



# Aquatrax

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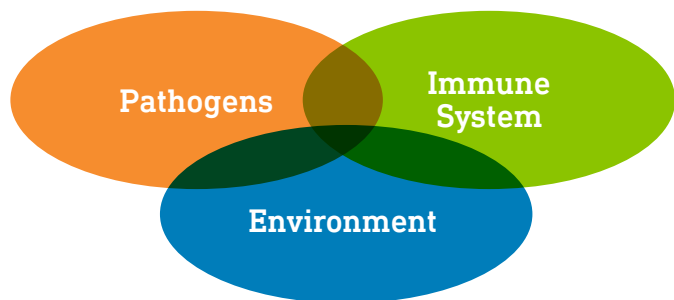
Prevent. Protect. Perform.

**Technical bulletin:  
Two studies into *Pichia guilliermondii*  
and its inclusion with shrimp diets**

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## The omnipresent challenges of shrimp production

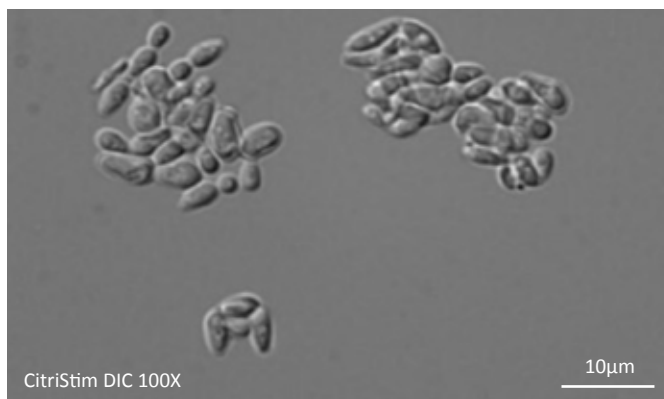


Environmental and health **stressors** are present everywhere in **aquaculture**. The **lack of an adaptive immune system** in shrimp potentiates these challenges. Achieving efficient and profitable production, especially with the increasing global threat of **antimicrobial resistance**, is critical for producers. The search is on for management practices including the use of **in-feed solutions to help shrimp better perform with physiological and health stress**.

## A solution with a unique yeast

*Pichia guilliermondii* is a novel yeast. Thanks to its unique **morphology, structure** and bioactive **cell wall** components it has physical properties for distribution and interactions within the gastrointestinal tract.

Aquatrax is a *Pichia guilliermondii*-based specialty feed ingredient created specifically for aquaculture. **Aquatrax provides extraordinary immune support in shrimp for enhanced productivity.**



*Pichia guilliermondii*

## Technical Bulletin

This paper documents the results of **two studies** into *Pichia guilliermondii* and its inclusion with shrimp diets.

TB001. *Pichia guilliermondii* in shrimp diets is associated with significant impacts on critical immune parameters.

TB004. Improved growth under normal conditions in shrimp fed *Pichia guilliermondii*.



*Pichia guilliermondii*



## *Pichia guilliermondii* in shrimp diets is associated with significant impacts on critical immune parameters

### Key Findings

Shrimp fed 0.18% *Pichia guilliermondii* in their diet for 28 days had a significantly greater proportion of **granular hemocytes** amongst total hemocytes, and 3 hours following *Vibrio harveyi* challenge had significantly less *V. harveyi* cells in their hemolymph, compared to shrimp that did not receive *P. guilliermondii* in their diets.

### Introduction and objectives

Aquatrax is a specialty feed product for use in aquaculture, based on the unique yeast *P. guilliermondii*. The objective of the study was to evaluate changes in **critical shrimp immune parameters** following experimental challenge with *V. harveyi* when shrimp are supplemented with *P. guilliermondii* compared to those without supplementation.

### Material and methods

The study took place at a research facility in Thailand and involved pathogen-free *Litopenaeus vannamei* shrimp with initial live weight of 6.5g. The shrimp were housed in a 2.5m<sup>3</sup> tanks, and allocated to either a treatment diet, containing 0.18% *P. guilliermondii*, or a control diet, fed five times a day over a period of 28 days.

At the end of the feeding period, 15 shrimp per group were sampled to measure the concentration of total and granular hemocytes in hemolymph.

**Hemocytes** are invertebrate blood (hemolymph) cells that are involved in critical shrimp immune defence processes such as coagulation and phagocytosis of invading microorganisms.

