



# Efficacy of Growstone<sup>®</sup> as a Filter Medium in Aquaculture Applications

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# Introduction

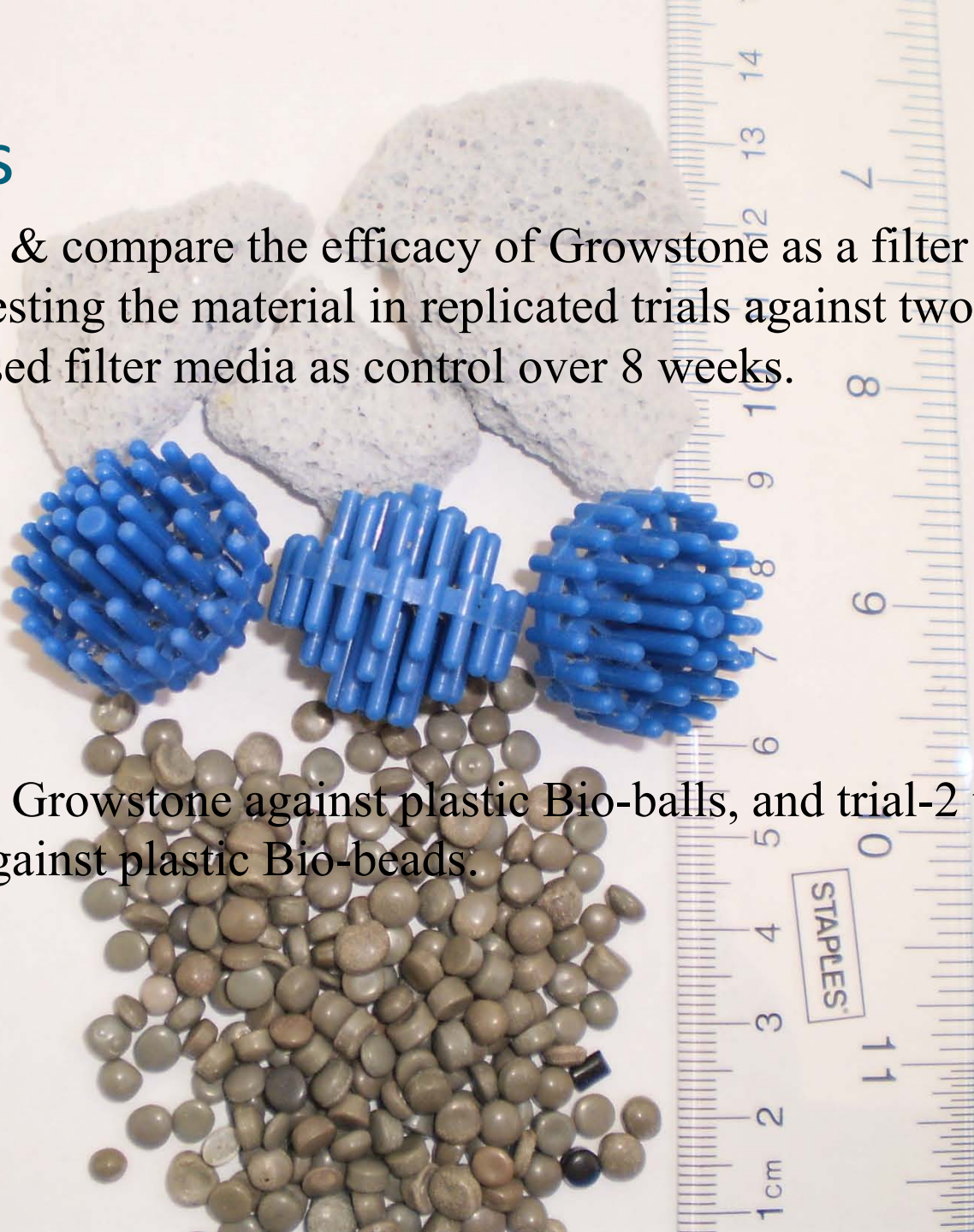
- Re-circulating aquaculture systems require physical & biological filtration.
- Filter media helps to remove solids, dissolved organic matter & ammonia.
- Growstone is proposed as a new filter medium due to its non-toxic nature, large surface area to volume ratio & made of recycled glass.

