

## Evaluation of the potential of meat and bone meal as an alternative to fishmeal in experimental diets for grow-out culture of shrimp *Penaeus monodon*

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A one month in door feeding trial was conducted using recirculating saline water system to evaluate the feasibility of using meat and bone meal as a protein source in replacement of fish meal in diets for black tiger shrimp, *Penaeus monodon*.

Six isonitrogenous (45% crude protein) and isolipidic (6.5% crude lipids) experimental diets formulated by replacing 0, 20, 40, 60, 80 and 100% of fish meal (FM) with meat and bone meal (M & BM) on a crude protein basis were fed to shrimp (mean initial body weight varied from  $4.8 \pm 0.13$  (n=3) to  $4.93 \pm 0.2$  g) (n=3) four times a day at a feeding allowance of 10% body weight per day.

Average daily weight gain of shrimp that were fed with 20% fish meal replacement in the diet ( $0.04 \pm 0.01$  g/day) (n=3) was significantly highest compared with shrimp fed 80% ( $0.02 \pm 0.01$  g/day) (n=3) and 100% ( $0.01 \pm 0.00$  g/day) (n=3) fish meal replacement in the treatment diets ( $P < 0.05$ ). However, similar daily weight gain was observed in shrimp fed with 0 to 60% fishmeal replacement in the diet ( $P > 0.05$ ). At inclusion levels greater than 60% there was a progressive decline in shrimp growth performance. Similarly *P. monodon* fed diet with 20% fish meal replacement in the diet displayed maximum food conversion efficiency ( $8.16 \pm 1.92$ ) (n=3) and protein efficiency ratio ( $0.19 \pm 0.04$ ) (n=3) compared with 80% ( $4.85 \pm 1.25$  and  $0.11 \pm 0.03$ ) (n=3) and 100% ( $2.71 \pm 0.72$  and  $0.06 \pm 0.02$ ) (n=3) fish meal replacement in the diet respectively. The highest ( $86.67 \pm 10.41$ ) (n=3) and lowest ( $61.67 \pm 0.01$ ) (n=3) survival rate were varied shrimp fed diet with 20% fish meal replacement and 40% fish meal replacement in the diet without significant differences between treatments ( $P > 0.05$ ).

The highest ( $3.62 \pm 0.24$ ) (n=3) and lowest ( $2.24 \pm 1.94$ ) (n=3) carcass lipids content results from shrimp were fed 100% and 40% fishmeal replacement in the diet respectively. However, carcass protein and moisture content varied without significant differences ( $P > 0.05$ ).

These results demonstrated that meat and bone meal could be included at 60% to partially replace fishmeal in diets for *P. monodon* without adversely affecting growth rate.

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