Understanding Hydroponics

by **dutchypoodle** on September 5, 2008

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Intro: Understanding Hydroponics

This instructable will explain household hydroponics, with the intention of growing edible flora.
In layman's terms, hydroponics is the science of growing plants without soil-- although the plants may or may not be suspended in a solid medium such as gravel, or expanded clay balls.
Soil retains minerals and nutrients, which "feed" flora, as we all know. Plant roots can't absorb dirt, however; when water passes through soil, it dissolves and collects some of the nutrient particles embedded. This "food" solution is absorbable as a liquid. As you can see, the soil itself is not an integral part of a plant's feeding cycle-- it is simply a stabilizer for the roots, and a convenient filter.

Why eliminate the soil?
Plants breathe air, just like humans. School children are taught a simple lesson: plants take in carbon dioxide, and release oxygen. The entire plant-- not just leafy material-- contributes to this process.
If not properly maintained, soil can retain too much moisture, effectively suffocating ("drowning") a plant's root system. Alternatively, if the soil doesn't contain enough moisture, the plant will be unable to absorb the nutrients it needs to survive.
The roots of a hydroponic plant have constant access to both air and water, and it can be much easier to maintain that balance since the roots are typically visible.
The average plant needs at least five things to survive. Air, water, nutrients, minerals, and light. So long as you can provide these things in plenty, your plants should stay healthy.

Growing your own food can be a rewarding experience. It's a good way to save money on pesticide-free produce, and you'll know it wasn't shipped from a third-world serf farm supporting bad business. If your hydroponic system is indoors, you can grow food during the off-season in winter, too.

That being said, there may be more efficient systems out there for the home grower. I created this instructable to inform, more than anything.
After all, if anything's worth doing, it's worth doing right. Gotta do your research, kids.

step 1: Substrate 101

Although not necessary for the survival of a plant, substrate can help to support a plant physically and hold it upright, either by securing the root system, or by outweighing the plant itself. There are many kinds of substrates commercially available. Check your local greenhouse or hardware store. Alternatively, there are plenty to be found outdoors, especially near bodies of water.
Even simple rock can alter the PH of your system. When checking your PH balance, be sure to check it after it has circulated through your substrate.

In the moisture-rich conditions hydroponics typically provide, substrate can be generally classified into the following categories: sandy, granular, and pebbled.

Sandy environments consist of particles between .06 (fine) and 2mm (coarse) in diameter. Even coarse sand retains a considerable amount of water (except in comparison to soil), and is not generally considered appropriate for use in a hydroponic system. If you use a pump, for example, the small particle size may lead to clogging. However, it is cheap and readily available, and, when wet, is heavy enough to provide a reasonable anchor for plant roots.
There is some absorbable nutrient in sand. Typically speaking, the nutrients latent in sand culture vary widely on the substrate's color and origin. Most sand contains a large quantity of shell fragments, and thus has a high calcium content.
Black sand usually has a high magnetite content originating from volcanic rock, known for its fertility. Orange or yellow sand might be an indicator of a high iron content.
White sand tends to be very high in silica, which helps build healthy cell walls in plantlife. Diahydro, for example, is made from diatoms, a type of algae.
Sand is semi-reusable. Sterilizing it between uses can be messy. (Sand can be sterilized by boiling it in water for extended periods of time.)

Granular particles range between 2 and 4mm. This may consist of gravel, or plant mulch.
Stone gravel makes a heavy, non-biodegradable anchor for plant roots, and is highly recommended for use in hydroponic systems. Stone gravel contains very little latent plant nutrition, just like sand. There are several grades of gravel readily available to choose from.
Creek rock and Pea Gravel consist of round, shiny stones. The smooth shape of these stones allows for great aeration and root growth, although the drainage may be excessive.
Crushed rock is typically made by crushing large chunks of limestone or dolomite into smaller pieces. Crushed rock has sharper edges than creek rock, and tends to interlock better. This tighter knit makes for higher water retention, although limestone tends to weigh less. Limestone is a strong alkali. Check your PH, and balance accordingly.
Stone-based substrate is highly re-useable. It is considerably less messy than sand to boil for sterilization.
If weight is not a concern (ie: the plants you grow are not expected to reach considerable heights) you might consider using a plant mulch, such as peat mulch, cedar shavings, or coir (coconut peat). Mulches retain a high quantity of water, but also breathe very well. Mind you, they are also highly degradable, which can lead to clogged pumps, and wood shavings often contain aromatic oils which can inhibit plant growth. Mould and algae growth poses a higher risk when mulches are involved, but pose one considerable advantage over rocky substrate: they can be composted and replaced with fresh material. It does not need to be stored. I would n't suggest re-using 'em, anyway. This is especially convenient if you use hydroponic systems exclusively to start seeds, or grow during the off-season.

