

HydroBuddy's Hydroponic Database

Online Formulation

There are certainly thousands of different ways in which a hydroponic nutrient solution can be prepared. You can make a solution schedule to closely follow the environmental and growing conditions of a certain crop – like tomatoes – or you can simply make up a generic formulation to use within all your hydroponic plants. Besides this we also have an incredible amount of commercial formulations you would perhaps like to imitate and a ton of ways in which you can experiment with nutrient ratios to improve things such as the flavor, size and production of your crops. Since there are so many ways in which we can prepare nutrient solutions I have decided to create an Online Nutrient Database we can use to store and easily access all this information.

My hydroponic nutrient calculator – a.k.a HydroBuddy – has the ability to save and load formulations for the creation of almost any hydroponic nutrient solution. Since the calculator has the ability to grab external files and load them into its internal database I saw no reason why we couldn't create an online database in which we could keep a global record of all the formulations we find and develop. The calculator – since v 0.95 – includes a “download online database” button which downloads all the formulations kept within the online database to the grower's HydroBuddy program. This way the user doesn't have to keep on downloading the database manually but simply by pressing a button all the information is automatically re-downloaded and updated. Added to this is the benefit that the users other loaded formulations remain intact as the calculator detects which formulations are downloaded and which ones were created by the local user.

Quick Load Formulations List

0

0

0

0

0

0

Name of the Formulation

Name of the Formulation

Quick Formulation Load

Use this new button to download the online formulation database. Everytime you click it an updated version of all the formulations is downloaded to your computer from my website

The idea of this online database is to put all the information available about nutrient formulations into one place so that people all around the world can benefit and experiment with different setups. Added to this is the ability to make the imitation of commercial formulations even easier since the formulations can be kept within the online database. So in my mind it is a win-win situation for everyone, we get to have the opportunity to create a unique database filled with information about solutions from both empirical, commercial and academical sources while we retain the flexibility to use them or modify them within HydroBuddy as we please. This also makes the standardization of formulation use much easier since you can easily tell people what HydroBuddy database formulation you are using and they can easily then reproduce what you have or change it slightly to fit the nutrients available in different regions of the world.

How can you contribute to this database ? **In order to add a file to the database you need to send me an email to [dfernandezp\(at\)unal.edu.co](mailto:dfernandezp@unal.edu.co)** , you need to include the name of the formulation you are adding, its intent and source (what plant or if its an imitation of what commercial fertilizer) and a file created by HydroBuddy with the necessary information. In order to create this file just save the formulation on the "Desired Formulation" tab then send me the file created within HydroBuddy's directory. After you send me your contribution I will add it to the Online Database so that everybody will be able to download it with the click of a button.**If you want to send many files just put them all within**

a zip files so that they will be easier to download from my email client, include in the body of the email the necessary descriptions for each file as detailed above.

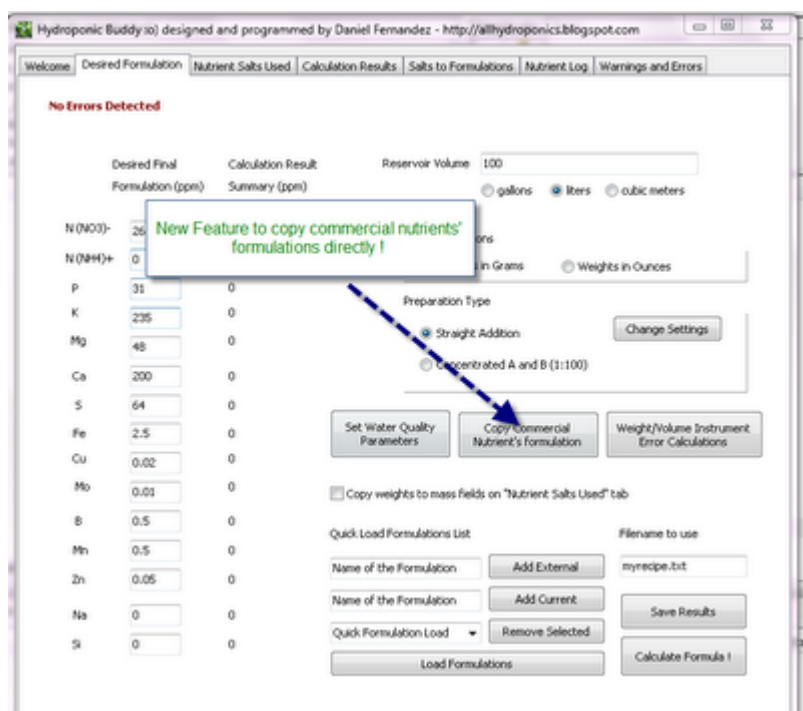
So if you have been waiting for an opportunity to contribute to HydroBuddy feel free to share with me any formulations you might have found or created that you would consider useful for someone. If you have spent a lot of time taking the formulations of commercial nutrients and translating them into HydroBuddy you can now share this knowledge with the rest of the world. I will also do my fair share to add new formulations to the online database, particularly regarding academic sources since most people do not have access to the research databases where the articles detailing them can be found.

If you want to contribute and support HydroBuddy but you do not want to send any formulations feel free to donate using the paypal donate button on the left hand sidebar :o)

Imitating Commercial Nutrients : A Tutorial Using HydroBuddy (my free Hydroponic Nutrient Calculator)

A few months after the first official release of [my free hydroponic nutrient calculator](#) it seems that many people are using it to imitate commercial hydroponic fertilizer formulations. Although the calculator had the capacity to do

this from the time when the “salts to formulations” feature was implemented many users apparently did not know how to use this very well and the process seemed to be more extensive than what would be ideally necessary to get the end ppm concentration values of some commercial fertilizer formulations. In order to make the process far easier I decided to implement a new feature within the calculator that allows anyone to easily input the guaranteed analysis of any commercial fertilizer, the density, the amount of mL or grams added per Liter or gallon and get the end ppm values which can now be used as a recipe in order to come up with a personal formulation that exactly mimics this end result.

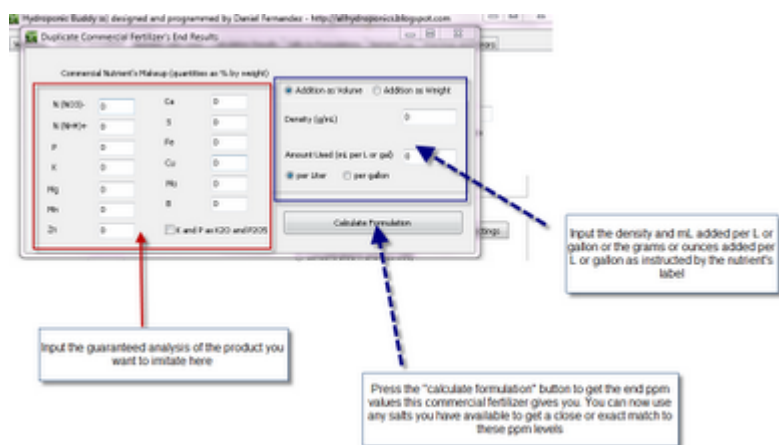


This new feature – as shown above- is accessible through a button in the “Desired Formulation” tab. This button is located between the water quality and instrument precision buttons, just below the “preparation type” dialogue box. When this button is clicked a new window pops up in which the user can input the percentage composition of the commercial fertilizer he/she wishes to imitate as well as the manner in which this commercial fertilizer is supposed to be added in order to arrive at the final concentrations intended by the manufacturer.

For liquid fertilizers the maker usually gives you a volume measure to add per gallon or liter which should be expressed as mL per gallon or liter (you can choose if you want to

specify the quantity added per gallon or liter using the radio buttons for this purpose). In the case of solid fertilizers the label usually tells you to add a given number of grams or ounces per liter or gallon. You can choose between specifying a given volume and density or a given weight by using the “Addition as weight” or “Addition as volume” radio buttons located at the top right of the new window.

