
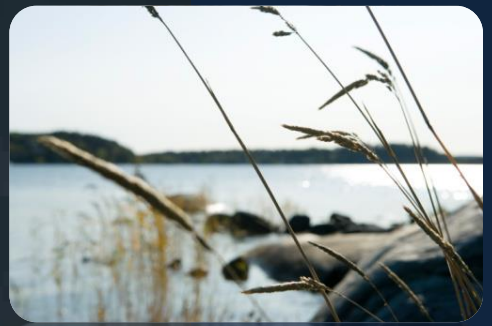

PROBIOTICS TECHNOLOGY: APPLICATION FOR FISH AND PRAWN

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AQUACULTURE

- Global fish production - more than 30 % between 2006-2011 or 47.3 million tons to 63.6 million
- Shrimp farming - in the Asian countries 91% of the world food production.

- Many fisheries have reached their maximum sustainable exploitation.
- Concerns about security and safety of food.
- High demand for high quality, low calorie, high protein aquatic products.
- Minimum carbon dioxide emission.

Challenges in Aquaculture

Pollution

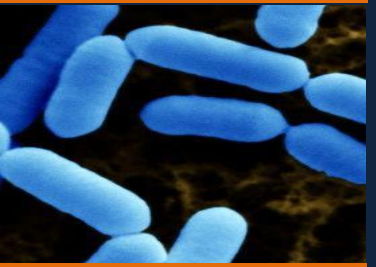
Diseases

Low productivity

PROBIOTICS

- **represent one of the most promising alternatives to antimicrobials developed in recent years**

Saccharomyces cerevisiae
(Yeast)



Lactobacillus casei
(Lactic Acid Bacteria)

Bacillus megaterium
(*Bacillus* sp.)

PROBIOTICS IN AQUACULTURE

- **live microorganisms that have a beneficial effect on the host by modifying the microbial community associated with the host.**

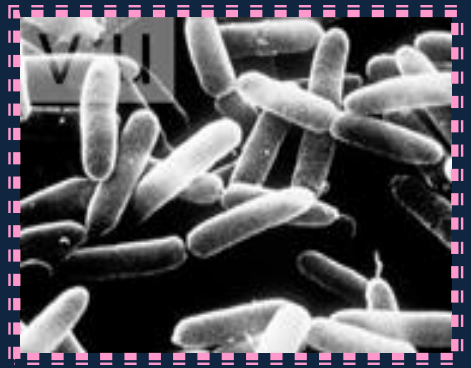
- **ensure improved use of the feed or enhance its nutritional value**

- **enhance the host response towards disease**

- **improve the quality of its ambient environment**

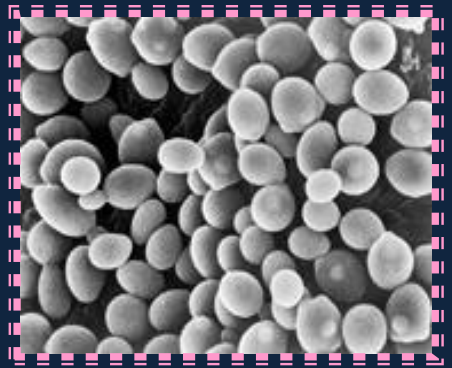
Microorganisms with Probiotic Properties

Lactobacillus spp.

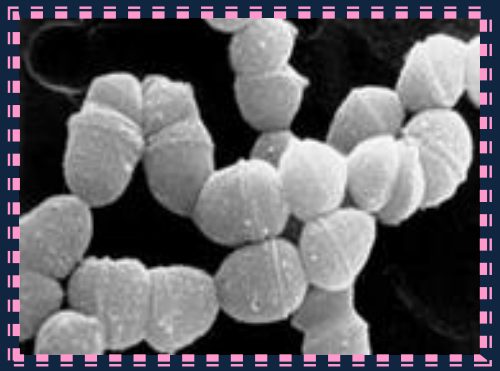


Bacillus spp.

