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# Clean Water Is Good, Pure Is Better

*You may ask yourself, Why would anybody spend money on a water filter to grow plants? Serious gardeners have long realized how important pure water is to the success of their important crops* **BY RICH GELLERT**

Most gardeners give straight tap or hose water to their house plants and garden plants, and the plants do just fine. But what if you're growing exotic plants and fruits, prized by growers everywhere? What if you want give your plants only the purest inputs? More important, what if you're interested in pushing your plants to the maximum and achieving explosive growth?

For hydroponic growers in particular, water is at the heart of the garden, and growers can't do more for their plants then provide them with the purest water possible.

## Nutrient Formulas

If you look at the top nutrient manufacturer's feed charts, you will notice a common theme: They all require using 0 ppm (parts per million) water as a starting base for the nutrient solution. Without this ultra-pure base, it is much more difficult to dial in the ppm's of your formula while making sure you have the proper amounts of each component vital to healthy growth. When a feed chart indicates bringing the nutrient solution to 1200 ppm and you are starting with water that is at 500 ppm, what do you do? It's hard to guess what composes that 500 ppm, let alone try to adjust for it in the nutrient formula.

## What's Wrong With Your Water?

The first step is to determine what's in your water and then what type of water purification system would be most beneficial to your garden. Free water reports are available from your municipality or water company. However, a single water test will not tell you everything you need to know about your water, since water quality fluctuates greatly throughout an area and over the seasons. Some hydroponics shops do water testing, and there are many professional labs that can do an analysis.

A key indicator of water quality for plants is total hardness as expressed in ppm of calcium and magnesium, or in grains per gallon (gpg). With too much hardness, the nutrient formula can be thrown out of balance, and deficiencies and lockouts can quickly become a major problem. Any water source over 50 ppm

Contaminant	Source	Effects on plants
<b>PPM of TDS</b>	Well/Spring Municipal/ City	Water with high PPM of TDS (total dissolved solids) has unknown contaminants that is the key cause of nutrient lock-out and deficiencies in plants.
<b>Chlorine</b>	Municipal/ City	Biocide that kills beneficial bacteria, fungi and micro-organisms. Any healthy organic or bio-hydro garden is chlorine free. If you are using or brewing compost teas or bio-extract solutions, removing the chlorine is essential.
<b>Chloramines</b>	Municipal/ City	Biocide that's a combination of chlorine and ammonia and is much more stable than chlorine. It will not dissipate by bubbling or even by boiling off. Can only be removed by proper filtration. Toxic to beneficial bacteria, fungi, micro-organisms, fish and amphibians.
<b>Hardness</b>	Well/Spring Municipal/ City	Dissolved calcium and magnesium that forms scale on equipment and tubing. Too much of either of these in your water and you are locking out key nutrients to your plants. Your plants will be unable to feed properly and will exhibit deficiencies. Pipes and equipment can eventually get clogged and fail. Mineral hardness is the key cause of water problems in hydroponics and other gardening systems.
<b>Fluoride</b>	Municipal/ City	A hazardous waste product that is present in all municipal water. This is a toxic substance to humans and plants. Thirty-four enzymes in plants are affected by fluoride as is seed germination. Enzyme additives will not do their job properly with fluoride in the water.
<b>Volatile Organic Compounds</b>	Municipal/ City	Some VOC's are known or suspected carcinogens. Trace amounts of these can end up in the plant's tissue, flowers, and fruits.
<b>Iron / Sulfur</b>	Well/Spring Municipal/ City	Water containing iron or sulfur may have a metallic taste and an offensive odor. Nutrient lockout, algae growth, and equipment staining can be results of too much iron on the water.
<b>Pesticides/ Herbicides</b>	Well/Spring Municipal/ City	Local agricultural areas may be leaching harmful contaminants into the ground water. These can end up in your water supply and in your plants.
<b>Bacteria</b>	Well/Spring	Local water sources may be affected by animal and human waste. These toxic substances can be found in trace amounts in fruits and flowers and can be harmful to humans.
<b>Nitrates</b>	Well/Spring Municipal/ City	Runoff from agriculture, animal yards, etc. Toxic substances that contribute to over-nitrification and algae growth. Causes "blue baby syndrome".
<b>pH</b>	Well/Spring Municipal/ City	Water that has either too high or low pH will not allow nutrients to be absorbed properly and can be corrosive to equipment. Adjusting pH may be difficult due to fluctuations in levels.

of hardness should be purified. This translates to 3 gpg and is considered soft water, which, unfortunately, few people have straight from the tap.