Once you input these parameters you are now ready to get the intended end result for this commercial fertilizer by using the “Calculate Formulation” button. When you click this button the program will automatically calculate the end concentrations which result from adding the amount of the commercial nutrients you specified with the composition you also specified. These values are automatically copied to the “Desired Final Formulation” column and they can now be used to imitate the commercial formulation. You can now select a given number of salts you have available and use the regular preparation types in order to come up with a direct addition or 1:100 concentrated solution which will match up the end concentration results achieved with the commercial fertilizer you input.



Of course, this will NOT guarantee a perfect copy of the commercial fertilizer since many of the ingredients a commercial fertilizer may contain may not be listed or they can be listed but their actual concentration levels may not be specified. For example you will find that many commercial

nutrients contain Boron but their guaranteed analysis does not show it. This is mainly because the law does not require them to include boron in their analysis and therefore they will add it but they will not disclose its actual concentration or sometimes even its presence. Several other additives or nutrients may receive similar treatment so for this reason it is always good to make up A and B concentrated solutions or direct additions which include ALL elements necessary for plant growth.

Do you find this feature useful ? Is there any feature that you would like to see implemented in hydrobuddy ? Feel free to leave a comment with any opinion or suggestion you may have :o)

My Hydroponics Calculator : Features and Objectives

For those of you interested in the preparation of your own hydroponic nutrient solutions, my hydroponic nutrient calculator should prove to be a very useful (hopefully invaluable !) tool to complete this endeavor. Within the following paragraphs I want to talk to you about the main objectives and uses of my calculator as well as some of the confusions that arises when people new to hydroponics and the chemistry of nutrient solutions starts to use it. After reading this you will be able to know precisely what my calculator does, how it can be useful to you and what the calculator simply doesn't do.

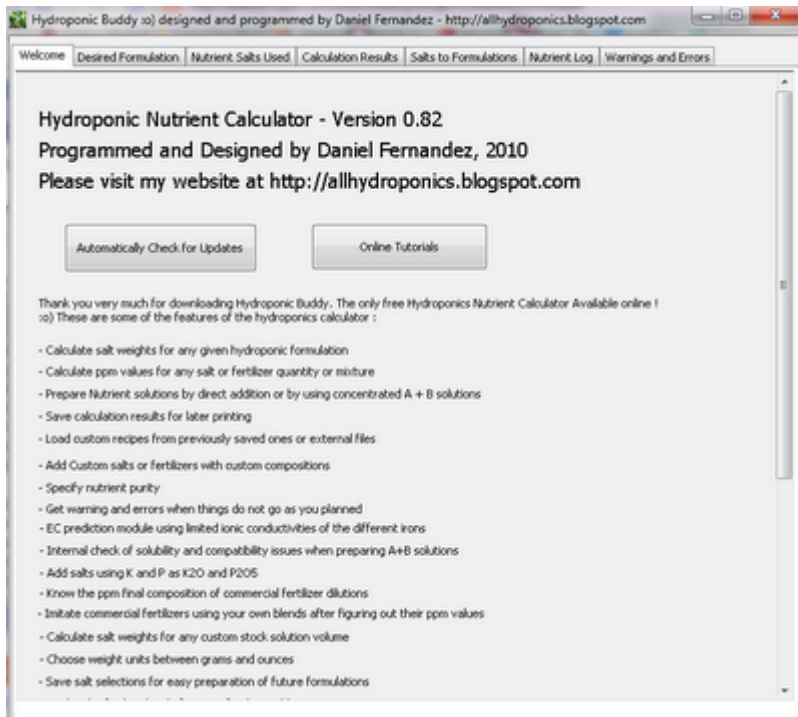
My hydroponics nutrient calculator (hydrobuddy, [which you can get here](#)) is a tool designed to aid people to prepare their own hydroponic nutrient solutions in a straightforward and easy manner. The idea of the calculator is to make all the mathematical calculations needed to go from a desired

formulation composition to a given weight of a fertilizer salt much easier than how it usually is with excel spreadsheets or manual calculations. Hydrobuddy therefore allows a person to know exactly how the addition of a given salt affects the concentration of a certain number of elements within a hydroponics solution, allowing the user to select and use the salts that precisely fit his/her desired formulation.

The main function of hydrobuddy is to take a given formulation specifying the concentration of all the giving nutrients as ppm and translate it into the necessary weights of salts or fertilizers needed to achieve these concentrations. It is however important here to note that these ppm values have NOTHING to do with the ppm values read by your EC meter. The values an EC meter reads as ppm are TDS or salinity measurements that correspond to the concentration of a sodium chloride solution of equivalent conductivity. This measurement has nothing to do with the ppm values used to specify the concentrations of the different nutrients within a solution.

Hydrobuddy also allows you to do some other very interesting things such as the calculation of salt weights for concentrated (1:100) stock solutions and the use of the "straight addition" method that allows you to calculate the weights of salts you need to add directly to a reservoir to arrive at certain concentration levels. Hydrobuddy also contains a "salt to formulation" feature which allows you to input a given weight of a salt or fertilizer and obtain the ppm values you would arrive to within your solution. This should be especially helpful for those of you looking to use hydrobuddy as a way to calculate the concentrations you get when you using specific weights of commercial fertilizers; it is also great if you want to manually tweak your calculation results if the calculator doesn't give you the salt proportions you desire.

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The calculator also has a “nutrient log” feature that allows you to keep a record of how your hydroponic solution evolves, warning you when it is time to change solutions in recirculating systems or when pH swings are too wild. Hydrobuddy also allows you to use the “run to waste” option to login the pH and EC in-out measurements of your system to keep a record of how it evolves as a function of time. The nutrient log allows you to plot the evolution of your hydroponics system and quickly realize and correct any problems that might be happening.

If your water is very hard or if you have other problems such as high nitrate concentrations, hydrobuddy allows you to input your water quality parameters by pressing the “water quality” button, letting you take into account the hardness and quality of your water when preparing hydroponic solutions.

As you see my hydroponic calculator allows you to do many things easily which would definitely take a long time to do if done manually or with excel spreadsheets. The calculator allows you to quickly change formulations, used salts, custom fertilizers, etc without having to do a lot of effort. The checklist interface and the ability to save and load

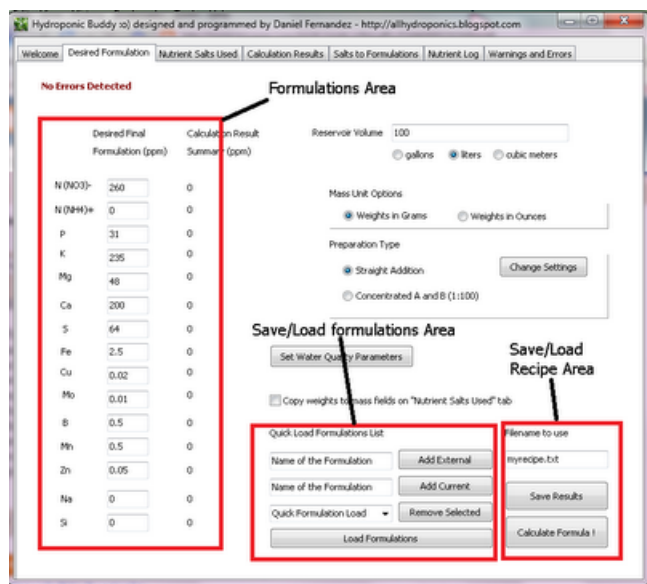
formulations makes the program ideal for those of you who do a lot of hydroponic growing with custom solutions but don't want to go through all the math or spreadsheet changes every time the formulation needs or when some nutrient sources need to be changes.

My Hydroponic Calculator Tutorial : Saving and Loading Formulations and Recipes

One of the greatest features of my hydroponic nutrient calculator ([which you can get here](#)) is the ability to save and load recipes and formulations into the software. These options open up a lot of possibilities and allow you to quickly and effectively modify your previous work or get the information you need for the preparation of new reservoirs or stock solutions pretty quickly. However for many people the use of these features is not that straightforward, reason why this tutorial focuses on showing you how you can exactly use the different buttons to save and load different formulations and recipes.