Although total hemocyte count is used as an indicator of overall shrimp health status, **granular hemocytes** contain the primary humoral defence factors that are released during a pathogen invasion. An elevated proportion of granular hemocytes amongst total hemocytes may therefore indicate primed immune capabilities, and consequently a **more effective response** to pathogen challenges.

In addition, at the end of this feeding period, a sample of 15 shrimp per group were infected with a *V. harveyi* suspension by intramuscular injection.

To assess the response to this challenge, **bacterial clearance was measured**: three hours following *V. harveyi* injection, hemolymph samples were collected from the challenged shrimp to measure the concentration of *V. harveyi* cells.



## Results

### Proportion of granular hemocytes

Whereas the level of total hemocytes remained unchanged, the **granular hemocyte count was significantly increased** in the hemolymph of shrimp fed *P. guilliermondii*. ( $P < 0.05$ ; Figure 1)

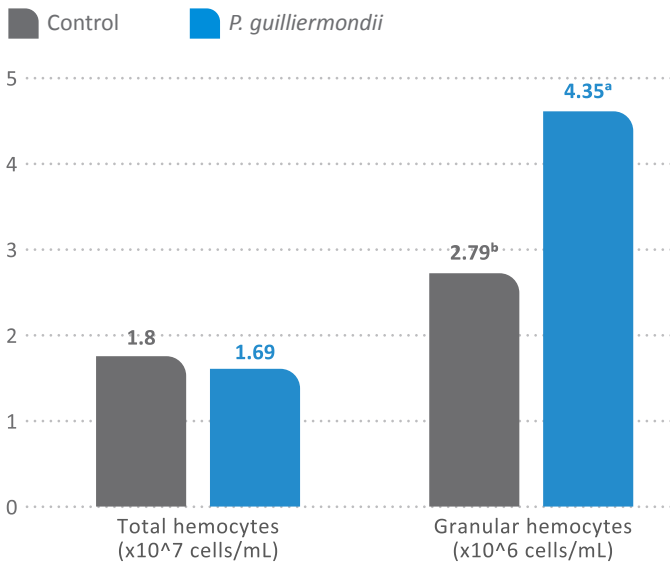


Figure 1: Number of granular hemocytes and total hemocytes

### Clearance of *V. harveyi*

The number of ***V. harveyi* cells** remaining in hemolymph three hours following challenge **was significantly lower** in the shrimp fed *P. guilliermondii*, compared to that in shrimp not fed *P. guilliermondii*. ( $P < 0.05$ ; Figure 2)

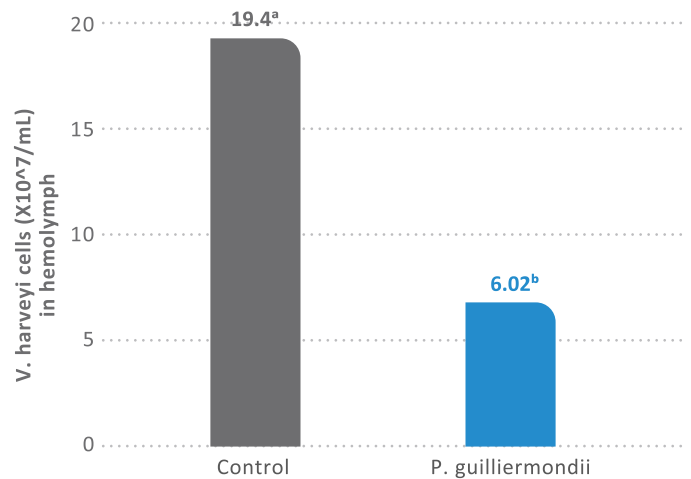


Figure 2: *V. harveyi* cells remaining in hemolymph 3 hours following challenge

## Conclusion

The **inclusion** of 0.18% *P. guilliermondii* in the diet of shrimp for 28 days was associated with a **significantly higher** quantity of granular hemocytes amongst total hemocytes and less ***V. harveyi* cells** remaining in hemolymph 3 hours post *V. harveyi* challenge, compared to control fed shrimp.

Technical Bulletin 001 is based on Data on file, ADM internal study no. CSINTEQC2012. TB 001 was conducted at aquaculture feed manufacturer research facility in Thailand, in 2012.



