

2nd International Conference on

Livestock Nutrition

July 21-22, 2016 Brisbane, Australia

Growth performance and oxidative stress of Malaysian prawn *Macrobrachium rosenbergii* by partial replacement of dietary fishmeal with palm kernel meal

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Effect of partial replacement of fish meal with palm kernel meal on growth performance and oxidative stress of Malaysian prawn, *Macrobrachium rosenbergii* was evaluated. A closed aquaculture system with 21 fiberglass tanks with the capacity of 150 liter was set up for the experiment. Five test diets were formulated by replacing 0, 10, 20, 30 and 40% fishmeal with palm kernel meal and labeled as PKM0, PKM10, PKM20, PKM30 and PKM40, respectively. Another two diets were prepared by the supplementation of 2% shrimp meal and 2% squid meal in PKM30 and PKM40 diets which designated as PKM30+ and PKM40+, respectively. All the test diets were iso-nitrogenous (30% crude protein), iso-lipidic (12% crude lipid) and iso-energetic (19 KJ/g DM gross energy). Triplicate groups of 30 post-larvae (0.041±0.001 g) were stocked in previously prepared tanks and fed the test diets at the rate of 20-30% of their body weight, twice a day for 60 days. The results showed that there was no significant differences (P>0.05) in final weight (g), percent weight gain (%) and specific growth rate (% per day) of prawn fed PKM0, PKM10, PKM20 and PKM30 diets. However, all these growth parameters were significantly decreased in prawn fed PKM40 diet compared to fishmeal based control diet (PKM0). Supplementation of crude attractants such as shrimp meal and squid meal recovered the depleted growth performances. It was found that the above growth parameters were significantly improved in PKM30+ and PKM40+ diets compared to all other PKM diets. No significant differences were also found between these groups of prawn and the control group. The feed conversion efficiency and protein efficiency ratio also followed the similar trends where PKM40 showed significantly lowest values compared to the control. The feed utilization parameters were significantly improved in PKM30+ and PKM40+ groups. The survival (%) was not significantly affected by any of the dietary treatments. On the other hand, superoxide dismutase activity was similar in all the dietary treatments except in PKM30. It is concluded that 30% fishmeal can be replaced with PKM in the diets of prawn without any detrimental effects on growth performance and feed utilization. Supplementation of small amount of crude attractants such as squid meal, shrimp meal etc could replace 40% or more fishmeal from the diet of Malaysian prawn.

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Acridid grasshoppers: An imperative unconventional protein source in poultry diets

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On the quest of alternative protein sources, researchers have found insects to be nutritionally rich and among insects acridid grasshoppers have a good future. In this context the present work concentrated to formulate various protein rich conventional and acridid supplemented diets to feed the Japanese quail *Coturnix japonica*. The experiments were divided into two phases. In the first phase various diets were prepared where fish meal was gradually replaced by acridid meal (i.e., 0%, 25%, 50%, 75%, and 100% replacement). Consumption of the diet having 50% replacement of fish meal with acridid meal resulted higher feed utilization and weight gain of the quails, however egg laying performance and meat quality was slightly better in the birds feeding on the diet having 75% acridid inclusion level than the one having 50% acridid inclusion level. This proved that at least 50% fish meal could be replaced by acridid meal. In the second phase fish meal based, soybean meal based and acridid meal based diets were prepared. All of them had three different inclusion levels of the major ingredients (i.e., 5%, 10%, and 15% of the diet). The growth and egg laying performance of *C. japonica* was better in most of the cases for 10% acridid meal added diet. This particular diet also gave better results compared to the fish meal based and soybean meal based conventional diets without showing deleterious effect on flesh and egg quality. These encouraging results successfully established acridid grasshoppers as an alternative protein source for poultry birds.

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