First of all we need to make a clear distinction between what I call a "formulation" and what I call a "recipe". A formulation is simply the group of desired values of concentrations you want to achieve for the different nutrients within your final nutrient solution. A formulation does not deal with weights or specific salts but it mainly specifies the concentrations of the different nutrients expressed as elemental ppm values within the solution. A recipe – on the other hand – includes the results of a calculation for a specific formulation, reservoir volume and a specific set of salts, the recipe tells you exactly how much of each salt you

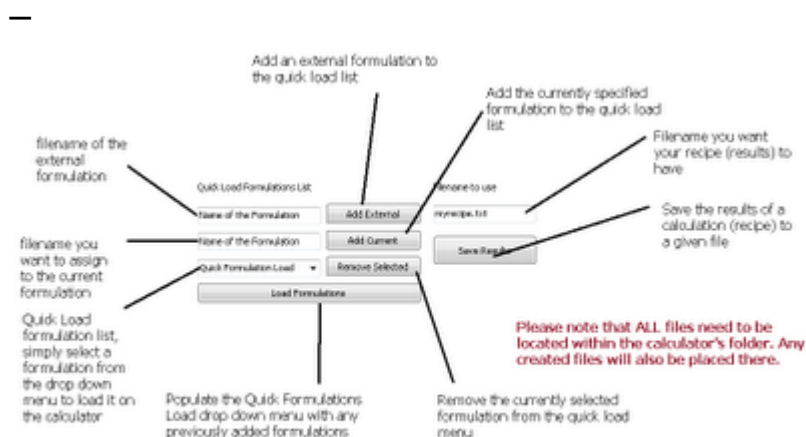
need to add in a given volume of water to prepare a given final or stock solution. So the formulation contains merely the concentrations you want to achieve while the recipe contains the amounts of salts needed to weight to achieve a given concentration on a given reservoir or stock solution setup.



The image above shows you the areas within the calculator that deal with the inputting of the formulation, the saving/loading of formulations and the saving of recipes. After you specify a given formulation within the formulation area, you'll be able to save it using the "Add Current" button, which simply adds your formulation to the "quick load list" drop down menu right below it. Additionally you can add an external formulation by inputting the exact filename next to the "Add External" button and clicking this button. Remember that any external formulation files you want to add must be placed in the exact same folder as the hydroponic calculator's executable. Once you restart the program, the quick load list will be lost but you will be easily able to repopulate it using the "Load formulations" button which adds all the previously saved formulations to the quick load list.

One of the most useful features of this implementation is that you can easily share formulations with other people simply by

sharing with them the files created by the calculator. When you use the “Add current” button, a file is created within the calculator’s folder containing all the necessary information for the calculator to interpret the formulation. If you want to share your formulation just send this file to the person you want to share it with and tell him or her to load it using the “add external” button and field after adding the file to the calculator’s folder.



Another very interesting feature is the ability to save recipes. Once you select the salts and do the calculations for a given nutrient solution formulation you will be able to save all the results using the “Save Results” button. This creates a file within the calculator’s folder with all the necessary salt weights and instructions necessary to carry out the preparation. You can now print this file and use it when you are preparing the formulation or you can share it with others so that they will be able to reproduce your recipe with the exact same salt additions, volumes, etc.

As you see, the calculator provides you with a great set of features that allow you to easily save/load formulations and save and share recipes for hydroponic culture. Using the above mentioned features you should be able to save your formulations, save modifications of your formulations, quickly load formulations using the quick load menu, load external formulations onto the quick load list, save recipes and share your recipes and formulations with others around you who might

also be interested in them. This is a great tool if you are sharing knowledge and the preparation of nutrients within a forum since others will be able to easily load and checkout your formulations and modifications without a lot of effort.

Preparing Your Own Hydroponic Nutrients : A Complete Guide for Beginners

Chances are that if you are into hydroponic gardening and you live in Europe or in the US you have been buying your nutrient solutions from one of the many hydroponic nutrient sellers available locally. Generally people do not prepare their own nutrients because they consider this task “terribly difficult” and they prefer to keep buying previously made formulations so that they don’t have to deal with the technical problem of making their own fertilizers. What most people don’t realize is that the profit margin of hydroponic nutrient producing companies is HUGE. You would be surprised to know that each one of those concentrated nutrient gallons you buy costs only a few dollars to make (sometimes even only pennies) and you are probably paying a few times what the whole fertilizer is worth.

Obviously if you are going to be growing plants for a long time or if you simply want to grow a large garden the buying of this commercial nutrient solutions is not an option and starting to make your own formulations – adjusted to your own needs – becomes the main priority. On today’s article I will be speaking to you about how to prepare your OWN solutions using my nutrient solution calculator, carefully explaining to

you what you need, where to buy it and what you should expect. I will guide you through making your own first A+B solution by YOURSELF getting all the chemicals and utensils you need easily and economically.

So what do you need to make your own nutrients ? The list below shows you the things you will need to start making your own A+B solutions. You will notice that you will need two scales since we are going to have to weight two "nutrient sets" with different precision, micro nutrients (which are used only in small amounts, need to be weight more precisely) and macro nutrients (which are used in larger amounts and therefore need scales with larger capacity).

Note, the links below are amazon affiliate links. This means you help out this blog by buying through these links at no extra cost to you.

- Scale that can weight down to 0.01 g at a +/- 0.01g precision (something [like this](#) is perfect) with a max weight >100g.
- Two Empty one gallon containers with caps
- Plastic Spoon
- Plastic small container (to weight salts)
- A source of R0 or distilled water (your tap water will NOT work)
- Download my hydroponic nutrient calculator [here](#).

Now these are the chemicals you will need (an online purchase link is included for each one) :

- Calcium Nitrate ([here](#))
- Magnesium Sulfate Heptahydrate ([here](#))
- Potassium Nitrate ([here](#))
- Copper Sulfate Pentahydrate ([here](#))
- Mono potassium phosphate (also known as Potassium Monobasic phosphate) ([here](#))
- Manganese EDTA ([here](#))


- Zinc Sulfate Monohydrate ([here](#))
- Sodium Molybdate (dihydrate) ([here](#))
- Boric Acid ([here](#))
- Iron EDTA ([here](#))

These chemicals can be bought in a variety of places but there is a link next to each one showing you a link where you can actually make the purchase. Often it is also possible to get these chemicals on ebay. The purity may not be as guaranteed as when purchased from a regular supplier but it is good enough for practical purposes in hydroponics.

Of course you may see right now that the initial investment might be significant (from 100 to even more than 500 USD depending on whether you buy 50lb or 1lb quantities of macro nutrients) however after this purchase you will be able to produce more than one hundred gallons of concentrated A+B solutions which would cost you more than 10 times the price you will be paying if you bought them commercially. After doing the math you will see that this is a GREAT way to save money and produce your own solutions ! Hey you could even start selling to the neighbors !

After you buy the chemicals, open my hydroponic calculator and select the "Hoagland Solution". Then click the "Concentrated A+B Solutions" radio button and make sure you select the "Input Desired Concentrations" option. Set the amount of stock solution volume to 1 and the radio button to "Gallons". Then click the "Substance Selection" button and make sure you add all the substances that are from the above list into the "Substances Used for Calculations" list. Now click the "Carry Out Calculations". Your screen should look like the picture shown below .

| Element | Target Conc. (ppm) | Result (ppm) |
|----------|-----------------------------------|--------------|
| N (NO3-) | <input type="text" value="210"/> | 216.165 |
| N (NH4+) | <input type="text" value="0"/> | 11.308 |
| P | <input type="text" value="31"/> | 33.789 |
| K | <input type="text" value="235"/> | 232.791 |
| Mg | <input type="text" value="49"/> | 49 |
| Ca | <input type="text" value="200"/> | 195.328 |
| S | <input type="text" value="64"/> | 64.689 |
| Fe | <input type="text" value="2.9"/> | 2.9 |
| Zn | <input type="text" value="0.05"/> | 0.05 |
| B | <input type="text" value="0.5"/> | 0.5 |
| Mn | <input type="text" value="0.5"/> | 0.5 |
| Cu | <input type="text" value="0.02"/> | 0.02 |
| Mo | <input type="text" value="0.05"/> | 0.05 |
| Na | <input type="text" value="0"/> | 0.024 |
| Si | <input type="text" value="0"/> | 0 |
| Cl | <input type="text" value="0"/> | 0 |



Zero all targets
 Disable Pop-ups
 Small Window

Substance Selection

Stock solution volume

Gallons
 Liters
 Cubic Meters

Concentration Units

ppm
 mM
 M
 mN

Mass Units

Grams
 Ounces

EC Model

LMC
 Empirical

Solution Preparation type

Concentrated A + B Solutions
 Direct Addition

Concentration Factor Calculate liquids in mL

Calculation Type

Input Desired Concentrations
 Concentrations from Weights

This is how the calculator should look after you click the “Carry out Calculation” button. Note the selections that are active.

