

An Our Garden Gate Special Report: Successful Vegetable Gardening

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by Fred Davis, Hill Gardens of Maine (To view other helpful gardening articles, visit www.HillGardens.com and click on "Article Archives")

An Introduction

There were people out there planting peas in March this year!...*in Maine!* Robins were pulling worms from the ever-so-slightly-green lawns; there were flower buds on dandelions, and the "heave" had settled back to a more or less tolerable level. It was what most of us northerners call a mild and "open" winter. Why, there were spots in our garden which never froze!

Not long after the first part of April, the howl of mowers and tillers fractured the peace, and large clods of muck began to be churned into small particles of garden soil. Well, maybe. Let's look closely at soils—*our garden's foundation*, what makes them "tick," and the things gardeners do to nurture—or *harm*—them.

Our thin, somewhat exhausted and overworked layer of topsoil is really quite the interesting concoction. It's made of tiny pieces of sand, clay, organic matter ("humus"), a few chemicals (nitrogen, phosphorus, potassium and a number of other "minor" elements), even tiny fragments of our past—rust particles, pieces of old buildings, residues of animals and people—plus air, water and lots of roots, pebbles, "bugs" and soil microorganisms. Mixed together and allowed to quietly occupy its spot with minimal external disruption, soil is literally a living organism capable of supporting varied plant life.

Complications arise when people do something which interferes with the normal scheme of things: plowing, trodding upon, artificially feeding (fertilizing), applying dreadfully-dangerous substances to control (or *attempt* to control) a whole host of plant diseases and insect invaders. All that, compounded by too little or too much water, fertilizer, tilling and other similar abuses, robs previously-healthy, vibrant, *alive* soil of its will or ability to survive. At that point, an ever-descending spiral usually ensues. Because their seeds fail to sprout, plants seem to languish, and vegetables shrivel, pucker and rot, well-meaning gardeners dump on more fertilizer, attack the rapidly-expanding flocks of bugs with increasingly lethal chemicals...and the very last, almost desperate act is to call the Cooperative Extension Service for *HELP!* Or to give up in utter frustration.

Don't laugh. Both you and I have seen it happen...sometimes a little closer to home than we prefer. But it doesn't have to be that way! With just a little thought, effort, and coaching from your local expert or library, your vegetable (*and* flower) garden can be alive and healthy, producing an abundance of attractive and nutritious crops which will make you and your

family happy and healthy—and make your garden the talk of the neighborhood.

Most vegetable garden plants prefer deep, rich, dark and well-aerated soil. Soil particles need to be very much like crumbled cornbread and chocolatey brown in color. Here's a general guide: Go grab a handful of soil from your garden and pinch a little between your thumb and finger. If it feels "slippery" it's probably clay and will compact and perform poorly. If it feels "gritty" it's likely somewhat sandy, will remain loose but won't hold water or nutrition for very long. If it's pale tan in color, it's usually exceedingly low in organic matter and must be heavily fertilized to eke out a crop. Gray colored soil is most often a relatively poor clay...with low organic matter and "life." A medium brown color normally indicates the occasional addition of at least some type of organic matter like old manure, compost, chopped up or decayed leaves or spoiled (rotted) straw, and will usually grow an acceptable crop.

If, on the other hand, that pinch of soil has the color and "feel" of, say, coffee grounds, count yourself fortunate indeed. It's pretty much what soil that's been respected and responsibly maintained looks and feels like...*dark, crumbly with a pleasant "earthy" smell*. If you were to put some under a good microscope, you'd see *zillions* of beneficial bacteria. Not very many gardeners I know of can boast of that kind of soil!

Soil which has been nurtured, loved, appreciated—and *kept alive*—is almost always that deep, chocolatey brown mentioned above. It produces juicy, succulent, vitamin-packed, satisfying and healthy crops. Huge carrots; *sweet* corn (2 or 3 ears per plant), abundant and perfect tomatoes, baskets full of beans, peas and practically everything else you plant.

Healthy soil holds moisture *because it's loaded with organic matter*; it doesn't erode or blow away *because it's loaded with organic matter*; it's easy to cultivate *because it's loaded with organic matter*; it has all the natural fertilizer it needs to produce a wonderful crop without buying bag after bag of the artificial stuff *because it's loaded with organic matter*; plants are strong, insect- and disease-resistant and have a pleasing, healthy-looking color *because it's loaded with organic matter*; it can be worked (without repeated bludgeoning with a rototiller) earlier and more efficiently *because it's loaded with organic matter*. Are you beginning to see a pattern here? Run down this checklist and bring *life* back into your soil:

- Wait until you can squeeze a handful without dripping water on your shoe.

