

As the surge in the demand for eco-friendly farming practices and food products without chemical contaminants in aquaculture continues, the industry has shifted to focus on improved maintenance of fish and shrimp health to enhance performance.

Focus on the development of novel feed additives are increasingly applied in aquaculture, including phytochemicals. Phytochemical feed additives are plant-derived

products, often supplemented to diets to enhance palatability of feed and improve growth performance by supporting immune status, gut health and antioxidant responses of fish and shrimp.

Research has found that supplementing phytochemicals, like garlic and cinnamon, can have a supportive function in antibiotic-free diets.

Cinnamon and garlic have shown to beneficially impact the health of terrestrial animals and a diverse group of fish and shrimp species due to their anti-parasitic, anti-bacterial and immune-stimulating effect.

Garlic can protect against parasites like

gregarines (Kasornchandra et al., 2005), and cinnamon has proven to be beneficial against *Vibrio* (Brackman et al., 2008).

Cinnamon's primary bioactive compound, cinnamaldehyde, produces an anti-inflammatory effect that slows down the destruction of tissues and supports performance. Cinnamaldehyde responds strongly against pathogenic gram-positive bacteria, gram-negative bacteria, yeasts and molds.

Garlic has 32 active thiosulfonates that facilitates broad protection against pathogens. This is because allicin, the main active compound of garlic, is formed during the crushing process of garlic when alliin and the enzyme alliinase meet (Figure 1).

Alliin is volatile and can lose activity in 0.1 seconds at 37°C. To ensure allicin becomes active within the animal's intestinal tract, Excential Alliin Plus has been developed. This feed solution is a natural blend of high-quality cinnamon and garlic, in which the precursor alliin is available in a stable form thanks to a unique processing technology.

Experimental design involving whiteleg shrimp

Orffa has partnered with Thailand's Kasetsart University to evaluate the Dutch company's Excential Alliin Plus' effect on growth performance and the immune status of whiteleg shrimp (*Litopenaeus vannamei*).

ORFFA: Garlic & Cinnamon Blend For Enhancing Shrimp Production



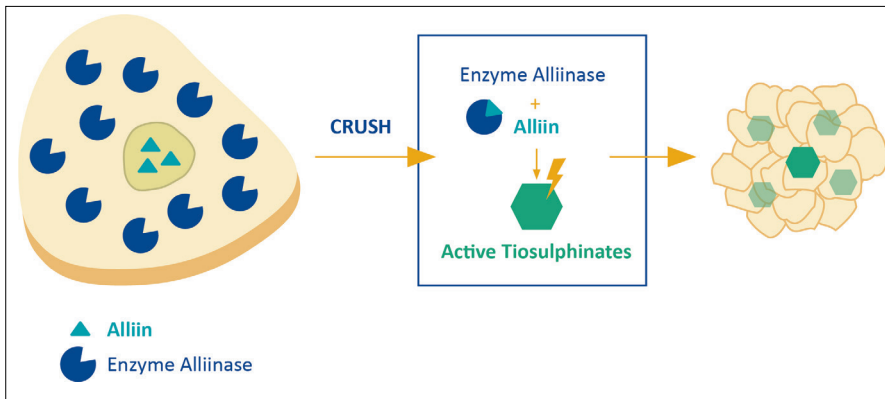


Figure 1. Allicin and other active thiosulphinates are formed when alliinase and alliin are in contact with each other throughout the crushing of the garlic clove.

The shrimp (2.21±0.06g) were placed in tanks in groups of 20. Each tank was randomly allocated to one of the three different treatments with five replicates each. The control group was fed a basal diet, while the other two groups were fed diets supplemented with Excential Alliin Plus with the inclusion of 500ppm and 1000ppm, respectively. The experiment took place over eight weeks.

The effects of the different treatments were determined. Weight was measured every two weeks. After eight weeks of feeding, the enzyme status of the shrimp was measured 12 hours after they were injected with *Vibrio parahaemolyticus*.

Significant improvement of performance

Results indicated that the growth performance of the shrimp significantly increased after feeding Excential Alliin Plus (Figure 2). As seen in Figure 3, the feed conversion ratio (FCR) of the shrimp also improved when feed was supplemented with Excential Alliin Plus at both applied dosages.

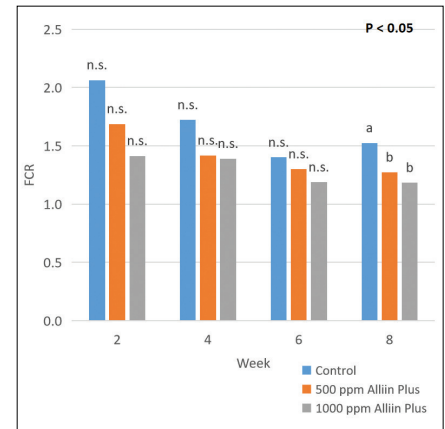
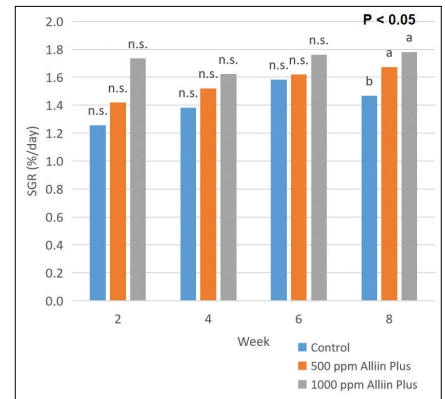
Strengthened immune status after exposure to *Vibrio parahaemolyticus*

Hemolymph protein contains antibacterial enzymes. Phenoloxidase is one of the enzymes active against invading pathogens. Table 1 shows that after the shrimp were injected with *Vibrio parahaemolyticus*, supplementation of 1000ppm of Excential Alliin Plus significantly increased both the hemolymph protein level and phenoloxidase activity. These results indicate that the addition of Excential Alliin Plus resulted in a boost of the immune system and increased protection of shrimp against *Vibrio* while also improving performance and elevating the efficiency of the shrimp population.

Conclusion

Improving the development of shrimp production requires using effective solutions to tackle the challenges the industry is facing.

There is evidence that natural phytogetic products, like garlic and cinnamon, can modulate physiological functions and intestinal microbiota of shrimp, allowing for better performance while reducing the use of non-eco-friendly chemicals and antibiotic



growth promoters. This results in enhanced performance and reduced bacterial pressure such as *Vibrio* spp.

Excential Alliin Plus is recommended in shrimp production to upregulate the immune status and increase production yield. 🌱

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	Haemocyte count (x 10 ⁵)	Hemolymph protein (mg/dL)	Phenoloxidase activity (unit/min/mg protein)
Control	11.2	5.2 ^b	115.6 ^b
T1 – Excential Alliin Plus, 500 ppm	11.2	6.3 ^a	109.8 ^b
T2 – Excential Alliin Plus, 1000 ppm	13.6	6.3 ^a	247.72 ^a
P-value	0.278	0.008	< 0.001

Table 1. Effect of different treatments on haemocyte count, hemolymph protein and phenoloxidase activity of shrimp.