Pebbled substrate measures between 4 and 64mm.
Stone pebbles have the basic characteristics of creek rock. They are typically smooth, often shiny, and the gaps between the stones make for low water retention and high aeration. The shinier the stone, the worse the water retention will be. A matte or pockmarked surface indicates a porous stone, which will stay damper, longer, whilst still providing excellent aeration. Pebbles-- especially the porous variety-- can explode when heated for sterilization.

A common alternative to these substrates is mineral (rock) wool. You've probably seen it used as insulation in housing. Rock wool contains fiberglass, and it can be absorbed into the body by inhalation-- irritating eyes, skin, and lungs. It needs to be treated before it is a tolerable substrate for plant growth. Altogether, I don't recommend its use.

As I've said, you should boil your substrate between uses to sterilize it. Bacteria love warm, wet environments and will probably thrive in a hydroponic system.
Just a heads-up, here... algae loves wet and warm (and lukewarm... and cold) systems, too, and it can look unsightly. If you care about appearances, boiling your substrate between uses will discourage blossoming, but if you use grey (recycled from previous use) water you'll be fighting a losing battle.

step 2: Plant Food 101

This article discusses nutrient solutions available for hydroponic gardening.

Water alone is not enough to feed a plant. Distilled water, in particular, lacks the minerals and nutrients which make flora thrive.
In systems where the substrate is allowed to moisten and support roots, the substrate itself may be permeated with nutrients and minerals. In systems where there is no substrate, or the substrate is simply provided to support the plant physically, the water must be saturated with store-bought or homemade nutrient-and-mineral solutions.

The PH of your solution is important for the health of your flora, and the maintenance of your equipment. Your water/nutrient solution should have a final PH between 6.0 and 7.0.
These solutions usually contain varying quantities of potassium nitrate, calcium nitrate, potassium phosphate, magnesium sulfate, iron, manganese, copper, zinc, and nickel. Potassium, especially, assists with healthy root growth. Salt is an important (but often forgotten) addition to the solution, as it tends to improve the taste of the plants grown.

Store-bought liquid-soluble fertilizers are readily available at your local big-box greenhouse, nursery, or hardware store. They work well enough, but they can be expensive, or simply may not be available.

The rest of the article will discuss making your own fertile solution.

A popular, homemade recipe consisting of accessible ingredients is available at your disposal. I daresay it's not the most eco-friendly option, but it's quick and easy. For every gallon of water your system requires, add two teaspoons of Miracle Gro and 1 teaspoon of epsom salts.

I've always found semi-symbiotic relationships both fascinating and convenient.

On a controversial note, human urine can be used as a nutrient solution. Remember, the body filters everything you eat and drink, expelling toxins and retaining the essentials. If you eat something slathered in pesticides, you'll be urinating it out later. If you use that urine to grow spinach, you'll re-absorb it when you eat it. There are risks involved. Do your research.
You'll need to have a sample of your pee tested by a floraculture lab, of course, so you may need to adjust your diet. Vegans will find their urine more appropriate for plant growth than their animal-product-eating companions.
If the plants you are growing are intended for consumption, you will need to find a way to treat and sterilize your urine, making it less of a biohazard. Introducing nitrous bacteria, and diluting the solution, will help break down the ammonia prevalent in your urine. Circulating it through a biofilter will do this. Alternatively, you may be able to find an ammonia treatment in your local aquarium store.
Wanna learn how to build a biofilter? I'll get back to you on that one.

