

# Growing In A GS Hydro System



Unlike many other hydroponics manufacturers, we care if you have successful grow in your unit. We offer support and guidance on many common plants that will provide quality sustainable food for you and your family.

We use tomatoes as the example plant in this book. The reason is tomatoes are a common high-producing plant in hydroponics. In addition, the setup for tomatoes works with a vast variety of flowering plants and medicinal plants.

This short book cuts to the chase and helps you get your growing in hydroponics off to a successful start. Growing in hydroponics is not as difficult as it may seem. This guide covers all the basics without confusing extras.

## Topics Covered in this Booklet.

Choosing a Crop

Companion Plants by PH Requirements

Water Prep before Adding Nutrients

Making PH simple

Managing Nutrients

Starting A Plant from Seed

Cloning A Plant

Steps For Cloning

Trellises or Plant Support

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Nutrients Too Cold

Nutrients Too Hot

Hydrogen Peroxide/H2O2 Use

Root Rot Treatment and Prevention

Overflow Prevention

## **Choosing A Crop**

Choosing a crop is just as important as choosing a system, and both should be considered simultaneously. For instance, if you know you are going to want to grow a sprawling plant, then the 9 Plant Straight System is the best option. If you don't intend to grow plants like squash or cucumbers, then you likely don't need the 9 plant system unless you are looking to grow more plants or larger plants than the other systems provide for.

The other consideration is PH levels. Choosing crops for your system involves choosing plants with the same or similar PH requirements. This is why many people own multiple systems. One system may be growing plants with a requirement of 5.5 to 6.5 PH, while the other system has plants with a requirement of 6.0 to 7.5 PH. Since PH is so critical in hydroponics, it is imperative that you choose plants that companion well together.

## **Companion Plants by PH Requirements**

Many plants will still grow even outside of their PH ranges. Using the recommended PH ranges will ensure healthy high producing plants. Most plants will grow in a 6.0 PH range. However, holding a tight PH range for those who are new to hydroponics is a bit difficult in your first grow or two. Therefore Companion planting may be something you save for the future.

When you decide to grow multiple plant types in one system, take these few tips into consideration. Try to choose crops that will allow you the widest PH range. For instance, a crop

that requires 6.5 to 7.5 will not companion well with one that requires 5.5 to 6.5. You would have to hold your PH at 6.5. This is far too tight a range for your average home gardener. On the other hand, plants that require a 6.0-6.5 range would companion well with a plant that requires 5.5 to 6.5. Just keep the PH above 6.0 and below 6.5, and you're doing fine.

If you decide to grow more than one type of plant in your system, the next section will provide some guidance on what will grow well with other plants.

### **First Time Water Preparation before adding Nutrients**

Before starting your plants, you should prep your system for nutrients and get it ready for the growing cycle. This is done by filling your system with water and adding 2 oz of Hydrogen Peroxide per 5 gallons of water, and balancing the PH. Let the system run for a few hours and

check everything to make sure the PH has held. GSS systems take a little time to cycle a balance into the tubes. To decrease this time, you can set up your water before turning the pump on. The tubes hold varying amounts of water for the 3 plant tubes. It is about a half a gallon per tube for the 9 plant tubes it is about 1.5 gallons in the tube it's self. Fill the reservoir as far as you can, make your adjustments and add your H2O2, then turn the pump on.

To learn more about the benefits and using H2O2 go to the **Hydrogen Peroxide/H2O2 treatments** section of hints and tricks.

### **Making PH simple**

I don't want you to panic and think that PH range is so critical that if it falls out of your range, you will have an instant catastrophe. This is not the case. If you check your system regularly every couple of days and adjust the PH when it falls out of range, you are going to do fine.