Now that you have calculated the weights needed you should go to the “calculation results” tab where you will be able to find the weights of the different nutrients you need to prepare the solution in the amount you specified. The results of the calculation to prepare 1 gallon of A and 1 gallon of B stock solutions are shown below.

| Substance Name [click for url] | Formula | Mass (g) [Edit to fine-tune] | Preparation Cost |
|--------------------------------------|------------------------|------------------------------|------------------|
| B - Copper Sulfate (pentahydrate) | CuSO4.5H2O | 0.03 | 0 |
| A - Iron EDTA | Fe(EDTA) | 8.444 | 0.5 |
| B - Mn EDTA | MnEDTA | 1.456 | 0.1 |
| A - Calcium Nitrate (ag grade) | 5Ca(NO3)2.NH4NO3.10H2O | 389.156 | 3.1 |
| B - Zinc Sulfate (Monohydrate) | ZnSO4.H2O | 0.052 | 0 |
| B - Boric Acid | H3BO3 | 1.083 | 0 |
| B - Sodium Molybdate (Dihydrate) | Na2MoO4.2H2O | 0.048 | 0 |
| B - Magnesium Sulfate (Heptahydrate) | MgSO4.7H2O | 188.119 | 0.4 |
| B - Potassium Monobasic Phosphate | KH2PO4 | 56.202 | 2.5 |
| A - Potassium Nitrate | KNO3 | 186.121 | 4.1 |

| Element | Result (ppm) | Gross Error | Instrumental Error |
|----------|--------------|-------------|--------------------|
| N (NO3-) | 216.165 | 2.9% | +/- 0% |
| K | 232.791 | -0.9% | +/- 0% |
| P | 33.789 | 9% | +/- 0% |
| Mg | 49 | 0% | +/- 0% |
| Ca | 195.328 | -2.3% | +/- 0% |
| S | 64.689 | 1.1% | +/- 0% |
| Fe | 2.9 | 0% | +/- 0.1% |
| Zn | 0.05 | 0% | +/- 19.3% |
| B | 0.5 | 0% | +/- 1% |
| Cu | 0.02 | 0% | +/- 33.7% |
| Mo | 0.05 | 0% | +/- 21% |
| Na | 0.024 | 0% | +/- 0% |
| Si | 0 | 0% | +/- 0% |
| Cl | 0 | 0% | +/- 0% |
| Mn | 0.5 | 0% | +/- 0.7% |
| N (NH4+) | 11.308 | 0% | +/- 0% |

Total Cost is 10.7

Values calculated for the preparation of 1 gallons of A and 1 gallons of B solution. Please use 10mL of A and B within every Liter of final solution

Predicted EC Value

EC=1.81 mS/cm

Stock Solution Analysis

Nutrient Ratio Analysis

Detailed Per Substance Contribution Analysis

 Export To Csv

Amounts of salts to be weighted to prepare 1 gallon of A and 1 gallon of B solution.

You should now follow these steps to prepare the solution:

- Mark one gallon container with an A and the other with a B. One gallon will contain all the A salts, the other all the B salts.
- Fill each one gallon container with half a gallon of RO or distilled water
- Weight one salt on the plastic container you set apart for measuring. Make sure you always DOUBLE check the weights and the appropriate A or B gallon container you need to add the salt to.
- After you measure the salt transfer it to either the A or B gallon container (depending on which one it should go into). Use a little bit of water (RO or distilled) to

transfer any remains that cannot be easily added and dry the container you are using to weight before measuring the next salt.

- Shake the container where you added the salt and make sure it is fully dissolved before measuring and adding the next one.
- Do the same as above for all the salts
- After you are done adding the salts add half a gallon of water (again RO or distilled) to each container
- Then seal the containers and shake them vigorously
- You have just prepared your first batch of self-made nutrient solution !

The above formulation is a general multi-purpose blend – a Hoagland solution – that should allow you to grow a large variety of plants. You simply need to add 10mL of A and 10mL of B for each final LITER of nutrient solution. You should use your pH meter and EC meter to adjust these values as you do with your regular commercial nutrients.

It is very important now to keep your solid chemicals stored in air-tight container in a dark and cool place. Some chemicals like calcium nitrate will absorb moisture and become useless if you leave them in contact with air for prolonged periods of time!

Of course, once you are more comfortable with preparing your own nutrients you can research the available literature for some custom formulations available to grow each one of your plants under its favorite nutrient levels. I hope this tutorial has allowed you to reach a new level in your hydroponic gardening experience, hopefully accompanied by a drastic reduction in your soil-less gardening costs !

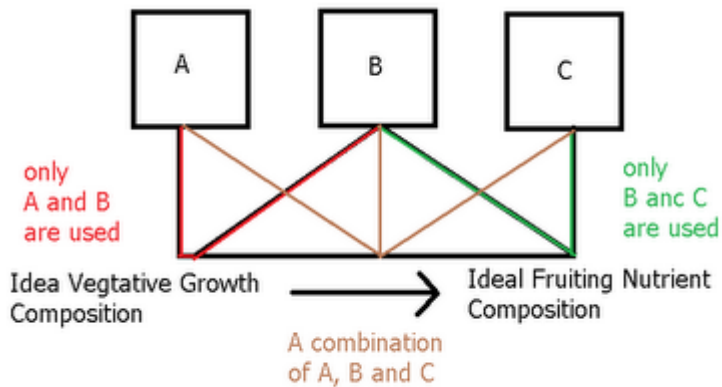
Make sure you also checkout [this youtube video](#) for a similar tutorial using a premade chelated micronutrient mix.

Preparing A, B and C (three part) Concentrated Nutrient Solutions, a Tutorial for my Hydroponic Nutrient Calculator

On the last tutorial dealing with my hydroponic nutrient calculator we learned how to prepare A and B concentrated nutrient solutions for any given formulation we would like. We learned about the different incompatibilities that need to be avoided and why this leads to the creation of two separate solutions. After learning how to prepare these solutions many of you may be interested in knowing how to make the three part formulations commonly made available by most hydroponic nutrient sellers. For example, companies like Advanced Nutrients and General Hydroponics offer three part formulas which are meant to be combined to ensure adequate nutrition during a plant's whole growing cycle. Today I am going to explain to you the main objectives of a three part formula, the difference with a two part formula and how you too can prepare your OWN three part nutrients to feed your hydroponic plants through their whole vegetable, flowering and fruiting cycles. As with the past two tutorials you will need to download my hydroponic nutrient calculator available [here](#) for free.

