

Aquaponics Systems

In this FAQ guide, several elements of the aquaponic system will be addressed. In the first part of the guide, the environmental variable information and solutions will be provided. The second part of the guide will include helpful tips to consider as your system develops and grows. The next section of the guide will focus on important Frequently Asked Questions that come up during troubleshooting and implementing your aquaponic system during the workshop and beyond. Finally, there will be a developing section as questions are asked throughout the workshop. Check back frequently as this section will be changing daily!

Click below to the section you need to move to!

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Aquaponic Environmental Variable Information

This section will focus on specific variables we will test for in the initial setup of the aquaponics system and monitor during operation.

Air Temperature: The air temperature will initially affect plants

Symptoms: Too Low—[below 4° C (40° F)] some plants won't grow well
[below 0° (32° F) some plants will die]

Too High—[above 35° C (95° F)] plants might wilt & become heat stressed

Remedies: If too low—Heat air temperature in room to at least 20 ° C (68° F)
If too high—Have fans to circulate air in room.

Water Temperature: The water temperature will mostly affect the fish.

Symptoms: Too Low—fish will become more sedentary, slow growth
Too High—fish will become more active, oxygen saturation is reduced,
increased chance of disease

Remedies: If too low—Adjust your water heater to maintain safe temperature for fish.
If too high—Add another aerator to increase the oxygen level. Short term
solution add ice cubes to water or water exchange. High Water temp will
NOT be a problem with Tilapia.

Notes:

- 1.) These symptoms are fish species dependent – so it is important to know specific life history details for the species you are using.
- 2.) High & low temperatures should NOT be a problem in a climate-controlled classroom, can be in a greenhouse or other enclosed space.

Ambient Light: The ambient light will mostly affect the plants. Fish prefer minimal light

Symptoms: Too Low—Plants will not grow well; won't photosynthesize enough
Too High—Plants might burn (get yellow leaves) mostly occurs with young
Seedlings.

Remedies: If too low—Add a grow light, locate plants near a sunlit window
If too high—If near a window- pull shade down for a time during the day
For fish - cover tank with a shade cloth
Usually NOT a problem in a classroom.

Humidity: Not pertinent in an aquaponics system where plant roots are submerged in water

UV Light: Not needed by plants or fish, but fish can get sunburn!

Symptoms: Too Low—Not Applicable

Too High—Fish may receive a sunburn

Remedies: If too low—Not Applicable

If too high—For fish - cover tank with a shade cloth

pH: The plants will be more affected than the fish, specifically in terms of growth.

pH for Fish:

The ideal pH for fish also depends on the species. Tilapia pH range (4.0 – 10.0)

Tilapia ideal pH is (7.0 – 9.0)

Symptoms: Too Low—Can cause burns on the fish's skin, especially young fish pH<5

Too high—Fish exhibit slow growth, ammonia toxicity increases

Remedies: If too low—Add sodium bicarbonate (baking soda)

If too high—Usually not a problem, fish and microbe metabolism cause system pH to decline over time (overall system respiration produces carbon dioxide which becomes carbonic acid in water.

pH for Plants:

The ideal pH for plants depends on the plant. Basil pH range (5.0 – 8.5)

Basil ideal pH is (5.5 – 6.5)

Symptoms: Too low- Plants will not grow well; affects nutrient uptake

Too high Plants will not grow well; affects nutrient uptake

Remedies: See above for pH of Fish

1. Add bicarbonate (baking soda) to buffer pH, must be repeated periodically.

Nutrient Balance: Nitrates and ammonia will fluctuate in your system as a result of plant, fish and microbial metabolism in a closed system. (check pH and water temperature too₅)

Symptoms: Changes in behavior, including opercular beat rate, lethargy, and reduction in growth rate₅

1. Most important is the balance between fish feeding rates and plant biomass
 - a. Follow guidelines provided as strictly as possible.
2. Maintain a healthy microbial community (nitrifying bacteria) for bioconversion of toxic metabolites especially ammonia.

