

Growing Plants Can Be High, Medium or Low Tech

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By Scott Hieber

I am often asked if there are really technologically advanced methods of aquatic gardening and if one is better than another for growing aquatic plants. The answers are yes and no.

“High tech” and “low tech” are subjective terms with no standard definitions in the aquatic hobby. The following descriptions, however, give general delineations among setups that fall within the different “tech” ranges.

Heating

High tech: Substrate cable heaters fit here. These are promoted as natural approaches; after all, we all know that the earth is hotter at the core and cooler at the surface. The tank is heated with plastic-coated electrical wires. If using these, consider there may be sharp objects in the tank from the use of pruning scissors, gravel spatulas and algae scrapers.

Medium tech: A glass or metal tube heater.

Low tech: Locate the aquarium near a sunny window or in a warm room.

Because there is no demonstrated special benefit to the plants or fish having substrate heating cables, the price, risks and hassles make cables a good choice mainly for avid technophiles. Tube heaters are an easy and economical way to maintain a regulated water temperature for tropical aquariums. A sunny room works well for temperate setups, especially if the fish are tolerant of widely fluctuating temperatures.

Adding CO₂

High tech: A two-stage, high-precision, specialty gas regulator with a built-in 4-micron filter (a micron is a measurement of the smallest size particle that the filter will pass; 1 micron = one-thousandth of a millimeter) and stainless steel diaphragms with factory calibration, a vernier scale 500-turns-per-inch gas flow metering valve (a vernier scale is made to slide or rotate along the division of another graduated scale for indicating parts of divisions), a higher-cost pH controller, a solenoid plus one-quarter-inch copper tubing and brass fittings, and a reverse flow external CO₂ reactor.

Medium tech: A combo regulator-solenoid metering valve, or a regulator plus a metal metering valve, ultra gas tubing and a homemade “reactor” made from a gravel vacuum sleeve (or just insert the CO₂ tubing into the intake of a powerhead or canister filter).

Low tech: A 2-quart soda bottle of water, sugar and yeast, and vinyl air line fed into a canister filter or powerhead intake.

The expensive equipment is easy to adjust and maintains a remarkably stable flow of CO₂. Otherwise, once your regulator and metering valve are adjusted, you generally do not have to fiddle with them much.

A solenoid on a timer can save you some CO₂ when the lights are off. You can also just run the CO₂ all day, every day. Whichever you choose, the changes in pH will not be important.

In any case, plants do not care where the CO₂ comes from.

Substrate

High tech: Calcined fractured natural clay substrate with an underlayment of commercially processed laterite (i.e., more clay) or nutrient-enriched manufactured porous gravel.

Medium tech: A bag of baseball infield gravel; or ordinary aquarium gravel or river sand that isn't too finely grained, with a build-up of mulm (the fine organic leftovers of aquarium detritus).

Low tech: Backyard dirt topped with some “ready mix” gravel from the lawn and garden center.

The commercial natural clay and manufactured substrates offer some visually pleasing choices. Plus, these substrates are

robust growing media right from the start. Ordinary sand or gravel will also work once the mulm builds up and provides “natural” enrichment. You can add some sphagnum peat moss as an underlayment to help get the substrate enriched at the start. Interestingly, I once found sphagnum moss growing in one of my aquariums that had a peat underlayment.

If the substrate is too fine, it can pack and develop pockets of anaerobic bacteria. If the granules are too large, too much detritus may embed between the stones, and it can be hard to keep plants rooted. A substrate with grains about 2 to 3 millimeters in size works very nicely.

Soil underlayments (or “dirt bottoms”) work well if you keep the lighting moderate to low: about 1 ½ to 2 watts per gallon of twin-tube compact fluorescent lighting with high-quality specular reflectors. The dirt can steadily provide (for years) all the nutrients that slower-growing aquatic plants require. Also, because the dirt will develop some anaerobic activity, it also produces a small amount of CO₂. Fast-growing plants, such as Echinodorus sword plants, will do better if some macronutrients (nitrogen, potassium and phosphate) are added to the water.

Dirt tanks are a particular style of planted aquarium championed by Diana Walstad in her book Ecology of the Planted Aquarium. The main benefits are that it is relatively inexpensive, simple, and because it is a slow growing method, the maintenance is low. On the other hand, it can be hard to keep the dirt out of the water when you uproot plants. Fast-growing plants can appear stunted without additional fertilizer, and the stronger plants will tend to dominate the aquarium over time (although you can temper this with pruning and the occasional uprooting).

Next month, I will talk about the more hotly debated subject of high-tech and low-tech lighting. As in the reefkeeping part of the hobby, lighting is a lightning rod for controversy.