Plants don't just fall over dead in your system because the PH drifted out of range. In many cases, the plants will tell you there is something wrong by wilting over or the leaves are curling. This, too, is an indication to check the system. Most plants will recover in hours once the PH is adjusted back in, and you will never know that the PH has fallen out of range. In addition, plants don't react immediately to the PH changes. It may take a day or two for them to show the signs and sometimes longer. Therefore if you are checking your PH levels and nutrient levels regularly, you should never have a problem. Once you are good at managing your system, you will find that things become very easy.

While I'm writing this, I have 3 tomato plants growing in a super mini. With only, a month or two of outdoor growing left I wanted to get my indoor garden started. I have been checking the PH regularly and noticed it has been drifting down some. On the last check that was 3 days ago, my PH was around 6.4 today. It was at 5.8. I brought it back up to 6.4. I just set the system up and used cuttings from outside. Once the system is stable, the PH should stop drifting as much,

but it is still very manageable. After 7 days, there are visible roots coming from the bottom of the net cup, so the clones of my best tomatoes from outside are going to do just fine.

I have grouped these into easy to companion groups. The first two groups just keep the PH between 6 and 6.5, the second group between 5.5 and 6.5, the third group 6.5-7.5, and the final group right around 6. If you are new, I would choose group 2 or 3 to grow from. They have a wider range that is easier to maintain.

Lettuce	6.0-6.5
Beans	6.0-6.5
Eggplant	6.0-6.5
Peppers	6.0-6.5
Broccoli	6.0-6.5
Peas	6.0-6.8
Cauliflower	6.0-7.0
Pumpkin	5.0-6.5
Strawberries	5.5-6.5
Tomatoes	5.5-6.5
Squash	5.0-6.5
Cabbage	6.5-7.5
Brussell	6.5-7.5
Sprout	6.5-7.5
Collard greens	5.8-6.0
Cucumbers	5.8-6.3
Zucchini	5.8-6.3

The simple fact is most plants will grow with a PH of 6 and grow very well. While you may run into the occasional strain or breed of plant that gives you a hard time simply change breeds, there are numerous varieties of every plant out there. Some just don't work well in hydroponics. I have found that heirlooms are usually some of the best for hydroponics.

### **Managing Nutrients**

While many plants can handle a variety of nutrient ranges, there are some solid easy to follow guidelines. Feel free to look up your plants but if you stay in these ranges, you will have some

very successful crops. While many plants can handle higher ranges for the beginner, these are good guidelines that make growing easy.

Seedlings 200-250ppm

Vegetative or Previous to Flowering 600 to 800ppm

Flowering/Fruiting 1000 to 1200ppm

Check nutrient levels every 5 to 7 days in early growth and every 3 to 5 in later growth once your system is set up and your first nutrient levels are set.

If you follow the first two ranges for seedlings and vegetative plant growth cycles, they are fairly standard and work with just about any plant. The final stage, flowering, and fruiting is the one that you can experiment with raising levels within tolerance ranges for different plants. Simply look up the plant types you are growing, and you will be able to find the max levels. However, due to the cost of nutrients and the fact that in most cases, the increase in growth is minimal, I pretty much have stuck to these ranges. If you are new just stick to these until you are comfortable with experimenting with higher ranges.

### **Starting A Plant from Seed**

Starting from seed is the most common way people start plants. There are several effective methods of doing this.

**The first and my preferred method** is to set up your net cup with the stone wool and grow rocks. The setup is the same for seedling or cloning. Pre-soak the cube in PH balanced water, I add a drop of nutrients also. Just a drop will do but it isn't necessary.

Line the bottom of the cup with grow rocks so that the cube is even with the top of the net cup. Then put the stonewool into the net cup and fill the area around the stonewool with grow rocks.

Place the seed into the stonewool. There is a provided hole that can be used for most seeds. However, if it is a shallow seed, just split the stonewool a small amount and set the seed near the top of the cube. Then pull a little bit of the stonewool off of a corner just enough to cover the seed slightly.

**The second method** is the start the plant in the net cup outside of the system. This is usually done by using a cup with some water in it to set the net cup in until the plant is started. This can save power as the cup can be set in a window or other area for the week or two that it takes to get the plants started.

