

# CHAPTER 44

## LEARN HOW TO BEGIN A SUCCESSFUL ORGANIC PEST CONTROL OPERATION IN GARDENS, GROVES, FIELDS AND ORCHARDS



**“No illness which can be treated by diet should be treated by any other means.”  
Moses Maimonides, noted 12 Century Physician**



## Why should anyone farm or eat organic? Scientists Estimate that Pesticides are Reducing Crop Yields by ONE-THIRD Through Impaired Nitrogen Fixation - July 2007

[http://www.organic-center.org/science.hot.php?action=view&report\\_id=99](http://www.organic-center.org/science.hot.php?action=view&report_id=99)

Over the last 40 years nitrogen fertilizer use has increased seven-fold and nearly every acre of intensively farmed, conventional cropland is treated with pesticides. A team of scientists explored the impact of pesticides and other environmental toxicants on symbiotic nitrogen fixation (SNF) brought about by Rhizobium bacteria (Fox et al., 2007). Their findings were published June 12, 2007 in the prestigious Proceedings of the National Academy of Sciences. <http://www.pnas.org/cgi/content/abstract/104/24/10282>

The team describes the critical role played by SNF in supporting crop yields and environmental quality. SNF has great potential to reduce farm production costs – a factor of growing importance as rising natural gas prices push upward the cost of nitrogen fertilizers. In Brazil, SNF from soybeans reduces production costs an estimated \$1.3 billion per year. The research by Fox et al. (2007) explored in depth the signaling processes between plants and bacteria colonizing plant roots – processes that govern the degree of SNF and the production of certain phytochemicals. They focused on the ways that pesticides can disrupt signaling and impair the efficiency of SNF. Some 30 pesticides are known to disrupt SNF; the most widely used pesticide in the United States, glyphosate (Roundup®) is known to be toxic to nitrogen fixing bacteria.

The “Conclusions” section of the paper begins by stating: “The results of this study demonstrate that one of the environmental impacts of pesticides and contaminants in the soil environment is disruption of chemical signaling between the host plants and N-fixing Rhiz(obia) necessary for efficient SNF and optimal plant yield.”

Drawing on their recent work and other published studies, the team projected that pesticides and other contaminants are reducing plant yield by one-third as a result of impaired SNF. This remarkable conclusion suggests one mechanism, or explanation of the yield-enhancing benefits of well-managed, long-term organic farming systems.

Source: “Pesticides reduce symbiotic efficiency of nitrogen-fixing rhizobia and host plants”

Authors: Jennifer E. Fox, Jay Gullledge, Erika Engelhaupt, Matthew E. Burrow, and John A. McLachlan.

Proceedings of the National Academy of Sciences, Vol. 104, No. 24, June 12, 2007.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1885820/>

There are about 50 to 60 million insect species on earth - we have named only about 1 million and there are only about 1000 pest species; already over 50% of these insect pests, 150 plant diseases and 270 weeds are known to be resistant to our volatile, dangerous, synthetic pesticide POISONS. We accidentally lose about 25,000 to 100,000 species of insects, plants and animals every year due to “man’s footprint”. But, after poisoning the entire world and contaminating every living thing for over 60 years with these dangerous and ineffective pesticide POISONS, we have not even controlled much less eliminated even one pest species and every year we use/misuse more and more pesticide POISONS to try to “keep up” because these POISONS do kill the beneficial species that control pests naturally! Because of all this expensive and unnecessary pollution, we lose more and more crops and lives to these thousand pests every year.

We are losing the war against these thousand pests mainly because we insist on using only synthetic pesticide POISONS and fertilizers. There has been a severe “knowledge drought” - a worldwide decline in agricultural R&D, especially in production research and safe, more effective pest control since the advent of synthetic pesticide POISONS and fertilizers. Today we are like lemmings running to the sea insisting that is the “right way”. The greatest challenge facing humanity this century is the necessity for us to double our global food production with less land, less water, less nutrients, less science, frequent droughts, more and more contamination and ever-increasing pest damage. Now, one in every six people worldwide suffers from chronic hunger -- over a billion women, men and children are literally starving.

In addition to the fact that pesticide POISONS are really not protecting our crops and helping to feed us, we know that pesticide POISONS on food have been linked to attention-deficit hyperactivity disorder; and that they interfere with sexual development among hundreds of other health and environmental ills. So, pesticide POISONS are not only a poor choice for pest control — they truly are not safe or organic!

**How do you begin a successful organic pest control operation in gardens, groves, fields and orchards? First, you need to create an Intelligent Pest Management® system.**

Intelligent Pest Management® first of all accurately identifies your pest problem and the pest's natural enemies, establishes an ongoing monitoring and record keeping system for regularly sampling, identifying and assessing pest and pest enemy populations and then when economically necessary choosing and properly using safe and effective pest controls that do not harm people, pets, the environment and/or the beneficial enemy populations. You must always find the safest products and/or procedures that are the least harmful to health and the environment. Use only those controls that you know will not create pest resistance. Your monitoring program should clearly define where the inspectors should look for, what they should be looking for and when they should be looking. Remember the object is not to destroy every single pest but to protect the crop from economic loss. **Economic loss can be created by expensive control programs that cost more than they "save". Always error on the side of safety rather than error on the side of control!**

**You Can Start with the Use of Dormant or Horticultural Oils.**

**1) Dormant Oil**

Dormant oil can be many kinds of oil — canola, mineral, etc. Dormant oil is used in the early spring for a non-toxic control of sucking and chewing insects in their egg stage before they can do any damage. Insects that can be controlled this way are leaf-rollers, tent caterpillars, aphids, gypsy moth caterpillars, scales and others. Heavier, paraffin-based oils are more useful as dormant sprays on fruit trees and bushes because the oil must act to smother overwintering larvae of such pests as aphids, mites and scale insects. True dormant oils are often used at the rate of 4 - 6 oz. per gal. water.

**Things You'll Need:**

- ½ gal. used motor oil (non synthetic)
- 1 qt. oil based soap (like Murphy's or orange oil)
- ½ gal. water

Step 1 — Combine used motor oil, oil based soap and water and boil and mix well. Dilute in 20 gallons of water. **Remember to spray only when the plants are still dormant and not in leaf.**

Step 2 — Spray on a day when temperatures are above 40° F. and you are not expecting a freeze for at least 24 hours. This is also a good time to prune many fruit trees and bushes, so bring your pruning shears along if appropriate. For more accurate application choose a day that is not windy.

Step 3 — Inspect the tree or bush for egg masses. Scrape off egg masses from bark before spraying. Be careful not to damage bark.

Step 4 — Using a simple garden sprayer, carefully drench branches of your shrubs and trees thoroughly. Dormant oil spray when applied properly smothers insects before they hatch in the spring.

**You can also make an alternative dormant oil spray:**

- 1 gal. mineral oil
- 1 lb. oil-based soap (granular form)
- ½ gal. water

Boil all these and mix well. Dilution rate: 1 part to 20 parts water. This home-made dormant oil must be used immediately (cooled, of course) as these ingredients separate quickly.

**A Safer Dormant Oil Alternative:** In early spring, while fruit trees and shrubs are still dormant, many farmers and gardeners spray what is called a "dormant oil" on the bark and buds of their trees. A very old-fashioned approach to pest control, the purpose of the oily spray is to suffocate overwintering pests, such as aphids and mites. Most commercial products are made of kerosene or other petroleum oil. A much less toxic and more sustainable approach is to use a renewable resource such as vegetable (Canola) oil.

**Ingredients**

1 c. vegetable oil  
2 T. liquid soap  
1 gal. water

**Easy Directions**

Combine the soap and oil and stir to blend thoroughly. Add the water a bit at a time, stirring as you go (water and oil don't really emulsify; the soap helps this process). Pour the mixture into a clean garden spray container. Spray a coat of the mixture over the entire bark. Shake the container frequently as you are spraying. Makes 1 gallon, enough for one fruit tree.

**2) Horticultural Oil**

Horticultural oil is a complex mixture of hydrocarbons containing traces of nitrogen and sulfur-linked compounds that is used to control plant pests. It is an acceptable alternative to control pests in organic farming. (Olkowski; et.al., 1995: pp. 54, 84-87, 252) However, horticultural oil usage is poorly understood since the product labels give little information on the content.

**Types of horticultural oil**

- Dormant oil - used for woody plants during the dormant season. Dormant oil now refers to the time of application rather than to any characteristic type of oil.
- Mineral oil - any oil found in the rock strata of the earth. The white mineral oil is the tasteless petroleum used for pharmaceuticals or medicinal purposes.
- To control powdery mildew, add 3 tbsp. kerosene to 1 gal. water containing 1/2 tsp. detergent soap. Mix well and stir or shake constantly your extract container while in the process of application.
- Narrow-range oil - highly refined that has a narrow range of distillation.
- Petroleum oil - synonymous to horticultural oil and a more common term of reference.
- Spray oil - designed to be mixed with water and applied to plants as a spray for pest control.
- Summer oil/Foliar oil - used on plants when foliage is present.
- Supreme oil - highly refined and distilled oil.
- Vegetable oil - derived from the seeds of some oil seed crop. To control powdery mildew, add 3 T oil to 1 gal. water containing 1/2 tsp. of detergent soap. Mix well and stir or shake or agitate constantly your extract container while in the process of application.
- Botanical plant oil - derived from parts of the plant known to have insecticidal properties.

**Botanical plant/vegetable oil**

1. Garlic oil spray
2. Chinaberry oil spray
3. Citrus oil
4. Custard apple seed oil extract
5. Garlic oil spray
6. Neem oil spray
7. Pongam oil spray

**Pests controlled**

1. Aphids
2. Corn earworm
3. Fall armyworm
4. Leafminers
5. Leafrollers
6. Mealybugs
7. Spider mites
8. Scales
9. Whiteflies
10. Fungal diseases
11. Algae growing on fruit and fruit trees

## **Precautions when using horticultural oils - (Smith-Fiola, 1997)**

- Do not apply on sensitive plants and avoid drift onto them.
- Do not apply on drought-stressed plants. Plants that are under-stress may be damaged.
- Do not apply during freezing weather or when humidity is above 90% for longer than 36 hours.
- Do not apply when plant foliage is wet or when rain is expected.
- Do not spray during shoot elongation and when buds are fully-opened.
- Do not apply in combination with sulfur or sulfur-containing pesticides.
- Do not use spray tank that previously contained a sulfur-based fungicide.
- Do not mix oil with fungicide and do not spray oil within 2 weeks after fungicide treatment.

## **Standard procedures for the preparation and application of homemade extracts**

1. Read and follow the label instructions carefully. Ask for assistance from your local agriculturist office when using horticulture oil for the first time. **Test spray a small area before treating everything!**
2. Spray in the early morning or late afternoon.
3. Use utensils for the extract preparation that are not use for your food preparation and for drinking and cooking water containers. Clean properly all the utensils every time after using them.
4. Do not have a direct contact with the crude extract while in the process of the preparation and during the application.
5. Make sure that you place the extract out of reach of children and house pets while leaving it overnight.
6. Harvest all the mature and ripe fruits before extract application.
7. Always test the extract formulation on a few infected plants first before going into large scale spraying. When adding soap as an emulsifier, use a potash-based one.
8. Wear protective clothing while applying the extract.
9. Wash your hands after handling the extract.

## **How to make a simple horticultural oil**

Horticultural oil is a non-toxic mixture used to smother insects. Oils mixed with other safer items can produce effective fungicides and insect repellents. These recipes are based on vegetable oils rather than commercial petroleum based oils. Horticultural oils are the modern descendants of the dormant oils used by our grandparents to protect their fruit trees from overwintering pests such as scale. Dormant oil could not be used on plants in leaf because the low level of refinement left impurities that caused damage. Horticultural oils can be used on plants already in leaf, but you should still check for possible leaf damage.

### **Things you'll need:**

vegetable oil  
water  
dishwashing liquid  
garlic  
baking soda

### **Step 1**

In order for the horticultural oil spray to be effective the insect you're spraying for has got to be present on the plants you're spraying. The oil smothers the insects; when you spray - you are clogging all pores on the insect, effectively suffocating it.

### **Step 2**

When using these oils do a test spray on one of the leaves to see if there is any burning of the plant after a few days. Spray on a day when temperatures are above 40 degrees Fahrenheit and you are not expecting a freeze for at least 24 hours. This is also a good time to prune many fruit trees and bushes - so bring your pruning shears along if appropriate. For more accurate application choose a day that is not windy.

### **Step 3**

Any of the sap sucking insects like scale, aphids, spider mites and others that fall into this category are disposed of readily with horticultural oil.

**Step 4**

Generic Oil spray

1 c. vegetable oil

1 T. dishwashing liquid

Mix 1 T. with 2 c. water. Fill a spray bottle and shake well.

**Step 5**

Pest and Foliar disease oil spray

1 T. baking soda

2 T. ultra fine canola (or vegetable) oil

1 gal. water

Combine all ingredients and shake well. Use on plants to combat fungal diseases.

**Step 6**

Garlic Oil spray

3 oz. minced garlic

2 tsp. canola (or vegetable) oil

Soak mixture for 24 hours; mix with 1 oz. dishwashing liquid and 1 pint water. This mixture will repel insects as well as kill them;

**Another organic formula** — Mix 1 c. cottonseed or soybean oil with 1 T. liquid soap; use 1 to 1½ tsp. per cup of water to spray. When applying, make sure the temperature is below 85° F. and that plants are not drought- or heat-stressed.

**Misconceptions** — There are several misconceptions about soaps and oil. You may hear and read about substituting dish soap (or liquid laundry detergent) for insecticidal soap. Home dish soaps often damage plants when they are substituted for insecticidal soap and they generally are not as effective in killing the insects. The damage may be clear (browning edges or spots on the leaves) or it may also be less evident. Tests done on tomatoes and cucumbers show that spraying with the homemade soap solutions reduces and delays the yield of vegetables. Dish soaps commonly found in grocery stores today are no longer soap. They are all detergents. In addition, they all contain a lengthy list of moisturizers, degreasers, fragrances and dyes that can add to the damage of the detergent. You should only use a soft soap (do not use detergent soaps because these can be problematic to your plant's health) such as Ivory liquid dish soap, Murphy's Oil soap, or Castile soap. In addition, the household products vary greatly in concentration and effective rates of application have not been established. Insecticidal soaps are only slightly more expensive than dish detergents, but they will do their job without plant injury when used as directed. Occasionally, you will run into a recommendation to substitute a fine vegetable oil instead of horticultural oil. The ultra-refined horticultural oils are much easier to use since they will stay mixed into the water long enough for you to spray. Vegetable oils are also larger particles that are difficult to force through a sprayer. The Author recommends using the ultra-refined products manufactured for horticultural use.

**Using Horticultural Oil** — Horticultural oil can be the solution to many of your garden problems, but there is no one-size-fits-all remedy in horticulture. Horticultural oil is not tolerated by some plants, notably ferns and black walnut trees or other members of the genus Juglans. It should not be sprayed on plants with blue foliage such as blue spruce or blue hosta. Since their color is the result of the waxy coating on their leaves or needles, the application of oil may remove it, leaving them green instead.

**Cautions before spraying** — Plants under water stress (at or near wilting) may be damaged by horticultural oil. When in doubt, water the plant before spraying. If it is wilted, water the plant and wait for it to recover before spraying.

**When to spray** — The ideal time to spray is on a cool, cloudy morning when there is no wind and the temperature is between 40° F. and 90° F. The spray should dry before direct sun falls on the plant or before freezing occurs.

If it rains before the leaves are dry the oil will wash away and make re-spraying necessary. If your plants are under attack by a heavy insect infestation while the weather is uncooperative, particularly while it is too hot, spray them with water to knock off as many pests as possible; then wait for more favorable conditions.

**How to spray** — Be sure to mix the oil with water at the recommended rate. A stronger solution is likely to cause leaf damage. Agitate the sprayer often to keep the lighter oil mixed with the water. Always try to cover both sides of the leaves when you spray. Most insects hide beneath leaves or along the stems. Remember that oil and enzyme sprays must contact the pest to kill it. There is no residual killing action, but the coating the oil makes on leaves and stems can protect against transmission of some plant viruses and fungi.

**Horticultural oil used as a fungicide** — By mixing baking soda with the horticultural oil solution you can make a very effective, nontoxic fungicide. Add one rounded tablespoon of baking soda along with one tablespoon of horticultural oil to one gallon of water to make a spray that helps prevent powdery mildew, black spot and several other fungal leaf problems. Fungicides of all kinds are preventive, not curative, so you must use them before or just as an infection sets in. They will not cure an advanced case. However, since oil and baking soda mixed according to directions is nontoxic, it can safely be used as often as weekly to prevent these problems.

**Using Insecticidal Soap** — **NOTE: Horticultural insecticidal soaps are not the same as dish soap or liquid laundry soaps. Insecticidal soaps are potassium salts of fatty acids and their purity and concentration is controlled.**

**Cautions** — Plants that should not be sprayed with insecticidal soap include horse chestnut, mountain ash, Japanese maple, jade, lantana, gardenia, bleeding heart and crown of thorns. Also, some cultivars of azaleas, poinsettias, begonias, impatiens, ferns, palms and succulents are sensitive to soap. If in doubt, try a small area first and wait 24 hours to see if any damage develops. As with using horticultural oil, plants under water stress should not be sprayed. Water them before spraying if you are not sure. Wait until they have recovered if they were wilted.

**When to spray** — Once the insecticidal soap has dried on the plant it is no longer effective, so conditions that favor slow drying are best. Early or late in the day when the air is calm and cooler are good choices. Immediately after a rain or other times of high humidity and clouds are also good. Avoid hot, windy days or when the sun is falling directly on the plants that need to be sprayed.

**How to spray** — Be sure to coat the bottoms of the leaves as well as the tops. Most insects, their larvae and eggs are found under the leaves or along the stems.

**Follow-up** — Insects vary in their susceptibility to insecticidal soap and horticultural oil. Often the eggs or pupae are resistant to one or the other, so it is important to follow up with another spray in 4 or 5 days and in the case of tough problems like the whitefly, use a third spray, especially if the infestation has been severe. Due to their low toxicity, oils and soaps can be used as needed without fear of build up on the plant or in the soil.

**Note: Spraying the plant first with a fine mist of water will make the soap and enzyme sprays more effective insecticides.**

Note: Soaps and oils are most effective on sucking insects such as spider mites, aphids, scale and whiteflies. Though they are not effective against most adult chewing insects such as caterpillars and beetles, they are effective against the larval stages of many of them. Timing the application is the most important factor when using these products against any pest. Unlike their chemical counterparts, using soaps and oils doesn't increase pesticide resistance because their mode of action is mechanical, not chemical. Oils smother insects and their eggs. Soaps disrupt their membranes. Oils have several other benefits including their protective effects against viral diseases and several types of fungi. Aphids are a major carrier of plant viruses, and oils have shown effectiveness as a protector against transmission of the viruses as well as controlling the aphids. Powdery mildew, black spot on roses, alternaria leaf blight on melons and early blight on tomatoes are all fungus diseases prevented by timely oil sprays, especially in conjunction with bicarbonate of soda. Finally, if it becomes necessary to use a stronger chemical than these, the oil can often enhance the effectiveness of the chemical pesticide when mixed with it, thus reducing the amount you must use.

**If you still have pest problems — you can use neem oil, garlic, biological and alternative controls.**

### **3) Neem Oil, Garlic, Biological and Alternative Controls**

**Neem oil is an insect control product derived from the oil from the neem tree (*Azadirachta indica*)** which is native to India, Burma, Asia and Africa. Since it doesn't strongly affect humans, mammals, birds or beneficial insects, farmers use neem oil as an insecticide and miticide to keep away pests like aphids and white flies. Neem oil even protects crops from fungal infections such as mildew and rust.

The plant that gives us neem oil originates in Southeast Asia. People from these countries have long noted the benefits of crushing the leaves and stems against their skin to keep off biting insects like gnats. A wider industrial and commercial use was found for the potent oil by grinding the seeds of the neem plant. When the oil is distilled from seeds, its concentrated mixture contains high amounts of the active chemical azadirachtin.

Azadirachtin-rich neem oil gets sprayed on crops as an organic substitute for other harsher insecticides that might be carcinogenic, neurotoxic or have limited uses. Neem oil repels harmful insects like white flies, gnats, aphids, mites and weevils, as well as strengthening the crops against rust, scab, mildew and blight. Edible crops of vegetables do not get poisoned/contaminated when neem oil is used.

Neem oil makes the plants it touches taste bitter, so pests won't eat them, as a "contact" insecticide. Azadirachtin also interrupts insects' transitions between different stages of metamorphosis, such as growing from larvae to pupae. It prevents insects from developing a hardened exoskeleton. When the chemical gets absorbed through the roots of crops, it functions as a "systemic insecticide." That means crops don't need to be constantly re-sprayed.

The greatest benefit of using neem oil is that it doesn't harm beneficial insects. Butterflies, earthworms and bees all help plants pollinate or absorb nutrients. Lacewings eat insects trying to feed on the crops, but these beneficial bugs won't have a negative reaction to neem oil or azadirachtin.

Neem oil has even made it into cosmetic and household products. Lotions and skin sprays use the oil as a mild insecticide that isn't likely to cause rashes. If you soak cotton balls in neem oil and place them in your closet, it will keep clothes moths from devouring your clothes. Neem oil smells faintly of garlic.

