This is not a "Tidbit", it's a "Longbit". I present it as a national magazine turned it down because "the different studies showing both sides of most items will confuse our readers more than empower them." I'm pissed. What do you think of such an attitude? So, here is the entire article.

Companion Planting Myths and Realities

In the '70s I really wanted to believe in companion planting as represented by Rodale Press and others. And I did. Until I looked for the science to back up what turned out to often be anecdotal information. Luckily there's been some important research since then.

There are many definitions for companion planting. The one I like is: a specific type of polyculture when two plants are grown together because they are thought to have a beneficial, synergistic improvement on the growth of each other. This not to be confused with intercropping, which is the good use of space by planting vegetables close together or in close sequence to each other. Another definition comes from *Companion Planting and Insect Pest Control* (by Joyce E. Parker, William E. Snyder, George C. Hamilton and Cesar Rodriguez-Saona, © 2013.; licensee InTech) "…we define companion plants as interplantings of one crop (the companion) within another (the protection target), where the companion directly benefits the target through a specific known (or suspected) mechanism."

To this day my favorite example of the complexity of companion plants is a study (published in 1980!) of intercropping bush beans with marigolds—one of the most common "guidelines" of companion-planting books. It was the idea that French marigolds (*Tagetes patula*) and African marigolds (*T. erecta*) help keep Mexican bean beetles (*Epilachna varivestis*) away from green beans. The control plot had more damage than the beans with marigold rows, *but* the control plot produced *more* beans. It is thought that this is due to the exudates marigolds produce (thiopene and alpha-terthienyl) to stunt the growth of plants nearby: a form of evolutionary competitiveness of marigolds over other plants.

(From: *Effects of Companionate Planting on Snap Bean Insects,* ***Epilachna varivestia*** *and* ***Heliothis zed****,* M. A. Latheef, R. D. Irwin*,* Volume 9, Issue 2, April 1980, Entomological Society of America, Dept. of Agriculture, Virginia State Univ., Petersburg, VA 23803.)

(However, marigolds are a proven control of nematodes. Some of the cultivars that work the best for controlling nematodes are 'Nemagold', 'Petite Blanc', 'Queen Sophia', 'Tangerine', 'Golden Guardian', 'Single Gold', and 'Nema Gone'. These are best planted as a green manure one or more seasons before planting the crop. Intercropping has little effect. Once the soil is planted to a crop the nematodes begin to reappear.)

Attracting Beneficial Insects

There are a number of very different ways in which a companion plant might work:

- as a trap crop
- to repel the pest
- mask the target plant
- camouflage the crop
- by physically blocking the pest
- to harbor beneficial insects

Many people think of companion plants as those that repel pests when planted next to each other. The recommendations are not always accurate.

Sometimes it doesn't work:

- When three companion plants, rue (*Ruta graveolens*), zonal geranium (*Pelargonium hortorum*), and garlic chives (*Allium scheonparum*) were interplanted with roses the roses were not protected from the Japanese beetle, *Popillia japonica*. In fact, the geraniums increased the number of beetles. The same study surrounded roses with sachets of fennel seeds, cedar shavings, crushed red pepper, or osage orange fruits significantly *increased* the number of beetles than the control plants. (*Evaluating Companion Planting and Non-host Masking Odors for Protecting Roses from the Japanese Beetle* (Coleoptera: Scarabaeidae) D. W. Held,1 P. Gonsiska, and D. A. Potter, J. Econ. Entomol. 96(1): 81-87, 2003)

- Several putative companion plants were studied in their ability to deter Japanese beetles (*Popillia japonica*) from damaging roses and concluded that companion plants were unlikely to help. (Held D W, Gonsiska P and Potter D A. *Evaluating companion planting and non-host masking odors for protecting roses from the Japanese Beetle (Coleoptera: Scarabaeidae)*. Journal of Economic Entomology 2003; 96: 81-87.)