## Improved growth under normal conditions in shrimp fed *Pichia guilliermondii*

### Key Findings

Under **normal conditions** in 2 separate trials, shrimp receiving **0.1% *Pichia guilliermondii*** dietary supplementation had **significantly greater average body weight** gain compared to shrimp that did not receive *P. guilliermondii* in their diet.

### Objectives

The **shrimp body weight at harvest** is a critical parameter for successful and profitable shrimp production. There is great interest in feed additives that can be added to the shrimp diet to improve shrimp weight yield and provide a good **return on investment**.

The objective of this study was to **assess** the **impact on performance** of *P. guilliermondii* dietary supplementation in *Litopenaeus vannamei* shrimp kept under normal conditions.

### Material and methods

**Two separate trials** with similar design were established: **Trial 1** involved *L. vannamei* shrimp with an initial body weight of **7.0g** housed in 2m<sup>3</sup> cages in **outdoor ponds** at a stocking density of **160 shrimp per cage**; in **trial 2** the *L. vannamei* shrimp had an initial body weight of **4.6g** and they were housed in 1000L **indoor tanks** at a stocking density of **80 shrimp per tank**.

Each cage or tank was assigned to a diet – either a basal diet, or the basal diet with 0.1% *P. guilliermondii* added. The diets were sinking pelleted feeds. The *P. guilliermondii* was incorporated into the mash, before pelleting.

The diets were fed 3 times a day. There were **8 replicates** (cages or tanks) of each diet in both trials. Both trials ran for a duration of **48 days**.

Several **parameters** were **monitored** during the study: *total biomass* was weighed and **shrimps** were **counted** per cage or tank at the beginning and at the end of the trial. Uneaten feed was removed after each meal to estimate **feed intake** and the **feed conversion ratio**. **Water quality** was also routinely measured.

Data between groups were compared using ANOVA, to assess the group effect. The Tuckey test was used to differentiate groups.



## Results

In both trial 1 (cages) and trial 2 (tanks), the **average weight gain** of shrimp between the start and end of the study was **significantly greater** in the shrimp receiving the 0.1% *P. guilliermondii* supplementation compared to shrimp fed on the basal control diet (+ 9%,  $P < 0.05$ ; +10%,  $P < 0.05$ , respectively, Figure 3).

In both trial 1 and trial 2 average daily feed intake **was greater** in the *P. guilliermondii*-supplemented shrimp: + 11%,  $P < 0.05$ ; +16.2%,  $P = 0.048$ , respectively. The feed conversion ratio was not significantly different between the groups in both trials.

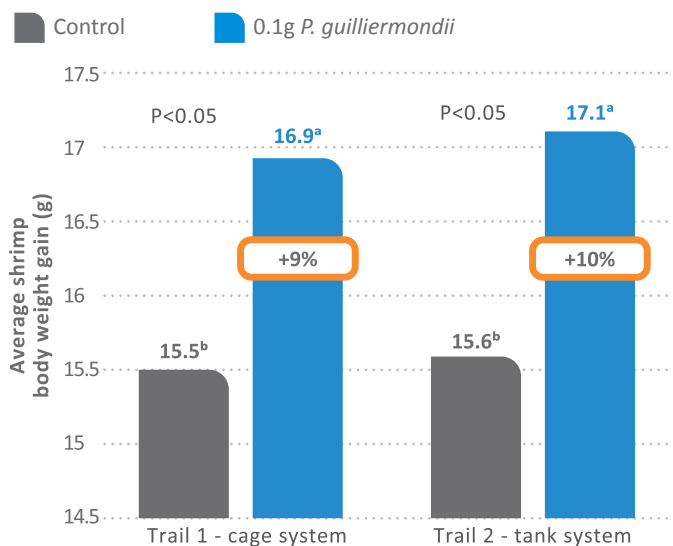


Figure 3: Average shrimp body weight gain over the study periods.

## Conclusion

In both trials, the **addition of *P. guilliermondii*** to the shrimp basal diet was associated with a **significantly improved average shrimp body weight gain** over the study periods.

Technical Bulletin 004 is based on Data on file, ADM internal study no. SHV G NBC 1903 (Trial 1), SHV G NBT 1903 (Trial 2) TB 004 was conducted at an ADM experimental station in Nhà Bè, Vietnam in 2019.