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The efficacy of poultry hydrolysed proteins and peptides on the growth performance and feed efficiency of *Penaeus vannamei* juveniles

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Abstract

The research team at the Prince of Songkla University, Thailand demonstrated that growth performance and feed efficiency of the white shrimp improved with the addition of several sources of poultry hydrolysed proteins and peptides added to diets at inclusion rates of 1 to 2.3%.

The trials were conducted at the university's pond facility in the Satun Campus, Amphur Lagnu, South Thailand.
In each cage, 100 *P. vannamei* shrimp of 6g initial weight were held in 1.4 x 1.4 x 2.0m cages submersed in an earthen pond measuring 71 x 83m and 1.7m deep. The cage bottom was about 10cm above the pond bottom. Cages were well aerated. A completely randomized design was used in the 6 week trial. There were 5 replicates for each treatment.

In the pond, water quality parameters such as pH, temperature, salinity, transparency and alkalinity were monitored daily. Dissolved oxygen, ammonia, nitrite, plankton and bacteria were checked weekly.
The necessary adjustments to water were carried out.
These were applications of lime and $NaHCO_3$ for pH and alkalinity, fertilizers for pond fertility as determined by water transparency and colour.
Zeolite and dolomite were applied to reduce ammonia in the pond.

Treatment diets

A total of six treatment diets supplemented with various sources of poultry hydrolysed proteins and peptides and which function as attractants and soluble proteins were incorporated into diets.
The crude protein levels of the supplements range from 12-14% for the liquid form and 62 to 70% for the powder form. These were added at 1.4% for poultry hydrolysed protein (PHP) and 2.3% for AquaTrac SD.
The basal feed contained 35% protein **(Table 1)** and was prepared by Inteqc Feed Co. Thailand. Feeding at a rate of 3-5% body weight per day was carried out 4 times a day at 07:00, 13:00, 19:00 and 01:00 hrs. Feeds were placed in 60x60cm feed trays. The feeding rate was 5% on the first day of the rearing period and after that shrimps were fed until saturation by checking feed trays every 2.5 hours. The cleaning of the feed

Table 1: Proximate analysis of treatment diets (% dry matter basics)

	Diets	Moisture	Protein	Fat	Ash	Ca	P	NaCl
T1	Control	9.81 ± 0.19	35.79 ± 0.32	4.16 ± 0.10	12.45 ± 0.30	2.83	1.56	1.98
T2	PHP	9.68 ± 0.27	35.86 ± 0.10	4.19 ± 0.19	12.47 ± 0.06	2.34	1.38	2.01
T3	AquaTrac sol SD	9.57 ± 0.19	35.56 ± 0.34	4.35 ± 0.31	12.48 ±0.10	2.19	2.76	2.21

tray and cages was carried out at intervals of 2 days and 1 week, respectively. Feed consumption of shrimp was determined every day.
Weight measurement was done every two weeks by sampling 10% of white shrimp in each cage (at week 2 and 4).

At the end of the trials, all of the shrimps in each cage were weighed.
The number of surviving shrimps was recorded.
The determination of weight gain was based on the total biomass in each cage. The calculations were made for feed consumption (g/shrimp), average daily gain (ADG) and feed conversion ration (FCR).

Growth performance

After the 6-week feeding period, the average body weight of shrimp fed treatment diets was significantly higher than shrimp fed the control group T1.
Individual weights increased to 16.2 to 16.4 which was significantly higher ($p<0.05$) than shrimp fed with the control diet which was 15.8 g (Table 2).
The biomass gain per cage of shrimp was higher than for the control group. There were no differences among treatments ($p<0.05$).

Table 2: Average body weight of white shrimp fed treatment diets for 6 weeks

Experimental Group		Rearing Period			
		0	2	4	6
T1	Control	6.17 ± 0.14	9.66 ± 0.29^{a}	13.21 ± 0.52^{a}	15.78 ± 0.07^{a}
T2	PHP	6.17 ± 0.21	9.71 ± 0.49^{a}	12.65 ± 0.66^{a}	16.25 ± 0.32^{b}
T3	Aqua SD	6.18 ± 0.19	9.66 ± 0.12^{a}	13.28 ± 0.32^{a}	16.36 ±-0.17^{b}

Mean +/- standard deviation of five replicates. Means within each column not sharing a common superscript are significantly different ($p<0.05$).