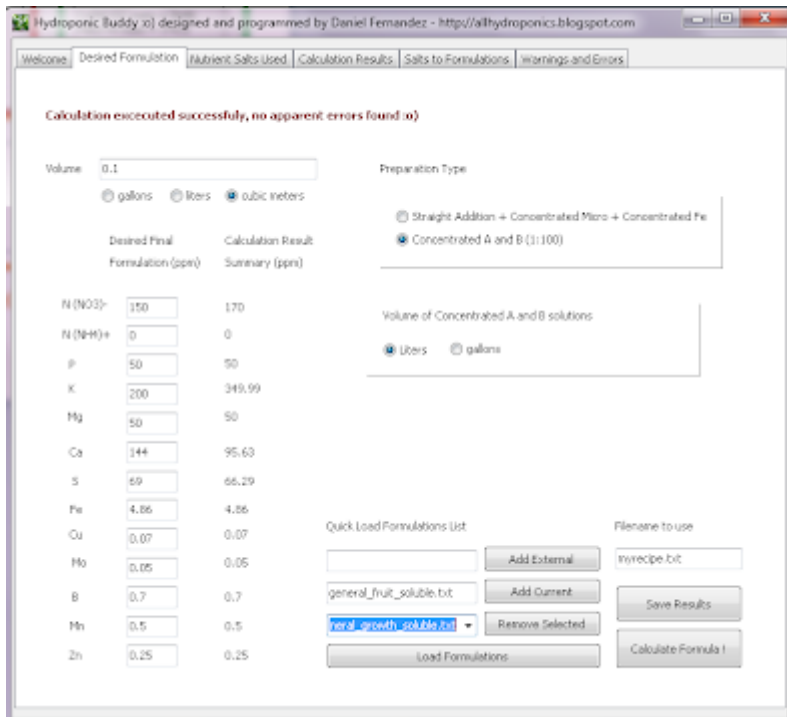
What is the difference between a 2 and a 3 part formulation ? What we need to understand here is that plants usually have different needs through their whole life cycle and therefore they require different nutrient ratios as they grow older and face different stages of their development. With a two part concentrated nutrient based formulation we can only vary this ratios in a certain way and doing any variations outside this scope will not be possible. With the default approach in my

calculator you can vary nutrient ratios by varying the “desired formulation” every time you prepare your reservoir again (since most nutrients are added directly) but with the A and B concentrated solutions you are bound to “stick” to a certain set of concentration values for each nutrient.

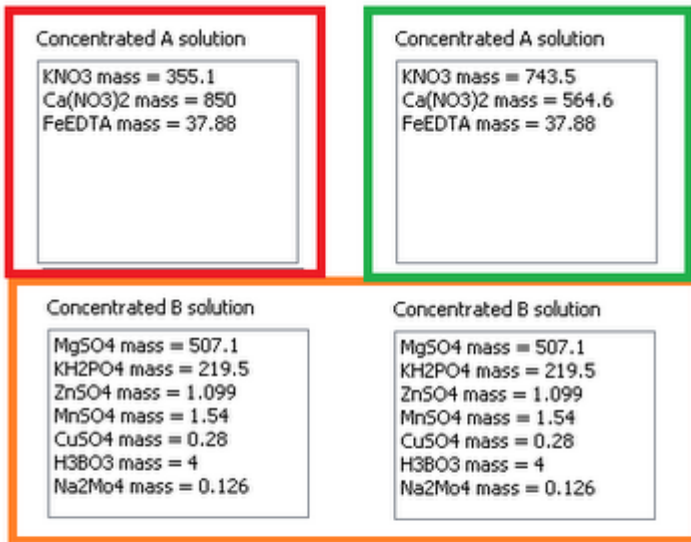


The solution to this problem is quite simple and this is what most commercial fertilizer sellers have come up with. You have two solutions with the same salts but varied nutrient ratios and a third solution that remains constant. What we have then is two possibilities of final compositions A-B and C-B and a whole new possibility for nutrient ratios by combining A-B-C. What is done most of the time is that A-B becomes an ideal formulation for vegetative growth while C-B is an ideal formulation for fruiting. When you start to grow you generally do so with A-B and then you move towards C-B by increasing C and decreasing A as reservoir changes happen.

In my program this sort of solution scheme is easily achieved. What you need to do is simply to have two desired formulations, one for ideal growth and one for ideal flowering and then you just need to make two sets of A and B calculations where B is shared amongst the two. To do this we will first load the `general_growth_soluble.txt` and `general_fruit_soluble.txt` desired formulations as indicated on the tutorial for the preparation of A and B formulations (you can download them [here](#) and [here](#)). After loading the `general_growth_soluble.txt` composition you should have the formulation composition displayed below.



Then follow the same procedure outlined on the “A and B solution tutorial” to arrive to the salt-weight compositions of the A and B formulations (save the results using the “save results” button) . Now load the general_fruit_soluble.txt formulation and repeat the calculation, also saving your results. A summary of the results of both calculations is shown in the image presented below. You will notice that both calculations share the same weights for the B solution (meaning they use the same B solution) while the composition of the A solution changes. What you have now is a basic three part formulation. You could now think about a regime to change from an A-B growth solution to the C-B fruiting solution in the amount it takes your plants to bear fruit.

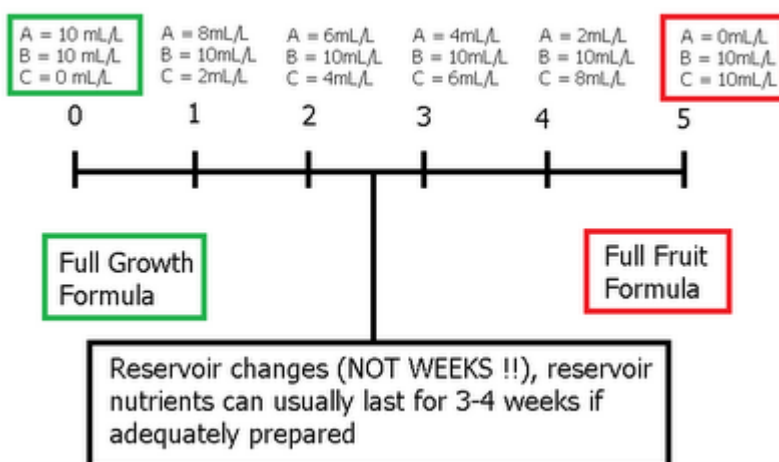


Shared B solution

A Solution

C Solution

For example, if your plants took approximately 5 reservoir changes you would then use different quantities of A and C to go from a 100% A feed to a 100% C feed during that time. A timeline if it takes your plants 5 reservoir changes to get to fruiting is shown below. Note how in the beginning we use 10mL of A per liter and then in the end we use 10mL of C per liter, meaning that we have done a full gradual change from a growth to a fruiting formulation.



As you see from the above, you can easily use my hydroponic calculator to prepare your own three part concentrated

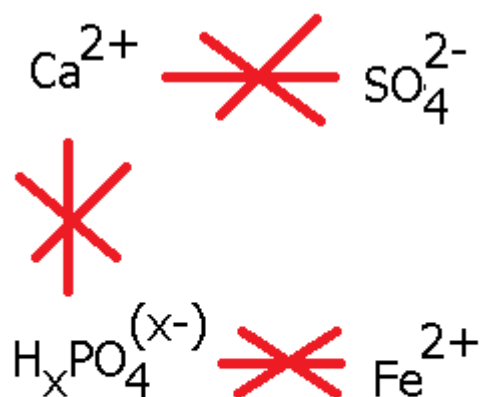
nutrient blends which you can use to build your own nutrient schedule to go from vegetative growth to fruiting. However if you are currently using a fixed composition of a three part commercial nutrient blend then you can easily prepare an A and B solution to replace it, three part nutrients are ONLY needed when you want to do a varying schedule like the one introduced above, using three part nutrients without doing this is simply an overcomplication since a fixed composition can be prepared using just two custom concentrated solutions.

Preparing A and B Solutions Using My Hydroponics Nutrient Calculator

The default way in which solutions are prepared using my hydroponic nutrient calculator involves the direct addition of some component in your nutrient reservoir plus the preparation of some micro nutrient and iron concentrated solutions from which 10 and 100mL are added per batch. This way of preparing solutions is specifically suitable for people with large reservoirs and commercial hydroponic growers since when reservoir levels go above 4 cubic meters all nutrients can be added directly to the reservoir, saving the time and cost of preparing any concentrated solutions. The approach is also good for people with small reservoirs since you can prepare the micro and iron concentrated solutions, dissolve other salts directly and in the end you will have a very accurate amount of micro and macro nutrients prepared with your own custom formulation. However upon the request of several people I implemented an approach that allows people to prepare traditional formulations using an A+B concentrated nutrient solution approach in which two concentrated solutions at a 1:100 ratio are prepared and then simply diluted to prepare

the final hydroponic reservoir's contents. On today's post I will discuss this approach and how you can use it if you have the appropriate nutrient salts. Please download my hydroponic nutrient calculator [here](#) to follow this tutorial.