Neem is a natural product and is very safe to use. In fact neem oil has been used in Southeast Asia as an insecticide, to clean teeth, to treat boils, and as a diuretic. Leaves from neem trees are eaten 'to purify the blood' in Hindu rituals. And neem oil is used in soap manufacture in India and the leftover neem oil cakes are fed to livestock. Neem oil soap can be used in the vegetable garden or orchard right up to the day of harvest. Needless to say; neem oil is considered safe.

Neem oil does work, but the way it works is different from other insecticides. Neem is not an instant, knock down, kill everything pesticide.

**How neem oil messes with the insects' brains and bodies —** Neem oil has many complex active ingredients that are similar to the hormones that insects naturally produce. Insects take up the neem oil ingredients just like the natural hormones.

Neem enters the system and blocks the real hormones from working properly. Insects "forget" to eat, to mate, and/or they stop laying eggs. Some forget they can fly. If eggs are produced, they don't hatch, or the larvae don't moult.

Obviously, insects that are too confused to eat or breed will not survive. The population eventually plummets, and they disappear. The cycle is broken.

How precisely it works is difficult for scientists to find out. There are too many different active substances in neem oil, and every insect species reacts differently to neem insecticide.

**Neem oil does not hurt beneficial insects.** Only chewing and sucking insects are affected. It is certainly a fascinating pesticide.

Like real hormones, neem oil insecticide works at very low concentrations, in the parts per million range. **A little neem oil goes a long way.**

But this is not something that happens over night. People spray neem oil as insecticide and expect everything to die instantly, because that's what they are used to from chemical poisons. When that does not happen they conclude neem insecticide does not work. It does work! Give it time to work. It's a much smarter way to deal with insect pests than to just POISON everything.

**How neem oil deters chewing and sucking insects — There is a nice story that demonstrates how grasshoppers react to neem oil insecticide. It goes something like this:**

Someone did an experiment. It involved two jars, two leaves, and two grasshoppers. One leaf was sprayed with a chemical insecticide and one with neem oil. The two grasshoppers were put in the two jars, with one leaf each.

The first grasshopper ate the leaf and died almost instantly. The grasshopper with the neem oil covered leaf did not touch the leaf and lived. At least for a few days. Eventually it starved to death.

What would you prefer? A poisonous half eaten lettuce, or an organic, untouched lettuce? It's a no brainer, isn't it?

**Neem stops insects from eating the plants —** Part of this action is due to the hormone like action of neem oil that the Author explained previously. Insects "forget" to eat after they've been in contact with even traces of neem oil.

But it is also the presence, the mere hint of a smell of neem oil, that seems to be enough to keep leaf eating insects away. Neem oil can be very powerful as an anti-feedant and insect repellent.

This anti-feedant property is one of the most often advertised and lauded properties of neem oil insecticide. However, the hormonal effects I described above are even stronger.

Neem oil as an insect deterrent works well against grasshoppers and leafhoppers, but all other insect pests are controlled mostly through the hormone action.

The subtlety of the hormonal effects, and the fact that they may take days or weeks to manifest, makes people overlook them. Ill-informed gardeners seek instant gratification, i.e., lots of dead insects immediately, rather than a balanced environment in the long run.

It's a shame because the hormonal effect is where the real power of neem oil lies. It's the key to neem oil being an effective insecticide and good for the environment at the same time. It's also important to understand this effect in order to use neem oil insecticide correctly.

**Neem oil works from inside the plant —** Many insecticides break down quickly. They wash away with rain, or when irrigating, or the sunlight destroys them. You either have to spray all the time, or you have to spray something that's so stable it stays around and contaminates the food, water and soil forever. That means the chemical builds up everywhere and eventually poisons everything, including you.

Neem oil breaks down very quickly, too. It is especially susceptible to UV light. But neem oil is also a systemic insecticide. That means you can pour it on the soil (not pure neem oil, of course; you use a dilution or extract) and the plants absorb it. They take it up into their tissues, and it works from the inside. A leaf hopper may take a couple of bites, but that's it. However, this does not work for all insect species. **The neem ingredients accumulate in the tissues deeper inside the plant. The phloem, the outermost layer, contains hardly any. A tiny aphid feeds from the phloem; it can not penetrate deep enough to get a dose of neem.** But any leafhoppers, grasshoppers or similar chomping insects will be incapacitated quickly.

People eat neem leaves to cleanse the blood, stimulate the liver and boost the immune system. So we certainly don't need to worry about a bit of neem inside our food.

**Neem oil suffocates insects** — Many gardeners use white oil (plain mineral oil) or even olive oil to combat soft-bodied insects like aphids, thrips or whitefly. The oil coats the bugs and they suffocate. Neem oil insecticide does that as well. But it's more like a little bonus on top of everything else it does.

It can be a hazard, though. Of course, there is no difference between suffocating good or bad bugs. Oil suffocates anything. So this aspect can harm beneficial insects! **Note: the enzyme cleaner can be so diluted that it also does not harm the beneficial insects.**

**Neem oil and beneficial insects** — Neem is normally nontoxic for beneficial insects. The main reason is that insects need to ingest the neem oil to be affected, and beneficial insects don't eat your plants. But you can still kill beneficial insects if you smother them with neem oil, so please be careful.

Beneficial insects are most active during the day. The best time to spray neem insecticide is very early in the morning so the spray can dry before good insects become active. Also a good time is the late afternoon or evening. Once the spray has dried it does not harm your bees, ladybugs, lacewings, predatory mites and wasps, etc.

### **What Insects Does Neem Oil Control?**

Neem oil repels or kills over 50 insect pests. The most common insect pests controlled by neem oil soap include: aphids, crickets, flea beetles, grasshoppers Japanese beetles, lacebugs, mealybugs, mites, mole crickets, scales, spider mites, tent caterpillars, thrips and whiteflies.

In the lawn it controls chinch bugs, regular crickets, grasshoppers and mole crickets.

In trees and shrubs it controls adelgids, aphids, gypsy moth caterpillars, hemlock woolly adelgid, Japanese beetles, lacebugs, mites, pear psylla, pear slug, psyllids, scales, spruce woolly aphids, and tent caterpillars.

On flowers it controls aphids, earwigs, flea beetles, grasshoppers, green stink bugs, harlequin bugs, Japanese beetles, lace bugs, leafhoppers, leafminer, mealybugs, mites, plant bugs, rose slugs, rust mites, sawflies, scales, thrips and whiteflies.

In the vegetable garden it controls aphids, cabbage loopers, cabbage worms, Colorado potato beetle, earwigs, flea beetles, grasshoppers, green stink bugs, Japanese beetles, leafhoppers, Mexican bean beetle, mites, squash bugs, striped cucumber beetle and whiteflies.

On houseplants, it controls aphids, mealybugs, mites, scale and whiteflies.

**Using Neem Oil - Precautions — First the no-no's:** Do not use neem oil on drought stressed plants. It should not be used on new transplants and recently rooted cuttings. Because of potential phototoxic problems; it is wise not to spray neem oil on plants while they are exposed to full sun. Use it early in the morning, better in the evening hours. Avoid using neem oil with the air temperature is much above 85° F.

Because neem oil is in fact an oily substance, it can cause problems for certain plants because of the way it filters the sun to the leaf surface. This "phototoxicity effect" can cause the leaves to wilt and flowers to wilt. On most plants it is not a problem at all.

There are a number of the more delicate plants wherein sometimes it is a problem and sometimes it is not a problem. The trick is to try it on a few leaves and wait a day to see if any wilting occurs. If not, it is safe to use. Use this technique on plants such as begonia, camellia, chrysanthemum, plants in the cucumber family, delicate ferns, fuchsias, grapes, impatiens, ivies, palms, peppers, schefflera, some conifers and succulents such as cactus and bromeliads.

There are some plants that cannot tolerate neem oil under any conditions. They include bleeding heart, crown

of thorns, gardenia, horse chestnut, jade plant, Japanese maple, lantana, mountain ash and sweetpeas. Generally it is wise to avoid spraying the neem oil directly on blossoms of most plants.

**70% Neem Oil** — The **70% Neem Oil** controls numerous diseases as well as insects. A naturally-occurring compound made from the neem tree that is grown in India:

- Broad spectrum insecticide/fungicide/miticide
- Controls insects and mites including whitefly, aphid and scale
- Controls fungal diseases including black spot, rust, mildew and scab
- For indoor/outdoor use on ornamental plants, flowers, vegetables, trees, shrubs and fruit and nut crops
- 

**Application** — **70% Neem Oil** is an effective fungicide for the prevention and control of various fungal diseases including powdery mildew, black spot, downy mildew, anthracnose, rust, leaf spot, botrytis, needle rust, scab and flower, twig, tip blight, and alternaria. As a preventative, 70% Neem Oil should be applied on a 7 to 14 day schedule until the potential for disease development is no longer present. To control disease already present, apply 70% Neem Oil on a 7-day schedule until disease pressure is eliminated. Then continue spraying on a 14-day schedule to prevent the disease from reoccurring. To prevent rust leaf spot diseases, anthracnose and scab; begin applications at the first sign of spring budding. To prevent powdery mildew; apply in mid-summer or when disease is first detected. Applications should continue until disease pressure no longer exists.

**Mixing Instructions** — Mix 70% Neem Oil at the rate of 2 T. (1 oz.) per gal. water. Thoroughly mix solution and spray all plant surfaces (including undersides of leaves) until completely wet. Frequently mix solution as you spray.

**Is It Safe?** Well, neem products are used in medication and consumed by humans; so any exposure to neem while treating your plants does not pose a treat. There are no restrictions put in place by the EPA.

The Author spoke to a few growers that have been using neem oil in their “pest control” program and they are delighted with it. Not just from the safety aspect — but the control. They have found the neem oil to be effective as a repellent – insecticide – miticide and fungicide. It also functions as an antifeedant which discourages insects feeding patterns.

- Insects would rather die than eat plants treated with neem oil.
- Extracts from neem have shown incredible success with not only battling fungus problems but also many forms of root rot.
- Neem biodegrades in a matter of weeks when exposed to the sunlight.

Here are a couple of tips on using neem oil:

- Pure neem oil will retain its potency much longer if stored at about 40° F. in low light
- Don't mix any more than you need
- Add water and a little soap before you spray
- Spray the complete plant including the potting media
- Mix 1 oz. in 1 gal. water. A weaker solution may be used for maintenance

**Using garlic to control aphids** — Aphids, also called “plant lice,” infect a variety of different plants. These tiny insects rarely exceed 1/8th inch long and may be yellow, green or black. Aphids can wreak immense damage on plants, particularly when large colonies manage to form. They suck the juices from the plant, leaving it nutrient-deficient and dehydrated. **They can even transmit plant viruses, which may in fact be more dangerous than the actual physical damage they inflict.**

#### **Garlic**

1. Aphid control may be accomplished in a number of ways, both through commercial means and home remedies. One such home remedy uses garlic, an herb known for its powerful antimicrobial properties. Garlic also contains sulfur, which is what helps give it its pungent odor and taste. Additionally, garlic will also help protect the plant from future infections of all sorts, aphids included.

## How to Make the Spray

2. This aphid spray takes about a day to make, so monitor your plants and possibly prepare this beforehand if you know your plants are likely to become infected. Peel and mince 12 ounces, or  $\frac{3}{4}$  cup, of fresh garlic and put it into a sealable container. Pour four ounces, or  $\frac{1}{4}$  cup, of mineral oil over this, put the lid on and set it aside. This will need to sit for about a day at the least, but remember that the longer you let it sit, the more potent the spray will be.

When you think it has sat enough, mix one tablespoon plus one teaspoon (or four teaspoons) of fish emulsion with a half-gallon of water. Then mix in  $\frac{1}{4}$  cup of (Castile) soap, which is an olive-oil based soap. Make sure to get the liquid form for the easiest mixing. Lastly, strain the garlic oil and then slowly add it to the fish emulsion water. Store it in a sealed glass container; it will keep for several months.

## Using the Spray

3. Before you use the spray, you'll need to dilute it a little bit. Mix two tablespoons of the garlic mixture to one pint of water. Put this into a spray bottle and you're set.

There's one concern, however, when using this spray. Plants are susceptible to something called phytotoxic burn, which essentially means that they can be harmed by certain substances that are potentially toxic, like the oil in the garlic spray. The garlic spray becomes harmful to plants at temperatures of more than 80° F., so make absolutely sure you don't use this spray at temps above that level. Likewise, humidity may also be a factor. Add the current temperature to the humidity level. If the number is greater than 140, you risk phytotoxic burn, so you shouldn't spray. With a number close to 140, such as 135, it's still technically safe to spray; however, do so with utmost caution as phytotoxic burn can kill plants.

Apply the spray to your plants as often as necessary when it is safe to do so. You may also want to consider spraying other uninfected plants susceptible to aphids, as aphids tend to simply migrate when an environment becomes inhospitable. This is mostly a precautionary measure, however, since this spray will kill most if not all aphids that come in contact with it.

**Aphid notes** — Although aphids seldom kill a mature plant, the damage and unsightly honeydew they generate sometimes warrant control. Consider the non-chemical controls first; as most insecticides, if used, will destroy beneficial insects along with the pest. On mature trees, such as in citrus orchards, aphids and the honeydew they produce can provide a valuable food source for beneficial insects.

**Monitoring** — Check your plants regularly for aphids—at least twice weekly when plants are growing rapidly. Many species of aphids cause the greatest damage when temperatures are warm but not hot (65° to 80°F). Catch infestations early. Once aphid numbers are high and they have begun to distort and curl leaves, it is often hard to control them because the curled leaves shelter aphids from insecticides or natural enemies.

Aphids tend to be most prevalent along the upwind edge of the garden and close to other sources of aphids, so make a special effort to check these areas. Many aphid species prefer the undersides of leaves, so turn them over to check them. On trees, clip off leaves from several areas of the tree to check for aphids. Also, check for evidence of natural enemies such as lady beetles, lacewings, syrphid fly larvae, and the mummified skins of parasitized aphids. Look for disease-killed aphids as well. They may appear off-color, bloated or flattened. Substantial numbers of any of these natural control factors can mean that the aphid population may be reduced rapidly without the need for treatment.

**Biological Controls** — Natural enemies can be very important in the control of aphids, especially in fields, groves, orchards and gardens not sprayed with broad-spectrum pesticides (organophosphates, carbamates and pyrethroids) that kill natural enemy species as well as pests. Usually natural enemy populations do not appear in significant numbers until aphids begin to be numerous.

Among the most important natural enemies are various species of parasitic wasps that lay their eggs inside aphids. The skin of the parasitized aphid turns crusty and golden brown, a form called a mummy. The generation time of most parasites is quite short when the weather is warm, so once you begin to see mummies on your plants, the aphid population is likely to be reduced substantially within a week or two.

Many predators also feed on aphids. The most well known are lady beetle, lacewing and syrphid fly. Aphids are very susceptible to fungal diseases when it is humid. Whole colonies of aphids can be killed by these pathogens when conditions are right. Look for dead aphids that have turned reddish or brown; they have a fuzzy, shriveled texture unlike the shiny, bloated, tan-colored mummies that form when aphids are parasitized.

Weather can also impact aphids. Populations of many species are reduced by summer heat, especially in desert areas, and aphid activity is also limited during the coldest part of the year.

**Alternative controls** — Ants “farm” aphids, often keeping them in their nests during winter, then bringing them out in spring and placing them on the host plant. The ants eat the honeydew the aphids produce and move them from plant to plant spreading any diseases that are present. The honeydew favors formation of a black fungus known as “sooty mold.” Control of the ants may often solve the aphid problem. Aphids abound in warm, moist environments and will attack almost anything, favoring succulent new growth.

**Predators** — Green lacewings, ladybugs and their respective larvae have a voracious appetite for aphids. Larvae from the syrphid fly also consume aphids. Hover flies and praying mantis feed on aphids.

**Repellent plants** — Anise, chives, coriander (cilantro), garlic, onions, petunias and radish. Nasturtiums act as a trap crop. Aphids definitely prefer yellow flowers.

- Squashing a few aphids around the infested plants releases a chemical signal that makes the other aphids drop from the plants and leave.
- To foil aphids: Flatten a square of aluminum foil around the base of plants to bounce light on the undersides of leaves. This also helps the plants in giving them more light.
- Try a barrier of powdered charcoal, calcium dust or bonemeal to keep them away from your plants.
- Stinging Nettle Spray: Aphids and Thrips - Cover 1 quart nettles with water, cover and ferment for 3 weeks. Mix 1 part nettle tea with 7 parts water. Spray.
- Spread out a barrier of tansy around the base of the plant to stop those ants.
- Use a spray made from a tea of tomato or potato leaves and water.
- Chop 12 or so tomato leaves and 1 chopped onion in ½ cup of 70% isopropyl alcohol for a few minutes. Apply the mixture directly on aphids with a Q-tip or paintbrush.
- A forceful spray of water is often enough to knock the aphids off the plant and may discourage the ants; well, sometimes.
- Put a bright yellow plastic pan in a strategic spot in the garden. Fill it a third of the way full with water. Aphids are drawn to the yellow color, land on the water, sink and drown.
- A soap spray can be used to strip them of their protective wax coating, dehydrating them. Mix 1 tablespoon of Castile soap to 1 gallon of water, spray.
- Garlic oil spray can kill aphids and other soft-bodied pests.
- A dusting of food-grade diatomaceous earth is lethal to aphids. Wear a mask when using DE.
- Teas made from elderberry or rhubarb leaves can act as a deterrent. Oxalic acid is the compound present in these plants that makes a spray effective. It is poisonous.
- Place banana peels at the base of infested plant. The peels give the plants a shot of potassium too!
- Horseradish, elderberry and yarrow tea.
- For woolly aphids on apple trees: Grow the trailing-type nasturtiums, training them to wrap up and around the tree trunk to ward off these pests. Very attractive too! Note: Nasturtiums will specifically attract the black aphid while repelling others.
- Crop rotation stops the buildup of pests and the depletion of soils.
- Read the rest of Chapter 37.
- 

#### **4) Then if you still have pest problems - use the ideal pesticide - Safe Solutions Enzyme Cleaners.**

So, how does the Safe Solutions enzyme cleaner safely and far more effectively control insects, arachnids, mold, fungus, bacteria and viruses? - <http://www.theidealpesticide.com> Basically, the same way it cleans. The various ingredients are skillfully combined to give a synergistic control of virtually all of your pest problems. The same way a boxer throws different punches/combinations to control his opponent - Safe Solutions, Inc. uses various ingredients that all have different pest control abilities to virtually control all pest problems. Let us look at the various ingredients:

**Sodium Borate** — Works as a dust, liquid and/or foam. Boron in the form of sodium salt has been used as an embalming agent by the ancient Egyptians, and as a flux for welding gold. Boric acid and borax have been used as mild antiseptics, especially for burns and the eyes. For the last 200 years boric acid was used to preserve food, but this use has been stopped because it could be used to “cover up” food unfit for consumption. Boric acid has been used to alleviate burns and stings and as a powder to prevent rash. Patients have been given 10 gm. per day for extended periods, and then excreted boron after 7 weeks. The acute boron dose for an adult is 20 - 60 mg. in a single dose and infants have died with 5 gm. In many countries, boron is given as a food supplement with the claim it heals 80% - 90% of all arthritis, cardiopathies have been corrected, vision has improved, balance has been restored, cases of psoriasis have also been improved. Dogs, horses, cattle, deer and goats have all been healed of arthritis. Today western societies (like the U. S. A.) ingest about 2 mg. boron daily; early in the 1900s we ate about 8 mg. boron per day. It is thought 5 - 6 mg. boron per day will prevent arthritis, but a higher dose may be needed for treatment. It is a registered (non-volatile) pesticide and a lumber preservative and as a micronutrient. The disodium octaborate ( $\text{Na}_2\text{B}_8\text{O}_{13}\cdot 4\text{H}_2\text{O}$ ) product (DOT), e.g., Tim-bor<sup>®</sup>, has been used by Stroz Services, Inc., Get Set, Inc. and many countries for years as a wood preservative and as a remedial control of wood destroying pests. Boric acid ( $\text{H}_3\text{BO}_3$ ) and its salts, the borates, borax ( $\text{Na}_2\text{B}_4\text{O}_7\cdot 10\text{H}_2\text{O}$ ) and disodium octaborate tetrahydrate ( $\text{Na}_2\text{B}_8\text{O}_{13}\cdot 4\text{H}_2\text{O}$ ), DOT, have been used for wood protection in Australia and other countries since the 1940s. Liquid borate sprays protect the wood against decay, carpenter ants, wood boring beetles and termites. Sodium borate is currently coming into wide use as a wood preservative here in the U. S. These compounds make wood permanently resistant to fungal decay and insect damage, and also act as fire retardants. Borates are slow-acting stomach poisons to insects and contact poisons to wood destroying fungi. Borates are not directly lethal to an organism. Borates reduce the intestinal flora which allow insects to digest food. Borates deactivate enzymes by cross-linking the enzyme's hydroxyl groups. Although borates are highly toxic to insects, they are less toxic to mammals because mammals excrete boron faster than insects. Borates are biostats rather than biocides. On fungi borates work on contact, since disrupting the enzymes in fungi stops them from extracting nutrients in the wood. Sodium borates inhibit necessary oxidative metabolic activity at the cellular level - a constant energy-producing process necessary for life. Over time inhibition of fundamental biochemical activity results in death. Tests for termite control in the 1930s had shown promise, but more toxic chemicals were introduced and these naturally-occurring controls were simply ignored by the poison applicators here, in favor of the extremely dangerous and carcinogenic termiticide poisons, e.g., chlordane, aldrin and heptachlor.

