Five reasons why a dedicated hydroponic testing room is a great idea

Most commercial hydroponic setups completely lack testing environments. The most common reason for this is that commercial crops are meant to produce revenue and a testing environment means dedicating space, time and money into something that might not be as productive as the rest of the production facility. Furthermore a testing room implies that you will need to create a completely independent setup and hire someone who knows how to do research in order to ensure it is both adequate and fruitful. Although many people believe this not to be worth it today I want to talk about the five most important reasons why I consider that a testing room is something incredibly useful to have as a part of your commercial growing facility and why getting one will probably pay off greatly for you going forward.

Testing product changes. Perhaps the first and most direct benefit to having a testing room is to ensure you can test product changes. It may be the case that your supplier for some particular fertilizer product or additive has ran out and you now want to test a new product to replace it. It may also be that you want to test how a product does compared to what you generally use but you don’t know if it does better or worse. Most growers are afraid of change because making facility-wide changes that won’t work could have huge financial consequences. A testing room ensures you can test safely and then roll-out changes slowly without having to risk your entire crop cycle to find out.

Optimizing what you currently have. Change is very rare across commercial facilities because growers understandably want to preserve their current results, even if some better results by making some change would be possible. This constraints growers from making incremental changes that might make their crops significantly more productive. By having a testing room you can optimize the setup you already have by making adequate research into optimizing things such as environmental or nutritional factors.

Trying potentially game-changing modifications from academic research papers. There are many papers published each year on how to increase the yields of hydroponic crops. Some of these papers offer somewhat risky and controversial changes that might not transfer well across species. However if something gives you the potential to increase your yields by say, 50%, it might definitely be worth trying across a testing setup. Obviously these things are too risky to try across an entire facility but a testing room would be perfect to help you try these new and exciting modifications, potentially giving you a huge edge versus all the other people who will never try this.

Try new plant varieties. Usually growers try new plants without having a clear idea of how productive they are going to be under their growing setup. This means that you introduce a new variety with a huge question mark regarding its productivity and potentially financial benefit or cost. A testing room provides you with a risk-free way to test how a particular plant variety will perform under the exact conditions in your facility, potentially allowing you to make far less risky decisions when it comes to making planting changes in your facility.

Research new ideas. A final benefit you can get from a testing room is that you can research your own new ideas. With adequate experimental design even a small room with just 10 plants can be used to test some ideas to see how they affect plant growth. This means that you can develop your own in-house growing modifications that will make it much harder for others to compete with you. For example if you developed a secret foliar additive in your growing facility it would allow you to only use this for your own crops, without the industrial secret ever being used by your competitors.

Of course there are many other advantages to testing rooms but the above are just some of the wonderful things you'll be able to do if you have a testing room and someone trained in scientific research who can help you design experiments and get the most out of it. A testing room also doesn't need to be huge and even starting out with 10 plants can be a huge step in taking your commercial growing facility to the next level.

Using UV sterilization in your recirculating hydroponic crop

In general most growers want their hydroponic setups to remain fairly sterile. This is because maintaining a sterile environment discourages problems such as algae growth and can eliminate bacterial and fungal problems even before they appear. This is especially important in recirculating hydroponic setups where algae can cause important nutrient balance issues within hydroponic solutions and root pathogens can spread very quickly across an entire hydroponic operation. Today we will be talking about one of the least invasive methods to maintain sterility within a hydroponic solution, UV light.

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This days hydroponic growers have access to a wide variety of in-line UV lamps that can be used in all hydroponic system sizes. An inline UV lamp like the one above – which uses 18 Watts of power – can be used to effectively sterilize at a 750 GPH flow rate and can therefore provide appropriate sterilization for even moderate system sizes of 200-300 gallons. Larger inline setups also exist but if you cannot find them there is also no reason why you cannot use several of these – each one with its own pump – in order to maintain an even larger reservoir sterilized.

