

# Impact of Partial Fishmeal Replacement with Empyreal<sup>75</sup> on the Growth and Performance of Juvenile Yellowtail (*Seriola quinqueradiata*)

**BACKGROUND:** Yellowtail (*Seriola quinqueradiata*) is an economically important species of farmed fish. Depending on regional rearing practices, fishmeal has historically been the primary protein source in these diets. However, this is not without consequences due to cost of ingredient as well impact on sustainability. The use of alternative protein sources, such as corn protein concentrate (Empyreal<sup>75</sup>), would be beneficial to producers.

**OBJECTIVE:** To test the impact of Empyreal<sup>75</sup> on the growth and performance of yellowtail.

## MATERIALS AND METHODS:

- The trial was conducted at the Biological Research Station; Kochi University over an eight-week period, in tanks supplied with natural seawater pumped from 50m offshore.
- Juvenile yellowtail, weighing 1.4 to 2.3g, were allocated to one of three treatment groups in triplicate tanks, with 12 fish per tank.
- Treatments were fishmeal (FM) control, and Empyreal<sup>75</sup> fed at 7.5% (E7.5) and 15% (E15) of the diet (Table 1) and were balanced to be isonitrogenous and isocaloric.
- Diets were handfed once per day, and fish were group-weighted every two weeks.

## RESULTS:

- Initial body weight was not significantly different between treatment groups. However, fish receiving 7.5% Empyreal<sup>75</sup> in the diet weighed significantly more (58% increase).
- Feed intake and DFI were not significantly different between treatments.
- The 7.5% inclusion treatment group had significantly better performance for: gain, FCR and SGR above the control and the 15% group.

## CONCLUSIONS:

- Based on the results of this trial, reduction of fishmeal by inclusion of 7.5% Empyreal<sup>75</sup> in yellowtail diets significantly improved performance.
- As shown in Table 3, the cost of production for the 7.5% and the 15% inclusion was ¥133.92 and ¥179.60, compared to the control at ¥197.50/kg of production.
- The combination of FCR and growth provided superior economic benefits when Empyreal<sup>75</sup> was fed at 7.5% of the diet.

**TABLE 1.** Diet formulation comparisons

| Ingredient                 | FM (Control) | E7.5 | E15 |
|----------------------------|--------------|------|-----|
| Fishmeal (CP65)            | 650          | 530  | 425 |
| Empyreal <sup>75</sup>     | 0            | 75   | 150 |
| Wheat flour (CP13)         | 100          | 100  | 100 |
| Fish oil                   | 102          | 108  | 115 |
| Starch                     | 80           | 80   | 80  |
| Cellulose                  | 4            | 8    | 26  |
| Vitamin and Mineral premix | 30           | 30   | 30  |
| Calcium phosphate          | 0            | 20   | 20  |
| Choline chloride           | 4            | 4    | 4   |
| Guar gum                   | 5            | 5    | 5   |
| CMC-Na                     | 25           | 25   | 25  |
| DL-Methionine              | 0            | 1    | 1   |
| L-Lysine                   | 0            | 5    | 9   |
| Taurine                    | 0            | 10   | 10  |

**TABLE 2.** Average weights and performance factors by treatment

| Treatment    | Initial BW (g) | Final BW (g)      | Feed Intake (g DM) | Gain (g)          | FCR (feed/gain)  | DFI (38d) | SGR (56d)         |
|--------------|----------------|-------------------|--------------------|-------------------|------------------|-----------|-------------------|
| FM (Control) | 4.8            | 13.6 <sup>a</sup> | 12.4               | 8.7 <sup>a</sup>  | 1.4 <sup>a</sup> | 5.4       | 3.8 <sup>a</sup>  |
| E7.5         | 4.6            | 21.5 <sup>b</sup> | 16.8               | 16.8 <sup>b</sup> | 1.0 <sup>b</sup> | 7.3       | 5.0 <sup>b</sup>  |
| E15          | 4.6            | 15.5 <sup>a</sup> | 13.6               | 9.9 <sup>b</sup>  | 1.4 <sup>a</sup> | 5.9       | 4.0 <sup>ab</sup> |

<sup>ab</sup> Columns with different superscript were significantly different ( $p \leq 0.05$ )

**TABLE 3.** Cost of production

| Treatment    | FCR | Yen/kg Production |
|--------------|-----|-------------------|
| FM (Control) | 1.4 | 197.50            |
| E7.5         | 1.0 | 133.92            |
| E15          | 1.4 | 179.60            |