- …found no significant differences in the number of eggs, larvae, pupae, or damage by cabbage pests between companion plants; French marigold (Tagetes patula L.), garden nasturtium pennyroyal (Mentha pulegium L.), peppermint (Mentha piperita L.), garden sage, thyme and control treatments. (Latheef M A and Irwin R D. The effect of companionate planting on lepidopteron pests of cabbage. The Canadian Entomologist 1979; #111: 863-864.)

- French marigolds (*Tagetes patula*) intercropped in carrots did not repel the carrot fly (*Psila rosae*). (Uvah I I I and Coaker T H. *Effect of mixed cropping on some insect pests of carrots and onions.* Entomologia Experimentalist et Applicata 1984; #36: 159-167.)

- Even though sage and thyme represent two common companion plants noted for their pungent odors, there were no differences in diamond back moth oviposition between Brussels sprouts (*B. oleracea*) intercropped with sage (*S. officinalis*) and thyme (*T. vulgaris*). (Dover J W. The effects of labiate herbs and white clover on Plutella xylostella oviposition. Entomologia Experimentalis Applicata 1986;42: 243-247.)

Sometimes it does:

- With the tests of Brassica crops the companion plants that helped included sage (*Salvia officinalis*), rosemary (*Rosemarinus officinalis*), hyssop (*Hyssop officinalis*), thyme (*Thymus vulgaris*), dill (*Anethum graveolens*), southernwood (*Artemisia abrotanum*), mint (*Menta* spp.), tansy (*Tanacetum vulgare*), chamomile (several genera), and orange nasturtium (*Tropaeolum majus*). (Isman B., *Botanical insecticides, deterrents, and repellents in modern agriculture and increasingly regulated world*. Annual Review of Entomology 2006; #51: 45-66.)

- Basil (*Ocimum basilicum*) planted with tomatoes have been recorded to repel thrips and tomato hornworms. (Anon. Organic vegetable IPM guide. 2004.)

Note: The source of the above information is from: *Companion Planting and Insect Control*, Joyce E. Parker, William E. Snyder, George C. Hamilton, and Cesar Rodriguez-Saona. 2013. InTech. As this review states: "As a result, a repellent plant that can be effective for one pest might not provide effective control for another. Finally, many experiments to determine plant's repellent capabilities were carried out in laboratory settings and do not necessarily represent field conditions."

Hedges and Flower Borders for Companion Pest Control

One of the most important crossovers from agricultural research to the home garden is how to enhance the habitat for beneficial insects. This has a lot to do with what can truly be scaled down from an agricultural setting to the backyard. Or, front yard.

There has been a lot of research at the California of Davis in a suburban setting of near-by Village Home's backyards about using borders (hedgerows) to farm fields as shelters for beneficial insects to help control pests in the field. The most work was done by Robert Bugg (true name, must be destiny!) and Miguel Altieri. Altieri found that many of the beneficial insects could migrate from the hedgerow 25 meters (82 feet) into the neighboring field of corn. (personal communication 10-29-10) Obviously 82 feet covers most gardens if not landscapes. So a hedgerow has plenty of habitat for beneficial insects to pursue pests throughout the garden.

- In the fields bordered with *Phacelia tanacetifolia* (*Lacy Phacelia)*, significantly more hover fly eggs were found in fields surrounded with *P. tanacetifolia* than in control fields. (Hoverflies are syrphid flies that look a lot like bees but can, unlike bees, hover—thus the name. They belong to the insect Family *Syrphidae*.) Thus biological control of aphids by syrphid larvae can reduce the use of insecticides. *Use of Phacelia tanacetifolia Strips To Enhance Biological Control of Aphids by Hoverfly Larvae in Cereal Fields*, by Janice M Hickman, Stephen D Wratten.