**The third method** is to set the stonewool cubes up on a plate or in a tray while the seedlings start. Once the seedlings have started, they are then transferred to net cups and then into the system. I'm not fond of this method as the seedlings can be damaged during the transfer.

*See the cloning section for images on setting up a net cup.*

## **Cloning A Plant**

Many plants can be easily cloned to start the next growth cycle. Cloning directly into hydroponics is easy for many varieties of plants and an effective way to getting a couple of extra grow cycles from your favorite plant.

This is where owning a bubbler or bucket or tub-style DWC or deep water culture system is good. Stonewool cubes are great for cloning directly into, and once your plant is established, you can end your growth in your regular system and just move the newly rooted clones into the main system. I have had very few issues when cloning and a success rate with tomatoes of over 80% with this method. When cloning, I run my nutrients at about 150 or 200 and my PH at standard levels for tomatoes around 6.0 PH.

The below are pics of two of my plants that I have taken cuttings from my outdoor plants and moved indoors. The plant on the right was a cutting taken right off the main stock. Within 7 days, it was rooted, and by 10 days, it had grown 4 to 6 inches. The one of the left was another clone I took a week later. Both were put directly into the system as I didn't have anything growing in the system at the time.



These are the cutting for cloning the one on the right is around 7 days. You can see the stressed leaves that have died but most the leaves survived. The one on the left is at 2 days and doing well, there is no wilting so the plant is up taking water with out roots just fine.



These are the roots starting on the large cutting 7 days after it was taken. This picture was taken at the same time as the other.



This is the same plant at about 14 days after cutting. Notice how the leaves have recovered except a few spots which can be expected with a cutting this size. Also notice the growth (using the stake behind the plant to measure the growth) in comparison to before. The plant is now established and starting to grow faster than my outside plants. Also note I'm only using a 125 watt fluorescent at this point. The light is on a 12/12 cycle and the plant is getting some sun from outside in the late afternoon. This is also the original prototype of the 3 plant mini marvel that we used to work any bugs out of the system before the final design. Now it's a great little corner unit in the back room.

### Steps For Cloning

#### Step1:

Choose a viable branch or portion of the plant to take your cutting from. Make sure you are not just cutting a leaf off. Leaves will not grow into plants then cut must be below a branching node.



Step 2:

Take your cutting at about a 20 degree angle using a razor or very sharp knife.



### Step 3:

Prep your stonewool and grow rocks by rinsing them out and soaking the stonewool. Soak the stonewool in PH balanced water. I use my system reservoir if I'm running nutrients at 200PPM for seedlings if not, balance a small bowl of water and rinse the cube in that. Then place in the net cup like the following pictures depict.



Rinsed Grow Rocks, Prepped stonewool Cube, Net Cup and our Cutting



Line the bottom of the net cup with some grow rocks so the cube will be nearly to the top of the Net Cup.



Place stonewool cube into Net Cup and pack with Grow Rocks

Step 4:

Insert your plant into the stonewool cube till its firmly against the bottom of the provided hole in the cube. The cube will then wick water into the stem of the plant. If the cutting isn't secure enough it may not wick water properly and your cutting may die.



See how the plant has been inserted about an inch into the stonewool cube. It is firmly in place and will wick water properly. Now place in the system either your prep bubbler or your regular system. In about 7 days you should start seeing roots from the net cup, sometimes they are hard to spot but if your plant isn't dieing and is staying firm you are fine it has begun rooting by this time even if you don't see them. Within 10 to 15 days you should start to see noticeable growth.

Stonewool has to be the best invention ever when it comes to cloning plants. I would use stonewool to clone even into soil. The success rate for stonewool is fare superior to any other form of cloning in my experience. I believe this is due to the nature of the wicking effect of water that stonewool has. For more tender or harder to clone plants add a little cloning gel or powder to the stem of the plant before inserting into the stonewool.

