# EFFECTS OF DIETARY CARNITINE SUPPLEMENTATION ON GROWTH, BODY COMPOSITION, AND LIPID METABOLISM IN GIANT GROUPER, *Epinephelus lanceolatus*, FED WITH HIGH PLANT PROTEIN DIET

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## 1. INTRODUCTION

Fish meal is the main protein source in aquafeed. However, due to climate changes, marine pollutions, and over-fishing, the cost of this ingredient dramatically increased in the recent years (Lin and Yeh, 2022). Consideration of sustainability of aquaculture, looking for adequate alternative protein sources becomes an important issue. Soybean meal is widely used as fish meal replacer because it is cost-effective and high availability, and contains rather balanced nutritional compositions. However, several recent reports indicated that the lipid metabolism were interfered by ingestion of high levels of soy protein, and caused fatty liver and high visceral fat contents for fish (Lin et al., 2022).

Carnitine (γ-trimethyl-β-hydroxybutyrate) functions in long-chain fatty acid transportation across mitochondrial membranes and yields energy through β-oxidation (Dias et al., 2001). This nutrient can be *de novo* synthesized by converting lysine with methyl group donated by methionine (Dayanand et al., 2011). It should be noted that lysine and methionine as well as carnitine are deficient in soybean. Therefore, lipid metabolism disorder is expected while fish fed with the diet containing soy protein. The present study evaluated effects of dietary carnitine supplementation on growth performance, body composition, and lipid metabolism in giant grouper, *Epinephelus lanceolatus*, fed with high plant protein diet. Until now, the rate-limiting enzyme of carnitine synthesis, i.e. γ-butyrobetaine hydroxylase 1 (BBOX1), is still unclear in fish. The regulation of carnitine synthesis was also established.

## 2. MATERIALS AND METHODS

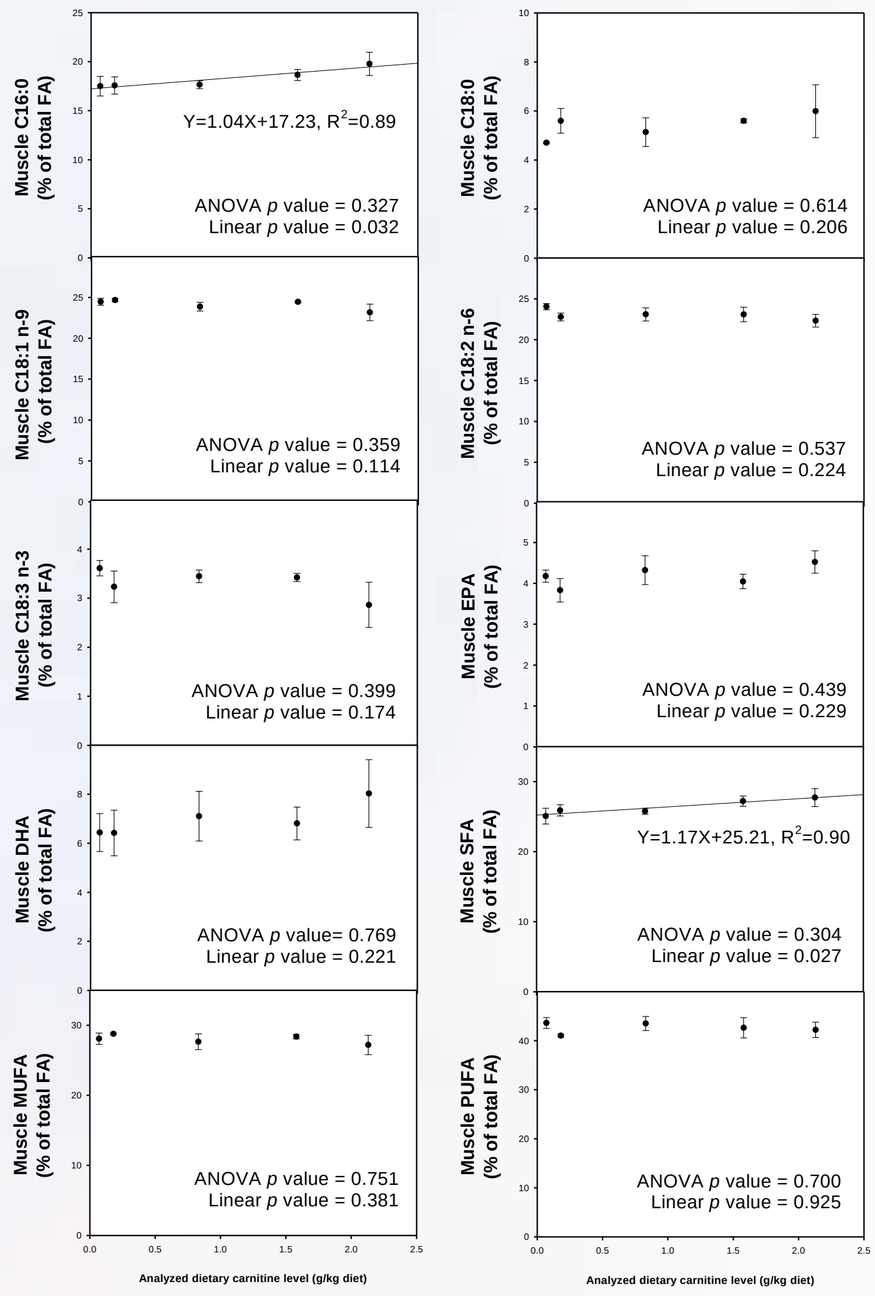
### Feed formulation of the control diet

