

Jump Start Your Bio-Filter

By Larry Lunsford

One of the essential components of a successful Koi pond is a well established bio-filter. Unfortunately, it seems that just when our Koi most need a good bio-filter is when the bio-filter is not up to speed (such as when putting new or sick Koi into a quarantine tank or starting a new pond). This article will show you how to get your bio-filter working before introducing Koi into the pond.

The function of your bio-filter is to take care of the chemical waste produced by your Koi. The main waste product of Koi is ammonia which is toxic and must be removed from the water. Your bio-filter cleans your water naturally. In the presence of ammonia, naturally occurring bacteria multiply on the surfaces of your bio-filter media (and on every wet surface in your pond). The bacteria convert ammonia (NH_4) into nitrite (NO_2) and nitrite into nitrate (NO_3). Nitrite is also toxic to your Koi but the final product, nitrate, is relatively non-toxic.

When you first fill your new pond with water, there will be very little ammonia and very few of the bio-filtering bacteria present. When you introduce Koi into the new pond, they will give off ammonia which will start to accumulate. As the ammonia accumulates, the bio-filtering bacteria start to multiply. At first, there will not be enough ammonia eaters to keep up with the ammonia produced by your Koi and the ammonia level will steadily rise. The ammonia eaters multiply and eventually there will be enough to keep up with the ammonia produced by your Koi. Once you have a large enough colony of ammonia eaters, they will consume ammonia as fast as it is produced and they will keep the ammonia level in your pond near 0. The rise and fall of ammonia level in your pond's water is called the ammonia cycle. The ammonia eaters give off nitrite which causes a second cycle, the nitrite cycle.

The severity and duration of your ammonia and nitrite cycles depend on many factors. At best, your Koi will survive the cycle with little harm. At worst, your Koi will die from unacceptably high levels of ammonia or nitrite or other problems associated with stress caused by bad water quality.

You can save your Koi from the hardships of bad water during the cycle by cycling your bio-filter before you put Koi into the pond. You can cycle your bio-filter by feeding it ammonia chemically. **WARNING: Do NOT use this process with Koi (or animals of any kind) in your pond!!!** You can use some household ammonia cleaners or ammonia chloride (NH_4Cl) as your ammonia source. If you use an ammonia cleaner do not use one with anything other than water and ammonia - additives like surfactants and scents can be toxic to your Koi. If you use an ammonia cleaner you'll also have to experiment a bit to determine how much to use - the bottle usually doesn't say how much ammonia it contains. I prefer to use ammonia chloride (a white powder) so that I don't have to worry about unknown contents or doses.

To start the chemical cycling process, get your pond completely ready. Your air and water pumps should be running and all filter media in place. Make sure your water is de-chlorinated. I like to keep my carbonate hardness (KH) around 200ppm while cycling the filter. If your KH is low, add baking soda until its close to 200ppm. Add enough ammonia to bring the level to 5ppm. At 5ppm, you will have enough ammonia to quickly grow the desired bacteria, but at levels above 10ppm the ammonia is toxic even to the bacteria that eats it. To figure how much ammonia chloride to use to bring your pond to 5ppm, use the formula: ounces NH_4Cl = gallons of water / 500. Mix the ammonia chloride (or other ammonia source) with some water in a bucket and slowly add it to your pond near your stream, waterfall, or other water source. Don't pour the ammonia/water mix directly on your bio-filter - you may kill it. **Remember - Do NOT do this with any fish in your pond!!!**

Now just test and wait. Test the ammonia and KH levels in your pond daily. You may have to dilute your pond water with distilled water when testing in order to get an accurate test reading. Dilute your pond sample 50:50 with distilled water before testing and multiply the result by 2 to determine your actual ammonia level. Once the ammonia level starts to drop, start testing for nitrite. Ammonia consumption and nitrite production by the ammonia eaters is not a 1 to 1 process. The ammonia eaters seem to have to build up a certain level of nitrite before they release it into the water. After you detect nitrite, keep testing until the nitrite drops back to 0.

You can speed up the process by seeding your bio-filter with good bacteria. The best source of bio-filtering bacteria is some bio-media from a seasoned pond filter. Just a little bit of active bio-media will get your filter seeded well enough to get it up to speed in just a few days. The bacterial solutions for sale are of questionable value - I haven't seen credible evidence that any of them are worth while.

Once ammonia and nitrite have both peaked and then dropped to 0, your bio-filter is ready for a modest fish load and you can add some Koi. Your freshly cycled bio-filter should be good for a fish load of around 1 pound of Koi per 150 to 300 gallons of pond volume.

If you want to prepare your bio-filter for a heavier fish load, continue feeding ammonia in 1ppm doses. The amount of ammonia chloride you need for a 1ppm dose is: ounces NH_4Cl = gallons of water / 2500. Add baking soda with the ammonia to keep the KH stable. The amount of baking soda you need to go along with the ammonia is: ounces baking soda = gallons of water / 800. After adding the 1ppm ammonia dose, test for ammonia, nitrite, and KH. Once the ammonia and nitrite return to 0, you can feed your filter another dose. The longer you continue to grow your bacteria colony, the faster it will be able to consume 1ppm doses of ammonia. Continue growing your bacteria colony until it is able to consume bacteria at a rate that matches your planned fish load. The table below shows the approximate time for Koi to produce 1ppm of ammonia for various stocking densities. There are many factors which can cause your ammonia production rate to vary greatly including feeding rate, type of food, and temperature.

Gal. H ₂ O Per Pound Of Koi	Time To Produce 1ppm NH ₄
10	2 hours
20	4 hours
30	6 hours
40	8 hours
50	10 hours
60	12 hours
70	14 hours
80	16 hours
90	18 hours
100	20 hours
125	1.0 days
150	1.3 days
200	1.7 days
250	2.1 days

300	2.5 days
400	3.3 days
500	4.2 days