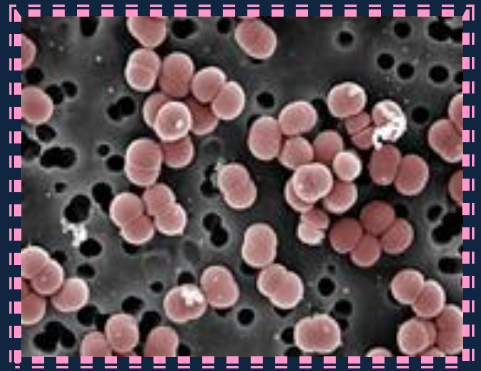
Bifidobacterium spp



Saccharomyces spp.

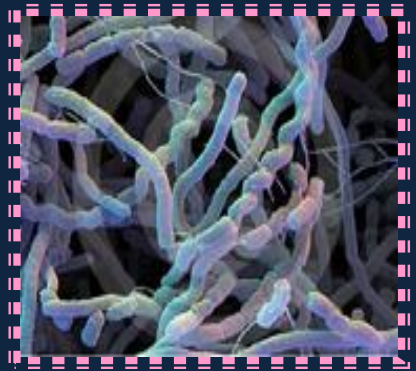


Streptococcus spp.



Pediococcus spp.

Leuconostoc spp.



Streptomyces spp.

COMMERCIAL PREPARATIONS

(Available in liquid or powder form)

Global Market for Probiotics - US $ 19,600 million in 2013

Annual Growth rate- 4.3%

BIOSTART

YIELD

ENVIRON-AC

AQUA-PS

OBJECTIVES

1. Develop a probiotic product using characterized and established probiotic strains.
2. Establish process technology
3. Evaluate product quality

Production of Probiotics

Batch Process of Powder Probiotic Production

Microbial Strain → Seed Medium → Fermentation Medium

Seed Medium → Propagation → Seed inoculant → Fermentation Medium

Fermentation Medium → BIOREACTOR → Cultivation → Conditioning → Formulation → Drying → Labeling → Powder Probiotics

Production of Probiotics

Batch Process of Liquid Probiotic Production

Microbial Strain → Seed Medium → Fermentation Medium

Seed Medium → Propagation → Seed inoculant → Cultivation

Fermentation Medium → BIOREACTOR → Cultivation

Cultivation → Conditioning → Formulation → Bottling → Labeling → Liquid Probiotics

SELECTION OF PROBIOTIC STRAINS

Sources

- As cited in literature
- Stocks from laboratory & local culture collections (PNCM)

Screening of Microorganisms

- Biomass Determination
- Lactic Acid Concentration
- Co-culture Screening Tests
- Test for Hemolysis
- Well Diffusion Assay