# Introduction...

- Experiment results, from trials on the performance of Growstone against the commercially recognized bio-filter media, can help to examine the practical advantages of using it in aquaculture business.
- Water quality parameters : ammonia (NH<sub>3</sub>-N), nitrate (NO<sub>3</sub>-N), total suspended solid (TSS), dissolved oxygen (DO), PH and temperature are the most crucial factors that affect fish growth in a closed system aquaculture.

# Objectives

- To determine & compare the efficacy of Growstone as a filter medium by testing the material in replicated trials against two other commonly used filter media as control over 8 weeks.
- Trial-1 tested Growstone against plastic Bio-balls, and trial-2 tested Growstone against plastic Bio-beads.



# Materials and Methods

- The experimental setup for Trial-1 consisted of nine systems of three replicates of the three treatments: 100% Growstone, 100% Bio-balls & 50-50% Mix.
- The experimental set up for Trial-2 was the same as the first trial except the Bio-beads were replaced for Bio-balls.
- Each system consisted of one cubic meter production tank stocked with five Kilograms of tilapia, and two 190 liter drums.

# Materials & Methods...

- One drum was used to house the cylinder of filter media and the other for the pump that drives water circulation. Total of nine pumps were applied.
- Each system used 32 liters of filter media contained in bags of plastic mesh.
- Water samples were taken every week from production tanks, and analyzed in a lab.



# **Results and Conclusion**

# Trial-1

Table-1. Mean & standard deviation per treatment for NO<sub>3</sub>-N, NH<sub>3</sub>-N, TSS and growth rate of fish.

	Growstone		Bio-balls		Mix	
Parameter	Ave	STD	Ave	STD	Ave	STD
NO <sub>3</sub> -N (mg/L)	7.675	4.766	10.117	5.931	7.821	6.253
NH <sub>3</sub> -N (mg/L)	2.833	3.852	2.667	2.761	2.917	2.339
TSS(mg/L)	9.667	18.544	15.683	15.971	6.417	4.452
Growth (Kg)	2.143	0.113	1.992	0.511	1.652	0.693



# Trial-1...

Table-2. P-values Generated Using ANOVA

Parameter	Growstone Vs Bio-balls	Bio-balls Vs Mix	Growstone Vs Mix
NO <sub>3</sub> -N (mg/L)	0.0175	0.1264	0.9091
NH <sub>3</sub> -N (mg/L)	0.8467	0.6791	0.9219
TSS(mg/L)	0.2406	0.0185	0.3925
Growth (Kg)	0.6349	0.3555	0.3679

# Trial-1...

- In Trial-1 there were two statistically significant differences between treatments.
- The mean nitrate level for bio-balls Vs that of Growstone, and the mean TSS level for bio-balls Vs that of the mix, were significantly different.
- Among the rest of the comparisons there were no statistically significant differences.