You might consider using your hydroponic system in lieu of a filter for a fish tank, hooking up a circular system filtering fish water through various substrates. There are three kinds of filter medias used in household tanks-- mechanical, biological, and chemical.
Mechanical media is used to filter out solid matter-- chunks of substrate, algae scrapings, what have you. Sponges and fibrous materials (rock wool, for example) work admirably in this fashion. Consider inserting a sponge or somesuch in each plant's drain, to reduce the risk of clogging your system, at the very least.
Biological filters are meant to encourage colonies of healthy bacteria, and control levels of ammonia, nitrites and nitrates prevalent in fish waste. Your plants will be glad to serve this function.
Chemical filters clean your water of unwanted color and odor. Unfortunately, it also excels at removing the trace elements which allow plants to thrive. You won't need it.
If you already have a fishtank, you could simply use the water you would normally siphon off and discard during cleaning, and use it to top off your hydroponics system. If your fishtank filtered, you'll have limited success with this technique.

In the meantime, consider this: a successful hydroponics system will grow plenty of plant matter, and much of it will be consumed. What little waste there is, could be recycled back into the system (accompanied by other waste matter) with the help of another animal: the worm.

VERMICOMPOSTING

Vermicomposting is a composting technique in which live worms are used to turn food waste into fertile soil. A handy by-product of the process is a nutrient-rich liquid commonly referred to as "worm tea".
Obviously, this bin won't be for composting materials from your hydroponic system exclusively-- your kitchen scraps should go in, too. Waste not, want not!

Vermicompost can be suitable for indoor and outdoor composting. If maintained properly, a good vermicompost system will not stink the same way traditional compost can. The ammonia smell we commonly associate with compost is only prevalent when the wet waste content (rotting detritus) of the bin overexceeds the dry matter (paper or plant fiber) mixed in. Worms-- red wrigglers in particular-- like to have soft, dry bedding like shredded paper or coconut fiber available to them, anyway. A stinky bin usually means unhappy worms.

There are many ways to compost in this fashion, however, for the intentions of this instructable, we will focus on the relatively uncomplicated "non-continuous" vermicompost bin.
This system is usually very small and easy to build, but if you plan on using the worm castings as well as the worm tea, you'll need to dump out the whole container after draining it. I would highly recommend transferring your worms and a small portion of the castings to another vermicompost system of any other build type, after dumping.

In order to harvest liquid worm tea (instead of distilling it from worm castings in a water bath) you will need a large plastic bucket with a draining tap and a lid. Plastic is nonporous, unlike wood, so it shouldn't absorb the valuable tea. That old, giant thermos football players bully their waterboys around would do the trick nicely.
Non-continuous systems like this can be very simple-- they're just an undivided container layered from the bottom up as follows: sump, bedding, worms, wet waste, dirt.
The bottom layer-- the sump-- should consist of a two-inch deep level of small stones and gravel. This area will be rife with crevices liquid can settle into, to drain at your convenience. A layer of fine mesh should be placed over this level to prevent the worms and their solid castings from falling into the sump. Mesh should not be placed between any other levels.
Worm bedding, as mentioned earlier, is typically three inches of loosely-packed shredded paper or coconut fiber. This level will help aerate the mixture, lower fragrant nitrogen levels, and allow your worms to thrive.
Your wet waste should never include meat or dairy product like cheese or yoghurt. Frankly speaking, those things stink when they decompose, which they do quickly because of their high protein content. Genuinely putrid food is toxic to worms. Beans are also high-protein, and dangerous as such. Oils and fats prevalent in animal products will cling to the skins of your wrigglers and suffocate them.
Stick to eggshells, tea bags, vegetable peels, stale/mouldy bread, coffee grounds, rotting fruit, etc. Citrus fruit is generally considered safe, but not citrus peel-- the oil found in the skins are toxic. Banana peels are usually heavily sprayed with herbicides and pesticides, so include them at your own peril. Worms are highly sensitive to poison.
Wet waste should be covered with another layer of bedding, for odor control.

