**Nitrification Cycle in Aquaponics

HOW IT WORKS

Homework: Memorize, Illustrate, and Prepare to Present on April 5, 2013**

Nitrogen is a fundamental element that is necessary for all forms of life on Earth.  (Around 80% of atmosphere is N2)

Nitrogen is an important component in both plant and animal cells. Organisms need nitrogen to produce proteins, nucleic acids, and amino acids.

Although Nitrogen gas (N2) is roughly 78% of the earth’s atmosphere, it is unusable in this form.

The majority of organisms on earth can only use nitrogen when it is ‘fixed’ – combined with carbon, hydrogen or oxygen. (C), (H), (O2).

The nitrogen cycle is the process by which microorganisms convert the nitrogen in the air and organic compounds (such as within water) into a usable form.

The Nitrogen cycle is the most significant process within aquaponics. It is responsible for the conversion of fish waste into nutrients for the plants.

Without this process, the water quality would deteriorate rapidly and become toxic to both the fish and plants in the system.

The water therefore in aquaponics doesn't need to be treated chemically to make it ‘safe’ nor does it have to be replaced.

In aquaponics, a system is said to have ‘cycled’ when there are sufficient quantities of bacteria to convert all the ammonia into an accessible form of nitrogen for the plants.

The bacteria will arrive naturally to a system and colonize the water column and biofilter (usually clay pebbles, gravel or netting).

The bacteria are the microscopic organisms that are involved in the conversion of fish waste into nutrients for the plants.

 It is important to understand how to create a healthy environment for the bacteria that will allow them to thrive within the system.

A healthy colony of bacteria will determine your success with an aquaponics system.

A mature system will contain enough bacteria to break down and convert all the fish waste into nutrients for the plants.

**STEP BY STEP: HOW IT WORKS**
The following factors outline how this process occurs within the aquaponics system:

1. The fish in the tank are fed, they digest and break down the food and produce waste.

2. Fish excrete ammonia through urine, faeces (approx 17%) and their gills (approx 80%).

3. The nitrification cycle is the process by which the ammonia produced by the fish is converted by one type of bacteria to nitrite and then by another type of bacteria to nitrate (the most plant-accessible form of Nitrogen in the cycle – and safest for the fish).

4. The two types of bacteria that break down ammonia (NH3) and nitrite (NO2) are:
-  Nitrosomonas
-  Nitrobacter

5. The Nitrosomonas bacteria convert the ammonia into nitrite and then the Nitrobacter bacteria converts the nitrite into nitrate (NO3). Nitrosomonas.

6. This bacterium takes in ammonia and converts it to nitrite. Nitrite is the less poisonous compound for the fish than ammonia would be.

7. However, high levels of nitrite will prevent the fish from taking up oxygen and will cause damage to their gills.

8. Nitrogen release in cycling
Nitrobacter is the next bacterium in the cycle and it consumes nitrite and converts it to nitrate.

9. Nitrate is a very accessible nutrient source for plants. Fish will also tolerate a much higher level of nitrate than they will ammonia or nitrite.

10. When all these bacteria are found in sufficient numbers in order to convert all of the ammonia and nitrite being produced in a system, it is said to have ‘cycled’.

11. This process generally takes about a month however it can happen much quicker or much slower depending on external environmental conditions.

12. It is really important to have a good test kit to check the various levels of Ammonia, Nitrite and Nitrate within your system.