	Cucumbers (bush) Summer squash Tomato	Cucumbers (vine) Snap beans Tomatoes: cherry, grape slicer or paste	Eggplant Lima beans Muskmelon Okra Pumpkins (bush) Squash (winter) Sweet corn	Pumpkins Tomatoes (yellow) Watermelons	Jerusalem artichokes Popcorn Sweet potatoes Soybeans

Check the roots. This is especially important with cole crops such as broccoli, brussels sprouts, cabbage, kohlrabi, cauliflower and the new broccoli-cauliflower cross called "broccoflower." Diseases such as clubroot are almost impossible to get rid of once they are introduced into the garden soil. Healthy roots are white, sometimes with visible white root hairs.

Choose recommended or familiar varieties. Whenever possible, select those that are also resistant or tolerant to insects, diseases and nematodes.

### Hardening off the plants

Whether you have purchased transplants or raised them yourself, they should be transplanted out into the garden as soon as the danger of frost is passed. Allow a short transition period (also known as hardening off) outdoors for seven to 10 days before planting.

Set the transplants in a shady location protected from sun and wind to help them adjust to their new outdoor environment. Gradually expose transplants to longer periods of sun and wind.

Keep the transplants' soil moist during this transition period.

### Planting transplants

- ✓ Water plants well before transplanting.
- ✓ Transplant seedlings in the evening or on a cloudy day so they are not dried out by the sun's heat.
- ✓ Dig a hole slightly larger than the transplant container.
- ✓ Move each seedling from its pot as you get ready to plant it.
- ✓ Keep as much of the plant's growing medium (soil) around the roots as possible.
- ✓ Gently loosen the roots to encourage proper root growth.
- ✓ Set plants at the same depth that they were in the containers.
- ✓ Gently firm soil around the plant gently with your hand. Create a circle mound around the plant to hold water near the roots.
- ✓ Water new transplants gently, but thoroughly.

- ✓ Get the plants off to a good start by keeping the soil moist, but not wet for the first week after planting. **Do not** overwater.
- ✓ Apply two to three inches of organic mulch to prevent weeds, conserve water and moderate soil temperatures. Do not allow mulch to touch plant stems.

### Spread out the harvest

Vegetables can be harvested over a longer period of time if you do several plantings throughout the season. For example, three or four small plantings of corn, beans and lettuce two weeks apart will be better than a single large planting. It is also important to use early, mid-season and late-maturing varieties in conjunction with successive plantings to insure a continual harvest.

Table 4. VEGETABLE PRODUCTION CHART\*

Vegetable	Amount needed for one adult (fresh use)		Amount needed for a family of four (fresh use)		Amount needed for one adult (processed/storage)		Amount needed for a family of four (processed/storage)		Spacing between rows Inches	Yield per 100 feet of row** Pounds	Yield per 100 square feet** Pounds	
	Pounds	Feet of Row	Pounds	Feet of Row	Pounds	Feet of Row	Pounds	Feet of Row				
Asparagus	1.5	10	5	35	5	35	15	100	36	15	5	
Beans, Lima	3	40	10	125	3	40	10	125	21	8	5	
Beans, snap	15	25	50	85	18	30	55	90	21	60	34	
Beets	3.5	4	10	10	7.5	8	25	25	21	100	57	
Broccoli	8	20	25	60	12	30	35	90	30	40	16	
Brussels sprouts	6	20	20	65	8	25	25	85	30	30	12	
Cabbage	15	13	45	40	15	13	45	40	15	30	120	48
Carrots	10	8	30	25	10	8	30	25	21	120	69	
Cauliflower	9	10	25	30	12	15	35	40	33	90	33	
Celeriac	0.5	1	2	3	--	--	--	--	21	60	34	
Celery	4	1	12	3	--	--	--	--	28	430	184	
Chinese cabbage	2	1	6	2	--	--	--	--	27	420	187	
Collards	2	3	5	7	4	5	10	15	21	80	46	
Cucumbers	8	4	25	12	10	5	30	15	48	200	50	
Eggplant	4	3	10	9	--	--	--	--	30	115	46	
Endive	4	7	10	18	--	--	--	--	15	55	44	
Garlic	1	4	3	12	2	8	5	20	15	25	20	
Jerusalem artichoke	1.5	2	5	3	1	2	3	2	48	150	38	
Kale	1	1	3	3	2	2	6	6	21	100	57	
Kohlrabi	1.5	2	5	7	--	--	--	--	21	75	43	
Leeks	1	3	3	7	1	3	3	7	15	45	36	
Lettuce	6	12	20	40	--	--	--	--	15	50	40	
Muskmelon	10	9	30	27	2	3	6	6	48	110	28	
Mustard	1	2	3	6	--	--	--	--	21	50	29	
Okra	3	5	10	17	4	6	10	20	27	60	27	
Onions (dry)	8	12	25	30	20	24	60	72	15	115	92	
Onions (green)										50	40	
Parsley	0.25	1	1	4	0.5	2	2	7	15	30	24	
Parsnips	3	6	10	20	3	6	10	20	21	50	29	
Peas, shelled	4.5	15	15	50	7.5	25	25	85	15	30	24	
Peas, snap	1	3	3	8	1	3	3	8	15	40	32	
Peppers	3	3	10	8	3.5	3	10	8	30	120	48	
Pop corn	--	--	--	--	4	15	15	55	33	28	10	
Potatoes, Irish	25	21	75	50	75	50	225	150	30	150	60	
Potatoes, sweet	3	18	10	25	4	10	10	25	36	40	13	
Pumpkins	10	4	30	10	8	3	25	8	60	300	60	
Radishes	4	40	10	100	--	--	--	--	9	10	11	
Rhubarb	4	4	10	10	4	4	10	10	48	100	25	
Rutabaga	1.5	2	5	5	2	2	5	5	21	100	57	
Salsify	0.5	1	2	3	0.5	1	2	3	21	80	46	
Spinach	3	6	10	20	5	3	15	8	15	50	40	
Squash, summer	10	5	30	12	3	2	10	4	42	240	69	
Squash, winter	6	3	20	9	3	2	10	4	60	230	46	
Sweet corn	25 ears	25	80 ears	80	50 ears	50	160 ears	160	30	100 ears	36 (kernels)	
Swiss chard	3	4	10	12	4.5	6	15	20	21	85	49	
Tomatoes	24	15	70	40	36	23	110	65	36	165	55	
Turnips	5	5	15	15	7	7	20	20	21	100	57	
Watermelons	12	12	35	35	--	--	--	--	72	100	17	

\*Assumptions per person is for individuals who like to eat that particular plant. If they don't, they won't plant any.

Amount for a family of four is generally about three times the amount needed by one adult. This is because a family of four would usually include some children who probably wouldn't eat as much as an adult, or the family might include one or more members who wouldn't care to eat that particular vegetable.

\*\* Yields are based on standard row plantings. Wide row planting, trellising, and other intensive gardening techniques would probably yield more than the amounts listed above.

TABLE 6. VEGETABLE PLANTING CHART For a typical home garden for a family of four (fresh use only)										
Vegetable	Field planting times*	Weeks from seed to transplanting	Days to maturity	Days between flowering and harvest	Depth to plant (Inches)	Amount of seed or plants (Ounces)**	Row length (Feet)	Planting in rows after thinning	Distance between rows	Estimated production (pounds)
Asparagus	April		2 to 3 years		8	12 plants	35	12 to 18	36 to 60	5
Beans, Lima	May 20 – June 1		68 to 90	40 - 45	1 to 2	8 ounces	125	3 to 4	18 to 24	10 (shelled)
Beans, snap	April 20 – June 30		50 to 70	10 - 14	1 to 2	2 ounces	85	3 to 4	18 to 24	50
Beets	April 1 – July 15		57 to 80		½ to 1	¼ ounce	10	2 to 3	18 to 24	10
Broccoli	April 20 – July 15	4	60 to 75		(plants)	12 plants	60	12 to 15	30	25
Brussels sprouts	April 20 – May 15	4	90 to 95		(plants)	15 plants	65	18 to 24	30	20
Cabbage	April 1 – July 15	4 to 6	65 to 100		(plants)	12 plants	40	12 to 15	24 to 36	45 (18 heads)
Carrots	April 1 – July 1		85 to 110		½ to 1	1/8 ounce	25	1	18 to 24	30
Cauliflower	June 20 – 30	4	55 to 95		(plants)	5 plants	30	18 to 24	30 to 36	25 (10 heads)
Celeriac	April 1 – 20		110 to 120		½	1/32 ounce	3	4 to 6	18 to 24	2
Celery	April 1 – May 30	8 to 10	85 to 100		(plants)	30 plants	3	6	24 to 32	12 (6 stalks)
Chinese sabbage	June 20 – July 30		47 to 80		½	1/32 ounce	2	12	24 to 30	8 (3 heads)
Collards	April 1 – Aug 1		75 to 80		½	1/16 ounce	7	6 to 8	18 to 24	5
Cucumbers	May 20 – June 20	4	50 to 70	4 – 8 (pickles) 15 – 18 (slicers)	1 to 2	1/16 ounce	12	12	48 to 72	25
Eggplant	May 20 – June 1	6 to 8	60 to 80	30 - 40	(plants)	3 plants	9	24 to 30	24 to 36	10 (10 fruits)
Endive	April 1 – 20		85 to 100		½	10 plants	18	8 to 12	12 to 18	10
Garlic	April 1 – 20		115		1 ½	4 cloves	12	3	12 to 18	3 (48 bulbs)
Jerusalem artichoke	April - May		90 to 130		4	1 tuber	5	12 to 18	36 to 48	3
Kale	June 20 – July 30		55 to 60		½ to 1	6 plants	3	8 to 15	18 to 24	3
Kohlrabi	April 1 – June 30		50 to 60		1 to 1 ½	24 plants	7	4 to 8	18 to 24	5
Leeks	April 20		130		½	1/16 ounce	7	2 to 3	12 to 18	3
Lettuce (head)	April 1 – July 15	4 to 6	85 to 90		¼ to ½	18 plants	15	8 to 15	18 to 24	24 (21 heads)
Lettuce (leaf)	April 1 – July 15		40 to 50		¼ to ½	1/64 ounce	25	6	12 to 18	11
Muskmelon	May 20 – June 1	4	80 to 90	40 – 45	(plants)	6 plants	27	36 to 48	48 to 60	30 (5 – 6 fruits)
Mustard	April 1 – August 15		45 to 50		½	1/32 ounce	6	6 to 8	18 to 24	3
Okra	May 20 – June 1		80 to 90	4 – 6	½	¼ ounce	17	12 to 15	24 to 30	10
Onion (sets)	April 1 – May 1		45 to 90		1 to 2	4 ounces	15	2	12 to 18	11
Onion (transplants)	April 1 – May 1	12	90 to 115		(plants)	120 plants	15	2 to 3	12 to 18	11
Onion (seeds)	April 1 – May 1		105 to 130		½	¼ ounce	15	2 to 3	12 to 18	5
Parsley	April – July		76 to 85		¼	1/32 ounces	4	4	12 to 18	1
Parsnips	April 1 – 20		105 to 120		½	1/16 ounce	20	3 to 4	18 to 24	10
Peas	April 1 – 30		60 to 70	7 – 14 (edible podded) 14 – 20 (hulled)	1 to 2	16 ounces	58	2 to 3	12 to 18	18
Peppers	May 20 – June 1	6	60 to 80	45 – 55 (green stage) 60 – 70 (red stage)	(plants)	6 plants	8	14 to 18	24 to 36	10
Pop corn	May 20 – June 1		90 to 120		2 to 2 ½	½ ounce	25x2r	10 to 12	30 to 36	14
Potatoes	April 20 – June 1		100 to 120	Until frost	4	5 pounds	50	10 to 12	24 to 36	75
Potatoes, sweet	May 20 – June 1		120		(plants)	25 plants	25	12 to 18	36	10
Pumpkins	May 20 – June 15		100 to 120	80 - 110	½	1/8 ounce	10	36 to 48	60 to 72	30
Radishes	April 1 – July 15		23 to 30		½	1/8 ounce	100	1 to 2	6 to 12	10
Rhubarb	April		1 to 2 years		(plants)	3 plants	10	36 to 48	48	10
Rutabaga	June 1 – 20		90 to 95		½	1/8 ounce	5	4 to 6	18 to 24	5
Salsify	April 1 – 20		120		½	1/64 ounce	3	3 to 4	18 to 24	2
Spinach	April 1 – July 15		40 to 50		¼ to ½	1/16 ounce	20	3 to 6	12 to 18	10
Squash (summer)	May 20 – June 1		45 to 55	4 – 7	1 to 1 ½	1/16 ounce	12	36 to 48	36 to 48	30 (60 – 120 fruits)
Squash (winter)	May 20 – June 1		80 to 110	60 – 70	1 to 1 ½	1/8 ounce	9	48 to 60	60 to 72	20 (5 – 10 fruits)
Sweet corn	April 20 – July 1		65 to 95	18 – 23 (from 50% silking)	2 to 2 ½	2 ounces	40x2row	10 to 12	30 to 36	24 (kernels) (80 ears)
Swiss chard	April 1 – 20		50 to 60		½	1/16 ounce	12	6 to 8	18 to 24	10
Tomatoes	May 20 – June 1	4 to 6	60 to 90	45 – 50 (red ripe)	(plants)	10 plants	40	36 to 48	36 to 48	70
Turnips	April 1 – July 30		40 to 60		1 to 1 ½	1/8 ounce	15	18 to 24	18 to 24	15
Watermelon	May 20 – June 1	4	85 to 95	45 - 50	(plants)	6 plants	35	72	72	35 (3 – 5 fruits)

\* Earliest dates are for southern parts of the state; northern plantings should be one to three weeks later.

\*\* One ounce = 28 grams.

## Hardening Off Your Seedlings

Source - <http://www.burpee.com/brpGyggArticle:10355/hardening-off-your-seedlings-article10355.html>



Moving is one of life's most stressful events. Imagine how trying it would be to move from a perfect climate where it's always 70 degrees, calm and sunny, to a harsh and windy climate where it gets really cold at night and the sun is burning hot during the day. Put yourself in your seedlings shoes. If you had to move from San Diego to Montana, wouldn't you want some time to adjust?

You've started your seeds. Kept them hydrated just right. Transplanted them. Maybe fed them a diluted dish of fertilizer or two. They are tall now. Your seedlings may look like they are ready to go it on their own in your garden, but be kind, prepare them for the extremes of your garden with a process called 'hardening off.'

The author of 'Grocery Gardening', Jean Ann Van Krevelen, said you shouldn't skip the step of hardening-off your seedlings. Young plants may not make it if planted directly into your garden without a transition.

"When seedlings are grown inside in a controlled climate, they don't have the opportunity to develop the strength and structure to live out in the elements. They need to get acclimated to their new home," said Van Krevelen. To harden off your seedlings, gradually introduce them to the outdoors. It helps to store your seedlings in trays, at this point, to make transporting the plants easier.

"Take your seedlings to a protected location outside for one hour for the first day," she said, "Do this each day for a week. Add one hour for each day of the process. By the end of the week, you'll be at 7 hours and the plants will be ready to be transplanted," While inside, seedling stems haven't been exposed to winds. Plants, like us, need to start our workouts and gradually increase the intensity to become strong. So early on in the hardening off process, provide seedlings shelter. "Don't put them in direct sun. Don't put them in a windy location. Keep in mind, they are just babies," said Van Krevelen.

If you want to help your plants beef-up early, you can add a fan to the area where you are storing your seedlings. Use the fan to gently move the air. Too much direct breeze from a fan could dry out the seedlings and do the same damage wind would in the garden.

Gardeners have different approaches to the watering aspect of the hardening off process. Van Krevelen keeps her seedlings evenly moist from grow light to garden.

“Provide consistent moisture. Seedlings are susceptible to any extreme until they are established,” she said.

Horticulturalist Erica Shaffer agrees. “Don't send your babies into the big, bad world of your garden thirsty and hungry,” she said. Good gardeners aren't perfect. And the process of hardening off doesn't have to be executed perfectly or uniformly to be highly successful. If you forget to take your plants out one morning before work, just start back up the next day. If the spot you chose for them becomes too sunny as the day went on, all is not lost. Plants are a forgiving lot and will hang in with you as long as you give them a little attention.

There is a bit of hassle involved in schlepping the plants outdoors and back in again each day over a week. But after gently caring for your baby plants for weeks, the added effort is good insurance that your plants will leave your nest safely and do well in your garden. After all, don't you want to shield everything you love from unnecessary stress?



MSU Extension's EZ Plant and Grow Tips

# Container gardening with vegetables and herbs

## Tip Sheet

Nothing tastes as good as fresh produce. It tastes even better when you pick it in your own garden. What if you don't have much space or no yard? You can have some vegetables and herbs growing on a sunny patio, porch, or deck in containers. A few minutes of planning and preparation will improve your success and enjoyment of any container garden.

### Site selection

Vegetables and herbs need to be placed in a location with at least six hours of sunlight each day. Shade from overhangs, buildings or furniture will decrease the total number of hours the container receives sunlight, so take that into consideration. Without enough sun, there won't be much production.

### Container selection

The most important part of container selection is to find a container that has sufficient drainage holes in the bottom. Anything, in theory, can be a container from boots to wagons to tires. A good container has numerous small holes, ideally quarter-inch holes every two to three inches of container bottom. One large hole does not permit as much drainage as numerous small holes.

### Material

Plastic containers are lighter in weight and can be more easily moved from one spot to another, if you like to move containers as you might move your furniture. Resin containers look like clay or terracotta, but are also lightweight and easily moved. Real clay and terracotta containers are heavy and more difficult to move. Concrete, iron and other materials may not be moved much, if at all. Hanging basket containers may not have solid sides, but have coconut

coir or other natural material sides. Solid wall containers will generally hold more moisture longer than containers with natural materials as their sides. Terra cotta is an exception to this as some moisture is lost through the unglazed clay container. Take the material into account as you determine container size and the number of plants you can easily grow in the container.



This container of mixed herbs makes a great hanging basket.

[www.migarden.msu.edu](http://www.migarden.msu.edu)

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Project GREEN

Author: Bridget K. Behe, MSU Horticulture. Reviewed by Jennie Stanger and Rebecca Finneran, MSUE.  
Last updated June 11, 2010.



Tomatoes (shown here), peppers and eggplant all can be grown in a larger container.

### Size

The size of the container will limit how much potting mix you can fill the container with. Smaller volume containers, and especially smaller containers with natural material side walls, will dry out much faster than larger containers with solid side walls. Hanging baskets with coir (coconut fiber) sides may require watering two or three times per day during warmer months. If you don't want to water that often, select a larger volume container and one with solid side walls.

### Potting mix

It is best to use a potting mix, one you purchase or make, rather than field soil in any container. Lighter mixes will drain better, have better root development, and will give you a lighter total container if you want to move it. Mixing equal parts (by volume) of peat moss and perlite makes a great potting mix for most plants. You can also purchase potting mixes, but avoid heavier "potting soils," which may not drain well.

Fill containers with mix and wet the dry potting mix with warm water before adding plants. In very large containers, use solid pieces of Styrofoam to fill no more than one-third of the total volume of the container. Do not use Styrofoam peanuts to fill a part of the container.

Often, these peanuts are now biodegradable and will "melt." Larger pieces of Styrofoam won't compact and will just take up space, saving some money on potting mix.

## Plant selection

### How many plants do I need?

As a general rule of thumb, select approximately one plant for each eight to twelve inches of the diameter of the top of a round container. For example, if your container measures 18 inches across the widest part of the top, then use only one to two plants in that container. Often, larger diameter containers are deeper and can hold more potting mix. If you over-crowd a container, plants won't grow as well and you will be watering very often. You also won't get much production if you crowd plants.

### Which vegetables grow best in containers?

Without much space, you'll need to think of using smaller varieties so they can grow well in a container. Look for dwarf plants or smaller height plants at plant maturity. Most of this information is contained on seed packages and plant labels. If the plant has a mature height of 36 inches or less, you can probably find a container to grow it in.

### Vegetables well-suited for summer container gardening.

<b>Cucumbers</b>	Bush varieties are easier to manage, but vining varieties can be trellised.
<b>Eggplant</b>	Most varieties work well.
<b>Peppers</b>	Most bell and hot peppers grow well in most containers.
<b>Squash</b>	Summer squash do the best.
<b>Tomatoes</b>	Grape, cherry and other smaller varieties. Bush, "patio" or determinate varieties are good choices.

## Herbs well-suited for summer container gardening.

<b>Herbs</b>	Parsley, sage, cilantro, thyme, rosemary and oregano. Note: plant mints separately so they don't overtake a container.
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### Care and maintenance

Keep soil medium in containers well-watered. Healthy and actively growing plants are more disease and insect-resistant than water stressed or over-watered containers. As the plants grow, they will use more water each day and may need to be watered twice daily toward the end of the summer.

### Fertilize

Fertilize following the fertilizer's label directions. Most containers will benefit from regular fertilization, either from slow or controlled-release fertilizer or regular application of a soluble fertilizer.



R. Finneran

Herbs in a container garden can be colorful and tasty.

## Notes:



## Straw Bale Gardening

- Peter Huttinger, Director, Community Gardening, Turner Farm Community Gardening Program  
This year at the Turner Farm Community Gardening Program's *Freedom Gardeners* East End site we will be experimenting with two variations on straw bale gardening. Developing new gardens on urban lots, with their poor heavy soils, is challenging and can be expensive. Purchasing high quality garden soil is costly and may not be an option for many gardeners. Because wood chips can often be obtained free they are often used as a first step in building viable garden soil, this will work but it can take many years for the woodchips to completely decompose. To investigate an alternative method the Turner Farm Community Gardening Program are experimenting with two types of building garden soil using straw.

Straw is an agricultural byproduct of grain crops. It is different with Hay which is grow for and used as livestock feed. A straw bale is a rectangular compressed block of straw bound by string or wire. The standard size of a bale is approximately 14x36x18 inches. When the straw is cut and bound it is layered running in one direction. Because of this layering when a bale is opened a section of it will naturally separate from an untied bale - this is referred to as a "flake".

**#1 Straw Mulch** The method uses " flakes" of straw over an existing garden bed/row as a form of sheet mulching to smother weeds, retain moisture and to build healthy biologically active soil. Bales of straw are broken into flakes approximately 2-3 inches thick and laid flat on the soil surface in a grid. The row or bed can be between one to four sections wide and as long as you want. After laying out the straw flakes bedding plants are planted or seeds sown into the soil between the flakes, or holes are cut in the flakes and plants or seeds inserted trough the straw into the soil. Please note when direct sowing seeds vegetable larger plant varieties such as beans, summer squash and okra are best suited for the type of garden.

### #2 Straw Bale Garden

Some Straw Bale Gardening Basics:

- Bales should be relatively sterile and weed-free, do not use "Hay Bales".
- Straw bales should be bound with wire or poly fiber twine. Natural Jute and cotton twines will not work because they will decompose allowing the bales to fall apart.
- The bales' raised height make tending fruits and vegetable easier.
- Bales warm-up earlier in the season and when ground soil is wet the bales will dry sooner.
- Through conditioning he inside of the bale composts and becomes soil, a kind of virgin soil that should be weed free.

- For watering plants through the growing season the use of a soaker hose is recommended.
- At the end of the growing season straw bales can be composted and a new group can be used to for the following year. Or the bales can be left in place and allowed to compost overwinter to develop a raised garden bed.

### Preparation of Straw Bales

- Timeline reference/adapted from *Straw Bales Garden Complete* by Joel Karsten [1] and *Straw Bale Gardening* by Washington State University Fact Sheet FS109E [2]

Set up 10 -12 days before planting, treat in the following way...

Day

1. Place straw bales cut-end up, treat each with 1 cup of organic fertilizer (Revita 8-3-3) then saturate the bales with water
2. Water bales, saturate
3. Fertilizer treatment with 1/2 cup per bale, Water 2 gallons per bale
4. Water, 2 gallons per bale
5. Repeat fertilizer treatment with 1/2 cup per bale
6. Decomposition should be started, some odor and generating heat
7. Fertilizer treatment with 1/4 cup per bale, Water 2 gallons per bale
8. Repeat Fertilizer treatment with 1/4 cup per bale, Water 2 gallons per bale
9. Repeat Fertilizer treatment with 1/4 cup per bale, Water 2 gallons per bale
10. Repeat Fertilizer treatment with 1/4 cup per bale, if splits are happening in bales fill with sterile garden soil/medium (if you use your own garden soil or homemade compost you risk introducing weed seeds)
11. Let straw bales rest
12. Bales can be planted at this time
  - Bedding plants make openings where you will place plants fill sterile garden soil/medium the sow plant.
  - Direct seeding cover the top of the bales with 1-2 inches of sterile garden soil/medium, gently pat down then sow seeds

Note: To water plants through the growing season a soaker hose is recommended.