PROBIOTIC PRODUCTS

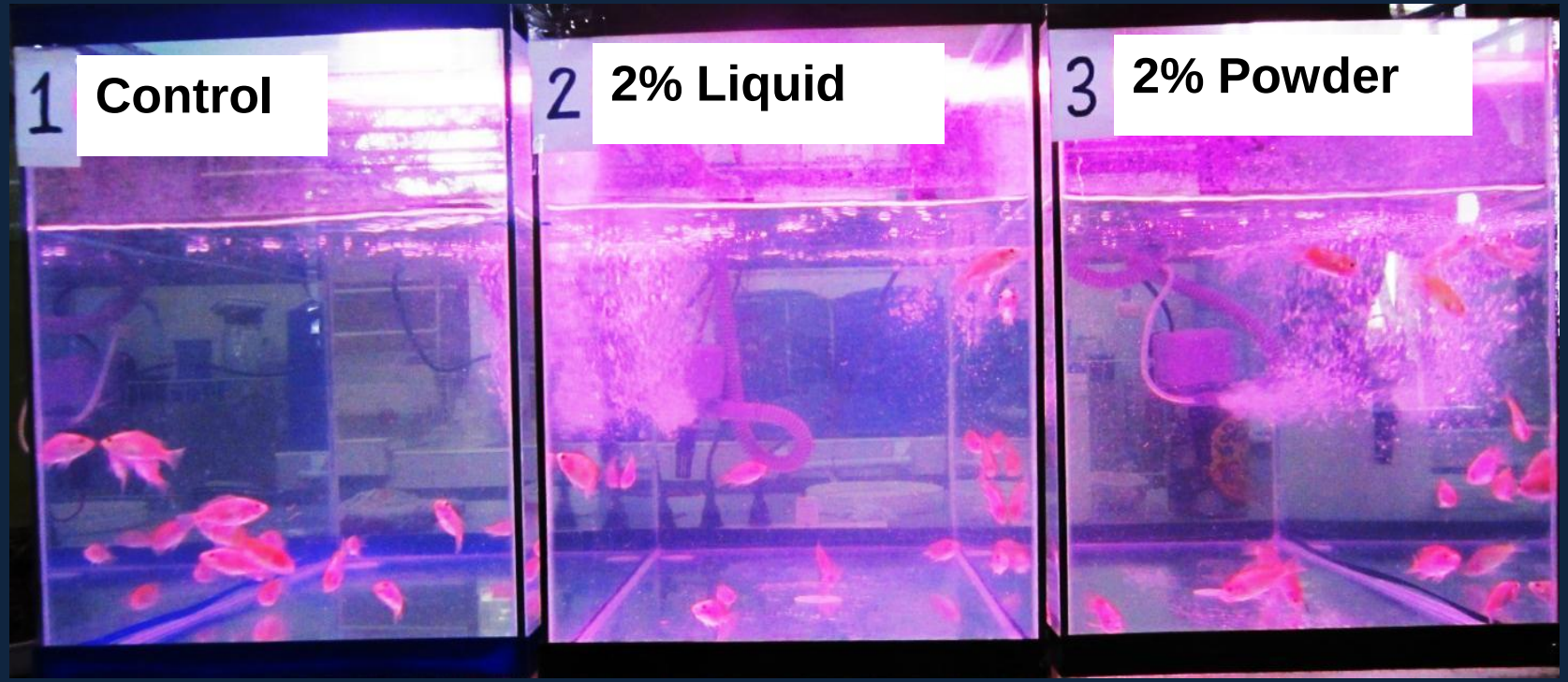
Aquaculture probiotics in liquid and powder form produced using the five strains that passed the final screening procedures.

PROPERTIES

Parameters	Powder Probiotics	Liquid Probiotics
Live Microbial Cell count	Trillion cfu/g	1.25×10^{13}
Appearance	Free flowing white powder	Viscous, beige-colored liquid
odor	Milky sweet	Milky sweet
Moisture	10%	NA
pH	Neutral	4.7

EVALUATION OF PERFORMANCE

Laboratory feeding trial: Red Tilapia (*Oreochromis spp.*)