Before we go into the main aspects of the preparation of concentrated solutions we must first understand the incompatibilities that are present within concentrated solutions that restrict the salts that can be used. The program checks for these incompatibilities automatically when using any of the saved salts and for this reason custom salts cannot be used for the A and B custom preparation. The main incompatibilities are shown on the image below. Mainly what we want to ensure is that certain ion pairs that would precipitate insoluble salts are never present together. For this we should avoid putting calcium and sulfate ions together as well as calcium and phosphate species and iron and phosphate species.



$x = 1 \text{ or } 2$

What we have left is the layout shown below that describes the general distribution of ions relevant to solubility of an A and B hydroponics formulation makeup. As you see what we achieve by dividing the concentrated solution into two is to keep away the ions that would precipitate when put together. This of course also restricts our ability to use iron sulfate and a different source of iron, either a chelate (FeEDTA, FeDPTA, etc) or iron nitrate must be used. It also restricts our sources of Calcium to calcium nitrate and therefore our sources of phosphate and sulfate are reduced to potassium salts.

Solution A

Nitrates
Iron
Calcium

Solution B

Phosphates
Sulfates

Now let us use our basil_soluble.txt example to calculate the composition of the given A and B solutions needed for this formulation. Unzip the calculator and txt files to any given directory and input basil_soluble.txt under the field next to the “add external” button in the “Desired Formulations” tab, then click the “add external” and “Load Formulations” buttons and select the basil_soluble.txt formulation from the drop down menu. The end result of this process is shown on the image below. Also make sure you check the “Concentrated A and B” option so that the program calculates the results for these solutions instead of the regular method.

The screenshot shows a software interface with the following elements:

- Volume:** 0.1 (with radio buttons for gallons, liters, and cubic meters).
- Preparation Type:** Radio buttons for "Straight Addition + Concentrated Micro + Concentrated Fe" and "Concentrated A and B (1:100)".
- Volume of Concentrated A and B solutions:** Radio buttons for "Liters" and "gallons".
- Table of Nutrient Concentrations:**

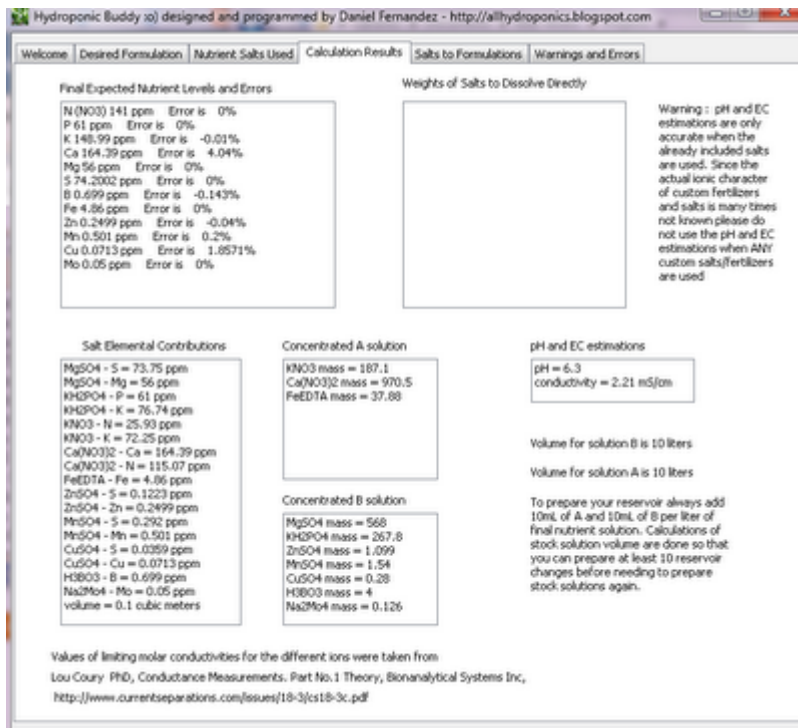
| | Desired Final Formulation (ppm) | Calculation Result Summary (ppm) |
|----------|---------------------------------|----------------------------------|
| N (NO3)- | 141 | 0 |
| N (NH4)+ | 0 | 0 |
| P | 61 | 0 |
| K | 149 | 0 |
| Mg | 56 | 0 |
| Ca | 158 | 0 |
| S | 74.2 | 0 |
| Fe | 4.86 | 0 |
| Cu | 0.07 | 0 |
| Mn | 0.05 | 0 |
| B | 0.7 | 0 |
| Mn | 0.5 | 0 |
| Zn | 0.25 | 0 |

Quick Load Formulations List:

- basil_soluble.txt (with "Add External" button)
- myrecipe.txt (with "Add Current" button)
- basil_soluble.txt (with "Remove Selected" button)
- Buttons: "Load Formulations", "Save Results", "Calculate Formula 1"

After doing this go to the “Nutrient Salts Used” tab and uncheck Calcium Monobasic Phosphate and Iron Sulfate and check Iron EDTA, Potassium Sulfate and Potassium Monobasic Phosphate. Now go back to the “Desired Formulations” tab and click the “Calculate Formula!” button. The program will now calculate the volume of A and B solutions you should prepare

so that it will last for 10 reservoir changes of the volume you have input under the “Desired Formulations” tab. So for this case in which we left the input as 100L the final concentrated solution volume is 10L since it will last for 10 changes of the 100L nutrient reservoir, adding 1L per reservoir change. It should also be clear that the concentration ratio of 1:100 cannot be increased due to solubility limitations of salts. The results of the calculation are shown below.



Hopefully with this tutorial you will be able to prepare any A and B solution for any final formulation you would like. It is also clear that this approach has less flexibility than the “default” since it restricts the character and distribution of the salts used, making the use of very cheap fertilizers like calcium monobasic phosphate effectively impossible. However it also provides an “easy way” to make reservoir changes since concentrated A and B solutions only need to be prepared once every 10 times this happens. So it is clear that both approaches have their advantages and with the help of my calculator you’ll be able to choose whichever approach fits you best :o)

Using my Nutrient Calculator with Commercial Fertilizers : Part No.2

On the last part of this tutorial series I talked about how you could use my hydroponic nutrient calculator to figure out the ppm values of a commercial fertilizer. Today I am going to talk about how you can achieve a given ppm formulation using a commercial preparation figuring out what additional salts you would need to arrive at an adequate composition. I am also going to show how you can figure out the final concentrations of nutrients when using combined commercial fertilizers and salts and how this approach can be used to arrive at full, accurate and complete formulations for your hydroponic reservoir. In the end you will see how my hydroponic calculator (hydroponic buddy) is a great tool for the preparation of your hydroponic nutrients even if you rely solely on commercial formulations. You will need my hydroponic nutrient calculator to follow this tutorial, you can download it [here](#).

Today we are going to use a few commercial fertilizers from General Hydroponics and Advanced Nutrients as well as a hydroponic formula to grow tomatoes. The formula – applied for tomato growth in Florida for the first cluster growth stage – can be found [here](#). We are going to use the FloraBloom and FloraMicro nutrients from General Hydroponics (labels [here](#) and [here](#)) . As with yesterday's tutorial the first thing we are going to do is add all the custom fertilizers within the "Nutrients Salts Used" tab by using the "Add New Salt" button by entering the composition percentages found on the label and composition pages of the above mentioned fertilizers. After doing this we input the desired tomato formulation under the "Desired Formulation" tab like it is shown below.

Volume: 100

gallons liters

Desired Final Formulation (ppm)

| | |
|----------|------|
| N (NO3)- | 70 |
| N (NH4)+ | 0 |
| P | 50 |
| K | 120 |
| Mg | 40 |
| Ca | 150 |
| S | 50 |
| Fe | 2.8 |
| Cu | 0.2 |
| Mo | 0.05 |
| B | 0.7 |
| Mn | 0.8 |
| Zn | 0.3 |

Once we have the formulation we select the custom fertilizers, uncheck all other salts and input a volume of 100 liters. After doing this we press the "Calculate Formula !" button which produces the results shown below. The software also warns us about errors so we need to go to the "Warnings and Errors" tab where we see that certain nutrients are missing from the formulation. In particular we see that we are missing Zn, B and Cu. You will notice that many combinations of hydroponic fertilizers miss one or several essential nutrients for plant growth (even micro-grow-bloom combinations often miss B, Zn and Cu).