[1] Joel Karsten, *Straw Bales Garden Complete*, Cool Springs Press, [www.strawbalegardens.com](http://www.strawbalegardens.com)

[2] *Straw Bale Gardening* <http://cru.cahe.wsu.edu/CEPublications/FS109E/FS109E.pdf>

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# Soil Fertility Testing

By Holly Utrata-Halcomb, District Administrator  
Hamilton County Soil & Water Conservation District

**A. Soil tests are used by landscape managers like blood tests are used by physicians. Both types of tests disclose vital information that is mostly hidden from view.**

Soil Test Results: Ideal Values								
pH	Phosphorus P lbs. / A*	Potassium K lbs. / A*	Calcium Ca lbs. / A*	Magnesium Mg lbs. / A*	Cationic Exchange Capacity C.E.C. meq./100 gms	Base Saturation		
						% Ca	% Mg	% K
General Ideal Levels 5.5 to 6.5	50 to 100	250 to 400	800 plus	150 to 250	7 to 10 or higher	40 % to 80%	10% to 40%	3% to 5%

\* To convert lb/A (pounds per acre) to ppm (parts per million), divide by 2. Example: 100 lb/A = 50 ppm

Specific crops\*: Optimum levels for Turf - pH should be between 6.6 – 7.5  
 - Phosphorus should be between 10ppm – 20ppm  
 - Potassium should be between 60ppm – 125ppm

Optimum levels for Most Vegetables - pH should be between 6.2 – 7.2  
 - Phosphorus should be between – 40 ppm – 70 ppm  
 - Potassium should be between – 90 ppm – 125 ppm

Optimum levels for Most Flowers - pH should be between 6.2 – 7.5  
 - Phosphorous should be between 70 ppm – 90 ppm  
 - Potassium should be between 150 ppm – 200 pmm

\*Optimum levels determined by Michigan State University Soil Testing Lab.

## Why not just use a "Do-it-yourself" Soil Tests versus the Soil Testing Labs:

- Soil testing kits and equipment can be purchased through catalogs and from local garden centers; however, their overall quality and dependability is strongly associated with, "you get what you pay for." A good example is that a one degree difference in pH is an exponential amount. Given the expenses that can be incurred by making fertilizer application errors (e.g. too much or not enough), the expense of using a reputable soil testing lab is usually justified.

## What a Soil Test Can Do:

- Provides information important to understanding the chemical and physical qualities of the soil.
  - Allows us to learn the soil's pH. This is a component of soil chemistry which may interfere with the way nutrients are made available to plants.
  - Discloses information about the nutrient content of the soil including phosphorus, potassium, calcium, and magnesium.
  - The Cation Exchange Capacity (CEC) listed on soil test results provides a snapshot of the ability for the soil to hold onto and exchange positively charged nutrients (cations). Soils with a high CEC will remain fertile over a longer period of time, requiring fewer fertilizer applications, compared to a soil with a low CEC.
  - Sand, silt, and clay are known as the "mineral components" of the soil, and the relative percentages of these particles in the soil is known as the "soil texture." Soil tests can allow us to learn the texture of the soil.
  - Soil testing labs can also provide information on the organic content of the soil.
- Provides recommendations for correcting problems with soil nutrients.
  - Problems with soil pH are addressed by lime recommendations to raise the pH, or sulfur (or other soil acidifiers) recommendations to lower soil pH.
  - Problems with nutrient deficiencies are addressed by fertilizer recommendations.
  - Conversely, a soil test will prevent over-application of nutrients, which can be just as detrimental to the health of plants as nutrient deficiencies. It is a waste of your time and money and runoff will compromise water quality.

### What a Soil Test Cannot Do:

- Standard soil testing labs do not provide information on general soil chemical contamination. While most soil testing labs can perform special tests (for an additional fee) to determine the concentrations of certain elements, such as "heavy metals" (e.g. lead, arsenic, etc.), the labs typically do not offer tests for pesticide contamination.
- Soil testing labs can provide information on soil texture (percentage of sand, silt, and clay); however, they normally do not provide recommendations aimed at changing soil texture.
- Standard soil testing labs do not provide information on nitrogen in soils. This element is subject to rapid movement into the soil, and rapid uptake by plants. Nitrogen concentrations change too rapidly for soil tests to provide accurate results for this element. A general recommendation for Nitrogen will be provided with your test results. However, if lawn clippings are returned to the lawn this recommendation should be cut in half. Also, do not apply more than 1 lb. of Nitrogen/1000 sq. ft. per application.

### Soil Testing Tips:

#### Equipment Needed:

- A shovel or hand trowel, or a soil testing probe. Soil probes are comparable in price to a good quality shovel; however, they make it easier to take multiple soil samples.
- A clean, plastic bucket. The bucket will be used to collect soil samples. Metal buckets can introduce contaminants into soil samples.

#### When Do You Soil Test?

- A soil test should be performed in enough time prior to planting to allow time to make corrections based on soil test recommendations. Fall or early spring are both fine.
- Soil testing should be repeated every 3-5 years for most mineral soils.
- Soil tests can also be performed "as needed" as an aid to diagnosing problems.

#### How Many Soil Tests?

- Different Plants = Different Tests:
  - The recommendations from soil test results are based on the type of plants being cultivated.
  - A lawn, a flower bed, and a vegetable garden would require three separate soil tests.
- Different Areas = Different Tests:
  - Individual soil tests should focus on areas in the landscape that have the same soils.
  - The top of a slope may vary from the bottom of a slope. Also, if any amendments were added in the past to one area and not to another, separate tests should be run.
- The same consideration applies to large lawns covering more than 5 acre.

#### How Many Samples Per Soil Test?

- There will be some variability in soils, even within small areas. A single sample taken from a spot visited by a neighbor's dog will produce a highly inaccurate test result!
- You should take several soil samples in the area that is covered by a single soil test. A general rule is to take 8 - 12 samples.



#### How to Take Soil Samples?

- Depth: 4 - 6" for turf grass soil tests (6 - 8" for gardens and other plantings).
- Remove organic matter and debris from the top of the sample.
- With the slice of soil on the blade of the shovel, remove the sides of the slice with a trowel, knife or your hands to create a ribbon of soil 2 inches wide.
- Mix these samples in a clean plastic bucket (do not use a metal bucket!).
- Dump the contents onto a newspaper and allow soil to dry.
- Pulverize (stomping works!) soils clods and return contents to the bucket.
- Mix again and remove a single "composite" sample from the bucket (about 3/4 cup) to be used for the test.
- Place the soil sample (about 3/4 cup) in the zip lock bag provided.
- Fill out the required information sheet.
- Place bagged soil and completed form in the box addressed to Michigan State University Soil Testing Lab.



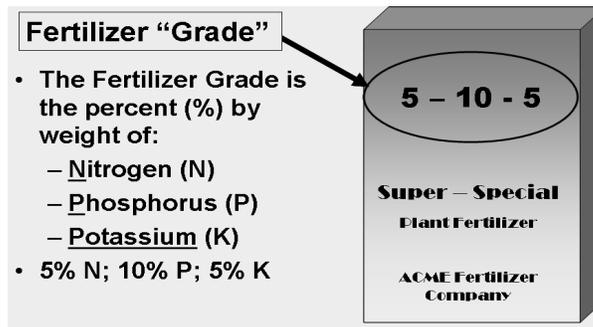
## C. Fertilization

### Applications: it's about the macronutrients

- Macro nutrients are elements that are heavily used by plants. The three most significant macro nutrients are nitrogen (N), phosphorus (P), and potassium (K).
  - Nitrogen moves rapidly through the soil; consequently N is not normally measured in soil tests.
  - Phosphorus and Potassium move slowly through the soil
  - Needs and rates are based on soil test results.

### Grade: the percent, by weight of N-P-K in a fertilizer product.

- 5-10-5 fertilizer would have: 5% nitrogen; 10% phosphorus; and 5% potassium.
- A 10 lb. bag of that fertilizer would have: .5 lbs. of N; 1 lbs. of phosphorus; and .5 lbs. of potassium.



**NOTE: The maximum single nitrogen application for lawn and garden should not exceed 1 lb/1000 sq. ft.**

### Turf Grass Fertilization Schedules:

- Turf grass quality is significantly enhanced by fertilizer applications. However, too much fertilizer can have the opposite effect.
- Splitting the recommended fertilizer application from your soil fertility test into three applications per year is optimal for Ohio. Some lawncare companies make 6 – 8 applications per year. Keep in mind that most grasses used in SW Ohio are cool season grasses and usually go dormant when temperatures exceed 85°F. Therefore, fertilizer should **not** be applied during July and early to mid August. Watering will be required and the resulting new growth will be weak compared to that of the fall when soil temperatures are warm and the air temperatures are cool. Why waste water, time and money on fertilizer - just wait 6 weeks. It is recommended that you apply fertilizer, based on your soil test results, in March, early September and October. If you return grass clippings to the soil, you can cut the application rate in half!!

### Vegetable Garden or Flower Beds Fertilization Schedule:

- Split the application recommended by your soil fertility test into two applications. Broadcast half of the fertilizer when preparing the soil for planting after March 15<sup>th</sup>. Work fertilizer as uniformly as possible to a depth of 3 inches. Do not work soil if it is too wet as it will destroy the structure and result in clods. The second application should be applied when plants begin to set blossom. This is a general recommendation. Exceptions include corn which should be side dressed when 12" tall. See <http://ohioline.osu.edu/> for specific flower and vegetable recommendations.

## B. Getting More Help:

- In Hamilton County, OH, soil testing kits are available through the Hamilton County Soil and Water Conservation District. Call the office at 513- 772-7645 for further information, or visit the website at: <http://www.hcswcd.org/soil-fertility.html> The District welcomes questions on soil fertility testing results.

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3. Fundamentals of Soil Science – 5<sup>th</sup> edition, H.D. Forth; L.M. Turk
3. The Ohio State University – OHIOLINE - <http://ohioline.osu.edu>

For more detailed information on Soil Fertility Basics, go to [http://www.plantstress.com/Articles/min\\_deficiency\\_i/soil\\_fertility.pdf](http://www.plantstress.com/Articles/min_deficiency_i/soil_fertility.pdf)

## Don't guess - soil test! Get your Home Lawn and Garden Soil Test kit today

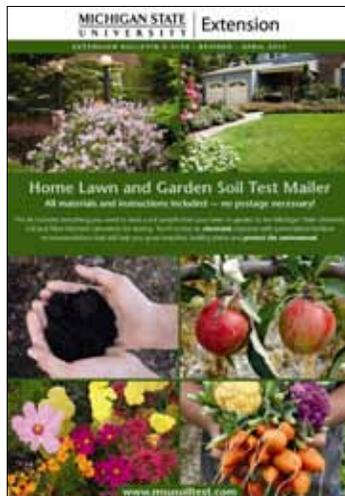
Rebecca Finneran, Michigan State University Extension

Plant scientists know that lawn and garden plants require 18 nutrients for healthy, productive growth. Your lawn and garden “soil environment” is a reservoir that houses these nutrients, providing the platform for plant roots to acquire them. Understanding each individual plant’s needs and the type of soil you have is the first step in properly managing soil fertility.

Often our lawn and garden soils are rich and productive, needing little or no enhancements. Others may be poor soils or depleted, needing to be replenished. Approaching plant care without conducting a base-line soil test may put gardeners at the risk of over fertilization. This not only can have negative effects on plant growth and create an imbalance in the soil environment, but can also lead to pollution of local water resources.

Michigan State University Extension provides an easy-to-use [soil test kit](#) that can be purchased online from the [MSU Extension Bookstore](#) ([www.bookstore.msue.msu.edu](http://www.bookstore.msue.msu.edu)) or from your [local county MSU Extension office](#).

The **Home Lawn and Garden Soil Test Mailer** can be used to process any type of home soil sample, such as lawn, vegetable garden, tree, shrub, flower, and tree or small fruit. Based on your soil test results, you will receive a custom fertilization program to meet the needs of your plants and safeguard the environment. The cost of this mailer is \$25 plus shipping and handling fees. This mailer may also be available for pick-up at your local MSU Extension county office.



### Why should I soil test?

- **Know your soil.** Soil testing is an important diagnostic tool to evaluate nutrient imbalances and understand plant growth.
- **Understand.** The most important reason to soil



test is to have a basis for intelligent application of fertilizer and lime.

- **pH.** Testing allows homeowners to adjust soil pH to the optimum range (6.0-7.0), which makes nutrients more available for plant growth.
- **Protection of our environment.** Avoid contaminants that can enter our surface and ground waters by over-application of phosphorous or nitrogen fertilizers.
- **Cost savings.** Why apply what you don't need? Soil test results provide information about the soil's ability to supply nutrients to plants for adequate growth and are the basis of deciding how much lime and fertilizer are needed.

### What will I find out from my soil sample?

Home Lawn and Garden Soil Test Mailer results will determine your soil type, pH, level of organic matter and provide you with a reading for

nutrients including phosphorus, potassium, calcium and magnesium. The results will also provide a recommendation for nitrogen and will determine how much lime should be applied based upon the type of plant you specify.

### How long before I receive my test results?

You should receive test results in about two weeks. The lab analysis takes three to five working days from the time samples are received. Remember, MSU recommendations are in pounds of nutrient needed, not pounds of fertilizer to be applied!

Your results will also include an area calculator that helps you determine how many square feet you need to apply fertilizer.

### How do I take a soil sample?

- Determine which one lawn **or** garden area you would like to test. Don't combine these soils.
- Using a spade or trowel, collect 10 random soil samples from the area



Mary Wilson

- and place in a clean pail.
- Each sample should be a slice of soil as deep as the plant roots go (3 to 4 inches deep for lawn; 7 inches deep for gardens and all other plants).
- Remove plant debris, roots and thatch from the sample.
- Combine the 10 random samples in the pail, mix thoroughly and remove approximately

1 cup of mixed soil. If the soil is wet, spread it on paper and allow it to air dry overnight before filling the sample bag. Do not use artificial heat as it will skew test results.

- Fill the re-closable plastic bag included in the Soil Test Mailer with your dry soil and seal carefully.
- Place bag inside the white, postage-paid envelope and put in your mailbox for pick up.

For more information on a wide variety of **smart gardening** articles, or to find out about smart gardening classes and events, visit

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## ORGANIC FERTILIZER ALTERNATIVES

*By Holly Utrata-Halcomb, Administrator*

*Hamilton County Soil & Water Conservation District*

### pH

**pH** is the most critical aspect of soil fertility. If pH is too low (acidic) or too high (alkaline) vital macro and micro nutrients may be present in the soil but not available to plants. Most vegetable crops prefer a slightly acidic soil with a pH around 6.5 – 6.8. This range makes for happy worms and microorganisms and generally supports an abundance of readily available soil nutrients. Your soil fertility test results will list a target pH.

To lower pH, elemental sulfur or iron sulfate may be applied. It is recommended that these products be applied in the fall as it will take several months to be effective. This application must be applied every fall because the soil pH will tend to migrate back to its original level. One downside of using iron sulfate is that it could also tie up phosphorus, particularly in the case where the phosphorus soil test is on the low side.

Aluminum Sulfate is immediately effective after application, but the Aluminum can be toxic to ericaceous (acid loving) plants such as Rhododendron, Azalea and Blueberries. Peat Moss and coffee grounds will help to moderate pH, but the amount of coffee grounds required to lower pH by 1 point would prove to be toxic to the plants.

***To Decrease pH: Apply 2 to 3 pounds of sulfur per 100 square feet to lower soil pH 1 point.***

***Always read package directions***

***To increase pH: Apply 5 pounds of lime per 100 square feet to raise soil pH by 1 point.***

***Always read package directions***

### Organic Matter

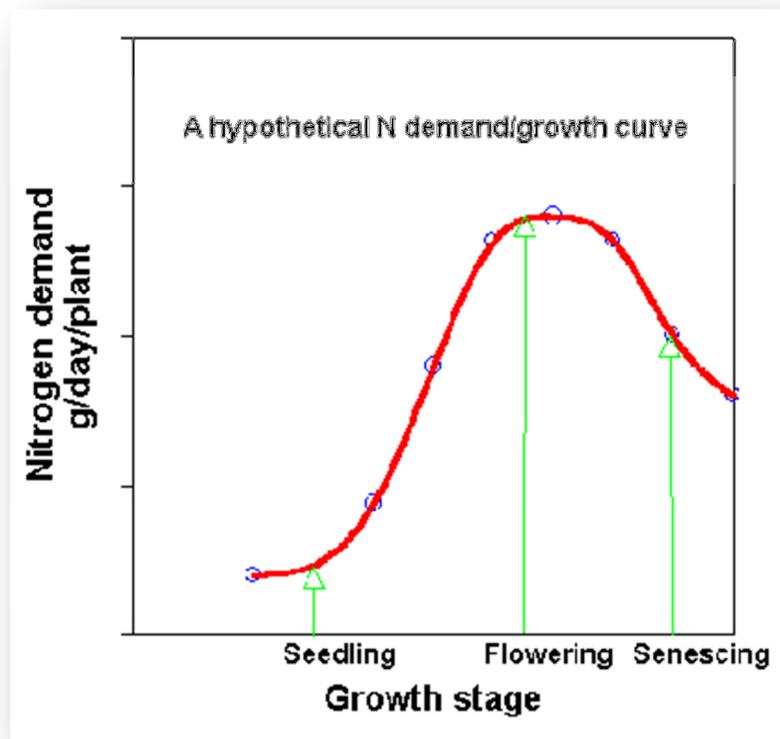
Incorporate organic matter into your soil with a locally available compost material. Mulching gardens with 2-3" of organic material annually will increase soil organic matter and reduce the amount of commercial fertilizer you need to apply. This organic material will feed the microorganisms, help to moderate soil temperature and pH, loosen compacted soil and help to retain moisture during dry periods. After 3 years, the rate of fertilizer could possibly be reduced by 1/2. This is one reason why soil fertility tests should be run every 4-5 years. It is advisable to add organic matter prior to pulling samples for a soil fertility test, not afterward.

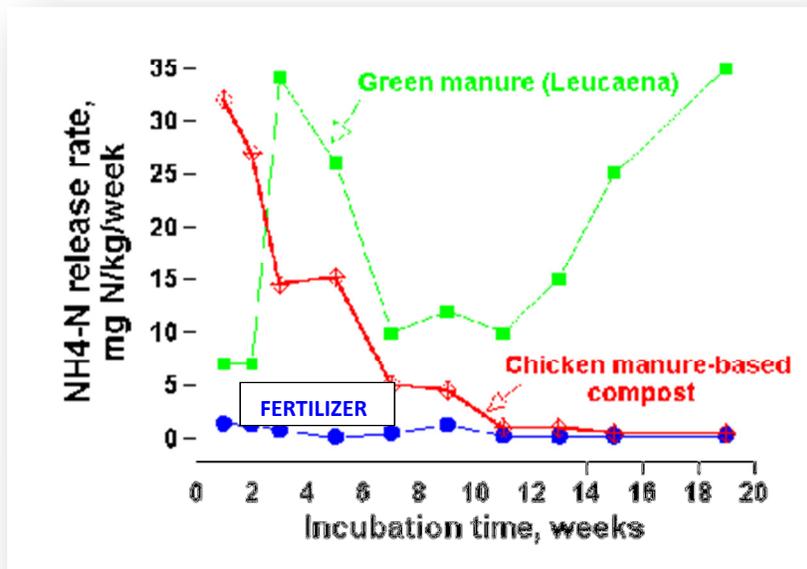
## Nitrogen (N)

**Total N Concentration in Common Organic Sources**

Organic Source	Total N (%)
Poultry manure	1.5-3.0
Pig, horse, cow manure	0.3-0.6
Green manure	1.5-5.0
Compost	0.5-2.0
Seaweed meal	2.0-3.0
Sewage sludge	1.0-5.0
Fish waste	4.0-10.0
Blood (slaughter house)	10.0-12.0
Human urine/night soil	1.0-1.5

**Synchronization.** The need for N fertilizers would be reduced significantly if the crop's N requirement can be timed closely to the nitrogen release from organic sources.





Plants require different amounts of N at different stages of growth: seedlings and senescing plants definitely require much less N than flowering or fruiting plants. We also have known that different organic manures have different N releasing patterns. For example, the above chart shows the N release patterns three organic sources.

Nitrogen from poultry manures (non-composted) is more quickly available than N in manure from cow, and sheep. This is because poultry manure contains significant amounts of uric acid, which is readily decomposable. Also, roughage in cattle diets results in manure that is less readily decomposed due to lignin and cellulose. Horse manure is the least desirable type of manure due to the high rate of viable weed seed. Presence of bedding or litter lowers N content by dilution, but its effect on N availability cannot be easily predicted.

Moist manure, when exposed to the air, undergoes significant loss of N as volatile  $\text{NH}_3$ . Fresh manure can also burn plants. Nitrogen losses after spreading can be significantly reduced by incorporating the manure --even shallow incorporation is adequate.

Nitrogen in composts is a more stable form than N in manures. Thus, there is a decreased likelihood of losing compost N from the system. On the other hand, composts containing less than 1.5% total N and supply little or no N to crops during the first few weeks after application.

Green manures are fast growing catch crops like clovers, mustard, rye, radishes and vetches that are incorporated into the soil while they are still green in order to improve the soil and to supply N to the associated/subsequent crop. A properly managed legume cover crop can fix up to 3 – 4 lbs. of N/1,000ft.sq. in 3 to 6 months. (Bugg and Miller, 1991).

## **Phosphorus (P)**

### **Total P concentration in organically acceptable sources**

<b>Source</b>	<b>Total P (%)</b>
Rock phosphate	17-26
Bone meal	20-30
Fish meal	5-10
Wood ash	2-5
Poultry manure	0.5-1.5
Green manure	0.2-0.5
Compost	0.2-0.5
Sewage sludge	0.4-2.5

The above table shows P content of selected sources that are acceptable to the organic farming community in most states. Among these, the first two, rock phosphate and bone meal, have reasonably high total P content: between 20 and 30%. However, P in these two sources is very insoluble, thus much less plant available than P in treble superphosphate. More specifically, P in rock phosphate and bone meal has the formula:  $\text{Ca}_5(\text{OH})(\text{PO}_4)_3$  which is hydroxy apatite or apatite for short. This is the same material that our bones and teeth are made of. As our teeth can attest to it, apatite is quite durable; is very hard to dissolve in water, meaning that it provides very little phosphate to your crop in the short term.

A couple of things should be mentioned about rock phosphate. First, it is a source of P for long-term soil improvement, don't expect any noticeable effect from it within weeks or months, unless you use huge amounts of it. Second, its solubility, and thus plant availability, depends strongly on soil pH and particle size. It is more effective in acid soils than in calcareous or alkaline soils; more effective when it is fine than coarse, and more effective in the presence of mycorrhiza than without mycorrhiza.

By contrast, P contents of chicken manure, compost, and sludge are relatively low, usually below 3%. Thus, large amounts would be needed to meet P requirement of the crop. Yet, pound for pound, P from these organic sources is quite available to plants; sometimes even more effective than treble superphosphate. Our recent work has shown that organic matter from the manure interacts with clay minerals and reduces P sorption by the soil, thereby enhancing P availability to plants (Hue, 1990; 1991).

## **POTASSIUM (K)**

In plants, potassium is required for maintaining osmotic potential of cell. That is, K makes plants look turgid. Since K regulates the osmotic potential of cells, and the close or open conditions of stomata, it plays an important role in water relations in the plant. Potassium is involved in water uptake from the soil, water retention in the plant tissue, and long distance transport of water in the xylem and of photosynthates in the phloem. Potassium affects cell extension. With adequate K, cell walls are thicker, thereby improving plant resistance to lodging, pests and disease. Fruits and vegetables grown with adequate K seem to have a longer shelf life in the grocery store.

**Total K concentration in selected organically acceptable sources** (*Adapted from Nick and Bradley, 1994; and personal data*)

<b>Source</b>	<b>Total K, %</b>
Sul-Po-Mag [Mg, K, SO <sub>4</sub> ]	22.0
Polyhalite [Ca, K, SO <sub>4</sub> ]	10-15
Wood ash	5-10
Green sand	5-7
Green manure	2-5
Seaweed meal	2-3
Compost	0.5-2.0

**Quick Tip Guide**

**Table 7. Average Plant Food Content of Natural and Organic Fertilizer Materials  
(Percentage on a Dry-Weight Basis.)**

<b>Organic Materials</b>	<b>% N</b>	<b>% P</b>	<b>% K</b>	<b>Availability</b>	<b>Acidity</b>
Fish Scrap	5.0	3.0	0	slowly	acid
Fish Meal	10.0	4.0	0	slowly	acid
Guano, Bat	10.0	4.0	2.0	moderately	acid
Sewage Sludge	2.0-6.0	1.0-2.5	0.0-0.4	slowly	acid
Dried Blood	12.0	1.5	0.8	mod. slow	acid
Soybean Meal	7.0	1.2	1.5	slowly	v. sl. acid
Tankage, Animal	9.0	10.0	15.5	slowly	acid
Tobacco Stems	1.5	0.5	5.0	slowly	alkaline
Seaweed	1.0	---	4.0-10.0	slowly	---
Bone Meal, Raw	3.5	22.0	---	slowly	alkaline
Wood Ashes	---	2.0	4.0-10.0	quickly	alkaline
Cocoa Shell Meal	2.5	1.0	2.5	slowly	neutral
Cotton Seed Meal	6.0	2.5	1.5	slowly	acid
Ground Rock Phosphate	---	33.0	---	very slowly	alkaline
Green Sand	---	1.0	6.0	very slowly	---
Basic Slag	---	8.0	---	quickly	alkaline
Horn and Hoof Meal	12.0	2.0	---	---	---
Milorganite	6.0	2.5	---	---	---
Peat and Muck	1.5-3.0	0.25-0.5	0.5-.10	very slowly	acid
Spent Mushroom Compost	2.0	.74	1.46	moderately	acid

To determine % of nutrient to lbs./1,000ft square use this quick calculation.

$$\frac{\text{Amt. of Nitrogen Needed in lbs.}}{\text{}} \text{ Divided by } \frac{\text{\% of Nitrogen}}{\text{\% of Nitrogen}} = \frac{\text{\# lbs Needed}}{\text{\# lbs Needed}}$$

Example – My soil test shows the need for 1 lb. of Nitrogen and 4 lb of Potassium/1,000ft. sq.