FEEDING TRIALS IN FISH AND PRAWN

AQUAPROBIOTICS

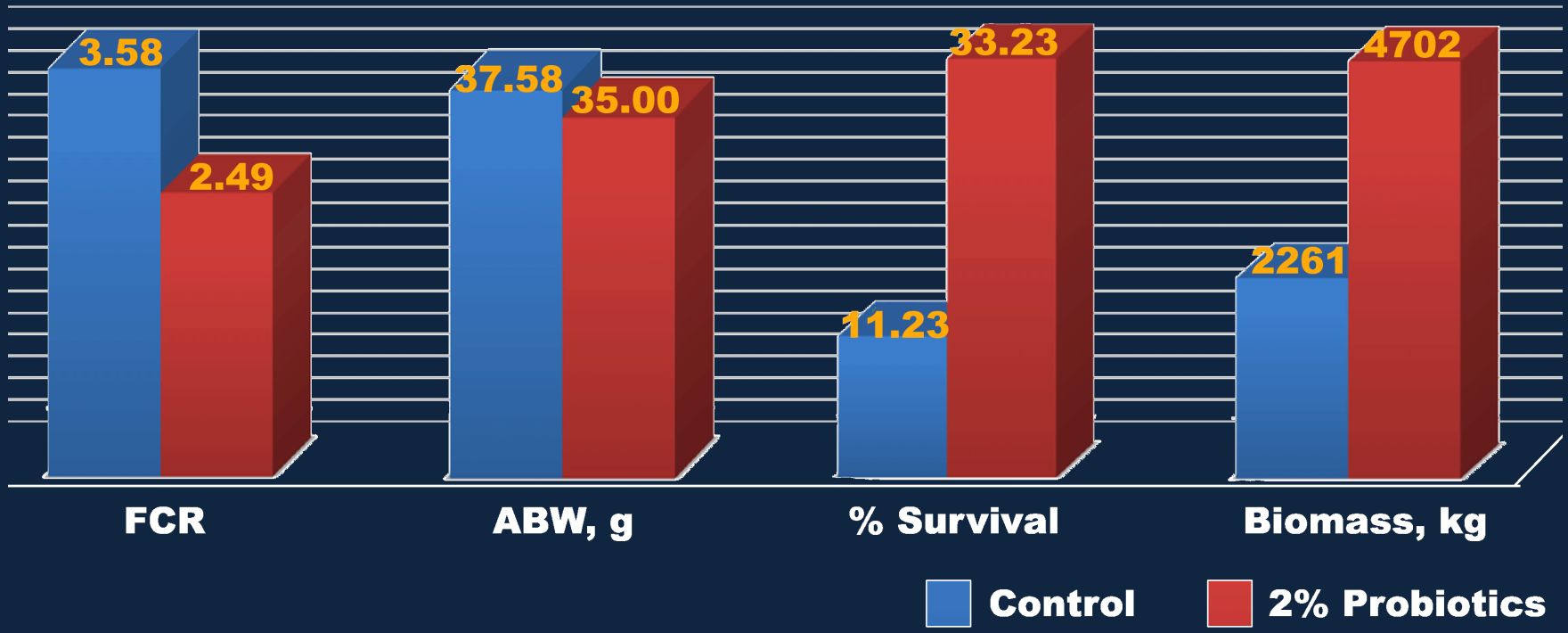
Batch # _____ Date _____

National Institute of Molecular Biology and Biotechnology (BIOTECH)

U.P. Los Baños

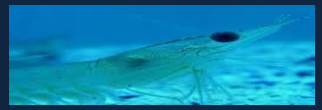
Feeding Trial on Bangus

PARAMETERS/ POND #	34 (CONTROL)	38 (2% PROBIOTICS)
Date Stocked	08/13/13	08/22/13
Date Harvested	01/12/14	01/14/14
Area	4,258 m^2	4,258 m^2
Population	550,000 pcs	550,000 pcs
ABW	37.58 g	35 g
Biomass	2,261.10 kg	4,702.10 kg
D.O.C.	134 days	156 days
FCR	3.58	2.49
Pieces Harvested	56,700 pcs	182,740 pcs
Survival	11.23%	33.23%



Feeding trial on Bangus (pond)