Fig.1. Nitrate nitrogen (NO<sub>3</sub>-N) levels

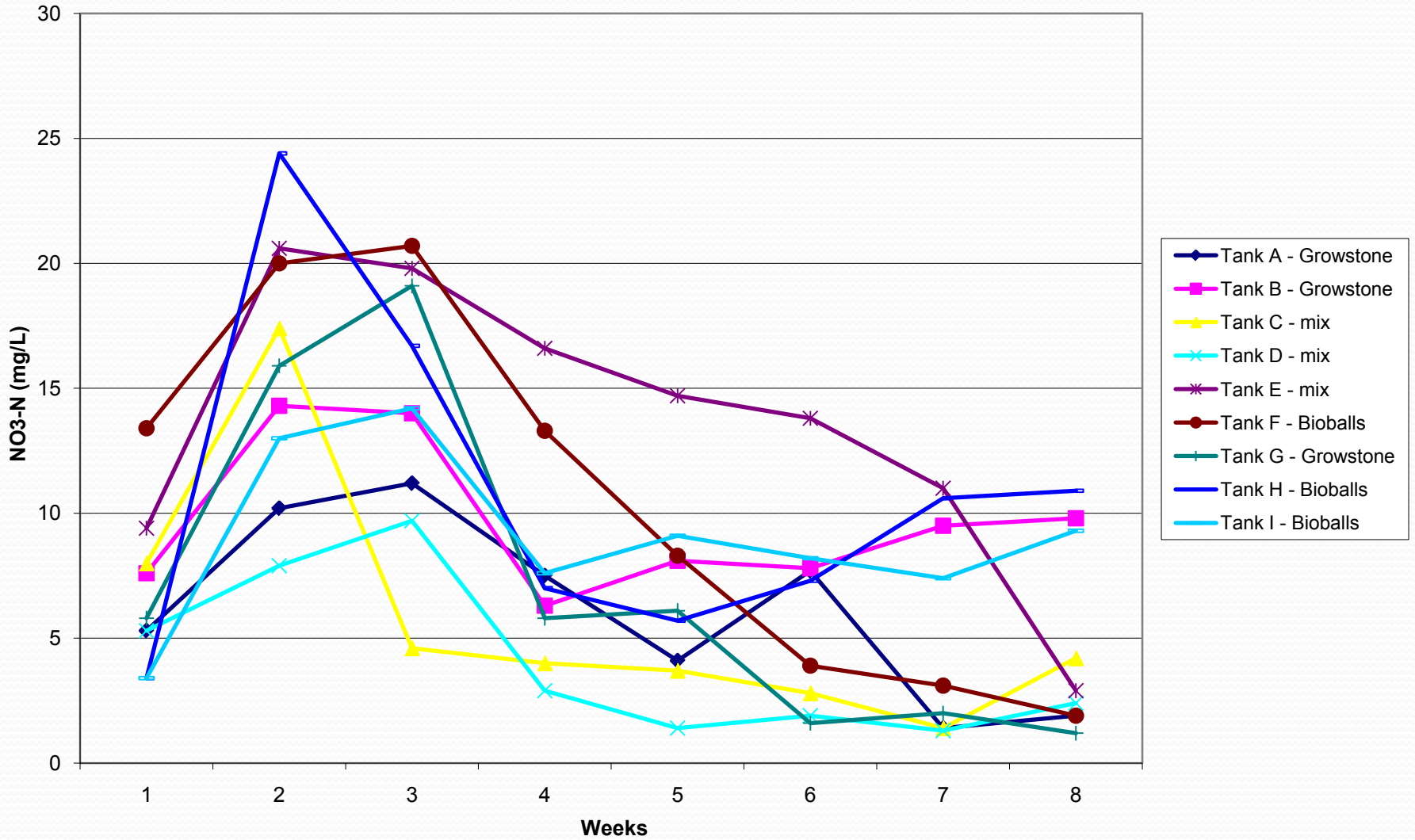


Fig.2. Total ammonia