### Don't Kill Your Microbiology

Organic gardeners using bio-extraction solutions or compost teas should use purified water. Anyone gardening with living micro-organisms such as beneficial bacteria, fungi, nematodes, mycorrhizae, and trichoderma must have chlorine-free and contaminant-free water in order for those helpful microbes to survive and flourish. Unfortunately, it's a rare grower who with a water source that's perfect for her prized plants. Letting city water sit out overnight may get rid of some free chlorine, but this technique won't work to reduce levels of chloramines or other contaminants in the water. Water from well or spring sources is often too high in minerals such as calcium, magnesium, sulfur and iron. This water may be fine to drink, but for hydroponics it may be too heavy with these minerals and may contribute to nutrient lockup.

Following is a table that shows the most common contaminants in water, where they come from, and the harmful effects they can have on plants. After looking it over and realizing how many things in your water can do damage to your crop, you may want to grab yourself—and your plants—a nice glass of pure water!

### What is your PPM made of?

There are several customized filtration systems available for gardening and hydroponics on the market. The proper water filter for you depends on your water source. There are a variety of contaminants that you can read on a ppm pen. Hardness is usually a large part of that total ppm and the key cause of problems in your garden. The other part of the ppm in water is sediment, rust, chlorine, chloramines, iron, sulfur, volatile organic compounds, and, to a lesser degree, heavy metals and pesticides.

Fortunately, many hydroponics shops have choices of water filtration systems to help you deal with your particular problems. Take a look at the table below to determine what type of filter would best suit your needs.

Contaminant	Which Filter Works Best?		
	Reverse Osmosis	Carbon/Sediment Filters	Softeners
Chlorine & Chloramines	✓	✓	
Sediment & Rust	✓	✓	
Volatile Organic Compounds	✓	✓	
Removes 95% + PPM	✓		
Nitrates & Pesticides	✓		
Removes 98% + Bacteria	✓		
Hardness (Excess Calcium & Magnesium)	✓		✓
Helps Stabilize pH	✓		✓
Iron, Sulfur & Fluoride	✓		✗

✗ only low iron levels

### Reverse Osmosis

You can see that a reverse osmosis (RO) system can remove all of the contaminants and seems like the best choice. If you have extremely hard water (12+ grains per gallon or 200+ ppm calcium), then a softener is recommended to pre-treat the water before going into an RO filter. The softener does a great job at quickly and efficiently removing hardness, making it much easier for the RO machine to clean the rest of the pollutants. Softeners exchange calcium and magnesium for sodium chloride (table salt) which is harmful to plants but easy to remove with reverse osmosis.

Carbon and sediment filter systems are essentially instant de-chlorinators and dirt removers. You will normally not see a huge drop in ppm like you will with a reverse osmosis filter. Most de-chlorinators have higher flow rates than typical RO filters and are priced more affordably. They remove 99% of harmful chlorine and 85%+ of chloramines to ensure that the living microbiology (beneficial bacteria, fungi,



Left: Merlin Garden Pro- High-flow reverse osmosis system produces 30 gallons per hour or 750 gallons per day of ultra-pure, low ppm water. Removes 95%-plus of chlorine, hardness (calcium and magnesium), excessive minerals (iron) and all other contaminants. Unit is sold by Hydro-Logic. Right: Stealth RO 200- Customized reverse osmosis filter produces up to 200 gallons per day of ultra-pure, low ppm water. Removes 98%-plus of chlorine and contaminants.

trichoderma, etc.) in your nutrient solution and soil and root zone remain healthy and thriving.

If you want to remove chlorine and sediment and all other contaminants as well, then a reverse osmosis filter is what you need. RO technology is the ultimate solution if lowering your ppm is the primary concern. A good RO machine is capable of removing 95%+ of everything in your water producing soft, pure H<sub>2</sub>O.

There are several specialty filters available to deal with particularly nasty situations. Some people on well water experience high sulfur levels indicated by a typical rotten egg smell and taste. High levels of iron can also require specific pre-treatment. An overabundance of either of these can be harmful to plants and humans, and a water conditioning expert in your area should be consulted.

Many hydroponics shops sell water-purification systems and carry a variety of water filters capable of

helping solve your water problems. Most of these shops can be very helpful in determining what the right filter is for you and your plants. 🌿

*Rich Gellert is owner of Hydro-Logic Purification Systems based in Santa Cruz, Calif.*

### Resources

#### Hydro-Logic Purification Systems

Company specializes in a wide range of water purification products exclusively for the hydroponics and gardening industry.

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