

Impact of Partial Fish Meal Replacement with Empyreal® 75 on the Growth and Performance of Juvenile Yellowtail (*Seriola Quinqueradiata*)

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Background: Yellowtail (*Seriola quinqueradiata*) is an economically important species of farmed fish. Depending on regional rearing practices, fish meal 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 75), would be beneficial to producers.

Objective: To test the impact of Empyreal 75 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 50 m offshore.
- Juvenile yellowtail, weighing 4.6–4.8 g, were allocated to one of three treatment groups in triplicate tanks, with 12 fish per tank.
- Treatments were fish meal (FM) control, and Empyreal 75 fed at 7.5% and 15% of the diet (Table 1) and were balanced to be isonitrogenous and isocaloric.
- Diets were hand-fed once per day, and fish were group-weighted every two weeks.

Table 1: Diet formulation comparisons

Ingredient	FM (Control)	7.5% Inclusion	15% Inclusion
Fish Meal (CP65)	650	530	425
Empyreal 75	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 ^a	12.4	8.7 ^a	1.4 ^a	5.4	3.8 ^a
7.5% Inclusion	4.6	21.5 ^b	16.8	16.8 ^b	1.0 ^b	7.3	5.0 ^b
15% Inclusion	4.6	15.5 ^a	13.6	9.9 ^b	1.4 ^a	5.9	4.0 ^{ab}

^{ab} Columns with different superscript were significantly different (p≤0.05)

Table 3: Cost of production

Treatment	FCR	Yen/kg Production
FM (Control)	1.4	197.50
7.5% Inclusion	1.0	133.92
15% Inclusion	1.4	179.60

Results:

- Initial body weight was not significantly different between treatment groups. However, fish receiving 7.5% Empyreal 75 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 15% groups.

Conclusions:

- Based on the results of this trial, reduction of fish meal by inclusion of 7.5% Empyreal 75 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 75 was fed at 7.5% of the diet.

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