by Roland Evans of Organic Bountea

Build Your Own GOTHIC Greenhouse

Big Gothic Greenhouse

Seven years ago, I was about to give it all up – gardening, I mean. Here in the Colorado Mountains the sunlight is too harsh, the season too short and the winters too cold. Using the simple structures described in my article, *Gardening in the Fall and Winter*, I was able to grow a limited number and range of produce. But it was not enough. I wanted a real vegetable garden with red ripe tomatoes and tall rows of peas. The answer had to be some sort of greenhouse or protective structure. The problem is, I prefer to make things myself – and I keep to a very tight gardening budget.

Old Greenhouse

There followed a couple of years of experimentation, building growing structures from low cost, easily available materials. I started with a rounded hoop house made from ¾-inch PVC pipe. The plans I found on the web were well designed and easy to follow, so I glued up the plastic joints and covered it with standard four micrometers thick transparent poly sheeting. It looked sturdy. I particularly appreciated the simplicity of the foundation; the PVC ribs slipped over two foot lengths of ½-inch rebar hammered into the ground.

The snows that winter were heavy. I spent a number of sleepless nights with a broom pushing snow off the top of the structure, trying to lighten the load on the hoops. Spring roared in with wind gusting around 80 mph. A loud scrunching noise was heard and the greenhouse collapsed into a tangle of broken pipe and pierced sheeting. The only positive that came out of the snowfall was that the simple foundation held the hoop house solidly to the earth.

The answer seemed to be, make it stronger. Bending ½-inch metal conduit into semicircular ribs was tricky, but two trees growing close together came to my assistance. I drew a template on the ground and bent each rib to shape, using the gap between the trees and gentle even pressure. A piece of ½-inch copper tubing fit tightly into the ½-inch conduit to serve as a jointing method.

Slip Connector

The main technical problem plaguing me was connecting the crossties to the ribs without drilling and bolting each one - a horribly tedious process. After wandering around my local hardware store handling all the odds and ends, I came up with a solution. Using four standard metal pipe straps with nuts and bolts, I fashioned a slip connector that could be moved around and then tightened into place *(see picture above)*.

The new hoop house looked even more robust. Still, it could not stand up to a full scale Colorado blizzard the next winter.

I calculated that the poor structure was trying to hold up about half a ton of snow on its broad back – about the same weight as my old Ford truck.

Obviously, I needed a shape that could shed snow easily and withstand strong winds. But why reinvent the wheel? The Victorians designing the glass greenhouse in my grandmother's kitchen garden in Wales had solved those problems 125 years ago. They knew the gothic arch shape with its pointed ridge and curved sides was incredibly strong and resilient.

I found a company online called gothicarchgreenhouses.com and studied their pictures. Their greenhouses looked beautiful and functional but they were more expensive than my limited budget allowed. I just needed to solve a few technical problems: how to connect the ribs at the top, what to do about a ridgepole and how to construct an end wall and doorway.

Ridge Connector

After a few more experiments, it came together. Using ribs made of ¾-inch galvanized conduit, the ends fit tightly into ¾-inch 90º galvanized iron fittings, the kind used for gas piping. This created a sharp ridge that could be covered by 1 ½-inch PVC pipe with notches cut to hold the iron elbows (see picture above). The end walls were constructed out of standard two-foot by four-foot lumber with a used door from the local recycling yard, cut down to size.

To finish the structure, I ordered conventional six micrometers thick UV resistant polyethylene film from gothicarchgreenhouses.com. On past structures, I had tried different methods of fixing the plastic sheeting but I decided to splurge and get the wiggle wire installation

Recycled door

system. It proved to be the most expensive budget item but was well worth it in reducing the hassle of fixing or tightening the poly film. I attached two foot by four foot lumber along the walls using pipe clips, about 12 inches off the ground to hold the wiggle wire. That allowed the plastic to be rolled up to provide extra side venting on hot days.

The first prototype, a 10-foot x 12-foot greenhouse, still works well after five years (see picture on page 82). Two other 10-foot x 20-foot and 10-foot x 24-foot joined the collection over the next few years. According to my calculations, the final and largest structure cost me less

Side plate

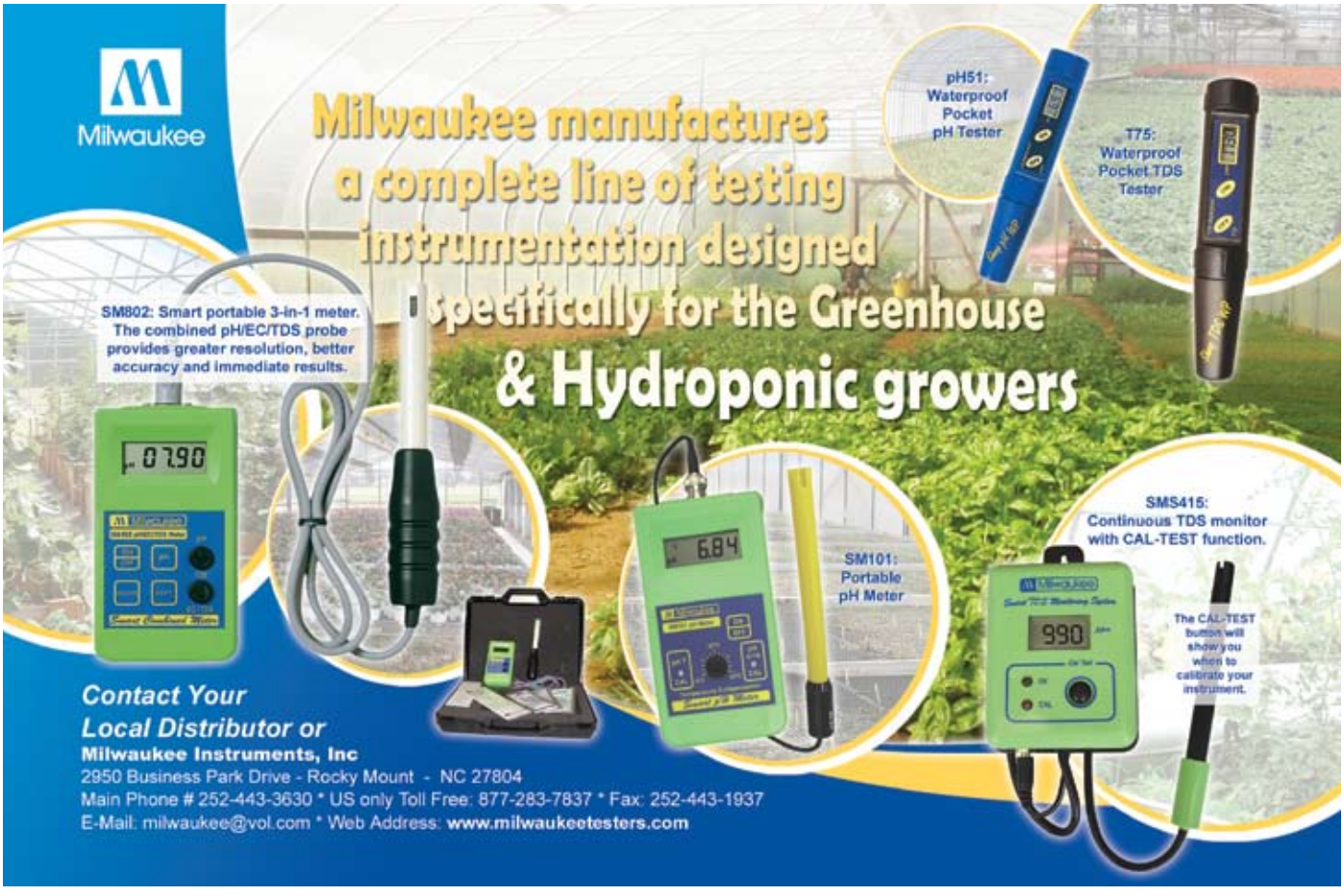
than $350 complete. They stood up to the 2006 blizzard with 40 mph winds and six-foot snow drifts that locked us in our house for a week. Last winter, I harvested 12 different varieties of greens and salads October through February with temperatures below zero. The only heating method was 50 gallon plastic barrels of water used to capture the sun's energy during the day that were released slowly at night.

Interest in this method of greenhouse building has spread through my community. I often have visitors asking how to make their own. A mountain friend has added a number of useful adaptations (see pictures on next page) with heavy-duty conduit, automatic-venting mechanisms on the tops of the end walls and a much simpler end wall structure and door. You can build your own gothic style greenhouse out of easily available materials and adapt the design to your skills and budget. Then you are ready for all year round growing.

Wigglewire

Gothic greenhouse with heavy-duty conduit, automatic-venting mechanisms on the tops of the end walls and a much simpler end wall structure and door.

Close-up picture of the automatic-vent



RESOURCES *Gothicarchgreenhouses.com*

For additional images of Gothic Greenhouses visit maximumyield.com

Picking peas inside the greenhouse

Build a Gothic Greenhouse

CONSTRUCTING THE GOTHIC GREENHOUSE

Basic Materials List for a 10-foot x 20-foot greenhouse

18 - two-foot lengths of ½-inch rebar
18 - 10-foot lengths of ¾-inch galvanized metal electrical conduit, standard or heavy duty
six - 10-foot lengths of ½-inch galvanized metal electrical conduit, standard or heavy duty
nine - ¾-inch 90° galvanized iron elbows
two - 10-foot lengths 1 ½-inch PVC piping
56 - ¾-inch metal pipe straps
42 - ½-inch metal pipe straps
one - box of ¾ inch #10 round head bolts
one - box of #10 washers
one - box of #10 nuts
four - 12-foot lengths of two-foot by four-foot lumber
eight - nine-foot lengths of wiggle wire base
12 - six-foot lengths of wiggle wire
one - box of ¾-inch wide head screws
21-foot x 40-foot six micrometers thick polyethylene film
Lumber and door to construct the end walls.

- Draw your plans before you start and adapt the materials list to your needs
- Choose a flat area that is approximately 10-feet by 20-feet. If possible, dig a 24-inch wide center pathway and sure up with 10-inch boards to create two raised beds, each approximately four feet wide.
- Measure and lay out the placement of the rebar every 30 inches (nine to a side) making sure it is square and straight. Hammer them into the ground for 15 inches leaving nine inches exposed.
- Make a template of the gothic arch shape on flat ground. The ribs are bent only in the middle four-foot leaving the last three feet of each end straight. Take care to bend slowly and evenly using a commercial bending machine, two trees or heavy barrels of water placed close together.
- Connect two rib ends together using the 90° elbows, hammered or screwed down tight. Place the connected ribs over two opposite rebars, easing them down carefully.
- When all the ribs are up in the air, attach the ½-inch conduit crossties using the connectors, one as close as possible to the top and one on each side about half way up the ribs.
- Attach the two-foot by four-foot side plates 12 inches off the ground using ¾-inch pipe clips. Join the plates together in the middle with a screwed on two foot piece of two-foot by four-foot lumber.
- Build the two end walls out of two-foot by four-foot lumber with a door in one end. Drill and screw the last end ribs and crossties to the end walls
- Drill the wiggle wire base and attach to the wall plates and end walls using the wide head screws
- Cover the greenhouse with poly film, stretch it tight and attach with the wiggle wire worked into the bases. Make ventilators at the top of each end using plywood or Plexiglas and an automatic venting mechanism, if desired.

Fruits and Vegetables Just in Time for Fall

Buying according to season is the most cost-effective way to shop for groceries with the added benefit of enhanced flavor. As well, purchasing in-season fruits and vegetables are a sure way to get the highest level of nutrients, vitamins and anti-oxidants from your food.

The following is a list of what produce to look for this fall and how to test their quality.

Acorn Squash
- Look for blemish-free, dull green rind.
- Can keep up to two months.

Apples
- Choose firm, unblemished apples.

Butternut Squash
- Feel for top-heavy squash.
- Check skin for blemishes.

Cauliflower
- Look for tightly-packed florets.
- Check for yellow spots before buying.
- Keeps up to five days, refrigerated.

Figs
- Squeeze to test for firmness - not too soft, not hard.

Grapes
- Check for grapes to be plump and vibrant-colored.

Mushrooms
- Avoid blemished or dried out mushrooms.
- Store in paper bag for the right humidity.

Parsnips
- Shouldn't look withered or limp or have too many small roots.
- Can be stored up to four weeks in refrigerator.

Pears
- Find pears free of blemishes or bruises.

Pomegranate
- Whole pomegranates should feel heavier than they look.
- Can be stored up to three months in the fridge.

Pumpkin
- Pick a pumpkin with a tough skin that can't be scratched by your thumbnail.

Sweet Potatoes
- Avoid sweet potatoes with black spots.
- Make sure they're not shriveled.

Swiss Chard
- Leaves should be vibrant and green.
- Avoid wilted chard.

MY

Growing Food from Scraps Indoors

By Bonnie Burton

My indoor garden started with a royal flush: During a poker game with friends, I was halving an avocado for guacamole when I realized, to my complete shock, that I had a good hand. Instead of pausing the game to throw the pit in the trash, I poked a hole in the soil of the nearest houseplant, dropped in the pit and forgot about it. I was reminded a month later when the fast-growing avocado plant took over the pot. You, too, can grow an indoor garden with kitchen scraps usually thrown onto the compost heap.

Green Onions

1. Use green onions with healthy, white roots attached to the bulb. Snip off green tops for cooking with scissors. Leave a little green top on the onion bulb.

2. Plant the entire onion while leaving the short top above ground in a small pot filled with a loamy, organic potting soil. Make sure your container has drainage holes. Put in a sunny windowsill and water once a week or when soil feels dry to the touch.

3. Harvest new green shoots with scissors to use for cooking or as a tasty garnish. Continue to leave the onion in the soil. With each new growth the onion will taste more potent. After each harvest of onion tops, dress the topsoil with organic compost. Enjoy green onion tops in stir-fries, omelettes and in sandwiches all winter long.

Pineapple

1. Indoor pineapple plants rarely produce flowers and fruit, but their striking foliage adds a touch of the exotic to any houseplant collection. All you need to grow one is the green top you cut off when you eat the pineapple. For best results, use a pineapple that has fresh center leaves at the crown. Lob off the top, right where the crown meets the fruit. Peel off the bottom leaves and clean off the leftover fruit. Let the top rest a day before planting.

2. Fill a shallow pot with rich, loamy organic soil mixed with a few tablespoons of well-rinsed coffee grounds. Pineapple grows best in an acidic soil. Plant the pineapple top so the soil is even with the bottom of the crown.

3. Water well and mist the leaves and crown with a diluted, organic liquid fertilizer. As a member of the Bromeliaceae family, which also includes air plants, pineapple plants take much of their nourishment not from the soil but from nutrients in the moist air.

Avocado

1. For best results use only a ripe avocado. Carefully halve the fruit and rinse the pit. Pat dry and let sit overnight in a warm, dry spot. The next day, peel off any of the parchment-like skin from the pit.

2. Place the pit with the wider end of the base toward the bottom in a seven-inch pot full of loamy, rich organic soil. Make sure the tip is above the soil, exposed to light for proper germination. Water thoroughly.

3. If your apartment is dry, place a clear plastic cup over the exposed seed tip to serve as a mini-greenhouse. Though the plant does not need direct light to germinate, placing the pot on a sunny windowsill will speed up the growth.

4. Continue to water every week and make sure the soil doesn't dry out completely. The pit may take over a month to germinate so be patient.

5. When the sprout emerges and grows to about four inches, add another layer of organic soil to cover the pit completely. This not only protects the seed, but also any roots that may poke through the soil in search of nourishment.

6. Once the plant starts growing, it may remind you of the story "Jack and the Beanstalk." You can watch the plant grow tall for a year (supported with a wooden rod) and let it branch on its own, or make a decision to prune it and force it to branch, making a sturdier plant. If you choose to prune, it's best to trim with a diagonal cut two inches from the top. Be careful as you prune not to cut the main stem more than 1/3 of its height.

7. Continue to add organic compost to fertilize the soil with each pruning and water as you would a houseplant. Only repot the fast-growing plant when it is six times taller than the diameter of the pot.

8. Though avocado plants do not bear fruit if grown indoors, you can plant multiple avocado pits at various times in the same pot for a more interesting arrangement.

