

# The Importance of Oxygen in Hydroponic Systems

It is very common for new hydroponic gardeners to have an over developed focus on the nutrient aspects of their cultures while totally neglecting other very important aspects such as aeration and light. Some of the most common problems that plants face are a direct consequence of a lack of a proper supply of oxygen, issues which could easily be fixed if this factor was taken into account with as much interest as the composition and character of the hydroponic nutrients used. On today's post I want to talk a little bit about the paramount importance of oxygen, why it is so important and what things you can do to ensure that your hydroponics crops are not starved of this extremely important element.

First of all we need to understand why plants need oxygen. This gas is vital for many living organisms because it performs a very important function within their cells. Oxygen reacts with carbohydrates within any aerobic organism's organelles to produce ATP, which is the primary chemical used to fuel biochemical processes. Plants need this ATP to perform several functions which require energy, like the absorption of nutrients and the production of aminoacids. Plants need great amounts of oxygen in their roots in such an extent that one of the limiting factors of growth in hydroponics – after light – is oxygen availability to root cells.

   
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A very important thing that you must take into account is how much oxygen your hydroponic system allows roots to have. Static culture systems, like lettuce floating rafts or any system where roots are permanently soaked in water offer little available oxygen since the solubility of oxygen in water is quite low. Even if you aerate the solution constantly using an airpump, the solubility limitation makes the use of such systems to grow large plants – such as tomatoes – extremely difficult.

Larger plants, which have much larger nutrient and energy requirements generally need systems in which the availability of oxygen is not limited. In this case systems where roots are

periodically wet and exposed to air have very good results. For example, ebb & flow and drip irrigation systems in which plants are in contact with nutrient solution and with air in an on/off manner guarantee that the large oxygen requirements of energy demanding plants will be fulfilled. In the end, you will see that plants will perform much better when their oxygen and nutrient availability is optimal. For this reason – aeroponic systems – which supply both requirements in an ideal fashion tend to give the best results for most plant types.

In your hydroponic system, ensuring a good supply of oxygen is absolutely vital. You should ensure that your hydroponic system is adequate for the plant you want to grow and you must also check that your system is always giving its maximum oxygenation potential. In static systems you always need to check the frequency and quantity of aerators and on dynamic setups checking cultivation media drainage and irrigation frequency is key to get the best possible results. After taking into account all this you will see that paying close attention to oxygenation will eliminate many of the problems you may have, giving you a much healthier and productive hydroponic crop.

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## **Making Your Own Hydroponic Solutions – Download my Free Ebook**

Many of us have always dreamed about making our own hydroponic solutions to stop buying all those expensive solutions from the hydro fertilizer companies. Sadly, most people do not have the necessary knowledge to prepare solutions and coming up with an adequate formulation seems to be extremely difficult

for almost everyone out there. As a chemist, I have the fortune of having the knowledge necessary to prepare hydroponic solutions and the initiative to teach you how to do this by yourselves in an understandable way. Through the past 6 years I have worked as a hydroponic consultant, lecturer and avid gardner and I believe this experience allows me to teach all of you how to design your own hydroponic solutions.

How do you make your own final solutions ? The first thing is to get away from the notion that doing this is extremely difficult. Certainly there are a lot of technical aspects that need to be known but I have taken them all and simplified them so that everyone can actually make their own hydroponic fertilizers with little or no practice. Within my ebook – which you can download freely at the end of this post – you will find detailed instructions on how to prepare your own hydroponic solutions using a spreadsheet I made that makes the preparation of these solutions extremely easy.



My ebook gives you the ability to take any formulation and easily translate it into the real amounts of chemicals you need to weight in order to prepare your final hydroponic nutrient reservoirs. All the chemicals I have included within the ebook are extremely easy to find – as they are very common fertilizers- allowing you to prepare ANY formulation you may want. You can now fulfill your dreams of preparing one solution for each separate growth stage controlling the exact amount of each single nutrient you add into the solution.

What you will find here is a very easy to use solution – made by a proffesional in chemistry – that will help you prepare fertilizers in the most cost effective yet flexible and satisfying way there is. You will now know exactly what is inside your hydroponic formulations and you will be able to pin-point and solve any nutrient related problems that may arise within your crop. You will also be able to easily discard problems as not being nutrient related since you KNOW the exact quantities of each nutrient you are putting into the solution.