- Send a sample out for a soil test (the Cooperative Extension can help—and it won't cost an arm and a leg.
- Spread a *liberal* layer—3 or 4 inches at least—of some form of organic material like old manure, fresh compost, shredded and decayed leaves, straw or washed seaweed over the surface (compost, by the way, naturally balances soil pH close to the correct level for most garden plants). An important note: it'd be better if you avoided applying manure—even aged manure—where beets or potatoes will be grown.
- If you have poor drainage, add a liberal amount of sand on top of that...*unless* you have heavy clay soil. Adding sand to thick, slippery clay usually turns it into something akin to concrete.
- Hand-spade or till it in *once* as deep as you are able. Twelve inches would be great! Most rototillers, by the way, have trouble getting past 4 inches deep...in spite of what the advertising brags. Giant tillers pulled behind large farm tractors *say* they'll go a foot deep. Not in my experience!...they're lucky to make it past 6" or 7" — *and then their giant tires and heavy weight compact what's left.* Stick with a good, sharp spade. Besides...you probably need the exercise.
- Rake it out smooth without walking on it any more than required to get the job done.
- Vow to be a more attentive and responsible gardener this year...*and do nothing which will bring harm to your soil*—the most valuable asset your vegetable garden will *ever* have.

What Makes It All Happen

In order to properly maintain the family automobile, it usually helps to have a fairly substantial understanding of its inner works. Not only *where* the oil, water and gas goes, but *why*. It helps to have a basic knowledge of how an internal combustion engine functions and how the force it generates gets to the drive wheels.

Vegetable raising, too, becomes more satisfying and rewarding when the gardener has a better understanding of the make-up of plants and the internal/external processes which culminate in sweet, juicy, nutritious fresh produce for your table.

Plants are made up of tiny, generally single-purpose cells which combine to form structures like stems, leaves, roots, flowers, pollen and, finally, seeds. These cells increase in number by a process similar to that which causes an infant to grow to full stature and size.

Photosynthesis. In the presence of sunlight and warmth, basic elements like oxygen, water, carbon dioxide and minerals are taken into green plant cells

where they are converted into complex sugars, vegetable fats, proteins and vitamins, then are used in the production of more plant tissue or some form of storage or reproductive structure. The process cannot normally occur without light, moisture and, to a degree, heat. A byproduct of photosynthesis is the release of oxygen, carbon dioxide, water and a certain amount of energy, in a process called **respiration**.

Reproduction. Almost all plants reproduce themselves by seeds—small storehouses of energy, nutrition and a tiny embryo of the next generation. Stored materials are derived from the air, soil and whatever the gardener has opted to apply as fertilizer or other elements—whether organic or chemical.

Water, heat and light combine to encourage “germination”—the emergence of stem and root—and eventually, another mature plant. Only enough “food” is stored within a seed to produce the barest-essential root and elementary leaves. At that point, the young seedling is “on its own,” it must locate and process external materials in order for growth to continue, and begins gathering up, processing and storing literally everything useful in sight.

Seeds are either clustered together in tight groups and large numbers (corn and other grains), carried singly or in small numbers within a protective covering (peas, beans), or completely surrounded by what may seem as an enormous reserve food supply (tomatoes, melons, cucumbers, squash, pumpkins). Sometimes seeds lie on the *outside* of their food reserves (strawberries).

It's a short step from understanding a plant's internal processes to the realization that the part we or our animals consume as food is made up of whatever the plant was able to garner from its surroundings and store in concentrated form. All this is very basic. Let's now insert a “wrinkle” or two.

Essential Nutrients. At least 15 different chemical elements are required for the growth of plants. They include oxygen, carbon, phosphorus, hydrogen, nitrogen, sulphur, iron, calcium, magnesium, boron, manganese, zinc, copper, potassium and molybdenum. While most are considered “trace” elements, needed only in very small amounts, the three “primaries” (nitrogen, phosphorus and potassium) are required in substantial quantities and are—*far too often, in some cases*—added by the gardener.

Organically-grown vegetables derive the nutrition required for development of leaves and storage structures from clean water and air, compost, well-rotted animal manure and a biologically-alive soil. Healthful, natural substances are gathered, processed and deposited in plant tissues for later consumption by you and I, and our children.

Chemically-grown veggies have probably taken in, processed and stored unnatural materials—some of them

highly-toxic in more concentrated form, others suspected of causing various levels and intensity of health problems in humans. Additionally, food grown in contaminated or chemically abused soils (including but not limited to hazardous wastes, spilled or “dumped” chemicals, and heavy metals from old house paint, improperly disposed of batteries and the injudicious dispersal of sewage sludge) may very well have absorbed and stored dangerous levels of those contaminants.

A Personal Decision. Of course, it must be left to the individual to decide whether to allow Nature to produce the food we consume, or to supplement Nature with artificial nutritive substances. I personally find serious conflict between two *powerful* philosophies not only confusing...but disconcerting as well. On the one hand, state and federal governments advocate extensive use and reliance on artificial or synthesized fertilizers, the likely result of nearly irresistible lobbying by various chemical industries. On the other side, ever-growing ranks of strictly organic farmers and gardeners who proclaim the benefits of compost, soil health, and abhorrence of anything unnatural in their food or the earth in which it is grown.

I believe, and recommend to others, that it's far better to err on the side of caution. Clearly the best method is to rely heavily on improved soil nutrition via the addition of *vast* quantities of clean organic matter, and the avoidance of artificial chemical alternatives. An exception to this personal restriction of artificially-produced chemicals occurs when the total crop is threatened (an *extreme* emergency) and then only in the most judicious quantity sufficient to solve the problem.

