

THREE YEARS OF EXPERIMENTAL AND APPLIED RESEARCH ON THE USE OF DIETARY PROBIOTIC *PEDIOCOCCUS ACIDILACTICI* IN SHRIMP CULTURE : OVERVIEW OF THE MAIN RESULTS

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Introduction

Vibriosis is currently one of the main diseases affecting shrimp culture and outbreaks lead to dramatic crop failures in the major shrimp-producing countries (Lin, 1995). In recent years the biological control of diseases by environmental friendly methods such as probiotics has become an important subject of investigation in aquaculture research. Probiotics are live microorganisms which when administered in adequate amounts confer a health benefit on the host (FAO/WHO, 2001). In the last 4 years, IFREMER in collaboration with Lallemand company, have carried out researches in New Caledonia with the aim to assess the probiotic strain *P. acidilactici* MA 18/5M on farmed shrimp *Litopenaeus stylirostris*.

Probiotic effects on farmed shrimps

The probiotic *Pediococcus acidilactici* has been assessed on shrimps farmed under earthen pond conditions in a commercial farm currently affected by the «summer syndrome» (Fig 1) (Lemonnier et al, 2008; Castex et al., 2008). The probiotic improved the zootechnical results with increases in the survival rate (up to 15%) and final biomass (up to 12%) and lower feed conversion ratio (FCR). Beside, the shrimps fed probiotic exhibited in their digestive gland higher digestive enzymes activities (amylase and trypsin) and more nutrients in storage. Additionally, prevalence and load of pathogen *Vibrio nigripulchritudo* in hemolymph were reduced in animals fed with the probiotic.



Fig 1 : Probiotic assessment on shrimp under pond conditions in New Caledonia

Probiotic effects on physiology of the shrimp

Nutritional status and growth

The probiotic improves the growth of the shrimps and the feed conversion ratio (Fig 2). These effects are partially due to a better use of the food particularly of dietary carbohydrates but also suggest an action on metabolism and/or on the growth *via* the contribution of essential nutrients.

Health status with respect to oxidative stress

The level of infection was reduced by the probiotic in shrimps during challenge with pathogenic *Vibrio nigripulchritudo*. Besides, infection by this pathogen led to a reduction in antioxidant defences, to a rise in oxidative damages, and to a release of mortalities within 48 hours. This oxidative stress level, induced by bacterial infection, was better controlled by animals receiving the probiotic diet and significant improvements of the resistance of the probiotic treated shrimps to infection was recorded. Similarly, the shrimps fed probiotic were more resistant to «winter syndrome» (Costa et al., 1998) caused by another pathogen *Vibrio penaeicida* (Fig 3).

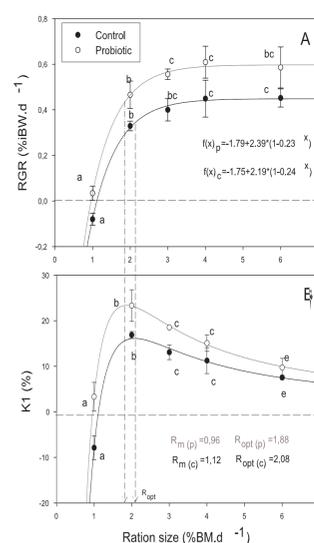


Fig 2 : Effect of probiotic on Growth-ration (GR) (A) and gross conversion efficiency-ration (K_1R) (B) curves.

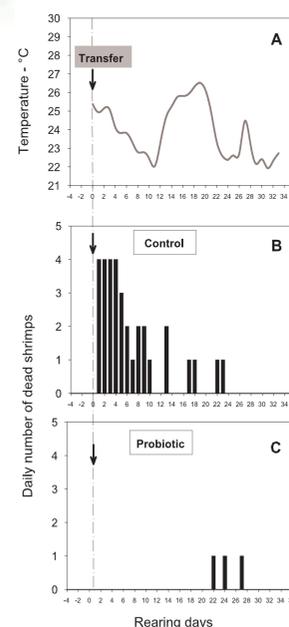


Fig 1 : Water temperature (A) and number of death shrimps recovered after their transfer from pond to experimental tanks in control group (B) and in group receiving probiotic (C).

Conclusion

This project started in 2005 demonstrated the beneficial effects of the probiotic *Pediococcus acidilactici* dietary supplementation on the nutrition and the health status of penaeid shrimps and highlighted that its use as probiotic can be part of the natural solutions proposed to face the challenge of today's shrimp farming industry.



References

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