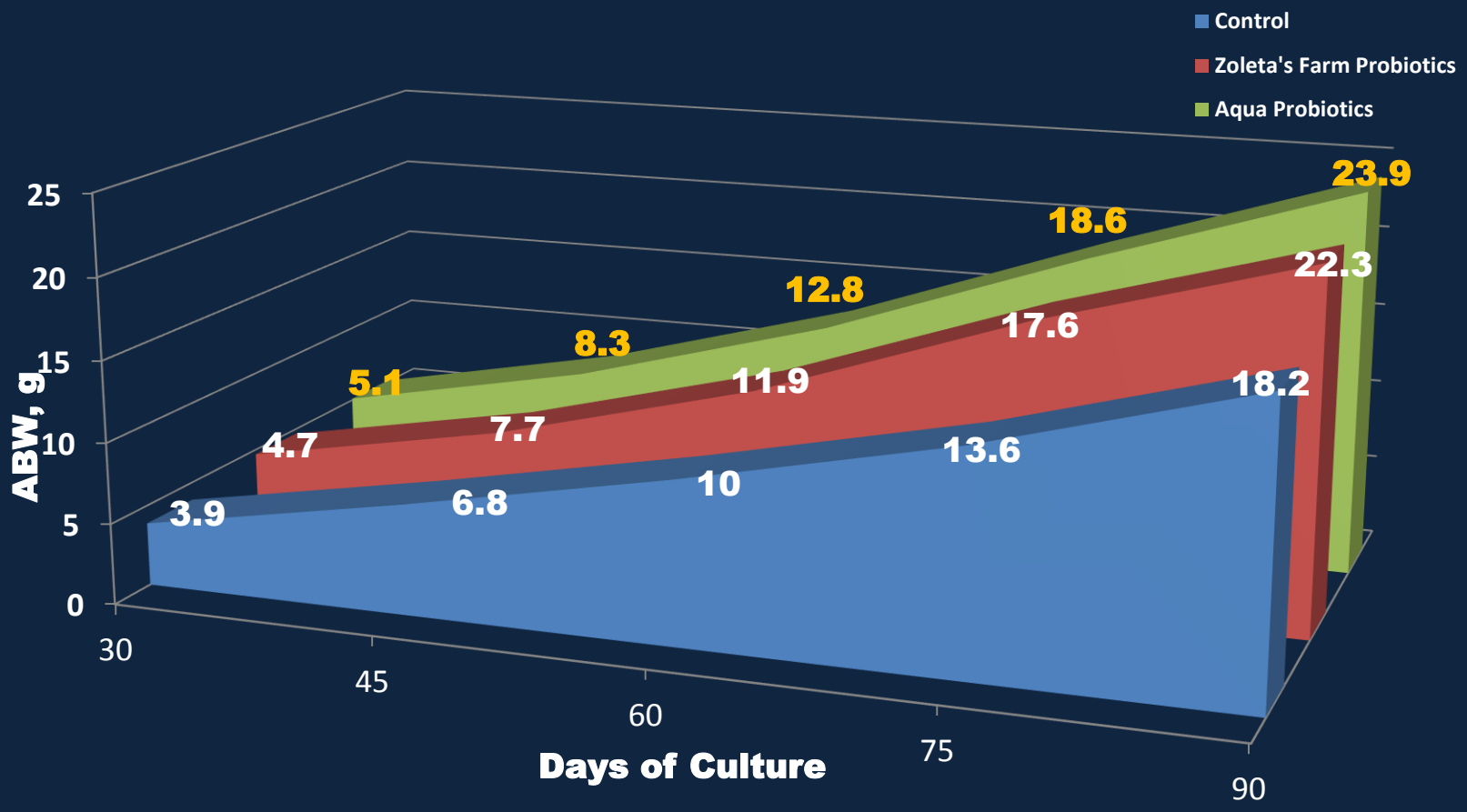
Feeding Trial on *Penaeus vannamei* (Intensive Culture)