Next, we'll take a closer look at mulches (living and artificial), green manures and cover crops...in short, protecting both our soils and our crops.

Mulches, Green Manures & Cover Crops

Protection of the exposed surface and under-stories of our garden's foundation should rank highest among the priorities of all gardeners. Neglect this vital facet of gardening and the negative impact will surely be felt for generations! It may take *millennia* to produce new soils.

Mulches. Reasons for applying mulches are almost legion but can be cooked down to these few:

- As a protection against the icy winds of winter and the heaving of spring;
- To prevent the evaporation of moisture, thereby conserving ever more valuable water;
- Protection of the soil surface from the effects of erosion by wind and rain;
- Inhibiting the growth of unwanted seedlings—especially weeds;
- And for the prevention of various soil-borne plant diseases.

Mulches are available in different forms, suited to several vegetable garden uses. Wood and bark chips, for example, are excellent for long-term surface protection and weed suppression. Compost (decayed plant material) also adds valuable humus to soils *plus* it suppresses certain diseases and, because of its near-neutral pH, repels all but the most determined slugs and snails.

Inorganic (manufactured) mulches have long been used by gardeners and small farmers, and their value is unquestionably established. Clear poly film, for example, warms the soil, sometimes to the point of destroying weed seeds, plant diseases and harmful insects. Black (opaque) poly is commonly utilized as a cover over large areas of vegetable gardens to suppress weeds, conserve moisture and maintain soil temperature. Indeed, combining black (or other infra-red blocking) material with increasingly popular floating row cover (REEMAY) has been shown to *double* the yield of many vegetable crops...with earlier harvests in the bargain.

All is not sweetness and roses, however. Mulch provides the perfect environment for several insects, some harmful, some benign and others beneficial. **Slugs** can be a particular annoyance, hiding in the cool recesses of moist mulch during the day, venturing out at night to do their dirty work...and they *love* to lay their eggs (lots of them) in its cool, damp depths. There are a number of substances and conditions which slugs cannot abide, however, chief of which is alkalinity. They really prefer acidic surroundings. Knowing that, their control and banishment from your mulched garden is assisted through the use of materials which have a near-neutral pH—between 6.5 and 7.0 or higher. Finished compost tests out at about pH 6.5 and makes a beneficial and convenient slug deterrent, especially when used as a mulch. Wood ash is strongly alkaline, and slugs can't stand the stuff. Just be careful not to spread them *in abundance* or you may shift too far into the alkaline (sweet) pH range.

If compost is in short supply, try sprinkling some wood ash on the soil before you apply your mulch, then a little more on top. Learn all about composting by reading Chapter 8 of Fred's book, *Keys to the Garden Gate*. Your complimentary copy awaits: www.HillGardens.com/keys-intro.htm.

Earwigs can be a perceived problem, too. Actually, to an extent they can be beneficial, feeding on other insect eggs and larvae. On the other hand, they occasionally damage vegetables and flowers, and may even come indoors to work on stored food.

One- to two-foot-long lengths of old garden hose, or sections of bamboo, laid on the ground near plants gives them a place to hide during the day. Simply make a habit of going out early in the morning to dump the wriggly contents into a pail of water with some salad oil floating on top.

Cutworms and the like may hide beneath mulch but, because they're larger (and not so slimy), they're easy to see and gather up. Encourage large (inch-long) ground beetles in your garden. They feed on cutworms, grubs and slugs.

Green Manures. Even though you might consider the compost or aged manure which you apply in the spring to be more than ample, there is *always* room for more. A green manure is a crop of some type of plant which, instead of being harvested to feed us or our animals, is chopped up and entirely returned to the soil—*just at its prime*.

Green manures abound in organic matter, contain significant amounts of nitrogen (“food” for plants...and the soil micro-organisms which cause it to break down into rich, dark brown humus) and, over the long haul, improves soil structure and vitality. You get better, bigger, tastier vegetables and, in the bargain, buy a natural “insurance” policy against deterioration or destruction of our most valuable natural resource—soil.

Hand-in-Hand

Green manures and cover crops are almost literally the same thing. Cover crops, like green manures, are plants seeded for a particular purpose but not necessarily for human or animal consumption. Both are returned to the earth to improve soil structure and tilth; each contains nitrogen and other elements essential to plant growth and health; both are seeded in soil left bare by recent harvests; and, in a way, each could rightly be considered a *living mulch*.

The difference is one of timing. Green manures are often planted early in the season and, because they're fast-growing, can be tilled in just before maturing—a week or two ahead of planting the vegetable crop. Some gardeners accomplish the same purpose by collecting and shredding early weed growth (before it sets seeds), spreading the ground-up greenery on their garden and plowing or rototilling it in. Either way, you get essentially the same effect: added organic matter, improved soil structure, better moisture retention and *much* happier crops.

Practically any low-growing plant—particularly non-invasive ground covers—can be utilized as living mulches. Space them so they'll just touch when mature. Some gardeners prefer one of the annual rye grasses or white clover. Either would make an effective living mulch...but clover might become invasive if not monitored closely.