As the worms eat the rotting material, add wet waste to the top level, sprinkling with shredded paper as you go. The worms will consume what they can, and then travel up out of their castings (urine and feces) and into the new feed. Continue the process until the bin is full, and most of the edible matter has been turned into castings by the worms. Drain the sump whenever your hydroponic system requires more fertilizer.
Make sure you test the water's final PH, and adjust accordingly!

step 3: Lighting 101

In nature, plants photosynthesize white light from the sun. Sunlight is free. Use it where and when you can.
There's no reason you can't build your system outside, after all, climate permitting. Alternatively, consider placing your hydroponic system in a room with plenty of natural lighting.
If you live in the north hemisphere, for example, your south-facing rooms typically get the most light over the course of the day. Put it there.

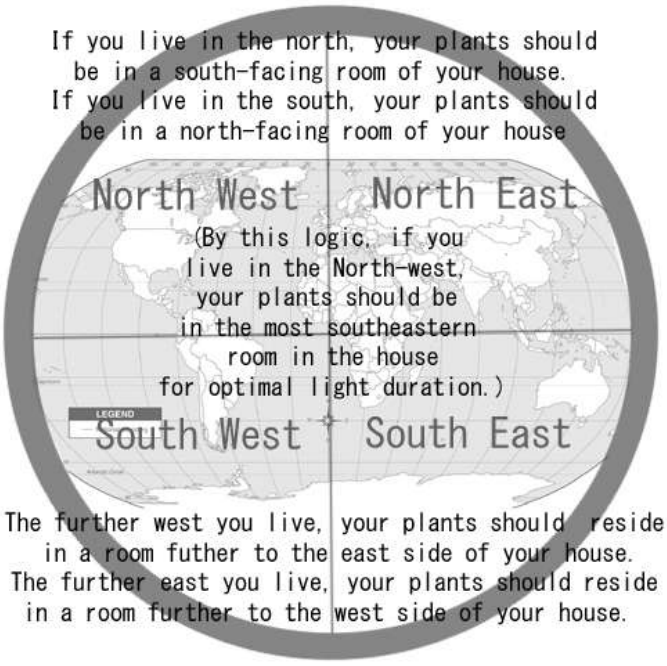
During the winter, even in areas where the temperature is tolerable year-round, the sun's light is weak, and plants will suffer. Besides, hydroponic systems are typically indoors where location limits proper daytime lighting to two or three hours in the middle of the season.

You can help mother nature along by using artificial light.

Artificial grow-lighting kits can be purchased in stores, or built on a budget at home. The cost will depend heavily on how many plants you plan to be lighting.
Frankly, you can expect to lay down at least $100 to light a very small area-- we're talking a meter squared, here.
Plants absorb red and blue light wavelengths efficiently, which stimulates growth. More importantly, plants absorb one more than the other. Whether you buy or build your grow lights, you should be looking for an 8-1 ratio of red and blue emitters. (8 red for every blue, not vice-versa.)
Although green lights are commonly included in standard grow light kits, they're not considered "necessary". Green light is mostly reflected, producing the vibrant color we associate with healthy leaves. Grown without green light, plants take on much darker shade-- almost black-- and rumor has it they take on different flavor characteristics. However, if energy consumption is a concern (this is a budget-saving project, after all) eliminate the green light, but not the blue or red.

LEDs are highly recommended for hydroponic projects, considering the serious advantages they hold over traditional halogen bulbs. They have much longer life-spans, produce less heat and consume less energy. For bonus eco-points, power your LEDs with solar chargers!
Consider the cost of the LEDs to be an investment towards lower energy bills (especially in comparison to operating halogen grow lights) and smaller grocery tabs.
There is one major drawback to using LED lighting, besides the cost. (Derrekito brought this up on another instructable.) The average plant absorbs is happiest absorbing red light at 600-625nm. The average red LED emits light at about 630-660nm.
LED lighting isn't perfect. I highly recommend supplementing with natural light.

I am not the person to ask about building LED grow-light systems. There are plenty of existing instructables available on the subject. Instructable's own }{itch seems to know his stuff. Look'im up.
http://www.instructables.com/id/high-power-LED-grow-lights-M.k2/



step 4: Irrigation 101

In hydroponics, water can be delivered to a plant via local irrigation, or sub-irrigation.
Local irrigation is a general term, describing the process of piping small amounts of water to individual plants. Typically this water is administered at the surface level. Drip and sprinkler irrigation works in this manner.
Sub-irrigation simply refers to any system which forces water to be absorbed from the bottom of a root system, to travel upwards-- wicking techniques partially submersing the roots or substrate of a plant are common.
Water is a valuable commodity. If you can, be eco-friendly by collecting rain or melted snow. As mentioned previously, siphoning used aquarium water from your fishtank in lieu of a filter will provide a nitrate-rich nutrient solution for your plants and the moisture they need to survive. There are lots of green alternatives to treated tap water.