To apply Tim-bor as an aqueous solution, use two applications of 10% Tim-bor solution or a single application of 15% Tim-bor, the 15% solution is created by mixing 1½ lb. of the insecticide per gallon of water and applying immediately and/or a surfactant/foaming agent can be added to create a dry foam. The Tim-bor foam may be applied directly to wood surfaces or injected into insect galleries or wall voids. Sodium borate may be applied in two ways for general control of roaches, silverfish, ants and other insects: (1) in powder form to insect harborage areas or as a crack and crevice and void treatment, or (2) as an aqueous solution for crack and crevice treatment only. The product is highly toxic to both wood-destroying organisms and general insects but has low acute mammalian toxicity and is normally excreted quite rapidly. It is environmentally sound and can be used around children and pets, with no need for evacuation. It is easy to handle and mix, requiring no harsh chemical solvents. Tim-bor<sup>®</sup> is not absorbed through unbroken skin and washes off easily with soap and water. It is also odorless and non-flammable. When you use/substitute sodium borate to create baits, use about 1/2 the amount you would with boric acid. If you mix a tablespoon of sodium borate, 1/8 teaspoon of tea tree oil or emu oil and 1/2 teaspoon of fish oil with a capsule of Not Nice to Arthritis in a cup of body lotion. Stir and heat ingredients in a microwave oven for 25 - 30 seconds until thoroughly mixed; this mix will greatly help as a topical treatment for arthritis. Caution: While borates are not known to bio-accumulate in humans or pets, and are not absorbed through intact skin, all dusts should be applied using adequate personal safety protective gear. A dust mask should be worn to protect the applicator from inhaling dust, especially in areas of poor ventilation. Rubber gloves and long sleeves are also recommended to prevent skin abrasion and dermatitis. When applying a dust, care should be taken to apply only a thin layer of the material on the surfaces being treated. When completed, the areas treated should look as if they are in need of a dusting. Dust applications should be done only in wall voids, under cabinets and shelving units and in other dead air spaces where it will not be contacted by people or animals. If you can get any insect to ingest DOT you will kill them. The dead sea will always be the dead sea - salts do not break down but they keep on killing - Death Valley is death to all because of the borax. So use sodium borates to permanently control wood-destroying insects, fungi, termites and molds. Caution: Sodium borate's  $\text{LD}_{50}$  is more toxic than boric acid, but remember boron (as sodium borate) is also a food supplement, e.g., in Chroma Trim Gum<sup>®</sup>. The Author, like many people, believes that baits

made with 3% or less sodium borate work better than baits made with boric acid. Sodium borate can be used for “pretreatment” baits to pretreat or control termites. In order to ensure the best control, make them at ½% to 3% and monitor them yearly. When sprayed on concrete, the Author believes DOT becomes calcium boron and will not leach - killing many pest, e.g., roaches, termites and fungi permanently.

The same sodium borate formula is also sold as Solu-bor<sup>®</sup>, a fertilizer (or as an essential micronutrient to plants) and as Poly-bor<sup>®</sup>, a fire retardant. DOT also will “microencapsulate” some pesticides, e.g., pyrethrum, and keep them around in crystals for generations. When any insect rests on them it quickly dies. The Author knows of route men in Florida who routinely added sodium borate to their sprayers, that already contained (several) volatile, synthetic pesticide poisons, and have all reduced the use of volatile, synthetic pesticide poisons up to 75% the first year and up to 90% the second year. See **Caution** in Chapter 36. U. S. borates were being tested for termite control at least since Cel Cure<sup>®</sup> was patented to protect wood in 1933, but research was shelved in favor of more toxic substances like the cyclodiene chlorinated hydrocarbons, e.g., chlordane, heptachlor, aldrin and dieldrin.

Already in the 1940s borax and boric acid and sodium borate were routinely being used to protect wood in Australia, New Zealand and Europe. Lumber was protected on a commercial scale by the dip-diffusion method in Australia in the mid-1940s and sodium borates with greater water solubility were being used in Australia and New Zealand in the 1950s. By the 1970s hundreds of research papers noted how great borates protected wood. Only after aldrin, dieldrin, chlordane, heptachlor and mirex were banned or removed in the U. S. in the 1980s did the U. S. allow these wonderful U. S. Pestisafes<sup>®</sup> to be used here. As of this writing, several states still will not allow them to be legally used to protect wood safely; these regulators still insist that the maximum rate of far more volatile and, therefore, more dangerous/toxic termiticide poisons, that do not last any where as long, or work as well (even when they are contaminating us), be “used” to protect people and their property - no matter what the people want! It is a sad fact that most U. S. homes treated with volatile, synthetic termiticide poisons or fumigants have to be routinely monitored and retreated. Not only do the volatile termiticide poisons not work, they are killing us. These regulators did not learn anything about safe termite control - now about 75% of all U. S. homes built before April, 1988 are permanently contaminated with significant levels of chlordane! When you compare this simple fact with another one - that with no contamination problems, borate-treated construction lumber in New Zealand has “effectively eliminated damage caused by all wood destroying organisms” in homes built there since the 1950s when standards for non-volatile borate treatments were first developed - you must ask the obvious question, “Who is getting paid off there?” Sodium borate or borax will completely denude a forest and kill any rodent or insect that eats it.

**Glycerin** — Glycerol, the main component of glycerin, has the chemical formula  $C_3H_5(OH)_3$ . It is a trihydric alcohol, possessing two primary and one secondary hydroxyl groups, which are its potential reaction sites and the basis for glycerin’s versatility as a chemical raw material. For example, glycerol esters, the reaction products of glycerin with various fatty acids, form an important class of derivatives that are extensively used in the food industry. The physical properties and characteristics of glycerin are as significant as its chemical properties for many applications. These qualities enable glycerin to be used as a humectant, plasticizer, emollient, thickener, solvent, dispersing medium, lubricant, sweetener, bodying agent, antifreeze and processing aid. **It is not unusual for glycerin to contribute two or more features or attributes to a product or application. In all applications, whether as a reactant or as an additive, the virtual non-toxicity and overall safety of glycerin is always of significant benefit.** Glycerin applications appear to be limited only by the imagination and creativity of the scientific and technical communities. Glycerin is used in many consumer products such as personal care preparations, cosmetics, pharmaceuticals and foods because of its contribution to product properties, stability and compatibility with a wide variety of chemicals, and relative non-toxicity. **Glycerol is naturally bacteriostatic and can be used orally to eliminate halitosis, as it is a contact bacterial desiccant. The same property makes it very helpful with periodontal disease; it penetrates biofilm quickly and eliminates bacterial colonies and, therefore, is of great help in Safe Solutions, Inc. enzyme cleaners.**

**Protease Enzymes** — Safe Solutions, Inc. enzyme cleaners contain protease and are virtually non-toxic, yet they quickly and safely destroy insect exoskeletons; when insects molt they inject a very tiny amount of protease into the “seam” of their exoskeletons - creating a “zipper” - so they can “step out”. Obviously, protease enzymes will never create immune or resistant insects like synthetic pesticide poisons do. If you were to describe the perfect pesticide you would want an inexpensive chemical, that left no poison residual, created no

contamination, was nontoxic to people and pets, was broad-spectrum and controlled virtually all insects, fungi, mold, mildew, bacteria, plant diseases, would not create resistant species, and could be applied in numerous ways; you can also add a “kicker” with food-grade diatomaceous earth, alcohol, hydrogen peroxide, garlic and other essential oils. Note: pure protease enzymes will not kill insects; the enzymes can not penetrate the exoskeleton until it is cleaned off with the surfactants; therefore, the wetter you make the enzyme/surfactant spray the better.

**Peppermint** — Crushed, dried peppermint leaves, securely tied in small sachets or bags, will make your summer home/cottage smell better; toss them in closets, drawers, dishwashers, stoves, under crawls, beds and furniture to repel mice. Peppermint inhaled or eaten will also keep you more alert. Peppermint soap diluted in water makes an excellent insect spray. Peppermint is a natural hybrid of the garden spearmint and the water mint. The principle components of peppermint oil are menthol, menthone and menthyl acetate, although analysis of peppermint’s volatile oil will typically show more than 40 different compounds. Peppermint oil (and tea) have been used to fight the common cold and have demonstrated significant anti-viral activity. The Author has found, when added to enzyme cleaners or when used alone, peppermint oil and/or soaps are excellent pest control chemicals. **All these natural components of peppermint oil give a wonderful wax stripping ability. Isn’t it interesting the outside of insects is covered in wax, and peppermint soap quickly kills most insects.** Crickets sprayed with 1 oz. peppermint soap per 1 qt. water die in 75 seconds or less. Mice are repelled for months by a few drops of quality peppermint oil. **Peppermint oil** controls and/or repels many rodent and insect pests, e.g., lice. Peppermint oil is bacteriostatic and anti-spasmodic. Put 1 - 3 drops in a glass of water and it can be used as an antiseptic mouth rinse and it will relax breathing. It counteracts fainting and dizziness sensations. Add 2 - 3 drops of peppermint oil to your tea or water and sip it during the day during flu and cold season.

**Surfactants (or surface-active agents)** — Are slightly viscous, clear amber substances or colloids that work as (“magnetic”) cleaners and degreasers. Surfactants can be used as household, industrial and marine cleaners, personal hygiene products, insect repellents and insect, arachnid and bird pest control compounds. A micelle is a colloid, microscopic particle formed by an aggregation of small biodegradable molecules. Each molecule has a hydrophilic (water-seeking) pole and a hydrophobic (water-repelling) pole. The hydrophobic poles attract each other, forming the interior of the micelle and the hydrophilic poles form the outer surface. When a single micelle or surfactant molecule comes in contact with a hydrocarbon molecule (grease, oil, wax, binders, etc.), the hydrophobic center of the micelle or surfactant quickly bonds via homologous attraction to the hydrophobic hydrocarbon site, locking it into a colloidal suspension, pulling the hydrocarbon into the micelle and lifting the hydrophobic hydrocarbon molecule from its original surface. This emulsification process easily penetrates highly viscous, dirty and/or sticky materials, lifting them off. Unregistered surfactants are used in pesticide poison formulations, but the Author has found they work better alone, but then they become “unregistered pesticides”. Because the exoskeletal structures, wax and joints of insects (all living cells) are basically all comprised of protein/hydrocarbon molecules = insects, gnats, mosquitoes, flies, etc. may avoid surfaces upon which diluted surfactants or (colloidal) micelles have been sprayed for two days or more. When sprayed directly with surfactants, (which cause the micellation) insects, mites, mold, bacteria, etc. will all die quickly because of the lifting of hydrocarbon molecules (they literally are dismantled)! Surfactants are considered to be biodegradable and basically innocuous to people and pets, but will often kill fleas, lice, spiders, ticks and other pests while washing or upon contact. If ingested, they may cause diarrhea primarily due to the emulsification of grease and oil in the digestive tract. A detergent builder can simply be the second surfactant.

**Some natural surfactants** are Castile soap, yucca extract, soapwort and quillaja bark extract. The Author has found that blending simple surfactants can kill insects and arachnids faster and more safely and effectively than any synthetic pesticide ever could and the insects and arachnids can not become resistant. One of the formulas he is trying to create in China is a cleaner that uses SAS rather than SLS. It is incredible and safe. Even greatly diluted, this formula not only out-cleans soap, but this basic formula is very economical and easy to produce. This formula can also be used as a basic pesticide to safely and inexpensively and effectively control most insects, arachnids, bacteria, viruses, molds, odors, stains, mildews, fungi, etc.

Remember that virtually any combination of ionic and non-ionic surfactants will work. Here in the USA the Author simply uses a concentrated dish soap to make enzyme cleaner. The Author uses concentrated baby shampoo to make lice shampoo because both sodium laureth sulfate and its cousin can be irritating chemicals. Soaps and shampoos containing sodium laureth sulfate can lead to direct damage to the hair follicle, skin

damage, permanent eye damage in children and even liver toxicity.

**Even so, both Sodium Laureth Sulfate (SLES) and its close relative Sodium Lauryl Sulfate (SLS) are commonly used in many soaps, shampoos, detergents, toothpastes** and over 80 products that are expected to “foam up”. Both chemicals are very effective foaming agents, chemically known as surfactants. National Institutes of Health “Household Products Directory” of chemical ingredients lists over 80 products that



contain SLS and SLES. Some soaps have concentrations of up to 30%, which the ACT report called “highly irritating and dangerous”. Remember the Author’s concentrated formula only uses 2.5% SLS and then it is diluted.

Although sodium laureth sulfate is somewhat less irritating than SLS, it cannot be metabolized by the liver and its effects are, therefore, much longer-lasting. This not only means it stays in the body tissues for longer, but much more precious energy is used getting rid of it.

Shampoos are among the most frequently reported products to the FDA. Reports include eye irritation, scalp irritation, tangled hair, swelling of the hands, face and arms and split and fuzzy hair. This is highly characteristic of sodium laureth sulfate and almost definitely directly related to its use.

**So why is a dangerous chemicals like sodium laureth sulfate (SLES) and/or Sodium Lauryl Sulfate (SLS) commonly used in USA toothpastes, soaps and shampoos?** The answer is simple - they are cheap. The sodium laureth sulfate found in our soaps is exactly the same as you would find in a car wash or even a garage, where it is used to degrease car engines. In the same way it dissolves the grease on car engines, SLES also dissolves the oils on the pest, which can cause a **drying effect**. It is also well documented that SLES **denatures skin/exoskeleton proteins**.

#### **USA Products commonly found to contain SLS or Sodium Laureth Sulfate**

- Soaps
- Shampoos
- Bubble-baths
- Toothpaste
- Washing-up liquid/dish soap
- Laundry detergent
- Children’s soaps/shampoos
- Stain remover
- Carpet cleaner
- Fabric glue
- Body wash
- Shave cream
- Mascara
- Mouthwash
- Skin cleanser
- Moisture lotion/moisturizer
- Sun cream

Please see: <http://www.theidealpesticide.com> .

**5) Finally, if you still have pest problems that are creating an economic loss, use food-grade diatomaceous earth (DE).**

**Safe Solutions, Inc. or Perma-Guard (food-grade) diatomaceous earth (DE) is milled at a consistency much like flour and is a fossilized shell (diatom), hence the name Fossil Shell Flour®. You can even apply DE with the enzyme spray to create residual control, but it must be continuously agitated as it is being applied. Please read about food-grade DE in Chapter 40.**

All diatomaceous earth is not the same. Diatomaceous earth packaged under the Safe Solutions, Inc. and Perma-Guard Fossil Shell Flour® labels comes from an extremely pure, fresh water deposit of the diatom *Melosira Preicelanica*. Why is this diatom so special? Its shell is made of amorphous silica. Its shape and hardness are important to how it works. Its hardness keeps it from dissolving in liquid. The holes along the diatom's wall allow it to absorb moisture, hence its use as an anti-caking agent. With more than 600 deposits of diatomite west of the Mississippi—and only four (to the Author's knowledge) that can be considered food grade—it is very important that people know what they are using. The vast majority of diatomite deposits are impure. When diatomite is formed, water currents bring in foreign material that mixes with the microscopic diatom shells. This type of diatomite is absolutely without value for practical purposes, but many people still tend to think that if it is labeled "Diatomaceous Earth," then it has the same value and safety as other, purer deposits. There are many places where diatomite deposits can be loaded up "for free," but generally this substance has no real organic value. If this impure diatomite is sold for practical usage, the customer may end up with an unpleasant surprise. **Make sure you always and only use food-grade DE!**

**Why fresh water vs. salt water DE?** Fresh water deposits like Safe Solutions, Inc. and Perma-Guard's have a consistent diatom presence. Their fossilized shells have maintained their tubular shape. This shape and strength of the fossil shell is critical to its effectiveness. Safe Solutions, Inc. and Perma-Guard's deposit has 89 - 95 percent amorphous silica content. This deposit is also more consistent in its purity of other elements that have settled in it. A fresh water deposit is confined to the run off water of its surrounding environment. A fresh water deposit in the mountains, such as Safe Solutions, Inc. and Perma-Guard's, formed when snow was pure and its run off provided the water source these diatoms lived in. Salt water deposits contain a mix of types of diatoms of different shapes. Their fossilized shells are fragile and break easily. This renders them ineffective for Safe Solutions, Inc. and Perma-Guard's purposes. The salt water deposits are less predictable in their sediments.

**What's the difference between amorphous and crystalline silica?** Amorphous silica is silica in its natural-occurring state. It is a trace mineral every mammal on the planet needs to live. It becomes crystalline when it is exposed to extreme heat through volcanic activity or commercial manufacturing means. The type of diatomaceous earth used in swimming pool and other filtration systems is crystalline silica. Crystalline silica is extremely dangerous when inhaled or ingested. It is not biodegradable, and, therefore, not usable in organic agriculture.

Bird and animal feed contain substances such as molasses that cause the particles to become "sticky". It forms clumps that not only make the feed hard to pour, but also to become moldy. Safe Solutions, Inc. and Perma-Guard's Fossil Shell Flour® mixed in the feed coats each particle making it difficult for the particles to stick together. This allows the feed to "flow" better and its absorption ability protects it from mold. No mold means less wasted feed. By separating the particles of feed, the animal's digestive enzymes are able to completely surround each particle. This allows for a more complete digestion. The animal gets more benefit from its feed and the farmer more benefit for his/her feed dollar.

Fossil Shell Flour® anti-caking agent is to be mixed at a rate not to exceed 2% of the dry weight of the rations. This means, when mixing, in every one hundred pounds of feed, 2 pounds of feed is replaced by 2 pounds of Fossil Shell Flour®. All regulated products are sold by the information on the label. Fossil Shell Flour® is OMRI listed.

Perma-Guard is one of the oldest producers of a line of natural insecticides using this same diatom because of it's shape. These diatoms are tubular with tiny holes and are very hard. The deposit from which Perma-Guard draws the DE for their formulated products was partially chosen for the consistency of the diatoms in the deposit and its purity of unwanted sediment. Salt water deposits have many different types of diatoms present and they are fragile. If the diatoms are not the correct shape and are fragile, or the deposit contains clay or other unwanted sediment, it is dangerous and not as effective in an insecticide formulation.

Food-grade DE insecticides kill by physical action, not chemical. First by being abrasive to the insects exoskeleton and absorbing its body fluids, thus posing no harm to warm-blooded life — it is a natural insecticide. DE is composed of finely milled fossilized shells of minuscule organisms called diatoms. The microscopically fine, sharp edges desiccate the insects' exoskeleton upon contact and the pests dehydrate and die within hours. The insects also die when they eat the dust. Safe Solutions, Inc. and Perma-Guard products are a much

needed revolution for pest control. These products are certain death to insects. Moreover, on any surface, these natural pesticide products have a remarkable repellency factor. As long as it is present, insects tend to stay away, making a serious infestation unlikely. Also, the more it is used, the more an environment is created that tends to make insects feel unwelcome.

**For control of aphids, whitefly, beetles, loopers, mites, leaf hoppers, adult flea beetles, sawfly, codling moth, twig borer, thrips, mites, cockroach, slugs, snails, earwigs, silverfish, and ants. Can also be used for bedbugs, cabbage root flies, carrot root flies, fleas, pill bugs, ticks and is helpful in dealing with fungus gnats. For use in the greenhouse or outdoors on fruits, vegetables, flowers, grains and grass — up to and including the day of harvest. A puffer bottle is adequate for indoors and outdoor potted plants.**

**Dry Application** — The goal is to get coverage over the entire plant, especially under the leaves. For young plants, as little as two pounds per acre may be adequate. For larger plants, 5 lb/acre is probably sufficient. With extra growth, it might be necessary to increase the amount. An examination of the leaves will tell if the leaf bottom is covered. A good dust applicator is essential and should be equipped with electronic nozzles, which put a negative charge on the dust. The plant, being positive, attracts the dust making for a better coverage even on the leaf bottoms. For young plants, as little as 2 lb/acre may be adequate. For larger plants, 5 lb/acre is probably sufficient. It applies best when there is dew or after a light rain. It is a long-lasting, natural, effective powder, and it is impossible for insects to build up a resistance to it.

**Wet Application** — The same rates per acre apply when using as a water and powder mixture. Adding water is merely a means of using existing spray equipment and can be used by making a thin slurry of food-grade DE and water. This method can give you precise coverage and when it dries the DE goes to work. A slurry can also be used as a “paint” on tree trunks to discourage insects and to give sunscald protection to the bark. A slurry paint may also be useful in deterring borers from laying eggs on bark.

#### **Mixing Instructions:**

##### **For Fruit Trees:**

The Author has used 8 oz. per gal. or 2½ lbs. per acre and found it to be very effective.

Minimum dilution: 1 lb. to 2 gals. water

Maximum dilution: 1 lb. to 25 gals. water

The purpose is to get a solution that will flow easily through the nozzle and still put the recommended amount of product per acre. Again, it is essential to get coverage on the underside of the leaf.

##### **Garden and Yard Plants:**

The same specifications apply. Get coverage on top and bottom of leaf. Apply either wet or dry.

**Applicators:** A variety of units are available, from small hand held units, to backpacks. Some are capable of applying either wet or dry product.

**Stored Grain Pest Protection with Food-Grade Diatomaceous Earth** — Just add 7–10 lbs. of Food-Grade Diatomaceous Earth to each ton of grain as it is conveyed into storage. When added to grain, Diatomaceous Earth kills any bugs that are present. It also protects the grain from further invasion. And bugs cannot become immune!