nitrogen (NH3-N) levels

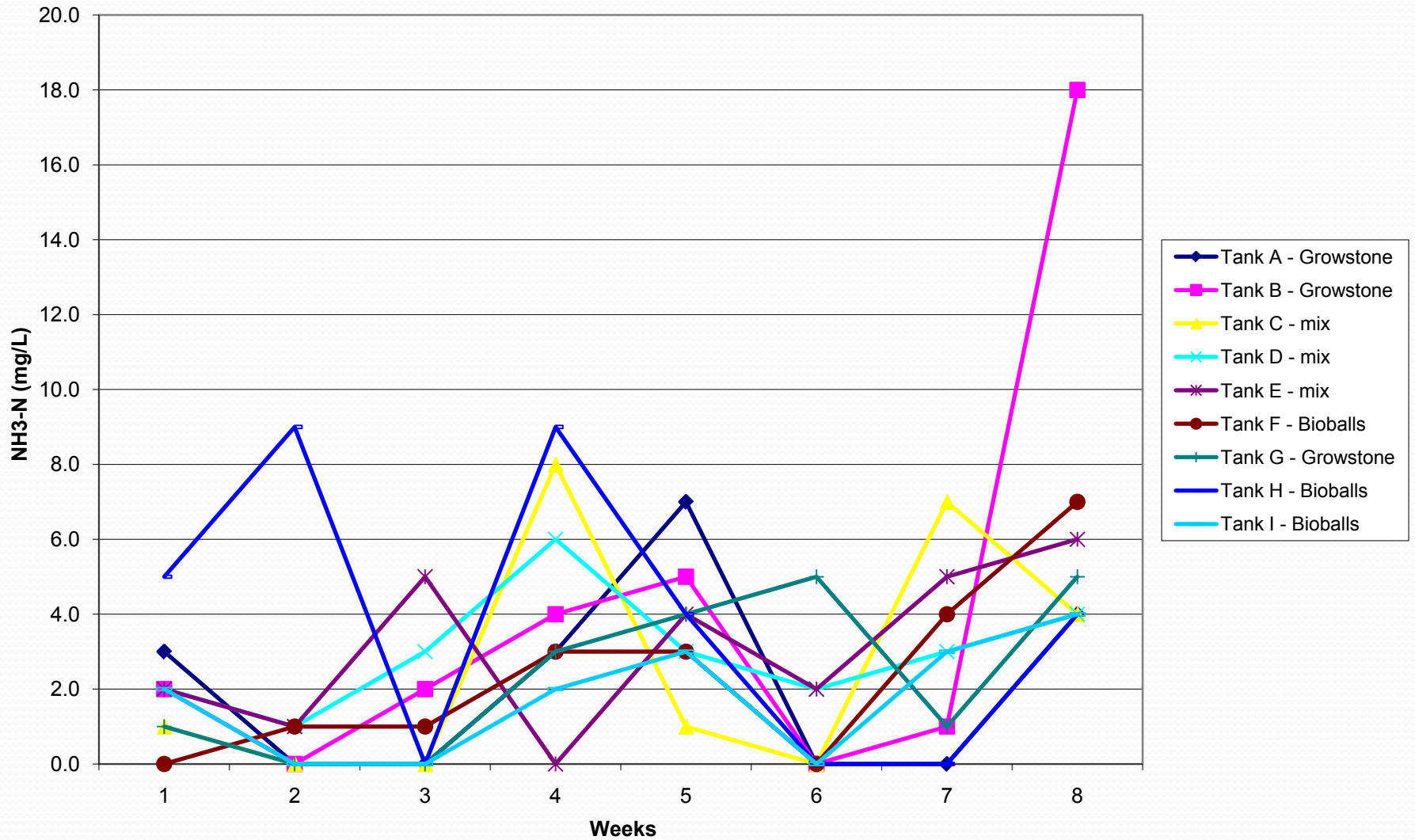
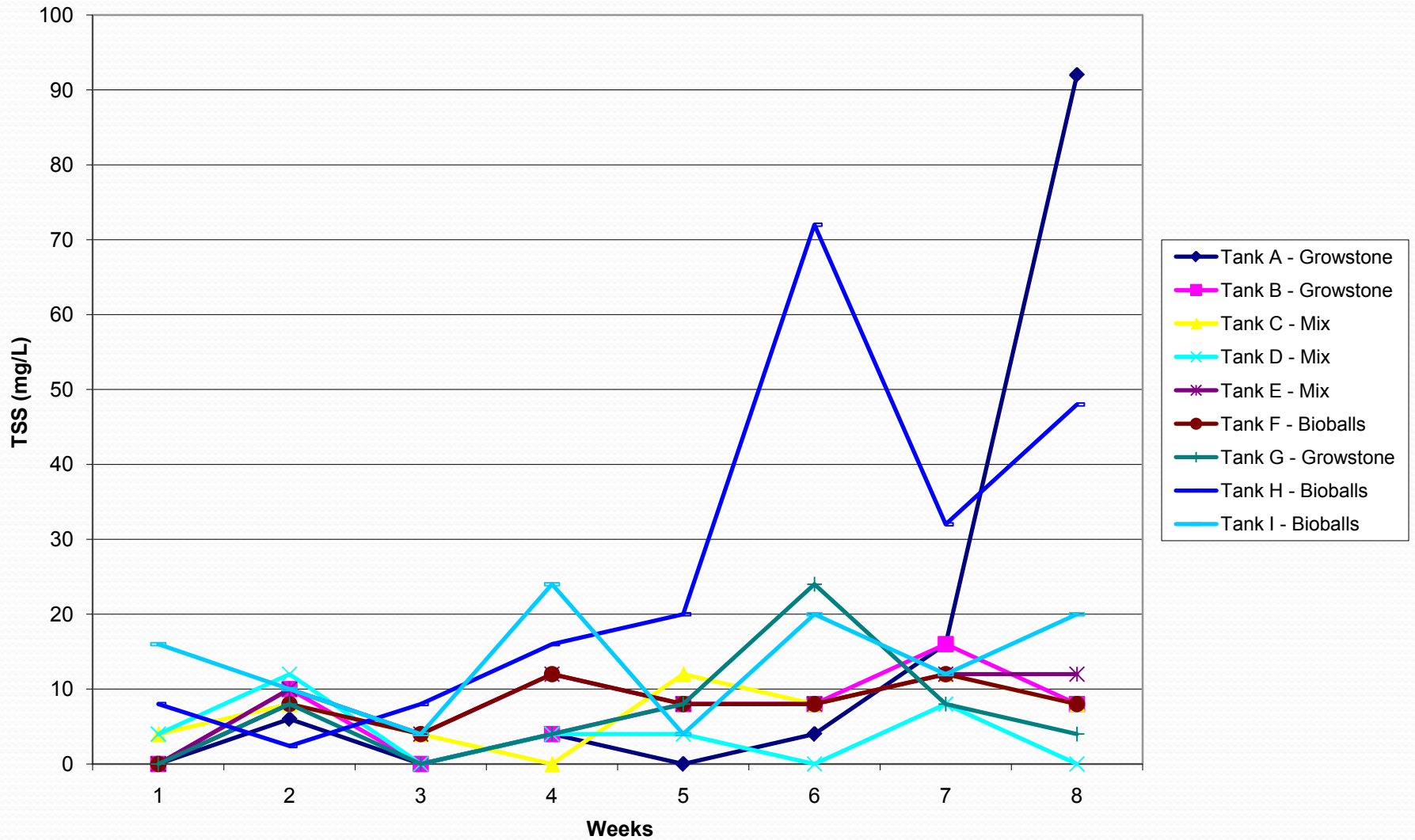