So are you ready to embark yourself in the journey for total freedom and independence in the world of hydroponic nutrient

solutions ? . Please leave any comments with any suggestions, questions or doubts you may have :o) Also if you want to share this ebook with anyone please direct them to my website so that they can download it themselves.

I have also recently made a great move forward by coding my own windows application to calculate hydroponic nutrient formulations. If you would like to learn more about this program and download it absolutely for FREE please follow the link shown below.

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**This EB00K is NO LONGER AVAILABLE  
as it was replaced by HydroBuddy.**



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## **Hydroponic Nutrients... Why Solid is Better than Liquid**

One of the most important decisions you can make when buying hydroponic nutrients for your plants is the way in which the nutrients are prepared. Fertilizers for soil-less culture are available both within solid and liquid presentations and it is very likely that you have been buying the liquid once up until now since these are the most well-known and easiest to prepare. However, you may not be realizing that by buying liquid fertilizers you are putting an enormous burden on your hydroponic growth wallet. The fact is that by buying solid hydroponic nutrients you could be saving 5 to 10 times your

hydro-food costs. Within today's post I will explain to you the difference between solid and liquid fertilizers and why buying solid nutrients is always a better choice for your hydroponic garden.

Liquid fertilizers available for hydroponics are generally prepared by dissolving an array of salts and additives in water. After these additions are done the concentrated solution is prepared and ready to be sold. When you get it the only thing you need to do is to take a given measure of volume from the liquid and pour it into your hydroponic reservoir. What you may not be realizing is that – due to the fact that salts need to be dissolved in water – there is an inherent limitation in the amount of nutrients you are getting and most of what you are buying is actually water. There is also the added cost that in order to make up a concentrated nutrient solution, compatible salts have to be used. This limits the chemicals that can be purchased and makes the cost of the fertilizer higher.

When you purchase a solid hydroponic fertilizer you simply buy a mixture of salts which you then need to weight and dissolve in a given volume of water. Since there is actually no water and the salts don't need to be predissolved in a concentrated solution, the array of salts that can be used are a lot wider and much cheaper costs can be achieved. Added to that is the fact that packing is a lot simpler and much more efficient since the need to bottle solutions is unnecessary. In the end you will see that with 2 pounds of solid nutrients you will be able to prepare more than 300 gallons of nutrient solution while you would probably need much more (about 10-30 gallons of concentrated solution) to prepare the same amount using concentrated liquid fertilizers.

You will definitely see that most hydroponic fertilizer companies are simply charging you a lot for liquid fertilizers when you could as easily be buying bulk solid fertilizers at a fraction of the cost. Premixed solid hydroponic fertilizers are also widely available commercially and easily made up with some basic chemistry concepts (more on this on a later

article!). So next time you are planning to buy more hydroponic fertilizers think about cost efficiency and look for some solid premixed hydroponic nutrients which are bound to give you as good – or better – results than your previous liquid mix.

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## **Hydroponic Solutions and Vitamins... NO real proof**

It has always surprised me that vendors of hydroponic solutions have always included vitamins and other nutrients as a “boost” and “bonus” of their nutrients. It is not very rare to see a fertilizer containing vitamins of the B complex, C, E, etc. When I first learned about this practice to include vitamins – as an avid hydroponic gardener and consultant – I decided to look into this and see if there was actually any positive effect or recorded evidence of the effect of adding vitamins into a nutrient solution. On today’s post I want to talk a little bit to you about my findings on the subject and the real truth behind the addition of vitamins and other “mysterious” additives into nutrient solutions.

What is a vitamin ? In order to understand the problem we first need to understand what a vitamin is. These compounds are usually defined as substances which are not synthesized by an organism – usually humans – and needed in milligram or submilligram doses each day for survival. This means that vitamins are vital nutrients which are not synthesized by the human body but – unlike other chemicals – they are only needed in very small amounts. The reason for this is that vitamins are usually used only as means -not as ends – within our body’s biochemistry. So the body uses vitamins as intermediaries for a lot of biochemical processes and only a few vitamin molecules are actually damaged along the way. If a small dietary intake is not made to replace the lost soldiers your body will eventually run out of these “messengers” and

you will die.