**Note: Though DE is completely harmless when ingested, the Author believes even food-grade Diatomaceous Earth (DE) — just like any dust — should not be inhaled by pets or people.**

**Intelligent Pest Management® uses an array of complementary methods: natural predators and parasites, pest resistant plant varieties, cultural practices, e.g., crop rotation and sequencing, biological controls, physical controls, preventative techniques to prevent pest populations from exploding and becoming a threat, deciding on acceptable pest levels, selecting the best plant varieties, deciding on proper plant nutrition, soil testing and finally on the proper choice and application of various alternative controls - if any. Quite often the best control is to do nothing.** The routine broadcast spraying of non-specific pesticide POISONS is never the proper answer/choice!

**7) Composting** — is the best and most simple way to add nutrient-rich humus that fuels plant growth and restores vitality to the depleted soil. It's also free, easy to make and good for the environment. You can add a layer of garden soil to your compost - this layer will help to mask any odors, and the micro-organisms that are present in the soil will accelerate the composting process.

Do not compost meat, bones or fish scraps (they will attract pests), perennial weeds (they can be spread with the compost) or diseased plants. Do not include pet manures in compost that will be used on food crops. Banana peels, peach peels and orange rinds may contain pesticide residue, and should be kept out of the compost. Black walnut leaves should not be composted. Sawdust may be added to the compost, but should be mixed or scattered thinly to avoid clumping. Be sure the sawdust is clean, with no machine oil or chain oil residues from cutting equipment.

For kitchen wastes, keep a large plastic container with a lid and a handle under the sink. Chop up any large chunks before you toss them in. When the container is full, empty it into the compost pile.

With yard and garden wastes, different composting materials will decompose at different rates but they will all break down eventually. If you want to speed up the composting process, chop the larger material into smaller pieces. Leaves and grass clippings are also excellent for compost, but should be sprinkled into the bin with other materials, or put on in thin layers. Otherwise they will mat together and take longer to compost. The following urls should really help you to start to understand composting.

<http://en.wikipedia.org/wiki/Compost>

<http://www.doityourself.com/stry/h2composting>

<http://www.wikihow.com/Compost>

<http://www.youtube.com/watch?v=aKlauRA7ugl>

[http://www.ehow.com/video\\_4467169\\_composting.html?ref=Track2&utm\\_source=ask](http://www.ehow.com/video_4467169_composting.html?ref=Track2&utm_source=ask)

Note: The Author uses composted chicken manure to nourish his soil and plants.

**8) How to remove most weeds** — Simply flame them - the flames will also kill the seeds.

**How to control/remove poison ivy** — Never flame poison ivy. Want to remove a few poisonous plants? Place a plastic bag over your hand and forearm and then carefully grab the vine/plant and pull out the roots. Then carefully pull the top of the plastic bag over the plant and its roots and tie it off, sealing the problem inside the bag. Now carefully and properly dispose of the sealed bag. Then you can wash with Burt's Bees Poison Ivy Soap or Fels Naptha Soap. For larger amounts of poison ivy you can carefully spray a mix containing 1 c. salt, 1 T. liquid dish detergent in 1 gal. vinegar — this mix will kill most vegetation. Spanish and Angora goat breeds absolutely love to eat poison ivy. Other goat breeds will normally not eat poison ivy. Note: Ammonium sulfonate is a registered herbicide POISON that is used to kill many types of woody plants, trees, poison ivy, etc.

**“Pesticides are war chemicals that kill - every year 220,000 people are killed by pesticides worldwide”**

“We are witnessing a massive corporate genocide - the killing of people for super profits. To maintain these super profits, lies are told about how, without pesticides and genetically modified organisms (GMOs), there will be no food. In fact, the conclusions of International Assessment of Agricultural Science and Technology for Development, undertaken by the United Nations, shows that ecologically organic agriculture produces more food and better food at lower cost than either chemical agriculture or GMOs.” - Excerpt from Vandana Shiva's *“The Killing Fields of Multi-National Corporations”*, *The Asian Age*, July 14, 2010

<http://www.asianage.com/opinion/killing-fields-mnacs-035>

**9) Remember - Often the best control of any pest problem is simply to do nothing but follow good planting practices including crop rotation and allow the natural beneficials to safely and effectively do your pest control! Read the rest of this free book and then do your own ongoing research!**

**WARNING: The Surgeon General Will Eventually Determine that Pesticide Usage Is/Was Dangerous to EVERYONE'S Health.**

## **In order to properly feed people - you need to first properly feed your soil/plants.**

It's not a secret that our soils have been virtually exhausted of essential, trace and rare minerals so vital to our health and life. Almost seventy years ago (1936), the United States Department of Agriculture issued U.S. Senate Document 264, stating "that virtually all soils in the United States were mineral deficient. Scientists at the 1992 Earth Summit in Brazil submitted documentation that soils world-wide were even then depleted of vital minerals. The United States soils were already rated as one of the most serious problem soils with 85% of the essential minerals depleted. [http://foliarfert.com/pages/where\\_have\\_all\\_the\\_minerals\\_gone.htm](http://foliarfert.com/pages/where_have_all_the_minerals_gone.htm)

### **WHERE HAVE THE MINERALS GONE?**

Minerals are basic elements of the earth and universe. They cannot be created or destroyed. Soils once rich with life sustaining minerals are now becoming depleted because they were simply absorbed into the growing vegetables and fruits. Once eaten, they were removed forever from the soil. While a plant can create proteins, carbohydrates and many other nutrients, it cannot create minerals. They are either available in the soil or they are not. Even if they are still available there they can not be absorbed by the plants without living beneficial micro-organisms.

Most soils have produced food for hundreds (in China for thousands) of years. The minerals in those foods were eaten generations ago. Now depleted, the produce grown is less nourishing and healthy. Fertilizers may increase growth rates, but the produce has become "hollow food". In addition, synthetic fertilizers may convert mineral ions into insoluble complexes, making it even more difficult for the plants to absorb any remaining essential minerals. Pesticides and herbicides may kill or greatly inhibit the beneficial micro-organisms in the soil responsible for solubilizing minerals so the plant roots can absorb them. Literally, the minimal amounts of minerals left in the soil may become, to a large part, insoluble and unabsorbable due to modern agricultural practices.

### **OUR FOOD IS DRAMATICALLY LACKING IN MINERALS AND OTHER NUTRIENTS**

Our enzymes, hormones, immune system and almost all biological activities absolutely demand wide varieties and amounts of minerals. For example: magnesium is the activator for over 300 enzymes and for producing ATP, the energy currency of our bodies. Magnesium is seriously deficient in the average diet and yet the mainstream of medical doctors (especially cardiologists) give little attention to our body's critical need for it. Zinc is a component of all cells, with significant benefits (in proper quantities) for the immune system, growth and development of muscular and skeletal structures, tissue repair and a cofactor in about 70 different enzymes. Yet foods generally contain much less zinc than we need, especially for children. Minerals also help alkalize our bodies to maintain a proper pH and to resist infections and cancer. When people die of a heart attack it would be more proper in the Author's opinion to say they died of a serious magnesium deficiency.

**Scientists theorize that mineral deficiency subjects us to more diseases, aging, sickness and destruction of our physical well-being than any other factor in personal health. A great many known ailments, around 60, are directly linked to mineral deficiency.**

Afflictions like osteoporosis, heart disease, arthritis, diabetes, liver disease, birth defects and impaired mental functions are only a few examples. Our health, energy and vitality is more dependent on minerals than the amounts of protein, carbohydrates or calories we consume. From vitamins to almost every process in the human body, mineral complexes are indispensable. However, if minerals are not in the soil, they can't be in your food. If they're not in your food....they can't be in you! No amount of fertilizer, water or cultivation can change that! That is why so many people take mineral supplements!

<http://www.healthylivingintl.com/minerals/colloidal.htm>

### **LOW MINERAL LEVELS STARVE OUR BODIES & IMMUNE SYSTEMS**

The World Health Organization estimated there are around two million children a year that die from health problems caused by mineral deficiencies. Many of us have seriously deficient diets, since so many vegetables, produce, fruits, grains and even meats are shockingly low on minerals. Minerals freely circulate through our body and are readily absorbed up by our organs, bones, tissues to build, repair, heal, create health and energy,

and a myriad of other vital health functions. Scant levels of minerals are starving our biological health and the Author believes contribute to the many health risks accompanying obesity. Research suggests that some of our appetite is controlled by how much and the varieties of trace minerals we get in our diet. University studies indicate we may over-eat and over-eat until our trace mineral levels get high enough to sustain us. We need to first nourish our plants so they can nourish us! <http://www.the-organic-gardener.com/organic-fertilizer.html>

**Please note: The Author does not recommend the use of Synthetic Chemical Fertilizers. This is because the Author firmly believes there are many dangerous health hazards due to the “use” of Synthetic Chemical Fertilizers, e.g., birth defects, reproduction problems, liver damage, kidney damage, Blue Baby Syndrome and reduced immune response. A few of these hazards are:**

- 1: Industries around the country are disposing of toxic waste by giving it to chemical fertilizer manufacturers.
- 2: Some chemical fertilizer has been found to contain dioxin, one of the most dangerous environmental chemicals ever identified, and heavy metals such as lead, cadmium and mercury.
- 3: Many edible plants such as lettuce, corn and potatoes uptake dangerous heavy metals which you then eat.
- 4: Common chemical fertilizers used by families on gardens or by farmers on fields of edible crops may contain toxic metals in amounts greater than what the law defines as “hazardous waste.”
- 5: The law does not require chemical fertilizer manufacturers to label which fertilizers contain toxic metals or where the various hazardous wastes were obtained.
- 6: Toxic metals known to have serious health effects are present in chemical fertilizers, yet there is no assessment of the synergistic and/or cumulative health problems to people, especially to children, animals and soils resulting from the repeated applications of chemical fertilizers that contain dangerous hazardous waste.
- 7: Children are most susceptible to the toxic effects of many metals, especially lead, which has been the subject of intense government efforts to reduce lead exposure to children. Products like synthetic chemical fertilizers are of special concern as children spend more time on or near the ground and are often exposed to ground level substances through hand-to-mouth behavior.

## **TOXIC CHEMICAL FERTILIZERS THREATEN HUMAN HEALTH**

The toxic substances found in the tested fertilizers have been linked to adverse human health impacts. The metals found in these fertilizers are known or suspected carcinogens, reproductive and developmental, liver, and blood toxicants. For example, beryllium is a suspected carcinogen, chromium and arsenic are known to cause cancer and barium can cause kidney and lung damage.

The California Public Interest Research Group (CALPIRG) Charitable Trust and Washington’s Safe Food and Fertilizer tested 29 fertilizers from 12 states for 22 toxic metals in dangerous quantities (Aluminum (Al), Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Lead (Pb), Mercury (Hg), Nickel (Ni), Selenium (Se), Silver (Ag), Thallium (Tl), Thallium (Tl), Uranium (U), and Zinc (Zn). This report documents the results of these fertilizer samples, demonstrates that the problem of toxic fertilizers is widespread, and details concerns with proposed regulations for the practice. Add to this list the thousands of hazardous compounds and then think about yourself, your spouse, your children, your pets and the earth. <http://www.amelsghana.com/health-hazards-of-chemical-fertilizers/>

Chemical Fertilizer “Labeling” is inadequate. Because fertilizer labeling laws only require beneficial nutrients, like zinc or phosphate, to be listed, fertilizers are sold directly to the public and farmers without warnings or information that clearly notifies consumers about the presence and quantity of any/all toxic metals/waste. Also, there is no indication on the fertilizer labels as to whether or not the fertilizers were tested have been further treated to meet federal land disposal standards.

Each of these contaminating metals is suspected or known to be toxic to humans and the environment by the U.S. EPA. Nine metals, like arsenic and lead, are known or suspected to cause cancer and ten metals, like

mercury, are linked to developmental effects. Three of the tested metals – lead, cadmium and mercury – are also persistent bioaccumulative toxins (PBTs). PBTs persist for long periods of time in the environment – some indefinitely – and they can accumulate in the tissues of humans and wildlife, increasing the long-term health risks at even low levels of exposure. These three metals are known to cause cancer, birth defects, or reproductive problems.

Existing standards for toxic metals in fertilizers are inadequate for protecting our soils, crops, plants, water, air and health. All commercial fertilizers made from recycled materials, such as hazardous wastes, and produced for the general public's use, are subject to the federal Land Disposal Restrictions. The U.S. EPA's federal Land Disposal Restrictions, which are applied to zinc fertilizers that contain toxic waste, are intended to ensure that toxic substances are properly treated before the waste is disposed of in heavily regulated, lined landfills. Land Disposal Restriction standards are technology-based standards, which mean that they are designed to predict the ability of a hazardous waste to leach from these landfills.

Unfortunately, the recycling of hazardous wastes into fertilizer products does not always include the process of treatment or cleaning of hazardous waste, but rather simply the dilution of the waste. Dilution involves adding substances to a hazardous waste to reduce the concentration of toxic substances that are present in the waste. **Dilution does not reduce the toxicity of the hazardous materials.**

The U. S. National Institute of Health estimates that 1 in 7 adults and 1 in 4 American children are already negatively affected by chemical fertilizers.

### **Some Other Harmful Effects Of Synthetic Chemical Fertilizers**

- Loss of beneficial micro-organisms
- Loss of fertile topsoil
- Loss of organic humus content in soil
- Reduced porosity of top soil
- Nitrate pollution of waterways
- Phosphate pollution of waterways
- Desertification
- Poisoning of people eating plants containing excessive levels of inorganic salts
- Blue-baby syndrome (methemoglobinemia) and miscarriage in pregnant women caused by nitrate pollution of drinking water
- Heavy metal pollution of soils causing poisoning and cancer - mercury, lead, cadmium and uranium
- Fertilizer burn - caused by too much fertilizer being applied, resulting in a drying out of the roots and damage or even death of the plant
- Trace mineral depletion of the soil. Because most chemical fertilizer programs don't these elements in the soil, they gradually get depleted by crops. Iron and Zinc deficiencies are common in soil over-loaded with non-dissolving P. Various diseases in livestock including Grass Tetany, Milk fever, Grass staggers, Scouring, Ill Thrift and a whole range of metabolic disorders
- Excessive energy consumption. 2% of the world's entire energy consumption is used to make ammonia, much of which is used to make N fertilizers
- Depletion of non-renewable natural resources. Phosphorous comes from rocks which are limited in supply. Nitrogen is made from fossil fuels.
- Eutrophication of waterways
- Loss of biodiversity in the ocean
- Soil Acidification
- Toxic persistent organic compounds - Dioxins, polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) have been detected in fertilizers and soil amendments
- Radioactive poisoning. Highly-radioactive Polonium-210 in phosphate fertilizers
- Increased Greenhouse Gases. Nitrous Oxide is the 3rd most important GHG because of the excessive use of chemical N fertilizers
- Increased pest problems caused by excessive nitrogen fertilizer applications
- Death, injury and environmental damage caused directly by the manufacture of chemical fertilizers
- Higher than normal rates of cancer in humans living close to phosphate mining operations

**Because of the above-mentioned inherent problems with chemical fertilizers, the Author's organic approach to gardening simply avoids using any chemical fertilizers and instead uses a wide variety of natural materials and substances derived from natural materials to boost and maintain the soil's fertility.** The most basic types of organic fertilizers are animal manures and green manures, composts and rock powders—substances that provide the soil with not only the major nutrients, but with trace minerals and organic matter as well. As organic farming has gained credence since the 1970's, more and more ready-to-use fertilizers derived from natural materials have come on the market. Many of these products have definite value, but none should take the place of the basic organic fertilizers: organic matter and rock powders.

[http://soils.usda.gov/sqi/concepts/soil\\_organic\\_matter/files/sq\\_tn\\_5.pdf](http://soils.usda.gov/sqi/concepts/soil_organic_matter/files/sq_tn_5.pdf)

Organic gardeners and farmers believe balanced, fertile soil, rich in organic matter, will consistently yield healthy plants in greater abundance. Their soil-building techniques basically resemble those practiced by their chemical fertilizer-oriented counterparts. <http://www.noble.org/ag/soils/OrganicMatter/Index.htm>

A. They test their soil so they know its nutrient levels, organic matter content and pH.

<http://www.ncagr.gov/cyber/kidswrld/plant/soiltest.htm>

B. They develop a long-range soil-management program based on the soil test results.

C. They seek to maintain major nutrient levels consistent with good plant yields.

Organic matter improves your soil - Organic matter has aptly been referred to as the earth's wholesome storehouse of the necessary soil's nutrients. Briefly, the reasons it is so vital to soils are that it:

- 1) Improves tilth and structure
- 2) Improves water-holding capacity
- 3) Aids in nitrogen fixation
- 4) Aids in soil structure aggregation
- 5) Is a reservoir of plant nutrients
- 6) Makes healthy minerals and other nutrients available to plants and thus to people once again
- 7) Prevents erosion

Soils differ widely in their content of plant nutrients, depending on the minerals from which they were formed and on the extent to which these original nutrients have been lost through erosion, leaching and crop harvesting. Some of these losses are made up by the weathering of minerals, rainfall, the action of earthworms and bacteria in the soil, and other natural soil phenomena. But serious deficiencies must be corrected if the soil is to produce adequate and healthy crops. This is the reason why organic fertilizers and mineral nutrients should be added—to maintain crop yields and to produce crops with the proper nutrients.

**Testing the Soil.** One of the best ways to gain an understanding of the major nutrient problems of soil is to have it tested, either with your own soil test kit or by your state experiment station or a commercial laboratory. Generally, a test of this kind will tell you whether or not your soil has a sufficient amount of the major nutrients—nitrogen (N), phosphorus (P) and potassium (K). Often, it will also indicate whether your soil is acid or alkaline. While most state experiment station laboratories still interpret soil tests and make recommendations in terms of excesses or deficiencies of chemical NPK, a growing number are prepared to provide organic equivalents on request. **Be sure to state this preference for organic methods when you submit your soil samples.**

**Feeding the soil not the plant.** The basic objective of natural soil fertility management is to feed the soil, not necessarily the plant. This approach entails a long-range commitment to building the overall fertility of the soil, as contrasted with merely supplying the minimum amount of nutrients to produce a single crop of plants in one season. The chemical fertilizer users have long made use of special proportions of fertilizers, such as 5-10-10 or 4-8-4. Such fertilizer formulas are merely simple ways to show the amounts of nitrogen, phosphorus and potash in the mixture of fertilizer. For example, in the combination 2-4-2, 2 percent is nitrogen, 4 percent is phosphorus and 2 percent is potash. The remaining 92 percent of the fertilizer is unknown "inert" matter.

**Chemical fertilizers and pesticides.** Our water supply is being contaminated with these synthetic toxins that have run off from agricultural land. Ground water contamination by chemical fertilizers or agricultural pesticides have already been confirmed in at least 40 States. Chemical fertilizer use has increased by a factor of 10 since World War II and many consider the amounts used to be far in excess of what can reasonably be expected to be taken up by the crops to which they are applied. In California, a massive 200kg/hectare/year or more is used on corn and other crops. The major chemical ingredient of fertilizers is nitrogen, in the form of nitrate, and this chemical alone can have a serious impact on human and animal health when ingested. Levels in drinking water

are frequently found to be above safe levels set by governments in industrialized countries. Nitrate is converted into nitrite in the body, which in turn lowers the blood cells ability to carry oxygen. This prevents adequate oxygen from reaching the brain, which can be fatal, especially in infants drinking formula where it can lead to so called 'blue baby syndrome'. In people with environmental illnesses, poor oxygen transport and utilization is already an issue, causing fatigue and muscle aches, so chronic exposure to nitrate in drinking water can only serve to exacerbate their health problems. Nitrate has already been strongly linked to gastric cancers.

**Organic fertilizers generally are naturally derived from plants, animals and/or minerals.** Microorganisms in the soil (if available) break down the materials into nutrients that plants can use. Some organic fertilizers contain significant amounts of only one of the major nutrients, such as phosphorus in bone meal, but they often have trace amounts of many other beneficial nutrients. Wise gardeners add various organic materials that not only improve the soil structure but also create and support soil microorganisms, which help make nutrients available more quickly, especially in warm weather when these living organisms are more active. As a general rule, organic fertilizers release about half their nutrients in the first season and then continue to nourish the soil over subsequent years. [http://en.wikipedia.org/wiki/Organic\\_fertilizer](http://en.wikipedia.org/wiki/Organic_fertilizer)

**Plant-based fertilizers - (avoid using GMO plants).** These plant-based fertilizers have low to medium NPK values (Nitrogen, Phosphorus, Potassium). They make the nutrients available quickly for the plants to use. Some of them even provide an extra dose of trace minerals and micronutrients. If you don't find all of these at the garden center, check out your local feed store. The most commonly available plant-based fertilizers include the following:

**Alfalfa meal:** This fertilizer is obtained from the alfalfa plants and made into pellet form. The meal adds potassium, nitrogen, growth stimulants and minerals. Roses, in particular, seem to like this fertilizer and benefit from up to 5 cups of alfalfa meal per plant every ten weeks, worked into the soil. A very good organic fertilizer for plants and soil. A plant food growth regulator, high in vitamins and minerals. 3-2-2--a green manure crop made from alfalfa which contains a plant growth regulator hormone. It jump starts millions of microbes that will then activate soil organisms that convert the surrounding nutrients into an available form that can be assimilated into the plants. Roses especially love alfalfa meal, but it also acts as a soil amendemnt for all plants. It can be added to your compost piles to speed up the process of breaking down the carbon rich materials. Use as a top dressing and water in, apply alfalfa meal dry at 10 pounds per 1,000 square feet.

