



# **EFFECTS OF BIO-MOS® (MANNAN OLIGOSACCHARIDE) ON GROWTH PERFORMANCES AND FISH HEALTH IMPROVEMENT OF TRA CATFISH**

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## INTRODUCTION

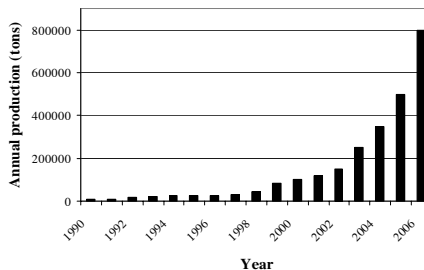


-Tra catfish industry in Vietnam obtained 1.2 million metric ton in 2007.

- In intensive tra catfish farming, fish disease often causes heavy damage

- Farmers often spent 5-10% production cost for disease prevention and therapeutic treatments (Hung et al., 2007).

- Antibiotics and chemical uses raise concerns in consumers on using farmed fish.



## INTRODUCTION



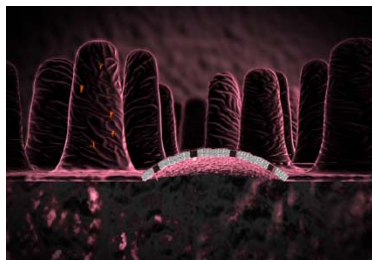
- Vaccination for tra catfish has not been available.

- Therefore, focus has shifted to nutritional strategies to improve fish health status, help optimize performance and improve stress and disease resistance.



## THE ACTION MOOD OF MANNAN OLIGOSACHARIDE

- Bio-Mos® is a mannan oligosaccharide derived from the outer cell wall of a specific strain of *Saccharomyces cerevisiae* using a proprietary process developed by Alltech Inc.



- Bio-Mos plays as a pathogen agglutination and eliminates pathogen through feces.
- Enhanced antigen presentation to immune cells and modulated antibody production

- Bio-Mos use in terrestrial animals is well documented (Miguel et al. 2004)

## Bio-MOS STUDY IN AQUACULTURE



- Use of Bio-Mos improved growth performances and health status of common carp (Staykov et al.. 2005); rainbow trout (Staykov et al.. 2005) and European catfish (Bogut et al.. 2006).

- The study aims to evaluate the use of Bio-Mos on growth performance, feed utilization and health status improvement of tra catfish



- The study on Nov. to Dec. 2007 under the framework of Asia Link project and the support of Alltech



## MATERIAL AND METHODS



## EXPERIMENTAL FEEDS



### Feed Formulation

Treatment	Experiment 1(Week 1-5)	Experiment 2 (Week 6-10)
<b>Control</b>	No supplement	No Supplement
<b>Treatment 1</b>	0.2% Bio-Mos	0.1% Bio-Mos
<b>Treatment 2</b>	0.4% Bio-Mos	0.2% Bio-Mos

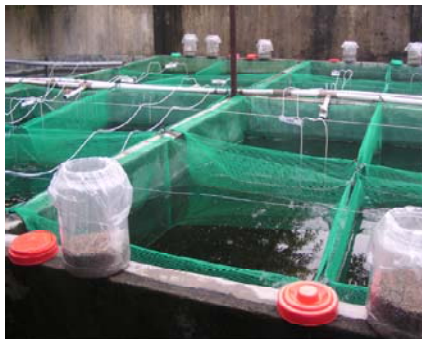
### Nutrient composition of experimental feeds

	Proximate analysis of nutrient (% dry matter)			
	Control	0.1% Bio-Mos	0.2% Bio-Mos	0.4% Bio-Mos
Dry matter	91.83	91.12	91.03	89.50
Crude Protein	31.83	31.18	28.88	30.91
Crude Lipid	4.13	4.33	4.34	4.12
Fiber	5.06	4.73	4.09	4.12
Mineral	11.86	11.39	11.22	10.94