Garlic

1. Plant a few garlic cloves with pointed tip facing up in a pot with loamy organic soil.

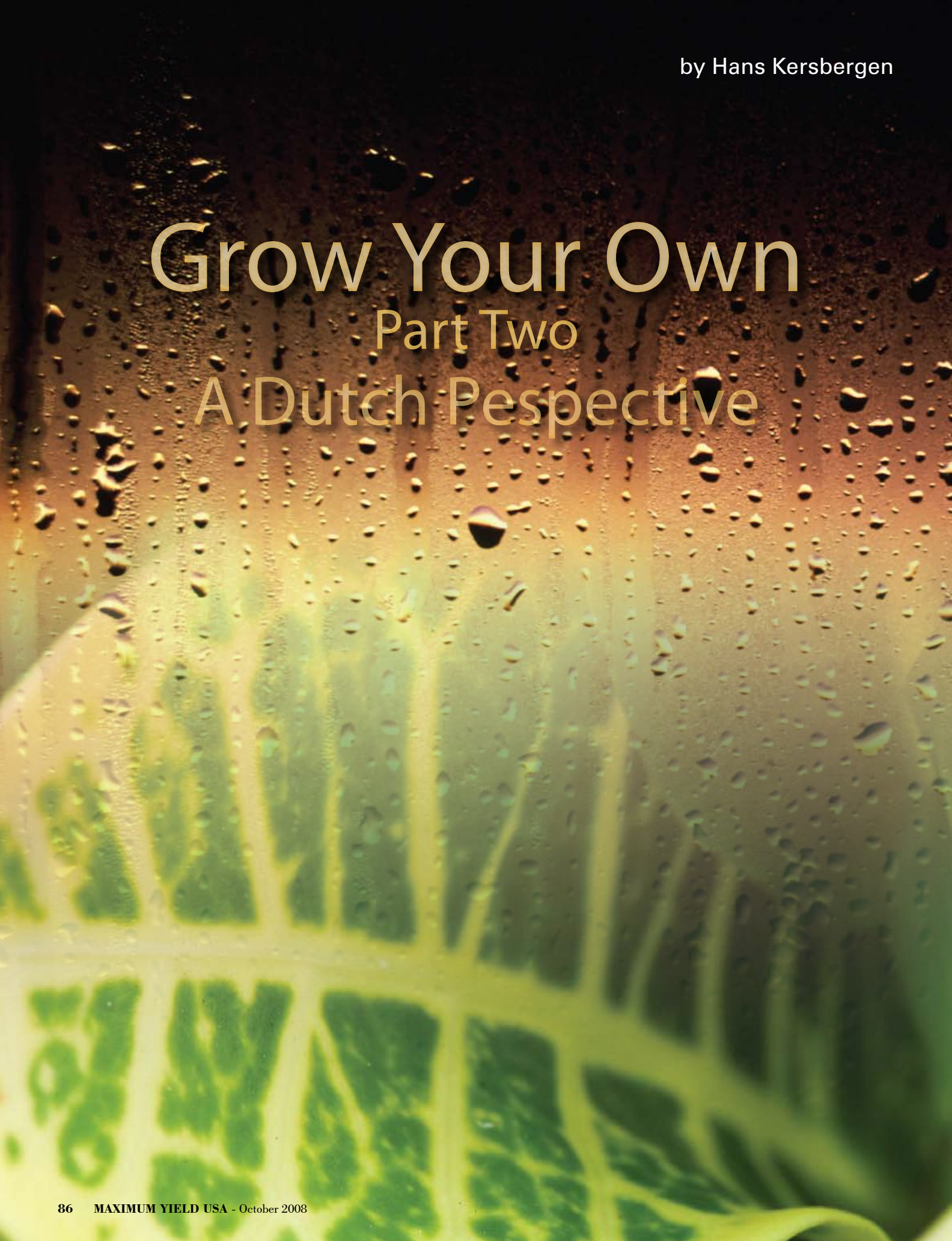
2. Place the pot on a sunny windowsill and water regularly like a houseplant.

3. Green garlicky shoots emerge in a week or so. Harvest with scissors to use in cooking or as a tasty garnish for soups, salads and baked potatoes.

MY

by Hans Kersbergen

Grow Your Own
Part Two
A Dutch Pespective



Humidity and the Growth Period

When checking the growth schedule of a concentrated nutrient line you will find that there are a number of rules that have to be followed to reach the desired result. One of these rules – and a very important one – is maintaining a high humidity during the growth phase over an 18-hour light cycle. But why is it so important? The answer is quite simple and at the same time rather technical. It's all about good climate control.

Small plant cuttings, or slips, carry a little bit of coolant just in case the water supply runs out too quickly. This means at the start of the growth period when the humidity in the grow room is too low, the leaves will have to use a lot of their coolant. This is caused by the conditions in the grow room and not by the plants themselves. Because the roots of the slips are still not fully developed, it is hard for them to transport coolant to the leaves, which may lead to curling leaf tips. Because the leaves can no longer cool themselves, production stops. It is possible that the leaves will start to burn and the slips may die. This is not because they are of inferior quality but because of the gardener's own climate control mistakes.

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"Be sure to check that the tips of the leaves do no start to curl (a clear signal that water has to be added to the medium)".

Starting the growth phase with a humidity of around 80 per cent means the grow room does not require as much coolant and, therefore, the medium can be kept a little dryer as the leaves are not asking for additional water. This makes for optimal root forming. The roots will have to start finding water.

After giving plenty of water the first time, try not to water the medium for the next few days. Allowing it to dry means the roots really have to work to find water. Be sure to check that the tips of the leaves do no start to curl (a clear signal that water has to be added to the medium). Curling leaf-tips indicate that the grow room has drawn all coolant from the leaves and an extra supply is needed via the roots so that they can keep cooling themselves against the sun (your lamp).

The trick is keeping the medium dry and asking as little coolant as possible from the leaves. This will lead to super fast root forming. When it is time to restart watering, always do so carefully.

Higher EC-value

Once your climate is under control through the humidity and the temperature (75.2°F when the lamps are on, and 75.2°F when the lamps are off), you can start to raise the EC (leaves burn because they can no longer cool themselves and not as a result of a too high nutrient value). This way you can keep your plants denser and shorter. The advantage being that the distance between the leaf nodes is much shorter and the plant will have more spare energy to form flowers.

An easy way to keep humidity high during the growth phase is tightening a plant net at a height of some 24 inches from the slips, and placing transparent plastic on top of it (creating a sort of glasshouse).

To release the heat build-up underneath, you have to make a few holes in the transparent foil. Then install a small humidifier (with a regulator) under the plastic and you can ensure the desired humidity all day and all night.

Do this for a day or five and you will see that everything goes as planned; the slips take root, the plants stay compact and the growth nutrients will show that you are using the right formula, the root stimulator will increase your Mycorrhiza fungi optimally which will produce plants that form roots very fast.

Ventilation

Never turn on the fans in the first phase and avoid aiming them at the leaves. Through the fan, the air around the leaves will dry out very quickly causing them to interpret this as a low humidity.

Leaf-sweating is accelerated by raising the temperature and lowering the relative humidity (RV) by increasing the amount of m3 air that is flowing past the leaves (by fans) and by supplying fresh air with another temperature and humidity.

"The biggest mistake growers can make is that they force their plants to sweat more than they are capable of."

The latter can increase or decrease the evaporation process of the leaves, depending on the values you will have to stick to.

Training

Getting the leaves to sweat more is quite a technical matter, but our plants, if trained, can evaporate three gallons of water in 24 hours.

The biggest mistake growers can make is that they force their plants to sweat more than they are capable of.

For example, when the temperature rises above 86°F, a too powerful exhaust system is used. Exhausting the old air (more cubic meters) with a higher relative humidity forces the plant to evaporate more water and this is impossible.

Lamps

In the beginning, hang your lamps as high as possible and turn them on for only a few starters. The light intensity, and the number of lamps, creates heat on the leaves. When they are too close to the small leaves and there is too much light, the leaves cannot cool themselves. MY

In our third instalment of Grow Your Own we will discuss growth phase temperatures, light, air and EC.

If you missed Part 1 of Grow Your Own visit maximumyield.com

by Philip McIntosh

Artificial Lighting: Powered by the Sun

Energy from the sun makes life possible on earth. Our planet is at just the right distance from the sun so that its rays provide enough heat to keep large masses of water in a liquid state, while at the same time not scorching it to the point where all the water boils away. Hence, the name given to this life supporting distance - the Goldilocks Region (not too hot, not too cold). The sun does more than keep the temperature livable; it also provides the energy for what is perhaps the most fundamental of life's processes - photosynthesis. Photosynthesis is the process by which plants (and some bacteria) convert electromagnetic energy into chemical energy, thus providing the basis of the food chain making every other living process possible.

We'll leave the details of photosynthesis for another time, but it's important to understand something about how plants absorb light so that the application of various lighting systems can be intelligently addressed. In plants, most photosynthesis takes place in the leaves. Leaves are generally green because they contain large amounts of chlorophyll, and chlorophyll is the light-absorbing molecule important in photosynthesis *(see figure one)*. The absorption of light energy by chlorophyll is the first step in the complex process of synthesizing carbon molecules (sugar) from carbon dioxide and water.

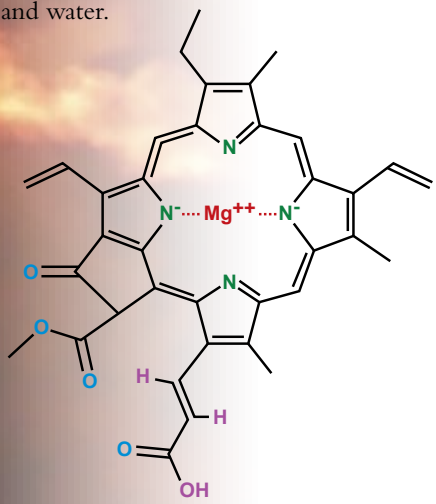


Figure 1: Chlorophyll a the light harvesting molecule of photosythesis.

Chlorophyll comes in a number of different molecular arrangements, with chlorophyll A and chlorophyll B being found in terrestrial plants. Chlorophyll A strongly absorbs light with wavelengths of 430 and 662 nm, while chlorophyll B has maximum absorptions at 453 and 642 nm. If you compare the absorption spectra of the chlorophylls *(figure two)* with a spectrum showing the wavelengths of light that are most efficient for photosynthesis *(figure three)* you'll see that photosynthesis proceeds most efficiently with light wavelengths between 400-450 nm (blue region) and 600-650 nm (red region), matching up closely with the peak absorbencies of the two chlorophylls. Light in the 400-700 nm range is capable of supporting photosynthesis and is called photosynthetically active radiation

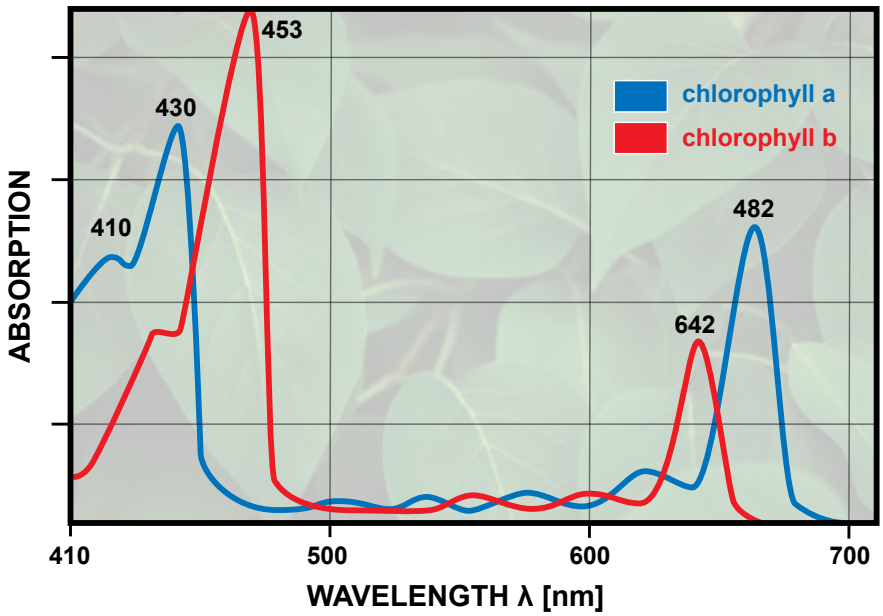


Figure 2: Absorption spectra of chlorophylls a and b.

(PAR). Also note that figure three shows the lowest rate of photosynthesis (but not zero) in the green region. Secondary photosynthetic pigments such as carotenes and xanthophylls absorb some green light. Chlorophyll reflects green light, which explains why plants look green.

Plants do quite well outdoors or in a greenhouse under natural light conditions (so long as the temperature is correct). Therefore, one might think that the sun is the perfect light source for plants. If you look at the wavelengths of light that reach the planet's surface *(figure four)* you see a fairly consistent amount of energy from 400-650 nm. Clearly there is plenty of PAR available in sunlight. So, when providing artificial light a full spectrum of PAR is fine. However, since the peak wavelengths for photosynthetic activity occur at around 430 and 650 nm, we can theoretically improve upon nature by employing lamps that have maximum outputs at these wavelengths.

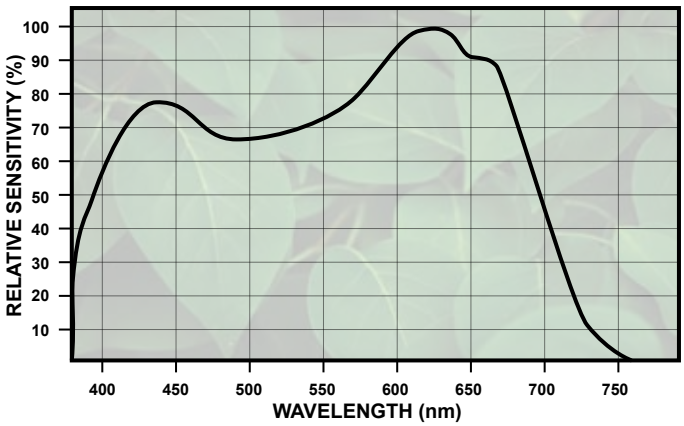


Figure 3: Rate of photosynthesis at different wavelengths of light.

Not only that, contrary to a common belief, a period of darkness is not required for photosynthesis to proceed normally. There are a series of reactions in photosynthesis called the dark reactions but they still occur even when there is light. However, the light-harvesting phase certainly does not occur in the dark, so plants can grow faster if grown in a longer light period.

Moreover, plant life cycles are governed in part by the wavelengths of light they receive. Throughout a natural light-growing season (Spring to Fall), the wavelengths of light reaching the earth slowly shift from the blue to the red, triggering various physiological responses in the plant. As a rule, blue light enhances vegetative growth and red light promotes flowering. The use of artificial lighting provides opportunities for enhancing and controlling plant growth and development that cannot be taken advantage of using natural light alone. Let's take look at some of the lighting systems available to hydroponic growers.