I will use composted Poultry Manure with an analysis of 3-1-1. The percentage of N is .03.

$$\frac{\text{1}}{\text{Amt. of Nitrogen recommended}} \text{ Divided by } \frac{\text{.03}}{\text{\% of Nitrogen in manure}} = \frac{\text{33}}{\text{\# lbs Needed}}$$

I divided 1 by .03 = 33lbs of composted poultry manure needed/1,000ft. sq.

---

This amount of Composted Poultry Manure also contains .33 pounds of Potassium.

$$\frac{\text{33}}{\text{\# pound being used}} \text{ Times } \frac{\text{.01}}{\text{\% of Potassium}} = \frac{\text{.33}}{\text{\# lbs supplied}}$$

I arrived at this number by multiplying the number of pound I will be using (33) times the percentage of Potassium available in composted chicken manure .01 = .33

---

I still need 3.67 lbs. of Potassium to make up the rest of the Potassium I need, I will use Green Sand with an analysis of 0-1-6. The percentage of each element is 0-.01-.06

$$\frac{\text{3.67}}{\text{Amt. of Nitrogen needed Needed in lbs.}} \text{ Divided by } \frac{\text{.06}}{\text{\% of Nitrogen}} = \frac{\text{61.16}}{\text{\# lbs Needed}}$$

This calculation shows I will need 61.16 lbs of Green Sand to make up the need for the rest of the Potassium. Note, these materials also will provide some Phosphorus, which I don't need, but it is the minimal amount from the choice of materials.

- <http://www.msusoiltest.com/tools/fertilizer-calculator/> Fertilizer calculator.

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## Fertilizer basics for the smart gardener

Rebecca Finneran, Michigan State University Extension

Soils that contain adequate amounts of nutrients will enable gardeners to produce healthy plants. The nutrient requirement varies with each species. For certain crops such as trees and shrubs, Michigan soils provide abundant nutrients with little need for supplemental fertilizer. However, in some cases where a plant exhibits a deficiency or to ensure production of a crop with high nutrient requirements, fertilizers can be applied to enhance growth.

Deciding what type of fertilizer to buy can be confusing, but choosing the right one will help ensure successful plant growth. In general, there are two classes of products available to home gardeners: naturally derived and synthetic. Naturally derived (sometimes called natural organic) and synthetic fertilizers have different characteristics, variability in cost and availability to the plant.



**Pelletized or slow release forms of fertilizer can be used easily and have a high level of safety from over-application.**

as a top dressing. Unless specifically designated as “slow release,” these products are quickly available for plants to take up once watered in. This makes this type of fertilizer especially useful for short-season, high need crops such as vegetables.

Pelletized fertilizer consists of granules that are

### Synthetic granulated fertilizers

Synthetic, granulated fertilizer is commonly found in garden stores and products may list a specific target crop such as a lawn. Simple formulations are relatively inexpensive and easy to spread using a commercially available fertilizer spreader or by hand

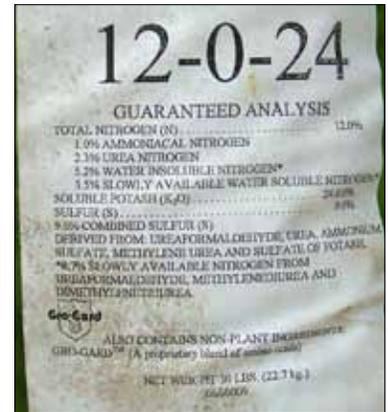
uniformly coated so they are easy to handle and spread, but tend to be more expensive. Either of these may have slow-release granules incorporated into the products or may be 100 percent slow release. A slow-release fertilizer has the advantage of being available to the plant over a much longer stretch of time. Formulations generally are sold to represent a three- to four-month window or five- to six-month window.

### Soluble fertilizers

Soluble fertilizers are sold as concentrated liquids or solids and are formulated to be diluted with water and applied directly to the plants. Nutrients in this form become available quickly to the plant and are used to augment plant growth for immediate response or to correct a deficiency. This very useful type of fertilizer is relatively low cost and most often used in tandem with a slow-release type of fertilizer.

### What determines an organic fertilizer?

The term organic as defined by a chemist versus a home gardener may not be the same thing. Organic compounds contain the element carbon, which would represent naturally derived sources of fertilizer as well as urea, a synthetically derived fertilizer. Generally speaking, products that



**A wide variety of granular fertilizers with the nutrient analysis clearly printed on the label. Many are for specialty crops such as a lawn.**



**Soluble fertilizers are sold in either solid form or as a liquid. Both are intended to be diluted with water according to the label.**

All photos Rebecca Finneran

are composed of organic matter such as composted animal manure, bone meal or leaf litter are accepted as “organic” by gardeners.

One of the advantages of using a naturally derived fertilizer is their ability to release nutrients slowly to plants. This is especially helpful to plants that live for more than one season, such as perennials, woody trees and shrubs, etc. Natural organic fertilizers will not quickly correct a nutrient deficiency and may not supply



**Many varieties of organically derived fertilizers are available which may have a lower analysis, but are also slow release and non-burning to plant material.**

enough nutrients for crops such as tomatoes that utilize larger amounts of fertilizer for optimum performance.

The second advantage of using a naturally derived fertilizer is its positive impact on the soil’s ability to hold nutrients, water and air. Because of the time involved in producing these products, they can often be more costly.

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## Preparing the smart vegetable garden

Pamela J. Bennett and Denise Johnson, Ohio State University Extension

### Soil preparation

Productive vegetable gardens are based on a strong foundation, and that foundation is the soil. Healthy soils consist of different non-living mineral particles, such as sand, silt and clay, as well as organic matter and living organisms. Healthy soils provide an environment conducive to root growth which leads to a healthy plant and fruit and vegetable production. The Smart Gardening tip sheet “Smart gardens begin with healthy soil” provides complete information about soil specifics.



All photos: Rebecca Finneran, MSUE

A smart vegetable raised bed with walking paths in between.

First, start with a soil test in order to know what nutrients are needed as well as the pH and organic content of the soil. Refer to the Smart Gardening tip sheet “Don’t Guess - Soil Test!” for details on how to do a soil test. Soil tests can be purchased online at the MSU Extension Bookstore (search for E3154 at [www.shop.msu.edu](http://www.shop.msu.edu)).

Once you have the results, you will know what amendments and in what proportion to add for best results in the vegetable garden. Only add the recommended amounts of fertilizer based on the soil test results. Over application of phosphorous and nitrogen fertilizers is a known contaminant of surface and ground water.

A collaboration with

Organic matter is also a very important component of your soil as it is the “glue” holding all of the soil components together, providing space for oxygen and good drainage. Organic matter includes composted animal manure, chopped up leaves, grass clippings and cover crops. These are added to sandy soils in order to improve water-holding capacity, and added to clay soils to improve drainage.

### Site preparation

If you are breaking ground for a new garden, eliminate grass or weeds that might be in the planned garden area first. One method is to remove the grass or sod by hand. This is most feasible when an instant result is needed. The sod chunks or grass removed can be added to a compost pile and re-entered to the garden system at a later time. However, this method will also require some organic matter be added to the soil below the old turf roots.

There are several methods that employ a “smothering” technique that will accomplish this task without using chemicals. Laying down a sheet of plastic and securing it with weights around the edges will effectively kill vegetation beneath except for the most stubborn of perennial weeds. Another easy way to smother weeds is to place several sheets of newspaper down in the



Organic residues can easily be seen on the soil surface in the no-till gardening system. As time goes on, soils should be crumbly and easy to plant.

area and layer compost or other organic matter such as chopped up leaves, grass clippings or mulch over the top. This is commonly called “sheet composting.” The organic layers on top will degrade while weeds below are dying out, resulting in a weed-free and ready-to plant-garden space. This may take a few months or can effectively start in the fall with spring planting in mind. Today’s newsprint is made with vegetable-based ink so there are no worries about residues left behind.



**Straw mulch used in walkways will reduce compaction and retard weed growth.**

## No-till preparation

No-till farming and gardening is a method in which the soil is left undisturbed except in the planting space for the seeds or plants. For years farmers have utilized the no-till method for crops, realizing the benefits of erosion control, soil moisture conservation, fewer weeds and building soil structure and health. Excessive tillage destroys the soil structure which is the foundation for healthy plant roots that interact with the living component of the soil.

Adding organic matter also enhances soil structure by encouraging microorganisms to act as a conduit for nutrients to enter plant roots. The no-till technique leaves crop residue on the soil surface which increases the organic matter content of the soil while enhancing the environment for the living component. Many gardeners are utilizing no-till vegetable gardening.

Planning a no-till smart vegetable garden requires a little bit of thought. It is imperative that you don’t walk on the soil in the planting areas as you work in the garden. This will only compact the soil. Therefore, you need to design your garden so that you have paths to walk on between the actual planting areas. The beds should be no more than 4 feet wide so that you can reach across the bed to weed or harvest while kneeling in the walkway. In addition, create beds that are shorter in length so that you are not tempted to cut across the bed to get to another one. A good size bed recommendation is around 4 feet wide by 8 feet long.

The sheet composting method mentioned above can be used to prepare the bed the first year. After that, organic

matter such as compost should be added to these beds each season; organic matter breaks down over time and needs to be replenished. One to 2 inches of compost may be all a garden needs for the season. It may take a couple of seasons to build your no-till beds, but once they are established, adding additional organic matter is all that is necessary. Using an organic mulch such as straw or wood landscape mulch will help prevent weeds from growing and can serve double-duty as organic matter; it’s an important component in the no-till garden.

You may want to explore other popular types of no-till systems, including sheet composting, lasagna gardening, straw bale gardens and container gardening.

If you choose a more conventional method of preparing the garden such as with a cultivator, you are encouraged to reduce tilling to a minimum. As mentioned before, tilling breaks down soil structure and disturbs the environment that is beneficial to living organisms, so the less tilling, the better.

The practice of rotating crops in the garden is also a smart tip. This action helps reduce pests and pathogens that may be carried on the same crop from one year to the next. In addition, crops such as beans and other legumes “fix” nitrogen on their roots which will benefit the next plant that gets planted in that space the following season.

For more information on a wide variety of **Smart Gardening** articles, or to find out about Smart Gardening classes and events, visit [www.migarden.msu.edu](http://www.migarden.msu.edu).



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# Attracting Pollinators to the Garden

Denise Ellsworth, Department of Entomology

Gardeners are increasingly concerned about the status of pollinators in Ohio. Important pollinators such as honey bees, bumble bees and monarch butterflies have gained attention in recent years due to concerns about declining populations. Pollinators are vital to the production of many food crops and provide a service essential to the survival of many native plants. Fortunately, gardeners can take steps to support these and other pollinators through plant selection and simple gardening practices. This fact sheet describes the importance of pollinators, their role in the ecosystem, and actions gardeners can take to help pollinator populations in their yards and gardens.



Bumble bee visits aster flower for pollen and nectar.



Swallowtail butterfly drinks nectar from bottlebrush buckeye flowers.

depend on repeat visits by pollinators, so many offer small rewards repeated at regular intervals to encourage return trips.

## How Pollinators Find Flowers

Flowers use a variety of strategies to attract pollinators, including petal color, scent, UV light patterns and nectar guides. Bees in particular use floral qualities such



Lines and coloration on petals help pollinators quickly find rewards.

## What Is Pollination?

Pollination is the movement of pollen from the male part (anther) of one flower to the female part (pistil) of another flower. Without pollination, most plants can't make seeds and fruits. Many plants are wind pollinated (e.g., grasses, small grain crops, and conifers), but others rely on animals, primarily insects, to carry pollen from flower to flower.

Plants attract pollinators by offering rewards, such as pollen, nectar and floral oils. Flowers also provide shelter and gathering places for pollinating insects. Flowers



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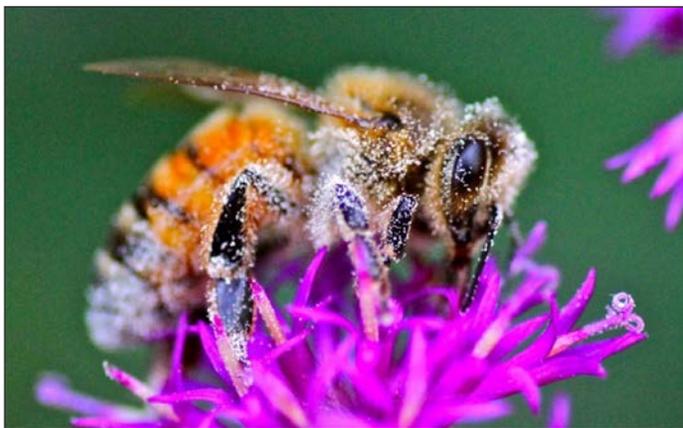
as polarized light patterns, petal texture, temperature, humidity, and electrostatic charge to help them locate flowers.

## The Importance of Animal Pollinators

Animal pollinators are essential to the food we eat. Some scientists estimate that one in three bites of food we take can be traced back to the role of animal pollinators. A 2012 study at Cornell University estimates that bees and other insect pollinators contribute \$29 billion annually to U.S. farm income by pollinating 58 crops, including almonds, apples, berries and squash. Pollinators play a key role in the production of many foods in the home garden.

In addition to their role on farms and gardens, pollinators are essential to the survival of native plants. Approximately 75% of all plant species depend on animal pollinators to move pollen from plant to plant. Without the work of pollinators, many native plants couldn't produce seeds to ensure the plant's next generation. These seeds and the fruit that often accompany them also provide important food sources for approximately 25% of birds and many mammal species.

Key animal pollinators include honey bees, native bees, flies, moths and other insects, as well as birds and some mammals.



The western honey bee is a key agricultural pollinator.  
(Photo courtesy of Karina Weatherbee.)

## Bees: Essential Pollinators

Bees are considered the most important pollinators because they are uniquely adapted to gather and transport pollen. Bees rely on flowers for food to feed their young, so they actively seek out and visit flowers. Bees' fuzzy bodies and branched hairs help female bees collect pollen into special structures, such as pollen baskets on the hind legs or long hairs on the thorax or abdomen.

Bees also forage for food close to their nesting sites, a practice called central place foraging. Bees visit one or only a few flowering species during each foraging trip, even when other flowers are available. This behavior, called flower fidelity or flower constancy, makes bees especially reliable couriers to move pollen to receptive flowers.

The western honey bee is the most dependable agricultural pollinator of many crops. It is not native to North America. Ohio is home to approximately 500 native bee species. These diverse bees play important roles as pollinators of agricultural crops and native plants. (See Ohio Bee Identification Guide at [go.osu.edu/ohiobees](http://go.osu.edu/ohiobees) to learn more about Ohio's native bees.)

Bees can be divided into three broad groups: social bees (bumble bees), solitary ground-nesting bees (such as mining bees), and solitary cavity-nesting bees (including mason bees and leafcutting bees).

Bees are often confused with wasps. Wasps may visit flowers for nectar, but they rely on insects or spiders—not pollen—to feed their young. Solitary wasps are beneficial predators; they are rarely aggressive. Social wasps, such as yellowjackets and hornets can become aggressive and may sting repeatedly.

Social bees like bumble bees will usually only sting when defending their nest. Solitary bees such as mining bees and leafcutting bees are not aggressive. Many of these bees can't penetrate human skin with their stingers.

Animal pollinators and bees in particular are currently facing many threats, such as lack of forage (flowers for food), pests, pathogens, pesticides, invasive plants, climate change and lack of suitable nesting sites. Gardeners can play an important role in pollinator conservation by providing plants and nesting sites for pollinators and by adapting gardening practices to protect pollinators.



Native mining bees frequently nest in sandy soils on south-facing slopes.

## What Gardeners Can Do

### Grow More Flowers

Trees, shrubs and herbaceous plants can provide food and nesting habitat for pollinators. An abundance of different flower shapes, sizes, and colors will appeal to a variety of pollinators. Grouping plants together in sunny locations helps pollinators find and feed on desirable flowers while expending less energy in the search for plants.

By observing flowers in the garden and taking note of any flower visitors, gardeners can learn which plants are most attractive to pollinators. Additionally, many plant lists are available to help with the selection of plants for pollinators (find plant lists at [go.osu.edu/gardensandbees](http://go.osu.edu/gardensandbees)).

Different flower shapes and colors attract different pollinators. For example, red tubular flowers with a nectar reward tend to attract hummingbirds. Daisy-like flowers that provide nectar and pollen in shallow flowers are often visited by bees and flies with shorter mouthparts.

Some cultivars and hybrids don't offer the pollen and nectar rewards that so-called "straight species" do, since the quality and quantity of nectar and pollen are sometimes lost during breeding. Plants bred with "double" flower petals are often inaccessible to pollinators. Gardeners can include less refined plants along with plant cultivars to offer broad pollinator appeal.



Some cultivars with complex petal arrangements and unusual colors are less attractive to pollinators, such as this 'Hot Papaya' purple coneflower.

### Bloom Through the Season

Different species of bees, butterflies and other pollinators are active in Ohio at different times of the year. Queen bumble bees, mourning cloak butterflies and blue orchard bees are active in early spring. Monarch butterflies, worker bumble bees and worker honey bees forage from spring into the cooler days of autumn.

Gardeners can help pollinators by planting flowers with a sequence of bloom throughout the growing season, from early spring through late fall. Early-blooming



Early-blooming maples provide an important pollen and nectar source for bees in early spring.

trees such as maples, willows and redbuds, and late-season perennials like asters and goldenrod provide important food at especially critical times. Consult [www.oardc.ohio-state.edu/gdd/](http://www.oardc.ohio-state.edu/gdd/) for a sequence of native and non-native woody flowering plants for Ohio.

### Key Plants for Pollinators

While literally hundreds of garden plants provide important sources of nectar and pollen for pollinators, try these garden-worthy additions:

- **Trees:** maple, crabapple, linden, serviceberry
- **Shrubs:** ninebark, pussy willow, sumac, viburnum
- **Perennials:** aster, hyssop, milkweed, purple coneflower
- **Annuals:** cosmos, marigold, sunflower, zinnia
- **Herbs:** basil, borage, catmint, lavender, oregano

### Caterpillar Host Plants

While adult butterflies will drink nectar from many types of flowers, immature caterpillar stages require specific plant species to complete development. Monarch caterpillars require milkweed plants, pearl crescent caterpillars feed on New England asters, and black swallowtail caterpillars feed on plants in the carrot family such as parsley and dill. Include butterfly host plants as well as flowers that provide a nectar source to attract egg-laying adult butterflies. Learn more about specific caterpillar food requirements in the ODNR field guide "Butterflies and Skippers of Ohio" at [go.osu.edu/ODNRbutterflies](http://go.osu.edu/ODNRbutterflies).

### Vegetable Garden Pollination

Flowers planted in and near vegetable gardens and fruit plantings help bring pollinators and other beneficial insects into the garden. Annuals, perennials and herbs provide important food sources for insect pollinators, especially in the heat of summer. Consider planting

sunflowers, zinnias, marigolds and cosmos in or near the vegetable garden. Herbs such as lavender, basil, borage, dill, fennel, oregano and catnip will also attract many pollinators.

## Plant Natives

Locally native plants attract native pollinators. Native plants offer nectar, pollen and other nutrients in quantities that native pollinators need. Consider adding more locally native trees, shrubs and herbaceous plants to the garden.

## Provide Nesting Sites

Brush piles, dead standing trees and clumping grasses all provide important nesting and overwintering habitat for bees and butterflies. Cavity-nesting bees make their nests in the pith of twigs like elderberry or sumac, or in abandoned beetle burrows in dead trees. Solitary ground-nesting bees usually nest in sandy, well-drained soils on south-facing slopes.

Artificial nesting sites can be made or purchased to encourage cavity-nesting bees. These structures require routine maintenance, and even periodic replacement, to prevent the build-up of bee pathogens and parasites.



Bumble bees will frequently nest under clump-forming grasses.

Bumble bees prefer to nest in pre-existing cavities with some form of insulation such as old rodent nests or bird nests, both above and below ground. They will also nest under clumps of grass. Purchased or constructed



Dandelions provide an important source of nectar and pollen for pollinators.

bumble bee nesting structures are generally considered unsuccessful at attracting bumble bee queens.

## Other Considerations

A water source in the garden helps thirsty pollinators, especially in the heat of summer. A shallow bowl or birdbath can provide sufficient water. A few sticks placed in the bowl will provide a place for bees and other insects to land and perch, thus preventing insect drowning. Additionally, a muddy puddle may be visited by pollinators like butterflies and mason bees.

Limit pesticide use in the garden. Pesticides can have negative effects on bees and other insects, killing them outright or affecting behavior, longevity or susceptibility to disease. Use an integrated pest management approach with multiple strategies to reduce pest damage. Contact your local Ohio State University Extension office for pest management assistance (see [extension.osu.edu](http://extension.osu.edu)).

Many plants frequently considered weeds do provide food for pollinators, including dandelions, milkweed, goldenrod and clover. Consider tolerating weeds with benefits to pollinators. On the other hand, many invasive weeds outcompete native plants important to pollinators. Eliminate invasive weeds such as privet, garlic mustard, and buckthorn.

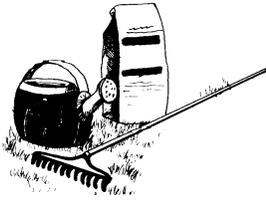
To learn more about pollinators and pollinator plants, consult these resources:

- The Xerces Society for Invertebrate Conservation: [xerces.org](http://xerces.org)
- Pollinator Partnership: [pollinator.org](http://pollinator.org)
- The Ohio State University Bee Lab: [beelab.osu.edu](http://beelab.osu.edu)

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## GROWING HERBS FOR THE HOME GARDENER

Erv Evans, Extension Associate, Horticultural Science  
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An herb is any plant used whole or in part as an ingredient for health, flavor, or fragrance. Herbs can be used to make teas; perk up cooked foods such as meats, vegetables, sauces, and soups; or to add flavor to vinegars, butters, dips, or mustards. Many herbs are grown for their fragrance and are used in potpourris, sachets, and nosegays; or to scent bath water, candles, oils, or perfumes. More than 25% of our modern drugs contain plant extracts as active ingredients, and researchers continue to isolate valuable new medicines from plants and confirm the benefits of those used in traditional folk medicine.

Herbs as a group are relatively easy to grow. Begin your herb garden with the herbs you enjoy using the most. For example, choose basil, oregano, and fennel for Italian cooking; lavender and lemon verbena for making potpourri; or chamomile, peppermint, and blue balsam mint if you plan to make your own teas.

The optimum growing conditions vary with each individual herb species. Some of the herbs familiar to North Americans — such as lavender, rosemary, thyme, bay laurel, marjoram, dill, and oregano — are native to the Mediterranean region. These herbs grow best in soils with excellent drainage, bright sun, and moderate temperatures.

When growing herbs follow these basic guidelines:

- Plant herbs in average garden soil with organic matter added to improve texture and drainage.
- Choose a site that receives at least 6 hours of direct sun each day.
- Avoid ground where water stands or runs during heavy rains.
- Compensate for poor drainage with raised beds amended with compost.
- Apply balanced fertilizers sparingly to leafy, fast growing herbs. Heavy applications of fertilizer, especially those containing large amounts of nitrogen, will decrease the concentration of essential oils in the lush green growth.

Plan your herb garden by grouping herbs according to light, irrigation, and soil requirements. Most herbs enjoy full sun, but a few tolerate shade. Herbs can be classified as either annual, biennial, or perennial. Be aware of the growth habits of the plants before you purchase them. Some herbs, such as borage, anise, caraway, chervil, coriander, cumin, dill, and fennel, should be direct-seeded, because they grow easily from seed or do not transplant well. Other herbs, such as mints, oregano, rosemary, thyme, and tarragon, should be purchased as plants and transplanted or propagated by cuttings to ensure production of the desired plant (do not come true from seeds). Additional information on specific herbs can be found in Tables 1 and 2.