Why in the world do plants need vitamins ? The truth is that plants don't need vitamins because they are the organisms which produce them. Consuming vitamins is vital to us – humans – because we cannot make them within our bodies. However, the vitamins we eat come naturally from plants or other organisms who have eaten plants as well. So do plants need vitamins ? No, they don't. The question now would be : do plants benefit from the addition of vitamins to their roots and/or leaves ? The fact is that there is simply absolutely NO scientific evidence published in a peer reviewed journal that points this out to be the case. I carried out an extensive search for any scientific literature that evaluated the effect of vitamins on plants and I came up with nothing. No one has studied this and no one has ever claimed that there is any benefit whatsoever gained from adding vitamins to nutrient solutions. Why do sellers do this then ? The fact seems to be that people buy solutions that have vitamins more, just because we have been educated to believe that vitamins are good. So if they are good for us, then maybe for our plants too.

The truth is that whatever benefit is gained from adding vitamins is not documented or accurately studied by an unbiased third party so up until now there is no scientific evidence to prove that vitamins do anything more than add to the price tag of whatever hydroponic nutrient you are getting. The fact is that as many other substances, vitamins may just be used – either by microorganisms within the solution that cannot produce them – or they may simply decompose as oxygen reacts with them. So next time you are going to buy your nutrients you should ask yourself... Is there really any benefit to this additive ?

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# Choosing a LED Grow Light for your Hydroponic Crop

One of the most common problems faced by urban gardeners who want to deal with hydroponic crops is lack of light. Generally plants need very large amounts of light to grow which can only be given by very powerful and expensive lamps which also have the big draw back of consuming large amounts of power. The solution – now readily available – is to buy light emitting diode (LED) lamps to deal with a very efficient yet low consuming light source for your plants. On today's post I want to talk to you about how you can choose your light emitting diode lamp for hydroponic growth and what lamps you should definitely avoid if you don't want your crop not to be a total failure.

So what is so expensive about current lamps and so great about LEDS ? Currently the traditional way to supply artifical light to crops has been the use of full spectrum lamps which can be either tungsten metal halide or high pressure sodium (although sodium lamps have a much narrower spectrum). These lamps are very inefficient – wasting most of the power given to them as heat – and therefore consume great amounts of power. A high pressure sodium lamp (HPS) needs to consume about 400-700W to be able to sustain an average tomato plant. The truth is that most of this energy is wasted as heat and almost none of it (around 20-40W of light) are actually absorbed by the plant.

Here is when LEDS come to save the day. Light emitting diodes are very efficient in generating light from electricity (wasting only a small fraction of the energy as heat) and they also provide light in very narrow ranges which can be tuned to only supply the wavelengths needed by plants. The reason why plants are green is because their main photosensitive pigment is chlorophyll (there are several types by the way), a pigment that absorbs red and blue wavelengths and reflects green. With this in mind – not only are LEDS able to supply your hydroponic plants with a higher efficiency – but they are also able to provide your plant with only the colors of light it needs. Achieving a double gain in efficiency. As a matter of

fact, a LED lamp with just 60W is enough to grow a tomato plant.

However, not all LEDS are created equal. Many people think that all LED lamps are the same and they end up buying cheap LED lamps or panels that simply do not provide plants with the energy they need to grow. There are generally two kinds of LEDS available for lamps. The first kind – low power LEDS – are the type of lights used to make your computer and keyboard lights. These lights are weak and they are usually sold in the forms of panels with HUNDREDS to make them appear “useful” for hydroponic growth. The second – high power LEDS – are lights used for traffic lights and high power applications and they ARE the type you need for hydroponic growth.

  

In general, when you are looking to replace your TMH or HPS lamps with LEDs you need to look for high power LED lamps in the range of 50-100W for each 400W lamp you want to replace. You also need to look at the red to blue light ratio since different plant varieties need different proportions of light. If you are growing plants that need to have flowers then you will need to aim for a red to blue ratio of about 8:2 while plants that do not produce flowers may grow well with only red lights. This is – of course – a very course guide to the light color ratio but it may guide you well when you are looking for lamps for a certain crop.

With this small guide and knowledge you will be able to eliminate most lamps that do not work and buy high power LED lamps that will deliver and provide you with a much more efficient, cooler and more eco-friendly way to provide your hydroponic crop with artificial light.