### **Trellises or Plant Support**

Trellising a plant or providing support indoors is different than outdoors. Most of the time outdoors, you have posts or polls you put in the ground. Indoors we have to fashion something to the system itself or have another device to hold the supports up. I like to use the legs on the system for posts or use a tomato cage.

If using a post, use garden wire ties to attach the post to one of the leg stands.

Tomato cages are by far the easy way to go. They come with three-wire posts that would normally go into the ground. Use these posts to wrap around the system, placing the first ring of the cage against the growing tube wrapping the wire posts around the bottom. Use garden wire ties to secure the posts under the tube. The drawback is if the plant gets heavy, it can lean the entire growing tube. To ensure this doesn't happen, use a wood post attached to the leg of the stand to give the cage extra support. I like the growing cages as they keep the tomato plants growing more up and less bushy. They are great for peas also. Pole beans work best with a post/pole attached to the legs. You can guide the climbers to the post. Once they find it, they will crawl up it on their own.

### **Hydroponics Hints and Tricks**

Some of the issues that growers may have are common not only in GSS systems but hydroponics in general.

#### **Nutrient Temps are too high.**

Ideal Nutrient temps are 62F to 65F temps over 70F may lead to problems. I have rarely had a problem with nutrient temps getting too far out of control. One way to solve this issue is to take the air pump and move it outside the growing area. The lights and other components in a growing area can cause room temperatures to rise. The nutrient reservoir will generally be at the grow room temperature. To lower the nutrient temperature move the air pump outside the grow room. This will pump the cooler air from outside the growing area into the nutrients, cooling them down. Most grow rooms with adequate circulation will not have an overheating of nutrients issue, but if you do, this simple fix will usually work.

If this does not work, you may be running your growing area at too high a temperature. You can also purchase a larger cool air pump or cool dual air pump and put more cool air into the system. GSS gives you a pump with the intention of stirring the nutrients and keeping the oxygen levels at acceptable ranges.

#### **Nutrient Temps are too low**

This is another easy fix, simply add a fish tank heater and adjust to the desired temperature.

#### **My grow room is too hot.**

This can almost always be solved by increasing the air exchange to the growing area. Again, this is a problem that is usually caused by lighting. It is common to have to remove heat from a grow room if using HPS lighting in a tight or enclosed space. By installing some kind of exhaust fan removing air directly from your grow room, you can lower the temperatures. I have used a simple 6" in-line fan with a dryer hose to pull the hot air out of a smaller grow room. Place the intake side directly above your light, so you are removing the most heat possible. It was inexpensive and easy to install.

### **My grow room is too cold.**

Having a growing area that is too cold is rarely an issue. There are times, though, in basements and in colder rooms during the winter that you may see temps that are too low. You can add a small space heater or increase your lighting if using HPS to increase the room's temperatures.

### **Hydrogen Peroxide/H2O2 treatments**

Again let's not make things more difficult than they have to be. I read a lot of articles on using hydrogen peroxide, and most end up confusing, and honestly, they make it sound like hard science. Just add 2oz of 3% peroxide per 5 gallons as the first treatment with each nutrient flush, or if you are having a problem, that's just a touch under 1/2oz per gallon. To continue treatment, you can add another 1 tbsp per 5 gallons a day to maintain your Hydrogen peroxide or H2O2 levels. Hydrogen peroxide is excellent at removing contaminants like chlorine from the water, so city dwellers may want to use it to help clean their water before a grow. Well water users like me will want to pre-treat the water in the system with some to kill spores and alga, and other microbiological problem makers before getting into a full grow.

Just remember, if you're not sure, put a little less in than you think you need, and you will be fine. Don't think you need to exact these measurements out. While it's always good to be exact, honestly, there is no real need in this case just don't overuse the stuff. It can damage your roots. I never do a continued use of H2O2 unless I have a sustained problem like algae or fungus. Usually, some form of microbiological that is rarely identified. We design our systems to keep out the light. This prevents most algae growth.