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**Table 1. Growing Requirements, Propagation and Uses of Annual Herbs**

Plant	Height	Spacing	Light Requirement	Propagation	Uses
Anise <i>Pimpinella anisum</i>	24"	10"	Sun	Grow from seed.	Leaves in soups, sauces, and salads; oil for flavoring; seeds for seasoning cakes, breads, and cookies.
Basil, sweet <i>Ocimum basilicum</i>	20 to 24"	6 to 12"	Sun	Grow from seed; grow transplants for early-season harvest.	Leaves in soups, stews, pasta sauce, poultry and meat dishes; flavors vinegar; teas.
Borage <i>Borago officinalis</i>	1 to 3'	12"	Sun	Grow from seed; self-sowing.	Edible flower; leaves in salads, teas, and sandwiches; attracts bees.
Calendula (Pot Marigold) <i>Calendula officinalis</i>	12"	12 to 18"	Sun, partial shade	Grow from seed.	Flower petals give color to soups, custards, and rice; cookies; vinegars; crafts.
Caraway <i>Carum carvi</i>	12 to 24"	10"	Sun	Grow from seed; biennial seed bearer, some cultivars are annual seed bearers.	Leaves in salads, teas, stews, and soups; seeds for flavoring cookies, breads, salads, and cheeses; roots can be cooked.
Chamomile, sweet false <i>Matricaria recutita</i>	1 to 2 ½'	4 to 6"	Sun	Grow from seed.	Tea, potpourris, garnish, crafts.
Chervil <i>Anthriscus cerefolium</i>	1 ½ to 2'	15"	Partial shade	Sow seeds in early spring; does not transplant well, not heat tolerant; needs light to germinate.	Leaves in salads, soups, and sauces; teas; butters.
Coriander (cilantro) <i>Coriandrum sativum</i>	24" to 36"	12 to 18"	Sun, partial shade	Grow from seed; goes to seed quickly, so plant frequently.	Entire plant is edible; leaves in stews and sauces; stems flavor soups and beans; seeds in sauces and meat dishes, potpourris, and sachets.
Dill <i>Anethum graveolens</i>	3 to 5'	3 to 12"	Sun, partial shade	Sow seed early spring.	Teas; seasoning for butter, cakes, bread, vinegars, soups, fish, pickles, salads, etc.; flowers in crafts.
Nasturtium <i>Tropaeolum spp.</i>	15"	6"	Sun	Grow from seed; does not transplant well.	Leaves, stems, and flowers have a peppery taste; use in salads.
Parsley <i>Petroselinum crispum</i>	6 to 18"	6"	Sun	Sow seed early spring; slow to germinate; soak in warm water; is a biennial grown as an annual.	Garnish; flavoring for salads, stews, soups, sauces, and salad dressings.
Perilla <i>Perilla frutescens</i>	36"	3 to 6"	Sun	Grow from seed.	Decorative plant; flavoring oriental dishes.
Summer savory <i>Satureja hortensis</i>	12 to 18"	10 to 12"	Sun	Sow seed in early spring, cuttings.	Mild peppery taste; used with meat, cabbage, rice, and bean dishes, stuffings, teas, butters, vinegars.

<b>Common name/ Scientific name</b>	<b>Height</b>	<b>Spacing</b>	<b>Light Requirement</b>	<b>Propagation</b>	<b>Uses</b>
Angelica <i>Angelica archangelica</i>	2 to 3'	3'	Partial shade	Grow from seed.	Stems raw or in salads; leaves in soups and stews; teas; crafts; closely resembles poisonous water hemlock.
Anise hyssop <i>Agastache foeniculum</i>	3 to 5'	12 to 24"	Sun, light shade	Grow from seed or division.	Attracts bees; edible flowers; leaves for flavoring or teas; crafts; seeds used in cookies, cakes, and muffins.
Artemisia <i>Artemisia spp.</i>	2 to 3'	24"	Sun, partial shade	Division.	Wreaths and other crafts; aromatic foliage.
Bee balm <i>Monarda didyma</i>	2 to 3'	12 to 15"	Sun, partial shade	Grow from seed or division; invasive rhizomes.	Attracts bees, butterflies, and hummingbirds; teas; flavors jellies, soups, stews, and fruit salads; edible flowers; dried flowers in crafts.
Burnet, salad <i>Poterium sanguisorba</i>	12"	18 to 24"	Sun, well-drained soil	Grow from seed or division.	Cucumber-flavored leaves used in salads, vinegar, butter, cottage cheese, and cream cheese; garnish.
Clary sage <i>Salvia sclarea</i>	5'	24"	Sun	Grow from seed; biennial.	Leaves in omelets, fritters, and stews; flavoring of beers and wines; oil.
Chamomile <i>Chamaemelum nobile</i>	2 to 8"	18"	Sun, partial shade; well-drained soil	Grow from seed, division, or stem cuttings.	Dried flowers for tea; potpourris; herb pillows.
Catnip <i>Neptea cataria</i>	3 to 4'	12 to 18"	Sun or shade	Grow from seed or division.	Teas; fragrance for cats.
Chives <i>Allium schoenoprasum</i>	12"	12"	Sun, partial shade	Grow from seed or division.	Edible flowers; leaves for flavoring, eggs, soups, salads, butter, cheese, dips, spreads, etc.
Comfrey <i>Symphythum officinale</i>	3 to 5'	3'	Sun	Grow from seed, cuttings, root division.	Safety of ingestion is highly questionable. Large, rambling plant; dyes, cosmetics.
Costmary <i>Chrysanthemum balsamita</i>	2 to 4'	12"	Sun, light shade	Division.	Garnish; fragrance.
Echinacea <i>Echinacea angustifolia</i>	1 to 2'	18"	Sun	Grow from seed or crown division.	Ornamental plant; used medicinally.
Fennel <i>Foeniculum vulgare</i>	4 to 5'	4 to 12"	Sun	Grow from seeds, difficult to transplant.	Entire plant edible; seeds in sausage and baked goods; leaves used with fish, vegetables, cheese spreads, and soups.
Feverfew <i>Tanacetum parthenium</i>	2 to 3'	12"	Sun, partial shade	Grow from seed or division.	Tea, crafts, dyes.
Geranium, scented <i>Pelargonium spp.</i>	12 to 24"	12 to 24"	Sun	Grow from stem cuttings.	Teas, potpourris, sachets, jellies, vinegars, desserts.
Germander <i>Teucrium chamaedrys</i>	10 to 12"	8 to 10"	Sun, partial shade	Slow to germinate from seed. Stem cuttings, layering, division.	Attracts bees, decorative plant.

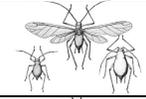
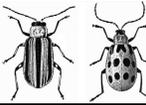
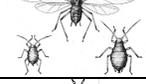
**Table 2. Growing Requirements, Propagation and Uses of Biennial and Perennial Herbs**

Common name/ Scientific name	Height	Spacing	Light Requirement	Propagation	Uses
Horehound <i>Marrubium vulgare</i>	24"	15"	Full sun	Grow from seed, cuttings, or division.	Attracts bees; tea; flavoring in candy, crafts.
Hyssop <i>Hyssopus officinalis</i>	24"	15"	Sun or division	Grow from seed, stem cuttings, usage, potpourris.	Attracts bees and butterflies; mostly decorative.
Lavender <i>Lavandula angustifolia</i>	24 to 36"	18"	Sun	Grow from seed or stem cuttings.	Potpourris; herb pillows; crafts, vinegars and jellies.
Lemon balm <i>Melissa officinalis</i>	3'	2'	Sun, light shade	Grow from seed, stem cuttings, or division.	Teas; flavors soups, stew, fish, poultry, vegetables, and meat dishes; garnish; potpourris
Lemon verbena <i>Aloysia triphylla</i>	2 to 5'	12 to 24"	Sun	Grow from stem cuttings	Potpourris; herb pillows; lemon flavoring , for drinks.
Lovage <i>Levisticum officinale</i>	3 to 5'	2'	Sun, partial shade	Sow seeds late summer; division.	Seeds in breads, butters, and cakes; teas; leaves in soup, stew, cheese, cookies, and chicken dishes; root edible.
Marjoram <i>Majorana hortensis</i>	1 to 2'	12"	Sun	Grow from stem cuttings, division, or seed.	Flavoring for meats, salads, omelets, vinegars; jellies; teas; flower head for crafts.
Oregano <i>Origanum vulgare</i> and <i>O. vulgare subsp. hirtum</i>	24"	8 to 12"	Sun	Grow from cuttings or division.	Flavoring for tomato dishes, meat, poultry and pork stuffings; vegetables and sauces, etc.
Peppermint <i>Mentha x piperita</i>	36"	18"	Sun, light shade	Cuttings and division recommended; invasive rhizomes.	Teas, fragrance.
Rosemary <i>Rosemarinus officinalis</i>	3 to 6'	12"	Sun	Seeds slow to germinate; use stem cuttings, layering, or division.	Teas; flavoring for vinegar, jam, bread, butters, stuffing, vegetables, stew, and meat dishes.
Rue <i>Ruta graveolens</i>	3'	12 to 18"	Sun	Grow from seed, stem cuttings, or division.	Decorative plant
Sage <i>Salvia officinalis</i>	18 to 30'	12"	Sun	Grows slowly from seed; stem cuttings, division, layering.	Seasoning for meat, vegetable and egg dishes; stuffings.
Sage, pineapple <i>Salvia elegans</i>	2 to 3'	24"	Sun	Stem cuttings.	Attracts hummingbirds and butterflies; teas; potpourri; cream cheese; jams, jellies.
Santolina <i>Santolina chamaecyparissus</i>	24"	2 to 3'	Sun, needs good drainage	Slow to germinate from seeds..	Dried arrangements and potpourris; accent plant.
Sorrel <i>Rumex spp.</i>	3 to 4'	12"	Sun	Grow from seed.	Flavoring of soups, butters, omelets; some species of sorrel are toxic.
Southernwood <i>Artemisia abrotanum</i>	4'	18"	Sun, well-drained soil	Stem cuttings, division.	Teas; sachets; potpourris.
Spearmint <i>Mentha spicata</i>	18"	18"	Sun, partial shade	Cuttings or division recommended; invasive rhizomes.	Teas; flavors sauces, jellies, and vinegars; leaves in fruit salad, peas, etc.

**Table 2. Growing Requirements, Propagation and Uses of Biennial and Perennial Herbs**

Common name/ Scientific name	Height	Spacing	Light Requirement	Propagation	Uses
Sweet marjoram <i>Origanum majorana</i>	8"	12"	Sun	Grow from seed, division, or cuttings.	Flavors tomato sauces, eggs, etc. Leaves in salads, sauces, pizza, and meats.
Sweet rocket <i>Hesperis matronalis</i>	3 to 4'	24"	Sun	Grow from seed.	Salads.
Sweet woodruff <i>Galium odoratum</i>	8"	12"	Partial shade	Division.	Tea; sachets, dyes.
Tansy <i>Tanacetum vulgare</i>	3 to 4'	2 to 3'	Sun	Grow from seed or division	Toxic oil in leaves; decorative plant; crafts.
Tarragon <i>Artemisia dracunculus</i>	24"	12"	Sun	Division or root cuttings, stem cuttings are slow to root.	Sauces, salads, soups, omelets, meat, vegetable, and fish dishes.
Thyme, common <i>Thymus vulgaris</i>	4 to 12"	6 to 12"	Sun	Cuttings, seeds, or division.	Teas; attracts bees; sachets; potpourris; flavoring for poultry, fish, stews, soups, tomatoes, cheese, eggs, and rice.
Valerian <i>Valeriana officinalis</i>	2 to 5'	12 to 24"	Sun	Division is recommended over seeding.	Roots for flavoring; ornamental plant.
Yarrow <i>Achillea millefolium</i>	8" to 5'	12"	Sun	Seeds or division.	Crafts.
Winter savory <i>Satureja montana</i>	24"	18"	Sun	Grow in light, sandy soil from cuttings or seed; cut out dead wood.	Leaves used to flavor meat, fish, salads, soup, stew, and sausage.
Wormwood <i>Artemisia absinthium</i>	36"	12 to 36"	Sun	Seed germinate slowly; use stem cuttings or division.	Bitter flavor; toxic if large quantity consumed; ornamental plant, dried arrangements; repels insects

## Common Pests in Ohio Home Vegetable Gardens

<i>Crop</i>	<i>Pest name</i>	<i>Appearance</i>	<i>Damage</i>	<i>Non-chemical management tactics</i>	<i>Insecticide options</i>
tomato	potato aphid		young leaves wilt due to sap-sucking	encourage ladybugs, lacewings, and other predators	soap, pyrethrins+PBO, acetamiprid, or oil
	whitefly		leaves wilt due to sap-sucking	trap with sticky yellow cards	soap or pyrethrins+PBO
cucumber, melon & squash	cucumber beetles		holes in leaves or fruit surface	row covers; plant late; early squash trap crop	permethrin, esfenvalerate, carbaryl, or pyrethrins+PBO
squash	squash vine borer		plant wilts from larva inside stem	row covers; plant late	permethrin or esfenvalerate weekly in July
	squash bug		leaves die from sap-sucking	hand pick; row covers; shingle traps; destroy crop remnants	pyrethrins+PBO or esfenvalerate for adults; spinosad or carbaryl for nymphs
beans	bean leaf beetle		holes in pods & leaves	row covers	carbaryl, permethrin, or pyrethrins+PBO
	potato leafhopper		leaves turn brown along edges	row covers	pyrethrins+PBO or carbaryl
	2-spotted spider mite		white stippling on leaves	encourage ladybugs & other predators; hose off with water	soap or oil
eggplant	eggplant flea beetle		many small round holes in leaves	row covers; hand-picking	carbaryl, pyrethrins+PBO, permethrin, or esfenvalerate
potato, tomato, eggplant	Colorado potato beetle		irregular holes in leaves	hand pick; plant early or late, not both	spinosad for larvae; permethrin or esfenvalerate for adults
cole crops	cabbage-worms		irregular holes in leaves	encourage parasitoids by flowering borders	B.t., or spinosad, or acetamiprid
	flea beetles		small pits or holes in leaves	row covers; hand-picking	carbaryl, pyrethrins+PBO, permethrin or esfenvalerate
	root maggots		plant wilts from tunnels in roots	stem collar; planting time	-
spinach	spinach leafminer		blotches in leaves	row covers; hand pick first infested leaves and destroy	permethrin, pyrethrins+PBO, or spinosad
lettuce	aphids		leaves wilt from sap-sucking	encourage ladybugs, lacewings, and other predators	soap or pyrethrins+PBO
onion	onion thrips		pale streaks in leaves	hose off with water	soap or lambda-cyhalothrin
asparagus	asparagus beetle		distorted shoots	hand pick	pyrethrins+PBO, carbaryl, or permethrin
sweet corn	European corn borer		chewed kernels in corn ears (also in pepper fruit)	avoid very early planting	B.t., spinosad, or permethrin, once per week during silking in June & August
	corn earworm		chewed kernels in corn ears (also in tomato fruit)	avoid late planting	inject corn oil + B.t. (20:1) in ear tip at full silk; or spray silks with spinosad or esfenvalerate

-Celeste Welty, Extension Entomologist, The Ohio State University, September 2006, revised March 2013.

## Vinegar: A Garden Miracle?

Submitted by Holly Utrata-Halcomb, Administrator

Home remedies for yard and garden problems and pests can be effective, but be sure you do your homework before you try them. If you attempt an internet search, it's best to rely on information from universities or other research based institutions. Antidotal recommendations may leave you disappointed and cause long-term damage to your soil. The following scenario will illustrate my point.

I recently received a call from a landowner questioning if he could use vinegar as a way to kill weeds and lower his pH. I had not thought of vinegar as a garden tool so I reached out to my soil fertility expert, John Dahl, Director of the MSU Soil and Plant Nutrient Lab at Michigan State University. His response was that he discourages the use of vinegar as a herbicide or soil acidifier. Vinegar is basically a weak solution of acetic acid (5% acetic acid solution). He then referred me to the following article by Jeff Gillman, Horticulture Professor at the University of Minnesota.

### [June 9, 2011 Just do it, Knock It Off home remedies, toxic Jeff Gillman](#)

**I've been working with homemade garden remedies in one context or another for about 10 years now. As someone who has spent days searching for odd cures to garden problems I consider myself qualified to say that, of all of the remedies I've seen, vinegar seems to be the product with the most (supposed) uses. You can kill weeds with it, as well as plant diseases and insects. You can also use it as a fertilizer or even to acidify your soil. It's amazing! But which of these uses are real and which are just someone flapping their jaws?**

**Vinegar as an herbicide: White vinegar which is about 5% acetic acid and does a nice job of burning the tops of plants, but not their roots – so a larger weed will live right through a spray even though it will look bad right after the spray. You can buy 20% acetic acid. It works faster, but it has essentially the same problem killing larger weeds that that 5% acetic acid does. Besides efficacy issues there are safety issues also. I've used 20% acetic acid and I think that this stuff is too dangerous for the average person. A little in the eyes could cause permanent injury. Just a little whiff of it is enough to make the nose start running (in other words it's not good for mucous membranes).**

**Vinegar as a disease control: What a great idea! Spray something that kills plants onto your prized petunias to control disease! OK, when you use vinegar as a plant disease control you do use a lower concentration which shouldn't hurt the plant. But vinegar has never proven to be particularly effective at controlling plant diseases.**

**Vinegar as a fertilizer: Nope, doesn't work. Acetic acid only contains carbon hydrogen and oxygen – stuff the plant can get from the air. The other things that may be in vinegar could be good for a plant – but it seems an expensive method of applying an unknown amount of nutrition.**

**Vinegar as a soil acidifier: This is one that I've seen a lot – and so I tried it. In a nutshell, it just doesn't work that well. It takes a lot of vinegar and the pH change is brief at best. Use something like sulfur instead.**

**So to summarize, despite a lot of recommendations, the only thing that vinegar has really proven to be good at is killing weeds – and then only if the weeds are young.**



## Turner Farm Community Garden Program

### ***Gardening in Partnership with Nature***

#### **Living with insects and weeds - Friends or trouble makers?**

To control unwanted pests in the garden there are three basic strategies: Prevention, Repealing and Killing. With biological (organic) gardening the first approach should be "Prevention", then "Repealing" followed by "Killing" as a last resort.

#### **Insects**

Your garden is an ecosystem and insects are an important component of a healthy ecosystem - they feed birds, moles and other wildlife, pollinate crops. Insects are also an important to the compost pile, they help to break down organic mater in the pile and become soil nutrients themselves when they die. Attempting to remove all insects from your garden or yard completely would be futile and create more problems than it would solve.

As with your personal health "prevention is the best medicine". Healthy soil, good airflow and drainage along with sunshine are important first steps in safeguarding your garden from insects. Other steps are: *Start with Healthy Plants*: If a plant is not healthy, stressed or diseased, do not plant it - most likely it will not end well.

*Hygiene*: Remove diseased and dead leaves, fruit and other plant material from the garden, if diseased it should be composted or disposed of. If a plant is heavily infested with harmful insects remove it from the garden.

*Watering*: "Water smart" to promote healthy growth a vegetable garden needs one inch of water a week. Over as well as under watering can stress a plant making it venerable to insects and disease.

*Cosmetic Defect*: Some level of damage to your fruits and vegetables is inevitable. Insignificant cosmetic defect and insect damage to fruits and vegetables will not affect the flavor and nutritional quality or harm the long-term health of the plant.

*Know your Pests*: Through observation and research learn the names and life cycles of the pests in your garden. Remember not all insects are harmful - you want to avoid killing "beneficial" ones by mistake.

*Do Not be Afraid to Get Your Hands Dirty*: Inspect your garden every few days thoroughly, including the undersides of the leaves. If you find a harmful insect on a plant handpick it off, swift justice can be served between your thumb and index finger. If you continue to see harmful insects on the same plant you should consider the use of safer soap or another organic treatment.

*Crop Rotation*: Vary the locations of vegetable plants from year to year. Different plant species have different nutrient needs - rotating crops will help you maintain the garden's soil fertility by not depleting nutrients in one area. Rotating crops will also help discourage pest insects and should help to limit their population.

*Companion Plantings*: Companion plants, when grown together, promote one another's healthy development and discourage harmful insects. Planting nasturtium can help discourage beetles in the garden and pairing basil tomatoes enhances the vitality both plants. These combinations are believed to discourage pest insects and provide necessary nutrients for plant growth.

**Organic and Botanical Pesticides:** Insect and disease killers derived from plant extracts are called botanical insecticides. Although from natural sources they are toxic and should be used with care. Among these are Neem and Pyrethrins and they should be employed only as a last resort after thoroughly reading the instructions for use and application. It is important to note that these insecticides are broad-spectrum, meaning they kill both good and harmful insects indiscriminately. As an interim step before using botanical insecticides it is recommended to try a safer soap spray or horticultural oil. The chemical capsaicin derived from hot peppers can be an effective ingredient when applied as a component of a safer soap spray. Another alternative is Diatomaceous earth, derived from fossilized marine algae called diatoms, is effective on earth crawling, soft-bodied adult insects, caterpillars, snails, and slugs as well as aphids, thrips, and adult flea beetles.

### Weeds

Beauty is in the eye of the beholder. Some weeds are crops, this may be hard to believe but it is only a matter of perspective. After years of weeding Purslane (*Portulaca oleracea*) from the garden bed it now makes it to our table in stir-frys and Dandelion (*Taraxacum officinale*) leaves are used in our early spring salads - a bitter culinary delight and spring medicinal. Several years ago I worked at a garden with refugees from Burundi, they regularly harvested pigweed (*Amaranthus palmeri*) which they cooked as part of a rice dish.

Weeds can also be indicators of the soils health. A patch of grassy land with clover can be an indication the soil will have nitrogen and phosphorus present. In addition to adding macro and micronutrients many weeds are biostimulants with plant growth hormones - fermentation of these plants, making a "weed tea", releases the growth factors without risk of spreading the weed seeds in your garden.

Plant	Provides soil
Clover	Nitrogen (N), Phosphorus (P)
Comfrey	Nitrogen (N), Potassium (K), Calcium, Magnesium, Iron
Dandelion	Potassium (K), Phosphorus (P), Calcium, Magnesium, Iron, Cooper
Dock (broad leaf)	Phosphorus (P), Potassium (K), Calcium, Iron
Fennel	Nitrogen (N), Phosphorus (P)
Lambs Quarter	Nitrogen (N), Potassium (K), Phosphorus (P), Calcium, Manganese
Mullein	Potassium (K), Sulphur, Manganese, Iron
Purslane	Potassium (K), Magnesium, Manganese

#### Macronutrients

Nitrogen (N) – Largely responsible for the growth of leaves on the plant

Phosphorus (P) – Largely responsible for root growth and flower and fruit development

Potassium (K) – A nutrient that helps the overall functions of the plant perform correctly

Calcium (Ca) - Essential part of plant cell wall structure, provides for normal transport and retention of other elements as well as strength in the plant

Magnesium (Mg) - Part of the chlorophyll in green plants and essential for photosynthesis, also helps activate many plant enzymes needed for growth

Sulfur (S) - Essential plant food for production of protein and helps in chlorophyll formation, It also promotes activity and development of enzymes and vitamins, improves root growth and seed production, invigorates plant growth and resistance to cold

#### Micronutrients

Cooper (Cu) - Important for reproductive growth and aids in root metabolism and helps in the utilization of proteins

Manganese (Mn) - Functions with enzyme systems involved in breakdown of carbohydrates, and nitrogen metabolism

Iron (Fe) - Essential for formation of chlorophyll

Weeds should be composted to take advantage of their macro and micronutrients - however to prevent the spread of weeds in your garden do not add ones that have gone to seed, these should be disposed of through the City of Cincinnati Yard Waste program or taken to a landscape company composting operation.



2. To provide garden soil a wide variety of for beneficial microorganisms, bacteria, fungi, insects, and worms that are necessary for plants to thrive.
3. Soils with High Bulk Density (a lot of solid matter, including clay, with little pore space) leads to compaction - a difficult environment for plants to grow. A healthy soil structure consists of a combination of solid matter (mineral and organic) and open pore space (spaces where air and water infiltrate the soil). Compost is a soil conditioner it adds humus to garden soil, which increases pore space for plants roots to grow, the storage of water and nutrients as well as creating a healthy environment for microorganisms, bacteria, fungi in addition to beneficial insects and worms.

In the process of composting, microorganisms break down organic matter and produce carbon dioxide, water, heat, and humus. Composting proceeds through three phases:

- Mesophilic - moderate-temperature phase, lasts for a couple of days
- Thermophilic - high-temperature phase, can last from a few days to several months
- Cooling and maturation phase - several-months

#### Overwinter with Compost

Clump soil then cover with compost or organic matter i.e. leaves. Compost and/or organic matter further decomposes helping to breakdown heavy clay soils into a healthy garden soil with a water and nutrient-holding capacity in addition to increasing air pore space. Helps replace essential nutrients that have been taken up by past garden crops.