Thirty shrimp at the beginning and 10 shrimp at the end of the experimental period of each treatment were sampled for protein analysis for the calculation of protein efficiency ratio (PER) and apparenet protein utilization (ANPU).

Survival ranged from 92.8 to 98% with small mortality occurring during weight monitoring and not during the feeding period in the cages.
Survival was not significantly different among treatments.

Feed efficiency

Feed conversion ratio (FCR) ranged from 1.69-1.70 which was lower than for T1 (1.82). Supplementation of attractants in the feed improved FCR but these were not significantly different among treatments ($p<0.05$).

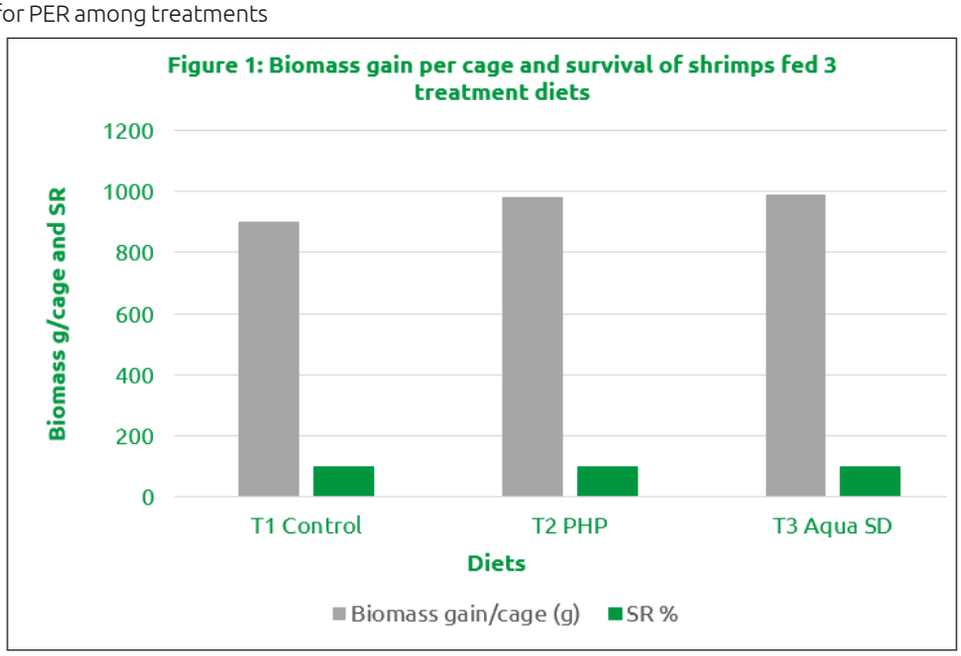
Protein efficiency (PER) ranged from 1.76 – 1.80, which was higher than for T1 (1.68). This demonstrated that all attractants supported a better utilization of feed protein for shrimp tissue. No significant difference was noted for PER among treatments ($P<0.05$) **(Table 3)**.

The apparent net protein utilization (ANPU) for all treatments differed, forming 2 groups. The lowest value was shown by the group fed T1 diets (34.69%); the other with moderate ANPU for T2 (38.75%) and T3 (37.56%). Significant difference existed for ANPU among treatments ($p<0.05$).

Table 3: Feed conversion ratio (FCR), protein efficiency ratio (PER) and apparent net protein utilization (ANPU) of shrimp fed 7 feeds

Experimental Group	FCR	PER	ANPU (%)
T1 Control	1.82 ±0.25[a]	1.68 ± 0.23[a]	34.69 ± 0.18[a]
T2 PHP	1.70 ± 0.06[a]	1.76 ± 0.06[a]	38.75 ± 1.45[b]
T3 Aqua SD	1.69 ± 0.16[a]	1.80 ± 0.20[a]	37.56 ± 0.28[b]

Mean +/- standard deviation of five replicates. Means within each column not sharing a common superscript are significantly different ($p<0.05$).



Conclusion

Results indicated that all four variations of poultry hydrolysed protein and peptides are beneficial to growth and feed efficiency of the white shrimp *P. vannamei*. The survival rates in all treatments were high and did not show any significantly difference. The preparation of poultry hydrolysed protein and peptides using no difference for all parameters studied. It was concluded that poultry hydrolysed protein and peptides can be used as feed additive enhancing the growth performance and feed efficiency in white shrimp

(P. vannamei).

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