**Compost:** Compost is considered by the Author as the best all-purpose organic fertilizer out there, and it can be safely used on all plants. Compost is generally not considered a true fertilizer because it is used more to increase the "bulk" of your soil. However, it is a vital component in your garden because it increases the health and richness of your soil. Think of it as the construction material of your soil and the protein for all the earthworms and microorganisms found in your soil. These organisms in turn unlock the minerals and nutrients found in the decayed organic material in the compost and surrounding soil. Compost can be easily created from your kitchen, yard and field waste in a compost bin or pile. Compost is considered the very best organic fertilizer because it is high in nutrients, soil microorganisms, humic acid, enzymes, vitamins, and humus.

**Compost tea:** A highly concentrated liquid brewed in water using a special blend of compost. Sprayed on plants and soil, compost tea has been shown to suppress disease, fight toxins, and increases nutrients available to the plants. Some gardeners say it makes vegetables taste even better.

**Coffee Grounds:** People are finding that a substance long tossed in the garbage is rich in nitrogen and can be used in the gardens, fields and compost piles. Check with your local coffee shop for a steady (and free) supply of coffee grounds.

**Cocoa Meal Shell Mulch: WARNING FOR PETS.** Cocoa Meal contains three percent nitrogen, four percent total phosphate and three percent potash. Application rates are normally two hundred to two hundred fifty pounds per acre, due to caffeine content. Cocoa meal is best used as an component in a fertilizer mix than as a direct amendment.

**Corn gluten meal:** Organic fertilizer and pre-emergent herbicide derived from corn, this powder contains 10 percent nitrogen fertilizer. **Apply it only to actively growing plants because it inhibits the growth of seeds.** The manufacturer recommends allowing 1 to 4 months after using this product before planting seeds,

depending on the soil and weather conditions. Use it on lawns in early spring to green up the grass and prevent annual weed seeds from sprouting.

**Cottonseed meal:** Derived from the seed in cotton bolls, this granular fertilizer is particularly good at supplying nitrogen (6 percent) and potassium (1.5 percent). Look for organic cottonseed meal because traditional cotton crops are heavily sprayed with pesticides, some of which can remain in the seed oils. Will keep weeds down if applied at the right time of year. Go for the organic meal as they do not contain pesticides. **Caution:** Cotton crops are the most sprayed crop with chemical herbicides and pesticides. Best if composted first to get rid of these toxic chemicals. Use in compost pile. Ground from cotton seeds which are a natural fertilizer considered by many to be the second best source of nitrogen after blood meal. Is a slow-release fertilizer and adds acidity to the soil.

**Cover Crops:** They are leguminous plants like clover and grains like rye and oats. Planted as a green manure. Some farmers are using short root alfalfa because it is easier to plow under. This is contrary to the whole purpose of deep root alfalfa - which was used initially to pull minerals and other nutrients from the deep earth.

**Kelp/seaweed:** Derived from sea plants, you can find this product offered in liquid, powder or pellet form. Although containing only small amounts of N-P-K fertilizer, kelp meal adds valuable micronutrients, growth hormones and vitamins that can help increase yields, reduce the plant stress from drought and increase frost tolerance. Kelp meal is made from dried seaweed. Is a good source of copper and boron. Rich in plant food growth hormones. a natural source of chelated trace elements that increases health of the soil and plants. Use as an additive to organic fertilizers at 10 pounds per 1000 square feet. **Apply it to the soil or as a foliar spray.** Saltwater plants, when dried and then ground, will stimulate root growth and have over 60 trace minerals that are needed by your plants. This organic fertilizer when combined with fish emulsion will make the best complete fertilizer. The Author has found that freshwater duckweed, algae and seaweed are also great organic fertilizers.

**Molasses:** An excellent food for microorganisms in the soil, molasses also contains trace minerals, sulfur and potash. Molasses plays a very important part in a complete organic program.

**Soybean meal:** Derived from soybeans and used in a pellet form, soybean meal is prized for its high nitrogen (7 percent) content and as a source of phosphorous (2 percent). To get the best price, search for it at animal feed-supply stores. Greenhouse research showed that soybean meal can prevent the germination of small seeds. Soybean Meal is 7% Nitrogen, 2% Phosphorus and 1% Potassium. Application rate: 4 pounds per 100 square feet. Soybean meal fertilizer is a high protein feed that when broken down by microbes provides natural organic nitrogen. It provides a soluble form of phosphorous. Like alfalfa meal, it is particularly beneficial to nitrogen-loving plants, such as roses.

**Humus:** When looking at organic fertilizer products, you'll invariably come across many that say they contain either humus, humic acid or humates. Some of these products have almost magical claims as to what they can do for your plants. Humus, humates and humic acids are simply organic compounds often found in compost. Humus is touted to increase soil microbial activity, improve soil structure, and enhance root development of plants. These products have no fertilizer value, but rather are used as stimulants to support soil microbial life that, in turn, supports the plants. Use them as supplements, but not to replace proper soil building and nutrition. They add organic matter to soil and enhance the quality of the soil. They do not work like a fertilizer themselves, but make all of the nutrients available faster to the plant. Humates are simply "digested" or composted organic matter and they are a source of humic acid and trace minerals and are the end result of a successful compost program. They smell like the forest floor decayed leaves.

### **Animal-based fertilizers**

All of the various creatures, animals, fish, and birds all freely provide organic fertilizers (manure) that can help your plants grow. Most animal-based fertilizers provide lots of nitrogen, which plants need for leafy growth. The following are some of the most commonly available ones:

**Manures:** Animal manures provide lots of organic matter to the soil, but most have low nutrient value. A few, such as chicken manure, do have high available nitrogen content, but should only be used composted because the fresh manure can burn the roots of tender seedlings. Actually all manure should be composted before

using because manures contain nitrogen and ammonia that can burn plants. Manures are rich in nitrogen and can, obviously, be obtained from many different creatures, some of which are far more effective than others.

**Bat/seabird guano:** This is the excrement from bats and seabirds. It comes in powdered or pellet form and is actually high in nitrogen (10 to 12 percent). Bat guano only provides about 2 percent phosphorous and no potassium, but seabird guano contains 10 to 12 percent P, plus 2 percent K and lots of trace minerals. The concentrated nitrogen in these products can burn young plants if not composted and used carefully. They tend to be more expensive than land-animal manures.

**Blood meal:** This is the powdered blood from slaughtered animals. It contains around 13 percent nitrogen and many other micronutrients. Leafy, nitrogen-loving plants, such as lettuce, grow well with this organic fertilizer. The organisms in the soil turn the dried blood into available nitrogen for plants. Lettuce and corn will benefit greatly. This blood meal will also aid your compost piles. Dried blood can also be used as top dressing or mixed with water and used as a liquid fertilizer. A slow-release source of calcium and phosphorus used to increase phosphorus levels. Can be recommended for bulbs and most vegetables. Excellent plant food. It also reportedly repels deer, but may attract dogs and cats.

**Bone Meal (steamed):** Is the best source of phosphorus and also contains calcium and some trace minerals. Because of its slow release, it is a safe fertilizer especially when potting new or young plants. Perfect for bulbs and good for lowering transplant shock. Promotes healthy root systems. Contains growth regulators and a good source of nitrogen and phosphorus, mostly used around roses. Excellent plant food. It is a popular source of phosphorous (11 percent) and calcium (22 percent), bone meal is derived from animal or fish bones and commonly used in a powdered form on root crops and bulbs. It also contains 2 percent nitrogen and many micronutrients. It may attract rodents.

**Crab Meal (5-2-0.5):** Considered a soil additive which is a by-product of the crab industry. Once they are kiln dried they are ground up into the meal. Adds life to soil by providing food for microorganisms, especially a protein called chitin. Chitin provides not only slow-release nitrogen but also suppresses pest nematode activity. General usage is anywhere plants grow and it can be added to compost piles.

**Earthworm Castings:** Organic fertilizer high in useful minerals and bacteria. The n-p-k is high and contains over 60 trace minerals, almost an ideal additive to soil. Made from worms digesting organic matter and then they excrete the castings. **Avoid chemical fertilizers which contain ammonium sulfate that is toxic to earthworms.**

**Feather Meal (12-0-0):** Feathers are ground up into a meal. Nitrogen is released over a long period of time. Use with other organic fertilizers as a slow-release source of nitrogen.

**Fermented Salmon (Coast of Maine) (1.4 - 0.2 - 0.2):** Is made from fermented salmon which has a very strong smell; pine oil will cover this smell. Consists of many nutrients and organic compounds that are immediately available to the plant. Naturally rich in oils and fatty acids when fermented that stimulate germination, root growth, foliage growth, product yield and stress recovery. Not a fish emulsion. Works to deter wildlife like deer and insects like aphids. Recently found to act as a fungicide. Use with any plant. **Apply as you would any other foliar spray or spray fertilizer.**

**Fish products:** Fish by-products make excellent fertilizers. You can buy them in several different forms. Fish emulsion is derived from fermented remains of fish. This liquid product can have a fishy smell (even the deodorized version), but it's a great complete fertilizer (5-2-2) and adds trace elements to the soil. When mixed with water, it is gentle, yet effective for stimulating the growth of young seedlings. Hydrolyzed fish powder has higher nitrogen content (12 percent) and is mixed with water and sprayed on plants. Fish meal is high in nitrogen and phosphorus and is applied to the soil. Some products blend fish with seaweed or kelp for added nutrition and growth stimulation.

**Leather Meal:** Made as a by-product during tanning process. A source of organic, slow-release nitrogen to be added to organic fertilizers mixes.

## Mineral-based fertilizers

Rocks decompose slowly into soil, releasing minerals gradually over a period of years. Organic gardeners use many different minerals to increase the fertility of their soils, but it's a long-term proposition. Some take months or years to fully break down into nutrient forms that plants can use, so one application may last a long time.

**Chilean Nitrate of Soda, also known as Natural Nitrate of Soda,** is a highly soluble, quick-acting granular fertilizer that is 16 percent nitrogen. It is also high in sodium, so do not use it on arid soils where salt buildup is likely or on plants that are sensitive to salt. Chilean nitrate is mined from a desert in northern Chile, most likely the only known deposit of this mineral salt. It should not be depended upon as the only source of nitrogen. Applying this nitrate mixed with an organic amendment like cocoa meal, peanut meal or compost will add to the efficiency of both products.

**Epsom salt:** Hydrated magnesium sulfate not only helps tired feet and is a health addition to any bath water; it's a fast-acting fertilizer too! Containing magnesium (10 percent) and sulfur (13 percent), **epsom salt is a fertilizer that you can apply in a granular form or dissolve in water and spray on leaves as a foliar fertilizer.** Tomatoes, peppers and roses love this stuff! Mix 1 tablespoon of epsom salt in a gallon of water and spray it on directly when plants start to bloom. Excellent organic fertilizer.

**Granite meal:** Is made from soft granite into a rock powder. A source of potassium to help produce sugar and starch for the plants. Its job is to provide trace mineral content where the soil has been overworked and lacking in trace minerals. Apply 75 pounds per 1000 square feet.

**Green sand:** Mined in New Jersey from 70 million-year-old marine deposits, green sand contains 3 percent potassium and many micro-nutrients. It's sold in a powdered form, but breaks down slowly, so it is used to build the long-term reserves of soil potassium.

**Gypsum:** This powdered mineral contains calcium (20 percent) and sulfur (15 percent). It's used to add calcium to soils without raising the soil pH. An excellent source of micro-nutrients sulfur and calcium. Used in clay soils because of its inherent draining capabilities and because it provides aeration to the soil.

**Lava Sand:** Ground up lava, loaded with trace minerals, water-holding ability, and is a much needed energy soil amendment.

**Potash:** Overall describes material containing potassium. It is potassium carbonate from wood ashes.

**Hard-rock phosphate:** A dry, organic fertilizer used to boost phosphorus levels. Slow to dissolve in water, so it will last for a long time. NPK 0-25-0. An excellent natural source of phosphorus, calcium and many essential trace elements. It works to build phosphate fertility, increase root activity in transplants and seedlings. Improves the soil and quality of the crops. Will not burn roots. Apply 2 pounds for trees and shrub transplants but it is great for any transplant. This mineral powder contains 25 percent phosphorous and 48 percent calcium, which can raise soil pH — avoid it if your soil is already alkaline. It breaks down slowly, so use it to build the long-term supply of phosphorous in your soils.

**Soft-rock phosphate:** Often called colloidal phosphate, soft-rock phosphate contains less phosphorus (16 percent) and calcium (19 percent) than hard-rock phosphate, but the nutrients are in chemical forms that plants can use more easily. It is a soft, natural colloidal clay formation that gives up its nutrient slowly enough to last for years without leaching or fixing. Unlike other phosphates, it contains colloidal clay that can bind sandy soils and add to their nutrient holding capacity. Apply 25 pounds per 1000 square feet or a fistful with transplants. This powder breaks down slowly, so one application may last for years in the soil. It also contains many healthy micronutrients.

**Limestone:** This mined product has various nutrient levels, depending on its source. It's used primarily to raise pH (reduce acidity), but dolomitic limestone, which is high in calcium (46 percent) and magnesium (38 percent), also adds magnesium to the soil. The calcium does keep the magnesium levels low. This powder also comes in an easier to spread granular form. Calcitic limestone is high in calcium carbonate (usually above 90 percent). Conduct a soil test for pH and for magnesium to find out which kind of lime and how much to add to your soil.

**Sulfate of Potash:** 0-0-52--natural potash that is 51% soluble. Second only to nitrogen in amount needed for plants. It can be applied as a supplement or mixed with other materials. You do need to conduct an accurate soil test first.

**Sulfur, potash and magnesium:** This combination is a natural fertilizer. Mix at a rate of 22% sulfur, 22% potash and 11% magnesium.

**Zinc:** Traces of this mineral show up in organic fertilizers. Too much of this mineral is toxic—do a soil test first.

**The first key to successful flowers and vegetables in your organic garden or fields is healthy soil.** In fact, the improvement of the soil is what the original concept of organic gardening is all about. Experienced gardeners know that feeding the soil is what helps plants grow and thrive. Adding liquid organic fertilizer is another great method during the growing season. All fertilizers contain trace elements of minerals, which plants need in small quantities. **The three major nutrients are shown on all fertilizer packages (organic and chemical), often as three numbers, which are percentages of the total package. In order of these numbers, they are:**

- Nitrogen (N) – promotes green, leafy growth
- Phosphorous (P) – encourages fruit growth and strong roots
- Potassium (K) – creates larger, more colorful flowers and helps in overall plant strength

**However, plants also need a variety of micro-nutrients in trace amounts that are just as essential to proper growth and production.** Not just that, the soil itself needs to have good structure to hold these minerals, excellent water-retention abilities and pockets of oxygen. Synthetic chemical fertilizers can not achieve this. Fortunately, organic materials can do exactly this.

#### **KNOW THESE ESSENTIAL MINERALS**

- Boron-B - found in solubar, borax and compost; controls quality and taste of food crops; helps create disease resistance.
- Calcium-Ca - one of the minerals in lime, bone meal, colloidal phosphate, gypsum and marl. It feeds microorganisms, affects permeability of cell walls and affects soil pH.
- Carbon-C - found in plant residue, compost leonardlite, humate, coal and carbon dioxide. Is essential for nitrogen and phosphate availability; microorganism's food source.
- Chlorine-Cl - source is city-treated water and compost. Helps crop stimulation.
- Copper-Cu - copper sulfate, bourdeaux. Helps disease resistance and makes strong stalks. Essential mineral.
- Hydrogen-H - found in water and air. Responsible for metabolic activities.
- Iron-Fe - found in copper as (ferrous sulfate), chelated iron and some organic fertilizers. Provides chlorophyll formation and photosynthesis; green color.
- Magnesium-Mg - in Sul-Po-Mag, epsom salts, plant residues, compost and Pro Mag 36. Its a component of chlorophyll; helps hold soil together; aids phosphate metabolism and effects soil pH.
- Manganese-Mn - is in manganese sulfates and chelates; helps enzyme system.
- Molybdenum-Mo - can be found in most organic fertilizers and compost. Aids nitrogen fixation, health of microorganisms.
- Nitrogen - one of the main minerals in organic matter; released by microorganisms and most fertilizers. A component of proteins, vital to general plant functions and growth.
- Soil oxygen-O - minerals found in water, hydrogen peroxide and bio-stimulants. Is critical for biological processes in soil.
- Phosphorus-P - is in colloidal phosphate, rock phosphate, compost and phosphoric acid. Helps transfer plant energy, color and vitality of plants, and increases seed and flower size.
- Potassium(potash)-K - granite, greensand, potassium sulfate, Sul-Po-Mag, molasses, plant residues, and compost. Metabolic regulator, produces winter and summer hardiness, root and shoot balance and movement of plant foods.
- Sodium-Na - found in most manures and compost; metabolic regulator, produces winter and summer hardiness, root and shoot balance and movement of plant foods.
- Sulfur-S - compost, molasses, sulfates, plant residues and gypsum . It will improve taste of food crops, increase protein content and seed producton, and assists legume nodule development.

- Zinc - kelp meal, liquid seaweed, and zinc sulfates. Aids vegetables and fruits to obtain sweet taste. Essential mineral. Always have detailed soil test done first.
- Pelletized Calcium - Increases sugar content of apples.

**Always Add Compost Before Adding Organic Fertilizers:** Adding organic matters, usually through compost and composting manures, are the main sources of soil fertility. These organic materials provide food to earthworms, beneficial bacteria and micro-organisms in the soil. All these creatures, seen and unseen, break soil down into compounds and nutrients in the decay of this material, nutrients that can then be absorbed into the plants' roots. Organic matter also improves soil structure and texture, allowing the ground to better retain water and allow pockets of oxygen to exist. Both soil microbes and plant roots need oxygen to survive. By adding organic matter once or a few times per year, you will not only create great soil that supports healthy plants, but you will also solve most of the problems experienced by conventional gardeners, such as disease, insect infestations and low vegetable yields.

**Organic fertilizers, because they come from natural sources that require breakdown by soil microbes, do not normally produce the immediate results that some synthetic chemical fertilizers do.** They do, however, improve the health and fertility of your soil over the long term and pose fewer risks to you and the environment. Organic ground fertilizers are naturally-occurring fertilizers, e.g., compost, manure. Naturally-occurring organic fertilizers include the waste of animals, plants or minerals, e.g., animal manure, slurry, worm castings, peat, seaweed, humic acid and guano.

Sewage sludge (night soil, Milorganite <http://www.goinggreen-forlife.com/waste-disposal.html>) use in organic agricultural operations in the U.S. has been extremely limited and rare due to USDA prohibition of the practice (due to toxic metal accumulation, among other factors). Processed organic fertilizers include compost, bloodmeal, bone meal, humic acid, amino acids and seaweed extracts. Other examples are natural enzyme-digested proteins, fish meal and feather meal. Decomposing crop residue (green manure) from prior years is another source of soil fertility.

**There are various enzymes that act to predigest or break down the different materials in compost:**

- Proteins (proteases): trypsin pH (3.5 to 6), bromelain pH 3 to 10, papain, acetyltyrosine, actinidine, ficin
- Carbohydrates and starch (amylases): amylase, bromelain, diastase
- Fats and oils: (lipase)
- Milk constituents: lactase
- White sugar (sucrose): iron sucrose
- Malt sugars and grains (maltase, diastase)
- Dietary fiber / Cellulose: (cellulase)

### **Advantages of organic fertilizers**

Although the density of nutrients in organic material is comparatively modest, they have many advantages. The majority of nitrogen supplying organic fertilizers contain insoluble nitrogen and act as a slow-release fertilizer. By their nature, organic fertilizers increase microorganisms and physical and biological nutrient storage mechanisms in soils, mitigating risks of over-fertilization. Organic fertilizer nutrient content, solubility, and nutrient release rates are typically much lower than mineral (inorganic) fertilizers. **A University of North Carolina study found that potential mineralizable nitrogen (PMN) in the soil was 182–285% higher in organic mulched systems than in the synthetics control.**

Organic fertilizers also re-emphasize the role of humus and other organic components of soil, which are believed to play several important roles:

- Mobilizing existing soil nutrients, so that good growth is achieved with lower nutrient densities while wasting less
- Releasing nutrients at a slower, more consistent rate, rather than burning the plants initially or starving them later
- Helping to retain soil moisture
- Improving the soil structure
- Helping to prevent topsoil erosion (responsible for desertification and the dust bowl)
- Organic fertilizers also have the advantage of avoiding certain problems associated with the regular heavy use of artificial fertilizers:

- The necessity of reapplying artificial fertilizers regularly (and perhaps in increasing quantities) to maintain fertility
- Extensive runoff of soluble nitrogen and phosphorus, leading to eutrophication of bodies of water (which causes fish kills)
- Costs are lower if organic fertilizer is locally available
- 

**The Author believes that organic fertilizer is far better than inorganic chemical fertilizers - the renewed microorganisms create living soil that allows the plants to again chelate and absorb minerals so that we now have nutritious food once again.**

**Organic fertilizers do have the following disadvantages:**

- As a dilute source of nutrients when compared to inorganic fertilizers, transporting large amount of fertilizer incurs higher costs, especially with slurry and manure.
- The composition of organic fertilizers tends to be more complex and variable than a standardized inorganic product.
- Improperly-processed organic fertilizers could contain pathogens from plant or animal matter that are harmful to humans or plants. Proper composting removes them.
- More labor is needed to compost organic fertilizer; increasing labor costs. Some of this cost is offset by reduced cash purchase.