#### Crop Rotation

In nature a forest is a polyculture that consisting a hundreds of plant varieties that vary in size, nutrient needs and life cycles. Some compete with others while some have symbiotic relationships. It is through the interplay of these plants - along with animals, microscopic organisms, insects and worms, bacteria, and fungi as well as the dynamic effects of the seasons - that the forest maintains a healthy regenerative ecosystem.

With Crop Rotation, the practice of growing a series of different crops in the same area in sequential seasons, the gardener replicates a polyculture system, in a modest way, to promote soil and plant health in the garden. Crop rotation balances the fertility demands of various crops, through variation, to avoid depletion of soil nutrients. Another benefit of the practice is avoiding the build up of pathogens and insect pests that occur when one crop is continuously cultivated in the same area. With a home garden this can be difficult because space can be very limited. However it is still important to implement a plan the best you can. Balancing soil fertility can be addressed through the use of soil additives such as Rock Phosphate (phosphorous and calcium), Blood Meal (nitrogen), Greensand (potassium) or a general-purpose organic fertilizer.

- Three-year rotation schedule... A basic rule of (green) thumb for a three-year rotation is to plant:
- Year One, Heavy Feeders: Corn, Squash, leeks, cabbage and leaf vegetables, tomatoes and peppers
- Year Two, Light Feeders: Legumes – beans varieties such as pole and snap peas, lima and soya
- Year Three, Soil Conserving: Root vegetables including beets and turnips; also potatoes and sweet potatoes

#### Tilling

Use Minimum Tillage. Tilling can be an important part of garden management however it should be done in a thoughtful way and only when needed. Deep tilling disturbs biological layering that occurs in nature. By avoiding, or minimizing this, you allow the action of small organisms living in the soil to do the work for you. In addition tilling can also turn up weed seeds and encouraging their germination. Another problem with repeated deep tilling in southwest Ohio soils is that you can create a "hard pan" layer of compacted soil under the soil surface – the tiller tines over time will create a "hard pan" a compacted layer that makes it impermeable – water, air and nutrients cannot move beyond this layer and soil can become supersaturated. A tiller is an important tool, in particular with larger home and

community gardens where garden beds are 200 square feet or larger. If you are working a raised wood frame garden bed that is 4x8 to 4x12 feet turning your soil with a shovel and/or spading fork is recommended.

### **Cover Crops & Green Manures**

*Green Manure: A crop that is grown and then incorporated into the soil to increase soil fertility and organic matter content.*

*Cover Crop: A crop grown to protect and enrich the soil, or to control weeds.*

- Rodale's All-New Encyclopedia of Organic Gardening: The Indispensable Resource for Every Gardener

#### *Cover Crop*

Maintain year-round ground cover:

- Living ground cover reduces topsoil erosion
- Ground covers add or replace nutrients to soil (i.e. any legume clover or vetch)
- Ground covers will suppress weed germination
- Weed control takes forethought and attention to timing. By planting cover crops between rows of food crops, you can add organic matter to soil, reduce soil erosion and increase diversity of available nutrients, in addition to crowding out weeds that can add to your labor time in the garden

#### *Why Green Manure & Cover Cropping...*

Improved soil structure, which follows from green manure/cover cropping, allows better penetration as well as retention of moisture. The greater permeability of the soil does not mean that nutrients are lost through leaching. The growing crop absorbs the nutrients from the soil and holds them in its tissue.

Many green manure crops are deep rooted enough to reach well into the subsoil, effectively opening the subsoil if it is heavy (which is often the case in an urban setting), creating a deep, loose soil for improved plant growth.

#### *Turning in Cover Crops & Green Manures*

To get the maximum benefit out of Cover & Green Manure Crops (with the exception of grasses and cereal grains like Winter Rye) they should be allowed to grow until 90% of the crop has flowered. You do not want to allow the crop to go to seed and re-sow, but allowing the plants to flower will keep them from growing back after turning them in.

#### *Examples of Cover Crops & Green Manures*

##### "Cocktail" Garden Cover Crop Mixes

Garden Cover Crop Mixes contain combinations of grasses, buckwheat, peas, clovers, and cereal grains providing high biodiversity for soil improvement. The tender cover crop mixes that dieback over winter are particularly useful for the home and community garden bed - because they winterkill turning them into the soil is much easier and can be done earlier in the spring. Walnut Creek Seed is an excellent source for seed and information on Garden Cover Crop Mixes:

<http://www.walnutcreekseeds.com/gardening-mixes/>

##### Buckwheat

SEEDING RATE: 1 ½ Lbs./1000 sq. ft.)

SOW: Late spring and summer

TURN UNDER: Summer or Fall

Good summer cover crop.

##### Clover (common white or crimson)

LEGUME

SEEDING RATE: ½ Lbs./1000 sq. ft.)

SOW: Fall

TURN UNDER: Spring

Legumes add usable nitrogen. Nitrogen is a necessary element for plant growth and needs to be replenished regularly. Turn under 2 to 4 weeks before Planting. Clovers can also be used as a cover in garden pathways.

#### Winter Rye

SEEDING RATE: 2 Lbs./1000 sq. ft.)

SOW: Fall

TURN UNDER: Spring

Please note: Winter rye is an annual cereal grain. The use of winter rye in a home raised bed can be difficult to turn in, it may require turning a second time, and two to three weeks for it to dieback before you can plant in the spring. For the home and community gardeners winter rye is best used as an overwinter green manure crop to prepare the soil in advance of installing a new garden.

#### Vetch (hairy)

LEGUME

SEEDING RATE: 1 ½ Lbs./1000 sq. ft.)

WHEN TO SOW: Spring/Fall

WHEN TO TURN UNDER: Fall/Spring

Vetch is a very effective overwinter crop. In early spring it can be cut back at ground level, leaving stubble that tomatoes, pepper and eggplants can be planted directly into... The green plant mass that is cut can be laid aside allowed to dry then used as mulch around tomatoes, pepper and eggplants. Vetch can also be turned into the soil as with other green manure and cover crops.

### **Organic Soil Additives**

- Rock Phosphate: a good source of phosphorous and calcium
- Greensand: an undersea deposit from the ocean. Greensand is a good source of potassium and helps plants produce better fruit. It also contains micronutrients that are very important to proper plant development
- Liquid Seaweed: a good “all-around” fertilizer for boosting vegetables or flowers
- Lime: helps reduce the acid level in soils. (Not needed in Southern Ohio region)
- Fish Emulsion: another good “all-around” fertilizer. Provides nitrogen and phosphorous. Concentrate made from fermented fish - mixed with water and sprayed.
- Blood Meal: dried blood - powder form and high in nitrogen. It aids growth of bacteria in your soil apply directly on the soil or mixed in with the compost.
- Animal Manure: Manure may be expensive or, at least, hard to come by if you do not live near a farm or have access to a truck. It should be aged at least six months to a year before adding it to soils or compost in order to give it a chance to “burn off” the ammonia that is found in fresh manure. Even after this period, the manure will still contain some weed seeds. In order to destroy weed seeds, the manure can be “hot” composted.

### **Gardening Reference Material**

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Cooperative Extension Service, University of Illinois at Urbana-Campaign, 1995

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*Encyclopedia of Organic Gardening*

Editors: Fern Marshall Bradley, Barbara Ellis and Ellen Phillips, Rodale Books, 1978

University of Kentucky Extension

<http://www.uky.edu/hort/document-list-home-vegetable>

- Home Vegetable Gardening in Kentucky (ID-128)

- Insect Problems



# Tomato Diseases in the Home Garden

Written by:  
Gretchen Voyle,  
MSU Extension educator

Tomatoes are one of the top three favorite vegetables grown in home gardens. Tomatoes are the most delicious when they are grown and picked at peak ripeness from your garden. But there is more involved than just planting and harvesting.

Four common diseases can ruin the tomato fruit or kill the plants or do both. They are all caused by different kinds of fungi. Fungal diseases cannot be cured once they have begun, but they can be successfully prevented. The best news is that all these diseases can be controlled by the same fungicides. The timing of protective fungicides for these diseases is also the same.

Depending on the weather and the year, one disease may be more severe than another. All fungal diseases depend on some form of moisture on the plants to enable the diseases to develop. It could be rain, high humidity, fog or

leaves getting wet from overhead irrigation — especially if watering occurs late in the day



Early blight

or in the evening when plants could stay wet overnight — that gives fungi a foothold.

## **Septoria leaf spot**

This is one of the most common diseases of tomatoes in Michigan. This disease can kill the plant but does not damage the fruit.

**Leaves:** Septoria begins on the lowest leaves on the plant. Small, dark spots are the first sign. Then the spots develop yellow halos. Leaves turn yellow, then brown, and dry before falling off. The disease spreads from lower leaves upward on the plant.

**Fruit:** The fruit is not damaged by the disease, but it may become sunburned from lack of leaves.

**Weather:** Usually hot and humid.

## **Early blight**

The fungus that causes this disease overwinters in plant debris and seeds. Diseased plant material must be destroyed. Plant and fruit will exhibit damage.

Lawn or garden questions?

Visit [migarden.msu.edu](http://migarden.msu.edu).

Call toll-free 1-888-678-3464.

# Tomato Diseases in the Home Garden

**Leaves:** Dark spots appear first on older leaves and develop a bull's-eye appearance as they enlarge. With many lesions, leaves turn yellow and fall off. Dark lesions can occur on stems.

**Fruit:** Infection usually occurs at the stem end of the fruit, causing dark brown, leathery spots with concentric rings. Infected small fruit fall off. In humid weather, fruit can be covered with a black, velvety coat of spores.

**Weather:** Humid or rainy; cool weather (less than 70 degrees F) or warm weather (75 to 85 degrees).

## Late blight

This is one of the most devastating and rapidly developing tomato diseases, but it occurs sporadically.

**Leaves:** The first sign is pale green to brown spots on the leaves, often with a purplish cast. Spots enlarge, turn dark brown to purple-black, and the leaves shrivel and die. Often, pale yellow or green halos encircle the enlarging lesions. Lesions on stems grow rapidly and kill the stem. Plants die within several days. Decaying plants have an unpleasant odor.

**Fruit:** Rotting often begins near the stem. Gray-green to brown, irregularly shaped spots appear and rapidly grow. The rotted portion is leathery and uneven.

**Weather:** Cool and moist. Potatoes can also be infected by this fungus.

## Anthracnose

This disease causes rotting of ripe fruit. It can also cause high mold counts if diseased tomatoes are canned. Anthracnose is often not as common as the other three diseases.

**Leaves:** The leaves are not damaged.

**Fruit:** Early symptoms are small, slightly depressed, water-soaked round spots. Spots enlarge, become more sunken and develop concentric rings. There may be tiny, black spots within the lesions. Spots can run together, and large rotten areas may appear.

**Weather:** Anthracnose can happen under a wide range of weather conditions, but some moisture is necessary. The disease may follow damage from a hailstorm or blowing sand that damages the skin of the fruit.

## CONTROL

It is important to use a recommended fungicide to prevent these fungal diseases. To successfully prevent them, begin spraying when the first tiny fruit appear. Repeat once a week or follow label directions.

Keep in mind that overhead watering or rain will wash off the applied protective fungicides. They will have to be reapplied or the protection is lost.

	Chemical ingredient	Possible brand name (maker)
Conventional fungicides	Chlorothalonil	Vegetable Disease Control (Ortho) Daconil (Ortho) Fungonil (Bonide)
	Captan	Orthocide (Ortho)
Organic fungicides	Biological — bacterium	(Agraquest) Serenade
	Sulfur	Various brand names

**IMPORTANT:** Fungicides are **preventive** — once the leaves or fruit are showing spots or are incubating a fungus, fungicides cannot cure them.

**When using pesticides, read and follow all label directions.**

**Use of chemical names does not imply endorsement of these products by MSU Extension.**

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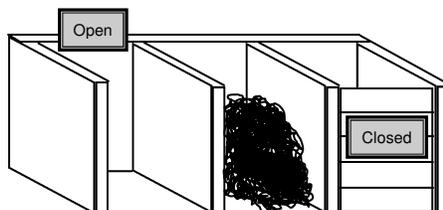
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# Composting Procedure



When using the Composting Bins please observe the following:

1. Only place material in the bin marked "Open".



2. If a bin is not marked "Open", or is covered with boards, please do not deposit material. The goal is to fill each unit completely, before starting another one.
3. Only compost organic materials, such as fruit, vegetable scraps, small twigs, yard/garden clippings, and leaves.

## **PLEASE...**

- DO NOT place meat, dairy products, oils or greasy foods in the composting bins.
  - DO NOT place brush or large tree branches in the composting bins. Place these materials on the brush pile to the right of the composting bins. These items will be chipped before added to the compost or used as mulch. Small twigs are OK.
  - DO NOT add weeds that have gone to seed, sick or diseased plants. Place these in the 'Yard Waste Only' garbage container to prevent the spread of weeds and diseases.
  - DO NOT place water containing non-biodegradable soaps, bleach or solvents in the composting bins.
4. After making your deposit of green stuff (i.e. young weeds or cuttings that are high in nitrogen), please lightly cover or layer it with brown stuff (i.e. old leaves that is high in carbon.) This material is stored in the holding wire bin near the compost area. Layering with the brown material is important to prevent odors, and it will facilitate the composting process.
  5. Once the unit is full, the material needs to be turned into an empty unit to aerate the pile. If you can help turn or water the piles on your work shift, check in with the project manager for the schedule.
  6. If a bin is marked "Spread" then the compost is ready to use. If you would like to use the compost please consult with the garden manager first in case it is needed for a specific project on the grounds. Otherwise, we encourage you to screen and use it to amend the soil in your plot. We will have plenty by the end of the growing season for everyone.

Thank you for your cooperation. Should you have any questions please feel free to contact the Garden Manager.

## Compost Basics

A compost pile is host to a wide variety of for beneficial microorganisms, bacteria, fungi, as well as insects and worms that a garden needs to thrive. The pile acts as a kind of nursery/habitat for this web of life to grow.

To facilitate organic matter decomposing efficiently in your compost bin or pile please remember the following basics:

- Space - A minimum of 3' x 3' x 3'
- Food - Mix of carbon (brown material) and nitrogen (green material)
- Water - Moist, like a damp sponge
- Oxygen - Aerate every 2 to 6 weeks
- Life - Having the compost pile in contact with the earth allows microorganisms, fungi, worms and beneficial insects to enter the process - this is an important contributor to the decomposition organic matter and its transformation into humus

### The Three Phases of Composting

In the process of composting, microorganisms break down organic matter and produce carbon dioxide, water, heat, and humus. Composting proceeds through three phases:

- Mesophilic - moderate-temperature phase, lasts for a couple of days
- Thermophilic - high-temperature phase, can last from a few days to several months
- Cooling and maturation phase - several-months

### Compost's Role

Adding mature compost to your garden soil is important for three reasons.

1. It is a source of nitrogen an important nutrient for growing healthy crops.
2. To provide garden soil a wide variety of for beneficial microorganisms, bacteria, fungi, insects, and worms that are necessary for plants to thrive.
3. Soils with High Bulk Density (a lot of solid matter , including clay, with little pore space) leads to compaction - a difficult environment for plants to grow. A healthy soil structure consists of a combination of solid mater (mineral and organic) and open pore space (spaces were air and water infiltrate the soil). Compost is a soil conditioner it adds humus to garden soil which increases pore space for plants roots to grow, the storage of water and nutrients as well as creating a healthy environment for microorganisms, bacteria, fungi in addition to beneficial insects and worms.

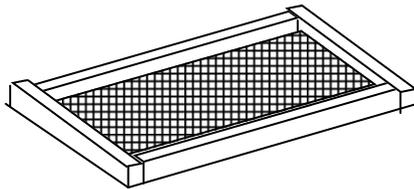
### Preparing Compost for Use in the Garden

#### Turning compost

There are differing viewpoints about when, how often - or if to - turn compost. Turning compost aerates the pile which facilitates decomposition. As a general rule the more often compost is turned the faster it decomposes. A compost pile will decompose on its own as long as: a) it is not compacted, b) it is not saturated with water 3), has a balanced composition of nitrogen (green plant material and food scraps..) and carbon (dry leaves, straw...). The recommended nitrogen / carbon ratio is 1 part nitrogen to 30 parts carbon. If your compost pile has a higher nitrogen ratio this can be compensated to certain degree by turning the pile - this introduces air (oxygen) into the pile facilitating decomposition.

### Screening compost

Screening compost is optional. Screening is often done when there is non organic material in the compost that you would not want in your garden, For example in some urban community garden pieces of concrete, brick, glass and other undesirable material referred to as "urbanite" make it into the compost bin. For safety reasons it is important to screen these materials out of the compost. Another reason to screen compost is if there are large pieces of un-decomposed organic debris such as woodchips or small branches (this debris can be removed and added to another pile in process) so the finished compost integrated into your garden is uniform which can be beneficial when direct sowing seeds. A simple screen can be build using 1/2 inch hardware cloth and wood construction grade 2 by 4s.



## **Alternative Compost Management System**

There are many ways to manage compost. The three bin system is popular with community gardens - it is an excellent approach but requires a fixed structure that may not work for all gardens. Windrow composting is other option for composting.

### **Windrow Composting**

Windrows are traditionally large scale systems used on farms. On a farm a windrow pile can be 5 feet tall and over 100 feet long, however this technique of composting can be scaled down for use in a community or home garden.

- Clear an area 4 x 12 feet
- Turn soil or if there is a heavy concentration of weeds in the area it can be covered with a cardboard or sheets of newspaper.
- Create a base that is 3 1/2 feet wide and the length of the prepared area by laying down your first layer of material, weeds (with no seeds), fall leaves or any other material you have to compost.
- As you build up the pile over time by adding more material slightly taper the sides inward and keep the top flat, when the windrow is 3 feet tall flatten the top with a slight concave along the length of the pile. The windrow can be left as is or covered with a layer of straw.
- Use a pitchfork or spading fork to turn the compost outward in line with the row. Essentially you are moving the pile 3-4 feet down the line, as you turn reform the pile until you reach the far end of the windrow then flatten the top with a slight concave along the length of the pile. The windrow can be left as is or covered with a layer of straw.

A compost windrow does not require a structure to contain it. The windrow is constructed by first clearing an area of ground 4 wide and a minimum of 12 long. This area can be shallow tilled (2 - 3 inches deep) to open the soil. If you do not have access to a tiller the soil can be turned with a shovel or if there is a heavy concentration of weeds the area it can be covered with a cardboard or sheets of newspaper. Wetting the cardboard and newspaper - on a windy day - will keep it from blowing away as you are building the windrow.

After the site is prepared lay down your first layer of material, weeds (with no seeds), fall leaves or any other material you have to compost. Create a base that is 3 1/2 feet wide and the length of the prepared area. As your garden creates material continue to add it along the length of the windrow, like adding layers a noodles and sauce to a pan of lasagna. You want to layer the material firmly but it is important there is still airspace - *Layer Do Not Compact!* In addition to your garden weeds and plant material you can also add dry leaves, straw and other dry material these are excellent sources of carbon the will help balance the nitrogen - carbon ratio of the pile. Grass clipping and coffee grounds can also be added to the pile, these should be treated as nitrogen sources for the pile.

As you build up the pile slightly taper the sides inward and keep the top flat, when the windrow is 3 feet tall flatten the top with a slight concave along the length of the pile. The windrow can be left as is or covered with a layer of straw.

#### Turning the Windrow

To turn a windrow start at one end, using a pitchfork or spading fork for turning the compost outward in line with the row. Essentially what you are doing is moving the pile 3-4 feet down the line, as you turn reform the pile until you reach the far end of the windrow then flatten the top with a slight concave along the length of the pile. The windrow can be left as is or covered with a layer of straw.

#### Planting the Windrow

A windrow can used for growing a crop of butternut, acorn or other vining squash. Direct sow squash seed in the ground along the base of the windrow. With a 12 foot windrow sow seeds (3 feet apart) in three places along each base of the pile. During the growing season train vines to cover the windrow. After the harvest you can allow the vines to lay in place or turn the windrow a discussed above.

#### Using a Windrow for Soil Amendment and/or Garden Expansion

A windrow can be used as a form of sheet mulching when building a new garden or adding new rows to a vegetable plot. Build the windrow where want your raised bed/row. Have the windrow run along the length of the bed leaving 3-4 feet at one end so you will have room to turn it. You can turn the windrow or plant it as described above - or a combination of the two. If you are interested no till gardening this is a good solution to building a garden bed, however it also work with most garden cultivation practices.



## **Living with Weeds**

### **Objective**

Basic introduction to the reason for weeding and how to manage weeds in the garden.

### **Introduction**

Beauty is in the eye of the beholder. Some weeds are crops, this may be hard to believe but it is only a matter of perspective. After years of weeding Purslane (*Portulaca oleracea*) from the garden bed it now makes it to our table in stir-frys and Dandelion (*Taraxacum officinale*) leaves are used in our early spring salads - a bitter culinary delight and spring medicinal. Several years ago I worked at a garden with refugees from Burundi, they regularly harvested pigweed (*Amaranthus palmeri*) which they cooked as part of a rice dish.

Weeds can also be indicators of the soils health. A patch of grassy land with clover can be an indication the soil will have nitrogen and phosphorus present. In addition to adding macro and micronutrients many weeds are biostimulants with plant growth hormones - fermentation of these plants, making a "weed tea", releases the growth factors without risk of spreading the weed seeds in your garden.

You can have too much of a good thing. When weeds are allowed to overgrow in your garden they compete with your fruits and vegetable plants for soil nutrients and moisture. For this reason they need to be managed.

### **How do Weeds Spread?**

Weeds are no dummies, and are determined to reproduce, so over thousands of years they have evolved ingenious ways to spread.

#### *Wind*

Dandelions are a good example of plant seeds that are spread by the wind. They form a composite flower head made up of hundreds of smaller florets, after the yellow flower matures it forms a seed head that is a round, white and called a "blowball". When fully dried the seeds of the blowball will be released by the wind, or being knocked by an animal or person, then become airborne spreading through your garden as well as being blown over long distances. Each of the hundreds of seeds from one Dandelion have the potential of becoming a new plant.

#### *Animals*

Many weed seeds are "hitchhikers" and will attach to a dog's coat or even your pant leg - Prickly Thistle (*Cirsium discolor*) burrs are a good example of this. In addition animals, for example song birds and deer, will eat the seeds and/or berries of plants then when the animal defecates the seed is dispersed. This is a fascinating partnership between the animal and plant worlds in that the bird or deer not only transport the seed from one location to another but the warmth of their digestive system helps prepare the seeds for germination and the excrement fertilizes them.

#### *People*

When transplanting seedlings and mature plants into your garden weeds and/or weed seeds can be in the soil encompassing the root ball. Always inspect the soil closely to be sure it is free of weeds and seed. With more mature plants (in particular perennials, but never young seedlings), if necessary they can be bare-rooted by gently washing the soil from the root ball then transplanting it directly into your garden soil. Be careful to not allow the roots to dry out or be exposed to direct sunlight.

Hitchhiking - as with a dog's coat weed seeds can attach to your pant cuffs, shoe laces or even in the muddy treads or your garden boots.

#### *Compost, Manure or Purchased Garden Soil*

##### *Compost*

If compost has not been properly managed and prepared it can introduce weed seed into your garden. When composting at home or a community garden never put weeds that have gone to seed into your compost pile.

##### *Manure*

Animal manure, commonly used as a fertilizer, can also contain viable weed seeds. Horse manure is particularly problematic in this way. When using animal manure it is important to be sure it is mature and aged over one year.

##### *Purchased Garden Soil*

In spite of landscape company's best efforts weeds can also be present in purchased bulk Garden Soil mixes. Always work with reputable companies and let them know you will be using the soil and/or compost for a vegetable garden so they can recommend an appropriate product.

### **How to Remove Weeds**

Weeding in a maintained garden can be a meditative and enjoyable project if approached with the right attitude. When pulling or discouraging weeds there a few things to consider.

Generally weeds have six growth habits/life cycles - these are listed in the Oregon State chart below. However when reduced to the basics there are five strategies to consider when removing them from your garden.

1. Hoeing. As a tool the hoe can be used to both prevent weeds from becoming established in the garden as well as killing them. By regularly hoeing, shallowly scrapping the soil's top surface in a garden bed and pathways, you are disrupting newly germinated seeds and cutting small weeds in half - this kills them before they have an opportunity to become established. When the weed plants are young and tender you can just leave them in the garden to wither then decompose.

Bindweed (*Convolvulus arvensis*) is a common and persistent problem in Southwest Ohio gardens. It is a "creeping perennial" that spreads through the garden with vegetative structures called rhizomes that run under the soil's surface. Digging Bindweed can be problematic because if you cut the rhizomes into pieces each can produce another plant. Many gardeners feel that by repeatedly cutting the Bindweed off at the soil surface with a hoe will eventually deprive the plant of sunlight, inhibiting photosynthesis, and kill the weed - I have also found this effective.