Well, that's it for now. I'll add more detailed instructions and expound on the subject further, as inquiries are made. In the meantime, you folks can consider starting (or expanding on) your own projects, armed with a better understanding of the subject.
And knowing is half the battle, eh?
Have fun.

Related Instructables

Make a super-easy hydroponics system! by Rotten194

My Indoor DWC Hydroponics System by LancePenney

Aeroponic System by NaTeB1

Build a Dry Mist "Fog" Hydroponic System for $20 by NaTeB1

How to keep a house plant alive by growerman

Another ez cheap Earthbox clone (without PVC!) by Cool-fool

Hydroponic Drip Garden for Vegetables, Herbs or Flowers by dirty_valentine

Homeschool Science (guide) by drinkmorecoffee

Comments

38 comments **Add Comment**

148wmcquiston says: Jun 30, 2009. 8:23 AM **REPLY**

Please tell me that your going to enter this into the garden competition. It is an excellent instructables (*****) and I can't wait to use the worm composting idea (I tried before and it didn't turn out well). One question though, how much and how often do I put the food and newspaper in?

dutchypoodle says: Jul 3, 2009. 1:40 PM **REPLY**

Hey, thanks for the rate, and your lovely compliments! I don't think I qualify for the garden competition, as this instructable was published last year. I'll have to look at the rules. As for your question: I use a rule of thumb. Time is not an issue, here, but for every three inches of food I add to the composter, I throw down a layer of newspaper. Sometimes that takes a day, sometimes a week.

Rahdzhillaxxx says: Apr 30, 2009. 10:28 PM **REPLY**

I Like the guide! am getting the bug to do something like this. Can you remove seedlings from potting soil to transplant into a hydro medium? I have a bunch of perlite still in the bag, will this work for a medium? If not I guess I can go get me some gravel some where or a bag of river rock at lowes. And also a great worm container! My old plastic tote of crawlers will love the new home once I find a thermos like that one ! One last question, will a nursery carry a commercial hydro food? if so will they help me decide on what kind I need for which veggies I want to grow?

dutchypoodle says: Jun 26, 2009. 9:23 PM **REPLY**

Oh, dear! I totally missed this comment. My appologies. I've had success moving potted seedlings to a hydro system, but very little moving hydro seedlings to pot. Perlite makes a fine medium, yes. I may have mentioned it, or a non-brand version of it, in the substrate chapter. I'm not fond of commercial hydro food-- labelling standards for this sort of product are poorly standardized, and you're working on a 50/50 chance, hoping that the staff are properly educated. I know my local nursery is fairly clever, but I can't promise the same for yours. Thus, the recipes provided. Thank you for the positive comments!

arduinoe says: Jun 3, 2009. 10:23 AM **REPLY**

"water is not enough " , why not ? everything is there and the sand and crap just holds the plant up.

the symbol equation for photo synthesis is 6 h20 + 6 C02 ----------> c6 h12 06 +6 o2

with chlorophyll and sunlight above the arrow . all the reactants are there , h20 is the main ingridient and c02 is worryingly plentifull

kikiclint says: Jun 23, 2009. 9:57 AM **REPLY**

Photosynthesis only requires the given formula, however the structures of every cell in the plant require all kinds of minerals. A large blend of different things creates more vitamins for you to eat.

dutchypoodle says: Jun 3, 2009. 8:04 PM **REPLY**

I challenge you to produce healthy, edible growth from a plant using distilled water. Go wild, sugar. I'll wait. The results are going to be pretty sad, though. As much as I'd love to cite a formula, I'm just going to let experience speak for me. Yes, the math is there-- a plant can subsist off of air and water alone. It will not thrive.

arduinoe says: Jun 23, 2009. 10:15 AM **REPLY**

im not saying that it would produce good plants , but it would produce a plant . cetainly fertilizer , mineral aditives and substrate would produce a better plant . but just water would produce a small , withered under nourished plant. and who said anything about it being distilled water , especially in my area , tap water contains more minerals and vitamins than a plant could ever want , ever! and no one would buy really expenive distilled water when tap wtare by its very nature is better . satisfied stressy knickers ? way to over react , i made a (valid) statement , that was all...