Cover crops are also seeded into soil left bare by human activities. The smart gardener *immediately* seeds a cover crop (which could be considered green manure) the very day that crops are harvested. Not a moment to lose! Take advantage of every precious second of growing time. “Cover” up bare soil with plants. Rather

than pulling nutrition from the ground, air and water...and *wasting* it, cover crops that are later tilled in *store* all that plant “food” to be used another day or season. Buckwheat, winter rye and white clover are appropriate cover crops.

Cover crops are also a must for protecting garden or farm soil from the ravages of winter: rain, wind and flood. Thick roots and a layer of surface organic matter bind soil particles, preventing them from washing or blowing away.

There's really no question about it...mulching, cover-cropping and green-manuring are three of the most effective strategies for insuring continued success in your vegetable or flower garden.

Seed in bulk for this proven method of protecting your soil is readily available from most farm 'n garden stores or one of the many mail order seed companies. One of the best: Johnny's Selected Seeds (www.johnnyseeds.com).

Hints, Kinks and “Secrets”

So far we've talked about the basics, a little botany, and different types of mulches. Now let's listen to what a few other gardeners have to say about what they've learned by years of experience and experimentation.

Tomatoes: Buy young plants, no taller than 8 inches, with *white* roots. Remove the lower leaves to about half their height and plant them *deep* so the bottom remaining leaf is at ground level. Some prefer to lay most of the plant on its side in a trench with just the top few leaves above ground. Use a low nitrogen (the 1st number in the formula; and not more than 5), high phosphorus (the 2nd number; at least 10...15 would be better) to encourage flowering and plenty of fruit instead of masses of leaves. [*I'm not a big fan of so-called miracle-working “blue-water” chemical fertilizers. Far too much nitrogen and an imbalance of phosphorus! I presume you want fruit...and not a gigantic plant with nothing but leaves until too late in the season.*] Don't use fresh manure or other high-nitrogen materials. Urea is an absolute no-no, unless all you want is *green*.

Plant your tomatoes in full, all-day, never-ending sun for best results. Commercial tomato growers *always* plant in fully open fields with *never* any shade...in very warm summers to get the best possible production (and, therefore, *profit*). Get the point?

100% finished and stabilized fresh compost poured into two old tires sitting one on top of the other in the hot sun (use a tomato cage) will give you an early and abundant crop.

Bell Peppers: They get essentially the same treatment except for the deep planting. If you use lots of compost and a good phosphorus source, you'd better use a sturdy stake to hold up all the peppers. Remember: not too much nitrogen.

Potatoes: One gardener claims success planting his spuds inside tires and using *huge* amounts of compost. Avoid lime, ashes and manure (fresh or aged) or you may end up with scab problems. As with tomatoes, be stingy with nitrogen or you'll grow all leaves and very few potatoes. Here's a nifty one: make a coarse wire "barrel" about 3 feet across and 3 feet tall stationed atop cultivated soil (in the roaring hot sun). Fill it with *really* good, fresh compost, insert your seed potatoes in around the sides and top, water...and jump back! Keep an eye on watering because, being exposed to the air it'll quickly dry out around the edges. About halfway through the season you can "sneak" in and harvest a few tender new baby potatoes for a mid-summer treat...followed by a genuine surprise when you pull the whole thing apart at harvest time! You'll find the whole potato-cage story, complete with how-to photos at www.HillGardens.com/potatoes.htm.

Carrots: If you have heavy clay, go for the little short varieties. Longer types will do better in more "normal" soil, especially if a couple inches of fine sand is added then mixed *deep*. For the best in appearance, maintain moisture...and thin to no less than 3" apart.

Beets: Work in about an inch or so of screened wood ashes before you seed. *Never apply coal or trash ash to any garden soil.* Wood ash is high in phosphorus and potassium. That translates into *big* roots—*beets!*

Corn: You'll actually get more, larger and nicer-looking ears if you *don't* remove the suckers which form at each stalk's base. I know...I was skeptical, too, until I tried it. Flies in the face of all I'd been taught...*but it works.* Here's a recently-discovered clever trick to help discourage raccoons from *totally destroying* the ripening corn: inter-plant (at the time of seeding) your winter squash along the corn rows. Squash vines have small nettle-like "prickles" on stems and leaves...and raccoons dislike getting tiny stickers in their busy little tender paws. Not to worry: 1) it won't do any more harm to the masked critter than a little irritation...and 2) if both squash and corn are seeded at the same time, as the corn takes its time growing taller, the squash will have plenty of light. *Then* as the corn approaches maturity, squash vines will have something to climb on. Nifty, huh? Just be careful where you step...and a pair of light gloves will keep *you* from getting prickles in your paws.

Broccoli: Select early varieties; space no less than 18" apart; prepare soil *deep* and with abundant compost. Broccoli grows leaves in hot weather and forms its heads in cool weather...so plant it in your coolest corner with full sun until late afternoon. It'll want to grow *fast* and steady so keep it moist and well-fed. Frequent drenching with a "tea" made by soaking a shovelful of fresh compost in a pail of water works wonders! Protect each young transplant from cutworms with collars made from tar paper about 6" tall, rolled into a "tube" and stapled.

