

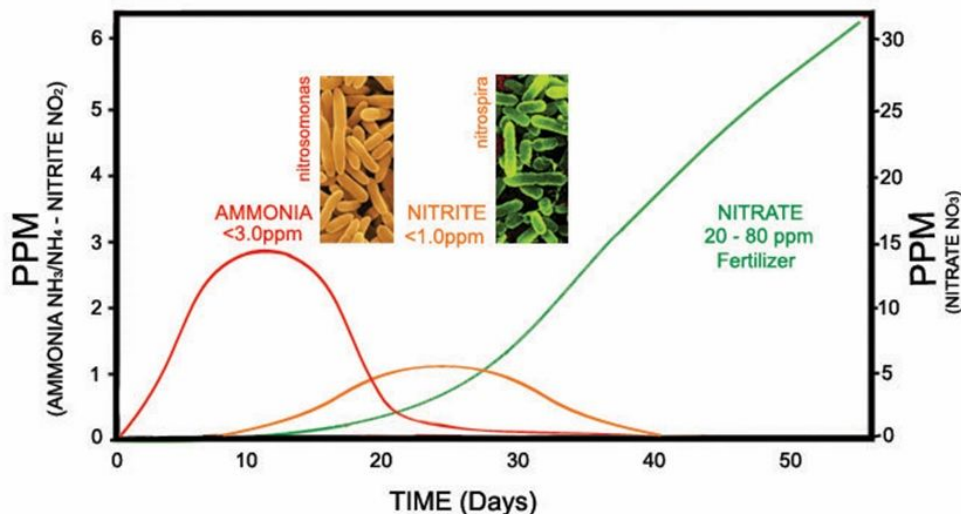
## Starting up Your Aquaponics System

### Introduction to The Nitrogen Cycle

Congratulations on setting up your aquaponics system! You're almost ready to add fish and start growing, but before you do, it is essential that you properly cycle your system. Cycling is the process of creating the biological environment that establishes nitrifying bacteria which will consume ammonia produced by the fish and turn it into nitrogen that is fertilizer for the plants.

To initiate cycling, ammonia must be introduced to attract bacteria and provide them with a food source. Nitrosomonas convert ammonia into nitrite. The existence of nitrites will attract nitrobacter. This second type of bacteria is what will convert the nitrites into nitrates, the form of nitrogen that plants can uptake. The chart below shows how this process will appear through your daily test numbers.

### The Nitrogen Cycle



### What's in your kit?

This Cycling Kit includes **ammonia** needed to attract and feed beneficial bacteria, **powdered seaweed** (MaxiCrop) to get your plants off to a healthy start, and a bottle of **Nitrifying Bacteria** to help speed up the cycling process. It also includes a **Data Tracking Worksheet** so you can easily record the progress of your system startup. Just follow the directions below, test and record **daily**, and your system will be off to a good start as a safe home for your fish in just a few weeks. **Patience is key!** This process will take time 15-30 days at least, but is absolutely essential to a properly functioning aquaponic system.