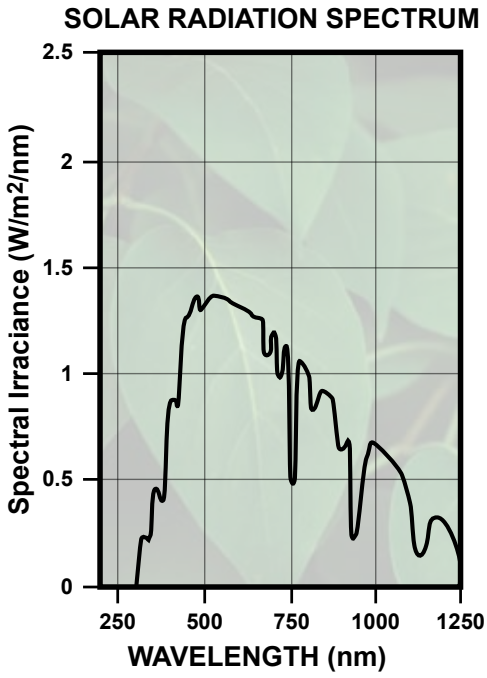
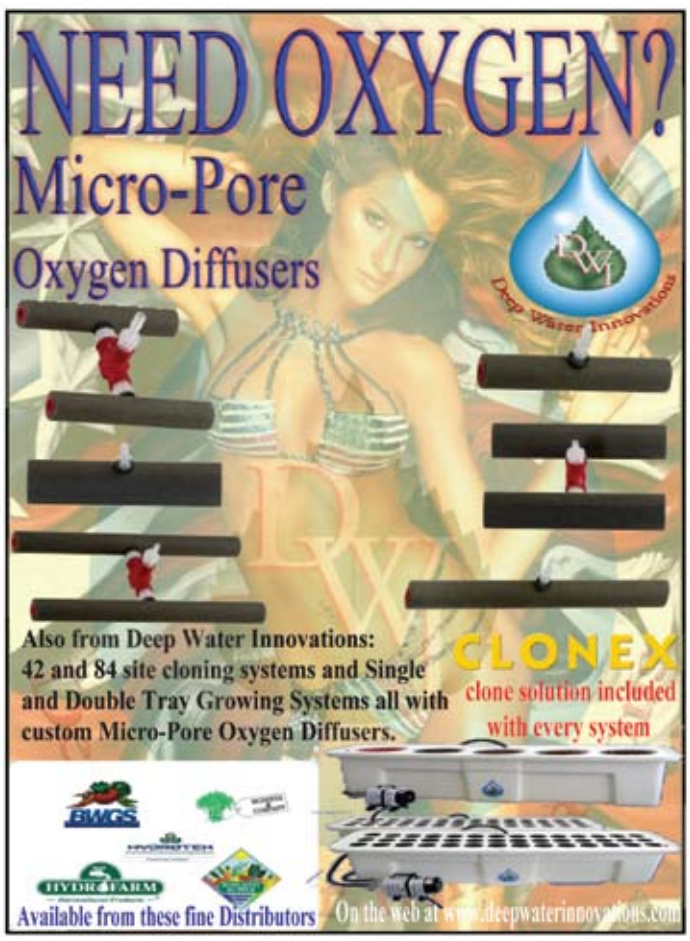


Figure 4: Spectrum of natural sunlight that reaches the surface of the earth.



Incandescent Lights

Incandescent lamps are the original light bulb as invented by Edison. They consist of an evacuated glass bulb enclosing a filament usually made of tungsten. When an electric current passes through the filament, the filament rapidly heats and glows brightly to emit light. One advantage of these simple bulbs is that they require no external equipment like a transformer (ballast) to develop the voltage required to start them.

Incandescents are of little use to hydroponic growers (for other than lighting the equipment storage closet). If you look at the emission spectrum of a typical incandescent bulb *(figure five)* you'll see the emission at the blue end is relatively low while the red is fairly high. However, the output in lumens per watt is low so the amount of PAR per dollar of electricity used is also low.

Incandescent bulbs might be useful for a small application where additional red light is desired, however they have an additional flaw. Figure five shows that the output continues past the visible light region into the infrared. Infrared radiation is heat rays so incandescent bulbs expend a lot of energy producing heat rather than light. In a terrarium or other small space where some heating is actually desired, they can be useful. So-called full spectrum incandescents have the same heat problem and merely filter out some of the yellow wavelengths to produce a more natural color of light.

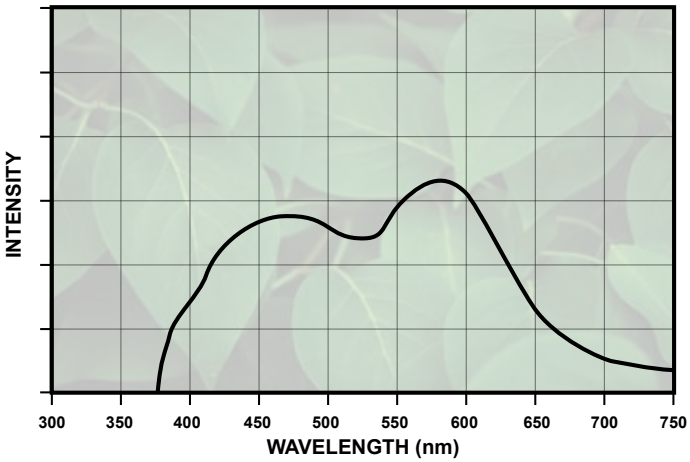


Figure 5: Emission spectrum of a typical incandescent light bulb.

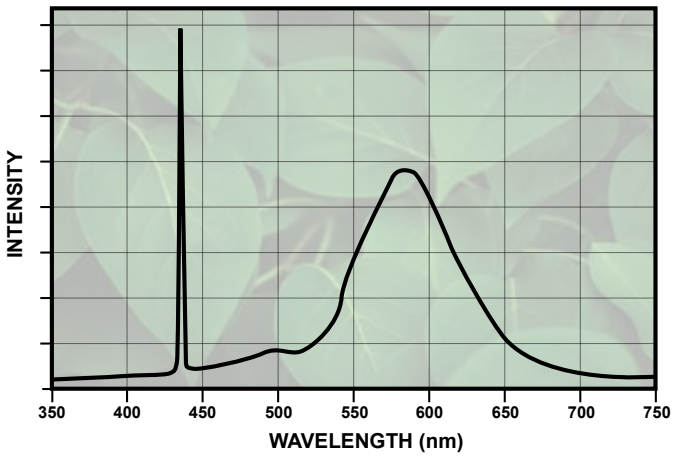


Figure 6: Output of a typical halophosphate fluorescent lamp.

Fluorescent Lights

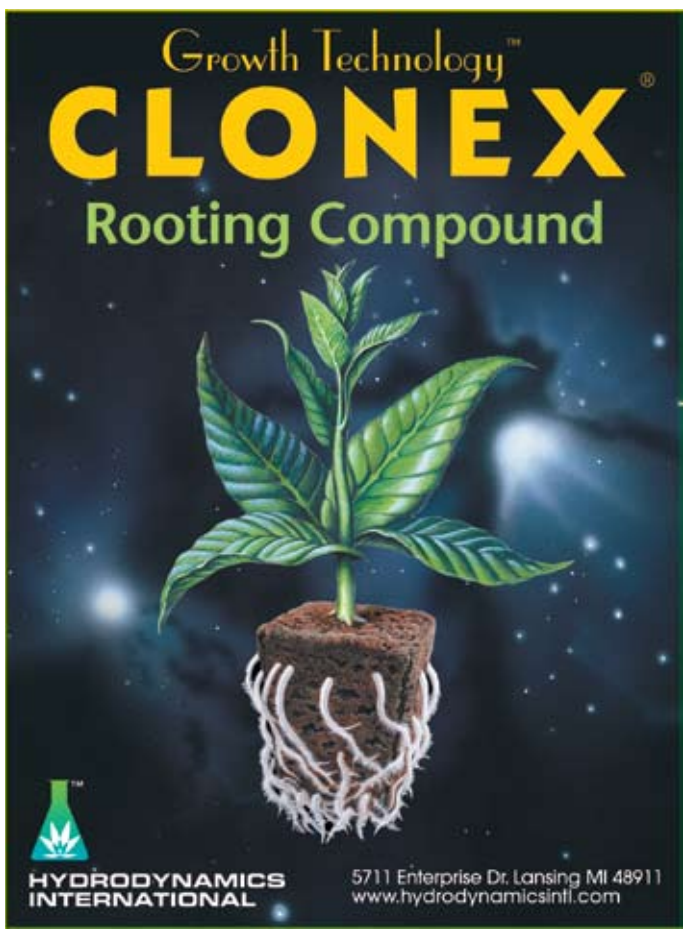
Fluorescent lamps work on a different principle than incandescent lamps. A fluorescent lamp *(figure five)* consists of an evacuated tube containing a low-pressure mercury vapor and a pair of electrodes. When power is applied, electrons begin to flow between the electrodes and collide with the mercury atoms. The collisions cause electrons surrounding the mercury nuclei to jump to a higher energy level. The electrons quickly fall back down to lower energy levels, releasing the additional energy as a photon of ultraviolet (UV) light. The UV photons then collide with atoms in a fluorescent coating on the inside of the tube, which in turn excites electrons in a similar way. However, when the electrons in the coating return to a lower energy level a photon of visible light is released. That's the light we see emitted by the lamp (along with a bit of invisible UV light).

Although the intensity of light emitted by fluorescents is considerably higher than that of incandescents, it's still fairly low, so the lamps have to be placed rather close to the plants to have good effect. Fortunately, the PAR is pretty good and there is little heat, so they are more efficient than incandescents.

The makeup of the fluorescent coating can be varied to provide a variety of color outputs. So called cool fluorescent lamps as would be used to light a workspace provide outputs at a very narrow range of peak intensities, however, they do have peaks in the optimum PAR ranges. Halophosphate coatings provide a strong peak at about 430 nm and a broader output near 600 nm *(figure six)*. Natural sunshine or natural spectrum lamps provide a broader range of output wavelengths designed to mimic natural sunlight. It's unclear that this is an advantage for plants since only the 430 nm and 650 nm regions are optimal.

Standard fluorescent tubes find use in starting seedlings and maintaining small plants. Standard tube-type fluorescent lamps are limited by their large size and relatively low output and the need to put them close to plants for maximum effect, so they are not used much in large growing operations.

Other options have been made available in recent years with the advent of the T5 and the compact fluorescent lamp. The T5 is a high output (up to 5000 lumens) fluorescent designed for horticultural applications that can be run in a single tube fixture or in banks of up to eight tubes in a fixture with a reflecting hood. Compact fluorescent lamps combine the energy efficiency inherent in the fluorescent design with a smaller size that makes them a practical alternative to high intensity discharge lamps since they produce less heat and can be grouped together in modules that can be placed close to plants (within four to 12 inches) while taking up little space.



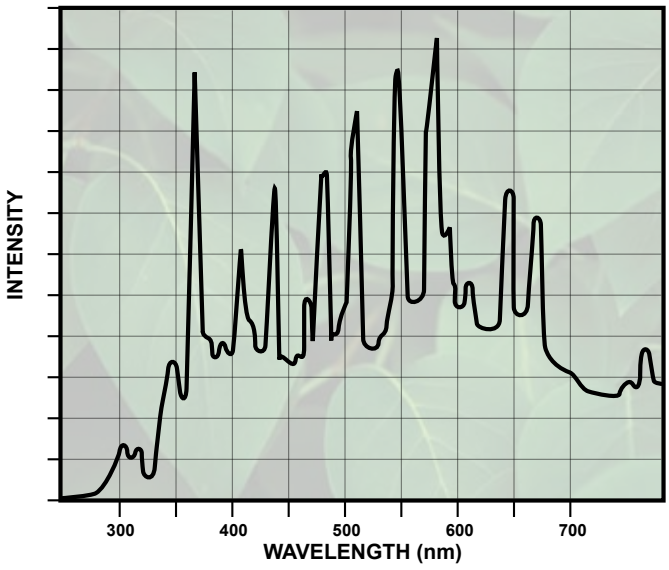


Figure 7: Emission spectrum of a typical metal halide lamp.

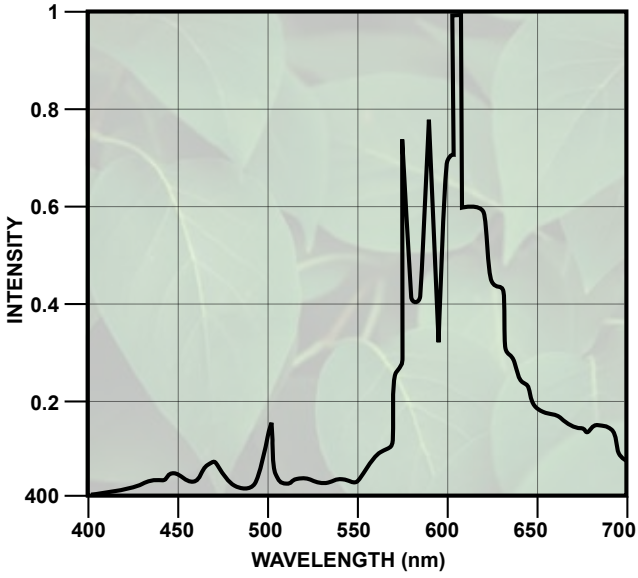


Figure 8: Typical output spectrum of a high pressure sodium lamps.

High Intensity Discharge Lamps

High intensity discharge (HID) lamps have become the lamps of choice in many indoor applications. There are two types used in horticulture: metal halide and high-pressure sodium. They work on a principle similar to what was described above for fluorescent lamps (an electric current passes through a mixture of gases to excite electrons resulting in the production of photons). The makeup of the gases in the lamp affects the wavelengths of light produced.

HID lamps require an external ballast to develop the initial voltage required to start the lamps. They also generate quite a bit of heat so they can't be placed too close to the plants and good ventilation will often be needed to keep the air temperature down. This is more of a problem in a small space than a large one. Ultraviolet radiation is also a hazard because of the emissions from the mercury that is included to provide the conductive path for the electric current in the lamps. The bulbs are usually not coated with a UV absorbing substance, as is the case with fluorescent lamps. Never look directly at an HID lamp. The use of an eye-shielding hat or goggles is recommended when working near them.

The metal halide (MH) is a type of HID lamp employing a mixture of mercury, argon and metal halides enclosed in a quartz tube. A metal halide is a combination of a metal ion and a halogen ion (a halogen is an element of group 17 of the periodic table which includes fluorine, chlorine, iodine, bromine and astatine). Metal halide lamps provide good broad-spectrum illumination with a slight bias toward the blue end *(see figure seven)*. This makes them ideal for promoting vegetative growth. One thing to keep in mind is that the quartz tube will slowly become opaque over time (because of changes in the crystal structure caused by heating). Even though the lamp may function normally, it will have to be periodically replaced to maintain rated luminous output.

High Pressure Sodium (HPS) lamps produce light that is biased toward the yellow/red end of the spectrum (figure eight) making them a good choice for promoting flowering. Some manufacturers produce HPS lamps that are more color balanced for plants that do not do well with more of a fall sun colored light. The reason for this is that of all the lamps we have discussed, HPS lamps are the most efficient, producing the most lumens per watt. They are the most economical to operate. This is a major consideration for large installations. Other manufacturers provide combination units that include an MH and an HPS lamp in the same fixture to provide a high intensity balanced spectrum output.

When an HPS lamp initially starts, it doesn't emit its usual color. This is because it works slightly differently than other vapor lamps. The initial arc of an HPS lamp conducts through xenon gas producing a pinkish color. A slug of solid sodium/mercury amalgam vaporizes as the lamp heats up changing the color from whitish blue (from the mercury) to the warmer

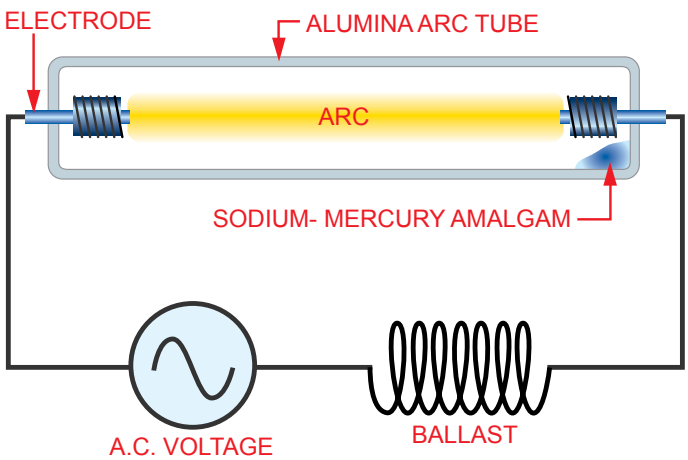


Figure 9: Diagram of a typical HPS lamp system. Lamp is shown just after starting before the sodium-mercury amalgam has vaporized.