2. Pulling and Digging. For herbaceous weeds, and those with taproots, digging or pulling them out is an effective form of management in the home and community vegetable garden. When digging out a weed loosen the soil with a trowel, garden blade or spading fork then grab the weed at its base and pull slowly. When there is dense coverage move from one weed to the one next to it, that way the pulling of one weed loosens the soil to aid in pulling the next... If your soil has a high organic matter content and is not too wet or compacted you may not need to use a tool at all. When pulling grasses or other perennial weeds with vegetative structures called stolons or rhizomes it important to remove the stolons and rhizomes. When pulling these do your best not to chop them into pieces because each piece if left in the soil has the potential to grow into a plant. For Bindweed see hoeing.

3. Smothering. Using heavy mulches or landscape fabrics can smother young weed plants and keep seeds from germinating. Another common practice is covering the soil surface with newspaper (five to

six layers) or cardboard then covering it with mulch or woodchips. When laying out newspaper and cardboard overlap the edges (newspaper 4 - 6 inches and cardboard 6 - 8 inches), be sure that the edges are laying flat on one another - this can be facilitated by damping after the newspaper or cardboard is laid out. Space between the layers acts a pathway for weeds (in particular vine-type weeds) to travel through and above the mulch.

This technique can be effective when first establishing pathways in a garden but can be problematic in actual growing beds. Fresh woodchips, usually obtained from tree service companies, during their decomposition will heat up harming young plants and can rob nitrogen from existing soil and vegetable plants.

4. Cover Crops. The use of cover and green manure crops is an effective way to prevent weeds from spreading as well as their seeds from germinating. In addition, the use of cover crops reduces topsoil erosion, replaces nutrients to soil and provides organic matter for the soil - important in creating a healthy ecosystem for a vegetable garden.

5. Herbicides. The use of herbicides is discouraged because of side effects such as harming beneficial insects and pollinators, contamination of ground water and health concerns for wildlife and humans. One option that is employed by organic gardeners is horticultural vinegar. Horticultural vinegar contains 20% acetic acid (household vinegars contain 5%). This will kill weeds as well as any plant it comes in contact with. When spraying horticultural vinegar it is important to be very careful and not to allow the spray to drift onto your skin or get in your eyes - in some cases it can be a skin irritant and could be harmful to eyes. It is best used on a calm day (little or no breeze) and away from children and pets. Contact your local extension agent for recommended uses and effectiveness on specific weed pants.

<b>Lifecycle</b>	<b>Definition</b>	<b>Examples</b>
[1] Annual	Weed species that completes its life cycle (seed to seed) within one growing season or one calendar year	redroot pigweed, kochia
[2] Summer Annual	Summer annual weeds are a subcategory of annual weeds. They germinate as temperatures rise in the spring (April to May) through summer, whenever soil moisture is adequate.	redroot pigweed, common lambsquarters, green foxtail, Russian thistle,
[3] Winter Annual	Winter annual weeds germinate in the fall through early spring (October to March), when soil temperature and moisture are favorable.	downy brome shepherd's-purse
[4] Biennial	Weed species that completes its life cycle over two growing seasons.	wild carrot, common mullein, musk thistle
[5] Perennial	Weed that continues to regrow over a few seasons to many seasons.	johnsongrass, buckhorn plantain, sagebrush
[6] Creeping Perennial	Perennial weeds with vegetative structures (stolons or rhizomes) that permit them to reproduce asexually (without seed).	field bindweed, quackgrass, Canada thistle

Chart source: <http://forages.oregonstate.edu/nfgc/eo/onlineforagecurriculum/instructormaterials/availabletopics/weeds/lifecycle>

## Smart watering in the vegetable garden

Rebecca Finneran and Mary Wilson, Michigan State University Extension

Smart gardeners know managing water in a home vegetable garden not only conserves water resources, but will also lead to healthy plants and improved productivity. But how much water does a vegetable garden need? The answer is rooted in understanding your garden soil and plant's needs at various stages during their life cycle.

### Get to know your soil

First, dig into your garden and find out whether you have clay or sandy soil. Different soil types dramatically affect how much moisture is available to garden plants. Sandy soils are prone to drying while soils with high clay content hold moisture much longer. Soils with proper amounts of organic matter will better retain moisture during drought. It may be necessary to add organic matter to your garden in the beginning of the season or after harvest each year. Compost or well-rotted manures are often used for moisture retention and can contain natural bacteria and microorganisms to boost soil health (see the Smart Gardening tip sheet "Smart fertilizer use: A vegetable garden begins with a soil management plan" at [www.migarden.msu.edu](http://www.migarden.msu.edu)). To gain an understanding of your soil type and organic matter levels, find out how to take a soil sample in the Smart Gardening tip sheet "Don't guess – soil test!" at [www.migarden.msu.edu](http://www.migarden.msu.edu). Soil tests can be purchased online at the MSU Extension Bookstore (search for E3154 at [www.shop.msu.edu](http://www.shop.msu.edu)).

### When to water

As with other plants, the time of day when you water is as important as how much water. Long periods of leaf wetness can lead to certain diseases. Focus on watering during morning hours or mid-day when leaves will dry off quickly, and if possible, avoid overhead irrigation. This helps reduce the potential for disease infections. Watering in the morning also reduces water loss from evaporation.

### How much to water

Some years natural rainfall may supply all the moisture your vegetable garden needs. However, with seasonal variations of rainfall and temperature conditions, gardeners may wonder if they need to provide additional water, and if so, how much? One way to know is to use a rain gauge. Wide variations in weather patterns distribute uneven amounts of rainfall across a geographical area. Watch your local weather forecast for information on rainfall, or visit MSU's Enviroweather at [www.enviroweather.msu.edu](http://www.enviroweather.msu.edu) and check the station nearest you. Be aware if you are out-of-town, one site may receive little to no rainfall while another nearby site could receive a deluge. Using a measuring device like a rain gauge or even an empty can will help you know how much water your garden received while you were sleeping. The gauge should be near the garden where water splashing off pavement or overhangs won't affect the reading.



Rebecca Finneran, MSUE

Focus on watering during the morning hours or mid-day when leaves dry off quickly.



Mary Wilson, MSUE

Smart irrigation types are soaker hoses or drip irrigation systems, commonly combined with plastic mulch.



Rebecca Finneran, MSUE

Many commercial sprinklers do not distribute an even pattern and should be evaluated using a rain gauge or empty can.

A collaboration with

Measuring irrigation outputs from your sprinkler or other watering source will help smart gardeners know how much irrigation is being applied. Many commercial sprinklers do not distribute water in an even pattern across the swath. If only using time as a method of measure, some of your vegetable plants may languish without enough water while others may be swimming.

Most gardening references agree the average garden needs about 1 inch of water a week. However, days that are windy and sunny with low humidity cause far greater losses of soil moisture than cloudy, calm or humid days. Never underestimate the power of your index finger when it comes to deciding when to water. Inserting your finger into the soil profile at a 1- to 2-inch depth will quickly tell you whether or not the soil is dry. When you can feel moisture just under the surface, you know irrigation is probably not needed.

Consider the plant's life cycle when you water. For example, recent transplants need frequent, light watering to accommodate their shallow, young roots and ease the shock of being pulled from their containers. Once plants are established, keep soil moist to a depth of 6-8 inches.

Steady watering is critical at the time of flowering and fruit formation to improve fruit set, flavor and quality. Consistent soil moisture can also prevent some vegetable disorders such as blossom end rot on tomatoes.

## Conservation is key

Many soils have adequate moisture-holding capacity. However, when soils don't have any vegetative covering or mulch, they dry out quickly, causing the beneficial microorganisms in the upper couple of inches of soil to be less effective. See the Smart Gardening tip sheet "Smart gardens begin with healthy soil" at [www.migarden.msu.edu](http://www.migarden.msu.edu) for more information.

Organic mulch such as straw, shredded leaves, bark or compost conserves water in your soil by shielding the ground from the hot rays that evaporates moisture. Organic mulches don't have to be thick to be effective. Using a layer 1-3 inches deep in between rows or beds will be sufficient for at least one year. Coarse, fibrous



Rebecca Finneran, MSUE

materials such as shredded bark may provide cover for up to three years.

Soak the soil before you lay on mulch. Just as the mulch maintains soil moisture evaporation, it also slows penetration of water to the roots. It's more efficient to get the water down first then mulch. It may also initially save your plants from waiting for water to percolate through the mulch when they are accustomed to getting it right away. As an extra bonus, mulch suppresses those thirsty weeds trying to elbow their way in the garden.

When plants are placed into beds instead of wide rows, the emerging canopy of foliage will act as a moisture conservation tool. When the foliage completely shades the soil, less moisture is lost and fewer competing weeds will germinate.

Inorganic mulches such as black or colored plastic will keep valuable moisture in the soil profile when summer heat escalates. Plastic mulch will need a source of moisture such as a drip or soaker hose underneath since the plastic also sheds natural rainfall and overhead irrigation. As with organic mulches, be sure to water the soil first before laying down the plastic.

## Soak 'em with soaker hoses and drip irrigation

There are a myriad of irrigation methods for vegetable gardens. The "smartest" types of irrigation are soaker hoses and drip irrigation systems. These two methods drastically reduce the quantity of water needed because water is concentrated at the root zone – right where it's needed – so less water is wasted. These systems also lay on the ground beneath the foliage canopy, providing water to the root system without wetting the foliage.

Soaker hoses and drip systems are often used in tandem with organic or inorganic mulch with the mulch covering the hoses or tubing. This efficient method of watering allows moisture to be distributed to the root system while conserving water loss from evaporation.

For more information on a wide variety of **smart gardening** articles, or to find out about smart gardening classes and events, visit [www.migarden.msu.edu](http://www.migarden.msu.edu).



For more information on other topics, visit [www.msue.msu.edu](http://www.msue.msu.edu). To contact an expert in your area, visit [expert.msue.msu.edu](http://expert.msue.msu.edu) or call our hotline at 888-678-3464.

Published January 2015



Go  
Green

# Vegetable Harvest Tip Sheet

**Asparagus:** Cut for only 3-4 weeks the second year of growth; harvest for 5-7 weeks all years afterwards. Cut when the spears first appear in the spring before the tips lose their tight appearance.

**Lima Beans & Snap Beans:** Pick before seeds reach their full maturity, when they are still tender. Never allow any old pods to stay on the bush or vine since this will slow down new pod set.

**Beets:** Beets are ready for harvest when the tops are large enough to be used for greens or the root is large enough for cooking (1--1-1/2 inches in diameter).

**Broccoli:** Cut when center shoot or head is about 5-8 inches across but while the little individual buds are still tight. Side shoots will develop that can be harvested for about a month.

**Cabbage:** Harvest when the heads are solid and before they split.

**Carrots:** Harvest when big enough to eat. Early pencil-sized thinnings are delicious.

**Cauliflower:** Tie leaves together when young heads are 2-3 inches in diameter. Cut white heads when big enough but before they get "ricey".

**Swiss Chard:** Keep outer leaves cut, and the plant will continue to produce greens until frost.

**Collards:** Harvest the leaves as needed. The flavor is improved by a touch of frost.

**Sweet Corn:** The best time for canning and eating fresh corn is when it is in the milk stage. The kernels are full grown but the milk is still watery and will squirt out freely when pressed.

**Cucumbers:** Harvest when fruits are slender and dark green, before color starts to get light. Keep the vines picked clean; just one old cucumber left on the vine will cause it to stop setting fruit.

**Egg Plant:** Fruits must be used while still highly glossy on the outside. As soon as the fruit begins to dull, the flavor becomes bitter. Harvest promptly when mature.

**Kale:** Cut outer leaves or the entire plant. Frost may improve the flavor.

**Kohlrabi:** Harvest as soon as the stem enlargement attains a diameter of 2-3 inches, since it becomes tough when larger.

**Leeks:** Toward the end of the summer the leeks should be blanched by hilling the soil around the lower stems. Harvest in fall, winter, or the following spring after a spring planting.

**Lettuce:** Pick outer leaves of leaf lettuce as they grow. Harvest heading types when the head is full. Harvest before heat causes bitterness if they variety is not heat tolerant.

**Muskmelon (Cantaloupe):** This is fully ripe when the stem will slip or break away by just lifting the melon.

**Okra:** Harvest every day or so to get the young (up to 3-1/2") pods that are still very tender. The pods must be kept picked for continuous pod production.

**Onions:** For scallions or spring onions, harvest when ½" in diameter. For storing, harvest when the stalks turn brown and fall over. More uniform ripening can be obtained by bending the tops over by hand.

**Parsnip:** Leave in the ground and use as needed. Can be harvested from first frost to late February, prior to spring growth.

**Peas:** Snow peas are harvested when the pods develop, but before the peas get large. Standard peas should be picked slightly before the seeds reach their full size.

**Pepper:** Harvest when the fruit is mature. Sweet peppers are of better quality when allowed to turn red on the plant.

**Potato:** Harvest when the vine dies (or before, if new potatoes are desired). Potatoes for storing will keep better if allowed to remain in the ground a while after the vines die. Prevent exposure of tubers to light as long as they are in the ground.

**Pumpkin:** Harvest when fully mature but before frost. The color will be dark and the rind will be hard.

**Radish:** Pull when the roots are big enough to eat. Early thinnings can be pulled small to make room for others to grow.

**Spinach:** May be harvested from the time the plants have 5-6 leaves until just before the seedstalks develop.

**Squash:** Summer Squash is picked when small and still very tender. Like cucumbers, they should never be left on the vine past maturity. Winter Squash can be picked young and eaten like summer squash; but should be left on the vine until they reach full maturity for the characteristic winter squash.

The rind will be hard and the color will have deepened in most cases.

**Sweet Potato:** May be dug as soon as the roots are edible size. For storing, they should be well matured before digging. That is, a cut surface dries on exposure to air, as opposed to turning dark as immature ones do.

**Tomato:** Pick when they become red ripe but before they get soft. If picked green, they will ripen in the dark.

**Turnip:** Harvest when tops are large enough to cut or when the roots reach the desired size.

**Watermelon:** The bottom color changes from a light to a richer yellow. The top surface takes on a dull appearance.

## Notes:

## Fall Vegetable Gardening

*Diane Relf, Extension Specialist, Horticulture, Virginia Tech*

### Planning for a fall harvest

By planning and planting a fall vegetable garden it is possible to have fresh vegetables up to and even past the first frosts. At the time when retail vegetable prices are on the rise, you can be reaping large and varied harvests from your still-productive garden site.

Many varieties of vegetables can be planted in midsummer to late summer for fall harvests. Succession plantings of warm-season crops, such as corn and bean, can be harvested until the first killing frost. Cool-season crops, such as kale, turnip, mustard, broccoli, and cabbage, grow well during the cool fall days and withstand light frosts. Timely planting is the key to a successful fall garden.

To calculate the time to plant a particular vegetable for the latest harvest in your area, you need to know the average date of the first killing frost and the number of days to maturity for the variety grown. Choose earliest maturing varieties for late plantings. The formula below for determining the number of days to count back from the first frost will help determine when to start your fall garden.

#### Number of days from seeding or transplanting outdoors to harvest

- + Number of days from seed to transplant if you grow your own
- + Average harvest period
- + Fall Factor (about two weeks)
- + Frost Tender Factor (if applicable); 2 weeks
- = Days to count back from first frost date

The **Frost Tender Factor** is added only for those crops that are sensitive to frost (corn, bean, cucumber, tomato, squash), as these must mature two weeks before frost in order to produce a reasonable harvest. The **Fall Factor**

takes into account the slower growth that results from cooler weather and shorter days in the fall and amounts to about two weeks. This time can be reduced two to five days by presprouting seeds. Almost any crop that isn't grown for transplants can benefit from presprouting. Sprout seeds indoors, allowing them to reach a length of up to an inch. Sprouted seeds may be planted deeper than normal to help prevent drying out, and they should be watered well until they break the soil surface. Care should be taken not to break off the sprouts when planting them.

### Planting for fall harvest

When planting fall crops, prepare the soil by restoring nutrients removed by spring and summer crops. A light layer of compost or aged manure or a small application of complete chemical fertilizer will boost soil nutrients in preparation for another crop.

Dry soil may make working the soil difficult and inhibit seed germination during the midsummer period. Plant fall vegetables when the soil is moist after a rain, or water the area thoroughly the day before planting. Seeds may be planted in a shallow trench to conserve moisture. Cover the seeds about twice as deeply as you do in the spring. An old-time trick for germinating seeds in midsummer is to plant the seeds, water them in well, then place a board over the row until the sprouts just reach the soil surface; at that time, remove the board. An organic mulch on top will help keep the soil cool and moist but should not be deep enough to interfere with germination. Mulching between rows can also help keep soil cool and decrease soil drying. In severe hot weather, a light, open type of mulch, such as loose straw or pine boughs, may be placed over the seeded row. This must be removed as soon as seedlings are up so they receive full sun. Starting transplants in a shaded cold frame or in a cool indoor area is another possibility.

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Once young plants are established, a heavier mulch may be used to hold moisture and control weeds. Irrigate when necessary so the young plants have sufficient moisture. Fall plantings often have few insect problems, as they avoid the peak insect activity period of midsummer. However, some insects, such as cabbageworm and corn earworm, may be even worse late in the year than in summer; vigilance is still required! Avoid some pests and diseases by planting crops of different families than were originally in that section of the garden.

Some of the best-quality vegetables are produced during the warm days and cool nights of the fall season. These environmental conditions add sugar to sweet corn and crispness to carrots. Parsnips and Jerusalem artichokes are examples of crops that are very much improved by a touch of frost.

The fall garden gives you a chance to try again any spring failures you might have encountered. Some crops, in fact, grow well only in the fall in certain areas. Cauliflower and long-season Chinese cabbage are two examples of crops that do not produce well in mountain areas in spring because they cannot reach maturity before the cool weather ends. Protection of vegetable plants during cold periods may extend your season even further. Although in the hot days of summer, the last thing you want to think about is planting more crops to take care of, look ahead to the fall garden which offers its own satisfaction through prolonged harvest of fresh vegetables, savings in food costs, and the knowledge that you're making full use of your gardening space and season.

## Care of fall crops

The beginning of fall garden care comes when the weather and the radio station announce the first arrival of frost. Your main concern then should be to harvest all ripe, tender crops. Tomato, summer squash, melon, eggplant, cucumber, pepper, and okra are some of the crops that cannot withstand frost and should be picked immediately. Store the vegetables in a place where they can be held until needed for eating or processing. If the frost warning is mild, predicting no lower than 30° F, try covering tender plants in your garden that still hold an abundance of immature fruit. Baskets, burlap, boxes, blankets, or buckets help protect them from the frost. Warm days after the frost will still mature some of the fruit as long as the plants have this nightly frost protection. Much will depend on the garden's micro-

climate. If your spot is low and unsheltered, it is likely to be a frost pocket. Gardens sheltered from winds and on the upper side of a slope are less susceptible to early frost damage.

When using a cold frame to extend the harvest season, be sure to close the top on frosty nights to protect the plants from the cold. When the sun comes out the next morning and the air warms, open the cold frame again; leave it closed if daytime temperatures are low.

Cool-season crops, such as cabbage, cauliflower, broccoli, spinach, and Brussels sprouts, can withstand some cold. In fact, their flavor may be enhanced after a frost. They cannot stay in the garden all winter, but do not need to be picked immediately when frost comes. Kale, spinach, evergreen bunching onion, lettuce, parsley, parsnip, carrots, and salsify are some crops that may survive all winter in the garden. Mulch these overwintering vegetables with 8 inches of mulch to prevent heaving of the soil. Most of these vegetables can be dug or picked as needed throughout the winter or in early spring.

## Care of perennial vegetables

Now is the time to prepare perennial vegetables for winter, too. Most will benefit from a topdressing of manure or compost and a layer of mulch, which reduces damage from freezing and thawing of the soil. Dead leaf stalks of perennial vegetables, such as asparagus and rhubarb, should be cut to the ground after their tops are killed by frost, though some people prefer to leave asparagus stalks until late winter to hold snow over the bed. Don't forget strawberry beds. Remove weeds that you let grow when you were too busy last summer. You can transplant some of the runner plants if you have had no disease problems and the plants are vigorous. Carefully dig a good-sized ball of soil with the roots. Mulch the bed well with a light material. Old raspberry canes can be cut back at this time or late in the winter.

When tender crops have been harvested and overwintering crops cared for, pull up all stakes and trellises in the garden except those stakes that are clearly marking the sites of overwintering plants. Clean remnants of plant materials and soil from stakes and trellises. Hose them down and allow to dry. Tie stakes in bundles, and stack them so that they won't get lost over the winter. If possible, roll up wire trellises and tie them securely. Store these items inside your attic, barn, or shed in an area where they are out of the way and where rodents

and other animals cannot get to them to use as winter nests.

## Preparing soil for winter

Now you are ready to prepare the soil for winter. Pull up all dead and unproductive plants, and place this residue on top of the soil to be tilled under or in the compost heap. Remove any diseased or insect-infested plant material from the garden that may shelter overwintering stages of disease and insect pests. If this plant material is left in the garden, you are leaving an inoculum of diseases and insects that will begin to reproduce next spring and add to your pest problems.

The best thing to do is to remove infested plant material from the garden or burn it, where legal. Burning will kill any diseases or insects that may be in plant wastes. Spread the ashes on the garden to get the benefit of mineral nutrients. Check laws in your area before burning anything; you may need a permit. If you live near a wooded area, burning may be too risky. In this case, haul the diseased material away.

Clean-up also gives you the chance to add compost to the garden. Compost contains highly nutritious, decomposed plant material and beneficial organisms and is an excellent soil builder. By spreading compost and other wastes on the soil and plowing them in, you are adding nutrients to the soil for next year's crop. The beneficial insects and microorganisms in the compost will help integrate the compost with the soil, and the added humus will improve soil structure.

Don't overlook other excellent sources of organic material available during the fall. Leaves are abundant, and neighbors will usually be glad to give their leaves away. Put some on the garden now, and store some for next year's mulch. Leaves will mat if put on in too thick a layer and will not decompose quickly. You can help leaves break down more easily by running a lawn mower back and forth over the pile. Put the shredded leaves directly onto the garden or compost them. Sawdust and wood chips can be obtained in bulk from some sawmills, and farms and stables often want to get rid of manure piles before winter.

If you wait until spring to add organic material to the garden, it may not have time to decompose and add its valuable nutrients to the soil by the time you are ready to plant, and you may have to delay planting to a later date. Hot (very fresh) manure can also burn young

seedlings. By adding these materials in the fall, you give them plenty of time to decompose and blend into the soil before planting time. If you don't have enough organic material for the entire garden, try to cover those areas that you want especially rich for next summer's crop.

Check with your county recycling center for mulch or compost but keep in mind that it may contain weed seed or disease.

If possible, plow or rotary till in the fall. Turning under vegetation in the fall allows earlier planting in the spring and is especially good for heavy soils, since they are exposed to the freezing and thawing that takes place during the winter. This helps to improve soil structure. If you have a rainy fall or if the garden is steep and subject to erosion, you may decide you'd rather plant a cover crop for winter garden protection. A cover crop decreases erosion of the soil during the winter, adds organic material when it is incorporated in the spring, improves soil tilth and porosity, and adds valuable nutrients. Winter cover crops can be planted as early as August 1, but should not be planted any later than November 1. They should make some growth before hard frost. Where you have fall crops growing, you can sow cover crop seed between rows a month or less before expected harvest. This way, the cover crop gets a good start, but will not interfere with vegetable plant growth.

Prepare the soil for cover crop seed by tilling under plant wastes from the summer. Ask at the seed store what the best type of cover crop for your area is and at what rate (pounds per 100 square feet) to plant it. Broadcast the seed, preferably before a rain, and rake it evenly into the soil. Spring planting may be delayed somewhat by the practice of cover cropping, since time must be allowed for the break down of the green manure. If you have crops that need to be planted very early, you may prefer to leave a section of the garden bare or with a stubble mulch.

When time or weather conditions prohibit either tilling or cover cropping, you may wish to let your garden lie under a mulch of compost, plant wastes, or leaves all winter to be plowed or tilled under in the spring. However, if you want to plant early the next spring, a mulch of heavy materials, such as whole leaves, may keep the soil cold long enough to delay planting. In this case, chop them fine enough so they will break down over the winter. The addition of fertilizer high in nitrogen will also help break down organic matter more quickly.

## Care of garden equipment

Clean-up of tools and equipment is another important practice related to the garden that should be completed in the fall. Proper clean-up of tools now will leave them in top shape and ready to use when spring comes. Clean, oil, and repair all hand tools. Repaint handles or identification marks that have faded over the summer. Sharpen all blades, and remove any rust. Power tools should be cleaned of all plant material and dirt. Replace worn spark plugs, oil all necessary parts, and sharpen blades. Store all tools in their proper place indoors, never outdoors where they will rust over the winter.

Unless you are lucky enough to live in a warm area where a cold frame will protect vegetables all winter, you will need to clean up the frame when all vegetables have been harvested. Remove all remaining plant material, and spread it on the cold frame soil. Spade the plant refuse and any other organic material into the soil in the cold frame as thoroughly as possible. Do not leave the top on the cold frame over the winter as the cold air or the weight of snow may crack or break the glass. Remove the top, wash it thoroughly, and store it on its side in a protected indoor area where it will not get broken.