## FEEDING METHOD AND EXPERIMENTAL FISH



- Experimental fish has a mean size: 12-13 g
- Fish were cultured in hapas (1x1x1 m). Stocking density 300 fish/cage
- Extruded feed
- Feeding twice a day: morning (8-9 am) afternoon(5-6 pm)
- Uneaten feed was removed after 2 hours, dried to deduct in order to calculate the feed intake
- Experiment has three treatments with 4 replicates. 12 hapas have distributed at random in 4 concrete tanks (6 x 4 x 1.5m)



## FOLLOWING UP THE EXPERIMENT



Five week cultured fish were challenged to evaluate fish health (Phase 1)  
The remaining fish were continued to be cultured for the second phase (week 5-10)

### Specific Growth Rate (SGR) %/day

$$SGR = \frac{(\ln W_2 - \ln W_1)}{T_2 - T_1} \times 100$$

In which:

- W2 : Final weight
- W1 : Initial weight
- T2- T1: Duration of culture (56 days)

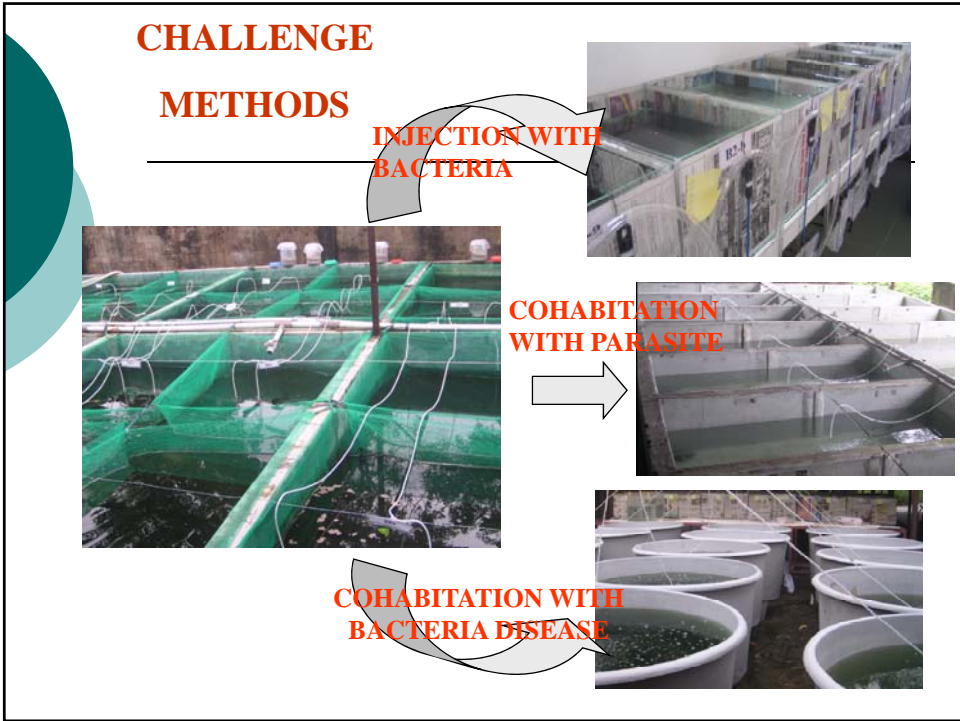
### Food Conversion Ratio (FCR)

FCR = Total consumed feed/ Total increased weight (W2-W1)

$$FCR = \sum Ft_{1..2} / W_{t2} - W_{t1}$$

### Feed Intake (FI)

FI = Total consumed feed in one hapa/ Fish number (g/fish/day)



**CHALLENGE WITH BACTERIA INFECTED FISH**

**Injection of solution containing bacteria *E. ictaluri* ( $10^6$ /ml)**

**After injection, fish were cultured to follow the survival rates in 7 days**

The complex block contains a title, three images, and two text blocks. The title is 'CHALLENGE WITH BACTERIA INFECTED FISH'. The first image shows a fish on a blue surface. The second image shows a person in a lab coat and gloves performing an injection on a fish. The third image shows a row of white fish tanks. The text blocks describe the injection process and the subsequent culturing of the fish to follow survival rates in 7 days.