**Conventional farming application**

- In non-organic farming a compromise between the use of artificial and organic fertilizers is common, often using inorganic fertilizers supplemented with the application of organics that are readily available, such as the return of crop residues or the application of animal and/or human manure.

**ORGANIC FOLIAR FEEDING IS BETTER AND GIVES FASTER RESULTS**

Foliar feeding, using bio-based, natural organic foliar fertilizers, is an effective, short-term method for correcting soil deficiencies and overcoming the soil's inability to transfer nutrients to the plant. Tests have shown that up to 90 percent of a foliar fed nutrient solution can be found in the smallest root of a plant within 60 minutes of application. A project conducted at Michigan State University, using radioactive tagged nutrients, proved that foliar feeding can be 8 to 10 times more effective than conventional soil feeding.

The effectiveness of bio-based foliar applied nutrients is determined by (1) The condition of the leaf surface, in particular, the waxy cuticle. The cuticle is only partially permeable to water and dissolved nutrients and, as a result, it can limit nutrient uptake. (2) The length of time the nutrient remains dissolved in the solution on the leaf's surface. (3) Diffusion, the movement of elements from a high concentration to a low concentration. For diffusion to occur, the nutrient must dissolve. and (4) The type of formulation. Water-soluble formulations generally work better for foliar applications as they are more easily absorbed when compared to insoluble solutions. Water insoluble formulations are generally slow-acting because they must dissolve before they can be absorbed and are more applicable for soil applications.

**TIMING**

**The best time to foliar feed is late evening to early morning.** These are the times when the stomata (the small openings on the leaves) are open.

**Avoid foliar spraying:**

- When the temperature is above 80°F.
- When the weather is hot and dry and water vapor is leaving the cells.

**Use foliar spray:**

- When the temperature is 72°F or below.
- Early in the morning when the cells of the leaf are full of water and dew has collected on the foliage.
- When air temperatures and humidity both equal 135 or less.
- When air temperature is cooler than soil surface temperature.

**NOTE:** A biological surfactant can reduce water tension and improve the absorption rate of bio-based foliar

sprays. Where possible, the pH of a foliar spray should be between 6.2 to 7.0. To promote young plant growth, a sweeter (alkaline) solution (pH 7.0) is recommended. For established growth, a more sour (acid) solution (pH 6.2) is recommended.

**An effective foliar application can produce results in 1 to 6 days. Use a refractometer to detect results.**

**NOTE: Ensure fertilizer is thoroughly mixed in water - apply in a fine mist - avoid drenching.** No special equipment is required. Foliar solutions can be applied with the aid of conventional spray equipment, i.e., fan sprayer, back pack sprayer, hi-boy, low- or high-volume ground sprayer, aerial sprayer, etc. Making liquid fertilizers requires no real skills, simple access to suitable materials. In general, a bucket is half-filled with the raw material and topped up with water. It is then allowed to ferment for about a month. **ALWAYS TEST ANY SPRAY ON A FEW PLANTS OR BRANCHES BEFORE SPRAYING THE ENTIRE PLANT OR FIELD TO CHECK FOR POSSIBLE CONTRAINDICATIONS/PROBLEMS.**

**Good products for foliar fertilizers are:**

- Seaweed
- Water weeds
- Comfrey
- Epsom Salts
- General greenery
- Manure
- Urine

**Caution: Liquid manures are often used for making foliar sprays.** That is a product which is sprayed onto the leaves of plants. **However, do not spray onto the edible parts of vegetables and ensure that they are thoroughly washed when picked.** The spraying should be done in the late afternoon and, if possible, the undersides of the leaves sprayed. If using as a spray, ensure that the solids are filtered out so that the spray nozzle is not blocked. Dilution rates can be cut by two-thirds if the fertilizer is applied directly to the soil around the plant. The residual mass of organic matter can be put onto the compost heap. **The ferment is rather smelly so keep it away from the house/neighbors if possible.**

**Seaweed** - There are many seaweed products on the market and most are very effective fertilizers as they contain many soil-enriching chemicals such as nitrogen, iron, sodium and calcium. They are particularly rich in bromine and iodine. Collect the seaweed (if it is legal to do so) and rinse the salt off. Chop up the weed and half fill a 2-gallon (10 liter) bucket which is topped with water. Loosely cover and let ferment for a few weeks. Strain and dilute about 20 times. It is more effective if you are able to collect samples of different seaweeds, especially if they have different colors and so have a different mix of beneficial elements.

**Waterweeds** - Waterweeds including duckweed, growing in freshwater ponds, lakes and streams are often invasive pests, so harvesting them and using them for composting and manuring serves a dual purpose. Weeds such as cabomba, duckweed, algae, dense water weed, water hyacinth, salvinia, water lettuce and many other water plants will all supply useful nutrients to your garden/field/ordhard plants. Like seaweed, they are chopped into pieces and allowed to ferment for a month. Water hyacinths are able to take up nutrients from polluted waters. Because of this, the root section should be discarded and only the green top used. Strain and dilute to a weak tea color.

**Comfrey** - Comfrey has been a favorite with Permaculturists and organic growers. It has value because it is easy to grow and its deep taproots bring up many minerals from parts of the soil not usually accessed by shallower rooted garden plants. The problem with comfrey is that it is very difficult to eradicate once it is growing in your garden/fields. Choose its position carefully as even the slightest sliver of root will regrow. To make a fertilizer, chop or tear the big dark green leaves and half fill a bucket and pour on a quart (1 liter) of very hot water to speed the decomposition. Leave this for an hour and then fill the bucket with cold water. Cover loosely and allow to ferment. Strain and dilute 10 times.

**Epsom Salts** - See above under "Mineral-based fertilizers".

**General greenery** - Collect a mass of bits and pieces of grass, weeds, hedge trimmings and soft field debris and then treat as you would for comfrey. Let ferment for a month at least.

**Manure** - Poultry manure, which is very strong but high in the essential elements potassium and nitrogen, may “burn” plants if used directly. Allowed to ferment in water at the rate of 2 pounds (1 kilogram) to 2 gallons (10 liters), strain and use the liquid diluted at least 10 to 15 times.

**Urine** - Allow a quart (liter) of urine to ferment without dilution in a bucket. After a week, the bucket is filled with water. Apply as a general tonic. **This fertilizer should be not be used regularly in the same place as it is only for occasional use.**

**Liquid foliar fertilizers are easy to make and apply, save expense and avoid the over-use of synthetic fertilizers.**

### **How is it going?**

On April 12 - 13, 2010 the Author flew to Tibet/China to create a locally-produced Chinese biopesticide using Chinese components. On Sunday, September 5, 2010, the Author was informed that the lab and field tests on a Chinese variation of his patented enzyme/surfactant formula had been completed. There were extensive experiments conducted in Ningxia, Haixi Quighai and areas surrounding around the headquarters of the Qinghai General Health Bio-science Co., LLC - these experiments were conducted repeatedly since 4/21/10 when the Author finalized the Chinese enzyme formula using Chinese components

The laboratory finalized bio-pesticide formula would have allowed China to commercially produce organic goji berries a/k/a Chinese wolfberry, mede berry, barbary matrimony vine, bocksdorn, Duke of Argyll's tea tree, Murali (in India), red medlar, or matrimony vine. Unrelated to the plant's geographic origin, the names Tibetan goji and Himalayan goji are in common use in the health food market for products from this plant. According to the Author's interpreter, Professor Xingwu Liu, the person who supervised these extensive tests, Mr. Zhu, said the Chinese enzyme formula outperformed all the other available pest controls. The problem was that workers in the field sprayed pesticides on their own initiative and Mr. Li Gang decided not to continue with the project.



The Author and his partner in China Xingwu Liu at the invitation of Ningxia Balanceuticals Organic Corporation, LLC., People's Republic of China revisited China in March, 2011 and after frank and friendly discussions decided to conduct related experiments and then created a Sino-American joint venture in China to manufacture a series of effective and nontoxic products to create organic agricultural products to begin with on many tens of thousands of acres of land and greenhouses. The name of the joint venture is “Sino-American Ningxia Organic Biotech Pesticides Manufactures, LTD. <http://www.theidealpesticide.com>.

In August, 2011, the Author received Field Testing Records from China the organic enzyme pesticide he developed in China works extremely well at dilution rates of 1:150, 1:100 and 1:75. The field tests continue to prove the organic product is safely and far more effectively killing (even pesticide resistant) insects, arachnids and their eggs and when aphids are found in several layers - at least the first layer (65 -70% of the total) is destroyed by the spray and the rest of the aphids are eaten by the ladybugs who are not effected by the organic enzyme sprays. Thus again proving this ideal pestisafe® can be applied to kill pest species in a way that will not harm the beneficial species! No pesticide POISON can kill resistant pest species, their eggs and not kill beneficials or create organic food!

The Author thought he would also add the following section to this organic chapter at this time.

## The Wild, Wonderful Weed called Burdock



**Description** - Burdock (*Arctium* spp, *Arctium lappa*, *Arctium minus*) AKA: Aireve, Airup, Bardana, Bardona, Beggar's Buttons, Beggar's Lice, Bur, Burrseed, Burs, Bur Weed, Cockleburr, Cockle-button, Clotbur, Fox's Clote, Gobo (Japan), Grass Burdock, Great Burdock, Happy Major, Hardock, Hare-burr, Herrif (Anglo-Saxon from hoeg or "a hedge"), Hurrburr, Lappa, Love Leaves, Personata, Philanthropium, Thorny Burr, Turkey Burrseed, Wild Rhubarb, Woolly Burdock; American Common Burdock. The name *Arctium*, is from *arktos* meaning "bear," is in reference to the roughness of the burrs. *Lappa* is derived from a word meaning "to seize" or "hand." The old English names like Aireve and Airup come from reafe, a "robber," or

reafian, "to seaize." The burrs have been used as temporary fasteners for ripped clothes or missing buttons. Burdock grows along roadsides, in fields, in overgrown gardens, wooded areas and in driveway cracks. It's most recognizable by its dark green leaves that can grow up to 28" long. The leaves are generally large, coarse and ovate, with the lower ones being heart-shaped. They are woolly underneath. The leafstalks are generally hollow. *Arctium* species generally flower with spiny, purple flowers from July through to October. These flowers become sticky burrs in the Fall and are noted for easily catching on to fur, feathers and clothing, thus providing an excellent mechanism for seed dispersal. Burrs cause local irritation and can possibly cause intestinal hair balls in pets. These burrs are not toxic, but the spiny burrs from these plants have been known to cause corneal ulcers in horses. The burrs can be deadly to small birds like kinglets, warblers and creatures like bats. Burdock's burrs act like Velcro to trap any birds and bats unfortunate enough to come in direct contact with them. Burdock can also be a nightmare when burrs get tangled in your dog's coat or horse's mane or tail! Common burdock is an aggressive plant that can take over disturbed fields and can provide its own fertilizer. It shades out other plants and keeps them from growing in new fields. Burrs from the flowers can become entangled in sheep's fleece and can damage the quality of the wool.

A large number of species have been placed in genus *Arctium* at one time or another, but most of them are now classified in the related genus *Cousinia*. The precise limits between *Arctium* and *Cousinia* are hard to define; there is an exact correlation between their molecular phylogeny. The burdocks are sometimes confused with the cockleburs (genus *Xanthium*) and rhubarb (genus *Rheum*). The roots of burdock, among other plants, are eaten by the larva of the Ghost Moth (*Hepialus humuli*). The plant is used as a food plant by other Lepidoptera including Brown-tail, *Coleophora paripennella*, *Coleophora peribenanderi*, the Gothic, Lime-speck Pug and Scalloped Hazel. The green, above-ground portions may cause contact dermatitis in humans due to the lactones the plant produces. A perennial, the plant can grow to heights of nine feet. While the leaves and seeds can be used in tea, the root, hard, wrinkly and grayish-black in color, is most potent when brewed in tea. In its first year, it forms a cluster of large leaves, resembling rhubarb. These grow from a carrot like tap root that may penetrate over two feet into the ground. It is this root that is most often used as an herbal medicine. After a year of growth, the plant puts forth a branched stalk with smaller leaves and, in the late summer, purple-pink flowers. In autumn, these flowers are replaced by round brown burrs that persist into the winter. The seeds contained in these burrs are also used medicinally. It has been said that the seeds of Cocklebur soaked in milk will cure cancer. The seeds are used for acute disorders (their action is quicker to manifest, but less permanent) while the roots are preferred for chronic conditions (they are slower to manifest, but yield more permanent results).

The deep roots, which are used medicinally, are brownish-green, or nearly black on the outside. Burdock consists primarily of carbohydrates, essential oils, plant sterols, tannins, and fatty oils. Researchers aren't sure which active ingredients in burdock root are responsible for its healing properties, but the herb is reported to have anti-inflammatory, antioxidant, antifungal and antibacterial effects. It has many medicinal qualities and has been used for centuries in many herbal remedies. The root is sweet to the taste and has a gummy consistency. Traditionally, burdock has been used as a remedy throughout the world for psoriasis, eczema, liver remedy, boils, canker sores, carbuncles, acne, skin tumors, fungal infections, measles, sties, feverish colds, sore throats, arthritis, gout, tonsillitis, viruses like colds, and as a diuretic. In modern times, burdock is also used in oncology and to treat many other serious health problems.

**How to get rid of Burdock** - Mow your lawn/fields regularly. Burdock can't produce blooms if you cut them back often enough. Cut stray individuals back to ground level with shears. This is a significant control because *Arctium* only propagates by seed. Toss non-flowering plant parts onto your compost heap, but burn or haul all

blooming material away from your property. Hoe and weed gardening areas often. Burdock is unable to establish itself in areas that are disturbed by frequent cultivation. Dig up small burdock plants that haven't begun to bloom with a garden spade or hand trowel. Dump the material on your compost heap. Cut large flowering burdock off at ground level with shears from July until frost. Don't bother digging up the roots because the plants are already on their way out. These weeds are biannual, and die after they bloom a single time during their second year. Do not add blooms, burs or seed pods to your compost heap. Burn or dispose of them to prevent seed dispersion. Best of all, turn goats out into the infested area to systematically annihilate every single burdock plant they can reach.



**How to Grow and Harvest Burdock** - Burdock seeds will not germinate without sensing light. Seeds must be barely covered with soil. Burdock handles a variety of soil types, as long as the soil remains moist and well drained - burdock prefers a fresh, worked soil, rich in humus, and plants should be positioned in full sunlight. Burdock is very reactive to nitrogen fertilizer. Propagation is achieved through sowing the seeds midsummer. To promote root growth, according to "The Complete Illustrated Book of Herbs," remove the flowers and burrs as they form. A hardy plant, it tolerates cold and resists most pests and diseases. Compost or other organic material mixed in with the dirt 2 feet down will help encourage straight root growth, which works better for harvesting and drying. The opportune time to harvest burdock comes in both spring and fall. In spring, young shoots and leaves offer themselves up for cooking. The best time to dig up the roots themselves arrives in fall, or about 100 days after planting, when they reach the length of 1 foot. The roots discolor when they dry.

**How to use Raw Burdock Root** - Buy or harvest fresh burdock root. Burdock root can be found in the produce section of natural food stores or Oriental groceries. You can also harvest burdock root from the wild - if you know what you are doing! Consult several field guides to verify identification before eating any wild plants. Dig up burdock root with a hand trowel. Clean the burdock root. Packaged burdock root from the store may already be washed and peeled. If necessary, remove the thick skin with a vegetable peeler. Burdock has long been used in Asian and macrobiotic cooking. Sliced fresh roots can be used in soups, stir-fry's and tea. To make Burdock tea - Coarsely chop one teaspoon (about two grams) of raw burdock root for every cup of tea. Place the burdock root in a pot and cover with one cup of water for every teaspoon of burdock root. Place the lid on the pot and bring the water to a low boil. Allow the tea to simmer for at least 10 to 15 minutes, or up to an hour if a stronger dose is desired. Remove the pot from the heat and strain the tea through a colander lined with cheesecloth. Discard or compost the remaining burdock root. Drink one cup of burdock root tea up to three times a day.

**Historical Uses of Burdock Root** - Perhaps the archetypal blood purifier, Burdock makes an excellent metabolic tonic, improving the functioning of the liver and kidneys, digestion, lymphatic and endocrine systems. Burdock has a long history of use for a wide variety of health ailments e.g., its traditional usage in treating gout, arthritis and rheumatism, which are often caused by a lack of fluids, or perhaps internal "heat" that "cooks down" fluids and causes the precipitation of solid crystals in the joints, which creates friction, and as a result, inflammation. By increasing the volume of urine excreted, Burdock brings these wastes back into solution and expels them from the body, thereby removing the cause of the inflammation. Nettle would be an excellent accompaniment towards this end. Turmeric also is an excellent anti-inflammatory. Common burdock was introduced into the USA in the 1700's because of its medicinal uses. Burdock leaves bruised or blanched and applied externally as a poultice is a traditional application of bringing boils to a head. The drawing action of Plantain, Peach leaves, and/or Honeysuckle flowers would lend itself well to such a poultice, and aid in treating the infection as well. Burdock was also used to make paper and coffee. The root, leaves and seeds are used to make medicine. Burdock is used for skin problems, such as abscesses, boils, acne, eczema and psoriasis. Herbalists say burdock is especially useful in skin conditions that are dry and scaly or that result from poor blood circulation. Part of burdock's effectiveness on skin conditions results from its anti-microbial anti-inflammatory properties. Burdock may be applied topically as a poultice or taken internally as a tea, liquid extract or capsule. Burdock may be helpful for various infections. It helps to relieve colds, fever, sore throat and cough. According to Dr. William Mitchell, a naturopathic physician and author of "Plant Medicine in Practice: Using the Teachings of Dr. John Bastyr," burdock is an excellent remedy for infections of the glandular system. This includes mononucleosis, a infection caused by the Epstein-Barr virus that comes with fatigue, weakness, sore throat, skin rash and swollen lymph nodes. Burdock contains lignans, polyacetylenes and organic acids that stimulate the immune system. Burdock helps to lower blood sugar, which can be helpful for individuals with

diabetes or pre-diabetes. It is also thought to help remove fat tissue in individuals with perpetually high blood sugar levels. Because of burdock's effects on blood sugar, it should not be combined with insulin, unless under the supervision of a doctor. Burdock is used to treat various forms of arthritis, such as rheumatoid arthritis, osteoarthritis and psoriatic arthritis. The different forms of arthritis have unique underlying causes, but all result in joint stiffness and pain. Burdock's usefulness in arthritis is thought to result from its anti-inflammatory properties. Burdock may be helpful for indigestion, as well as other digestive complaints, especially those related to suboptimal liver or gallbladder function. Burdock gently stimulates digestive function, enhancing the digestion of food and elimination of toxins. Burdock root contains high levels of inulin and mucilage, which contributes to its soothing effects on the gastrointestinal tract. Burdock may also be helpful for ulcers. Burdock's actions are mild, and it may be taken for long periods. In addition to its concentrated use as a medicine, burdock may also be eaten as a vegetable.

Burdock root has often been used to purify the blood by removing toxins that can build up in blood. It can be taken orally or used topically as a remedy for skin disorders. Also, burdock root can be a diuretic or soothe aching joints. Traditional Chinese healers used burdock root in combination with other plants to make cures for colds, measles, throat pain and tonsillitis. Burdock root was also popular in Japan as a source of vitamins and other nutrients. In modern times, burdock root has been employed in the treatment of certain cancers. However, this use of burdock root still needs to be systematically tested. Historically, the seeds of the burdock plants were compressed to make a mixture that was effective in cleansing the bloodstream, easing pain from arthritis, and treating gout, rheumatism, ulcers, acne, eczema and psoriasis. Burdock's cancer-curing properties were also utilized in Russia and India. The Chinese used it as an aphrodisiac, and found it effective in treating barrenness and impotence.

Burdock root oil extract, also called Bur oil, (sometimes combined with Tea Tree oil) is used to increase sweating and urine output and to promote healthy hair, to help relieve scalp irritation and improve scalp conditions. It is a natural hair oil applied to get rid of scalp itching, redness and dandruff, improve hair strength, shine and body and to reduce and reverse hair thinning. Modern studies indicate that **Burdock root oil extract is rich** in phytosterols and essential fatty acids (including rare long chain EFAs), the nutrients required to maintain healthy scalp and promote natural hair growth. It combines immediate relieving effect with nutritional support of normal functions of sebaceous glands and hair follicles. Burdock oil is obtained by direct cold extraction into virgin olive oil, a method used for centuries to produce Burdock herbal medicines. (Note: Many oils are marketed as first cold pressed or cold extraction, this is a denomination describing the temperature at which the oil was obtained.)

People residing in localities where the use/misuse of pesticides and chemicals are excessive should think about using burdock as dietary add-ons for the pet dogs. When burdock is added to a dogs' diet, it helps in sorting out the lethal contaminants found in the atmosphere from their system. In addition, burdock is also very effective in curing unceasing skin disorders like eczema. Burdock is not only an effective, but also safe aromatic plant and can be administered without any apprehension of adverse effects or any degree of toxicity. Instead, the herb helps in eliminating toxicity. What is more interesting is the fact that even most dogs like the flavor of burdock and eat it willingly. One may procure fresh burdock roots at the local health food stores, chop them and put these in his or her dog's food. Alternatively, dehydrated burdock roots are also available and may be mixed with the dog's food. When the dug up burdock root has been washed, it can be chewed into a pulp which is good for all cuts and scrapes, especially rat bites, even if they're infected. Press on wound. Will sting.