Acanna says: Nov 22, 2009. 6:24 AM **REPLY**

I tend to disagree with this statement beyond the nutrient factor as tap water by it self in a hydroponic system attracts diseases and infestation. This is a big reason for using distilled water. When it comes to hydroponics cleanliness is next to godliness and one cannot obsess.

On the nutrient level, the trace elements in your water might be JUST enough to keep a plant alive(for a bit) but once the plant starts taking up nutrients and the PH swings with it you have to adjust your PH almost daily in order to prevent nutrient lockout. Plant require 3 main N-P-K and 12 micro nutrients to thrive. They take up these different nutrients at different PH levels. (around 5.8 to 7.0, plant dependent) There are more obstetrical to what you have said which in all reality makes it very impractical to state that water alone will grow a scawny plant, Not to term. Why would someone want to grow that. But I would be willing to give it a shot to see the out come. If so just shoot me a analysis of your water so I can produce to the same. We could use either my DWC or top drip bucket systems.
Be safe, Acanna

steveastrouk says: Jun 4, 2009. 12:40 PM **REPLY**

Healthy urine IS sterile - so why would you want to sterilise it ? Steve

dutchypoodle says: Jun 4, 2009. 4:04 PM **REPLY**

Good point!
Treating the urine is the important part, obviously, otherwise you'll give the plants a nasty case of fertilizer burn.
I hear now that simply allowing a bucket of urine to sit for a month is sufficient to break it down, and render it safe to use on plantlife. But that's just hear-say, alright?
I mentioned sterilization because, obviously, not everyone's urine is healthy. It's better to be safe, than sorry. Even if it's just 1% of the time.

steveastrouk says: Jun 4, 2009. 11:53 PM **REPLY**

You are pretty ill if you have infected water - I don't think you'd want to pee for your plants ! Steve

Darrone says: Mar 27, 2009. 7:18 AM **REPLY**

A great beginner guide! Your PH suggestions seem a bit high though. A 7.0 PH is going to significantly reduce nutrient uptake is a large number of plants. Perhaps editing to mention that different plants required different PH levels, and some go as low as 5.0?

PKTraceur says: Mar 20, 2009. 4:17 PM **REPLY**

Just thanks for the instructable! (5starred, faved of course!) I actually know understand hydroponics! And now comes teh questions... Hydroponics consists of growing plants "In Water." Isnt using a substrate, well, cheating? Does the substrate contain/hold any nutrients? How is the growth of a plant affected by the nutritional absorbence of the substrate? What substrate absorbs the most nutrients? water? toxins? Does PVC affect the plant growth? Are there certain pumps you can use to filter the NutrientWater? Do you think you could filter a sand substrate, that is nutrient induced would grow a plant? Am I revers engineering hydropnics using only filtered sand? Is that the equivalent of regular growing? Perhaps im overthinking this? Ah screw it, its just starting spring, might as well start. Thank! -PKT

dutchypoodle says: Mar 26, 2009. 10:20 AM **REPLY**

It could be cheating, sure-- but until somebody comes up with a better plan for supporting long-stalked plants without substrate, I'll be using rock. I use a variety of substrates, depending on, well, what I have on hand. To be honest, at the moment-- most of my plants are supported by river stones I stumbled across at the local creek. Clay substrate is HIGHLY absorbent, and so is sand. Clay pellets are much easier to boil and clean. Yes, when PVC is exposed to light, it leeches chemical over time. Although I haven't noticed any negative effects, there's a scientific argument for not using it. I have plans to build a hydroponic system out of clay-- but that's going to be an expensive and time-consuming process. I'll make do with what I have, in the process. I use a fish-tank pump, because it was accessible and cheap. There are specialty stores you might find something more suitable at, of course. There are pond pumps which you might find beneficial for a large system. Sand is made up of smaller pieces of rock, which contain nutrients. Filter to your heart's content, but you're still going to be leeching. I am under the opinion that growing a plant in sand is not true hydroponics, but it's a matter of opinion.