## CHALLENGE BY COHABITATION WITH BATERIA INFECTED FISH

- Fish cultured with Bio-Mos supplemented feed was challenged by cohabitation with *E. ictaluri* infected fish
- 30 fish were cohabitated with 5 infected fish in 500 liter composite tank.
- Number of dead fish were daily recorded
- Fish were fed the same feed as the trial during 21 days
- Three treatments with 4 replicates



## CHALLENGE BY COHABITATION WITH FISH INFECTED WITH PARASITES

- 30 trial fish were cohabitated with fish infected with external parasite (*Ichthyophthirius multifiliis*).
- Three treatments with 4 replicates (12 concrete tanks)
- Fish were observed in 21 days to evaluate incidence and severity rates



$$\text{Incidence rate (\%)} = \frac{\text{Number of infected fish}}{\text{Total observed fish number}} \times 100$$

$$\text{Severity rate (No parasite/fish)} = \text{Parasite number of } Ichthyophthirius \text{ multifiliis found in a gill arch or on skin of an individual fish.}$$



## RESULT AND DISCUSSION

### GROWTH PERFORMANCE FIRST EXPERIMENT



**Fish growth, FCR and Feed Intake of tra catfish after 5 week feeding experimental diets**

Treatment	Initial weight (g)	SGR (%.day)	FCR	Feed Intake in 5 week (g)	Survival rates (%)
Control	12.54 a	1.94 a	1.64 a	20.33 a	97.8 a
0.2% Bio-Mos	12.63 a	2.34 ab	1.27 ab	19.94 ab	99.1 ab
0.4% Bio-Mos	12.80 a	2.48 b	1.09 b	18.51 b	99.4 b

**- Supplement Bio-Mos 0.4% in tra catfish result in higher growth rates and lower food conversion ratio (FCR)**

-The same result was observed in common carp, rainbow trout (Staykov et al. 2005) and sea bas recently (Torrecillas *et al.* 2007).

## GROWTH PERFORMANCE FIRST FEEDING



Fish growth, FCR and Feed Intake of tra catfish after 5 week feeding experimental diets

Treatment	Initial weight (g)	SGR (%.day)	FCR	Feed Intake in 5 week (g)	Survival rates (%)
Control	12.54 a	1.94 a	1.64 a	20.33 a	97.8 a
0.2% Bio-Mos	12.63 a	2.34 ab	1.27 ab	19.94 ab	99.1 ab
0.4% Bio-Mos	12.80 a	2.48 b	1.09 b	18.51 b	99.4 b

- Feed Intake in Bio-Mos supplemented fish tends to reduce when compared to the control

- **Supplementing Bio-Mos in feed improved the survival rates of fish in the trial (Significant improvement in treatment 0.4% Bio-Mos)**

## GROWTH PERFORMANCE SECOND EXPERIMENT



Fish growth, FCR and Feed Intake of tra catfish after 5 week feeding experimental diets FOR THE SECOND PHASE

Treatment	Initial weight (g)	SGR (%.day)	FCR	Feed Intake in 5 week (g)	Survival rates (%)
Control	28.26 a	1.88 a	1.39 a	36.15 a	98.5 a
0.1% Bio-Mos	27.57 a	2.04 ab	1.30 ab	36.92 a	98.7 a
0.2% Bio-Mos	27.45 a	<b>2.13 b</b>	<b>1.14 b</b>	34.62 a	99.5 a

- Fish growth and Feed Utilization has improved with supplementing 0.1% and 0.2% Bio-Mos in the feed

- Fish survival rates have improved but not significantly different

- **Inclusion rate of 0.1% Bio-Mos has low effect on fish growth and feed utilization and 0.2% inclusion rate has clearly improved**

