Do It Yourself CO2 Injection for the Planted Aquarium by Zenin Skomorowski KWAS

Plants in your aquarium require four variable factors. They are light, carbon dioxide (CO2), trace elements and macronutrients. A general rule is to have between 1 and 2 watts of light per gallon. You have to make sure that the light is bright enough in order to make use of the other factors, especially the CO2. The trace elements and macronutrients are usually provided by solid fish waste dissolving in the water and perhaps liquid supplements like iron that you might add. Some of the CO2 that the plants require is provided when your fish breathe out. Unfortunately, it is usually not enough to meet a large plant's needs. Supplemental CO2 is required or else algae will thrive on the unused factors.

The most expensive but consistent method to supply supplemental CO2 is to purchase a cylinder of CO2 with a precise needle valve to inject the gas into your water. Too much for me. The next lesser expensive option is to buy a ready made CO2 generator/reactor from your local fish store. These are easy to set up. Just follow the directions to add water and the pouch contents. The reactor assembly looks very cool in your aquarium as it allows the trickle of CO2 bubbles to slowly rise and be absorbed by the water. You are required to purchase additional refill pouches as your original supply gets used up. For me, this is still too much to spend. For a sampling of these products you can go to www.bigalsonline.com and do a search for CO2.

The last and least expensive method is to make your own CO2 injection system with many components that you may already have on hand.

The do it yourself CO2 injection system contains the following:

- a 2 litre plastic soft drink bottle with twist cap (for aquariums over 50 gallons, you will need two bottles and caps)
- air line tubing long enough to reach from the floor up to the top of the aquarium and then to the bottom
- an airline "tee" connector (only if you need two bottles)
- an air check valve (recommended but not essential)
- an air stone
- 2 cups of sugar per bottle
- 1 teaspoon of baker's yeast per bottle
- warm (not hot) water
- silicone aquarium sealant

To begin building the reactor, drill a hole in the bottle cap just a tad smaller than the air line tubing. Force about 3 cm (just over an inch) of the tubing through the top of the cap. Seal where the tubing passes through the cap with the silicone aquarium sealant. If you do not have any sealant on hand, you can buy a small tube for under $5, and use the remainder to secure rocks and avoid avalanches caused by those excavating cichlids … hey, that sounds like a future article …

Let the siliconed cap and hose assembly sit undisturbed for a day. If you are using two bottles, drill and seal the second cap at this time as well. There should be about 30 cm (12 inches) of tubing before the "tee" connector. From the "tee", the air line will run up and into your aquarium, and all the way to the bottom. Here, the air stone will be the reactor releasing a fine stream of CO2 bubbles to be absorbed by the water.

Here is the procedure to prepare the mixture for one bottle that will last 10-14 days:

1. dissolve 2 cups of sugar in 1.5 litres of warm (not hot water) in a pitcher or other suitable pouring vessel
2. add 1 teaspoon of baker's yeast to a cup of warm (not hot) water

3. wait a few minutes for the baker's yeast to start foaming
4. use a funnel to help pour the sugar water and yeast water into the 2 litre bottle
5. you may need to add a bit more water to bring it up to where the bottle starts to narrow, make sure there is air space in the bottle to allow some foaming
6. secure the cap to the bottle by turning the bottle and holding the cap steady (less chance of disrupting the silicone seal)
7. bubbles of CO2 should be coming out of the air stone by the end of the next day, usually sooner

If you have a two bottle system, wait at least a week before filling the other bottle. The cap must be on both bottles at all times or else the CO2 will not be forced through the air stone.

If you do not have bubbles coming from the air stone by the end of the second day, examine the seal at the bottle cap, or the "tee" connector. A little water may reveal CO2 leaking. Amend if necessary. It is possible the yeast is old and my require a bit more time before the reaction gets going. Some times it helps to swish the mixture around a bit to get it going. If after another day, no foaming activity appears on the surface of the mixture, remove the mixture from the bottle, rinse, and try again with fresh yeast, and not so warm water.

There is a possibility for some of your aquarium water to be siphoned when the warm mixture in the bottle cools. It is recommended to install a check valve (around $3) in the air line just outside the aquarium to avoid this possible mess.

You can let the CO2 bubbles rise to the surface. If you have a canister filter, direct the bubbles to the intake. This might assure complete absorption of the CO2 into the water before being returned to the aquarium. I tried this for a day, but I found that the CO2 bubbles were accumulating around the impeller of my Fluval causing a rattling sound. Very irritating for a normally quiet pump, so I now allow the CO2 bubbles to simply rise to the surface on their own. I lowered the spray bar that returns water from the canister filter, to be below the water line. This minimizes surface turbulence that would quickly allow dissolved CO2 to escape into the air. Optimally growing plants will produce plenty of oxygen for your fish.

You can get very fancy building a reactor. The longer you keep the CO2 bubbles in contact with the water, the greater the possibility of absorption. A series of rigid tubes connected with large diameter hose elbows in a zigzag pattern and held in place with a few suction cups could look very cool. Give it a try, be creative!

Some warnings regarding use of a CO2 generator. Do not restrict the flow of CO2 anywhere along the air way. Enough pressure may build up and cause the 2 litre bottle to split and make a very nasty mess. Also, make sure the bottle can not be easily tipped over. The mixture might stop working or may leak through the silicone seal or it may block the exit tube and allow excessive pressure build up. There are other considerations regarding CO2 concentration testing, pH levels, water hardness, and lowering of pH when producing carbonic acid. These are discussed in many articles found at http://www.thekrib.com/Plants/CO2/kh-ph-co2-chart.html