Fig.3. Total Suspended Solids (TSS, mg/L)



# Trial-2

Table-3. Mean & standard deviation per treatment for NO<sub>3</sub>-N, NH<sub>3</sub>-N, TSS and growth rate of fish.

Parameter	Growstone		Bio-beads		Mix	
	Ave	STD	Ave	STD	Ave	STD
NO <sub>3</sub> -N (mg/L)	7.163	4.35	8.33	5.102	7.838	4.262
NH <sub>3</sub> -N (mg/L)	3.000	2.13	4.08	5.332	4.000	3.190
TSS (mg/L)	4.967	4.67	57.52	191.498	9.967	15.552
Growth (Kg)	5.000	1.32	4.47	0.764	4.31	0.866

# Trial-2...

Table-4. P-values Generated Using ANOVA

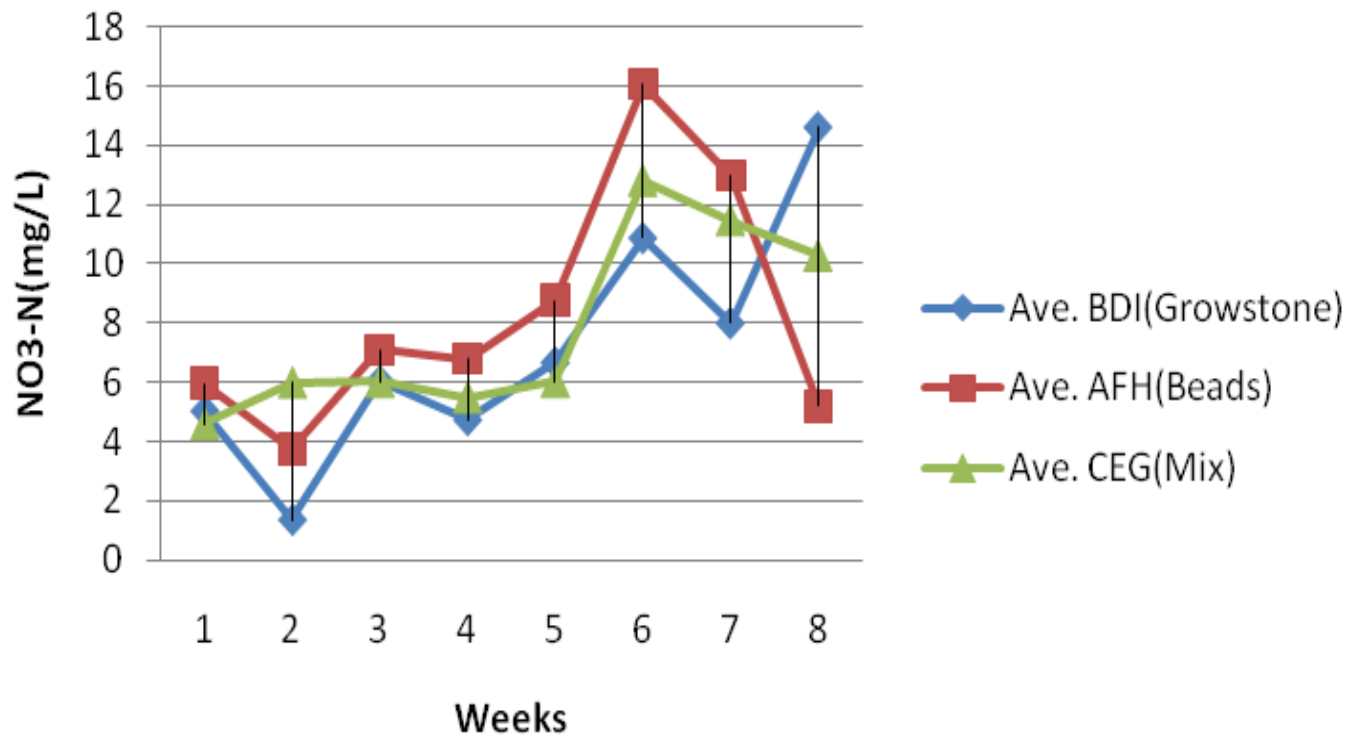
<b>Parameter</b>	<b>Growstone Vs Biobeads</b>	<b>Bio-beads Vs Mix</b>	<b>Growstone Vs Mix</b>
NO <sub>3</sub> -N (mg/L)	0.399	0.719	0.590
NH <sub>3</sub> -N (mg/L)	0.360	0.948	0.208
TSS(mg/L)	0.186	0.232	0.138
Growth (Kg)	0.256	0.643	0.176