Squirm it down over the young plant so it goes into the soil at least an inch. Two inches would be better. Contrary to popular opinion, cutting broccoli heads with long stems (8" to 10") will force much stronger side shoots from near ground level and will produce a second, slightly smaller, later crop.

Finally, after harvest, immediately remove or till in *all* organic mulch and plant a dense cover crop to not only disrupt normal metamorphosis of destructive insects, but to protect and rebuild the soil as well.

Solving Problems the *Natural* Way

We'd all do well to review some of the more pressing problems many of us will almost certainly encounter as the growing season progresses.

First, an appeal: Giant chemical companies, in tune with our sense of cabin fever, urgency and deep desire for successful gardening experiences, will have renewed their perennial push to sell, *sell, SELL* long before the growing season actually begins in earnest. "*Just buy our products,*" they'll say in glitzy/splashy ads, "*and all your bug, disease and plant nutrition problems will be over! Never mind what's in them, just sprinkle, pour, dust and spray, and chase all those nasty problems away!*"

Big chemical manufacturers and their distributing partners *thrive* on gardeners who explicitly trust every spoken or printed word about "*easy, carefree and bug-free*" gardening...words which press for quick(and big) sales, while leaving the worrying about possible side-effects to them and their research scientists and lab technicians.

I *urge* you to thoughtfully weigh every artificial or non-natural substance you might consider using in or on your family's food or recreation area. Be deeply concerned about any potential long-term consequences of any inorganic material touted as "safe and effective." Be especially wary of spoken, written or implied corporate assurances of quick results, easy care, "miracles," worry-free gardening...or someone whose line reads, "Don't worry about what's in it...*just use it!*"

Even some so-called "natural" forms of pest control can have a negative impact on plant and human health if abused or used improperly. It is possible, for example, to apply too much rotenone, insecticidal soap or pyrethrin. Sprinkling something as seemingly benign as table salt on a few slugs is one thing; emptying a five pound bag on vegetable garden soil is quite another. Dusting a thick layer of sulfur to control mildew might *seem* and *sound* innocent enough but could quickly alter soil pH (making it too acidic) and can destroy beneficial insects and normal soil micro-organisms...*and* can cause damage to cucumbers and roses.

The point is, use only enough "naturals" to resolve the problem at hand without leaving thick residues

which might end up being as toxic as some synthesized materials.

Consider, also, that truly healthy soil—loaded with rich, dark compost, literally *alive* with earthworms and other beneficial fauna, prepared deep and lovingly nurtured and cultivated, will produce healthy plants which are rugged, mostly self-supporting and able to fend off insect and disease attacks without the aid of pesticides—natural *or* chemical.

Potato Late Blight: a serious threat!

Blighting, caused by the same fungus (*Phytophthora infestans*) blamed for the great Irish potato famine between 1845 and 1852 that wiped out nearly 25% of that country's population, was predicted by Cornell University plant pathologist William E. Fry to wreak havoc among home gardeners during the 1995 vegetable growing season. Of particular concern were the increasing numbers of organic gardeners, farmers, and health-conscious home gardeners because of their unwillingness to apply powerful fungicides. Indeed, 1994 saw late blight causing some farmers to lose their entire income. Every year since, potato late blight continued to be a serious economic issue threatening production and, therefore, supply of un-infected potatoes in the marketplace. That threat remains to this day.

Irregular or circular lesions on potato foliage or stems are symptoms of late blight. Young lesions may appear water-soaked, while others can be surrounded by a halo of collapsed tissue that is yellow or brown. Infected potato tubers may have a discolored reddish brown granular rot. Sometimes, in humid weather, a white fuzz or mildew-like growth appears on the foliage or stems, indicating that the fungus is giving rise to reproductive spores (sporulation). It can occur at any time during the growing season, according to Fry.

Effective means of avoiding late blight are: most importantly, *do not save and re-plant potato seed from last year*; use only fresh, health-certified potato seed, rejecting and burning any with blemishes; and select blight-resistant varieties. (Until the early 2000s, “Elba” had been one of the most blight resistant varieties, but in June, 2001, it was announced that Cornell University has provided Russia with “New York 121” in the hopes of preventing dangerous food shortages. Other blight-resistant varieties are “Kennebec,” “Sebago,” “Allegany” and “Rosa.”)

Other ways to avoid Potato Late Blight in your garden: scout gardens at least weekly, especially in wet weather; destroy infected plants by burning *immediately*; avoid wetting potato foliage when watering (if that's unavoidable, don't water after mid-day); for best air circulation, maintain a weed-free garden and don't crowd crops; if the situation is critical and you risk losing the entire crop and *must* use fungicides (though

fungicide is not Mr. Fry's favorite option, he considers it worth consideration), consult the experts at your Cooperative Extension. If it were my entire potato crop, I believe I'd burn the lot and shop at the local Co-op.