## EVALUATING FISH HEALTH STATUS



### Survival 7 days post challenge (First experiment)

Treatment	Injection	Cohabitation with infected fish	Cohabitation with parasite infected fish
Control	70.00 a (%)	91.18 a (%)	75.00 a (%)
0.2% Bio-Mos	80.83 a (%)	92.65 ab (%)	75.71 ab (%)
0.4% Bio-Mos	87.50 a (%)	97.06 b (%)	80.00 b (%)

- Survival rates have been improved in Bio-Mos treatments but no significantly different
- In cohabitation with infected fish, 0.4% Bio-Mos treatment has significantly improved survival rates
- In cohabitation with parasite infected fish, 0.4% Bio-Mos treatment has significantly improved survival rates

## EVALUATING FISH HEALTH STATUS

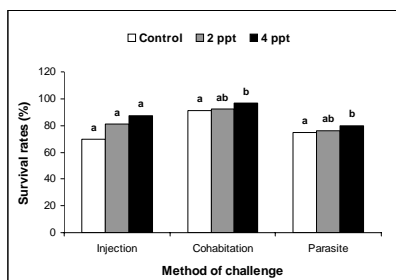


### Survival 7 days post challenge (Second experiment)

Treatment	Injection	Cohabitation with infected fish	Cohabitation with parasite infected fish
Control	4.17 a	73.75 a	81.50 a
0.1% Bio-Mos	17.50 b	80.00 a	90.00 a
0.2% Bio-Mos	25.00 b	81.88 a	92.50 a

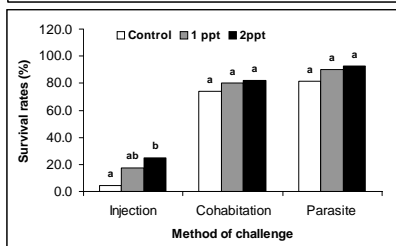
- In second phase, supplementing 0.1 and 0.2% Bio-Mos in feed has improved the survival rates in injection challenge
- When cohabitated with parasite infected fish, 0.2% Bio-Mos treatment has improved the survival rates but not significantly different.

## Challenge result in first and second phase in tra catfish



-In general, supplementing 0.2% Bio-Mos in feed helps to protect fish from disease

Bio-Mos effects on cohabitation challenge thank to protecting the pathogen intrusion through intestine



Bio-Mos effects on injection challenge thank to enhancing the immune system

## CHALLENGE WITH EXTERNAL PARASITE



Incidence and Severity rates of external parasites in skin and gill of fish fed with different feed

Treatment	Incidence rate (%)		Severity rate (parasite/fish)	
	skin	gill	skin	gill
Control	26.0 a	19.09 a	12.46 a	13.39 a
0.2% Bio-Mos	1.0 b	0.96 b	0.96 b	0.96 b
0.4% Bio-Mos	1.0 b	0.00 b	0.96 b	0.00 b

- Bio-Mos supplementing has effect to protect fish from external parasites

- Incidence and severity rates of *Ichthyophthirius* on skin and gill has reduced in 0.2% and 0.4% Bio-Mos treatment

- The increased mucus in skin and gill in Bio-Mos treatment can be the way to protect fish from external parasites.

## STRESS TEST



**Survival rates 5 days post stressed with ammonia and salinity**

Treatment	Ammonia test	Treatment	Salinity test
Control	28.75 a (%)	Control	63.75 a
0.1% Bio-Mos	33.75 ab (%)	0.2% Bio-Mos	76.25 a
0.2% Bio-Mos	80.00 b (%)	0.4% Bio-Mos	81.25 a

## CONCLUSION



- **Supplementing 0.2% Bio-Mos in feed results in better growth performances, feed utilization and improve survival rates.**
- **When challenged with parasite and bacteria, 0.4% Bio-Mos inclusion improves survival rates in the first phase and the inclusion can be reduced to 0.2% in the second phase.**
- **0.2% Bio-Mos inclusion can protect tra catfish**
- **0.2% Bio-Mos inclusion also help the fish increase the resistance to the ammonia test.**



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**THANK YOU FOR YOUR  
ATTENTION**