## Aquaponics System Start-up Instructions

- 1. Add water** to your aquaponic system and begin circulating through the media.  
(Ensure that the water is free of chlorine or chloramine if using municipal water)
  - a. Ideal water temperature is between 70° - 75° F (20° - 23° C).
  - b. pH during the cycling process can actually be higher than during normal operation of the system. Nitrifying bacteria prefer pH in the range of 7.0 to 7.6 so don't rush to lower your pH right away. Once you have a well established bacteria colony and fish in the system, pH should decline naturally to a more desirable range for plants such as 6.6 to 7.0.
  - c. Adjust temperature and pH if needed before cycling.
- 2. Add ammonia** in the suggested amount to the fish tank. Allow water to recirculate for a couple of hours before testing to ensure ammonia is mixed in.
  - a. *Fish tanks under 100 gallons (378L)* - add ¼ teaspoon or less at a time, and then test. ½ teaspoon of ammonia powder should give you about 4 ppm in 100 gallons of water.
  - b. *For fish tanks over 200 gallons (757L)* add 1 teaspoon (5mL) of ammonia powder at a time. Note that 1 teaspoon of ammonia in 200 gallons of water will give you almost 4 ppm.
- 3. Test for ammonia** using an API or similar test kit (sold separately), follow the kit instructions to detect the ammonia level.
  - a. *Ideal ammonia level during cycling is between 2ppm to 4ppm.*
  - b. If you see zero ammonia on your test you may not have added enough ammonia to register on the test or the test was performed incorrectly.
  - c. If ammonia is above 6ppm, drain ⅓ of the water and dilute the ammonia level by refilling the remaining tank with fresh (dechlorinated) water. Retest to ensure that ammonia is within ideal range.
- 4. Add Nitrifying Bacteria**, 1 teaspoon (5mL) for every 10 gallons (37L) of tank size.  
(For example, a 100 gallon (378L) tank would take 10 tsp, ⅓ cup or 50 ml)

### After Day 1 until system is cycled

1. Test your water for ammonia, nitrites, and pH and record them on the attached *Data Tracking Sheet*.
2. If ammonia levels have dropped below 1ppm, add ammonia until levels are between 2 to 4 ppm again (dropping ammonia levels indicate that the bacteria are actively consuming and converting ammonia into nitrites).
3. Add Nitrifying Bacteria **every other day** until you run out.
4. Once you see measurable amounts of **nitrites**, start measuring **nitrates** and record on the *Data Tracking Sheet*.
5. As soon as 2ppm of ammonia can be reduced to 0ppm in a 24 to 48 hour period and

nitrites drop to zero AND you are seeing measurable levels of nitrates such as 20ppm or higher, **then you are fully cycled** and ready to add fish. After fish are added, stop adding ammonia. The fish waste will replace this ammonia. You may need to continue to periodically add ammonia until you are able to add fish in order to keep "feeding" the bacterial colony. Once fish are added though, discontinue adding ammonia.

## Speeding Up Cycling

- Cycling will happen quickest when water temperatures are between **74 and 80°F** (23-26°C). Any water temperature below **64°F** (18°C) will slow bacterial growth rates by 50% or more. After cycling, slowly allow the temperatures to drop into the 70° - 74° range which is better for plant growth.
- Keep your system recirculating while cycling. This will keep the grow beds moist, and will keep oxygen levels high. The beneficial bacteria is aerobic (uses oxygen) and will benefit from higher oxygen levels.
- Be careful not to add chlorinated water or citric acid to your system. Both are detrimental to bacteria and will slow down or stop the cycling process.

## Adding Plants

You can add plants during cycling, ideal pH for plants in aquaponics is between **6.6-7.2**.

1. Mix the contents of the Seaweed bag into the system water. This will darken your water, but will clear after about a week of running.
2. Plant your grow bed. You can grow almost anything in your aquaponics system!
  - a. **Purchased plants from the nursery:** gently remove as much dirt from the roots as possible before planting into your aquaponics system. Look closely to ensure you aren't bringing in unwanted pests.
  - b. **Start seedlings** in a starter media such as seedling plugs. Transplant into your system when plants are 2" tall (5cm)
  - c. **Add cuttings** from other plants directly into your grow beds. Rosemary, basil, tomatoes propagate very well using cuttings.
  - d. For the first **4 months**, we recommend that you stick with leafy greens instead of fruiting plants. Some nutrients that fruiting plants require to flower and set fruit may not be fully available in sufficient amounts to support fruiting plants until after that time.
  - e. You can plant 2-4 times more densely in aquaponics than in soil.
3. Continue recirculating water through your media once you have planted to ensure bacteria (which colonize the media) always have food (ammonia) and the plant roots always have nutrients, oxygen and fresh water. Recirculation ensures that water doesn't stagnate.
  - a. If using a pump timer, set it to 15 minutes on and 45 minutes off every hour.