Research has also shown that UV light sterilization is effective in reducing bacterial and fungal populations (see here). But this research also shows that the use of UV lights also affects native bacterial populations so if you're using any type of beneficial microbes these will need to be systematically replenished to compensate for their loss due to the sterilization system. There have been some reports of 99.99% of pathogen inactivation in water in hydroponic crops when using adequate doses of UV radiation, so this is definitely a good way to keep pathogens at bay, even if it can somewhat compromise root bacteria populations.

Iron stability has also been an important concern in UV sterilization for a while. This is because UV irradiation of chelated iron species can destabilize and destroy the chelate, leading to non-chelated forms of iron that can much more readily precipitate from solution. The image below – taken from this article – shows the degradation of 3 different Fe chelates at pH values of a (3.0) and b (6.0) as a function of time. Note that the fact that free Fe is generated does not mean that the Fe is precipitated but merely that the chelate has been destroyed, which is the first step before the Fe can precipitate. From this it is clear that different chelates have very different stabilities and in this case chelate i-Fe-EDDHA had the largest stability while other chelates had much poorer stability against UV radiation.

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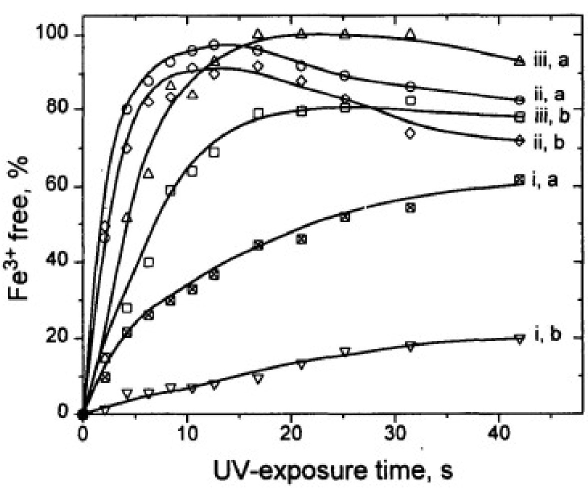

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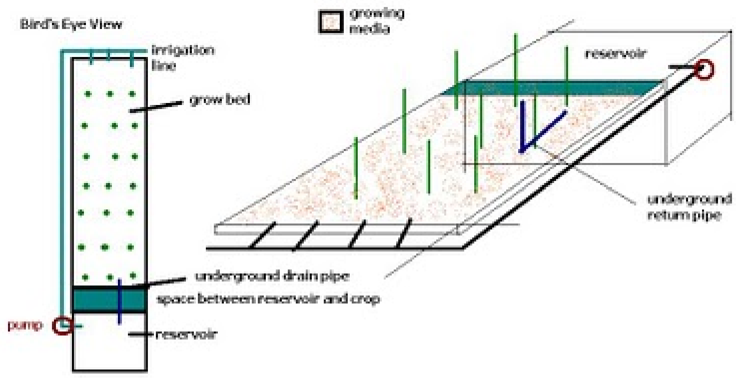
In the end UV sterilization offers many advantages with only a few disadvantages if the formulation is properly prepared and the crop is properly managed. Fe depletion can be a problem if chelates like EDTA and DTPA are used but this problem can be alleviated in great measure by using a chelate like Fe-EDDHA. Micro-organism depletion from the roots can also be a problem if symbiosis are important for yields but this can also be alleviated by the periodic introduction of new beneficial microbe populations within the plant root environment.

However UV is definitely not the only way to go for nutrient solution sterilization. There are other methods that can be used, some of which do not generate the problems that UV has – but different problems – and others that are less generic in their protection, implying that they must be somewhat targeted towards a particular pathogen in order to be effective. You can read this review about nutrient solution sterilization in hydroponics if you want to learn more before I post about these alternatives.