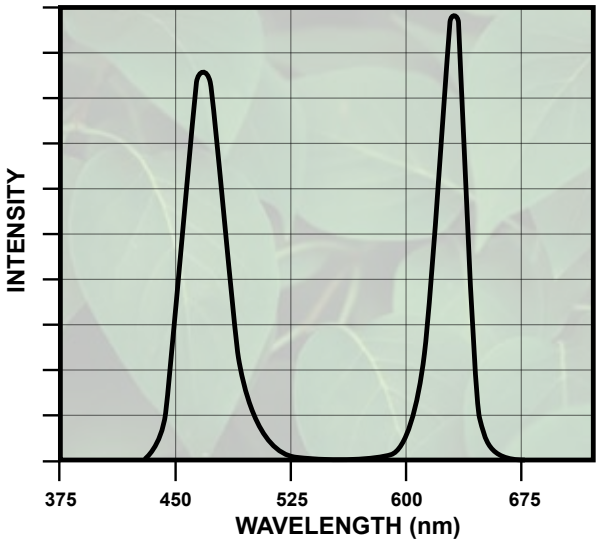


Figure 10: Output spectrum of red and blue LEDs.

yellow/red as the sodium vaporizes and the pressure increases in the lamp *(figure nine)*.

LED Lighting Systems

Advances in light emitting diode (LED) technology have allowed the development of LED-based grow light systems. LEDs offer the advantage of low power consumption, low heat generation and precise color outputs that can be provided to optimize the provided PAR *(figure 10)*. They also last an impressively long time without needing replacement (up to 7 1/2 years compared to one to two years for HID lamps).

LEDs are nothing like a light bulb. There is no glass to break, no hazardous gases and no ultraviolet radiation. They are semiconductor devices that emit light when conducting an electric current. Each individual LED is about the size of a thumbtack so they must be grouped together to provide a workable lamp *(figure 11)*. However, this is another of their advantages -- red and blue LEDs can be combined in virtually limitless combinations to provide any desired ratio of red-to-blue light at just about any intensity.

Figure 11:
A typical blue/red LED lamp assembly.

LEDs are not as bright as HID lamps, but because of their low heat output, they can be placed quite close to plants to make up for it. Much technological advancement in LED lighting systems can be expected in the near future.

Decisions, Decisions

You obviously have many choices when it comes to artificial lighting. No one system is perfect for every application.

TYPE	HEAT	EFFICIENCY (lumens per watt)	BULB LIFE (hours)
Incandescent	Moderate	5-25	100-2,000
Compact Fluorescent	Low	45-60	6,000
T5 Fluorescent	Low	80-100	16,000
Metal Halide	High	50-55	10,000
High pressure sodium	High	150	16,000-24,000
Colored LED	Low	8-50	80,000
White LED	Low	100	80,000

Figure 12: Output spectrum of red and blue LEDs.

The species being grown, the size of the growing space, heat consideration, initial installation costs and electricity cost must all be factored in to any decision. The features of each of the lamp types are summarized in *figure 12*. MY

HID = High Intesity Discharge
HPS = High Pressure Sodium
LED = Light Emitting Diode
MH = Metal Halide
PAR = Photosynthetically Active Radiation
UV = Ultraviolet

For comparisons of the lighting techniques discussed in this article visit maximumyield.com

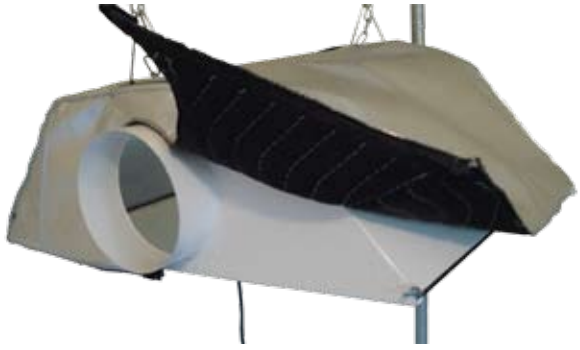
PRODUCT spotlight

ask for these exciting new products at your favorite indoor gardening store.

Continued from page 34

Reflective Heat Shield Available from Hydrofarm

The Reflector Heat Shield™ is a sturdy, custom-fitted cover that double insulates your existing air-cooled hood against the heat your lights generate. With the Reflector Heat Shield™, less heat escapes into your room and is instead contained within your hood to be better carried away by your existing air-cooling. This results in a cooler environment, happier plants and energy savings from increased A/C efficiency.



- 95 per cent reflective exterior
- Saves money and energy
- Heavy duty insulating material custom fit to your reflectors
- Reduces your grow room temperature
- Maximizes cooling system efficiency
- Reduces air flow noise
- Soft, durable and machine washable
- Strong, high quality construction
- Made in the USA

National Garden Wholesale Has Precise Electronic Controls for Your Garden

National Garden Wholesale proudly welcomes a new group of cutting-edge environmental controls ideal for indoor gardens, solariums and small greenhouses from Solatel. With their simple and accurate designs, these electronic products provide better management of a garden space with less effort needed on the part of the gardener.

The new Solatel products are:

- Plant Pro™ Environmental Controller with CO_2
- Plant Pro™ Environmental Controller without CO_2
- Precise electronic controls for lighting, irrigation, ventilation and CO_2
- Flood Detector Stand Alone (Special Order)
- This device detects overflow of water or nutrient if a pipe breaks or drains clog
- CO_2 300 (Special Order) - Simply set the desired CO_2 level and the CO_2 300 does the rest.
- THP 100 Atmospheric Controller - This device coordinates ventilation and CO_2
- PWX-240-4 Power Expander
- PWX-240-U Power Expander
- Controls up to four 1000-watt 240-volt lighting systems.

Let these Solatel products take control of your garden.

For only the best for your gardening needs trust National Garden Wholesale.

Active Air Dehumidifiers by Hydrofarm

High humidity can cause plants to grow poorly and can also promote mould. Hydrofarm's new analog dehumidifier will extract up to four gallons of water per 24-hour period, keeping humidity under control so your plants can thrive.

- Convenient handle for easy carrying
- Water level detection and automatic shut off
- Adjustable air outlet
- Optional continuous drainage
- Removable front-loading water tank
- Washable, activated carbon filter
- Six foot power cord
- 110-120-volt/60Hz/3.6-amps/400-watts

ActiveAir Two-Way Meter New from Hydrofarm

Gardeners can conveniently test moisture and pH levels with the handy ActiveAir Two-Way Meter from Hydrofarm. Moisture readings register on a scale of zero (dry) to 10 (moist), and pH readings between pH zero (acidic) and pH 10 (basic). The durable, easy-to-read tester is suitable for indoors or out and needs no batteries to operate.

Sun Gro's New Micronutrient Fertilizer Provides Increased Iron and Magnesium with SunTrace™

For growers looking to improve their levels of iron, magnesium and sulfur, Sun Gro Horticulture Distribution Inc. (Sun Gro) has developed and added to its professional fertilizer portfolio two new micronutrient products: SunTrace™ and SunTrace™ Max.

SunTrace™ is designed to boost micronutrient levels in the root zone. This homogenous (small) granular product ensures that each granule contains magnesium, sulfur, copper, iron, manganese molybdenum and zinc. These secondary and micronutrients are critical for plants to achieve their top performance. The SunTrace™ particle size is approximately one millimeter and was designed so growers could benefit from elevated levels of iron, magnesium and sulfur compared to industry standards and has no additional boron or calcium carbonate. This allows the grower to regulate their micronutrient levels by adding SunTrace™ in their soil mix without increasing their limestone rates in the mix.

Sun Gro's second introduction is SunTrace™ Max. This product has all the same improved nutritional benefits of SunTrace™, but with a larger 2.3-millimeter particle size. Growers now have two particle sizes to choose from when they use SunTrace™ as their source of micronutrients. Both products can also be used in conjunction with a traditional NPK fertilization program.

In addition to SunTrace™, Sun Gro has three other professional fertilizer product lines.

Within the horticultural industry, Sun Gro is the master distributor of Multicote controlled release fertilizers in both Canada and the United States. Sun Gro also distributes its Technigro water-soluble fertilizer product line, which has recently been rejuvenated with new formulations. And finally in the Western United States, Sun Gro is a distributor of Nutricote controlled release fertilizers.

Homebox Flange By Eastside-impex

The Homebox FL160 flange enables additional inputs and outlets to be installed on all original Homeboxes. The only tool required is a sharp knife.

The flange is made of extremely sturdy ABS plastic (acrylonitrile butadiene styrene). ABS is also used to manufacture motorcycle helmets because of its highly shock-resistant and hard surface.

Eastside-impex has specially designed this accessory to make installation child's play.

Simply cut the material to size using the template supplied (the sealing washer), install the flange, screw tight and you're done. The sealing washer ensures a perfect fit.

The flange has a 160-millimeter diameter installation bracket on either side to ensure air hoses fit properly.

Various screw-on reducer fittings (160 millimeter=>125 millimeter / 160millimeter=>100millimeter) are also supplied.

Applications include:

- Direct cooling of lamps
- Air inputs and outlets
- Additional water inputs and outlets

Contents of delivery:

FL160:

- Flange (three parts)
- Filter to protect against dust and insects
- Installation manual

FLR125:

- Two reducer fittings

FLR100:

- Two reducer fittings

PRODUCT spotlight

ask for these exciting new products at your favorite indoor gardening store.

Heat Shield™ Products by Hydro Innovations

Reduce your air conditioning needs and keep lamp heat from affecting your environment with our radiant barrier reflector, duct and fan covers. The full line of Heat Shield™ products are sturdy, custom-fitted covers that double insulate your reflector, ducting or fan against the heat your lights generate. With Heat Shield™ products, less heat escapes into your room and is instead contained within your reflector and ducting to be better carried away by your existing air-cooling. This results in a cooler environment, happier plants and energy savings in the form of increased A/C efficiency. The use of these products in combination can reduce the load on your air conditioner by an average of 7 ½ per cent, reducing your energy bills and your carbon footprint, not to mention making your plants much happier in their cooler environment.

Flairform pH Test Kit

Flairform's pH Test Kit provides the easiest method of obtaining fast and accurate pH readings. With no complex or costly maintenance between tests you'll appreciate why many growers with electronic pH meters resist checking pH.

- Super concentrated - one drop per test - approximately 800 tests per bottle.
- Measures from pH 4.0 through to 8.0: Very important feature because some pH testers do not operate below pH 6.0 (i.e. if nutrient pH is below 6.0, a test will still show 6.0).
- Fast pH readings: Note that pH meter electrodes usually need to be left in the sample for several minutes before an accurate/stable reading is produced.
- Highly accurate, waterproof color chart on side of bottle.
- Perfect back up for die-hard pH meter users.
- Supplied in one ounce dropper bottle with quality test tube.

How accurate is Flairform's pH Test Kit? When using a pH Test Kit you will get accurate results every time. Unfortunately, electronic pH meters can be susceptible to error because lower quality electrodes can respond to foreign species such as sodium. For this reason, if using an electronic pH meter occasionally cross check your readings with a pH Test Kit.

Introducing Dr. DoRight's 100 per cent Bio-based Pest Control

Dr. DoRight's Pest Control is an innovative, 100 per cent bio-based solution to be used on common pests and powdery mildew problems. The product is now shipping from California and is an EPA FIFRA 25b exempt product that is registered or approved in most states (including CA, WA, OR, AZ, MI, NC). Dr. DoRight's is a non-toxic formula designed to combat problems or to be used as preventative maintenance to mite and mildew infestations. Dr. DoRight's is available as a concentrate, which allows for a cost effective routine to maintain plant health.

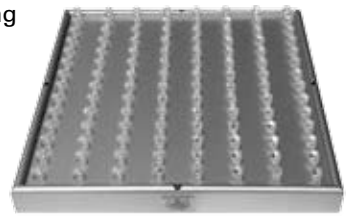
By utilizing colloidal chemistry, Dr. DoRight's breaks down food-grade essential oils and allows them to become water soluble, harnessing their natural insecticidal properties to kill common insects. Dr. DoRight's oil and water DO mix combine to yield a highly effective, yet not-toxic pest control product. The colloidal micelles in Dr. DoRight's break down an insect's otter shell, damaging their respiratory system, resulting in gradual suffocation.

Dr. DoRight's helps solve powdery mildew problems by penetrating and dislodging the fungal root system, preventing the mildew from feeding and reproducing.

Liquid Lumens HydroFlector Available Exclusively from Hydrofarm

Indoor gardening will never be the same with the new Liquid Lumens HydroFlector. The efficient water-cooled design allows you to install more lights per square foot and decrease the distance between your lights and plant canopy. Water-cooling is scientifically proven to be significantly more efficient than air at removing heat; it is already used in a wide variety of cooling applications including you car's engine.

Sunshine Systems is pleased to offer the GlowPanel™, GrowUFO™ and the GrowPanel Pro™ series of LED grow lights.



From seed to flower, our LED grow lights promote fast and vigorous growth while providing up to 80 per cent energy savings over HPS and metal halide lights.

Our proven technology saves you considerable money by slashing your grow light electric bill and by eliminating your maintenance costs. Every LED grow light we offer is designed to operate maintenance free for over 50,000 hours. There are no expensive and hazardous bulbs to replace.

Another great benefit to our LED grow lights is they emit virtually no heat. No heat means no money or energy is wasted on additional cooling or cooling equipment. No heat also means our LED grow lights are very discreet since there is no thermal footprint.

Our LED grow lights typically pay for themselves within a year. With an 11-year lifespan, it is easy to see why our LED grow lights are the smart choice for today's indoor grower.

Sunshine Systems' LED grow lights have undergone extensive testing and are proven in the field. We have many repeat customers who very satisfied with our products.

Our LED grow lights are in use in over 15 countries worldwide and are used by growers ranging from the home hobbyist to the large commercial greenhouse and nursery. Whether you are domestic or abroad we have a LED grow light for you.

Every LED grow light we offer is RoHS compliant and is free of mercury and hazardous materials.

Maverick Sun Introduces D Lux Horticultural Lamps

Using decades of lighting manufacturing experience, Brad Hawkins believed it was possible to develop HID lamps that would give higher yields than the lamps currently on the market. The prototype lamps were sent to Northern California for real world testing. The results of two crop cycles showed that Maverick Sun D Lux lamps gave higher yields than the big name brands. These tests were run using the same ballasts and hoods – the only thing they changed was some lamps. These results are backed up by lumen and spectral distribution test reports from Lighting Sciences.

This moderately priced lamp comes with a full year warranty.

MY

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Forget the Flowerpot!

Creative Ideas for Planting Indoors

by Lisa Koosis

The key to great indoor gardening is thinking outside the box -- or, more specifically, thinking outside the flowerpot. Though many garden supply stores stock only the traditional terracotta, ceramic and plastic flowerpots, there are many other alternatives for the indoor gardener with a little creativity.

Your indoor plants can be planted in a variety of containers. Being indoors gives you a bit of flexibility since you needn't worry about the extremes of weather conditions wearing on your chosen planter such cold breaking something or rain rusting it.

Why not consider a child's sand pail as a planter? They come in bright, cheerful colors and would make a great planter, particularly for a child's room or a sunroom. Leave the shovel (usually included) attached for added decoration.

For smaller plants, mugs make great planters and you can get quite creative. Mugs can be found in cute shapes such as animals, or with fun sayings and pictures. They make great planters for a kitchen herb garden and are just the right size to line up on a kitchen windowsill.

Going with that kitchen theme, why not use old pots and pans to plant in? As with any metal planter you choose, you'll need to line it with something waterproof. Most garden supply stores sell liners specifically geared to the job, but a thick trash bag works equally well. Copper pots in particular make beautiful planters.

Ceramic bowls, canisters and cookie jars are also wonderful options for planting. Items such as these make perfect homes for your plants because they're durable and often quite decorative.

Baskets also make pretty planters. What's nice about baskets is that you can use them one of two ways. You can set plastic flowerpots right into them, clustering plants for a container garden effect, but you can also plant directly into the basket if you choose. Again, you'll need to use a protective, waterproof liner to line it with before planting. Baskets come in a wealth of sizes and shapes and you'll easily find one to fit in whatever room you choose.

Don't hesitate to get creative. Some of the things you normally put in the recycle bin make great planters. Coffee cans, for instance, are the perfect size for a small to medium-sized plant. Why not let your kids decorate it for a personalized touch? If you're feeling creative yourself, why not try decoupage?

On the subject of creativity, plain old terra cotta pots make a great canvas for artistic endeavors. They can be made quite easily into mosaics or used for decoupage or even painted.

So why not spice up your indoor garden with a movement away from plain old terra cotta? What better way is there to incorporate your plants into your home décor and your life?

