Common Companion Planting Partners

Target Plant	Companions	Antagonists
Asparagus	Basil Parsley Tomato	
Beans	Carrots Cauliflower Potatoes Summer Savory	Onion Family
Pole Beans	Corn Radishes	Kohlrabi Sunflower
Beats	Bush Beans Kohlrabi Mustard Onions Pole Beans	
Broccoli	Aromatic Plants (dill, sage, rosemary) Beets Onions Oregano Potatoes	Pole Beans Strawberries Tomatoes
Cabbage	Bush Beans Celery Dill Hyssop Mint Onions Potatoes Thyme Wormwood	Pole Beans Strawberries Tomatoes
Caraway	Peas	Fennel
Carrots	Chives Leaf Lettuce Leeks Onions Rosemary Sage Tomatoes	Dill
Cauliflower	(same as cabbage)	
Celery	Bush Beans Cabbage Cauliflower Leeks Lettuce Tomatoes	
Corn	Beans Cucumbers Peas Potatoes Pumpkins Squash Sunflowers (in alternating strips)	Tomatoes
Cucumber	Beans Peas Radishes (2 or 3 radish seeds in hill with the cucumbers) Sunflowers	Aromatic Herbs Potatoes
Dill	Cabbage	Carrots
Eggplant	Green Beans	
Fennel		Wormwood
Kohlrabi	Beets Cucumbers Onions	Pole Beans Strawberries Tomatoes
Leeks	Carrots Celery Onions	
Lettuce	Carrots Celery Cucumbers Onions Radishes Strawberries	
Onions	Beets Cabbage Lettuce Strawberries Tomatoes	Beans Peas
Parsley	Asparagus Tomatoes	
Peas	Beans Carrots Corn Cucumbers Potatoes Radishes Turnips	Garlic Onions Shallots
Potatoes	Beans Cabbage Corn Horseradish Peas	Cucumbers Pumpkins Raspberries Squash Tomatoes
Pumpkin	Corn	Potatoes
Radishes	Bush Beans Kohlrabi Pole Beans	Hyssop
Tomato	Basil Carrots Chives Onions Parsley	Corn Potatoes

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0604

OKLAHOMA COOPERATIVE EXTENSION SERVICE HLA-6431

Earth-Kind Gardening Series

Cultural Control Practices

David Hillock
Extension Consumer Horticulturist

Clydette Borthick
Extension Consumer Horticulture Assistant

Effective control of insects, diseases, and weeds should begin before the garden is planted. Cultural controls play a key role in this effort. Cultural controls are ways of modifying the garden environment to hamper pests' breeding, feeding, and shelter habits. Cultural control practices can help reduce the need for pesticides while still maintaining a healthy garden. A healthy garden helps ensure healthy crops, and healthy crops are less susceptible to pest damage.

Some Helpful Definitions:

Cultural Control—the purposeful manipulation of a garden's growing, planting, and cultivation to reduce pest damage and pest numbers.

Earth-Kind Gardening—a program developed by the Oklahoma Cooperative Extension Service and the Texas Agricultural Extension Service to address environmental garden and lawn issues. The program promotes an environmentally sound stance on pesticide and fertilizer use, water quality, resource conservation, and solid waste management. Earth-Kind Gardening encourages non-chemical practices such as cultural, mechanical, and biological controls for garden pests.

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
http://osufacts.okstate.edu

Organic Gardening—a system of growing healthy plants by encouraging healthy soil and beneficial insects and wildlife (also known as "natural," "ecological," or "common sense" gardening). The philosophy includes the way gardeners treat the soil, design their gardens, and choose which plants to grow. It also includes how gardeners decide which fertilizers to use and how they control weeds and pests. Organic gardeners avoid using synthetically produced fertilizers, pesticides, and livestock feed additives. However, the term organic gardening has different meanings among different individuals, so a synthetically manufactured fertilizer or pesticide may be objectionable to one organic gardener but acceptable to another.

Cultural Controls: Making Your Site Unattractive to Pests

Cultural control methods include properly selecting and rotating crops, sanitizing and solarizing the soil, choosing the best planting and harvest times, using resistant varieties and certified plants, taking advantage of allelopathy, and intercropping.

Crop Rotation

Certain pests are more common in some crops than in others. Rotating crops to different sites can isolate pests form their food source or can change the conditions pests must tolerate. If another site is not available, change the type of crops grown in the garden plot. Do not put members of the same plant family in the same location in consecutive seasons. For example, do not follow melons with cucumbers or squash. This is also true for rotations using green manure crops, which add organic matter to the soil when they are tiled in before they produce flowers or seeds.

Waiting two years to plant the same family of vegetable in the same location is the most effective rotation practice; however, yearly rotations can also be beneficial. Rotating annual flower plantings is also a good practice.

Sanitation

Many organisms responsible for disease and insect problems overwinter in plant debris such as shriveled fruit. Diseases on these shriveled fruit infect new leaves following spring. Removing crop residues, weeds, thatch, and volunteer

Vegetables Families

Tomato Family:
tomato, potato, pepper, eggplant
Onion Family:
onion, shallot, leek, chive, garlic
Beet Family:
beet, Swiss chard, spinach
Cole Crop Family:
cabbage, cauliflower, broccoli, brussels sprouts, bok choy, collards, kale, kohlrabi, mustard, radish, rutabaga, turnip
Legume Family:
bean, pea, cowpea, peanut
Carrot Family:
carrot, celery, celeriac, parsley
Cucurbit Family:
cucumber, watermelon, cantaloupe, pumpkin, squash, gourds
Lettuce Family:
lettuce, chicory, endive
Green Manure Crop Family:
hybrid sudangrass, buckwheat, soybean, cowpea, mung bean, garden pea, fava bean, ryegrass, rye grain, barley, oats, vetch, Austrian winter pea, clovers, greens

plants by either disposing of them in a compost or by spading them into the soil will deter pest buildup and eliminate food and shelter for many insects and diseases. You can also reduce pest buildup by controlling weeds in the garden, landscape, and adjoining borders.