The Best Outdoor Hydroponic System. A Simple Way to Grow Large Amounts of Food

I have always seen that there is not a lot of information regarding outdoor hydroponics and the building of scalable and cheap systems that may provide large amounts of food without the complexity, trouble and expense of building a greenhouse. For the past several years I have been puzzled by this issue and I have challenged myself to build an outside hydroponics system that is able to deal with environmental conditions successfuly, providing adequate conditions for plant growth without significant expenses and without the need for any protective enclosure. Finally, I came up with a system which – I believe – has a lot of promise for the above, giving us the opportunity to build an outdoor hydroponic system which has a low cost and a very high productivity potential. On today's post I will be talking about this system and how it can be easily built with less than 1K USD for each 100 square meters.

How do you build a scalable system that can be used on the outdoors with minimal problems due to uncontrolled environmental conditions ? The easiest thing I could think of was a simple continuous flow system which used the ground itself as a place to put the plants. This system uses no NFT channels, no large amounts of PVC pipes and absolutely no complex engineering. The system – shown on the drawing below – is simply a channel which is dug on the ground of about 2 meters wide by 25 cm deep. The nutrient reservoir can be a tank burried in the ground or a reservoir made from bricks and tiles out of another hole dug on the ground depending on the actual volume needs of the crop. The hydroponic system uses a PVC line connected to a pump to irrigate the system at the top and a small decline in the slope of the channel allows the solution to return to the tank through an underground pipe shown in dark blue. The channel is filled with a nutrient media that has adequate drainage and the nutrient solution is fed continuously through the irrigation system. Of course, when the channel is dug on the ground the soil has to be covered with a polyethylene sheet to prevent the solution to drain into the soil.



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This system allows you to grow a wide variety of crops, from tomatoes to lettuce heads. The system can be used to grow plants of various sizes and nutritional needs since the media and continuous flow irrigation provides great oxygenation as well as a cheap alternative to more complex systems such as NFT or PVC pipe systems. The system is also absolutely scalable, it can be built from a few square meters to a full plot size commercial cultivation facility without significantly changing the principle of operation. Since the surface area of the system is also large, and all nutrient solution is returned to a central reservoir, rain volume can be accurately determined and nutrients can be added or changed to make up for this effect of external environmental conditions.

The image shown below shows you how the system can be expanded to a full plot system without any modification of the fundamental working principle. The only things that need to be bought to start this system are a tank, a shovel, a polyethylene sheet as large as the channel requires, PVC pipes for the irrigation system and returns pipes, media, nutrients and seed. Since there is no greenhouse, no gutters, no polymer channels and no expensive irrigation equipment, the system is very simple and effective at growing plants at a large or small scale under outdoor conditions. It is also perfect for people who want to start a small hydroponic business and then expand it as they want to increase their production, since adding channels is easy and requires almost no changes (besides perhaps having larger pumps and increasing reservoir size once this is required).

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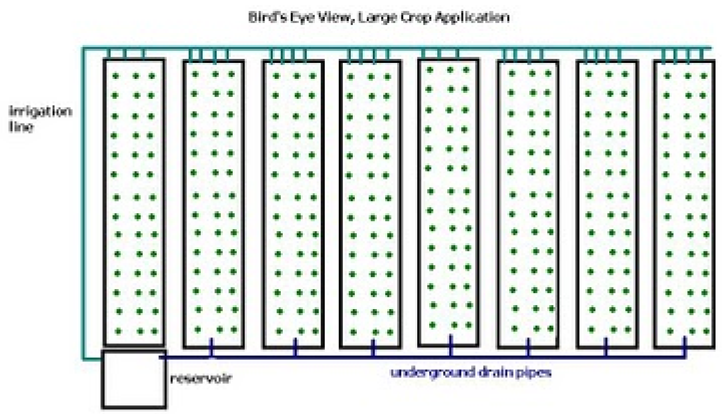

In the end I believe that this system summarizes everything that I wanted to achieve with an outdoor hydroponic system. It is able to control and measure the effect and added volume of rain, allows the growth of a large variety of plants and provides us with a cheap and scalable solution to small and large scale commercial growing. Definitely there will be some problems that will probably have to be solved once larger applications start to develop but certainly I can say right now that this idea seems to be the largest, cheapest and most scalable solution for outdoor hydroponic growing available online :o).