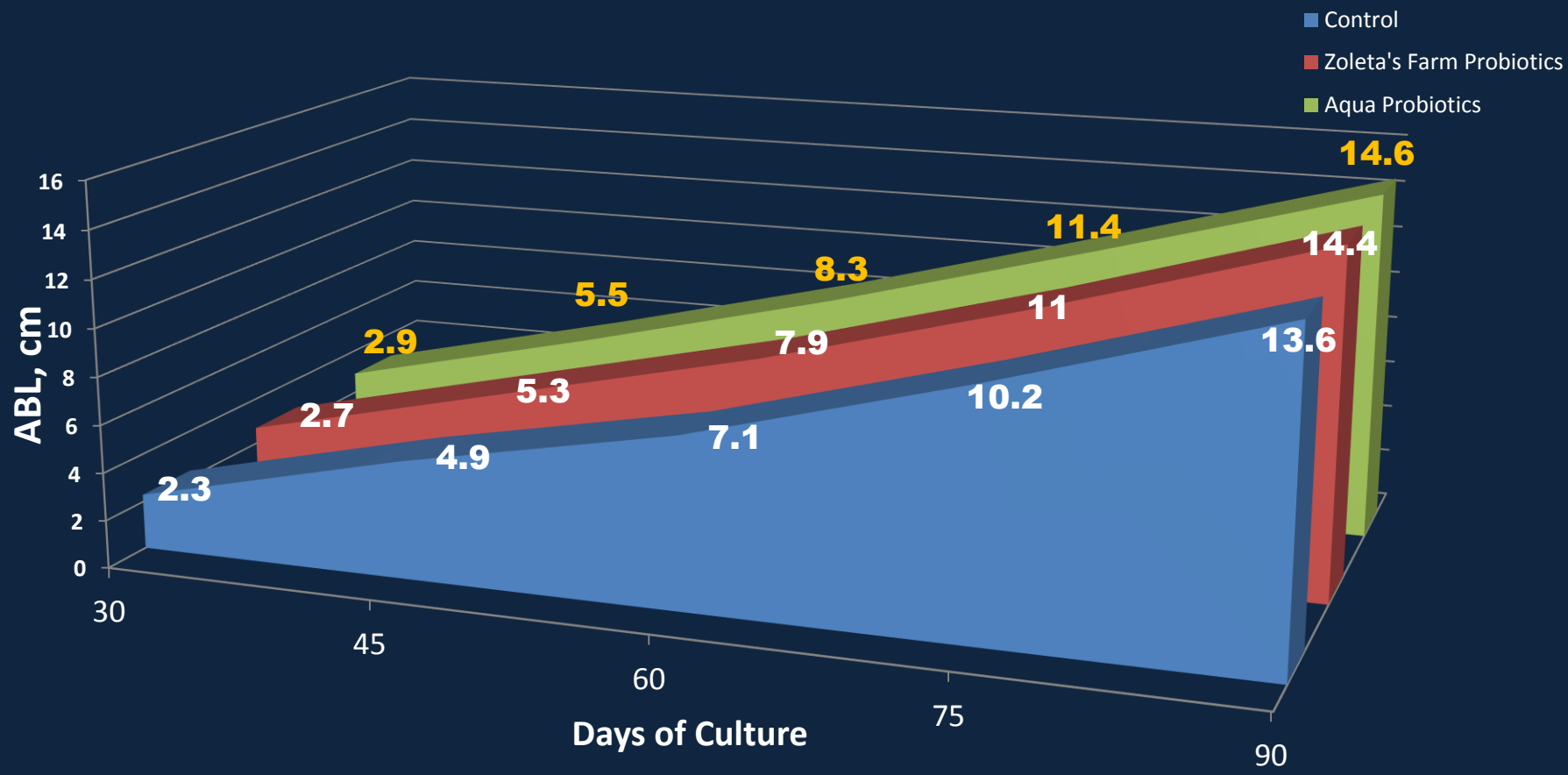
PARAMETERS/ POND #	8 (CONTROL)	9 (2% PROBIOTICS)
Date Stocked	11/20/13	11/18/13
Date Harvested	12/22/13	12/22/13
Population	418,176 pcs	456,190 pcs
ABW	15.06 g	9.48 g
Biomass	4,934.50 kg	861 kg
D.O.C.	94	96
FCR	1.528	6.13
Survival	78.30%	19.90%
Total Feeds	7,541.20 kg	5,282.80 kg

Feeding Trial on *Penaeus monodon* (Extensive Culture)