Finally, it's not wise to crop potatoes, tomatoes, peppers and eggplant in the same spot year after year. Crop rotation is a reasonably effective preventative and will go a long way toward thwarting difficult-to-handle plant disease problems.

Next, we'll put a few annoying and destructive insects under the magnifying glass to see if there's some way of thwarting *them*.

Some “Creepy-Crawlies”

So...soil is all prepared; a plan has been formulated; varieties selected; seed purchased; tools have been gathered and the air is filled with the sput-sputter of tired old rototillers and the sweet (more or less, depending on your perspective) aroma of their exhausts.

Gathering on the garden's horizon, however, are regiments of little creatures—waiting...patiently—anticipating the tender, green sprouts of beans, peas and nearly every other flora to push into open air. If you only knew just how many “creepy-crawlies” there are! Let's look at some of the more agriculturally important ones.

Cutworms are actually the larval stage of either *Peridroma saucia* or *Agrotis ipsilon* (most frequently the latter). Virtually every gardener has experienced the sadness or revengeful anger which follows discovery of nipped-off-at-the-ground seedlings or transplants.



Cutworms are the offspring of some of the many 1 to 1-1/2-inch fuzzy, plump moths which congregate near the porch light from early spring to late fall. This larval stage usually tunnels just below the soil surface where it feeds on succulent new roots, shoots and stems. At night, they emerge from their tunnels and seem to play the role of scythes, mowing down tiny seedlings by the dozens.

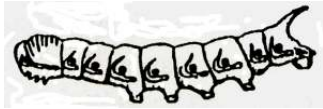
Surface cultivation generally disrupts their development or exposes them to the gardener's heel or hungry bird. Tar paper collars, fasten with staples and placed so they surround vegetable transplants and “wiggled” into the ground about an inch or more normally prevents nocturnal damage. Large black beetles (*Carabis nemoralis*, et. al.) and robins make a meal of the fat, juicy, wiggly morsels, and never seem to fill up on them.

BT (*Bacillus thuringiensis*—brand name “Dipel”) in solution and sprayed on or near susceptible foliage is very effective. BT is a beneficial microbe which attacks the insects' digestive system, causing perforations of the gut and brings a sudden end to their appetite, eventually ending in death.

There are also certain beneficial nematodes which attach themselves to cutworms, penetrate their defenses and then feast to their “heart’s” desire. Most organic material suppliers and many of the larger farm and garden stores will sell you these natural products. I always recommend avoiding chemical pesticides in the vegetable garden.

Tomato Hornworms

Hornworms are the larva of *Manduca quinque-maculata*, and are even longer than their name—three or four inches! They are *everywhere*: north, south, east and west. Long, fat, green and smooth, the larvae have seven or eight creamy-white stripes on their bodies accented by



a row of small spots along each side. Adults are quite large, too. With a four-inch wing span and mottled gray coloration, they hover around outside lights at night. But the worm’s two most significant characteristics are the black horn projecting from the rear of their bodies, and their tremendous appetite.

Hornworms will attack eggplant, pepper, potato and, of course, tomato...gobbling up great chunks of both leaves and fruit.

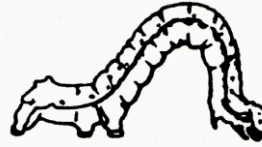
Most healthy plants can tolerate some feeding by these colorful worms but if damage becomes threatening, the least toxic form of control is to hand-pick and feed them to the chickens. BT will work, as will small, relatively harmless (to humans) braconid wasps which lay eggs on the worm’s skin where they form small white cocoons. Important note: If you find one that’s covered with those white cocoons, carefully capture it and find a new spot *away from your garden*. New braconid wasps will soon emerge, the worm will be destroyed by Nature, and you’ll have a couple dozen new wasps to fight your battles for you.

Rotenone dust may offer some defense against hornworms but I prefer to rely entirely on less aggressive controls whenever possible. A few final thoughts:

- Gathering large mottled-gray moths near porch lights *very* early on cool, spring mornings will go a long way toward reducing worm populations.
- End-of-season rototilling, just before planting your winter cover crop, will disrupt normal development of soil dwelling creepy-crawlies by mortally wounding their wintering-over stage.
- While weeding or cultivating, if you run across an inch-long pupal case with what looks like a “handle” on its blunt end, give it the “heel test” and you’ll avoid some grief next season.

Cabbage Worms & Loopers

These two do the most damage to members of the cole family—cabbage, broccoli, Brussels sprouts, kale, cauliflower and mustard. A cabbage worm is fat, velvety, jade green, has a yellow stripe down its back, and spends most of its larval stage eating holes in succulent new growth. They frequently hide deep within a cabbage head to show up on a guest’s plate—amidst a collection of dark green excrement pellets. Cabbage worms, if not controlled, will infest the entire patch.



Cabbage *loopers* are very similar in color, markings and destructive eating habits but are not quite as fat, and fold—or “loop”—their bodies as they move about.

Both attain 1½-inches in length at maturity but the adult stage (moths) are entirely different.