## Trial-2...

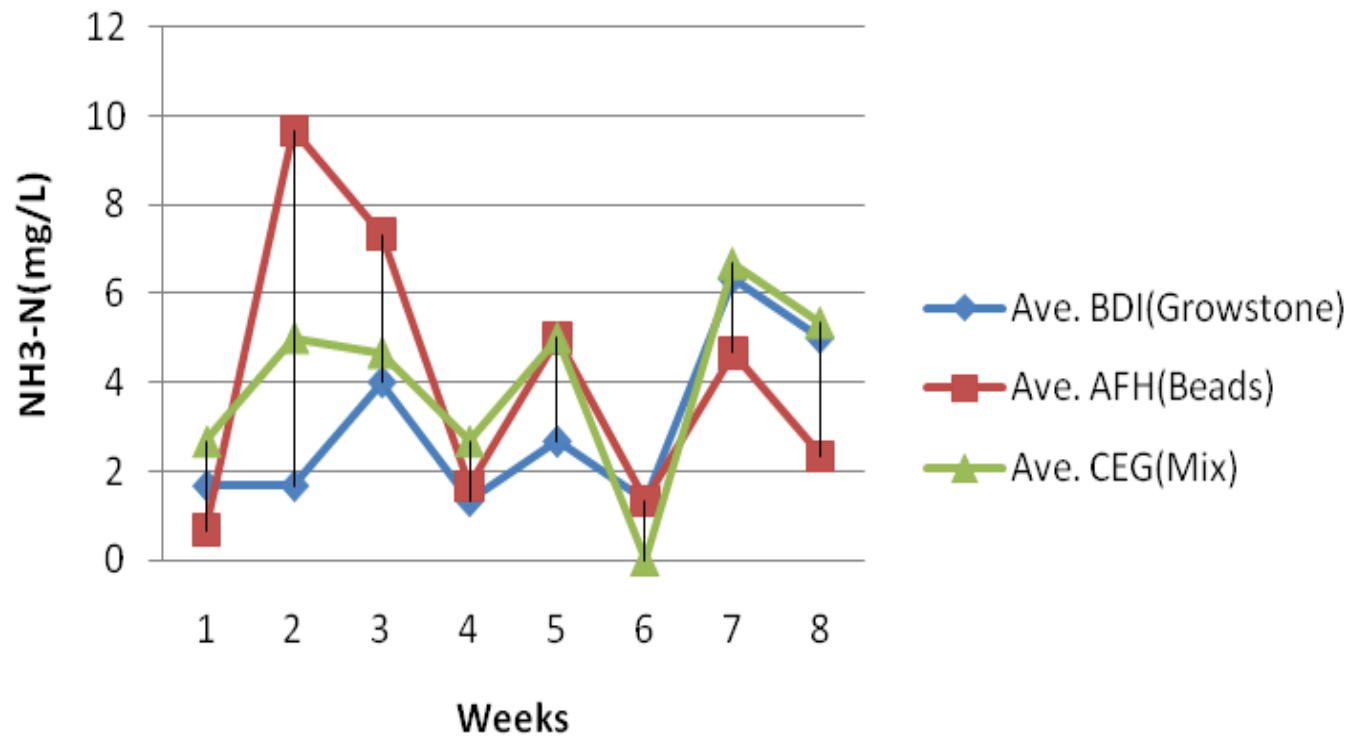
- In trial-2 there were no statistically significant differences among treatments.
- On average NO<sub>3</sub>, NH<sub>4</sub> and TSS levels for the tanks that were treated with Bio-beads filters have shown higher than those treated with Growstone and the Mix, but all differences for all parameters were statistically insignificant.