Lisa is an author on http://www.Writing.Com/, a site for Poetry Contests.
Article Source: http://EzineArticles.com/?expert=Lisa_Koosis

MY

DO YOU know?

1 Compost tea can be applied as a foliar spray to feed plants. Coating the leaves with the tea on the tops and bottoms of the leaves will provide a protective coating. However, the solution must be diluted enough as to avoid staining the leaves.

2 Fertility refers to the inherent capacity of a soil to supply nutrients to plants in adequate amounts and in suitable proportions.

3 Turning on fans in the first phase of growth will cause the air around the leaves to dry out very quickly causing them to interpret this as low humidity.

4 A solid-state relay is an electronic device used to switch the electrical current. They are just one part of a lighting controller and are controlled by a timer or trigger cable.

5 Once your plants are established, it is important to have a soil analysis performed on the first three to six inches of the soil and the 12-inch depth. Tests can be performed for pH, percentage of organic matter and NPK among other attributes.

6 When choosing a grow space, ensure every nook and cranny is cleaned. Using a viruscide/fungicide or a solution of nine parts water to one part bleach will ensure your grow space starts off as healthy and clean as possible. This process should be repeated before every crop rotation.

7 In terms of greenhouses, gothic refers to the shape of the arch. Gothic greenhouses are beautiful and functional and able to withstand strong winds and extreme weather due to their unique design.

8 A period of darkness is not required for photosynthesis to proceed normally. There are a series of reactions in photosynthesis called the dark reactions but they still occur even when there is light.

9 Vegetative crops like lettuce and oriental vegetables require less light than fruiting crops like tomatoes and cucumbers. Fruiting crops require less light when the plants are younger and still in the vegetative growth stage.

10 Along with sufficient area intake and exhaust to control fresh air supplementation to the garden, the installation of proper lighting ventilation is capable of removing up to 75 per cent of harmful heat that radiates from the bulb.

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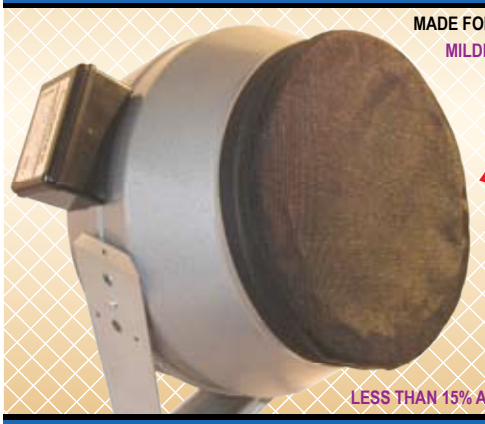

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CHECK YOUR growing I.Q.

by Erik Biksa

1. In terms of dry weights, most plants are ___ water?

a) 50%
b) 30%
c) 85%
d) 100%

2. What can be used to promote sturdier branches in crops?

a) applications of Potassium Silicate
b) increased air movement
c) sufficient plant spacing
d) yoga

3. Mycorrhize are _____ which form a beneficial relationship with the plants root system

4. Rhizobium are _____ which form a beneficial relationship with the plants root system

5. Which of the following can be used to classify the lighting requirements of plants?

a) Day neutral
b) Long day
c) Short day
d) Irregular day

6. Which of the following factors increases the occurrence of hermaphrodites in crops?

a) Irregular soil moisture
b) High temperatures
c) Interruptions in light/dark cycles
d) Michael Bolton

7. Spidermites can breed faster during hotter and drier periods

a) True
b) False

ANSWERS:

September 2008 quiz

1) c, **2)** Appliance constantly cycles **3)** e, **4)** a, **5)** e, **6)** a,b,c,d,e.

answers to this quiz will be printed in the November 2008 issue of Maximum Yield.

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601 East Broadway Road,
Tempe, AZ 85282
480-377-9096

Homegrown Hydroponics
1702 East Prince Road,
Tucson, AZ 85719
520-323-1212

Natural Pools & Gardens
2143 North Country Suite C,
Tucson, AZ 85716
520-323-2627

Sea of Green Hydroponics
815 W. University Dr. Suite 110,
Tempe, AZ 85281
800-266-4136

Sea of Green West
2340 W. Bell Road, Suite 116,
Phoenix, AZ 85023
602-504-8842

Sea of Green Hydroponics
402 North 4th Avenue,
Tucson, AZ 85705
520-622-6344

ARKANSAS

Fermentables
3915 Crutcher Street,
N. Little Rock, AR 72118
501-758-6261

Old Soul Organics and More
1771 Crossover Road,
Fayetteville, AR 72701
479-444-6955

CALIFORNIA

101 Hydroponics
2550 Vineyard Avenue, #200
Oxnard, CA 93030
805-988-6537

A+ Plant Technologies
1604 Babcock Street,
Costa Mesa, CA 95521
949-642-7776

Advanced Garden Supply
2660 Lake Tahoe Boulevard,
Buiding C Unit 9,
S. Lake Tahoe, CA 96150

Advanced Garden Supply
3113 Alhambra Drive, Unit F,
Cameron Park, CA 95682,
530-676-2100

Advanced Hydroponics
17808 Sierra Highway,
Canyon Country, CA 91351
661-299-1603

Advanced Indoor Agriculture
74991 Joni Drive, Suite 9,
Palm Desert, CA 92260

AG Natural
111 East 12th Street,
Marysville, CA 95901

Alameda County Hydroponics
20910 Redwood Road, Suite C,
Castro Valley, CA 94546

All Seasons Hydroponics
17614 Chatsworth Street,
Granada Hills, CA 91344
818-368-4388

Alternative Hydro
3870 East, Colorado Boulevard,
Pasadena, CA 91107
888-50-HYDRO

Always Sunny Hydroponics
708 W. Swain Road
Stockton, CA 95207
209-473-9827

American Hydroponics
286 South G Street,
Arcata, CA 95521
800-458-6543

Anthony's Garden & Lighting Supply
30 Ridge Road, Suites 8 & 9
Sutter Creek, CA 95685
209-267-5416

Anything Grows
10607 W. River St. Bldg 3 Suite C,
Truckee, CA 96161
530-582-0479

Atwater Hydroponics
3350 Glendale Boulevard,
Los Angeles, CA 90039
323-663-8881

Auburn Organic
4035 Grass Valley Highway,
Auburn, CA 95602
530-823-8900

B & S Gardening Supplies
590 Commerce Court,
Manteca, CA 95336
209-239-8648

Bare Roots Hydroponics
1600 East Cypress, #5
Redding, CA 96002
530-244-2215

Beginning Hydroponics
PO Box 1232,
Corona, CA 92787
951-735-4446

Best Coast Growers
4417 Glacier Avenue Suite C,
San Diego, CA 92120
800-827-1876

Best Yield Garden Supply
3503 Temple Avenue #A,
Pomona, CA 91768
909-839-0505

Berkeley Indoor Garden
844 University Avenue
Berkeley, CA 94710
510-549-2918

Berkeley's Secret Garden
921 University Avenue,
Berkeley, CA 94710
510-486-0117

BetterGrow Hydro
5623 Washington Boulevard,
Los Angeles, CA 90040
877-640-GROW (4769)

Better Grow Hydroponics
1271 E. Colorado Boulevard,
Pasedena, CA 91106
877-640-GROW

California Hydroponics
310 Coral Street, Suite C
Santa Cruz, CA 95060
831-423-4769

Caliponics Inc.
2030 Viborg Road, Unit 110
Solvang, CA 93463
877-PONICS9

Central Coast Hydrogarden
1951 Santa Barbara Street,
San Luis Obispo, CA 93401
805-544-GROW

Citrus Heights Hydrogarden
8043 Greenback Lane
Citrus Heights, CA 95610
916-728-4769

City Farmer's Nursery
4832 Home Avenue,
San Diego, CA 92105
619-284-6358

Clover Hydroponics & Garden Supply
2626 South Main Street,
Lakeport, CA 95453
707-263-4000

CNG Garden Supplies
470 Larch Road Suite 4,
Tracy, CA 95304
209-836-5550

Coca's Central Valley Hydroponics
116 West Orangeburg Avenue,
Modesto, CA 95350
209-567-0590

Concord Indoor Garden
2771 Clayton Road,
Concord, CA 94519
925-671-2520

Conejo Hydroponics
3481 Old Conejo Road #106
Newbury Park, CA 91320
805-480-9596

Conrad Hydroponics Inc.
14915 Unit E, Olympic Drive,
Clearlake, CA 95422
707-994 3264

Constantly Growing
6200 Enterprise Drive, Suite A
Diamond Springs, CA 95619
530-642-9710

Constantly Growing
4343 Hazel Avenue,
Fair Oaks, CA 95628
916-962-0043

Constantly Growing - Davis
123 D Street
Davis, CA 95616
530-756-4774

Corvallis Hydroponics & Organics
5490 SW Philomath Boulevard,
Corvallis, OR 97333
541-738-2820

D&S Garden Supplies
17-130 Doolittle Drive
San Leandro, CA 94577
510-430-8589

Dazey's Supply
3082 Redwood Drive,
Redway, CA 95560
707-923-3002

Dirt Cheap Hydroponics
17975 H Highway. 1,
Fort Bragg, CA 95437
707-964-4211

Discount Hydroponics of Riverside
4745 Hiers Avenue,
Riverside, CA 92505
877-476-9487

Eel River Hydroponics & Soil Supply
164 Dinsmore Drive,
Fortuna, CA 95540
707-726-0395

Elite Horticulture Supply
22330 Sherman Way, C13,
Canoga Park, CA 91303
818-347-5172

Emerald Garden
8249 Archibald Avenue,
Ranch Cucamanga, CA 91730
909-466-3796

Emerald Garden
13325 South Highway 101,
Hopland, CA 95482
707-744-8300

Emerald Garden
307 East Perkins Street,
Ukiah, CA 95482
707-463-2510

Evergreen Hydroponics
923 N. Central Avenue, Suite B,
Upland, CA 91786
909-946-7100

Everything Green Hydroponics
915 Texas Street,
Fairfield, CA 94533
707-432-0774

Everything Green
448 Georgia Street,
Vallejo, CA 94590
707-647-0774

EZ Green Hydroponics
7017 Reseda Boulevard,
Reseda, CA 91335
818-776-9076

Farm Hydroponics, The
1950 Lake Tahoe Boulevard #3,
S. Lake Tahoe, CA 96150
530-541-3276

Foothill Hydroponics
10705 Burbank Boulevard, N
Hollywood, CA 91601
818-760-0688

Four Seasons Garden Center
1737 Broadway,
Oakland, CA 94612
510-832-2545

Full Sun Supply
3535 Industrial Drive, Unit B-3
Santa Rosa, CA 95403
877-FULL-SUN

Funny Farms Hydroponics
963 Transport Way, #12
Petaluma, CA 94954
707-775-3111

G & G Organics and Hydroponics
901 W. Victoria Street Unit D,
Compton, CA 90220
310-632-0122

Garden Connection, The
2145 Park Avenue, Unit 2
Chico, CA 95928
530-342-7762

Garden Depot, The
203 Commerce St., Suite 101
Lodi, CA 95240
209-339-9950

Garden Shed, The
1136 El Camino Real
San Carlos, CA
650-508-8600

Garden Spout, The
44800 Highway 101,
Laytonville, CA 95454
707-984-7260

Garden Highway Garden Supply
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Yuba City, CA 95991
530-755-2877

Garden Spout, The
630 S. Main Street,
Willits, CA 95490
707-456-0196

Garden Warehouse
6355 Scarlet Court, #2,
Dublin, CA 94568
925-556-3319

Go Big Hydroponics
4501 Van Nuys Boulevard,
Sherman Oaks, CA 91403
818-789-3341

Golden Harvest Hydroponics & Garden Supply
8626 Lower Sacramento Road #48,
Stockton, CA 95210
209-951-3550

Gorilla Supply.com
2171 47th Avenue,
San Francisco, CA 94116
415-661-7986

Gottagrow Garden Supply
769 Wilson Street,
Santa Rosa, CA 95404
707-544-7782

Grass Roots Hydroponics
31877 Corydon, Suite 150
Lake Elsinore, CA 92530
951-245-2390

Grass Valley Hydrogardens
12520 Ste. 4, Loma Rica Drive, Grass Valley, CA 93945
530-477-2996

Green Acres Hydroponics
1215 Striker Avenue, Suite 180,
Sacramento, CA 95834
916-419-4394

Green Coast Hydroponics
3560 State Street,
Santa Barbara, CA 93105
805-898-9922

Green Coast Hydroponics
5900 E. Spring Street, Unit 6
Long Beach, CA 90815
562-627-5636

Green Thumb Lighting & Garden
1647 W. Sepulveda Blvd Unit 5,
Torrance, CA 90501
888-326-GROW

Greenfire Sacramento
3230 Auburn Boulevard,
Sacramento, CA 95821
916-485-8023

Greenmile Hydroponics
1035 S. Mt. Vernon Avenue,
Suite G, Colton, CA 92324
909-824-9376

Greentrees Hydroponics Inc.
2581 Pioneer Avenue, Unit D
Vista, CA 92081
760-598-7551

GreenWay Hydroponics
11510 Whittier Boulevard,
Whittier, CA 90601
562-699-4201

Grow A Lot Hydroponics, San Diego
1591 N. Cuyamaca Street,
El Cajon, CA 92020
619-300-2138

Growers Choice Hydroponics
1100 Carver Road,
Modesto, CA 95350
209-522-2727

Growers Choice Hydroponics
16754 East 14th Street,
San Leandro, CA 94578
510-278-6200

Grow It Yourself Gardens
401 Sunset Drive, Suite L,
Antioch, CA 94509
925-755-GROW

Grow King Hydroponics
932 South San Pedro Street,
Los Angeles, CA 90015
213-689-8982

Grow Your Own
3715 Cahuenga Boulevard,
Studio City, CA 91604

Grunder Family Organics & Hydroponics
12321 Magnolia Avenue, Suite C,
Riverside, CA 92503
877-468-7974

H20 Gardening
355 West 7th Street,
San Pedro, CA 90731
310-514-1416

Hahn's Lighting
260 E. VA Suite 1,
San Jose, CA 95112
408-295-1755

Harvest Hydroponics
6650 Merchandise Way Suite B,
Diamond Springs, CA 95619
530-622-5190

High Desert Hydroponics
13631 Pawnee Road, #7
Apple Valley, CA 92308
760-247-2090

Hi-Tech Gardening
5327 Jacuzzi Street, #282,
Richmond, CA 94804
510-524-4710

Hooked Up Hydroponics
339 S. Golden State Boulevard,
Turlock, CA 95380
209-668-1300

House of Hydro
224 Weller Street, #B,
Petaluma, CA 94952
707-762-4769

Humboldt Hydroponics
1302 Union Street,
Eureka, CA 95501
707-443-4304

Hydro Depot
5665 Redwood Drive, #B,
Rohnert Park, CA 94928
707-584-2384

Hydroasis
2643 S. Fairfax Avenue,
Los Angeles, CA 90232
888-355-4769

Hydrogarden Delight
13762 Doolittle Drive,
San Leandro, CA 94577
510-903-1808

Hydrogarden Mendocino County
1240 North Main Street,
Fort Bragg, CA 95437
707-962-9252

HydroPacific - Hydroponics & Garden Supplies
351 C Hastings Avenue,
Ukiah, CA 95482
707-467-0400

Hydroponic Connection, The
316 Fillmore Street,
San Francisco, CA 94117
415-864-9376

Hydroponic Connection Warehouse, The
1995 Evans Avenue,
San Francisco, CA 94124
415-824-9376

Hydroponics 4 Less
41669 Winchester Avenue,
Temecula, CA 92590
800-A1-HYDRO

Hydrostar Hydroponics & Organics
1307 W. Sixth Street, #211,
Corona, CA 92882
951-479-8069

Inland Empire Hydrogarden
1301-C South State Street,
San Jancinto, CA 92853
886-72-HYDRO

Inland Empire Hydrogarden
28822 Old Town Front St. #206
Temecula, CA 92590
886-74-HYDRO

Innovative Growing Solutions (IGS)
7922-B Miramar Road,
San Diego, CA 92126
858-578-IGS7

Lazy Gardeners Hydroponics 'N' More
14626 East Whittier Boulevard,
Whittier, CA 90605
562-945-0909

