

Supplementation of *Padina* Polysaccharide Extract (PPE) Promotes Growth And Enhances Survival of Juvenile *Penaeus vannamei* Against *Vibrio parahaemolyticus* Infection

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Abstract

The emergence of Early Mortality Syndrome (EMS) or Acute Hepatopancreatic Necrosis Disease (AHPND), caused by a pathogenic strain of *Vibrio parahaemolyticus*, has impacted the shrimp industry severely affecting *Penaeus vannamei* and *Penaeus monodon* production. This study evaluates the effect of *Padina* polysaccharide extract (PPE) as dietary immunostimulant in juvenile *Penaeus vannamei*.

Introduction

Aquaculture is one of the fastest growing sector in terms of food production and has expanded in the recent years. Shrimp farming has been widely practiced and has undergone rapid development and has contributed to the global economy. Early Mortality Syndrome (EMS), technically known as Acute Hepatopancreatic Necrosis Diseases (AHPND), which affects farmed shrimp particularly *Penaeus vannamei* and *Penaeus monodon* has cause losses in the shrimp culture industry in the past years (De Schryver et al., 2014). To date, there have been several works published on the control of EMS/AHPND such as the use of tilapia green water, probiotics and immunostimulants. Immunostimulants have established beneficial role for disease management in aquaculture systems (Mastan, 2015). Several compounds such as β -glucans, bacterial products, and plants constituents have shown immunostimulatory effects to shrimp. The present study aims to evaluate the effect of *Padina* polysaccharide extract (PPE) as dietary immunostimulant on the growth and survival of juvenile *Penaeus vannamei* against Early Mortality Syndrome disease.

Materials and Methods

20 *P. vannamei* (0.34±0.2g) stocked in 50-L aquaria fed with test diets for 30 days.



Feed formulation of control and test diets (g/110g).

	Control	T1 0.05 g.kg ⁻¹ PPE	T2 1.0 g.kg ⁻¹ PPE	T3 2.0 g.kg ⁻¹ PPE
Danish Fish Meal	28.00	28.00	28.00	28.00
Shrimp Meal	10.00	10.00	10.00	10.00
Soybean Meal	14.00	14.00	14.00	14.00
Rice Bran	7.00	6.95	6.90	6.80
Cornstarch	12.00	12.00	12.00	12.00
Cod Liver Oil	2.00	2.00	2.00	2.00
Gluten	13.00	13.00	13.00	13.00
Vitamin Mix	2.00	2.00	2.00	2.00
Water	10.00	10.00	10.00	10.00
Lecithin	2.00	2.00	2.00	2.00
PPE	0.00	0.05	0.10	0.20
Total	100.00	100.00	100.00	100.00

Vibrio parahaemolyticus infection

V. parahaemolyticus (10⁶ cfu/g) sprayed on feeds



Fed on *P. vannamei*, mortality was recorded daily

Hemolymph Extraction

Total Hemocyte Count

Phenoloxidase Activity

Serum Antibacterial Activity

Statistical Analysis

Data were reported as mean ± standard error of the mean. Data on growth trial were subjected to one-way analysis of variance (ANOVA) with Tukey's test used to determine significant differences between means. Data on pathogen infection test were analyzed using chi-square test. Significance level was set at p<0.05.

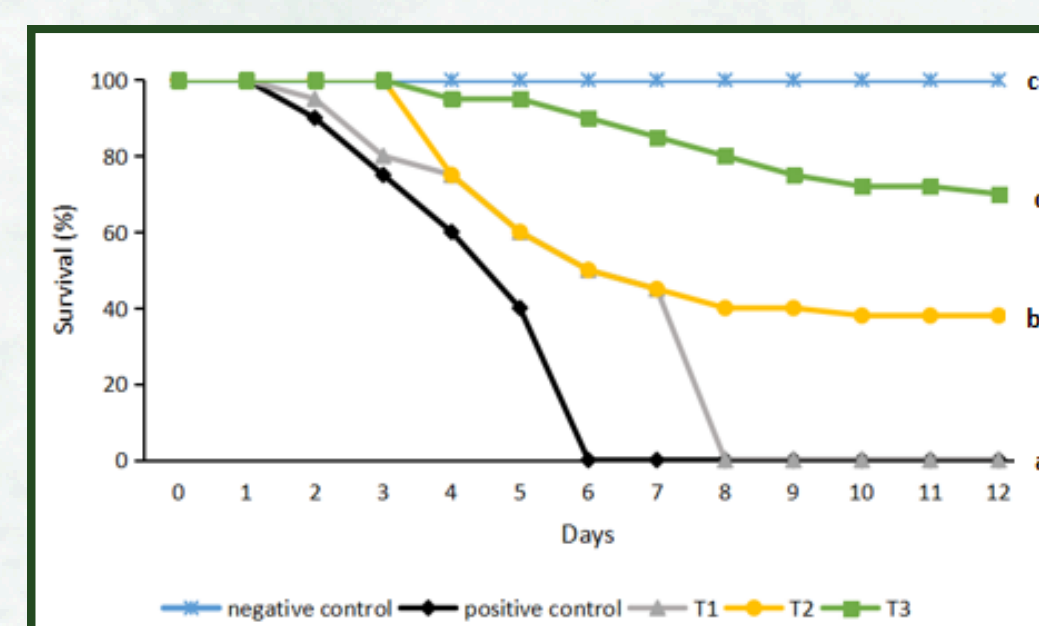
Growth performance of *P. vannamei* fed with different levels *Padina* polysaccharide Extract (PPE).

	Weight Gain(%)	Survival (%)
Control	30.54±3.67 ^a	91.62±3.31 ^a
T1 (0.05 g/kg PPE)	44.82±2.63 ^b	92.17±2.91 ^a
T2 (0.10 g/kg PPE)	47.65±1.27 ^b	91.79±2.11 ^a
T3 (0.20 g/kg PPE)	48.21±1.58 ^b	93.85±1.23 ^a

Immunological indices of *P. vannamei* fed with different levels *Padina* polysaccharide Extract (PPE).

	Total Hemocyte Count (x 10 ⁵ cells/mL)	Phenoloxidase Activity (OD/min/mg protein)	Serum Antibacterial Activity
Control	8.56±0.40 ^a	0.05±0.01 ^a	1.68±0.31 ^a
T1 (0.05 g/kg PPE)	6.78±0.75 ^a	0.13±0.02 ^b	2.34±0.43 ^a
T2 (0.10 g/kg PPE)	14.33±0.67 ^b	0.14±0.02 ^b	2.93±0.87 ^a
T3 (0.20 g/kg PPE)	12.00±12.22 ^b	0.17±0.01 ^b	1.69±0.17 ^a

Results



Survival of *P. vannamei* fed with different levels *Padina* polysaccharide Extract (PPE) after challenge with pathogenic *V. parahaemolyticus*.

Conclusion

Results of the present study shows that dietary *Padina* polysaccharide extract could enhance the survival of *Penaeus vannamei* against *Vibrio parahaemolyticus* infection

References

De Schryver, P., Defoirdt, T. and Sorgeloos, P. 2014. Early Mortality Syndrome Outbreaks: A Microbial Management Issue in Shrimp Farming? PLoS Pathog, 10(4); e1003919.

Mastan, S. A. (2015). Use of Immunostimulants in aquaculture disease management. International Journal of Fisheries and Aquatic Studies, 2(4):277-280.