Cabbage worm adults are beautiful, bright white butterflies with small black forewing spots. Females leave about 100 eggs on leaves. Adults are pretty and fun to watch but can bring on an infestation of worms that can quickly ruin a crop.

Cabbage looper adults, on the other hand, are rather drab, mottled, gray-brown moths with small silvery spots on the forewings. Females will deposit about 300 eggs on leaves.

One of the best tricks for avoiding worm and looper damage is to plant coles as early as possible in the season while temperatures are still too cold for adults to emerge from their winter quarters. Later, at the first sign of invasion, begin weekly applications of BT (*Bacillus thuringiensis*). I am thoroughly opposed to using chemical pesticide controls on vegetable crops but, if *you* don’t mind taking on the risk and responsibility, and believe you *must* resort to their use, contact your Cooperative Extension Service office for guidance. And, as I’ve often been known to repeat, exercise caution when either asking technical questions of big-box-store employees or shopping in their garden sections. Better to query one of the many Master Gardeners in our area.

Wireworms (a.k.a. Click Beetles)

Adults of wireworms are the occasionally-seen “click” beetles which used to fascinate me when I was a youngster. The larval stage—



wireworms—are experienced and proficient tunnelers, chewing their way through virtually any root, stem, seed, bulb or tuber. Carrots, corn, potatoes, beets, peas, beans, lettuce, onions and all other types which get in their way. The most common site of severe infestations are garden plots which were planted where there once was lawn.

Wire worms are usually between ½- and 1½-inches long, are a dark nut brown when mature (tan or cream colored when small), and are exceedingly tough.

The “heel” test nearly always fails unless it finds itself caught between a heel and a flat stone.



Natural controls for wireworms are almost non-existent, short of spreading some pretty deadly poisons. Frequent cultivation will disrupt normal development of the insect and expose them to the gardener’s wrath. I *never* allow a click beetle or its larval stage to escape while I’m weeding or cultivating. It would be very unwise to plant either a flower or vegetable garden in an area that had been recently sod—lawn. Burying half of a potato (with its eyes removed so it won’t sprout) will attract the larval stage. Mark potato halves carefully and after a couple of days, dig them up, collect the rascals, destroy them in soapy water or move them to a new spot *miles* away, and re-“plant” your half-spud.

Lastly, wireworms thrive in wet soil, so adding abundant organic matter, providing thorough drainage and frequent deep cultivation will go far towards discouraging this pest.

Corn Borers & Corn Earworms

Here are two of the most distressing pillagers of sweet and tender corn.

A **corn borer** chews a significant chunk out of a corn stalk, usually near the soil line, causing it to become weak, then topple. When it goes to work on a corn ear, you’ll see “shot-holes” near the base of an ear and deposits of their droppings that look much like wet sawdust. Eventually, the ear



will weaken and flop downward. They also bore into other plants like hollyhock, dahlia, zinnia, aster, chrysanthemum, gladiolus, potato, bean, pepper, onion and tomato. Wherever it bores it provides easy access to a number of plant diseases and other insect types.

Corn earworms generally limit their feeding activity to tender, developing kernels, leaving a trail of *yucky* brown deposits in excavated tunnels and chambers. Entering at the upper channel through which—and shortly after—the “silk” emerges, their course downward is framed in eons of instinct that leaves an inedible path of destruction.

Adults of both borers and earworms are small, gray-ish-tan moths which normally hide during daylight hours but are active throughout the night, and have the capacity to deposit *hundreds* of eggs during their brief lives. There are usually two generations during normal growing seasons, with larvae and/or pupae stages of the second generation over-wintering in crop residues to re-infest crops the following spring.

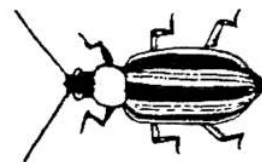
Control is two-sided: First, careful garden

sanitation. Corn stalks need to be completely removed and composted or ground to bits then tilled in. Both of these pests winter over in stalks and other crop residues left standing or laying in the garden until spring. Second, BT applied once *every* week until harvest will utterly defeat and destroy them before they can do any damage. It’s also important to control the adult stage—fuzzy gray-tan moths which congregate around lights left on at night.

Remember: the goal is *natural* control rather than chemical extermination (and contamination).

Striped Cucumber Beetle

This quarter-inch long pale yellow insect ranges across the entire eastern seaboard. It is distinguished by three distinct lengthwise black stripes on its wing cases. Most people consider only the adult beetle’s damage as significant—they chew on



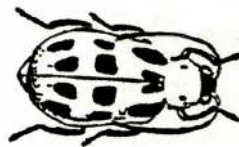
leaves and flowers, leaving behind a lacy appearance. But much of the real damage occurs *underground* by their larvae—they feed on concealed roots and stems.

The key to managing this pest is its worst enemy: various soldier beetles. Golden or dull orange with black markings and a black head, these highly beneficial ½”-long insects make quick work of cucumber beetles.

Rotenone dust does a fair job of controlling them but a mixture of lime (1 cupful) and wood ash (1 cupful) in about 3 gallons of water sprayed on upper *and* lower leaf surfaces will do the job even better.