dutchypoodle says: Mar 26, 2009. 10:10 AM **REPLY**

The answer is-- yes! If you don't use rock wool, the seedlings can be placed directly in the substrate of your choice. I sprout my seeds by stickin' them in a moist baggy of substrate on top of my fridge, where it's warm, until something green pokes out. Hardly scientific, but I've had great success with the process, thus far. I usually wait 'til the sprout is about an inch long before moving it into my hydroponic system. As for the bucket o' worms-- although I have enjoyed great success with my own bucket, I'm in the habit of leaving the lid off for days at a time. Several of my commenters have suggested drilling holes in the top, to allow for better ventilation. Use your judgement.

MDisdain says: Mar 26, 2009. 6:04 AM **REPLY**

Firstly, thank you so much for cramming all this info into one place for me. Substrate mineral content would have been an after thought to me. This entire instructable is well-organized and is going to be incredibly useful. I can’t wait to try the Bucket O’ Worms. Ok, so I’ve just gotten into hydro and I have a question based on this step. I am currently set up with rock wool sitting in expanded clay with felt wicks (it was a kit I got for xmas). So, if I don’t use rock wool, which isn’t readily available here anyway, do I just put the seedling directly into one of the substrates that you mention? And if that is the case how big should the seedling be before its put in?

watergeorg says: Mar 15, 2009. 12:50 PM **REPLY**

I am sure that you are right about all details, and it seems to me that the whole system is planned to be perfect in every detail. On the other hand, I have 3 fish tanks, the biggest one holds 250 liters of water. I think that I cleaned it the last time about 6 years ago. The thing is that we "clean" the fish thank about once a month by siphoning out about 50-75 liters each time, and refilling the same volume with fresh water. Now to the "thing": The "old" water is reused to water our plants, as it contains enough of nutrients to make our plants grow happily. Why not use this water in a hydroponic system? It would surely do the thing?

dutchypoodle says: Mar 15, 2009. 6:06 PM **REPLY**

I did make a brief note about this: "If you already have a fishtank, you could simply use the water you would normally siphon off and discard during cleaning, and use it to top off your hydroponics system." The answer is-- yes. Kind of. I wouldn't run a hydroponic system EXCLUSIVELY off the leavings of a filtered fish-tank, because the resulting veggies might not be very tasty. Not much salt in fishtank water, eh?

Uncle Kudzu says: Feb 28, 2009. 5:07 PM **REPLY**

i'm another one who has been looking (for ages) for a simple and easily available nutrient recipe; Epsom salt and Miracle-Gro i've already got. thanks so much for that alone, not to mention an excellent instructable! wouldn't it be great, though, if a body could get enough of that worm tea going to grow some nice hydro-edibles?

shmacky26 says: Jan 27, 2009. 9:30 AM **REPLY**

If you put the lid on the cooler would't you suffocate the worms? Or could you leave it loose, but then would the worms escape?

AMalePoet says: Jan 15, 2009. 9:42 AM **REPLY**

What about potential suffocation of the worms? Water tight generally equals air tight. I've seen the apartment dweller Veriform composter (somewhere)in a common storage tote with wholes in it.

quailman says: Oct 8, 2008. 10:52 PM **REPLY**

I've been looking all over for a nutrient solution recipe. I don't care (yet) that miracle-gro isn't that eco-friendly, I just need a simple place to start. Once I get things going, then I'll look at alternatives like worm-tea. Nice instructable, I'd love another one with more expert advice!

dutchypoodle says: Oct 9, 2008. 7:14 AM **REPLY**

Hey, Quailman! Thanks for the positive comment. I'm glad to hear you found something of use, in the miracle-gro solution. I wanted this instructable to be accessible-- it's nice to hear when it actually helps somebody. When you get your garden up and running, I'd love to see pictures of it!

quailman says: Oct 9, 2008. 3:21 PM **REPLY**

What do you know about aeroponics? or do you have a good info source? It seems like everybody wants to keep their methods secret on the subject. I'm going to try and set up a little hydro setup soon. Little apartment doesn't allow for much... but I'm really interested in aeroponics. Hopefully I'll wind up with slightly more room in the next year or so, then I really want to experiment with the two processes. Thanks again!

