COMPANION PLANTING

URI COLLEGE OF THE ENVIRONMENT AND LIFE SCIENCES (CELS) OUTREACH CENTER

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Websites:

URI Master Gardener Association
www.urimga.org

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www.uri.edu/cels/ceo

Most people think of plants as very passive organisms. They grow almost imperceptibly and only once a year do they flower or produce edible products. However, plants are very active in ways that are not obvious to the casual observer. Plants both change the chemistry of the soil and influence the types of microorganisms that grow around them. Plants actively compete with other plants for space. Some will poison their neighbor's offspring to maintain a competitive advantage, while others change the environment in ways that benefit other species. Plants wage a constant battle with insects, relying heavily on chemical warfare.

Naturalists have known about these properties of plants for thousands of years. About 2,000 years ago the Roman agriculturalist Varro, declared "Large walnut trees close by, make the border of the farm sterile." (We know today that plants will not grow near black walnut trees.) Chemicals in oak leaves retard the development of insects that feed on them. Some insecticides are derived from plants; examples include Neem oil, rotenone, and pyrethrins. Not all effects of plants are deleterious on other organisms. Alfalfa and clover enrich the soil with nitrogen that they capture from the air. Certain trees move groundwater to the soil surface where shallow-rooted plants can grow even under drought conditions. Such groups of plants that grow well together are called "companions."

Perhaps the best historical example of companion planting is the "Three Sisters," a system developed by Native Americans to provide food for a balanced diet from a single plot of land. In this system corn, beans, and squash are planted together in a hill; each of the crops is compatible with the others in some way. The tall corn stalks provide support for the climbing beans. The beans do not compete strongly with the corn for nutrients since as legumes, they can supply their own nitrogen. Squash provides a dense ground cover that shades out many weeds which otherwise would compete with the corn and beans.

Modern agriculture tends to rely heavily upon specialized machinery and synthetic inputs and thus have rendered companion systems such as the "Three Sisters" obsolete. Obviously, it would be difficult to harvest corn, beans, and squash simultaneously with a machine, especially when they are not planted separately in rows. However, interest is growing in using these special properties of plants to good advantage when

Note: The Hotline is open Monday—Thursday, 9:00 a.m.—2:00 p.m. from March 1 to November 1.

growing food. Home gardeners, unencumbered by the need for specialized equipment or row crop production, have rediscovered some of the beneficial interrelationships among plants. This knowledge, coupled with a long tradition of folklore, is being utilized to improve home garden production.

Selecting a Cover Crop

Certain cover crops concentrate specific nutrients in their tissues. Deeply rooted plants move nutrients from the subsoil to the aboveground parts and when the plants decompose the nutrients become available for subsequent crops. Potassium levels can be increased significantly by selecting a good preplant cover crop such as buckwheat, grain rye, and sudangrass.

Plants in the legume family are capable of gathering unusable nitrogen from the air and, with the help of special bacteria, converting it into usable nitrogen in root nodules. Legumes increase soil fertility as they decompose by releasing the stored nitrogen. An alfalfa sod that is plowed under will provide 150 to 200 lbs of nitrogen per acre the following year, 60 to 80 lbs the second year, and 30 to 40 lbs the third year. In fact, any cover crop that is plowed under will release nitrogen as the crop decomposes. This is the origin of the term "green manure."

Many plants produce substances that are toxic to other plants. The study of this phenomenon is called allelopathy. Juglone, for example, is a natural herbicide produced by the roots of walnut trees. Many plants have allelopathic effects, including sunflowers, cucumbers, oats, alfalfa, rye, and tobacco. When these crops are planted prior to other crops, weed pressure is reduced.

Enhancing Environmental Conditions

Maple trees can move groundwater from their lower roots to the upper roots where it is exuded into the soil. Herbaceous plants can use this groundwater when conditions are dry. Shade-tolerant plants often grow better under the trees than away from them.

Certain garden plants grow better if provided with some shade, while others need to be elevated above the ground to capture sunlight. Leaf lettuce grows well in the shade provided by taller crops. Rhododendrons and azaleas thrive under pine trees. Corn growers will often seed clover between rows so it will germinate after the corn is established. The clover grows throughout the fall and winter after the corn is harvested, increasing soil nitrogen when it decomposes the following spring.

Grasses often are planted between rows of perennial crops such as fruit trees. The grass alleys cool the soil, prevent erosion, improve water penetration, exclude weeds, and harbor beneficial insects.

Reducing Pest Damage

Most plants produce defensive chemicals that help repel insects and diseases. These chemicals may be insect poisons or feeding deterrents or they may have fungicidal properties. The roots of some French and African marigolds contain a substance that is toxic to certain types of nematodes; certain nematodes can be eliminated from a site by growing a thick crop of marigolds for one season prior to planting the vegetable or fruit crop, or by inter-planting marigolds between crop rows.

Destructive insects often locate their food by “smell.” Many plants, especially culinary herbs, produce strong scents that may confuse insect pests looking for a host to feed on. Garden vegetable plants such as garlic, onions, and chives, and herbs such as catnip, horehound, wormwood, basil, tansy, and mints, all produce scents which seem to repel insects or mask the scents that attract insects. A certain level of insect protection can be achieved by carefully interplanting some of these as companions to vegetables.

Many insect pests have specific food preferences while others feed on a wide assortment of hosts. Even those species that feed on a wide variety of hosts, such as Japanese beetles, have preferences for certain plants. It is possible to plant a preferred host as a trap crop near the plant that is being protected. Once the insects have settled on the trap crop, they can be killed periodically by spraying, without having to treat the protected plants.

Many insects are helpful because they eat or parasitize harmful insects. Most species of wasps and spiders are beneficial, as are ground beetles, praying mantids, lady bugs, pirate bugs, and several species of flies. It is possible to attract beneficial insects by planting flowers near the garden. Dill, parsley, carrot, coriander, angelica,

and parsnip feature flat-topped clusters of small flowers that have strong fragrances. They also seem to attract large numbers of beneficial insects, particularly predatory wasps and flies. This characteristic makes them good candidates for companion planting.

Some Practical Steps

Avoid monoculture in terms of space and time. A 100-foot long row of broccoli presents a large target for a cabbage moth that is flying by, but the same number of cabbage plants scattered over several thousand square feet, and interplanted with other crops, is less obvious and attractive to the insect. Pests that routinely plague large, commercial plantings of crops may never be a problem in the diversified home garden.

Learn to recognize beneficial insects as well as pests, and note which plants are attractive to beneficial insects. Less than one percent of insects are garden pests. Plant dill, marigolds, chives, onions, parsley, basil, and other flowers throughout the garden. Allow parsley, carrot, and celery to remain in the ground over the winter. They will produce flowers the second season and attract beneficial insects. Plant herbs with strong scents among vegetable crops. Some examples are:

- Chives planted at the base of roses may repel aphids.
- Garlic could be planted at the base of peach trees to repel borers.
- Basil planted among tomatoes may repel tomato hornworms.
- Nasturtiums grown near squash may repel squash bugs.
- Tomatoes planted among asparagus may repel asparagus beetles.
- Marigolds, mint, thyme, or chamomile may repel cabbage moths.
- Radishes make excellent trap crops for cucumber beetles among squash and cucumbers. Radishes also attract flea beetles when planted near cole crops (e.g., broccoli, cauliflower, Brussels sprouts, cabbage).
- Garden borders planted with low growing thyme or lavender deter slugs.
- Tansy and pennyroyal repel ants.

Observe plantings carefully and write down combinations that seem to work for pest control and growth enhancement. Communicate these observations to others. Try to replicate the observations or have others try the same combinations. Testimonials that are shared by many observers often turn out to be valid. Scientists have not spent much time looking at these relationships among plants and their community; furthermore, the number of possible combinations is enormous. You can be the first one to discover a new set of compatible plants!

Adapted from Robert Beyfuss and Marvin Pritts, Cornell University, 2001