Spotted Cucumber Beetle

Very much like the striped type, this one is just a little smaller and has 11 or 12 black spots on wing cases. Damage is similar, as is their control. A small predatory fly takes care of many of these insects but if things get

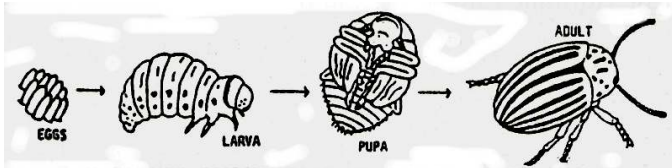


out of control, rotenone or pyrethrin (a natural substance derived from colorful *pyrethrum* daisies) will do the trick. Covering plants with cheesecloth or REEMAY floating row cover will make access to plants more difficult for winged adults.

Adults of both types of cucumber beetles over-winter in plant debris left lying about the garden so it’s important to do a bang-up job of post-harvest cleanup. Both also transmit a number of viral wilts and diseases—all the more reason to keep them under tight reins.

Colorado Potato Beetle

This one's the bane of virtually every gardener and natural-controls farmer who grows potatoes. About 1/3rd of an inch long, yellow with black stripes and dark spots on its "collar," and with voracious appetites, they infest and consume vast quantities of solanine types (eggplant, pepper, tomato and, of course, potato). Females deposit bright orange eggs on the undersides of leaves. Hatching within a few days into plump, soft-bodied, reddish-orange bugs with a double row of spots running the length of each side...*they multiply fast!*



Since adults over-winter in the soil near where potatoes were planted, one of the best preventatives—while not 100% effective—is crop rotation. Move the "solanine" types around every year. Never plant them in the same spot twice. Post-harvest cleanup, thorough tilling and a dense cover crop will help, as well. Hand-picking adults and larvae, and carefully destroying any eggs is about the best most gardeners and small market farmers can come up with, short of some pretty awful sprays. Rotenone dust sometimes helps but the coverage must be thorough and frequent. A new product available at www.johnnyseeds.com is Monterey Garden Insect Spray (item #9107). Approved for use by certified organic growers, its active ingredient is *Spinosad*, and is most effective when alternated with BT.

Aphids

Aphids are always a problem! Adults have wings and when temperatures begin to warm in the spring, *they're flying around everywhere!* Once again, rotenone dust and pyrethrin (or a mixture of the two, either as a dust or liquid spray) will offer some control.



Most long-time veggie gardeners will tell you to plant succulent, flowering annuals around the garden perimeter. Actually, not a bad idea...annuals like marigolds and nasturtiums act like "aphid-magnets," attracting the little buggers *away* from other, more valuable or desirable plants. It's a *lot* easier to keep an eye on them if they're concentrated on a border of flowers rather than spread throughout the garden.

Encourage predatory insects like lacewings and ladybugs, and spray aphid-infested foliage with soapy water followed by a rinse of clear a few minutes later. Safer's Insecticidal Soap works well, but a squirt of dishwashing liquid in a quart of water will save you

some money. Don't forget to rinse.

Slugs

These slimy wretches multiply in *prodigious* numbers, especially in gardens bordering native woodlands. Ranging in size from less than 1/2" to several inches long, and in color from nearly black to vivid, bright orange, slugs have insatiable appetites. They *love* tender leafy vegetables, leaving behind destruction and *most* unappealing and unpalatable deposits of slime.

A number of bait-type controls are available in the marketplace but there's a simpler way: A slug's physiology is powerfully acidic ("sour"). But when their environment is adjusted into the alkaline ("sweet") range, they run for the woods—where it's acidic. You accomplish that with wood ashes or a healthy dusting of lime *over everything*—soil, paths, surrounding grass or weeds. They can't stand "sweet!"

Finally, Earwigs

Dangerous-looking with a pair of sharp pinchers attached to their rears, earwigs are harmless to humans. Old wives tales of bugs creeping into the ears of small children while sleeping (eventually chewing their way into little brains...*gives me goose-bumps!*) is pure and simple poppycock and fantasy.



But they can do some amount of damage to flowers and vegetables. They ordinarily stalk at night, hunting other insect's eggs and small larvae but, if hunger overwhelms them, earwigs will nibble on tender parts of various vegetables and flowering plants.

Earwigs hide during the day...a bit of knowledge that'll assist in their control. A length of bamboo or a short piece of old garden hose left lying in the garden will make a convenient hiding place for them. Next morning you carefully pick it up, and dump its contents into a pail of soapy or oily water.

Of course, there are many more insects which plague veggie gardeners but those listed here are the more commonly experienced types. Recall that a healthy plant is a more resistant and tolerant plant...and health is achieved by improved soil condition and nutrition, becoming a "clean" gardener (one who doesn't allow plant waste to lie about, especially over winter), and careful scouting for signs of early insect problems or damage. It's the gardener who stays ahead of serious infestations who wins!

Finally, remember that you're surrounded by experts: Master Gardeners, the Extension Service and, best of all, experienced and successful gardeners. Life's greatest bargain is experience gained second-hand!