



# ASIAN PACIFIC AQUACULTURE 2011

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January 17-20, 2011

Le Méridien Resort and Convention Center

Kochi, India

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# *Certificate of Participation*

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*for Presentation of*

**EFFECTS OF DIFFERENT LEVELS OF *Bacillus subtilis* AND *Bacillus licheniformis* ON DIGESTIVE ENZYME  
ACTIVITIES IN *Artemia urmiana***

Roy Palmer

Co-Chairman, Asian-Pacific Aquaculture 2011

## EFFECTS OF DIFFERENT LEVELS OF *Bacillus subtilis* AND *Bacillus licheniformis* ON DIGESTIVE ENZYME ACTIVITIES IN *Artemia urmiana*

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Probiotics can enhance digestion through production of digestive enzymes. Better digestion leads to lower waste production and improve water quality. *Artemia* plays a major role in aquaculture as one of the most important live foods used in larval rearing. *Artemia* enhances growth and survival rate, stimulates the production of digestive enzymes and improves the pre-digestion of nutrients in fish larvae intestine. It seems it would be possible to stimulate the production of digestive enzymes in live foods using probiotics. The aim of this experiment was to study the effects of *Bacillus subtilis* and *Bacillus licheniformis* on digestive enzyme (protease, amylase and lipase) activities of *Artemia urmiana*.

In this experiment four different levels of probiotics (equal amount of *Bacillus subtilis* and *Bacillus licheniformis*)  $10^2$  (T<sub>1</sub>),  $10^4$  (T<sub>2</sub>),  $10^6$  (T<sub>3</sub>) colony per gram of artemia food (CFU) and control treatment (without probiotics) were fed to artemia through using a completely randomized design (4 treatments with 3 replicates). The experiment started from the first day of exogenous feeding. 12 tanks with the capacity of 60-liter and density of 20 nauplii per ml were used and the trial was lasted for 15 days. Culture condition and enzyme assays were monitored using standard methods.

Results showed that gut of *Artemia urmiana* is active from the first day by secretion of digestive enzymes. Using probiotics significantly increased protease (Fig. 1) and amylase activity (Fig. 2) from 10<sup>th</sup> day onward ( $P < 0.05$ ). However, there were no significant differences among the treatments in terms of lipase activity (Fig. 3). Possibly enzymes activity increase is due to their secretion by bacteria or stimulation of digestive system to produce protease and amylase. Probiotics used in this experiment did not affect lipase secretion. Also results showed that at least 10 days is needed for *B. subtilis* and *B. licheniformis* to take effect on digestive enzymes. Probably, increase in digestive enzymes activity will enhance digestion capacity and growth of artemia

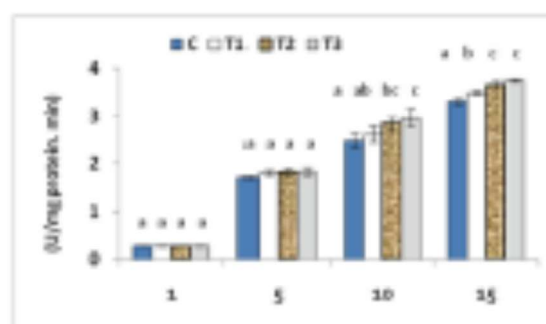


Fig 1 - Protease activity (Mean ± SD) in *Artemia* (n=3)

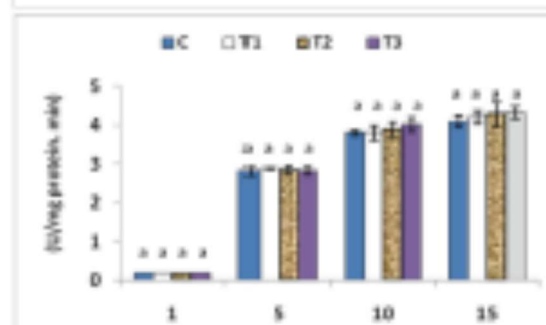


Fig 3 - Lipase activity (Mean ± SD) in *Artemia* (n=3)

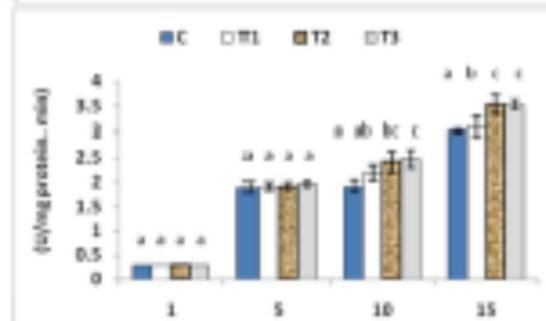


Fig 2 - Amylase activity (Mean ± SD) in *Artemia* (n=3)