Errors or warnings found, check the warnings tab!

| Desired Final Formulation (ppm) | Calculation Result Summary (ppm) |
|---------------------------------|----------------------------------|
| N (NO3)- | 141 |
| N (NH4)+ | 9 |
| P | 62.49 |
| K | 120 |
| Mg | 42.96 |
| Ca | 150 |
| S | 28.64 |
| Fe | 3 |
| Cu | 0 |
| Mo | 0.02 |
| B | 0 |
| Mn | 1.5 |
| Zn | 0 |

Quick Look: Name of it: tonoto_f1 Quick Pan

Warnings and errors

Warning! No Source of Boron Available
Warning! No Source of Zinc Available
Warning! No Source of Boron Available
Warning! No Source of Copper Available

Final Expected Nutrient Levels and Errors

N (NO3) 141 ppm Error is 100.43%
P 62.49 ppm Error is 24.98%
K 120 ppm Error is 0%
Ca 150 ppm Error is 0%
Mg 42.96 ppm Error is 7.4%
S 28.64 ppm Error is -42.72%
Fe 3 ppm Error is -100%
Fe 3 ppm Error is 7.143%
Zn 0 ppm Error is -100%
Mn 1.5 ppm Error is 87.5%
Cu 0 ppm Error is -100%
Mo 0.02 ppm Error is -60%

So right now we need to add sources of these elements to have

an adequate formulation. Go to the “Nutrient Salts Used” tab and select Zinc Sulfate, Boric Acid and copper sulfate and press the “Calculate Formula !” button again. This now produces the results shown below where all elements are present and the program tells us to prepare an additional 1L concentrated solution of Zinc Sulfate, Copper Sulfate and Boric Acid.

Calculation executed successfully, no apparent error

Volume: 100
 gallons liters cubic meters

| | Desired/Final Formulation (ppm) | Calculation Result Summary (ppm) |
|----------------------------------|---------------------------------|----------------------------------|
| N(NH ₄) ⁺ | 70 | 141 |
| N(NO ₃) ⁻ | 0 | 9 |
| P | 50 | 62.49 |
| K | 120 | 120 |
| Mg | 40 | 42.96 |
| Ca | 150 | 150 |
| S | 50 | 20.09 |
| Fe | 2.8 | 3 |
| Cu | 0.2 | 0.2 |
| Mn | 0.05 | 0.02 |
| B | 0.7 | 0.7 |
| Mn | 0.8 | 1.5 |
| Zn | 0.3 | 0.3 |

Weights of Salts to Dissolve Directly

GH+ FloraFlex mass = 300 g
 GH+ FloraFlex mass = 236.45 g

Micro nutrient Concentrated Solution (1L)

ZnSO₄ mass = 13.57 g
 CuSO₄ mass = 7.9 g
 H₂BO₃ mass = 40 g

Final Expected Nutrient Levels and Errors

N(NH₄)⁺ 141 ppm Error is 101.43%
 P 62.49 ppm Error is 24.96%
 K 120 ppm Error is 0%
 Ca 150 ppm Error is 0%
 Mg 42.96 ppm Error is 7.4%
 S 20.09 ppm Error is -42.22%
 B 0.69 ppm Error is -0.143%
 Fe 3 ppm Error is 7.143%
 Zn 0.3 ppm Error is 0%
 Mn 1.5 ppm Error is 37.5%
 Cu 0.201 ppm Error is 0.5%
 Mo 0.02 ppm Error is -60%

However we see now that the formula is not very well balanced since we have a 100% excess of N and a defect in S so to achieve the desired composition it might be necessary to tweak the results slightly in a manual fashion and use some additional salts like Calcium Nitrate. To do this tweaking you should input the weight values obtained on the “Mass” boxes next to each salt’s name (the mass of Zn, Cu and B salts is the mass of the concentrated solutions divided by 100 since the 1L concentrated solutions are prepared with a 1:100 dilution factor taken into account). The input and the results of the “salts to formulation” calculation are shown below.

| | | | |
|---|--------|----------------------|--------|
| <input type="checkbox"/> Calcium Sulfate (anhydrous) (CaSO ₄) | 0 | N(NO ₃ -) | 141 |
| <input type="checkbox"/> Ammonium Dibasic Phosphate ((NH ₄) ₂ HPO ₄) | 0 | N(NH ₄ +) | 9 |
| <input type="checkbox"/> Ammonium monobasic Phosphate (NH ₄ H ₂ PO ₄) | 0 | P | 62.41 |
| <input type="checkbox"/> Ammonium Nitrate (NH ₄ NO ₃) | 0 | K | 119.86 |
| <input checked="" type="checkbox"/> Copper Sulfate (pentahydrate) (CuSO ₄ .5H ₂ O) | 0.079 | Mg | 42.9 |
| <input type="checkbox"/> Potassium Sulfate (K ₂ SO ₄) | 0 | Ca | 150 |
| <input type="checkbox"/> Sodium Molybdate (dihydrate) (Na ₂ MoO ₄ .2H ₂ O) | 0 | S | 28.85 |
| <input checked="" type="checkbox"/> Boric acid (H ₃ BO ₃) | 0.40 | Fe | 3 |
| <input checked="" type="checkbox"/> Zinc Sulfate (dihydrate) (ZnSO ₄ .H ₂ O) | 0.1319 | Cu | 0.2 |
| <input type="checkbox"/> Ammonium Heptamolybdate ((NH ₄) ₆ Mo ₇ O ₂₄ .4H ₂ O) | 0 | Mo | 0.02 |
| <input type="checkbox"/> Ammonium Orthomolybdate ((NH ₄) ₂ MoO ₄) | 0 | B | 0.7 |
| <input type="checkbox"/> Adv.Nutrients - Grow | 0 | Mn | 1.5 |
| <input checked="" type="checkbox"/> GH - FloraMicro | 300 | Zn | 0.3 |
| <input checked="" type="checkbox"/> GH - FloraBloom | 266 | | |

Now we need to increase S and decrease N. To decrease N we need to reduce the amount of the most important Nitrogen source (FloraMicro) to about half. Since this reduces the amount of Ca significantly we can now add calcium sulfate to the formulation to make up our now acquired Ca and S deficiencies. Select calcium sulfate and give it a value of 15g. After doing this you will notice that Ca and S concentrations will be much closer to the desired end values given by the original formulations. The final result is shown below. Eventhough the amount of nutrients are not absolutely the same as the ones on the formulation we were able to achieve the same “global ratios” for all important nutrient levels and the solution will now contain ALL the necessary nutrients for adequate plant growth and – in this case – especially for the first cluster development of tomato plants.

| | | Calculation Result | |
|---|--------|----------------------|--------|
| | | Summary (ppm) | |
| <input type="checkbox"/> Calcium monobasic Phosphate (monohydrate) (Ca(H ₂ PO ₄) ₂ .H ₂ O) | 0 | N(NO ₃ -) | 75.2 |
| <input checked="" type="checkbox"/> Calcium Sulfate (dihydrate) (CaSO ₄ .H ₂ O) | 15 | N(NH ₄ +) | 4.8 |
| <input type="checkbox"/> Ammonium Dibasic Phosphate ((NH ₄) ₂ HPO ₄) | 0 | P | 62.41 |
| <input type="checkbox"/> Ammonium monobasic Phosphate (NH ₄ H ₂ PO ₄) | 0 | K | 108.24 |
| <input type="checkbox"/> Ammonium Nitrate (NH ₄ NO ₃) | 0 | Mg | 42.9 |
| <input checked="" type="checkbox"/> Copper Sulfate (pentahydrate) (CuSO ₄ .5H ₂ O) | 0.079 | Ca | 114.85 |
| <input type="checkbox"/> Potassium Sulfate (K ₂ SO ₄) | 0 | S | 56.73 |
| <input type="checkbox"/> Sodium Molybdate (dihydrate) (Na ₂ MoO ₄ .2H ₂ O) | 0 | Fe | 1.6 |
| <input checked="" type="checkbox"/> Boric acid (H ₃ BO ₃) | 0.40 | Cu | 0.2 |
| <input checked="" type="checkbox"/> Zinc Sulfate (dihydrate) (ZnSO ₄ .H ₂ O) | 0.1319 | Mo | 0.01 |
| <input type="checkbox"/> Ammonium Heptamolybdate ((NH ₄) ₆ Mo ₇ O ₂₄ .4H ₂ O) | 0 | B | 0.7 |
| <input type="checkbox"/> Ammonium Orthomolybdate ((NH ₄) ₂ MoO ₄) | 0 | Mn | 0.8 |
| <input type="checkbox"/> Adv.Nutrients - Grow | 0 | Zn | 0.3 |
| <input checked="" type="checkbox"/> GH - FloraMicro | 160 | | |
| <input checked="" type="checkbox"/> GH - FloraBloom | 266 | | |