Soil Solarization

A clear plastic sheet spread over the soil traps solar heat, which kills soilborne diseases, insects, nematodes, and many weed seeds. The treatment should occur during summer's high air temperatures and intense solar radiation. Keep the soil damp during the solarization process, and keep the plastic in place for several weeks. OSU Extension Fact Sheet EPP-7640 explains soil solarization in more detail.

Timed Plantings and Harvests

Many crops may be planted or harvested early to miss heavy pest infestations, while still achieving a full yield. Planting earlier than normal may involve the use of cold frames or hot caps to protect seedlings form the weather while they get a head start growing. The crop then has a competitive edge over pests. Early planting depends upon the gardener knowing the emergence times and life cycles of the pests to be controlled.

Resistant Varieties

When buying seeds or plants, try to choose those with built-in resistance to diseases and nematodes. Sources for this information include OSU Extension Fact Sheets, seed catalogs, and plant and seed packages. It may be better to forego some production capability in favor of the increased pest resistance, if you must make such a choice. During the growing season, stressed plants can lose their resistance to pests, so be sure the crop has the water and nutrients it needs. When shopping for seeds and plants, check the labels for abbreviations similar to these, used to designate various types of pest resistance or tolerance:

A—Alternaria stem canker
ALS—angular leaf spot
ANTH—anthracnose
CMV—cucumber mosaic virus
DM—downey mildew
F—Fusarium (race 1)
FF—Fusarium (races 1 & 2)
L—leafspot
MDM—maize dwarf mosaic
N—nematode
NCLB—northern corn leaf blight
PM—powdery mildew
SCLB—southern corn leaf blight
St—Stemphylium (gray leaf spot)
SW—Stewart's wilt
TLS—target leaf spot
TMV—tobacco mosaic virus
V—Verticillium

When buying seeds or plants, try to choose those with built-in resistance to diseases and nematodes.

Certified Plants

When they are available, consider buying plants labeled as "certified" or grown and inspected under sterile or quarantined conditions. Certified plants may cost more than others, but the certification guarantees they are free of diseases. Strawberries and potatoes are among crops which may be offered as certified plants.

Allelopathy

Allelopathy, a natural chemical interaction among plants, has been the subject of much research recently. Allelopathy refers to stimulatory as well as inhibitory properties. A living plant may release toxins, or in the case of decaying plant tissues, microorganisms may play a role in the release of the toxin. The microbes may also modify nontoxic compounds into toxic compounds. Black walnut trees and Johnson grass are among plants that have been shown to inhibit the growth of winter annual weeds and may offer some control of root knot nematode.

Intercropping or "Companion Planting"

The premise of companion planting is that certain plants repel insects, or attract beneficials that attack the insects. There is no significant data to prove the value of companion planting or intercropping, but it is thought that certain plants may produce substances which confuse insects, altering their impact as a pest. Some evidence also shows that planting flowers among vegetables attracts beneficial wasps seeking the flowers' nectar, and those wasps lay their eggs in the larva of certain pest species. There is a popular but largely inaccurate belief among gardeners that marigold will control nematodes and other insects if planted among vegetables. Most marigold varieties do not have this capability. Only the French marigold (*Tagetes patula*) varieties, such as Nemagold, Petite Blanc, Vinca, and Queen Sophia have been shown to reduce nematodes, and that reduction is only in their immediate root zones. To use the French marigolds as a control for root knot nematode, they should be planted throughout the garden area, as a mass planting, or as a rotation crop. This does not always provide consistent control and often is the least effective method for control of the nematodes. The marigolds may also attract spider mites tot the garden as they are a favorite host of mites.

…certain plants may produce substances which confuse insects, altering their impact as a pest.

No data from scientific studies exist to prove the value of companion planting. However, the companion planting partners listed in the table on page 4 are thought to have compatible growth habits. They share space well, and in many instances are believed to be allies by enhancing each other's growth and by warding off insects. "Antagonist" plants in the last column are believed to inhibit growth of the target plants.

Acknowledgments

The following reviewers contributed to this publication: Jim Coe, Extension Educator, Agriculture and CED, Comanche County; Jim Criswell, Associate Professor and Pesticide Coordinator, OSU Department of Entomology and Plant Pathology; Gerrit Cuperus, Professor and Extension IPM Specialist, OSU Department of Entomology and Plant Pathology; Ted Evicks, Extension Educator, Agriculture, and CED, Pittsburg County; Betsy Hudgins, Assistant Extension Specialist, OSU Department of Entomology and Plant Pathology; Gordon Johnson, Professor and Extension Soil Specialist, OSU Department of Plant and Soil Sciences; Cathy Koelsch, Extension IPM Agent, Oklahoma County Extension Office; Ron Robinson, Extension Educator, Agriculture and CED, Garfield County; Leslie Roye, Extension Educator, Agriculture, Wagoner County; Al Sutherland, Area Extension Horticulture Specialist, Chickasha Area Office.