Boz says: Nov 20, 2008. 11:12 PM **REPLY**

Here are a couple of sites that you might like to view on the subject:

www simiplyhydroponics dot com/system.htm

This is a nice site showing how to build systems

http://www.jasons-indoor-guide-to-organic-and-hydroponics-gardening.com/homemade-aeroponics-system.html

Hope this helps

dutchypoodle says: Oct 12, 2008. 7:30 AM **REPLY**

Frankly speaking, the science of aero-- and hydro--ponics are damn near the same thing, IMHO. Instead of having their roots suspended in a substrate, the roots are typically allowed to "hang" in the air, while constantly being misted by a water/nutrient solution. This gives the roots access to air and water. I have a problem with aeroponics. Outdoors, they're fine. Indoors, the room the unit is in gets... moist. The constant misting makes for a very humid environment. Sure, you could use dehumidifiers to keep the mildew off your walls, but who wants to use that much energy? I think the process is a little too invasive, and not particularly cost effective. It could be done with great success in a repurposed shower or commercial fridge, but... eeeeehh... where the heck are you gonna find that?

dutchypoodle says: Oct 9, 2008. 7:15 AM **REPLY**

PS; if you want to see another instructable from me, feel free to request something. I dib and dabble all over the map.

xeroseven says: Nov 11, 2008. 7:01 AM **REPLY**

Great instructable, I was with you right up to the picture at the end of step 3. You do realize that the Earth rotates on its axis, right? If you live in the West, the Sun will only be in the East for half the day.

qxjones says: Nov 8, 2008. 2:45 PM **REPLY**

Thank you!

wiley coyote says: Oct 17, 2008. 11:50 PM **REPLY**

Thanks for this very informative, all encompassing instructable and excellent links. The vermicomposter and LED lighting are very useful...and did I mention cool? I'm just a beginner and have been researching and experimenting to find something cheap and reliable and you've really gotta look to find useful information beyond the basics. Thanks to people like you and sites like this, the world will be a much better place! Okay, I'll stop know.....

jmckittrick says: Oct 14, 2008. 5:59 AM **REPLY**

Great post, only on question, do you have to dilute the worm fertilizer in water for your final product.

dutchypoodle says: Oct 14, 2008. 7:02 PM **REPLY**

I would like to SEE a vermicomposter capable of spewing enough worm tea to maintain a hydroponic system. You can't water a plant with undiluted fertilizer without fear of "burning" the plant. Despite worm tea's decided lack of harsh chemicals, and relatively safe PH, it probably shouldn't be the only thing your plant absorbs. I highly recommend diluting your solution. The important part; your water/nutrient solution should have a final PH between 6.0 and 7.0.

SpecEd says: Oct 11, 2008. 4:20 AM **REPLY**

Very informative for a novice, i.e., ME! I bounced here from Wiley Coyote's "mosquito" hydroponics instructable, looking for more information on the topic in general. BTW, the big coolers you mention are often available at season shift (fall-winter) in big box stores for relatively cheap (<$10, if memory serves)

dutchypoodle says: Oct 12, 2008. 7:34 AM **REPLY**

I'm going to cite this comment in my instructable, as you've brought something useful to the table. If it bugs ya, just let me know so I can edit it out. I'm glad you found something useful here, too! As always, if there's any point you'd like clarification on, or you have any questions, I'd love to help.

SpecEd says: Oct 12, 2008. 5:03 PM **REPLY**

No objection :o)

Toffy says: Sep 11, 2008. 2:35 PM **REPLY**

The use of this container is excellent. I had worms in plastic containers just for the castings and never did get the tea. The bottom of the container given me with the worms was not prepared properly as you have suggested. Now I know, and thank you for that. This is wonderful info, and I will give it 5 stars.

dutchypoodle says: Sep 11, 2008. 3:05 PM **REPLY**

So far as first commenters go, I'm gonna have to give YOU five stars. Thanks for being remarkably positive and encouraging! There's a li'l something in here for everyone, I hope.