I hope that this tutorial allows you to understand better how my hydroponic nutrient calculator can be used for the preparation of a wide array of formulas and the correction of

commercial nutrient fertilizers that lack some essential nutrients for plant growth. It also shows you how you can modify the results of the automatic calculator to further correct a formula if you believe that better results and pairings can be achieved. As you see, the calculator gives you tremendous flexibility and makes the preparation of hydroponics nutrients with precise ppm nutrient values a simple exercise.

Using my Nutrient Calculator with Commercial Fertilizers : Part No.1

One of the main reasons why I wanted to develop a nutrient calculator for hydroponics was to allow people to understand the amount of nutrients they are adding to their solutions and to use the calculated amounts to either use common salts to achieve the same nutrient percentages or to understand which salts are needed to adequately compliment the nutrition achieved by their hydroponic nutrients. On these posts I intend to show you how you can use my hydroponic nutrient calculator with your commercial hydroponic nutrient composition, figure out the amount of nutrients given by a certain amount of the fertilizer, adapt your fertilizer to a given formulation you want, supplement your nutrient with other salts and get a similar composition yourself with easily available salts (which are used to make your hydroponic nutrients most of the time). **For this tutorial you will need my hydroponic nutrient calculator available [here](#).**

First of all, lets learn how to add a given nutrient commercial fertilizer to your list of hydroponic salts/nutrients. After you open the program go to the "Nutrient Salts Used" tab and select the "Add New Salt" button. A screen will pop up in which you can input the percentage composition values of your fertilizer. As an

example, let us use the FloraBloom fertilizer from general hydroponics and add it to our fertilizer list. The fertilizer composition given on the product's label is available [here](#). Below you can see an image of the added percentages on my nutrient calculator, note that the K2O, P2O5 check box is used as the percentage values on the label are given as oxides for K and P. After finishing the addition the "GH – FloraBloom" item becomes available in the bottom of the page.

Custom Salt/Fertilizer Addition

Salt or Fertilizer Makeup (quantities as % by weight)

| | | | |
|----------|-----|------------|-----|
| N (NO3)- | 0 | Ca | 0 |
| N (NH4)+ | 0 | S | 1 |
| P2O5 | 0 | Fe | 0 |
| K2O | 4 | Cu | 0 |
| Mg | 1.5 | Mo | 0 |
| Mn | 0 | B | 0 |
| Zn | 0 | Purity (%) | 100 |

K and P as K2O and P2O5

Name
GH - FloraBloom

Add Custom

We are now going to calculate the ppm values for the different nutrients we would get for the recommended addition of 1 tbsp/gallon for regular growth. Since 1 tbsp is 15 mL and we assume the fertilizer density to be 1 g/mL we get an addition of about 15g per gallon of solution. We input 15 in the field next to the fertilizer name, leave the purity at 100% and go to the "Salt to Formulation" tab where we input a volume of 1 gallon. We then get the results shown below. You can see that this preparation would give us around 87 ppm of P, around 131 ppm of K, 60 ppm of Mg and 40 ppm of S. Now that you know how to get these values it becomes easy for you to know the amount of nutrients you are getting for a given amount of any commercial fertilizer simply by using the composition values available on the label.

Volume

gallons
 liters
 cubic meters

Calculation Result
Summary (ppm)

| | |
|----------|--------|
| N (NO3)- | 0 |
| N (NH4)+ | 0 |
| P | 86.59 |
| K | 131.76 |
| Mg | 59.52 |
| Ca | 0 |
| S | 39.68 |

[Calculate ppm from salts in grams](#)

Getting these values is only the first and easiest thing we can do with commercial fertilizers using my calculator but you will see within the next few tutorials that much more powerful things are possible. Right now you can also get the ppm values of different mixes of commercial fertilizers as well as current ppm values you are getting with any custom regime you are using. For example you could upload the whole General Hydroponics series to the calculator and see the different ratios you can achieve with different proportions of their products.

On the next tutorial we are going to use the above mentioned fertilizer as well as a predetermined formula to determine which salts are needed to compliment the above solution and obtain a well-balanced custom formulation. After that we are going to see how we can use the above obtained ppm values to makeup our own copy of this fertilizer as well as how we can improve it. I hope you are enjoying my free hydroponic calculator and that you leave any comments you may have :o)

Possible New Features for my Hydroponics Calculator

A few days after the release of my hydroponic calculator free software implementation I can tell you that I am absolutely happy with the results. The calculator had some resolution problems at first but these problems were easily fixed. After changing to a tabbed interface and by including the ability to save and load nutrient recipes I think that the calculator is on its way to become one of the most important tools for serious hydroponic hobbyists and small business owners. Right now the calculator allows you to get precise weights of different nutrients to prepare your own hydroponics solutions something which no other free software available online does. This allows people to save great amounts of money and achieve very good results around their hydroponic crops, at least when dealing with nutrients. However I believe that there is still a lot to do and for this reason I will be writing today's post about my ideas for the calculator and it will also be great to know what you have in mind :o)

There are several things I want my calculator to be able to do in the future but first of all my focus will be on everything dealing with hydroponic nutrients. The first important additions I am working on mainly deal with the ability to add custom salts to the program and obtain results of ppm concentrations achieved by placing certain amounts of salts within the solutions. Certainly being able to go from a given weight of salt or commercial fertilizer (with known percentage element compositions) to a ppm concentration will allow people to know how adequate their recipe is and – moreover- it will allow people to play with different levels of salts if they feel that the currently “automatic” salt quantity selection is not doing the best possible job. It will also allow people to “reverse engineer” their commercial hydroponic solutions by figuring out their ppm contributions, later using those on the nutrient design tab to obtain salt weights to arrive to those concentrations. By using different sources people will also be

able to pinpoint with good accuracy the nutrient sources used by their favorite commercial blend.

The next big feature I am looking forward to add is a “water quality” section which will help people adjust their nutrient solution to their water quality parameters. Things such as hardness, carbonate levels, magnesium, calcium, pH, EC, nitrogen and QOD (chemical oxygen demand) might be important parameters I will take into consideration within this section. A pH and EC prediction module – which is almost finished – will help people calculate an estimate of what their final solution properties for a given formulation might be.

Even though these features are bound to add great flexibility to my calculator, I believe that right now this is only the “tip of the Iceberg” of the potential the software has. After doing this I will attempt to put all my chemical knowledge regarding hydroponics crops into practice by inputting “optional additions” that people will be able to choose when preparing their formulations. For example, you might want to choose the “hydrogen peroxide regime” option and a summary giving you usage instructions as well as detailed explanations of how much peroxide to add and when to your reservoir will be shown. Similar options ranging from “potassium silicate treatment” to “cobalt supplementation” might become available as the calculator progresses.

As you see, there is a lot in storage for this little calculator program which I am hoping to rename to something like “hydroponic buddy” once version 1.0 comes out. Right now I am working on all the features and relearning a lot of Delphi programming which I honestly haven’t done extensively for almost 10 years. Do you have any suggestions for my hydroponic nutrient calculator ? Do you have any suggestions about what you would want to do with it ? Please leave any comments, questions or suggestions below ! By the way, you can get the latest version of the calculator [here](#).