Simple Break Down for initial use.

5 gallons = 2 oz

2.5 gallons = 1

A close estimate will do the trick. For instance, you are using a supermini with a 5-gallon reservoir, put just 2oz in these systems are running between 4 and 4.5 gallons. In a larger system, say the super mini or the 9 plants, both are running a 14-gallon reservoir use 4 Oz to treat it.

Continued use

5 gallons = 1 Tbsp

3 gallons is 2 Tsp

A close estimate will do the trick again. For instance, in our five-gallon super mini, this would be just under 1 tbsp.

### **Root Rot Prevention and Treatment**

The above-prescribed treatment of H<sub>2</sub>O<sub>2</sub> or Hydrogen Peroxide will help prevent root rot and keep your roots healthy. Spotting root rot is pretty easy. Most of the time, depending on nutrients, roots will be white and look healthy. Some nutrients can leave stains on the roots or build-ups. Don't mistake this for root rot. Most of the time, however, your roots will be white and look clean. Root rot has a rotting, very earthy smell. Roots in organic nutrients also have an earthy smell to them, but it is light.

If you find root rot, try to remove as many of the damaged, dead roots as you can without removing too many. If you remove too many roots, your plant depending on its size, may struggle to survive or die. Flush your system, treat it with hydrogen peroxide and a rooting booster if you have one or feel it's worth the money to buy one.

This is the main reason we have an aerator pump and stone included with our systems. This keeps oxygen levels high and not only helps prevent root rot it also keeps other microbiological contamination out of the system and minimized.

I have seen root rot in nearly every system of every type at some point. It generally seems to occur later in the plant's life when the roots are getting older, or you have grown your plant for far longer than expected, and your roots are getting tightly compacted in the growing tubes. You can thin down roots in a hydroponics system, but if you do this, I highly recommend a root enhancer to help the plants recover.

Fortunately, root rot is treatable most of the time with hydrogen peroxide and prevented with a little H<sub>2</sub>O<sub>2</sub> in the water, especially at water change.

### **Pests, Plant Fungus & Algae**

The occurrence of pests really depends on the location of your unit. Sometimes in rooms with direct access outside, you may find higher occurrences of pests. However, they do creep in on occasion. You can usually take care of common indoor pests using K+ Neem. In a greenhouse situation, you may also need BT. For the common indoor grower, if you get pests, they are usually little ones and can be taken care of fairly quickly with K+ Neem. This is an all-natural

pesticide that is safe for use in your home unless, of course, you have an allergy to it. Follow the label instructions and don't misuse them.

K+ Neem also works on leaf fungus and other external fungi. The most common is a grey-like fungus that looks like a powder on your leaves. Treat regularly with a K+ Neem spray. This will usually take care of the fungus rather quickly. This product also works great outdoors.

Sometimes we will see Algae growth on the stonewool cubes. Most of the time, it's nothing to worry about. Cover the Algae so it isn't getting any light that will usually kill it off. If not, there are treatments out there specifically for surface Algae.

### **Overflow Prevention**

Some plants, when grown in hydroponics, have a tendency to grow massive rooting systems. Keeping an eye on the rooting system near the drain line is a must. Sometimes the roots can grow into the drain plug and inhibit the flow of water.

If you notice a slower water flow or that the water levels are increasing in the system, this is a sign that the drain line is starting to become clogged with roots.

To prevent this, with a large, heavy rooting plant like tomatoes, you can leave the net cup near the drain empty. If you do have roots blocking the drain, you can cut them away. If your plant is too large to lift out of the system, easily shut the system off, let the water drain out. Remove the drain line and cut the roots out of the drain hole.

Another means of moving the roots away from the drain is to simply turn the plant in the system. This will usually pull the roots out of the drain if they are becoming a problem. Just rotate the net cup, so the roots are removed from the drain.