Let it Grow
1228 2nd Street,
Crescent City, CA 95531
707-464-9086

Let it Grow
160 Westwood Center,
Arcata, CA 95521
707-822-8733

Liquid Gardens
21752 Devonshire Street,
Chatsworth, CA 91311
818-718-7624

Long Beach Hydroponics & Organics
1772 Clark Avenue,
Long Beach, CA 90815
562-498-9525

M&M Garden Supply
2509 West Lane, Suite B
Stockton, CA 95205
209-939-0664

M&M Garden Supply
22540 D Foothill Boulevard, 2509 Westlane Suite B
Stockton, CA 95205

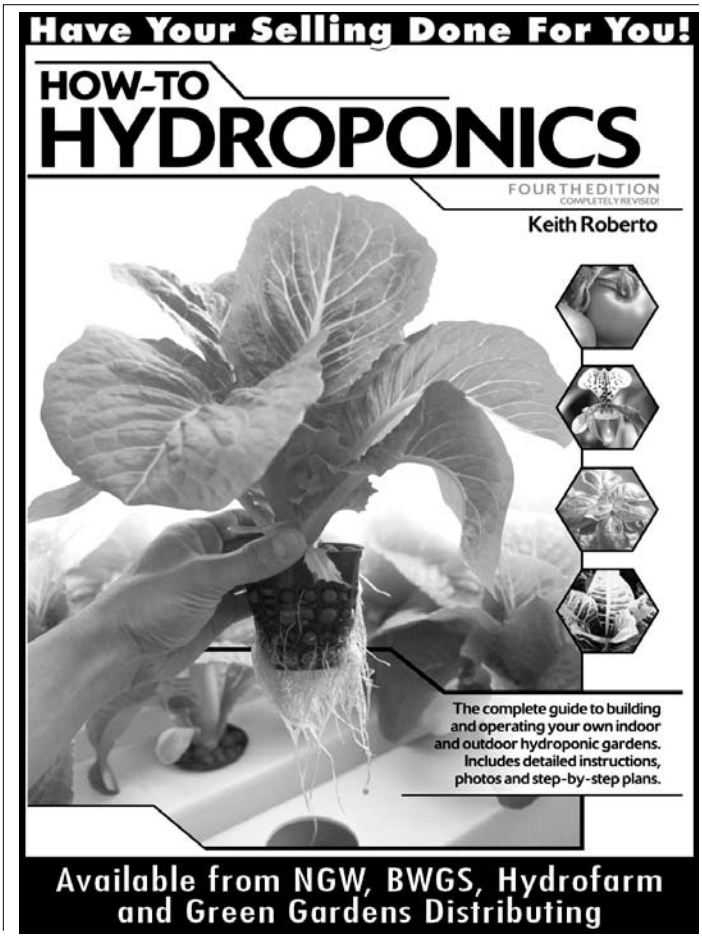
Marin Hydroponics
1219 Grant Avenue,
Novato, CA 94945
415-897-2197

Merced Hydroponics
1635 M Street,
Merced, CA 95340
209-726-4769

Mendocino Garden Shop
PO Box 1301
44720 Maint Street (at Hwy. 1),
Mendocino, CA 95460
707-937-3459

Mendocino Greenhouse & Garden Supply
900 East School Way,
Redwood Valley, CA 95470
707-485-0668

M.G.S.
22540 D Foothill Boulevard,
Hayward, CA 94541
510-582-0900



MAXIMUM YIELD distributors

Monterey Bay Horticulture Supply
224B Reindollar Avenue,
Marina, CA 93933
831-38-HYDRO

Monterey Bay Hydroponics and Organics
81 Hangar Way, #1,
Watsonville, CA 95076
831-761-9999

Myron L Company
2450 Impala Drive,
Carlsband, CA 9210-7226
760-438-2021

Mystic Gardens
8484 Florin Road, #110,
Sacramento, CA 95828
916-381-2464

National Garden Wholesale / Sunlight Supply
1950 C South Grove Avenue,
Ontario, CA 91761
888-888-3319

Nature's Dance Garden Supply
6542 Front Street,
Forestville, CA 95436
707-887-2280

Nature's Secret Garden and Supply
41469 Albrae Street,
Fremont, CA 94577
510-623-8393

Northcoast Horticulture Supply
122 West 4th Street, Suite B
Eureka, CA 95501
707-444-9999

Northcoast Horticulture Supply
1580 Nursery Way, Suite Q
McKinleyville, CA 95519
707-839-9998

Northcoast Hydrogardens
3450 North State Street,
Ukiah, CA 95482
707-462-7214

No Stress Hydroponics
7543 Santa Monica Boulevard,
West Hollywood, CA 90046
323-845-9874

NorCal Creations
PO Box 28,
Cedar Ridge, CA 95924

One Stop Hydroponics
12822 Victory Boulevard
North Hollywood, CA 91606
818-980-5855

Orange County Hydroponics
12687 Beach Boulevard, Unit H,
Stanton, CA 90680
714-893-9493

Pacific Beach Hydroponics
1852 Garnet Avenue,
San Diego, CA 92109
858-274-2559

Pacific Coast Hydroponics
4147 Sepulveda Boulevard,
Culver City, CA 90230
310-313-1354

Pacific Garden Supply
128 H Carlos Drive,
San Rafael, CA 94903

Palmdale Hydroponics
2728 East Palmdale Blvd. Suite 108,
Palmdale, CA 93550
661-266-9908

Palm Springs Hydroponics
4651 Ramon Road,
Palm Springs, CA 92264
760-327-ROOT

Plant It Earth
2279 Market Street,
San Francisco, CA 94114
415-626-5082

Plant Life
32 Race Street,
San Jose, CA 95126
408-283-9191

Precision Hydroponics
132 Kennedy Avenue,
Campbell, CA 95008
408-866-8176

Professional Gardening Systems
765 Petaluma Avenue,
Sebastopol, CA 95472
707-829-7252

Pro Gardening Systems
3715 Santa Rosa Avenue, #A7,
Santa Rosa, CA 95407

Redway Feed & Grain Supply
290 Briceland Road,
Redway, CA 95560
707-923-2765

Sac Hydroponics
9529 Folson Boulevard, Suite C
Sacramento, CA 95827
916-369-7968

San Diego Hydroponics
11649 Riverside Drive, Suite 141,
Lakeside, CA 92040
619-562-FARM

San Diego Hydroponics North
802 N. Twin Oaks Valley Road #108
San Marcos, CA 92069
760-510-1444

San Francisco Hydro
123 Tenth Street,
San Francisco, CA 94103

Santa Cruz Hydroponics & Organics - West
815 Almar Avenue, Suite K,
Santa Cruz, CA 95060
831-466-9000

Santa Cruz Hydroponics & Organics - East
4000 Cordelia Lane #4,
Soquel, CA 95073
831-475-9900

Santa Cruz Hydroponics & Organics - North
6241 Graham Hill Road,
Felton, CA 95018
831-335-9990

Santee Hydroponics
7973A Mission Gorge Road,
Santee, CA 92071
619-270-8649

Seaside Hydrogarden
1070 Highway 101 North,
Crescent City, CA 95531
707-465-3520

Sinoteqs Industries LLC
5755 Oberlin Drive, Suite 100
San Diego, CA 92121
858-558-6006

Skywide Import & Export Ltd.
5900 Lemon Hill Avenue,
Sacramento, CA 95824
916-383-2369

Socal Hydroponics
1727-B Oceanside Boulevard,
Oceanside, CA 92054
760-439-1084

South Bay Hydroponics and Organics
569 East Evelyn Avenue, Mountain View, CA 94041
650-968-4070

South County Hydroponics
22511 Aspan Street, Suite E
Lake Forest, CA 92630
949-837-8252

South Valley Hydroponics
320 Kishimura Drive, #3
Gilroy, CA 95020
1-866-848-GROW

Sparetime Supply
208 E. San Francisco Avenue,
Willits, CA 95490-4006
707-459-6791

Sun-In Hydroponics
1257A Cleveland Avenue,
Santa Rosa, CA 95401
707-578-5747

Sunland Hydroponics
8300 Foothill Boulevard,
Sunland, CA 91040

Supersonic Hydroponic and Organic Garden Supply
850 Shasta Avenue, Suite B
Morro Bay, CA 93442
805-772-5869

Supersonic Hydroponic and Organic Garden Supply
3850 Ramada Drive, Unit D2
Paso Robles, CA 93446
805-434-2333

Sweet Leaf Hydroponics
1611 Sebastobol Road,
Santa Rosa, CA 95407
707-575-GROW (4237)

Sylvandale Gardens
77 Avenue, Of The Giants,
Phillipsville, CA 95559
707-923-3606

Tell 2 Friends Indoor Gardening
62 Sutherland Drive,
Auburn, CA 95603
530-889-8171

Thrive Hydroponics
70 A West North Street,
Healdsburg, CA 95446
707-433-4068

Thunders Hydroponic Center
1729 Yosemite Boulevard,
Medesco, CA 95354

TNC Supply
9490 Main Street, P.O. Box 763
Upper Lake, CA 95485
707-275-9565

Tower Garden Supply
3 E Olive,
Fresno, CA 93728
559-495-1140

Turbo Grow
1889 San Pablo Avenue,
Pinole, CA 94564
510-724-1291

Urban Gardens
22516 Ventura Boulevard,
Woodland Hills, CA 91364
818-876-0222

Urban Gardens Unlimited
704 Filbert Street,
San Francisco, CA 94133
415-421-4769

US Orchid & Hydroponic Supplies
1621 South Rose Avenue,
Oxnard, CA 93033
805-247-0086

Valley Garden Solutions Inc.
15650 Nordhoff Avenue, Suite 104,
North Hills, CA 91345
818-336-0041

Wai Kula Hydrogardens
5297 Linda Vista Road,
San Diego, CA 92110
619-299-7299

Weather Top Nursery
44901 Harmon Drive,
Laytonville, CA 95454
707-984-6385

We Grow Hydroponics
3350 East Los Angeles Avenue,
Simi Valley, CA 93063
805-624-4566

West Coast Growers Hydroponics
13481 Colifax Highway,
Grass Valley, CA 95945
888-924-4769

West Coast Hydroponics, Inc.
27665 Forbes Road, Unit 10
Laguna Niguel, CA 92677
949-348-2424

Western Auto
1156 Main Street,
Fortuna, CA 95540
707-725-1189

COLORADO

Bath Nursery & Garden Center
2000 E. Prospect,
Fort Collins, CO 80525
970-484-5022

Boulder Hydroponics
1630 N. 63rd Street, #5,
Boulder, CO 80301
303-415-0045

Denver Hydroponic & Organic Center
6810 North Broadway, Unit D
Denver, CO 80221
303-650-0091

Greenhouse Tech
917 East Fillmore,
Colorado Springs, CO 80907
719-634-0637

Grow Store, The
737 Garden of the Gods Road,
Colorado Springs, CO 80907
719-278-9777

Grow Store South, The
5050 S. Federal Boulevard, #37,
Englewood, CO 80110
303-738-0202

Grow Store, The
8644 W. Colfax Avenue,
Lakewood, CO 80215
888-510-0350

Head Start Hydroponics & Organic Gardening Emporium
34500 US Highway 6, Unit B-9,
North Edwards, CO 81632
970-569-3139

Indoor Paradise Hydroponics
309 S. Summit View, Unit 17,
Fort Collins, CO 80524-1462
970-221-3751

Rocky Mountain Lighting and Hydroponics
7100 N. Broadway, Suite 3D
Denver, CO 80221
303-428-5020

Way To Grow
3201 E. Mulberry Street,
Fort Collins, CO 80524
970-484-4769

Way To Grow
6395 Gunpark Drive,
Boulder, CO 80301
303-473-4769

CONNECTICUT

Harvest Moon Hydroponics
775 Silver Lane,
East Hartford, CT 06118
860-568-4067

FLORIDA

3D Hydroponics and Organics
7139 US Highway #19,
New Port Richey, FL 34652
727-847-3491

Absolute Growing Solutions Inc.
7307 49th Street,
Pinellas Park, FL 33781
727-541-3333

Advanced Hydro Gardens
4960 NW 165 Street, Suite B-4,
Miami, FL 33014
866-97-HYDRO

American Agriculture Inc.
3857 NW 9th Avenue,
Oakland Park, FL 33309
954-567-1120

Atlantic Hydroponics
430 Count Street,
Melbourne, FL 32901
321-821-1535

Blossoms Experience, The
7207 NW 54th Street,
Miami, FL 33166
866-452-4769

Cultivating Eden
946 18th Avenue SW,
Vero Beach, FL 32962
722-564-8880

East Coast Hydroponics & Organics
461 Forrest Avenue, Suite 105
Cocoa, FL 32922
321-243-6800

Eden Garden Supply
5044 N. Palafox Street,
Pensacola, FL 32505
850-439-1299

Florida Garden Supplies
2692 W 79 Street,
Hialeah, FL 33016
1-800-931-5215

Future Farms Inc., The
14244 SW 8th Street,
Miami, FL 33184
305-207-9859

Gardener's Edge Gainesville
5000 NW 34th Street, Suite 13,
Gainesville, FL 32605
352-375-2769

Gardener's Edge Jacksonville
5325 Fairmont Street,
Jacksonville, FL 32207
904-398-8012

Gardening Indoors of St. Pete
13920 88th Avenue North,
Seminole, FL 33776

Gold Coast Hydroponics
1539 SW 21st Avenue,
Fort Lauderdale, FL 33312
1-800-780-7371

Gold Coast Hydroponics
4241 SW 71st Avenue,
Miami, FL 33155
1-800-780-6805

Grace's Hydro-Organic Garden Center
8877 North 56th Street
Tampa, FL 33617
813-514-9376

Green Thumb Hydroponics Inc.
13482 North Cleveland Avenue,
Fort Meyers, FL 33903
239-997-GROW

GreenTouch Hydroponics Inc.
5011 S State Road 7, Suite 104
Davie, FL 33314
954-316-8815

Growing Experience, The
7029-9 Commonwealth Avenue,
Jacksonville, FL 32220
954-960-0822

Growing Experience, The
1901 NW 18th Street, Building E,
Pompano Beach, FL 33069
954-960-0822

Growing Garden Inc., The
12811 SW 42nd Street,
Miami, FL 33175
305-559-0309

Harvest Time Hydroponics
14414 N. Florida Avenue,
Tampa, FL 33613
813-264-7101

High Tech Garden Supply
2975 West New Haven Avenue,
Melbourne, FL 32901
321-821-0853

Hydro For Less
9545 Southwest 72nd Street,
Miami, FL 33173
305-598-4311

Hydroponics International Inc.
7029-9 Commonwealth Avenue,
Jacksonville, FL 32220
904-693-6554

Hydroponics of Tampa
120 W. Bougain Villea,
Tampa, FL 33612
813-333-6828

Just Ripe Garden Supply
13444 SW 131 Street,
Miami, FL 33186
305-969-2004

Simply Hydroponics & Organics
7949 Ulmerton Road,
Largo, FL 33773
727-531-5355

Simply Hydroponics & Organics (North)
3642 South Suncoast Boulevard,
Homosassa, FL 34448
352-628-2655

Sunshine Hydroponics Garden Center
1420 East Altomonte Drive,
Altamonte Spring, FL 32701
407-830-GROW

Sunshine Hydroponics Garden Center
5561 S. Orange Blossom Trail,
Orlando, FL 32809
407-859-7728

Sunshine Hydroponics Garden Center
6100 Hanging Moss Road, Suite 500,
Orlando, FL 32807
888-833-GROW

Superior Hydroponics Supply, Inc.
968 N. Congress Avenue,
West Palm Beach, FL 33409
561-471-3475

Worm's Way Florida
4402 North 56th Street,
Tampa, FL 33610
800-283-9676

GEORGIA

Atlantis Hydroponics
1422 Woodmont Lane, #3,
Atlanta, GA 30318
404-367-0052

Atlantis Hydroponics
2561 West Point Avenue,
College Park, GA 33037
678-510-0032

Atlantis Hydroponics
1035 Baxter Street,
Athens, GA 30606
706-543-9980

HAWAII

Aqua Plant Hawaii / Kahala Hydroponics
4224 Wailae, Suite 1A,
Honolulu, HI 96816
808-735-8665

