The Fish Vet

Fluidised Bed Filter
K1 versus BioChip

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President of the World Aquatic Veterinary Medical Association (wavma.org).

Introduction

Just over a month ago, I was approached by a firm to try their, new-to-the-market, biofilter media known as **BioChip**. So I ran a trial. There were some very **interesting findings**.

The **BioChips** (pictured below, right) are wafer-thin, lightweight, plastic discs, with minute pores and are positively buoyant.

As you may know, **K1** is established in the market as a reliable filter media for fluidised beds. They are shaped like cart-wheels and are ever so slightly, positively buoyant (pictured below, left).

Materials:

- 2L BioChips
- 2L K1
- 2x 20L buckets
- 2x 10L water
- 2x 400mg ammonium chloride
- 2x aerator
- 2x bucket lids

Method:

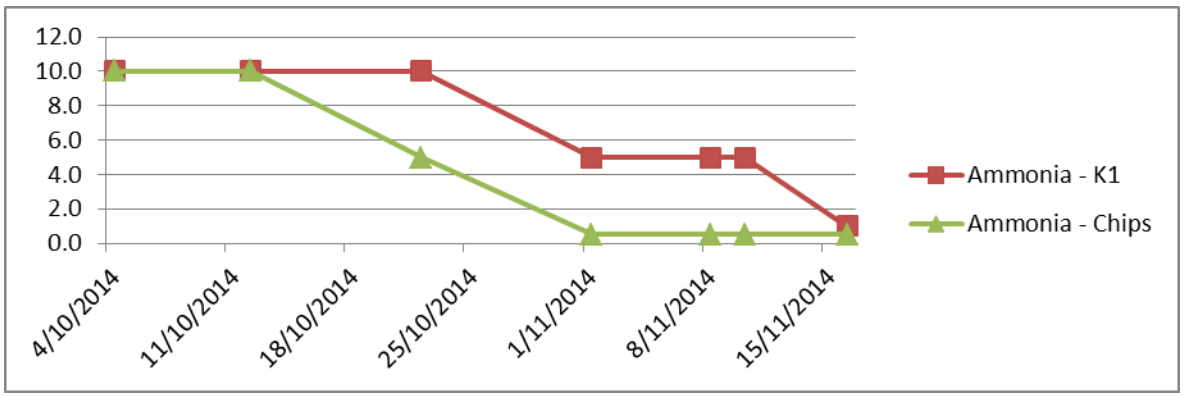
1. Each bucket is filled with 10L of water, ammonium chloride, the respective biomedia and equally aerated.
2. Water quality is analysed periodically for: TAN, nitrite, pH and temperature.

Due to time constraints, this preliminary test was ended on 16/11/14, albeit prematurely.

Results:

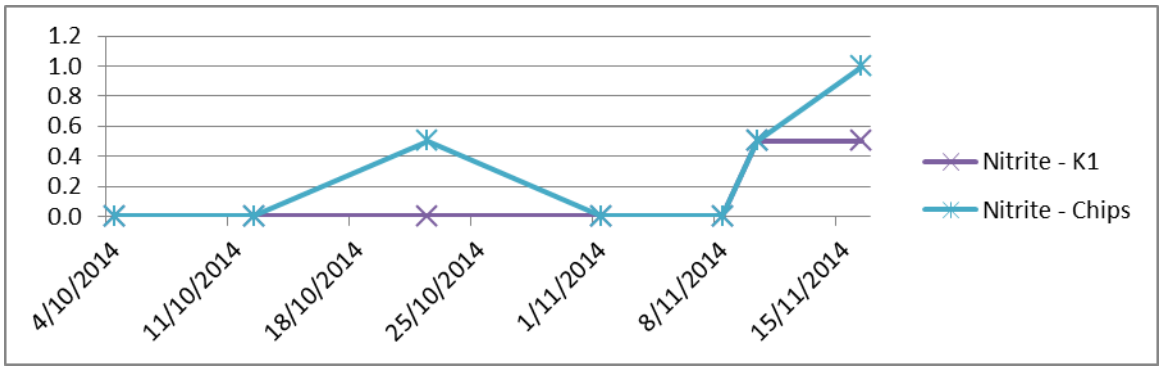
Total Ammonia Nitrogen

The levels of ammonia reduced more quickly with BioChip.



Nitrite

Nitrite levels were first detected in the BioChip and levels of nitrite fluctuated and was higher in the BioChip. Nitrite levels reached a maximum of 0.5mg/L.

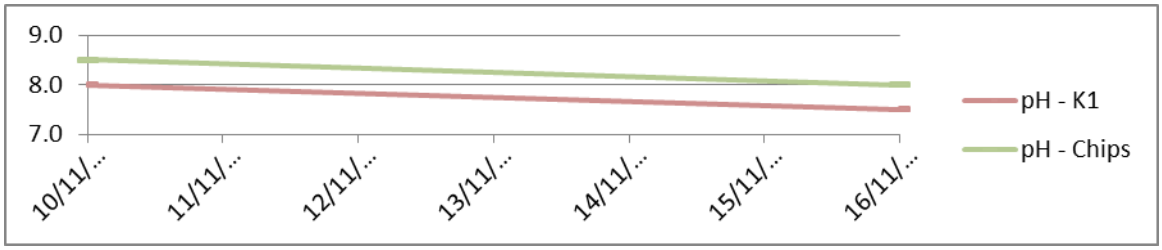


Nitrate

On 16/11/14, nitrate level in BioChip was higher (25 mg/L) than in K1 (10mg/L).

pH

The pH of the water started at 7.5, however, as time progressed, it increased, then decreased. The water with K1 increased to 8.0 and returned to 7.5, however, with BioChip the pH increased to 8.5 and was 8.0 at the last test.