- When predators of Colorado potato beetle (*Leptinotarsa decemlineata*) in eggplant fields were studied it was found that dill (*Anethum graveolens*) and coriander (*Coria drum sativa*) had flowers that were complementary to Colorado potato beetle predators. The number of predators were significantly higher in the fields interplanted with dill and coriander (ed. - not each dill or coriander adjacent to each eggplant, but strips of the herbs with rows of continuous eggplant between) than in the control field without flowers. *Impact of strip-insectary intercropping with flowers on conservation biological control of the Colorado potato beetle*. By Joseph M. Patt, George C. Hamilton, James H. Lashomb.

- When the effects of the flowers of sweet alyssum, *Lobularia maritima* were studied with the suppression of aphids in California lettuce fields, the presence of alyssum resulted in more hoverfly larvae and fewer aphids (*Hemiptera*: *Aphididae*). The results of this study showed that increasing flowers can enhance aphid suppression and crop quality due to the elevated levels of natural enemies. *Increasing Syrphid Fly Diversity and Density in Sown Flower Strips within Simple vs. Complex Landscapes*. Journal of Applied Ecology. Sebastian Haenke, Barbara Scheid, Matthias Schaefer, Teja Tscharntke and Carsten Thies.

- In another study of hoverflies (*Diptera*: *Syrphidae*), plantings in broad and narrow sown flower strips, grassy strips and in wheat fields (as a control) were studied. The landscape complexity was studied within a .5-4.0 km radius around the strips. Syrphid density was higher in narrow and broad sown flower strips compared to grassy strips and wheat. Within the flower strips (at a radius of .5-1.0 km) the syrphid flies were the most concentrated. Making local flower strips is more effective in simple while in complex landscapes, keeping the overall diversity is important. *The syrphid visitors to certain flowers*. By E. & H. Drabble. New *Phytologist*. Vol. XVI, Nos. 5 & 6. May & June, 1917!

- Holland, J.M., Thomas, S.R. & Courts, S. found that the plant attracting most species of syrphid flies was *Rubus* spp. The number of Syrphids visiting

Convolvulus arvensis was unexpected, as it does not strike it to be a beneficial attractant. They also recommended *Phacelia tanacetifolia* strips as a part of an integrated farm.

Sometimes it doesn't work:

- In another study of *Phacelia tanacetifolia*, syrphid flies moved up to 100m into the field. With *Phacelia* it was found that beneficial Ichneumonid wasps were more abundant in the *Phacelia* strip compared to the nearby wheat crop. Aphid populations and percentage of those parasitized were unaffected by differences in the wasps' distribution. Syrphids are stimulated in the crop by the vicinity of flowering plants like buckwheat and cornflower. During summer the differences in syrphid populations were not reflected in aphid populations perhaps because of other natural enemies that are less dependent on flower resources. *The impact of floral resources on syrphid performance and cabbage aphid biological control*. Paul C.J. van Rijn1, Jurgen Kooijman1, Felix L. Wäckers.

Here's another important study's conclusion. (It was done with a hedgerow next to a farmer's field, but applies to home gardens.) "...many (beneficial) insects moved 250 feet into adjacent field crops. Studies...showed that syrphid flies (70% of the introduced flies), parasitic wasps and lacewings fed on flowering cover crops in orchards and that some moved 6 feet high into the tree canopy and 100 feet away from the treated area (ed. where the beneficial insects where released.). The use of nectar or pollen by beneficial insects helps them survive and reproduce. Therefore, planting flowering plants and perennial grasses *around* (ed. my italics) farms may lead to better biological control of pests in nearby crops." This report is from: *California Agriculture* 52(5):23-26. DOI: 10.3733/ca.v052n05p23. September-October 1998.

So, research often shows that many beneficial insects can fly a long distance to pursue a pest. **To work, most beneficial plants DO NOT have to be planted right next to the plant you want to protect from a pesty insect.** This means one concept of companion planting is often irrelevant. And much of companion "literature" is just anecdotal and usually very locally oriented, not necessarily appropriate to the whole country.