Ohana Greenhouse & Garden Supply
300 Hukilike Street, #2M,
Kahalui, HI 96732
808-871-6393

Pahoa Feed & Fertilizer
15-2754 Old Government Road,
Pahoa, HI 96778
808-965-9955

IDAHO

Boise Hydroponics
614 North Orchard Street,
Boise, ID 83706
208-344-3053

Greenthumb Greenhouses
5895 Ensign Avenue,
Boise, ID 83714

ILLINOIS

Aerostar Global
824 South Kay Avenue,
Addison, IL 60101

Alternative Garden Supply
A-615 Industrial Drive,
Gary, IL 60013
800-444-2837

Brew and Grow
1824 North Besly Court,
Chicago, IL 60622
773-395-1500

Brew and Grow
3224 South Alpine Road,
Rockford, IL 61109
815-874-5700

Brew and Grow
2379 Bode Road,
Schaumburg, IL 60194
847-885-8282

COW Hydroponics
Suite B1-4415 Harrison Avenue,
Rockford, IL 61109
800-71-HYDRO

Fertile Ground
463 West MacArthur Drive,
Cottage Hills, IL 62018
618-259-5500

Green Fields
8137 N. Milwaukee,
Niles, IL 60714
847-965-5056

Grow Big Hydroponics
7817 B North 2nd Street,
Manchesney Park, IL 61115
815-637-4769

Gro Shop
5421 North 2nd Street,
Loves Park, IL 61111
888-4GROSHOP

Hydrocork
20647 Renwick Road,
Crest Hill, IL 60435
815-838-0100

MAXIMUM YIELD distributors

Kreation's Indoor Gardening Center
3427 Old Chatman Road,
Springfield, IL 62704
217-341-0821

Let it Grow
10273 Samuel Road,
Crainville, IL 62918
573-450-5075

INDIANA

Five Point Gardens
56555 Oak Road,
South Bend, IN 46619
574-287-9232

Frogs Lilly Pad, The
706 Citation Road,
Carmel, IN 46032
317-846-4610

Harvest Moon Hydroponics
4200 S. East Street,
Indianapolis, IN 46227
317-780-8070

Magic Bulb Garden Center
6229 Allisonville Road,
Indianapolis, IN 46220
317-202-2852

Sunleaves Garden Products
7854 North State Road 37,
Bloomington, IN 47404
888-464-9676

Worm's Way Indiana
7850 North State Road 37,
Bloomington, IN 47404
800-598-8158

KANSAS

Green Circle Hydroponics
6890 W. 105th Street,
Overland Park, KS 66212
913-642-3888

KENTUCKY

Garden Grove Organics
29 East 7th Street, Covington,
(Cincinnati Metro), KY 41011
859-360-1843

Grow Shop, The of Lexington
2320 Palumbo Drive, Suite 130,
Lexington, KY 40509
859-268-0779

Louisville Hydroponics
3471 Taylor Boulevard,
Louisville, KY 40215
502-366-4000

New Earth Garden Center
9810 Taylorsville Road,
Louisville, KY 40299
800-462-5953

Worm's Way Kentucky
1360 Donaldson Highway Suite A,
Erlanger, KY 41018
800-669-2088

LOUISIANA

Laughing Buddha Nursery
4516 Clearview Parkway,
Metairie, LA 70006
504-887-4336

Urban Organics
2805 St. Claude Avenue,
New Orleans, LA 70117
504-945-8845

MAINE

Green Thumb Indoor Gardening
19 Stage Road,
St. Albans, ME 04971
207-938-5909

Urban Gardenstore, The
235 Lewiston Road,
Topshan, ME 04086
207-373-0990

MARYLAND

East Coast Organics
2800 Sisson Street,
Baltimore, MD 21211

Maryland Hydroponics & Garden Supply
10-10051 North 2nd Street,
Laurel, MD 20723
866-MD-HYDRO

Meadowview Feed & Garden Center
1202 Meadowview Road,
Pasadena, MD 21122
443-817-0018

Purple Mountain Organics
100-7010 Westmoreland Avenue,
Takoma Park, MD 20912
877-538-9901

MASSACHUSETTS

Worm's Way Massachusetts
121 Worc-Providence Turnpike,
Sutton, MA 01590
800-284-9676

MICHIGAN

Blg Creek Hydroponics
555 Old Little Lake Road,
Marquette, MI 49855
906-249-5297

Brew and Grow of Michigan
32610 7 Mile Road,
Livonia, MI 48152
248-442-7939

Cultivation Station of Michigan Inc., The
23529 Little Mack Avenue,
St Claire's Shores, MI 48080
586-775-9485

Growco Garden Supply
1042 Michigan Street, NE,
Grand Rapids, MI 49503
877-939-6900

Homelight Gardens
3471 S. Huron Road,
Bay City MI 48706
989-922-0088

Horizen Hydroponics
1622 Leonard Street, NW,
Grand Rapids, MI 49504
866-791-1664

Hydroharrys.com
24500 Dequindre,
Warren, MI 48091
800-461-8819

J&L Growco
206 S. Michigan Avenue,
Big Rapids, MI 49307
231-796-1528

Kalamazoo Indoor Garden
450 W. Maple,
Kalamazoo, MI 49001
269-344-2550

Organic Plant-It
7740M 72 East,
Traverse City, MI 49684
231-267-5208

Sunshine Supply Co.
1807 South Mission,
Mt. Pleasant, MI 48858
989-775-3700

Superior Growers Supply
19582 Middlebelt Road,
Livonia, MI 48152
248-473-0450

Superior Growers Supply
4870 Dawn Avenue,
East Lansing, MI 48823
517-332-2663

MINNESOTA

American Garden Supply
601-6th Avenue, North,
Princeton, MN 55371
763-631-0543

Brew and Grow
8179 University Avenue,
Fridley, MN 55432
612-780-8191

EcoGarden Supply
1553 Como Avenue, Suite B
St. Paul, MN 55108

Eden Indoor Organic Gardens
831 Highway 75 North
Moorhead, MN 56560
218-477-EDEN (3336)

Indoor Gardening
10 NE 3rd Street,
Faribault, MN 55021
507-209-1546

Interior Gardens
115 -1620 Central Avenue NE,
Minneapolis, MN 55413
800-498-4178
612-870-9077

Midwest Hydroponics
3440 Belt Line Boulevard, Suite A,
Minneapolis, MN 55416
888-449-2739

Still-H2O Inc.
14375 North 60th Street,
Stillwater, MN 55082
651-351-2822

MISSOURI

Grow Your Own Hydroponics
3617 Saint John Avenue,
Kansas City, MO 64123
816-241-2122

Heartland Hydroponics
5695 E. Clark Lane, Suite L,
Columbia, MO 65202
573-474-GROW (4769)

Let It Grow
725 Broadway,
Cape Girardeau, MO 63701
573-450-5075

U-Grow
3320 N. Lindbergh Boulevard,
St. Louis, MO 63074
314-209-1519

Worm's Way Missouri
1225 North Warson Road,
St. Louis, MO 63132
800-285-9676

NEBRASKA

Paradigm Gardens
8949 J Street, Suite 5,
Omaha, NE 68127
402-339-4949

Patio-Ponics
3255 Cornhusker Highway, Suite 4
Lincoln, NE 68504
402-466-9218

NEVADA

AAA Indoor Organic Garden SuperCenter
2101 S. Decatur Boulevard, #21,
Las Vegas, NV 89102
702-450-4769

Advanced Gardens Hydroponics
3111 South Valley View, Suite V103
Las Vegas, NV 89102
702-257-4769

All American Hydroponics
4161 South Eastern, Suite E-3,
Las Vegas, NV 89119
702-894-9888

Anything Grows
190 West Moana Lane,
Reno, NV 89509
775-828-1460

Carson Valley Hydroponics
2520 Empire Ranch Road,
Carson City, NV 89701
775-884-4769

Lorraine Ink
290 Spear Court,
Fernley, NV 89408
775-575-7757

Nevada Hydroponics
4700 B Maryland, Suite 1,
Las Vegas, NV 89119
702-798-2852

NEW HAMPSHIRE

Hydro World
17 White Birch Lane,
Lincoln, NH 03251
603-745-3030

NEW JERSEY

77HYDRO
37 Fairfield Place,
West Caldwell, NJ 07006
877-774-9376

Claraqua
4 Redwood Court,
West Windsor, NJ 08550

Tasty Harvest Hydroponics
Route 41 and County House Road,
Deptford, NJ 08096
856-227-6300

NEW MEXICO

AHL Garden Supply
1051 San Mateo Boulevard SE,
Albuquerque, NM 87108
505-255-3677

Common Shaman
1319 San Mateo N.E.,
Albuquerque, NM 87110
505-255-6463

NEW YORK

California Hydroponics
27 Corporate Circle,
East Syracuse, NY 13057
315-432-9387

East Coast Hydroponics
14649 Horace Harding Exp,
Flushing, NY 11367
718-762-8880

Environmental Gardens
8 John Walsh Blvd., Suite 310
Peekskills, NY 10566
800-254-0507; 914-736-6676

FutureGarden Inc.
59 Central Avenue,
Farmingdale, NY 11735
516-420-0884

Greentree Nursery
308 Elmira Road,
Ithaca, NY 14850
607-272-3666

Grow Room, The
8 Bridge Street,
Nyack, NY 10960
800-449-9630

Harvest Moon Hydroponics
Henrietta Townline Plaza,
3047 West Henrietta Road,
Rochester, NY 14623
716-865-7353

Harvest Moon Hydroponics
340 West at 59,
Central Nyack, NY 10960

Harvest Moon Hydroponics
147 Fourth Street,
Troy, NY 10960

Hudson Valley Hydroponics
217 Route 32 North,
New Paltz, NY 12561
845-255-3633

Hydroponics of Buffalo
1497 Hertel Avenue,
Buffalo, NY 14216
716-838-3545

Hydroponics Shops of America
2606 Erie Boulevard,
Syracuse, NY 13224
315-251-2516

Indoor Outdoor Gardener
8223 5th Avenue,
Brooklyn, NY 11209
718-836-2402

KG Garden Supply
1327 Floyd Avenue,
Rome, NY 13440
1-877-KG-HYDRO

Saratoga Organics & Hydroponic Supply
38 Front Street,
Ballston Spa, NY 12020
800-850-GROW

Sunlight Solutions Hydroponics
2045 Niagara Falls Blvd., Suite 13,
Niagara Falls, NY 14304
888-GROWBOX

NORTH CAROLINA

Asheville Agricultural Systems
45 Banks Avenue,
Asheville, NC 28801
828-253-4112

Be Well Hydroponics & Urban Gardening
4732 Monroe Road,
Charlotte, NC 28205
704-344-8010

Carolina Hydrogardens
4823 Meadow Drive,
Durham, NC 27713
919-544-4300

Fifth Season Gardening Company
1616 D-3 Battleground Avenue,
Greensboro, NC 27408
336-271-3373

Flow & Grow Hydroponic Garden Center
404 Hope Mills Road,
Fayetteville, NC 28304
910-423-FLOW (3569)

Garden Works, The
5619-A Hillsborough Street,
Raleigh, NC 27606
919-852-4747

New Age Garden Center
2236A US Highway 70,
Swannanoa, NC 28778
828-299-9989

Progressive Gardens
5732 Oleander Drive,
Wilmington, NC 28403
910-395-1156

Urban Organics and Hydroponics
4604 W. Market St., Suite 106,
Greensboro, NC 27407
336-316-0604

Water's Edge Hydro-Gardens & Organics
107 South White Street,
Wake Forest, NC 27587
919-562-5343

OHIO

Advanced Hydrorganics Ltd.
2725 Hudson Drive,
Cuyahoga Falls, OH 44221
330-922-0330

Akron Garden Center
1749 South Main Street,
Akron, OH 44319
330-724-2700

Blooming Gardens
1805 Elm Road,
Warren, OH 44483
330-372-1039

Carefree Garden Center
5050 Greenwich Road,
Seville, OH 44273
330-769-2002

Cleveland Garden Center Inc.
727 East 185th Street,
Cleveland, OH 44119
216-481-7868

Dayton Hydroponics
3856 Miamisburg-Centerville Road,
West Carrolton, OH 45449
937-859-3999

Garden Indoors of Ohio
4720 Indianola Avenue,
Columbus, OH 43214
800-833-6868

Harvest Moon
9215 Market Street,
Youngstown (North Lima), OH 44452
800-776-8399

Garden Grove Organics
29 East 7th Street, Covington,
(Cincinnati Metro), KY 41011
859-360-1843

Grow Wizard, The
5700 Denison Avenue,
Cleveland, OH 44102
216-961-2500

Herb-N-Garden Center
14901 Puritas Avenue,
Cleveland, OH 44119
216-252-2001

Indoor Garden Worx
906 Blue Avenue,
Zanesville, OH 43701
866-900-9679

Indoor Gardens
1222 Hill Road, North,
Pickerington, OH 43147
614-866-6065

Kissed by the Sun Hydroponic
10740 Reading Road,
Cincinnati, OH 45241
513-769-0159

Magic Home Gardens
209 Cemetery Road,
Canal Winchester, OH 43110
614-837-2440

Magic Home Garden
4538 Indianola Avenue,
Columbus, OH 43214
614-263-2440

Summit Hydroponics
1030 Kenmore Boulevard
Akron, OH 44314-2114
330-753-5222

Sweet Greens
5540 Brecksville Road
Independence, OH 44131
800-421-7084

Super Harvest
5956 A Colerain Avenue,
Cincinnati, OH 45239
513-385-5999

Toledo Hydroponics Ltd.
855 S. Holland-Sylvania Road, Suite 2
Toledo, OH 43615
1-877-893-0716

Worm's Way - Greater Cincinatti / N. Kentucky
1360 Donaldson Road (Route 236),
Suite A, Erlanger, KY 41018
800-669-2088

OKLAHOMA

AAAAHA! Hydroponics Unlimited
P.O. Box 74,
Oakhurst, OK 74050

Tulsa County Hydro-Organics
1928 W. Albany,
Broken Arrow, OK 74012
918-259-HYDRO

OREGON

American Agriculture
9220 Southeast Stark Street,
Portland, OR 97216
800-433-6805

Anthony's Garden & Light Supply
93779 B Troy Lane,
Coos Bay, OR 97420
541-266-8822

Aqua Serene
2836 W. 11,
Eugene, OR 97402
541-485-2171

Aqua Serene Hydro Gardens
1090 Benson Way,
Ashland, OR 97520
541-482-7600

B.I.G.S.
155 SW Century Drive, Suite 401,
Bend, OR 97702
541-385-5222

BIGS Warehouse
2606 SW 4th Street, Unit B
Redmond, OR 97756
541-504-8886

Corvallis Hydroponics & Organics
5490 Philomath Road,
Corvallis, OR 97333
541-738-2820

Everybody's Garden Center
2701 SE 14th Avenue,
Portland, OR 97202
503-231-1582

Garden Spout, The
4532 South East 63rd Avenue,
Portland, OR 97206
503-788-4769

Gorge Garden Center
1203 12th Street Suite H,
Hood River, OR 97031
541-386-GROW

Green Thumb Hydrogarden and Organic Supply
2021 West Main Street,
Medford, OR 97501
541-779-8600

Grow America Garden Supply LLC
11511 SW Pacific Highway,
Tigard, OR 97223
503-841-6868

Growing Crazy (Hooked On Hydroponics)
817 W. 2nd Street,
Medford, OR 97501

Herb N' Jungle Hydroponics
930 SE Textron Drive,
Bend, OR 97702
541-382-4010

Homegrown Garden Supply
7112 NE Glisan Street,
Portland, OR 97213
503-954-1614

Indoor Garden Center
1697 SE 25th Street,
Salem, OR 97302
503-566-7888

Indoor Garden Depot
15828 SE McLoughlin Boulevard,
Milwaukie, OR 97267
503-786-2445

Island Flowers & Indoor Garden Center
909 N. Tomahawk Island Drive,
Suite 103, Portland, OR 97217
503-546-3185

