Adventures in Gardening

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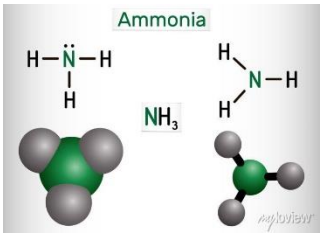
AQUAPONICS

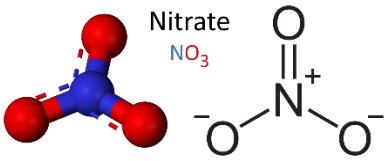
The Life of a Working Goldfish

Meet Goldie. Her job is to swim around, eat goldfish flakes, and pee at will. A pump moves the water up the orange hose into the top PVC pipe. It flows to the vertical pipe, through the lower horizontal pipe and out through a large opening back into the tank.

During that time an unfathomable number of bacteria get to work. Ammonia, which is toxic to both plants and fish if the level becomes too high, is converted into nitrites and nitrites are converted into nitrates.

As this process occurs the water becomes more acidic. But that isn't a problem because every day I remove a quart of this water and use it to water my house plants. I replace the removed water with water that has been sitting long enough for the chlorine to naturally out gas (*water that is chlorinated becomes less so if you just leave it out for a day*).





Come Help Us Grow!

This is the basil that grows above the tank. The only substance I need to add to the water so that these plants stay healthy is a bit of iron. I have a pump bottle of plant food for aquariums (*Thrive+ All in One Liquid Aquarium Fertilizer*) – but for my little 10 gallon tank it only takes a few drops every week or so. If you add too much iron this can be a disaster. True confession – this is Goldie **II**. Goldie **I** met an untimely end because I added too much iron. The iron is in the form of Fe^{2+} which means it is not fully oxidized, it reacted with the oxygen in the water forming Fe_2O_3 (rust) and deprived my fish of necessary oxygen! Lesson learned.

There is an added benefit of having an aquaponics system going (and this one has been going for about six years). I use this system to root cuttings. Here you see a Coleus. It's true that many plants are easy to root by just putting them in water and changing it as needed. But this system has water

flowing that is rich in nutrients. Cuttings grow roots fast. The only time this became a problem was when I put a mint cutting into the system. Mint grew roots too fast and the roots branched profusely – and like some monster the roots began to invade a large amount of space – but it was so interesting to watch it happen. We often don't have an opportunity to see the roots of plants – in this system we can learn about this hidden structure. I've noticed that the root systems of different plants have unique patterns and now I recognize them.

I build this system myself. PVC pipe comes in all shapes and sizes. There is a special glue to joint the pieces. I used a regular drill fitted with a hold borer to punch holes in the pipe. The two vertical boards are joined by a board behind the tank forming a U-shaped structure. It is a simple design – I learned about it during a workshop at **Plant Chicago**

I've found that basil is the easiest to grow but other plants are possible, parsley for example. It is important to note that hydroponics uses only nutrient solutions but aquaponics uses live fish. In large scale systems Tilapia are popular. I once ran a larger scale system in my greenhouse using Koi. It was lots of fun but that is expensive basil since I had to heat the water in the winter to keep the fish alive. Maybe one day I'll figure out how to attach solar panels that charge batteries that power a heating system – for now I'll enjoy my fresh pesto in the Winter.

References

https://university.upstartfarmers.com/blog/nitrogen-in-aquaponics
https://www.plantchicago.org