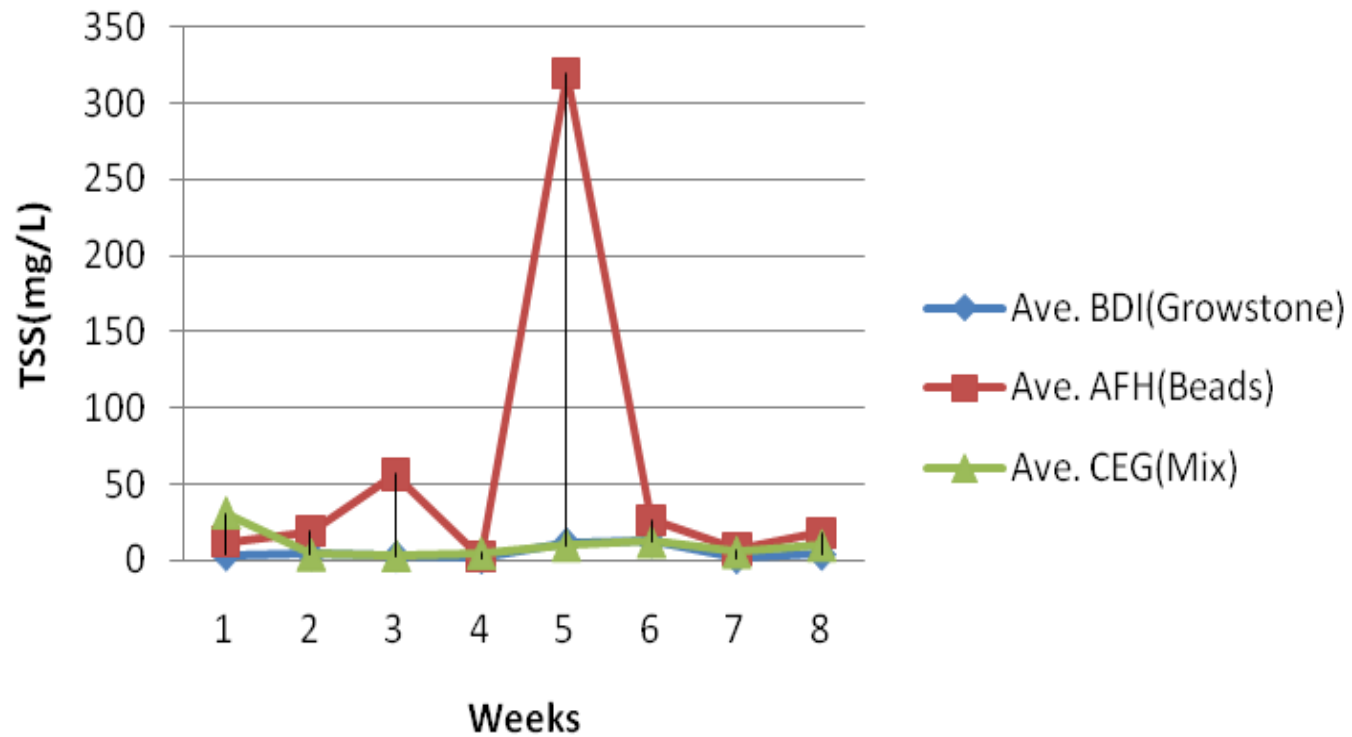
## Nitrate levels of treatments



## Ammonia levels of treatments



## Levels of TSS for treatments



# Conclusion

- From the results of this experiments, it can be concluded that Growstone can be used as equally reliable bio-filter as Bio-balls & Bio-beads.
- Based on the performance of Growstone as a bio-filter media, it is highly recommended for wide use of the product in aquaculture activities.
- Considering the fact that it is made from recycled glass and due to its large surface area to volume ratio, Growstone is relatively a better option compared to other bio-filers.

**THANK YOU**