Burdock's active ingredients are arcigen, calcium, chlorogenic acid, essential oils, flavonoids, iron, inulin, lactone, mucilage, polyacetylenes, potassium, resin, tannin and taraxosterol. The seeds of the plant contain beneficial fatty acids. The oil from the seeds can be used as a diaphoretic, which leads to increased perspiration, which is essential in cleansing the body of toxins or harmful elements. According to traditional healers, diaphoretics are integral to treating influenza, gallbladder or liver disorders, and to aid the kidneys which purify the blood.

Burdock root is eaten as a vegetable in many places. It has many nutrients like iron, inulin (a carbohydrate), and beneficial oils. Also, burdock can be used as a gentle laxative and help eradicate uric acid. Some of the active ingredients of burdock are polyacetylenes, which are known to be effective antibacterials and antifungals. Burdock enhances the performance of many of the organs which purify the body and eliminate toxins or waste (like the kidneys, liver, colon, etc). This enhances overall health and helps correct disorders.

Burdock is easily obtainable as an ingredient in teas, ointments, or pills. It is a powerful diuretic, and is safe to be taken internally, externally, or as food. However, it is important to make sure that the herb is pure. Some reports have indicated that burdock could have toxic properties, since cases of illness were reported that involved burdock tea. However, further analysis showed that the negative effects were the result of impure burdock root. Some belladonna, which contains atropine, had contaminated the burdock root. It is important to look at the source and purity of burdock root before obtaining it. Before taking burdock to treat a health condition, consult with a qualified, botanically trained health care professional about form, dosage and safety.

**Burdock Used As A Fertilizer** - You can harvest burdock leaves for composting: "The deep taproots bring up many beneficial nutrients and deposit them in the plant. If you want extra nutrients in your compost pile, purposely plant a few seed balls in rows a foot apart. Keep cutting all but two leaves off (to let the plant continue to grow) and put them in your compost bin/pile. Ashes from the plant harvested while in bloom will produce a high-potassium fertilizer.

**Nutrients in Burdock** - Burdock consists primarily of carbohydrates, volatile oils, plant sterols, tannins, and fatty oils. In terms its nutritional composition, burdock is rich in vitamin B complex, vitamin E, calcium, iron, magnesium, phosphorus, potassium and zinc --- all of which are essential elements for proper plant growth. - plants thrive when their soil contains potassium, calcium, zinc and magnesium. While calcium is a building block for plant tissue and other metabolic processes, magnesium helps plants to produce chlorophyll. Burdock has been collected and frequently burned by farmers in the autumn to make fertile ash for their fields. Large amounts of burdock growing on your land generally means the soil has a low pH level, is heavy in iron, and needs calcium. The Author also suggests using the leaves as an excellent compost material. **DO NOT COMPOST THE SEED HEADS!** Just as compost tea provides nutrients directly to the soil and plant roots, liquid fertilizer improves soil conditions. In gardening herb concoctions, Herb Companion recommends making the tea with just one herb. As you cut back fresh burdock, save it in a bucket to be used in tea. Be sure to strain the tea; macerated burdock can be also be directly tilled into the soil as compost. The best time to apply the tea --- either directly to the soil or sprayed on the leaves --- is in the early evening, when temperatures are cooler and pores or "stoma" on the leaves are open.

**Methods for Making Burdock Tea for Plants** - Soak burdock whole or chopped with the leaves, seeds and root in a bucket of cold water. While distillation is more effective in extracting essential oils for human use, cold water extraction is sufficient for the garden. Leave the burdock to soak or macerate for three days. Strain the liquid and save as concentrate. Foliar fertilizer - Dilute it before spraying it on leaves or for daily watering. Soil Fertilizer - Add full strength in a circle around the plant as a supplemental pickup of the soil.

**Methods for Making Burdock Tea for You** - Steep burdock roots, either dried or fresh, in boiling water anywhere from 10 to 15 minutes for an herbal tea. The University of Maryland Medical Center recommends drinking such the concoction three times a day. This tea also works well as a poultice when applied directly to affected skin. The Benefits of Burdock Tea - A natural diuretic, burdock helps clear the body of toxins, which has given it the label of "blood purifier," according the University of Maryland Medical Center. A digestive aid, it contains health-improving, prebiotic properties. In addition, traditional Chinese medicine utilizes burdock, with other herbs, as a remedy for sore throats and colds. When applied as a skin treatment, it soothes skin irritations such as psoriasis, eczema and acne.

**Medical Indications:** (Caution: interferes with iron absorption when taken internally. Humans are susceptible to skin reactions from contact with the lactones in burdock.) Burdock, an important ingredient in a cancer remedy, is in great demand today. The parts of Burdock that are used medically are: the root, seeds and leaves. Burdock is a cholagogue, diaphoretic, diuretic, and external antibacterial and anti-fungal. It acts as a blood cleanser. Boiled, the liquid may be used as a wash or reserved to make a balm for skin disease, rheumatism, gout, and respiratory problems. The bruised leaves are useful as a poultice for bruises, sores, acne, and inflammations. A poultice may also be applied as quick remedy for poison oak or ivy. During the Middle Ages, a poultice of bruised leaves in wine was even recommended for leprosy. While there is no cure for leprosy, such a poultice would certain benefit the condition considering its other qualities. The seeds have been used to stimulate the kidneys, and the leaves help stimulate secretions of bile. Burdock also serves to eliminate uric acid which is why it benefits certain forms of arthritis and gout. It relieves lymphatic congestion, restores liver and gallbladder function, and stimulates the immune system. Tea or a burdock tincture is recommended for stomach problems, but while a decoction or infusion of root is aperient for some, it may constipate others. An

old Pennsylvanian Dutch tonic called for burdock tea made from a year old root, and this was also used as a wash for dandruff and itchy scalp. The leaves are also a good toilet paper if you're in dire need.

Folk herbalists consider dried burdock to be a diuretic, diaphoretic, and a blood purifying agent. Various parts are used to prevent baldness and to treat rheumatoid arthritis, skin infections, acne, boils, bites, eczema, herpes, impetigo, rashes, ringworm, sore throat, sciatica, poison ivy and poison oak, as a tonic, diuretic and mild laxative, to stimulate bile production and to induce sweating. The seeds of greater burdock are used in traditional Chinese medicine, under the name niupangzi (Chinese: pinyin: niúpángzi; some dictionaries list the Chinese as just niúbàng.) Seeds contain arctigenin which may help memory. Arctiin and its aglucone, arctigenin has shown potent in vitro antiviral activities against influenza A virus in mice. Arctiin is transformed into a number of estrogenic metabolites by human intestinal bacteria. Arctigenin is has demonstrated anti-inflammatory activity (in vitro). Burdock is one ingredient in Essiac. The seeds have shown some anticancer activity in vitro. Burdock is a traditional medicinal herb that is used for many ailments. Burdock root oil extract, also called Bur oil, is popular in Europe as a scalp treatment applied to improve hair strength, shine and body, help reverse scalp conditions such as dandruff, and combat hair loss. Modern studies indicate that burdock root oil extract is rich in phytosterols and essential fatty acids (including rare long-chain EFAs), the nutrients required to maintain a healthy scalp and promote natural hair growth. It combines an immediate relieving effect with nutritional support of normal functions of sebaceous glands and hair follicles. According to some European herbalists, combining burdock root oil with a nettle root oil and massaging these two oils into the scalp every day has a greater effect than Bur oil alone. Burdock leaves are used by some burn care workers for pain management and to speed healing time in natural burn treatment. Burn care workers hold that it eases dressing changes and appears to impede bacterial growth on the wound site and that it also provides a great moisture barrier. Burdock seed is a known antibiotic. Dried Burdock Root is sold for about \$10.00/lb.

Greater burdock was used during the Middle Ages as a vegetable, but now it is rarely used, with the exception of Japan, Taiwan, Korea, Italy, Brazil and Portugal. Plants are cultivated for their slender roots, immature flower stalks may also be harvested in late spring, before flowers appear. The taste resembles that of artichoke, to which the burdock is related. In the second half of the 20th century, burdock achieved international recognition for its culinary use due to the increasing popularity of the macrobiotic diet, which advocates its consumption. The root contains a fair amount of gobō dietary fiber (GDF, 6g per 100g), calcium, potassium, amino acids, and is low calorie. It contains polyphenols that causes darkened surface and muddy harshness by formation of tannin-iron complexes. Those polyphenols are caffeoylquinic acid derivatives. The root is very crisp and has a sweet, mild, and pungent flavor with a little muddy harshness that can be reduced by soaking julienned/shredded roots in water for five to ten minutes. The harshness shows excellent harmonization with pork in miso soup (tonjiru) and takikomi gohan (a Japanese-style pilaf). In Kyoto, gobō can also be found as a snack food similar to potato chips. The root is eaten cooked and the young sprout can be eaten just like asparagus. Gobo is also used in tempura. Leaves are also eaten in springs in Japan when a plant is young and leaves are soft. Some *A. lappa* cultivars are specialized in this purpose. Burdock root is often artificially colored orange to resemble a carrot. The root, when dried and roasted, is used as a coffee substitute. A type of beer that reputedly purifies the blood can also be made out of it.

If you plan on eating burdock root, it should be harvested in the first year in June or July. It is peeled, sliced into thin strips, and boiled 30 minutes (1/4 tsp of baking soda may be added to the first change of water). Then the water is changed and simmered till tender and fried with butter. You may also try mashing the root into cakes and frying them in butter. The Iroquois dried the root and used it in soups. Some people compare the flavor to artichokes while others have said it tastes like asparagus. The tender shoots may be peeled and eaten raw or in salad with oil and vinegar, and the young leaf stems are boiled or eaten raw if peeled. Young leaves are added to salads and soups, or prepared as cooked greens. The flower stalks may also be eaten before flowering once they have been peeled and cooked. They may also be simmered in sugar syrup to make candy. Fish or game may be wrapped in Burdock leaves and left in a fire pit to cook. The roots can be collected and roasted for a coffee substitute. The roots maybe cut up and boiled like potatoes or fried like cutlets.

Burdock is believed to be a galactagogue, a substance that increases lactation, but it is sometimes recommended to be avoided during pregnancy based on animal studies that show components of burdock to cause uterus stimulation. In parts of the US (notably western New York), burdock stalks are eaten as a substitute for cardoon. The stalks are peeled, scrubbed, boiled in salt water, and fried in an egg and bread-crumbs batter.

**French Cloth** - In the early 1700's, Frenchmen introduced Burdock plants by the thousands into North America. They used it exclusively as a cotton twill. But once the cotton gin was invented, the Frenchmen left, and the weed burdock spread quickly. Burdock is considered an invasive species in North America.



**Burdock and Velcro** - After taking his dog for a walk one day in the early 1940's, George de Mestral, a Swiss inventor, became curious about the seeds of the burdock plant that had attached themselves to his clothes and to the dog's fur. Under a microscope, he looked closely at the hook-and-loop system that the seeds use to hitchhike on passing animals aiding seed dispersal, and he realized that the same approach could be used to join other things together. The result was Velcro.

**Precautions:** Burdock should only be given to children under the supervision of a doctor. The use of herbs is a time-honored approach to strengthening the body and treating disease. Herbs, however, can trigger side effects and can interact with other herbs, supplements, or medications. For these reasons, you should take all herbs with care, under the supervision of a qualified health care provider. Pregnant or nursing women should avoid burdock as it may cause damage to the fetus. People who are dehydrated should not take burdock because the herb's diuretic effects may make dehydration worse. It is best to avoid taking large amounts of burdock as a supplement because there are so few studies on the herb's safety. However, burdock eaten as a food is considered safe. Because the roots of burdock closely resemble those of belladonna or deadly nightshade (*Atropa belladonna*), there is a risk that burdock preparations may be contaminated with these potentially dangerous herbs. Be sure to buy products from established companies with good reputations. Do not gather burdock in the wild. There are no known scientific reports of interactions between burdock and conventional medications. However, you should talk to your doctor before taking burdock if you take any of the following: Diuretics (water pills) -- Burdock could make the effect of these drugs stronger, causing you to become dehydrated. Medications for diabetes -- Burdock might lower blood sugar, resulting in hypoglycemia (low blood sugar). Burdock is contraindicated during pregnancy especially in the first trimester because of the effects of anthraquinone glycosides found in the roots of burdock plants. It is also contraindicated in patients who are hypersensitive to the herb or related plant species. Allergic reactions have been demonstrated in people who are sensitive to the Asteraceae/Compositae family. Other members of this family include chrysanthemum, daisy, mangold and ragweed. Alert: Poisoning caused by atropine contamination of some commercial burdock teas can occur. Signs and symptoms of atropine toxicity include blurred vision, dilated pupils and rapid pulse rate. Treatment, if needed, includes physostigmine reversal .

Burdock Root Uses, Benefits and Side Effects - <http://www.naturalherbsguide.com/burdock.html>

A Modern Herbal | Burdock - <http://www.botanical.com/botanical/mgmh/b/burdoc87.html>

Plants For a Future - <http://www.pfaf.org/user/Plant.aspx?LatinName=Arctium%20lappa>

Burdock root pickle recipe - [http://www.familyherbalremedies.com/burdock\\_root.html](http://www.familyherbalremedies.com/burdock_root.html)

Pictures and description - <http://www.naturalbiodiversity.org/biobullies/downloads/Common%20Burdock.pdf>

Dr. Abdusallam reported research with extract of *Macrocystis*, that shows it to be an effective killer of mosquito larvae. (*Macrocystis pyrifera*, commonly known as Giant kelp or Giant bladder kelp, is a species of kelp (large brown algae), and one of four species in the genus *Macrocystis*.) Agricultural uses of seaweed are under development as seaweed has been found to improve seedling and root growth and flowering is increased in cabbages and marigolds. A 50 percent increase in yield was produced from ground nut plants treated with seaweed concentrate. In animals it is a growth enhancer with increased growth and muscle lipid content and with greater feed efficiency: it cost less to achieve weight gain. Most of the benefits of seaweed are due to its high content of potassium iodide; but in addition they contain carotenoids, essential fatty acids, amino acids, vitamins, trace minerals and antioxidant enzymes.

## **Organic herbicides - the cure to your weed woes!**

Weeds can compete with productive crops or pasture, or convert productive land into unusable scrub. Weeds are also often poisonous, distasteful, produce burrs, thorns or other damaging body parts or otherwise interfere with the use and management of desirable plants by contaminating harvests or excluding or poisoning livestock. Weeds tend to thrive at the expense of the more refined edible or ornamental crops. They provide competition for space, nutrients, water and light, although how seriously they will affect a crop depends on a number of factors. Some crops have greater resistance than others — smaller, slower growing seedlings are more likely to be overwhelmed than those that are larger and more vigorous. Vigorous plant stands are the best means for eradicating weeds. Using high quality seed, well-calibrated planting equipment, adapted varieties, optimal soil fertility, good soil drainage and tillage, and proper soil preparation will usually result in rapid, vigorous crop growth.

## **SOIL FERTILITY & CONDITION**

In the 1930s, it was noted that heavy use of newly introduced chemical fertilizers in Germany brought about a very perceptible alteration in the proportion of different types of weed species. Some species which had formerly been very common as field weeds were rapidly disappearing, while other types of weeds were becoming much more prominent. We continue to see today that the type of fertility amendments one uses has a powerful effect on weed pressure, in both the number and species present. In an organic system, it is important to rely on the biological activity of the soil as the main source of fertility and favorable physical structure. An active and diverse microbial population in the soil is key to growing healthy, high-yielding organic crops. While the chemical components of a soil are important, fertility management should focus on feeding the soil microbial life for the long term, rather than tending to the immediate and changing needs of the plants. Any fertility amendments or inputs should be considered supplemental to the natural fertility of the soil. This population can be stimulated by increasing organic matter, by performing certain tillage operations that add oxygen to the soil, and limiting other tillage operations that unnecessarily disturb soil structure, and by avoiding the addition of any materials that will adversely affect microbial growth. The presence of microorganisms and organic material in the soil is essential to holding soil nutrient ions in the crop root zone, to prevent them from being lost to erosion or leaching. Microbial activity in soil may also shorten the life of dormant weed seeds and break down perennial roots and rhizomes, further reducing potential weed pressure.

**Weed control** is the botanical component of pest control, using physical and chemical methods to stop weeds from reaching a mature stage of growth when they could be harmful to domesticated plants, people, pets and livestock. In order to reduce weed growth, many “weed control” strategies have been developed in order to contain the growth and spread of weeds. The most basic is ploughing which cuts the roots of annual weeds. Another mechanical method of weed control includes covering an area of ground with several layers of wet newspaper or one black plastic sheet for several weeks. In the case of using wet newspaper, the multiple layers prevent light from reaching all plants beneath, which kills them. Saturating the newspaper with water daily speeds the decomposition of the dead plants. Any weed seeds that start to sprout because of the water will also be deprived of sunlight, be killed, and decompose. After several weeks, all germinating weed seeds present in the ground should be dead. Then the newspaper can be removed and the ground can be planted. The decomposed plants will help fertilize the plants or seeds planted later. In the case of using the black plastic sheet, the greenhouse effect is used to kill the plants beneath the sheet. A 5-10 cm layer of wood chip mulch on the ground will also prevent most weeds from sprouting. Also, gravel can be spread over the ground as an inorganic mulch. Many people find that although the black plastic sheeting is extremely effective at preventing the weeds in areas where it covers, but in actual use it is difficult to achieve full coverage. You can also use asphalt rolled roofing or shingles, wood, cardboard, etc. to cover and kill weeds. Knowing how weeds reproduce, spread and survive adverse conditions can help in developing effective control and management strategies. Weeds have a large range of techniques that enable them to invade and then thrive.

**Man-made or Synthetic Herbicides, also commonly known as weed killers, are pesticide POISONS used to kill unwanted plants.** Selective herbicides kill specific targets while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often synthetic “imitations” of plant hormones. Herbicides used to clear waste ground, industrial sites, railways and railway embankments are non-selective and kill all plant material with which they come into contact. Smaller quantities are used in forestry, pasture systems, and management of areas set aside as wildlife habitat. More than 166 Canadian cities have banned the cosmetic application of pesticide POISONS on lawns. As a result, urban streams in

Ontario have seen an 80% reduction of the three most commonly used lawn herbicides - 2, 4-D, dicamba and MCPP. The easiest treatment for lawn weeds is to tolerate or ignore them. *"We are rightly appalled by the genetic effects of radiation; how then, can we be indifferent to the same effect in chemicals we disseminate widely in our environment?" - Rachel Carson*

Synthetic herbicide POISONS have widely variable toxicity, e.g., <http://www.scribd.com/doc/57277946/RoundupandBirthDefectsv5>. In addition to acute toxicity from high exposures there is concern of possible carcinogenicity as well as other long-term (chronic) health problems such as contributing to Parkinson's disease. Some herbicide POISONS cause a range of health effects ranging from skin rashes to death. The pathway of attack can arise from intentional or unintentional direct consumption, improper application resulting in the herbicide POISON coming into direct contact with people or wildlife, inhalation of volatile sprays, or food consumption prior to the labeled pre-harvest interval. Under extreme conditions, herbicide POISONS can also be transported via surface runoff to contaminate distant water sources. Most herbicide POISONS are supposed to decompose rapidly in soils via soil microbial decomposition, hydrolysis, or photolysis

Some plants produce natural herbicides, such as the genus *Juglans* (walnuts), or the tree of heaven; such action of natural herbicides, and other related chemical interactions, is called allelopathy.

Herbicide POISONS are widely used in agriculture and in landscape turf management. In the U.S., they account for about 70% of all agricultural pesticide POISON use. Prior to the widespread use of chemical herbicides, cultural controls, such as altering soil pH, salinity, or fertility levels, were used to control weeds. Mechanical control (including tillage) was also (and still is) used to safely and effectively control weeds.

Recently the term organic has come to imply products used in organic farming. Under this definition an organic herbicide is one that can be used in a farming enterprise that has been classified as organic. Commercially-sold organic herbicides are expensive and may not be affordable for commercial farming. Depending on the application, they are generally used along with cultural and mechanical weed control practices.

Typically a combination of methods are used in organic situations.