## Cover Crops

Type	Legume/ Non- legume	Amount to Sow/ 100ft <sup>2</sup> (oz.)	When to Sow	When to Turn Under	Effects	Notes
Alfalfa	L	1/2	spring  late summer	fall  spring	Fixes 150-250 lbs. N/ac./yr; deep roots break up hard soil, trace elements to surface.	Loam, fairly fertile soil; needs warm temps. for germination. Lime if pH is low. Hardy. In mountains sow by Aug 10. Drought tolerant. Inoculate.
Barley	N	4	fall  spring	spring  fall	Adds organic matter; improves soil aggregation.	Prefers medium-rich, loam soil. Lime if pH is low. Not as hardy as rye. Tolerates drought.
Buckwheat	N	2 1/2	spring  summer	summer  fall	Mellows soil; rich in potassium	Must leave part of garden in cover crop during season. Grows quickly. Not hardy.
Crimson Clover	L	1/3	spring  fall	fall  spring	Fixes 100-150 lbs. N/ac./yr.	Not reliably hardy. Sow before mid-Sept. in Piedmont and mountains. Not drought tolerant. Lime if pH is low. White clover is a bit hardier.
Fava beans	L	plant 8" apart	early spring  late summer	early summer  fall	Some types fix 70-100 lbs. N/ac./yr in as little as 6 weeks. Use small seeded rather than large seeded table types.	Will grow on many soil types. Medium drought. tolerance. Likes cool growing weather. Good for mountain areas. If planted in early spring can grow late vegetables. Inoculate with same bacteria as hairy vetch.
Oats	N	4	spring fall	summer spring	Adds organic matter; improves soil aggregation.	Needs adequate manganese. Not hardy; tolerates low pH
Rye, winter	N	3 1/2	fall	spring	Adds organic matter; improves soil aggregation.	Very hardy. Can plant until late October.
Vetch, hairy	L	2 1/2	early fall	spring	Fixes 80-100 lbs. N/ac./yr.	Inoculate; slow to establish. Fairly hardy. Till under before it seeds; can become a weed.
Wheat, winter	N	4	fall	spring	Adds organic matter; improves soil aggregation.	Prefers medium-rich, loam soil. Lime if pH is low. Not as hardy as rye. Tolerates drought.

CROP	1	1	1	1	1	1	1	9	8	7	6	5	4	3	2	1	0	0	2	3	4	5	6	7	8	9	1
	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
beans, bush																											
beans, wax																											
beets																											
broccoli																											
brussels sprouts*+																											
cabbage*																											
chinese cabbage*																											
carrots																											
cauliflower																											
chard, swiss																											
collards																											
cucumbers																											
endive																											
kale																											
kohlrabi																											
leeks																											
bibb lettuce																											
leaf lettuce																											
mustard																											
onion seed•																											
garden peasN																											
potatoes•																											
radish																											
rutabaga•																											
spinach																											
turnips																											

KEY

	PLANTING PERIOD		PLANT AND HARVEST		HARVEST PERIOD
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\* Transplants    + Use special two-season varieties only    • Tidewater and Piedmont only    N Mountains only

*Reviewed by Alan McDaniel, associate professor, Horticulture*

## Yard and Garden

# Grafting and budding fruit trees

Leonard B. Hertz, Former Extension Horticulturist

## What Is Grafting?

The seed from a Haralson apple will produce an apple tree, but it will not produce a Haralson apple tree. Likewise, the seed from a Honeygold apple will not produce a Honeygold apple tree. In other words, fruit trees cannot be reproduced "true" to the original cultivar from seed. They can only be reproduced by grafting.

Grafting describes any of a number of techniques in which a section of a stem with leaf buds is inserted into the stock of a tree. Grafting is useful however, for more than reproduction of an original cultivar. It is also used to repair injured fruit trees or for topworking an established tree to one or more different cultivars.

Nurseries often use the budding method to produce fruit trees (Figure 1). Asphalt grafting compound is applied to a completed whip graft to prevent wood tissues from drying out. This method is used mainly on young apple and pear trees when branches are small (Figure 2).

By topworking you can do the following:

- An undesirable cultivar can be changed by grafting a preferred cultivar to the branches.
- Cultivars that lack hardiness or have poor crotches (narrow angled) can be made more durable by grafting them on hardy, strong-crotched cultivars such as Hibernial, Virginia, or Columbia Crab.
- Pollinator cultivars can be grown much sooner by topworking than by planting young trees.
- New cultivars for trial can be brought into bearing in 2 or 3 years if topworked on stock of bearing age.
- Interesting novelties can be developed by grafting several cultivars on one tree.



Figure 1. A budded apple shoot completely wrapped with rubber budding strips.



Figure 2. A cleft graft covered with asphalt grafting compound

## A glossary of grafting terms

1. Budding knife
2. Grafting knife
3. A fine-tooth saw for cleft grafting
4. Pruning shears
5. Dormant scions (cultivar labeled)
6. Tying material such as grafting tape, adhesive tape, electrician's ber tape or rubber strips
7. Asphalt water emulsion compound for covering grafts
8. A light hammer for bridge grafting
9. A cleft-grafting chisel and mallet, or a heavy knife or hatchet can be used for a small job



## Protective coatings

All grafts should be covered with a protective coating immediately after completing the graft.

Electrician's tape is an excellent material that will bind and protect graft unions. Choose a brand that is elastic and amply adhesive. A good tape for the purpose will stick well to itself. Do not stretch this tape too tightly or it may crack or weather. Better brands will last throughout the first summer, after which the tape is no longer needed.

Asphalt water emulsion is now widely used as a protective coating on graft unions. It is of pasty consistency and can be applied with a brush. It is preferable, however, to smear it on thicker with a small paddle.

## Methods of grafting

### The Whip Graft

The whip graft is used mostly on young apple and pear trees when the branches are relatively small (not more than 1/2-inch in diameter) and the understock is about the same diameter as the scion of the new cultivar.

**Cut** – Cut off a branch of the understock, leaving a stub at least a foot long. Make a straight, slanting cut about 1 1/2 inches long on both the scion and the stock (see A and C in Figure 3). Make the cut straight and even – one stroke with a sharp knife will do it. For the tongue, make a straight draw cut (not split), beginning near the top and cutting about the full length of the level (B and D).

**Union** – Match the two parts together (E). Unless the scion and stock are the same size, be sure the scion is in contact with the inner bark on one side. If the toe of either the stock or scion extend beyond the heel of the other, cut it off evenly.

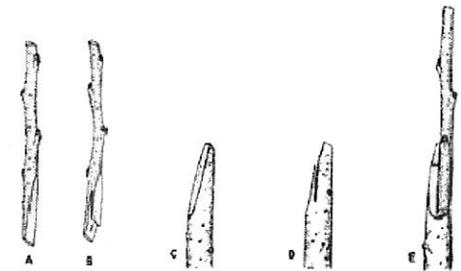


Figure 3. The whip graft is usually used for grafting root stocks and scions but can also be used for grafting small branches.

grow undisturbed. However, do not permit this understock growth to shade out the scions. The second spring, select the most suitable scion as the permanent branch and consider the others as spares. Leave the spare scions on to assist in healing over the stub, but cut them back to a few buds on each (see B). The third spring, severely cut back the spare scions again. In the fourth season, or when crowding is noted, cut off all of the spare scions as seems necessary (C).

Figure 6. Trouble ahead in the next storm. Don't let two leaders compete

#### The modified cleft graft

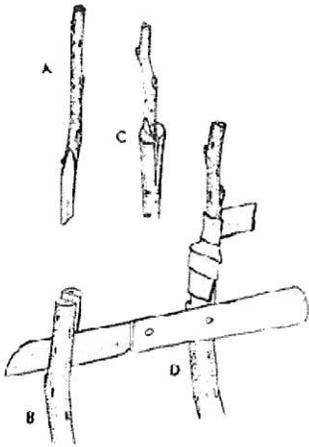


Figure 7. Modified cleft graft

Instead of trying to master the whip graft or side graft, use a simple kind of cleft graft on small understock. Stock (see B) about the same size as the scion (A) may be split and a wedge-shaped scion inserted.

Should the stock be larger than the scion, be careful to set the scion to one side instead of on center (C). In this way the cambium of stock and scion will make contact.

Wrap this graft union (D) carefully with a good grade of rubber tape. As the graft grows the tape stretches and eventually deteriorates.

Very large trees are generally poor subjects for cleft grafting, so when grafting their large branches, a slightly different method is ordinarily used.

Carefully saw off the branch undercutting it first to avoid tearing the bark. You may need to recut the stub to get it smooth. Saw the branch to receive the scions,

instead of splitting it.

Make two saw cuts about 4 inches deep at right angles to each other across the end of the stub, making a + shape. Then fit the scions into the four places made by these cuts.

#### The side graft

Although the side graft is adapted to a wide range of branch sizes (1/4 to 3/4 inch diameter), its use is generally restricted to branches that are too large for the whip graft yet not large enough for the cleft graft. As the name suggests, the scion is inserted into the side of the stock, which is generally larger in diameter than the scion.

**Cuts** – Select a smooth place on the understock branch at least a foot from the trunk. Make a slanting cut at a narrow angle almost to the pith (core of the branch) (see B in Figure 8). Cut the scion to a short, sharp wedge (about 1 inch) with one side thicker than the other (see A).

**Union** – Bend the branch slightly to open the cut. Press the scion in so the cambium layers of the stock and scion meet at one side (C).

**Tying and covering** – Tying is unnecessary if the stock binds well, but you may have to tie small materials if the scion is not held firmly. Cut surfaces should then be covered with grafting compound (E).

**Aftercare** – In about two weeks, cut off the stock above the union (D) using sharp shears in order to avoid

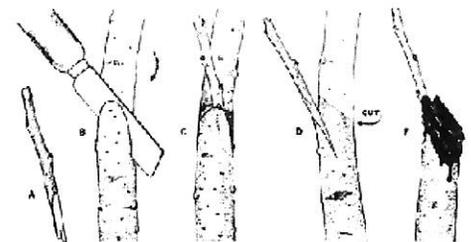


Figure 8. In the side graft, the cut goes across the grain to reduce splitting.

As illustrated in Figure 10, cut from A well under the bud to B. Remove the knife and rock the blade just through the bark at B. Grasp the bark between your thumb and finger and pinch the bark with attached bud (C) free from the wood (D). If the bud stick is fresh and in good condition, you will be successful after a few tries.

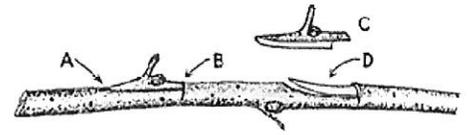


Figure 10. Bud with wood removed

Buds which have the sliver of wood removed have a complete cambium surface exposed to meet the cambium of the stock and sometimes result in better growth, but they are not rigid enough to handle easily. Buds with wood attached are easier to handle and usually give good results. (See above, for "Tying" and "Aftercare" of the bud.)

### The Bridge Graft

When the bark of a tree is removed (girdled) completely around the trunk, that part of the tree above the damaged area will die. Even though completely girdled, some trees may leaf out and remain alive for one season, but both the top and root will die the second year unless shoots have been produced below the girdled areas.

Girdling can be caused by rodents, which damage many fruit trees each year. Occasionally a tree may only appear to be girdled if the gnawing has not gone through the bark to the wood. Sometimes the girdled area extends less than halfway around the trunk, and such injuries are protected from drying out, new bark will grow from the cambium. As soon as you discover an injury, cover it with an asphalt grafting compound.

Rabbit damage is usually some distance above the ground or snow line. These animals cut off twigs and pull off bark in shreds. Mice work near the ground out of sight under grass or snow. They usually begin at one spot and enlarge it. Pocket gophers gnaw off roots below the ground. Trees hurt in this way often tip over and cannot be repaired.

The following supplies are necessary to repair girdled trees:

- A sharp knife, such as a good jackknife
- Small nails for tacking scions to the tree
- A light hammer
- A nail set
- A saw for trimming old thick bark
- A shovel or trowel if damage is below the ground
- A heavy scrub brush for cleaning excavated bark
- Dormant or fresh cut scions for bridges
- Asphalt grafting compound or asphalt wound dressing

**Scion** – Scions for apple trees may be taken from any hardy cultivar of apple or crab apple. Pear scions must be used for pear, plum for plums, and so on. Old trees rarely produce good scion wood unless they were pruned well the previous year. If 1-year old-wood is not available, 2-year wood may be used. If you can anticipate the need, you should cut the scions before any growth begins. Keep them in moist and cool

**Covering and care** – When all the scions are in place, the graft unions should be covered with grafting compound. Note that the entire girdled surface should be covered and more than one coat may be necessary.

In bridge grafting, after the scions begin to grow, it is important that all shoots or leafy growth be cut or rubbed off the scions.

## How to protect the graft

Immediately after completion of the graft the scions should be protected from drying out. Use a grafting compound on the graft unions and other cut surfaces.

### Some reasons why a graft fails

- The scion and stock were incompatible; apple will not unite with plum, for example.
- The grafting was done in the wrong season.
- The understock was not healthy.
- The scions were not vigorous.
- The scions were dry or injured by cold temperatures
- The scions were not dormant.
- The cambium of scion and stock were not meeting properly.
- The scions were upside down.
- The graft was improperly covered with grafting compound.
- The scions were displaced by wind, birds or storms.
- The graft was shaded too much after growth began.
- New growth was damaged by aphids or other insects.
- New growth was killed by fire blight.
- The union girdled because the bindings or label were not released in time.

### What if grafts fail?

One hundred percent success in grafting is rare. The failure of one or two scions is not serious, since usually more scions are inserted than are necessary for the completed tree. On branches where the scions fail let the shoots grow. These can be budded the same summer or grafted later. Some shoot growth is needed for regrafting, but don't let them become so dense that they crowd the scions.

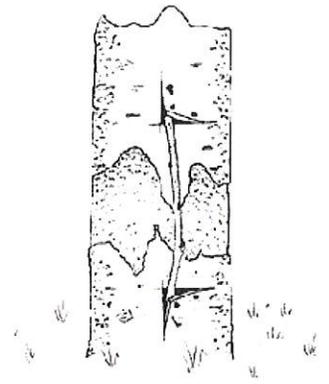


Figure 12. A quick way to bridge girdled trees. Scions are cut and inserted essentially the same as in Figure 8.

## Cover crops in soil health

The [Cornell Soil Health Team](#) is working to provide tools to assess soil health. These assessments let growers identify the improvements in soil management that would have the most impact.

The report from the soil health test provides prescriptions for ways to correct the deficiencies that the test identifies. Several of the prescriptions are to use cover crops. This site is intended to help fill those prescriptions. The following is a list of management goals and what you would look for in a cover crop to address them.

- Suppress weeds
  - Rapidly establishing smother crops
- Protect soil from rain or runoff
  - Broad leaves to intercept rain
  - Robust root system to hold surface soil
- Improve soil aggregate stability
  - Active exudation of glues and fungus food from roots
  - Root-surface fungi that produce aggregate glues
- Reduce surface crusting
  - Shallow, fibrous root system
- Add active organic matter to soil
  - High biomass with mixture of quickly and slowly-decomposing parts
- Break hardpan
  - Deep roots that swell during growth
- Fix nitrogen
  - Legumes with high biomass and active fixation in farm fields.
- Scavenge soil nitrogen
  - Active growth in fall and good nitrogen storage over winter.
- Suppress soil diseases and pests
  - Support beneficial soil microbes
  - Produce suppressive compounds

The [Soil Health Manual](#) has information on measuring your soil's condition. It includes information on the Cornell Soil Health Test sample collection and its interpretation. It also takes advantage of the [Cornell Soil Health Team's](#) new diagnostic tool for determining which aspects of soil health need improvement.

# Cover crops for mid to late summer

## Late season buckwheat and sudangrass; annual ryegrass

Early vegetable harvest begins in mid to late summer. Rather than leave the ground open to grow weeds, the land can be improved by holding it with a cover crop. Reducing weed seed production is an obvious advantage that will be appreciated the following year. Using the great growing conditions of late summer also allows you to address soil health issues by choosing a cover crop that directly targets properties that are a concern. Hard surface soil and subsurface compaction are both common vegetable production limitations. Both inhibit crop growth directly and create favorable conditions for soil-borne diseases by reducing percolation. Late summer cover crops also scavenge leftover nitrogen and add a lot of organic matter. These processes provide both organic nitrogen reserves and food for the microbes that increase the soil's potentially mineralizable nitrogen.

For planting in July, the main choices are buckwheat and sudangrass. These two cover crops are at their best when sown in July, and can be sown into early August. Annual ryegrass becomes a possibility beginning in August.

**Buckwheat and sudangrass** [Last month's article](#) described making the choice between buckwheat and sudangrass. Buckwheat works in a shorter window (40 days), is excellent on weeds, and leaves the soil mellow and ready to plant. Sudangrass and its relative, sorghum-sudangrass, are great for producing organic matter and penetrating a plow layer, but need a longer window (70 days), higher fertility, and more management. The following section recaps how to choose between buckwheat and sudangrass.

*Buckwheat:* One of the big advantages of buckwheat is that it works in little more than a month and leaves the ground ready to plant. The short

cycle lets you use buckwheat between summer crops. It can even fit between peas and broccoli. It works especially well before fall grains - it is done in time to sow grain at the ideal time. Buckwheat can be sown as late as mid-August, but growth slows down at its normal mid-September ripening time. There are many other cover crop choices available later in the summer.

Buckwheat seeded in July and early August sets seed quickly. If spring buckwheat volunteers are hard for you to control, make sure to stop the cover crop at the right time. If it is mowed too early (30 days), it will regrow and make seed in less than a month. If it is mowed or incorporated too late (45 days), it will already have viable seed that will sprout in the spring. Buckwheat volunteers tend not to be a problem with row crops that have early cultivation or post-emergence herbicide programs.

*Sudangrass:* Sudangrass needs over two months before the following crop can be planted. If you are seeding in late July, it will best be used as a winter-killed cover. Early July seedings may leave enough time to establish winter rye.

Sudangrass has a coarser and deeper root system that is valuable for correcting plow-pan compaction. It is also one of the best cover crops for resupplying the soil with active carbon. Active carbon is important to have in your soil because it provides sustenance for beneficial microbes. In particular, farmers with low-quality muck soil have seen great improvements by using sudangrass.

### **Annual ryegrass**

Annual ryegrass can be grown into the fall but is more commonly grown on through the winter. If you want an August-seeded, overwintering cover crop, the choice is annual ryegrass. It corrects hard surface soil by creating a sod. It does more for hard surface soil than buckwheat, but takes much longer and requires some time for decomposition. Annual ryegrass is also good for weed suppression. It grows vigorously enough to outcompete late summer annuals as well as winter annuals that start in the fall.

Annual ryegrass is a good cover crop choice on heavier ground because it has better flooding tolerance than other cover crops.

For weed control, a rapid start and vigorous growth are essential. A rapid start depends on good soil moisture. Vigorous growth depends on available nitrogen. There is often a substantial amount of nitrogen left in the soil after vegetables. If there is not, 30 lb/ac of nitrogen can double fall growth of the ryegrass. With these conditions, annual ryegrass will outcompete weed seedlings, but established weeds must be killed before sowing the cover crop.

The key to successful seeding is getting the seed in contact with moisture. Under dry conditions, drilling is essential. If the soil surface is moist, broadcasting without covering is effective. Good seedling growth requires continued moisture. July and early August tend to be too dry to support July-sown annual ryegrass seedlings. July seedlings can succeed with irrigation or in wet years, but buckwheat and sudangrass are much more reliable in July. Weak seedling growth can be an advantage when established between beds on plastic mulch.

Annual ryegrass will mostly overwinter, especially where there is good snow cover. Winter survival varies considerably among varieties: Southern types will kill, whereas Midwestern ones will survive. The variety is often not specified in the New York market, so winter survival may not be consistent. For more predictable performance, specific varieties can be ordered from Oregon through your dealer.

August seeded annual ryegrass makes a dense sod by spring. This is valuable for improving the soil condition and for nitrogen scavenging. However, it takes some decomposition after spring tillage to break it up. The major concern with annual ryegrass is that it not go to seed in the spring. [WHY?] It can be controlled by tillage. Once the air is warm, glyphosate also works. Glyphosate is not effective until the daytime temperature has reached the 50s. In vegetables, the common grass herbicides control annual ryegrass. Annual ryegrass volunteers are particularly undesirable in small grains, so special care must be taken if they are part of your rotation.

When planting annual ryegrass in August, it is worth having a plan for how the field will be prepared in the spring. The plan should include a method for killing the sod, and should allow time for it to decompose before the field is fitted and planted.

Annual ryegrass can be interseeded into crops that will be harvested in late August or September. If conditions are moist, simply broadcasting seed on the surface is enough. Interseeding is best done just before the crop fills the canopy. The crop will begin to establish a shallow root system, but will not be competitive in the shade of the crop. This early sod could reduce damage from harvest traffic, and could help speed the recovery of the soil after harvest. Interseeding into a vegetable crop allows the cover crop to establish better in the fall than does a grain sown well after vegetable harvest.

For August seeding, the planting rates are 10 lb/ac if drilled into reasonably moist soil, and 15 lb/ac in dryer soil. Broadcasting requires 15-20 lb/ac. On dry soil, rates can go as high as 30 lb/ac. Seed cost is usually under \$1/lb. Seedway distributes annual ryegrass seed in New York.

*This article is intended for publication in Cornell Cooperative Extension newsletters, and similar outlets, that reach growers by late June.*

*Cover Crop Seed Source:*

*Walnut Creek Seed LLC,*

*100 Basil Western Rd.,*

*Carroll, OH 43112*

*Sales: 330-475-6352*

*Email:*

*Sales@walnutcreekseeds.com*

*Info@walnutcreekseeds.com*



# Basic Floral Design

4-H 2354L

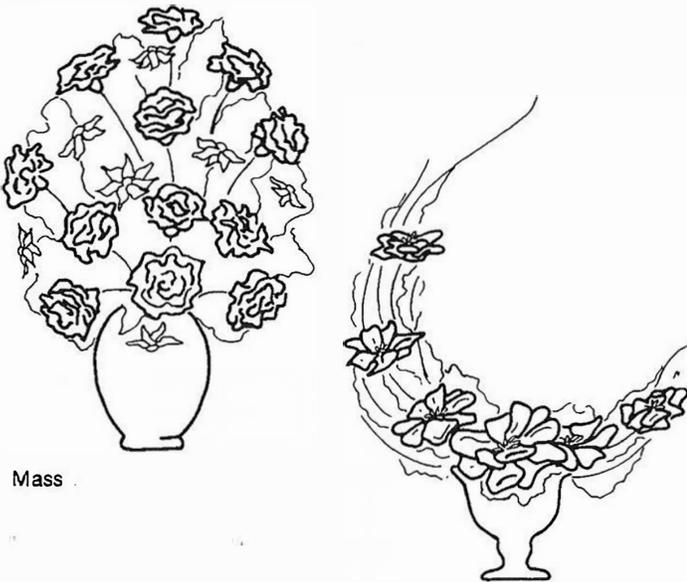
Oregon State University Extension Service

August 1979

# Basic Floral Design

This unit presents only the basics of floral design and gives patterns that 4-H participants may follow. A minimum of space is devoted to terminology and principles of floral design; many books describing these terms are available from local libraries. A slide tape series of all design principles and construction of the basic patterns is also available from the State 4-H Audio Visual Library, Extension Hall, OSU, Corvallis.

## History



Mass

Line mass

Most floral design today is a combination of Oriental and European influences. Oriental design is characterized by minimum use of plant materials. These arrangements often use a single flower as the focal or main point of interest and are traditionally referred to as "line" design. This conservation of natural materials was first taught by Confucius.

The European design is generally a large round or oval mass of flowers. Flower placement is not rigidly dictated as in Oriental design. The European "mass" design often does not have a focal point. The design itself is used as the room's focal point.

Much floral design in the United States is referred to as "line mass" and combines Oriental and European ideas. American floral design uses more material than the Oriental design, but far less materials than the European. Floral design in the United States is often built around linear patterns, further showing the Oriental influence.

## Principles and Terms

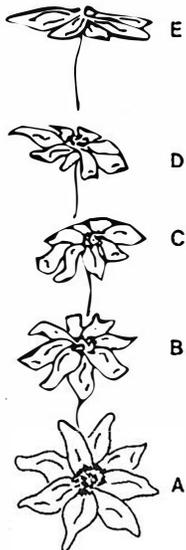


Balance

These principles have developed over many years and are used as guidelines in all types of design.

**Balance.** Balance refers to the distribution of "visual weight" on either side of the design's vertical axis. The design should have as much "visual weight" on one side of its vertical axis as on the other. Anything that appears to be unbalanced gives a feeling of uneasiness.

