

Biosecurity for Aquaponics Part 1:

Biosecurity is really simple: just keep all the bad stuff that can grow in aquaponics systems off your farm. Although our first experience with duckweed was costly and annoying, we (actually our excellent Chinese farm intern Xiao Cheng) have almost eradicated it from our hydroponics troughs. However, I (Tim) confess that I wasn't done with duckweed yet. I had brought some *salvinia* (another aquatic plant) onto the farm to try out as a fish food. I kept it carefully quarantined in a bucket, and tried feeding it to some fish in an isolated tank. No luck, they didn't touch it!

So I gave up on the *salvinia*. Then I noticed some small-leafed, **innocent-looking** duckweed that had come to the farm in the bucket with the *salvinia*. This was different from the first duckweed we tried; this duckweed looked cute and harmless. So I fed a bit to some juvenile tilapia that were in a small floating cage that was inside one of our breeding tanks that had a small-mesh hapa liner inside the normal vinyl liner material (the hapa allows one to collect tilapia fry and eggs, which would otherwise be very difficult and time-consuming). This is a stand-alone tank, with no way for the duckweed to get out of it into an aquaponic system. The small floating cage was made from very small-mesh screen, and I thought it would keep the duckweed inside. I was safe.

Two months went by, and although the fish in the floating cage hadn't eaten much of the duckweed, there also wasn't very much on the surface of the breeding tank. It didn't appear to be a problem. Then one day I noticed eleven of my best breeder tilapia floating on the surface of this tank, quite dead. I got out the DO meter, read the tank and found a DO reading (dissolved oxygen, what the fish breathe) of 2.2 ppm in the middle of the day, in a green-water tank that normally would have 14 ppm at that time of day because of all the algae in the tank.

I immediately jumped to the conclusion that the fish had died from low DO during the night (when DO can go MUCH lower; down to zero sometimes, because of the Diel cycle), but couldn't figure out **why** the low DO had occurred. Measuring our second, identical breeder tank gave me a DO of 5.75, quite acceptable. Then I peeled the fine-mesh "hapa" liner away from the side of the bad DO tank and found a huge wad of duckweed that had grown between the mesh liner and the vinyl liner of the tank. I pulled the hapa liner out of the tank, finding eleven more dead fish at the bottom of the tank which went into the wheelbarrow, and 26 live fish which went into another tank with good DO. This hapa was covered with stinking black goo that was just barely discernible as once having been duckweed before it died and sank to the bottom of the tank to get caught in the hapa.

So what happened was that the duckweed had grown out of control behind the hapa liner where I couldn't easily see it, then died and sank to the bottom of the tank where it used up all the available oxygen in its process of decomposition. I didn't notice it until the damage was done. To fix this, we drained the tank, scooped out the goo and cleaned the tank, sterilized the tank and the hapa with Chlorox, refilled the tank, put the hapa back in, then finally put the fish back in after dipping them in an intermediate tank to rinse any possible remaining duckweed spores off them. It's been a horrible two-day job, and I'm not bringing ANY more duckweed onto the farm.