

Effects of Empyreal® 75 on L. Vannamei Growth and Production

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Background: Pacific white shrimp (*Litopenaeus vannamei*) is the primary shrimp species cultured in farming practices. Development of ingredients such as Empyreal 75 (corn protein concentrate) has provided producers with value-added options to replace other protein ingredients in the diet, which may not only be sustainable, but affect overall production and profitability. Understanding optimal inclusion rates in shrimp diets is beneficial to capture the value of this technology.

Objective: Test the production performance of Pacific white shrimp using Empyreal 75 at variable levels in production diets.

Materials and Methods:

- Juvenile shrimp (mean initial weight 0.35 g) were randomly stocked into a recirculating culture system consisting of 20 220-L tanks, with 15 shrimp per tank.
- Diets (Table 1) were offered in equal amounts, twice daily, for an eight-week period. Diets 2, 3 and 4 had increasing levels of Empyreal 75 offered at: 4%, 8% and 16%.
- Feed response was measured at the end of eight weeks, with shrimp counted and group weighed to determine: weight gain, survival and feed conversion ratio.

Table 1: Composition of basal diet and Empyreal 75 diets. Diets formulated to contain 36% protein and 8% lipid.

| | Diet 1 | Diet 2 | Diet 3 | Diet 4 |
|-----------------------------|-------------|-------------|-------------|--------------|
| Manhaden Fish Meal | 6.00 | 6.00 | 6.00 | 6.00 |
| Soybean Meal | 61.50 | 55.00 | 48.28 | 34.66 |
| Menhaden Fish Oil | 5.53 | 5.53 | 5.53 | 5.53 |
| Corn Oil | 0.24 | 0.18 | 0.12 | 0.00 |
| Whole Wheat | 18.00 | 18.00 | 18.00 | 18.00 |
| Corn Starch | 2.83 | 5.24 | 7.79 | 13.00 |
| Trace Mineral Premix w/o Mg | 0.50 | 0.50 | 0.50 | 0.50 |
| Vitamin Premix w/o Choline | 1.80 | 1.80 | 1.80 | 1.80 |
| Choline Chloride | 0.20 | 0.20 | 0.20 | 0.20 |
| Stay C 250 mg/kg Using 25% | 0.10 | 0.10 | 0.10 | 0.10 |
| CaP-Dibasic | 2.25 | 2.40 | 2.52 | 2.75 |
| Lecethin | 1.00 | 1.00 | 1.00 | 1.00 |
| Cholesterol | 0.05 | 0.05 | 0.05 | 0.05 |
| Empyreal 75 | 0.00 | 4.00 | 8.00 | 16.00 |
| L-Lysine | 0.00 | 0.00 | 0.11 | 0.41 |

Results:

- When adjusted for survivability, there was not a significant impact on weight gain or feed conversion (Table 2).
- There appeared to be a numerical improvement on gain at the 8% inclusion level (Diet 3) in comparison to the control (Diet 1).
- All Empyreal 75 diets had improved feed conversions in comparison to the control.

Table 2: Production response to Empyreal 75 over an eight-week feeding period

| Diet | Initial Weight (g) | Final Weight (g) | Weight Gain (g) | Weight Gain (%) | Feed Conversion Ratio | Survival (%) |
|------|--------------------|------------------|-----------------|-----------------|-----------------------|--------------|
| 1 | 0.36 | 10.17 | 9.81 | 2747.54 | 1.88 | 83.33 |
| 2 | 0.35 | 9.82 | 9.47 | 2700.63 | 1.64 | 98.33 |
| 3 | 0.35 | 10.37 | 10.02 | 2885.73 | 1.59 | 95.00 |
| 4 | 0.35 | 10.03 | 9.68 | 2727.29 | 1.69 | 93.33 |

Conclusions:

- Use of Empyreal 75 provides flexibility in formulation as demonstrated from 4% inclusion up to 16% inclusion in this *L. vannamei* diet.
- Optimal inclusion appears to occur at 8% of the diet for both weight gain and feed conversion.
- Reduction in other proteins that may not be sustainable, or contain anti-nutritional factors, can be beneficial to production.

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