- **Drip irrigation:** Rubber hoses and other methods are used to bring water directly to the roots of the desired plants. This limits weed access to water.
- **Manually pulling weeds:** Laborers are used to pull weeds at various points in the growing process.
- **Mechanically tilling around plants:** Tractors are used to carefully till weeds around the crop plants at various points in the growing process. Besides tilling, other mechanical weed control methods including hoeing also exist
- **Ploughing:** Ploughing includes tilling of soil, inter-cultural ploughing and summer ploughing. Ploughing through tilling of soil uproots the weeds which causes them to die. In summer ploughing is done during deep summers. Summer ploughing also helps in killing other pests.
- **Crop rotation:** Rotating crops with ones that kill weeds by choking them out, such as hemp, *Mucuna pruriens*, and other crops, can be a very effective method of weed control. It is a way to avoid the use of herbicides, and to gain the benefits of crop rotation.
- **Weed mats:** A weed mat is an artificial mulch, fibrous cloth material, bark or newspaper laid on top of the soil preventing weeds from growing to the surface. There are special weed mats for lake vegetation

### Thermal Methods

There are several thermal methods known to control weeds. Weed burners heat up soil quickly and destroy superficial parts of the plants. Weed seeds are often heat resistant and even react with an increase of growth on dry heat. Since the 19th century soil steam sterilization is used as a farming technique to clean soil completely from weeds. Several research results confirm the high effectiveness of humid heat against weeds and its seeds. [http://en.wikipedia.org/wiki/Weed\\_control](http://en.wikipedia.org/wiki/Weed_control)

## Homemade organic herbicides include:

- **Corn gluten meal (CGM)** is a natural preemergence weed control used in turf grass, which reduces germination of many broadleaf and grass weeds. **Corn Meal** - Sometimes the most effective safe weed killers are the ones that stop the weeds before they even appear. Corn meal has a chemical in it that acts as a pre-emergent on plant seeds. That means that it will prevent the seed from germinating. Sprinkling corn meal in an area that you want to keep weeds out of, will not harm the current plants but will keep weeds from growing.
- **Sugar** is another organic weed killer. It puts the soil organisms into overdrive and the soil becomes temporarily unsuitable for plants. It is great for killing weed trees, bushes or vines that are hard to pull out. Simply pour some sugar at the base of the plant you wish to kill. If you are concerned about it becoming an attraction to pests, simply mix the sugar with equal parts chili pepper to deter those possible pests.
- **Some spices** are now effectively used in herbicides.
- **Vinegar** is effective for 5-20% solutions of acetic acid with higher concentrations most effective but mainly destroys surface growth and so respraying to treat regrowth is needed. Resistant plants generally succumb when weakened by respraying. Straight vinegar or vinegar with a squirt or two of dishwashing liquid will also lay weeds low, but it may take repeated applications to do the job. (You can help the vinegar along by adding of 10% clove oil or lemon juice concentrate to each quart of vinegar.) The more acidic the vinegar, the more effective it will be at controlling weeds, but it also becomes more dangerous for you to handle as the concentration increases. "Regular" grocery-store vinegar typically has 3 to 5 percent acidity; you may be able to find 10 percent vinegar at a restaurant-supply store or where supplies for pickling are sold. **Railway companies use a MUCH stronger concentration - 20% solution but at that strength, it can be dangerous to handle.** For more difficult weeds, you may need this stronger vinegar concentration. You can purchase a 20% acetic acid solution that uses Yucca extract as a sticking agent. The solution will kill unwanted grass, weeds or plant material by dehydrating the plant. Be careful, even though this is considered an environmentally safe weed killer, it can harm you and it will kill any vegetation that comes in contact. Repeated applications of "regular" vinegar will eventually acidify the soil, making it harder for future generations of weeds (or any plants) to get a foothold. Ordinary strength vinegar (5-6% acetic acid) can be used. To a gallon of vinegar, one would add a 1/2 tsp of dish detergent to act as a surfactant so the vinegar would penetrate the soil well and move down the root. Put the vinegar into a large squeeze bottle (for a small job). For larger jobs, use a garden sprayer that will deliver a thin stream instead of a wide spray. You can sweeten the soil later with lime.
- **Hot Water/Steam** has been applied commercially - it kills surface growth but not underground growth and so respraying to treat regrowth of perennials is needed. (Use the water from boiling your eggs in the morning. This is a great spot weed killer.)
- **Flame** is considered more effective than steam but suffers from the same difficulties. You can invest in a handheld flame weeder – basically a propane torch with an extended nozzle – that lets you wipe out weeds without any herbicides at all. You can find flame-weeder nozzles that attach to a gas-grill-sized propane tank by means of a long hose, or small models that use a 1-pound propane tank you can carry easily. An advantage of a flame weeder is that you can use it in the winter to rid your patio of treacherous icy patches, too. **Do not burn Poison Ivy!**
- **D-limonene (citrus oil).** D-limonene (citrus oil) is a natural degreasing agent that strips the waxy skin or cuticle from weeds, causing dehydration and ultimately death. Many safe weed killers are typically made of citrus oils, which are nontoxic, but effective.
- **Borax, Powdered Laundry Detergent (especially with bleach), Floor Strippers and many de-greasers** will also kill most plants - but can contaminate for a long time.
- **Bleach** kills almost everything, including plants. To use it as a weed killer, put a 50% bleach solution in a spray bottle and mist the offending plants.
- **Soap.** Spray a 50% dish soap, 50% water mixture on your weeds. You will suffocate them.
- **Rubbing Alcohol.** This one acts as a contact herbicide, burning the leaves of any plant it touches. It does not kill the entire plant, though. Vinegar can be used for the same purpose. Gin will also work and you can again help kill plants by adding the juice of two lemons.
- **Saltwater or salt** applied in appropriate strengths to the rootzone will kill most plants.
- **Acids** applied in appropriate strengths to the rootzone will kill virtually every plant. After which you can apply lime to sweeten the soil.
- **Monocerin** produced by certain fungi will kill certain weeds such as Johnson Grass.
- **Most homemade organic weed killers** use vinegar (acetic acid) and sulfur. If you are growing asparagus

or celery, and will be growing it more or less forever in the same spot, you can also use rock salt. Otherwise, stay away from the salt. Prepare a mixture of 1/8 soap, 1/2 vinegar and 3/8 water. Pour into a spray bottle and mist plants. The soap will help the vinegar “stick” to the plant, and the top of the plant will begin to die.

- **Ready-to-use products** that zap weeds with fatty acids (herbicidal soap), vinegar (acetic acid), or essential oils (such as eugenol or clove oil and d-limonene, or citrus oil) are available from various manufacturers.

One more **important** thing - it is generally best to do weed control on a **SUNNY HOT** day for best effects. If you try it during cool or wet weather, your results will generally be less effective. It generally needs a few days of hot weather to do the best weed control job.

The information in this free book is intended for educational purposes only. It is not the intention of the Author to advise on health care. Please see a medical professional about any health concerns you have. Disclaimer - These statements have not been evaluated by the FDA. The information on this web site and in this free book are not intended to prevent, diagnose, treat or cure any disease.

“Life has no remote. You have to get up and change it yourself!”

“We often forget that happiness doesn’t come as a result of getting something we don’t have, but rather of recognizing and appreciating what we already have.”

**Conclusion** - The world is already hungry. Micronutrient deficiencies, including lack of vitamin A, iodine and iron, adversely are already known to affect 1 billion people worldwide. Increasing populations, continued loss of arable farm land, global climate change, including higher temperatures and increased periods of drought, will all negatively impact agriculture even more, by further reducing soil fertility, micro-organisms and decreasing crop yields. <http://www.jstor.org/pss/2645567>

Traditional agricultural practices that have only emphasized increased production, Frankenfoods and/or synthetic chemical use/misuse have actually contributed to the degradation of our land, soil and local ecosystems, and ultimately have harmed the people who depend on these natural resources. Agroecological methods, including this Chapter’s organic farming practices, can help farmers protect their natural resources and provide increased yields by utilizing safe, sustainable alternatives to costly and dangerous chemicals. These include rotational grazing for livestock and intercropping to improve soil quality and boost yields. Efficient water management in agriculture can also boost crop productivity so, you must choose rather to utilize proper composting, organic fertilization, alternative intelligent pest management®, conservation tillage, proper irrigation, to mulch and/or to weed regularly, and to harvest rainfall more effectively. The earth’s declining soil fertility and crop yields will eventually create worldwide famine; organic fertilizers, e.g., green manure/cover crops, including living trees, bushes and vines, will help restore the soil quality and are an inexpensive and feasible solution to this serious problem. So, let us now begin to sow life in order that we can reap life rather than to continue to sow death.....

Of the more than 80,000 chemicals used in the U.S., only 300 or so have ever undergone health and safety testing. In fact, only five chemicals have ever been restricted or banned by the U.S. Environmental Protection Agency (EPA).

Agriculture is humankind’s most important activity. According to some estimates, some 70% of the water we use goes to crops and farm animals, and agriculture takes up more space than any other human activity. According to the United Nations Food and Agriculture Organization (FAO), agriculture employs at least half of the world’s workforce. Agriculture, therefore, must be at the very center of any project for revolutionary social change.

The green revolution is at the very center of the problems of agriculture in the 20th and 21st centuries. In brief, the corporate green revolution was the export of the American-style industrial and mechanized model of agriculture to the third world. The corporate green revolution was one of the single largest non-military undertakings of the twentieth century. In terms of massive use of human resources, proprietary scientific expertise and public funding, it was comparable to the Manhattan Project and the Apollo space program.

But the corporate green revolution failed miserably. After decades of relentless work, world hunger has not

been ameliorated. The world does not have less hungry people today, but it has more. Considering the vast human and financial resources that went into this endeavor, it is no exaggeration to state that the corporate green revolution was one of the biggest failures of the twentieth century. In spite of its painfully obvious failure, the corporate green revolution's protagonists and spokespeople continue to stubbornly refer to it as a success, that it was and still is one of the most noble and successful humanitarian undertakings of all time. In light of the persistence of this triumphalist discourse of denial, one can also say that the corporate green revolution was also one of the major deceptions of the last century.

The corporate green revolution had been under continuous and unending criticism ever since it started. In the early 1960's authors Rachel Carson and Murray Bookchin warned about the environmental and human health hazards of pesticides, one of the main elements of the corporate green revolution. In the following decade, American activists Frances Moore Lappe and Joseph Collins founded the non-governmental organization Food First, which has produced educational materials on food, agriculture and hunger, with an explicitly critical view on the corporate green revolution and neoliberal policies. In 1977 Lappe and Collins, with the collaboration of Cary Fowler, wrote "Food First: Beyond the Myth of Scarcity". This pioneering book made a bold frontal attack on every assumption of the corporate green revolution, from Malthusianism to the need for pesticides in agriculture. In 1981 Food First published "Circle of Poison", a book about the hazards of pesticides, which led to the founding of the Pesticide Action Network, a global network that today comprises over 600 non-governmental organizations, institutions and individuals in 90 countries. They are not alone in their criticism. Scientists Estimate that Pesticides are Reducing Crop Yields by ONE-THIRD Through Impaired Nitrogen Fixation - July 2007 - [http://www.organic-center.org/science.hot.php?action=view&report\\_id=99](http://www.organic-center.org/science.hot.php?action=view&report_id=99) . Over the last 40 years nitrogen fertilizer use has increased seven-fold and nearly every acre of intensively farmed, conventional cropland is treated with corporate pesticides. A team of scientists explored the impact of pesticides and other environmental toxicants on symbiotic nitrogen fixation (SNF) brought about by Rhizobium bacteria (Fox et al., 2007). Their findings were published June 12, 2007 in the prestigious Proceedings of the National Academy of Sciences. <http://www.pnas.org/cgi/content/abstract/104/24/10282>

The team describes the critical role played by SNF in supporting crop yields and environmental quality. SNF has great potential to reduce farm production costs – a factor of growing importance as rising natural gas prices push upward the cost of nitrogen fertilizers. In Brazil, SNF from soybeans reduces production costs an estimated \$1.3 billion per year. The research by Fox et al. (2007) explored in depth the signaling processes between plants and bacteria colonizing plant roots – processes that govern the degree of SNF and the production of certain phytochemicals. They focused on the ways that pesticides can disrupt signaling and impair the efficiency of SNF. Some 30 pesticides are known to disrupt SNF; the most widely used pesticide in the United States, glyphosate (Roundup) is known to be toxic to nitrogen-fixing bacteria. The "Conclusions" section of the paper begins by stating: "The results of this study demonstrate that one of the environmental impacts of pesticides and contaminants in the soil environment is disruption of chemical signaling between the host plants and N-fixing Rhiz(obia) necessary for efficient SNF and optimal plant yield."

Drawing on their recent work and other published studies, the team projected that pesticides and other contaminants are reducing plant yield by one-third as a result of impaired SNF. This remarkable conclusion suggests one mechanism, or explanation, of the yield-enhancing benefits of well-managed, long-term organic farming systems.

Throughout the 1980's and 90's a new chorus of critical voices spoke up against the corporate green revolution: the advocates and practitioners of what has come to be known as organic, or ecological, farming. The International Federation of Organic Agriculture Movements (IFOAM) defines organic agriculture as "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved."

What is not done for love - is done for money. A corporation has no soul, its only goal is to make a profit. A corporation cares not who is harmed in its pursuit of profit. A corporation cares not about the misery and pollution it causes - it cares only for its "bottom line". And when faced with the proof of the evil it has done in order to make a profit, the corporation can declare itself bankrupt and can not even be incarcerated. The Author believes the corporate green revolution should be more correctly called the corporate greed revolution!

For years the Author has written if you sow POISON you will reap POISON and that there are many safe and far more effective alternatives - that is what this entire free book (<http://www.thebestcontrol2.com>) is about. It is the Author's free gift to mankind and it is the Author's hope and prayer that we can stop the use/misuse of POISONS, synthetic fertilizers and Frankenfoods before it is too late!

The Author can be reached at [steve@getipm.com](mailto:steve@getipm.com) to produce a local enzyme/surfactant formula for other nations or corporations who wish to create a safe and far more effective pest control alternative to control even resistant insects, arachnids, fungi, mold, mildew, bacteria and viruses in seconds. The Author will also consult with growers, farmers, ranchers and others who are interested in producing organic produce and/or livestock.

"Del senno di poi (ne) son piene le fosse." = Graves are filled with after-the-fact wisdom.

We will be known forever by the tracks we leave. — Old Dakota Proverb

If we wonder often, the gift of knowledge will come. — Arapaho Proverb

If you are at all interested in the dangers of "Frankenfoods" - please view this 1 hour and 28 minute documentary. This is why the Author is working so hard to produce truly organic food.

<http://www.hulu.com/watch/67878/the-future-of-food>

#### Websites:

<a href="http://www.thebugstopshere.info">http://www.thebugstopshere.info</a>	<a href="http://www.thebestcontrol.com/">http://www.thebestcontrol.com/</a>
<a href="http://www.thebestcontrol2.com">http://www.thebestcontrol2.com</a>	<a href="http://www.getipm.com/">http://www.getipm.com/</a>
<a href="http://www.perfectpesticide.com">http://www.perfectpesticide.com</a>	<a href="http://www.theidealpesticide.com/">http://www.theidealpesticide.com/</a>
<a href="http://www.learnipm.com">http://www.learnipm.com</a>	<a href="http://www.licergone.com">http://www.licergone.com</a>
<a href="http://www.safesolutionsinc.com">http://www.safesolutionsinc.com</a>	<a href="http://www.stephentvedten.com/">http://www.stephentvedten.com/</a>
<a href="http://www.safelicecontrol.com">http://www.safelicecontrol.com</a>	<a href="http://www.safepestcontrol.org">http://www.safepestcontrol.org</a>
<a href="http://www.effectivelicecontrol.com">http://www.effectivelicecontrol.com</a>	<a href="http://www.licetesting.com">http://www.licetesting.com</a>
<a href="http://www.fastlicecontrol.com">http://www.fastlicecontrol.com</a>	<a href="http://www.licetest.com">http://www.licetest.com</a>
<a href="http://www.head-lice.us">http://www.head-lice.us</a>	<a href="http://www.licecontrol.org">http://www.licecontrol.org</a>
<a href="http://www.licecontrol.net">http://www.licecontrol.net</a>	<a href="http://www.licecontrol.info">http://www.licecontrol.info</a>
<a href="http://www.licecontrol.biz">http://www.licecontrol.biz</a>	<a href="http://www.freepestcontrol.org">http://www.freepestcontrol.org</a>
<a href="http://www.freepestcontrol.net">http://www.freepestcontrol.net</a>	<a href="http://www.freepestcontrol.info">http://www.freepestcontrol.info</a>
<a href="http://www.freepestcontrol.biz">http://www.freepestcontrol.biz</a>	<a href="http://www.intelligentpestcontrol.com">http://www.intelligentpestcontrol.com</a>
<a href="http://www.howtoremoventits.com">http://www.howtoremoventits.com</a>	<a href="http://www.removentits.biz">http://www.removentits.biz</a>
<a href="http://www.removentits.info">http://www.removentits.info</a>	<a href="http://www.removentits.net">http://www.removentits.net</a>
<a href="http://www.guaranteedlicecontrol.com">http://www.guaranteedlicecontrol.com</a>	<a href="http://www.removentits.org">http://www.removentits.org</a>
<a href="http://www.nitreoval.info">http://www.nitreoval.info</a>	<a href="http://www.fastnitremoval.com">http://www.fastnitremoval.com</a>
<a href="http://www.easynitremoval.com">http://www.easynitremoval.com</a>	<a href="http://www.controlpubiclice.com">http://www.controlpubiclice.com</a>
<a href="http://www.howtocontrolhornflies.com">http://www.howtocontrolhornflies.com</a>	<a href="http://www.healheadlice.com">http://www.healheadlice.com</a>
<a href="http://www.controlheadlice.com">http://www.controlheadlice.com</a>	<a href="http://www.howtocontrolheadlice.com">http://www.howtocontrolheadlice.com</a>
<a href="http://www.howtocontrollice.com">http://www.howtocontrollice.com</a>	<a href="http://www.safeheadlicecontrol.com">http://www.safeheadlicecontrol.com</a>
<a href="http://www.howtoremovelice.com">http://www.howtoremovelice.com</a>	<a href="http://www.resistantlice.com">http://www.resistantlice.com</a>
<a href="http://www.howtocontrolfleas.com">http://www.howtocontrolfleas.com</a>	<a href="http://www.howtocontrolticks.com">http://www.howtocontrolticks.com</a>
<a href="http://www.safetickcontrol.com">http://www.safetickcontrol.com</a>	<a href="http://www.safefleacontrol.com">http://www.safefleacontrol.com</a>
<a href="http://www.healswineflu.com">http://www.healswineflu.com</a>	<a href="http://www.organicthievesoil.com">http://www.organicthievesoil.com</a>
<a href="http://www.bestthievesoil.com">http://www.bestthievesoil.com</a>	<a href="http://www.4thievesoil.com">http://www.4thievesoil.com</a>
<a href="http://www.tweetmint.com">http://www.tweetmint.com</a>	<a href="http://www.fourthievesoil.com">http://www.fourthievesoil.com</a>
<a href="http://www.buythievesoil.com">http://www.buythievesoil.com</a>	<a href="http://www.fourthievesoil.net">http://www.fourthievesoil.net</a>
<a href="http://www.howtohealdisease.com">http://www.howtohealdisease.com</a>	<a href="http://www.howtocuredisease.com">http://www.howtocuredisease.com</a>

To learn how to kill pests and how to cure disease without killing yourself, please visit:

<http://www.thebestcontrol2.com>

Want to read the Author's updated free Chapter 41 on How to Cure Disease? Please see:

[http://www.stephentvedten.com/41\\_How\\_to\\_cure\\_disease.pdf](http://www.stephentvedten.com/41_How_to_cure_disease.pdf)

There is also more healing and detox information in Chapter 40 - Please see:

[http://www.stephentvedten.com/40\\_Detoxification.pdf](http://www.stephentvedten.com/40_Detoxification.pdf)

Learn how to cure mental illness - Please see:

[http://www.stephentvedten.com/43\\_Mental\\_Health\\_Disorders.pdf](http://www.stephentvedten.com/43_Mental_Health_Disorders.pdf)

“When a man who is honestly mistaken hears the truth, he will either quit being mistaken or cease to be honest.”

**Pesticide Free Benefits You and Me**

**For you, for me, we're pesticide-free**

**Pesticide-free! Health or pesticide. You decide.**

**Safe to Play! No Pesticides. No Way!**

**Safe to Play, No Poison Spray**

**Safe to Play on, No Poison Sprayed on!**

**Happy to say, 'No Poison Spray'!**

**No DANGER Here: Keep ON the GRASS!**

**Green Acres - it's the place to be! No Pesticides!**

**Pesticides are Poison – Don't poison your lawn!**

**Bee kind – Don't poison your lawn!**

**Because keeping us pesticide free is more important than weed free!.**

**Kiss My Grass**

**This Is Your Lawn Off Drugs...Any Questions?**

**A Chemical Free Lawn...Just As Nature Intended.**

**I ♥ Safe fields!**

**Safe fields are toxic free!**

**Safe for you and me.**

**Bare feet safe here!**

**Safe lawn – no chemicals – no worries!**

**My Lawn is Better than Your Lawn!**

**This lawn is a Safe Lawn. Yes it has a weed or two, but it doesn't  
cause cancer like the others do!**

**Chemical free is the only way to be.**

**Know what's in your lawn?**

**Chemical free zone.**

**Natural Lawn Care Practiced Here.**

**For you, for me, we're pesticide-free**

**Health or pesticide. You decide.  
Chemical Free...the way Mother Nature Intended**

**Truly \*ORGANICALLY\* Green**

**Because we love our families more, natural lawn is the way to go**

**Safe all year, no pesticides here**

**Pesticides don't care what they kill**

**I Practice Pesticide Abstinence.**

**You shouldn't have to kill for a beautiful lawn.  
WARNING: The Surgeon General Will Eventually Determine that Pesticide  
Usage is Dangerous to EVERYONE'S Health.**

**WARNING: Pregnant Women Exposed to Pesticides May Result in Fetal  
Injury, Premature Birth, And Low Birth Weight.**

**Win the DARWIN Award – Keep Using Pesticides**

**Don't Panic! It's Organic.**

**De-cide against pesticides!**

**DE-cide, DON'T Pesticide!**

**BEE pesticide free!**

**Imagine! No Pesticides!**

**My Lawn is Not In-Toxinated**

**Beautiful Lawns, Naturally!**

**Pesticide free, Naturally!**

**Birds Welcome – Pesticides Unwelcome**

**Growing with Nature**

**Turf's Up - Pollution's Down - Go Organic!**



**For of all gainful professions, nothing is better, nothing more pleasing, nothing more delightful,  
nothing better becomes a well-bred man than agriculture”  
Marcus Tullius Cicero, Roman Philosopher , 106 – 43 BCE**