Ammonia: Both fish & plants are affected, especially when high ammonia levels are combined with high pH and high temperature. Ammonia is NOT needed for fish and plant growth; however, the byproducts of ammonia bioconversion (nitrate) are used by plants for growth. Fish generate ammonia, and we depend on bioconversion to transform it into non-toxic nitrate, the key by-product used by plants.

Symptoms: Too Low—Plants will not grow well; may be toxic

Too High – Fish toxicity, ammonia toxicity increases with temperature & increasing pH

Remedies: If too high—Water change. This situation will improve as biofilter matures and nitrification increases

Nitrate Levels: Necessary for plant growth to occur in the system, extremely high levels can harm fish

Fish Symptoms₂: Too High—Flashing (side swimming) and erratic swimming
Too Low--Fish not affected

Plant Symptoms₃: Too High—Not affected
Too Low—Yellowing of leaves around the edges

Remedies: If too high—Particulates will be removed when filter is cleaned, excess dissolved nitrate may require water exchange

Phosphorus: An essential plant nutrient affecting growth

Symptoms: Plants will not begin to grow

Remedies: Phosphorus levels will increase over time if uptake by plant biomass is not sufficient. Add in small increments if plants are not sprouting

Aquaponics FAQs (Frequently Asked Questions)

What if the water level gets too high in the filter tank?

The water pump discharges water faster than the gravity drain via plumbing back to the fish tank. In order to prevent the filter box from overflowing the valve controlling the flow into the box needs to be partially closed. The goal is to have 1-3" of water in the filter box. This level will change over time so slight periodic adjustments will need to be made.

What if our water is not circulating?

If you notice that the water is NOT circulating through the 4 components, this is a situation that needs to be remedied or the fish can die from ammonia toxicity.

- Check to see if the electrical outlet breaker for the pump circuit has been tripped
- If the outlet works and the pump isn't flowing unplug the pump and see if the intake is clogged
- If the pump is broken a new pump will need to be installed. Steps should be taken to reduce ammonia toxicity. A 50% water change in the fish tank will alleviate the situation. Don't feed the fish until a new pump is installed. Check to assure that ammonia level is below 1 ppm. Repeat water change as needed to keep ammonia concentration below 1 ppm.

What if we have fish mortality?

If a fish dies, remove it from the system immediately. Take photographs of any external anomalies. Check ammonia levels. Be prepared to do a 50% water exchange if necessary.

What if our fish appear to be in distress?

If fish exhibit signs of distress, check all water quality parameters, perform the appropriate management activities, and be prepared to do a 50% water exchange if necessary.

What if our plants develop dark spots or yellowing of leaves?

Spots or yellowing may be symptoms of nutrient deficiency (macronutrients like nitrogen and phosphorus, or trace minerals). Nitrogen and Phosphorus supplements (liquid plant food) can be added temporarily until the system can be brought back into balance and fish feeding provides sufficient nutrients.

How much and how often do I feed the fish?

Refer to video "[Estimating fish feed amount](#)"

How often do I adjust the fish feeding rate?

Reweigh the fish in the tank once every 2 weeks for the first 3 months.

After 3 months, reweigh once a month. Refer to the Feeding rate Table corresponding to the average fish size.

What if our water appears cloudy or dirty?

If water becomes excessively cloudy or dirty, perform a 50% water change, reduce feeding rate, siphon fish culture unit and clean filter box.

Helpful tips:

1. As your fish grow, you will have to adjust your system to assimilate the amount of fish waste that will be produced₃.
2. If your water temperature is too low, it can also cause poor bioconversion performance and an accumulation of toxic metabolites. If your ammonia levels are high, check water pH and temperature₃!
3. Expect the pH of your aquaculture system to naturally decline over time. Make sure you are monitoring water quality and prepared to take steps to maintain a healthy balance₃.

Additional Questions Addressed Through Workshop

As we work through the modules, you may have questions that come up. These questions have not previously been addressed in the FAQ guide but are considered important to the health of your system or maintenance through the school year. Refer here and check back frequently as it will be updated often throughout the workshop!