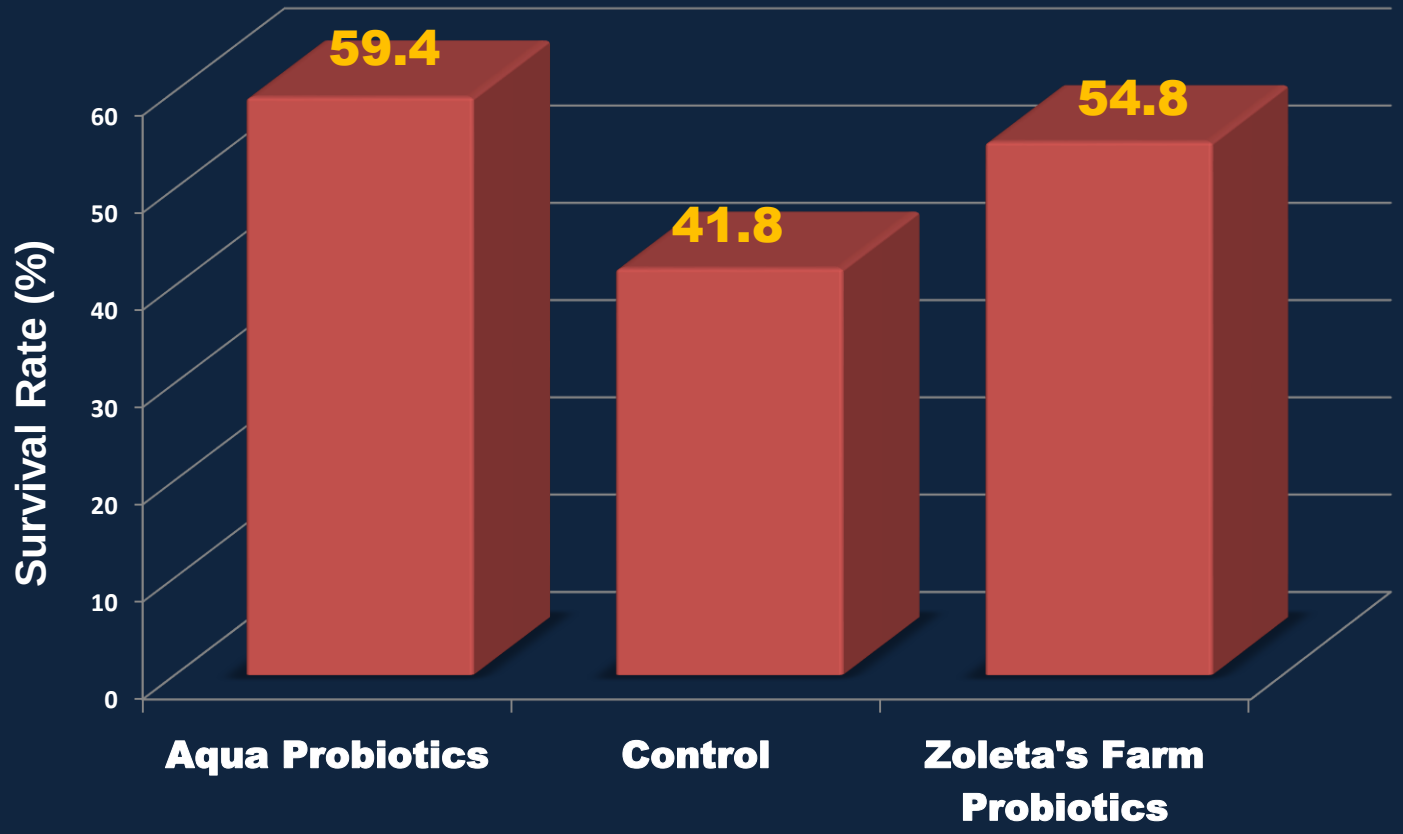
PARAMETERS/ POND #	CONTROL	ZOLETA'S FARM	AQUA PROBIOTICS
Date Stocked	03/15/14	03/15/14	03/15/14
ABW	18.20 g	22.30 g	23.90 g
ABL	13.60	14.40 cm	14.60 cm
Survival	41.8%	54.8%	59.40%



Average Body Weight



Average Body Length



Survival Rate

Storage Studies – Powder Probiotics

Months of Storage	Average Live Microbial Counts (CFU/mL)		
	Room	Refrigerator	Freezer
3	4.00×10^{16}	1.87×10^{16}	1.91×10^{16}
6	3.62×10^{17}	1.66×10^{16}	8.06×10^{15}
9	7.80×10^{14}	5.70×10^{13}	4.64×10^{14}
12	2.37×10^{15}	1.14×10^{15}	1.21×10^{15}

Storage Studies – Liquid Probiotics

Months of Storage	Average Live Microbial Counts (CFU/mL)		
	Room	Refrigerator	Freezer
3	9.00×10^{16}	7.40×10^{17}	1.12×10^{17}
6	1.48×10^{16}	1.94×10^{17}	4.57×10^{16}

A probiotic product was developed For the Aquaculture Industry. This probiotic product offers attractive windows of opportunities to reduce the importation of feed additives such as antibiotics. The process technology is continuously improved for more competitive products that will meet the demands of continuous growth.

THANK YOU

PCIERD,DOST
OVERSEA FEEDS
ZOLETA'S FARM

~

THE PROBIOTICS TEAM