J-N-B Hydro 2 Go
155 West Central Avenue,
Sutherlin, OR 97479
541-459-9211

Ladybug Indoor Gardens
3960 W. Main Street,
Medford, OR 97501
541-618-4459

Lights Distributing
9843 SW 55th Avenue,
Portland, OR 97219

Liquid Sun
4235 SW Highway 101,
Lincoln City, OR 97367
541-994-7070

Northern Light and Garden Beaverton
9290 SW Beaverton-Hillsdale
Highway, Beaverton, OR 97005
503-297-7331

Northern Light and Garden Grants Pass
1203 Rogue River Highway,
Grants Pass, OR 97527
541-474-1700

Northern Light and Garden Salem
1915 Lancester Drive,
Salem, OR 97305
503-364-4769

Oregon Rainforest Co.
19949 E. Burnside Street,
Gresham, OR 97233
503-465-9909

Paradise Supply Inc.
1409 N. Highway 99,
Ashland, OR 97520
541-552-1037

Rain or Shine
13126 NE Airport Way,
Portland, OR 97230
503-255-1981

Roseburg Hydroponics
853 SE Stephens Street,
Roseburg, OR 97470
541-229-1420

SunInside Gardening Co.
665 Conger, Unit F,
Eugene, OR 97402
541-686-9966

Urban Flora
3029 Division Street,
Portland, OR 97214
503-236-3344

PENNSYLVANIA

Full Bloom Hydroponics
84 South 24th Street,
Pittsburgh, PA 15203
888-872-3602

Garden Indoors of Pennsylvania
208 Route 13,
Bristol, PA 19007
800-227-4567

Harvest Moon Hydroponics
1239 S. Airport Road,
Allentown, PA 18103
800-550-3491

MAXIMUM YIELD distributors

High Tech Garden Supply
20232 Route 19, Unit 6,
Cranberry Twp., PA 16066
724-473-1113

SOUTH CAROLINA

247 Garden Supply
535 D Clemson Road,
Columbia, SC 29229
803-788-4445

All Good Hydroponics & Gardening
6729 Two Notch Road,
Columbia, SC 29223
803-708-4819

GreenSpirit Hydrogarden
1305 Ashley River Road,
Charleston, SC 29407
843-225-1GRO

Green Thumb Unique Gardening & More
1230 Rutherford Road,
Greenville, SC 29609
864-271-8830

TENNESSEE

Advanced Hydroponic Garden
783 French Mill Road,
Dandridge, TN 37725
800-521-1643

Advanced Hydroponic Garden
6912 Clinton Highway,
Knoxville, TN 37921
866-938-3318

All Seasons Gardening and Brewing Supply Co.
924 8th Avenue, South,
Nashville, TN 37203
800-790-2188

National Garden Wholesale / Sunlight Supply
126 Belinda Parkway,
Mt. Juliet, TN 37122
888-265-9005

Perpetual Harvest
75 Riverport Drive,
Jackson, TN 38301
877-422-3391

Sun City Hydroponics
2235 Whitten Road, Suite 104,
Memphis, TN 38133
901-372-8100

Worm's Way Tennessee
707 Rivergate Parkway, Suite E
Goodlettsville, TN 37072
800-397-4153

TEXAS

Airline Hydroponics
P.O. Box 980904,
Trader's Village #363,
Houston, TX 77098
713-942-0484

Brite Ideas Hydroponics & Organics
4201 S.Congress Avenue, #317,
Austin, TX 78745
512-444-2100

Casa Verde
726 Fredericksburg Road,
San Antonio, TX 78201
877-866-9669

Field of Dreams Indoor Growing Supplies
5302 Slide Road Unit B,
Lubbock, TX 79414
806-793-2901

Galaxy Hydroponics
380 CR 352,
Gause, TX 77857
979-279-2454

Houston Discount Hydroponics
9384 Richmond Avenue,
Houston, TX 77063
713-464-9406

Hydro Mart
3841 Main Street,
Rowlett, TX 75088
972-475-6114

Innergrow Hydroponics
24451 Interstate Highway 20,
Wills Point, TX 75169
866-475-4769

Jolly Green Hydroponics (Greenhouse Horticultural Supplies)
13628 Neutron Road,
Dallas, TX 75244
(866) WE-JOLLY: 469-341-5555

Lone Star Hydroponics and Organics
1302 Motor Circle,
Dallas, TX 75207
214-634-9376

Sol Organics & Hydroponics
1634 Babcock Road,
San Antonio, TX 78229
210-366-9082

Space City Hydroponics Organics
100 East Nasa Road 1, Suite 40
Webster, (S.Houston), TX 77598
832-971-8468

Texas Growers Supply
5990 N. Sam Houston Pkwy. E. #602,
Humble, TX 77396
281-441-3739

Texas Hydroponics & Organics (Central Austin)
5126 Burnet Road,
Austin, TX 78756
512-459-4769

Texas Hydroponics & Organics (South Austin)
2125-A Goodrich Avenue,
Austin, TX 78704
512-440-4769

Texas Hydroponics & Organics (Dallas)
3400 Elm Street,
Dallas, TX 75226
214-744-4769

Texas Hydroponics & Organics (Houston)
7730 A Park Place Boulevard,
Houston, TX 77087
713-641-4769

UTAH

Salt Lake Plant & Hydro
60 West 3300 S. #6,
South Salt Lake, UT 84115
801-488-3200

VIRGINIA

Blue Ridge Hydroponics & Home Brewing Co.
5524 Williamson Road, Suite 11
Roanoke VA 24012
540-265-2483

Clean & Green Technologies
196 Corning Drive,
Christiansburg, VA 24073
866-694-1628

Hydroponics & Growlights
13400 Occoquan Road,
Woodbridge, VA 22191
703-490-0700

I Love Hydroponics
612 N. Sheppard Street,
Richmond, VA 23221
804-377-3020

I Love Hydroponics
368 Newtown Road, #105,
Virginia Beach, VA 23462
757-490-5425

Inside-Out Alternative Garden Supply
6517 Backlick Road,
Springfiled, VA 22150
703-451-3259

VERMONT

Green Thumb Gardening
P.O. Box 235, Route 15,
Underhill, VT 5489
800-564-9376

Greenthumb - Vermont
394 Route 15,
Jericho, VT 05465
802-899-4323

WASHINGTON

Aqua Serene
3839 Stone Way North,
Seattle, WA 98103
206-547-GROW

Brewer's Healthcrafts
2747 Pacific Avenue, SE,
Olympia, WA 98501
360-705-0965

Eco Enterprises
1240 NE 175th Street, #B
Shoreline, WA 98155
800-426-6937

Garden Smart
500 Bond Drive,
Castlerock, WA 98611
360-274-7960

Green Gardens Distributing
12738 Bel-Red Road,
Bellevue, WA 98005
425-454-5731

Hydro-Tech
2121 Aurora Avenue, North,
Seattle, WA 98103
206-547-2202

Indoor Garden Depot
6305 NE Highway 99,
Vancouver, WA 98665
360-993-7779

Indoor Garden & Lighting
3839 6th Avenue,
Tacoma, WA 98406
253-761-7478

Indoor Garden & Lighting
23303 Highway 99, Suite A,
Edmonds, WA 98026
425-673-2755

Indoor Garden & Lighting Specialties
710 South Central Avenue,
Kent, WA 98032
253-373-9060

Kent Garden Supplies Ltd.
18817 East Valley Highway,
Kent, WA 98032
425-251-9299

Linda's Gardening & Hydroponics
11522 Canyon Road East,
Puyallup, WA 98373
253-531-9641

Liquid Sunshine Hydroponics
5087 Lincoln Road,
Blaine, WA 98230

M & R Lighting
17238 Memorial Drive,
Mt. Vernon, WA 98273
360-848-1080

M & R Lighting
Unit C 22914 Highway 410,
Buckley, WA 98390
253-891-4190

National Garden Wholesale / Sunlight Supply
5408 NE 88th Street, Building A,
Vancouver, WA 98665
888-478-6544

Northern Light and Garden Vancouver
6305 NE Highway 99,
Vancouver, WA 98665
360-993-7779

Northern Lights Gardening
2869 W Maplewood Avenue,
Bellingham, WA 98225
360-715-8585

Northwest Horticulture Supply
161 Hooker Road, #1,
Sequim, WA 98382
360-582-0702

Renton Indoor Garden Center
207 Sunset Blvd. N, Building A,
Renton, WA 98055
425-917-9000

River City Hydroponics
1514 East Francis Avenue,
Spokane, WA 99208
509-464-0246

SOL Lighting Inc.
222 South McKinnon,
Spokane, WA 99212
800-689-2007

Solar Shop
306 West 4th Street,
Tonasket, WA 98855
509-486-4508

Spokane Organic and Hydroponic Supply
4823 East Sprague Avenue E.,
Spokane Valley, WA 99212
509-534-4055

WISCONSIN

Brew and Grow
285 N. Janacek Road,
Brookfield, WI 53045
262-789-0555

Brew and Grow
3317 Agriculture Drive,
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FEATURES

Homeostasis in the Garden
Lee McCall helps your indoor garden flourish with tips on stability and control in the garden.

Winter Greens on a Greenhouse Energy Budget

James Browne educates on ways to conserve energy in your greenhouse this winter.

PART 4 Backwoods Gardening Part Four
Erik Biksa completes his backwoods garden in this article on reaping what you sow.

Grow Your Own: Dutch Perspective Part Three
Hans Kersbergen explains the importance of temperature, oxygen and light.

Fruiting and Flowering Indoors Organically
Matt LeBannister elucidates how to take over where Mother Nature left off.

Learn Something New

The November issue will be packed with one page reads that serve to inspire and educate. Learn how to grow a beautiful bouquet from seeds, read up on coco coir – the natural media alternative and discover over 100 varieties of incredible edible flowers.

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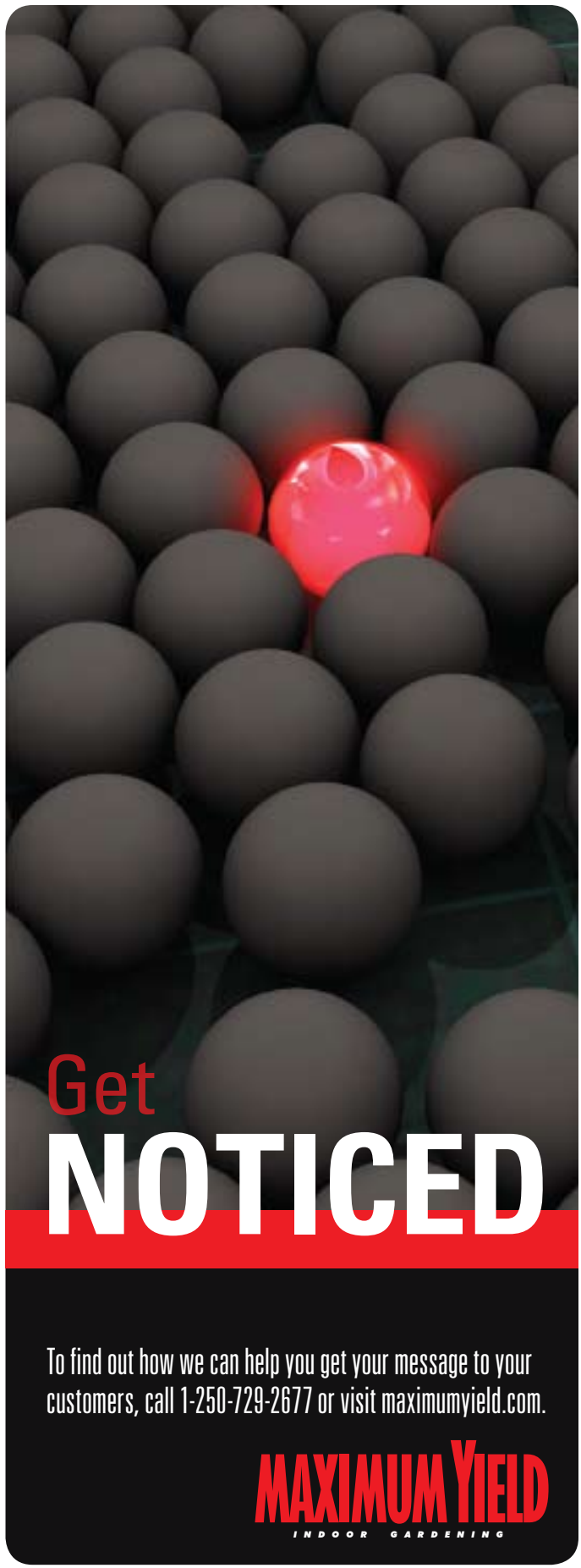

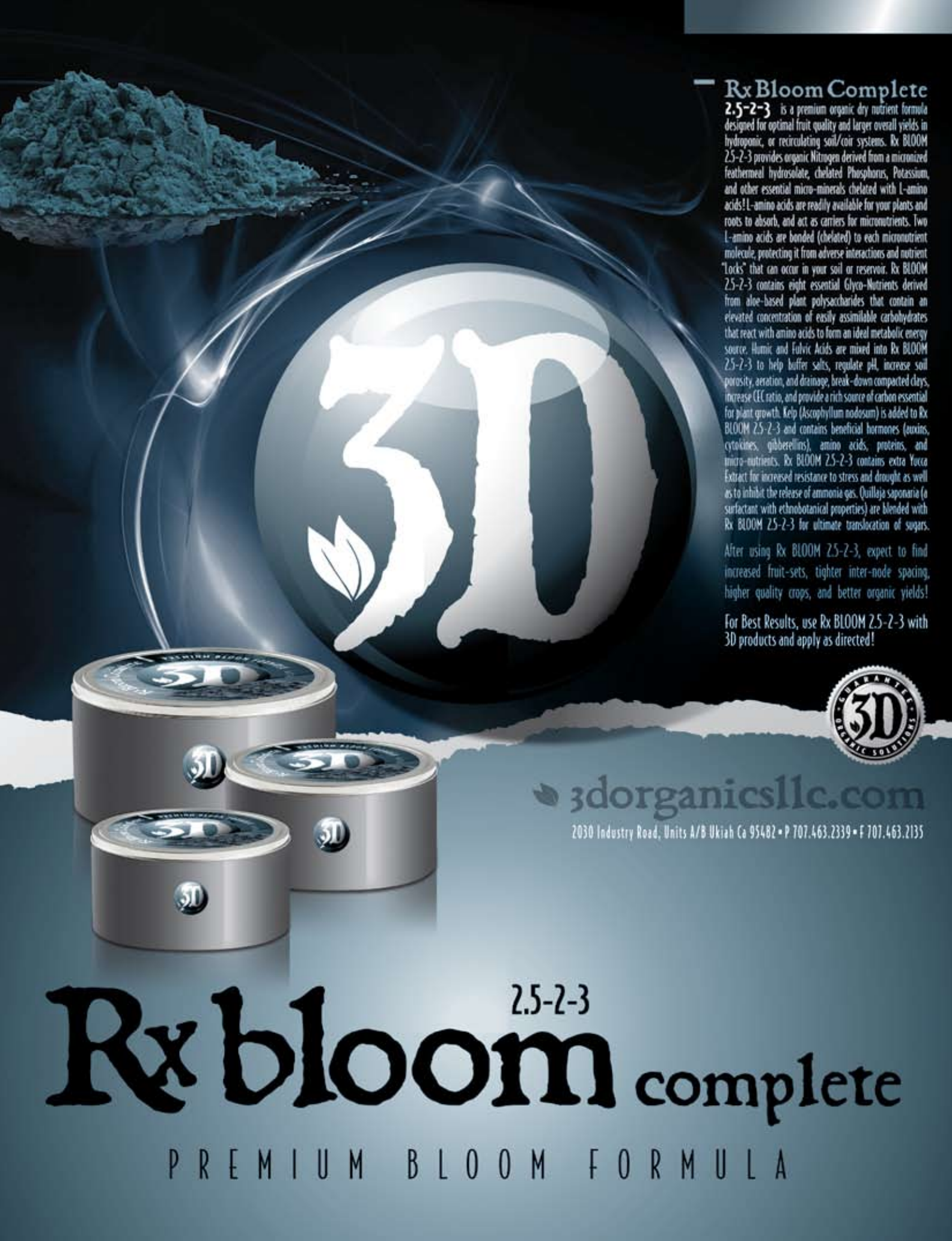
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