Discussion

I must admit that I thought the BioChip didn't look like they'd work because they were much too light and were rather hydrophobic. They didn't move around in the water like K1 with an equivalent amount of aeration. In the end, I had to use a stronger air compressor to run the experiment, both having an equivalent amount of strong aeration.

I've since been alerted that new BioChips need to grow a biofilm to become more hydrophilic, and to come closer to being neutrally buoyant. The rate at which this occurs is influenced by water temperature, nutrients and agitation. This may be somewhat true of K1 as well since there is the belief among koi keepers that new K1 "comes with some coating" that slows the initial establishment of bacteria.

BioChip had a measurable reduction in TAN, and a measurable amount of nitrite, 10 days earlier than K1. Additionally, at the end of the experiment, BioChip had a higher level of nitrate. This suggests the BioChip cycled more quickly than K1.

Does it mean BioChip is better than K1? We cannot draw conclusions yet. The plot thickens. K1 is not supposed to be agitated too vigorously, especially at the initial stages of growing a biofilm. The collisions that occur will "knock-off" the establishing bacteria around the outside. So, this means that future experiments will need to be optimised for the different filter media types. Thus this experimental design may have unintentionally favoured the BioChip.

A disadvantage of the BioChip is that the nitrite reaches dangerous levels (1.0mg/L), whereas, the K1 maintains nitrite at a relatively safe level of 0.5mg/L. This level of difference could spell disaster in certain fish species. But this high level of nitrite is somewhat offset by a rise in the pH of the water (nitrite is less toxic in alkaline conditions). The reason for the rise in pH for either filter media could not be explained.

Conclusion

Which is better? K1 or BioChip? At this stage, I can't categorically say whether K1 or BioChip performed better. Perhaps it would be advantageous to include both in your fish rearing system. BioChip could possibly speed up the cycling, and the K1 maintain the nitrite at a safer low level.

Future testing would require multiple replicates, aeration/agitation optimised for different filter media, comparison of new and old media, and in vivo testing. The latter would be important to establish if BioChip has the "self-cleaning" ability that K1 is renowned for.

NB: Dr Loh, The Fish Vet, received no financial benefits for running the experiment.

BACKGROUND OF THE INVESTIGATOR

Dr Richmond Loh
BSc, BVMS, MPhil (Vet Pathol), MANZCVS (Aquatics & Pathobiology), *CertAqV*.

Dr Loh began his professional career, working for 6 years, as a veterinary fish pathologist at Mt Pleasant Laboratories in Tasmania. His skill set is unique, having been admitted as a Member of the Australian & New Zealand College of Veterinary Scientists (ANZCVS) by examination in the subjects of "Aquatic Animal Health" and in "Pathobiology". As "The Fish Vet", he provides veterinary services for a range of clients and they include individual pet fish owners, public aquaria, retailers, wholesalers and fish farmers (ornamental and food fish). He has published two books entitled, "*Fish Vetting Essentials*" and "*Fish Vetting Medicines – Formulary of Fish Treatments*". He has also produced an instructional DVD, "*Fish Vetting Techniques and Practical Tips*". He is an author and reviewer to several journals and other publications. He is also active on social media.

Holds the current posts:

- President of the World Aquatic Veterinary Medical Association (2014).
- Secretary for the Aquatic Animal Health Chapter of the Australian and New Zealand College of Veterinary Scientists (2011- present).
- Adjunct lecturer at Murdoch University, School of Veterinary and Life Sciences (2009).
- Consultant veterinarian to the Aquarium of Western Australia.
- eHow Pets Expert on aquatic animal health.

University-based qualifications:

- Master of Philosophy – Veterinary Pathology, Murdoch University (2006).
- Bachelor of Veterinary Medicine & Surgery, Murdoch University (2001).
- Bachelor of Science, Murdoch University (2001).

Other qualifications:

- Certified Aquatic Veterinarian by the World Aquatic Veterinary Medical Association (2013).
- Awarded the George Alexander International Fellowship by the International Specialised Skills Institute (2012).
- Adjunct Lecturer for Murdoch University, School of Veterinary Science (2009).
- Examined Member Australian College of Veterinary Scientists (Veterinary Pathobiology) (2009).
- Examined Member Australian College of Veterinary Scientists (Aquatic Animal Health) (2006).
- Founding Member of the World Aquatic Veterinary Medical Association (2007).
- Diploma in Project Management – TAFE, Tasmania (2007).
- Certificate in Companion Animal Services – Aquatics, Level 3 – Nelson Marlborough Institute of Technology (2009).
- CMAVA (Chartered Member of the Australian Veterinary Association) (2006).