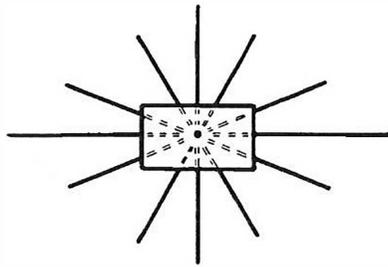
Balance can be symmetrical (both sides of the design are exactly the same) or asymmetrical (the two sides may be quite different in appearance). In all cases the "visual weight" on one side exactly counter-balances the "visual weight" on the other.



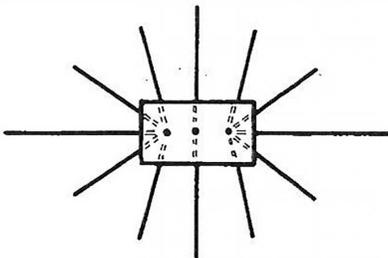
Facing

**Facing (size, shape and color).** Facing flowers in different directions greatly alters their "visual weight." Altering their respective positions increases or decreases the eye appeal or visual weight. Similarly, altering flower size, shape, or color creates these same effects.

For example, does **A, B, C, D,** or **E** have the greatest eye appeal or visual weight? As **A** appears largest, it would have the greatest attraction. All five are the same size, but they are merely faced differently.



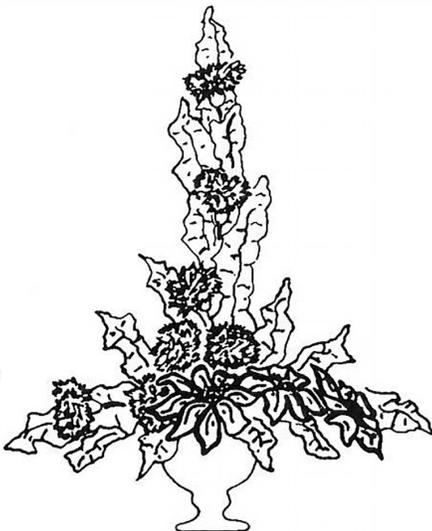
Good orientation



Poor orientation

**Orientation.** This refers to the radial distribution around the central axis within the design. Attempt to make all stems appear as if they come from one central point, but also use different lengths to avoid a flat appearance. Violation of this principle is most common in the construction of centerpiece arrangements.

Create "visual depth" or a three-dimensional effect by using flowers and greens of different lengths and by placing materials in front and back of the arrangement. If all flowers are positioned to give a flat, continuous effect, the design will look unnatural and artificial.



Dominance

**Dominance.** It is often very easy to develop a design using many kinds of flowers and foliages, but when the design is finished it appears to be a hodgepodge of color, texture, sizes, and shapes. Use a predominance of one color, texture, shape, and size in basic design, and compliment this with small amounts of other colors. By maintaining a dominance of one type of material, the finished design is more harmonious and pleasing.

Equal amounts of two colors often result in a lack of interest in the design. Equal quantities of material or colors compete for dominance and make the total design uninteresting.



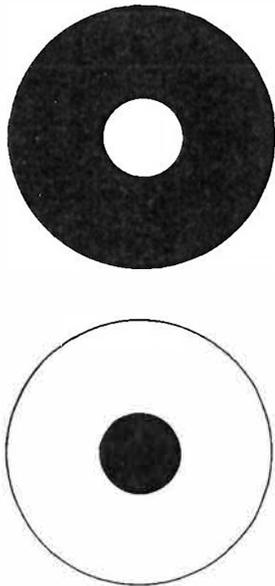
Proper focal points

**Focal Point or Center of Interest.** The focal point of your design is usually located in the lower center because the eye is drawn to this area. Develop the focal point by using all the principles discussed. Proper spacing of flowers moves the eye to the center of the design. This is also possible by proper facing, color, and size development of flowers.

**Visual Weight.** Visual weight is anything that draws, moves, holds, and returns the eye to a given place in the design. Light colors generally have more eye appeal than dark colors. The actual color, however, is not as important in eye appeal as the relative quantities of the various colors.

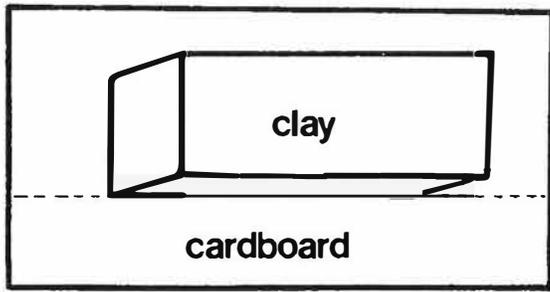
For example, a black circle with a white center, will draw the eye to the white center first, because of the color contrast and the position within the circle. A black spot in a white circle, will draw and hold the eye to the black spot for the same reason.

Color dominance and contrast is very important in design. When working with only a single color, flower facing, shape, and textures of foliage all play major roles in developing eye appeal. Although physical weight must be considered, it is visual weight that will most easily promote or destroy the finished product.

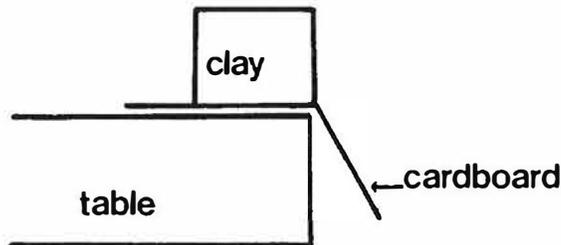


Visual weight

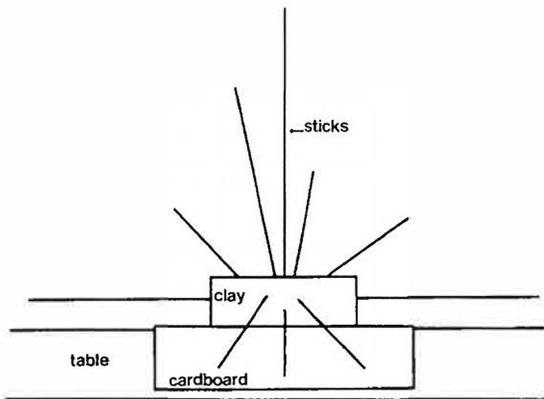
## Teaching Techniques



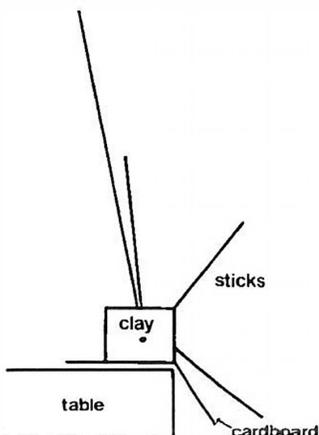
Top view



Side view



Front view



Side view

Since flowers are quite expensive and not always readily available, you may wish to teach positioning of main line flowers by using clay and sticks. Gather straight willow or filbert sticks and have your 4-H members cut them into various lengths. Do not handle the clay more than necessary; it will not hold position once it becomes warm. Place soft clay in the refrigerator or freezer for a short time to harden it.

Place the clay blocks (about 2 by 2 by 4 inches or about 5 by 5 by 10 cm) on a folded 4 by 6 inch (about 10 by 15 cm) card or paper. This prevents clay oil from soiling the table top.

Assume that the table edge is the container edge.

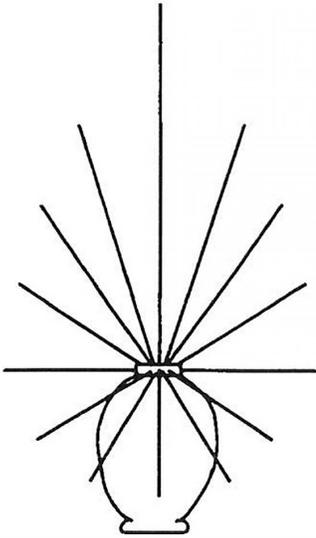
Place the clay on the table edge and use sticks to cover the edge. If the clay tips forward or backward, the design is out of physical balance. Fold the card over the edge of the table and complete the stick design following the directions in "Design Patterns."

Have beginners use flowers 2 to 2½ inches (5 to 6.5 cm) in diameter such as daisies, mums, calendula, bachelor buttons, zinnia, marigold, and spike flowers like snapdragons, salvia, and gladiolus. Foliages for beginning designers include privet, boxwood, forsythia, sword fern, and evergreens.

### Oval or round designs

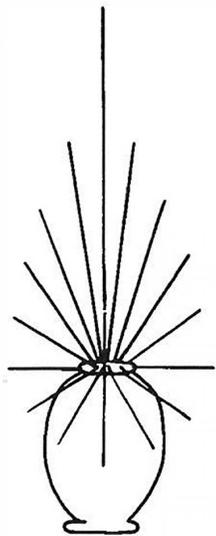
A completely symmetrical placement is normally used only in large oval or round designs.

The largest and fullest design pattern is the symmetrical *oval* or *round* design. All stems, other than the center line, are duplicated on the right and left sides.



Oval or round

Now shorten the sides and bottom.

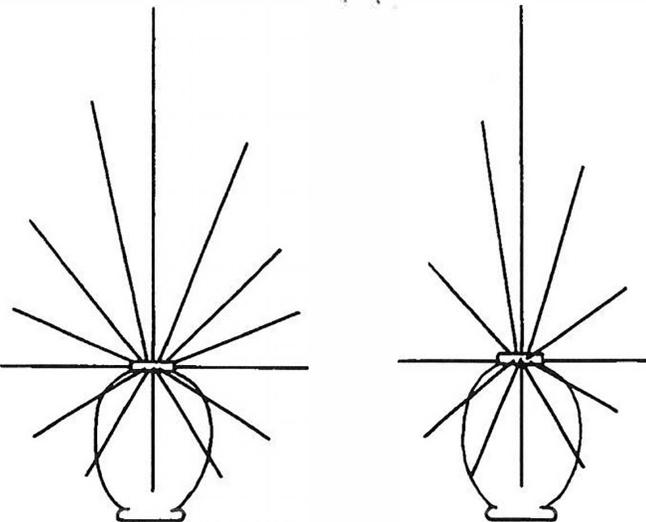


Begin shortening

### Teardrop or linear designs

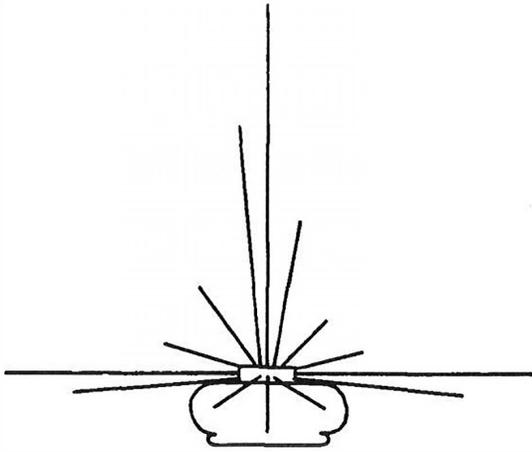
Use the same outline, but move to an asymmetrical placement of the main vertical lines. This makes a much narrower vertical line and creates an asymmetrical design.

The short stems at the base are symmetrically placed.



Beginning of a teardrop

Further lengthening of the sides creates an *inverted "T"* design. This style is often used in front of speaker's podiums or on tables.

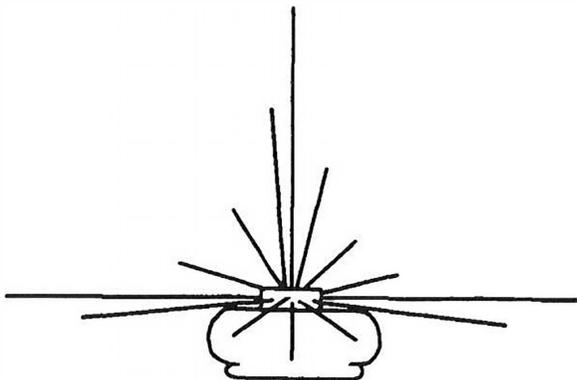


Inverted "T"



Finished inverted "T"

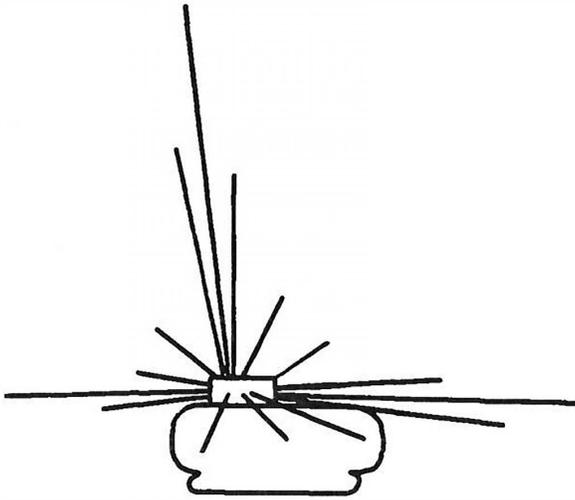
Leave the base broad and shorten the top. This resembles an inverted "T", and is popular on a coffee table or other low areas.



Low inverted "T"

### "EII" pattern design

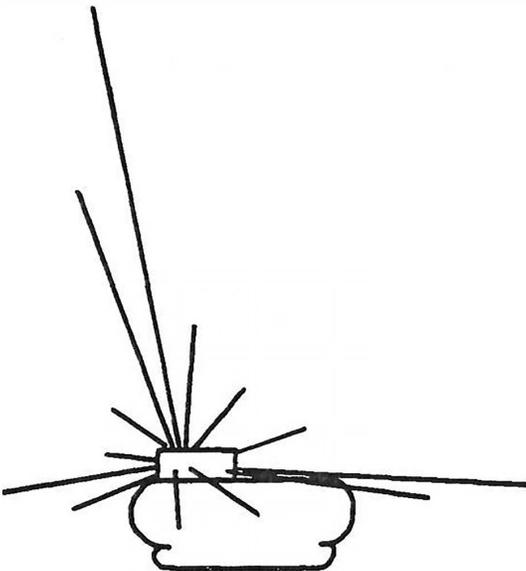
Start with an inverted "T." Move the floral foam to one side; lean the top to the same side and shorten the horizontal leg on that side to maintain balance.



Floral foam to one side

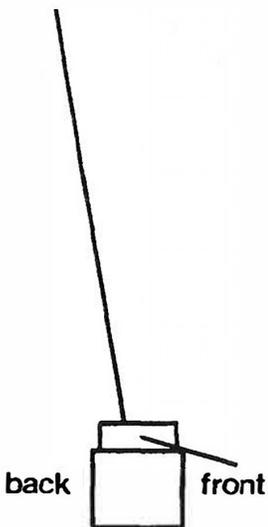
Shorten this side even more, and the *three-legged "EII"* pattern develops. As in other tall arrangements, the top leans slightly backwards to counterbalance the lower stems placed forward.

Notice that the second longest line in the vertical portion is always opposite of the horizontal leg.

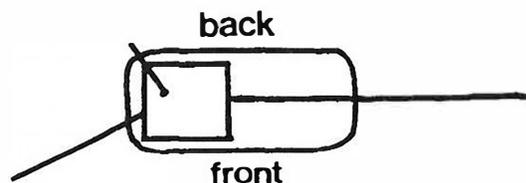


Three-legged "EII"

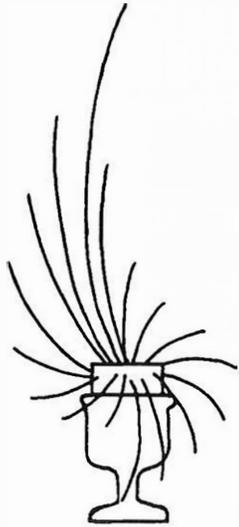
When making the three-legged "EII," position the shortened leg more forward than in the traditional "T" pattern.



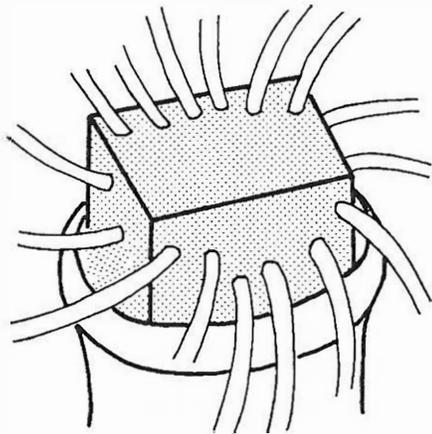
Side view



Top view



"S" shape (Hogarth)



Floral foam close-up



Finished Hogarth Curve

Two basic floral design patterns use easily curved materials like Scotch Broom, Pine, Forsythia, and Privet. In both the Hogarth Curve and the crescent shape, the uppermost line normally touches the center line of the entire design but this is not always necessary.

### Hogarth Curve design

The *Hogarth Curve* arrangement is named after William Hogarth who believed the "S" shaped line to be the essence of beauty. This elongated, stylized "S" arrangement has most of its visual weight near the focal point or just above the rim of the container.

Allow at least 2 inches (about 5 cm) or more of the flower holder to remain above the container.

The arc of greens begins in the center of the stem holder and gradually moves left and forward so that the shortest stems eventually come forward and down.

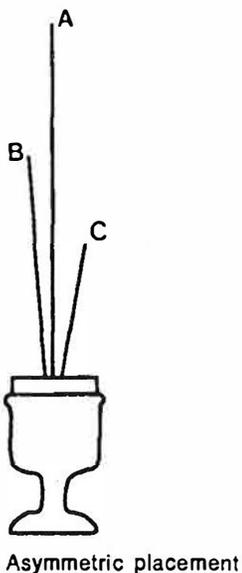
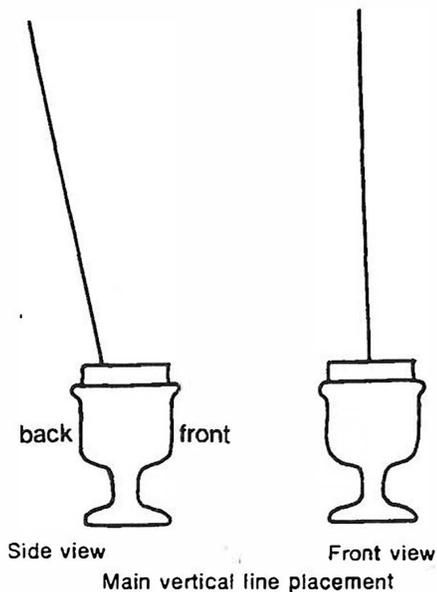
The lower half of the design is just the opposite with the longest lower line dropping out of the front of the holder and the shorter lines placed in the front, sides, and top of the holder. Focal point flowers are added only to a relatively small area.

## Design Construction

After learning about different floral designs, take a closer look at them by making two designs. Use a foam type holder (if this is not available, any type will work) and "asymmetric" placement.

### Constructing a vertical or linear oval

- Select either a vertical or linear oval design.
- Select a container. A tall linear shape, box shape or compote will do.
- Soak the flower holder material and place it into the container so that about 1½ inches (about 4 cm) shows above the container edge.
- Select the longest and least open flower for the main vertical line. Selecting the least open flower, reduces the visual weight at the top.
- Cut the stem about 2 to 2½ times the height of the container. Place it to the center or rear of the holder so that it leans backwards slightly.

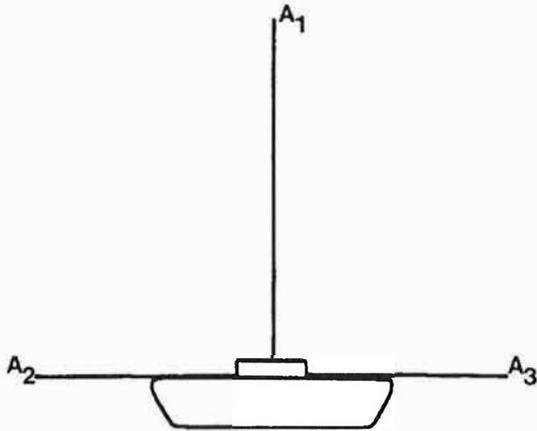


- Find stems slightly different in length and degree of openness. Place them in the three stem pattern (asymmetric placement) to develop the main vertical line (A, B, C).

### Constructing an inverted "T"

Let's now build another style of design.

- Select the "inverted "T" design style.
- Select a container. Low bowls work nicely for this style.
- Soak the flower holding material and place it in the container so that 1½ inches (about 4 cm) of the holding material extends above the container.
- Select the three longest, most sturdy and least open flowers for the three main lines (**A<sub>1</sub>**, **A<sub>2</sub>**, **A<sub>3</sub>**).

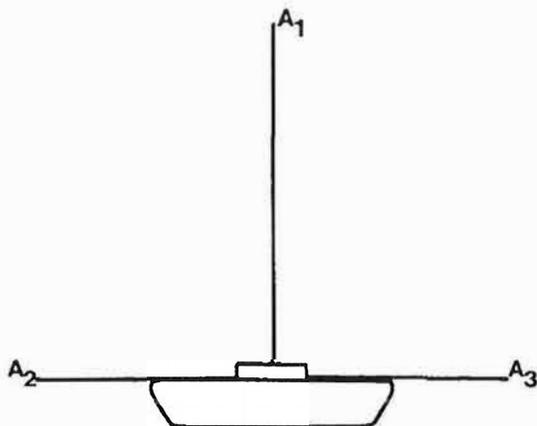


Main vertical lines



Side view, main vertical line

- Place the main vertical line to the rear or center of the holding material and lean it slightly backward. This offsets the weight in front of the holding material.



Main horizontal lines

- Place the main horizontal lines so that they extend straight to the sides or slightly forward. The angle depends upon the finished arrangement's location. Allow stems **A<sub>2</sub>** and **A<sub>3</sub>** to rest on the edge of the containers.



Finished Inverted "T"

• The inverted "T" can be made in many shapes and variations. Linear designs are generally more pleasing and less costly to make.

Remember too, that if the first design doesn't please you, tear it apart and make another. Practice makes perfect.

## Summary

These designs show the close relationship between design patterns and details of construction. Participants in 4-H basic floral design should understand and visualize that the change from one design type to another is generally not a major change but is achieved by altering a few stems.

Understanding visual balance is probably the most important design principle. Even though a piece of art is beautiful, it should not leave the viewer with an uneasy feeling because of a construction flaw.



# Poinsettia care

## Tip Sheet

### Poinsettias as part of a Real Michigan Christmas

Joel Poinsett was the first U.S. ambassador to Mexico, where poinsettias are native. He brought plants back to South Carolina in 1828 and is credited for naming the popular holiday plant (and founding the Smithsonian Institution). In 2010, Michigan ranked 7<sup>th</sup> nationally in poinsettia production growing almost 2.4 million poinsettia plants of a wholesale value over \$9.2 million. When you purchase a real poinsettia, check to see where it was grown. It may very well have been produced on a Michigan farm by a Michigan grower.

### Are poinsettias poisonous?

No! While they are not meant to be eaten, they are safe to display in your home. Studies have shown that poinsettia plants are not poisonous. In fact, a 1996 study published in the *American Journal of Emergency Medicine* reported no fatalities in more than 22,000 accidental ingestions, 93 percent of which involved children. However, some people may be allergic to the milky sap called latex and small pets may choke on fibrous leaves.

### How do I select a poinsettia?

Look for dark, green leaves throughout the



Martin LaBar @Flickr

plant, fully colored bracts, and few open yellow flowers (see diagram). Don't buy plants if they are already in a sleeve or displayed in a crowded manner. Avoid wilted plants, even though the media is moist. Protect plants from cold wind (temperatures colder than 50°F) with a sleeve. Carefully unwrap the poinsettia when you get it home.

### What kind should I buy?

Traditional red, white, and pink poinsettias are readily available, but there are also several unusual cultivars on the market now. For example, there is a curly cultivar named 'Winter Rose' and a multi-colored one called 'Holly Point.' You can even spray glitter on poinsettias to add even more sparkle to your holidays!

### How do I care for poinsettias in my home?

Poinsettias are living plants, so they need sunlight and water. Like most houseplants, it is best to display the plants in bright but indirect sunlight for 5 or more hours. Water when the



Leaves curl on this cultivar, 'Winter Rose.'

[www.migarden.msu.edu](http://www.migarden.msu.edu)

MICHIGAN STATE UNIVERSITY

Extension

Project GREEN

By Bridget K. Behe, Professor, MSU Department of Horticulture. October 2011.

soil/media becomes dry to the touch. If you're comfortable in the room, poinsettias are too (60 to 70°F). Only fertilize after the blooming period has ended, sometime between March and May.

### Can I get my poinsettia to rebloom next year?

You may want to leave it up to the professionals and add your poinsettia to the compost pile after the flowers fade. Or, be ready for some work. Cut the poinsettia plant back half way in April. By the end of May, new shoots should have emerged. Put the plant outside after danger of frost has past. Prune again in June to keep it bushy and compact. Water and lightly fertilize during this period of active growth from May through the end of summer. Poinsettias flower in response to the length of the night so, by October 1, you need to put the plant in complete darkness for 14 continuous hours (5:00 p.m. to 7:00 a.m.) **EVERY** night with 6 to 8 hours of bright sunlight. Doing that daily procedure should produce flowers for Christmas.



At left, a blue poinsettia, and below, 'Holly Point.'



At left, 'Peppermint Twist.'

### Notes: