



Companion planting and trap cropping vegetables

February 25, 2021

Companion planting is a great way to use space efficiently in the garden, plant your vegetables and flowers in mutually beneficial arrangements and even protect your most prized plants from insects.

At this year's Emerging Farmers Conference, farmer Lucas Humblet gave an excellent presentation about biocontrol and companion planting, and when participants asked for follow-up resources, I realized that we don't have many public-facing resources for companion planting.

Some quick internet searching revealed numerous guides and tables from seed companies and garden blogs, but it was hard to tell where they were getting their information. While some companion planting practices are a result of knowledge passed down through generations, the origins of others are hard to pinpoint.

Here's a review of different approaches to companion planting, and specific examples that are backed by research.

Companion planting for saving space, soil health, and mutual support

Companion planting can help you to achieve some important goals in the garden.

Saving space

Planting early, short-season crops in the same beds as later maturing crops is a way to conserve space, and grow multiple succession of plants in the same space. Examples include: planting lettuce, spinach, or basil early in the seasons, and transplanting peppers or tomatoes into the same bed as the early season crop matures.

By the time the early season crop is harvested, the canopy of the later season crop will begin to fill in. This is not only efficient but can help with weed management and soil health by keeping living roots in the soil and a plant canopy above the soil surface.

Soil health

By planting plants with different root structures together, you can aerate soil and allow plants to pull nutrients from different parts of the soil profile. Plants with taproots or tubers like carrots or potatoes can help to break up compaction in the soil; deep-rooted crops like melons and tomatoes pull water and nutrients from deeper in the soil profile.

Adding legumes to your garden is another great way to maximize soil health. Legumes fix nitrogen from the atmosphere and reduce your total fertilizer needs. Examples of legumes include peas, beans, and clover.

Legumes can either be planted as a crop you plan to harvest, such as snap peas or green beans, or you can sow a legume cover crop underneath your main crop (e.g. sowing cowpeas under sweet corn in a garden bed).



<https://extension.umn.edu/sites/extension.umn.edu/files/uploads/carrot-garden-rows.jpg>

Planting radishes and carrots side by side is a great example of space-saving in the garden.

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Mutual support

Some companion plants can physically support each other, reducing the need for staking or trellising. The most famous example of this is the three sisters model, which integrates corn, squash, and beans. Corn provides a stalk for beans to climb, as well as a visual deterrent for squash insects such as squash vine borer. Beans provide nitrogen, and squash can be a deterrent to vertebrate animals like raccoons, which often eat sweet corn.

The three sisters model first emerged in Mesoamerica and has been used by many indigenous communities including Pueblo, Mandan, and Iroquois tribes for hundreds of years. This model of combining corn, beans, squash and other vegetables is still the foundation of milpa farming systems in Mesoamerica today.

Companion planting for insect management

Companion plants work in three primary ways to help manage insects:

1. **With smells:** plants can emit odors that either repel insects, attract them, or simply mask the odors of other plants. Due to these traits, you can use plants to pull pests away from other crops (trap crops), repel them away from the area (repellent crops), or simply make insects less likely to land on your garden vegetables because there are too many signals to interpret.
2. **By attracting predators or parasitoids:** predator insects eat other insects, and parasitoids lay their eggs inside of other insects. By providing habitat and food for these insects, you can attract them to your garden to help you manage pests.
3. **By being visually distracting:** some insects use visual cues to find their target plants, such as leaf shape or color. If you have a whole plot full of the same plant, insects may find it more easily than if you have a variety of plants with different heights, colors, and textures.



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Marigolds are one of the most commonly promoted companion plants to ward off insects, but do they work? Sometimes yes and sometimes no.

Specific insect-plant relationships

While gardening charts online will provide you with long lists of plants that repel insects, these are not always accurate or backed by research. The following list highlights a few common garden vegetables and plants that have successfully reduced insect pest populations in research studies. This list is not exhaustive; there are likely more combinations of plants that can help to reduce insect pest populations that are not mentioned here.

Brassicas

- Various companion plants to repel flea beetles such as marigolds and green onions are listed on gardening sites and even some Extension websites, but there is little research to support this and some that contradicts it.
- However, it is well documented that some of the "spicier" Brassica crops can serve as a trap crop for flea beetles. Arugula, mustard, rapeseed, or napa cabbage can all be effective trap crops; and research shows that more diverse species compositions (3+ species planted together) are more effective at reducing flea beetle damage than single trap crops.
- Sage and thyme reduced diamondback moth populations on Brussel sprouts in the greenhouse. In an Iowa study, thyme, onion and nasturtium helped to reduce cabbage looper and imported cabbageworm damage in broccoli. Marigold, onion and nasturtium helped to reduce these two cabbage worms in cabbage.

Tomatoes

- A few studies show that basil and marigolds can be effective at reducing thrip populations in tomatoes in both field and greenhouse conditions, and intercropping with basil may even help to promote tomato growth.

Potatoes

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- Many gardening articles mention marigolds as a deterrent for Colorado potato beetles, but multiple studies have shown this to be untrue.
- In our own trial last summer to use eggplant transplants as a trap crop for potato beetles, we saw no effect (results not yet published).

Squash and pumpkins

- **Squash and pumpkins are insect-pollinated**
<https://blog-yard-garden-news.extension.umn.edu/2020/06/the-unique-pollination-systems-of.html> . By providing habitat and consistent flowers throughout the season, you can support bumblebees and other pollinators in your garden, which will help to improve pollination.
- Blue hubbard squash attracts cucumber beetle, squash bugs and squash vine borer. By planting blue hubbard squash, you can help to pull cucumber beetles away from your other cucurbits.
- Many garden blogs recommend planting nasturtium alongside squash plants. This age-old practice is supported by research, showing that nasturtium can help to reduce squash bug populations. Another study in Iowa showed that nasturtium and marigolds both helped to reduce damage from squash bugs and cucumber beetles.
- In a Florida study, African marigolds and sweet alyssum were planted with squash, which increased the number of natural enemies of aphids and had a slightly positive impact on yield.

Sweet corn

- Incorporating flowering plants with sweet corn including buckwheat, cowpea and sunn hemp has been shown to increase the populations of insect predators and parasitoids of the corn earworm

Add habitat for generalist predators and parasitoids

In many cases, simply providing a wide variety of food and habitat for beneficial insects will help to reduce pest populations.

One good example of this is syrphid flies. Syrphid fly larvae consume substantial numbers of aphids.

Adults are attracted to a wide variety of flowers, so by simply including plenty of flowers in your garden, you can attract the adults, which will lay their eggs nearby.



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Syrphid fly larva feeding on aphids

Research

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Author: Natalie Hoidal, Extension educator for local foods and vegetable crops

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