| Ingredient | % |
|---|---|
| Fish meal | 25.51 |
| Soy protein concentrate | 29 |
| Corn protein concentrate | 5 |
| Fish oil | 4.61 |
| Soybean oil | 2.1 |
| Soy lecithin | 1 |
| Squid liver meal | 5 |
| Scallop meal | 5 |
| Alpha starch | 7.69 |
| Wheat gluten | 5 |
| Yeast | 1 |
| Vitamin premix | 1 |
| Mineral premix | 2 |
| Choline chloride | 0.1 |
| Methionine | 0.22 |
| Lysine | 0.58 |
| Cellulose | 5.21 |

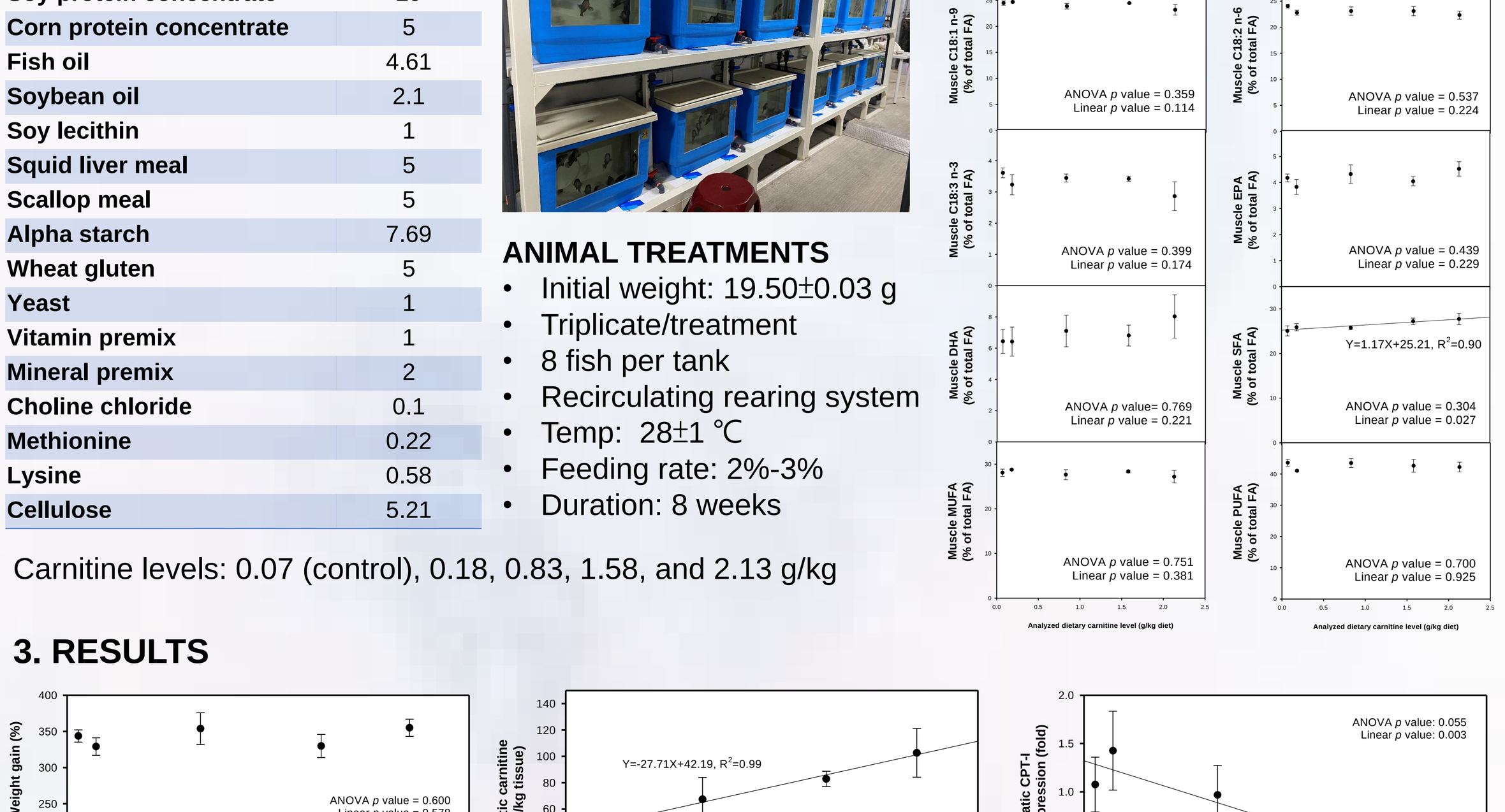
### ANIMAL TREATMENTS

- Initial weight: 19.50±0.03 g
- Triplicate/treatment
- 8 fish per tank
- Recirculating rearing system
- Temp: 28±1 ℃
- Feeding rate: 2%-3%
- Duration: 8 weeks

Carnitine levels: 0.07 (control), 0.18, 0.83, 1.58, and 2.13 g/kg




## 3. RESULTS




## 4. CONCLUSION

- Results indicate that dietary carnitine supplementation can accelerate saturated fatty acids accumulation through the depression of gene expression for fatty acid desaturation and oxidation.
- Grouper can synthesize required carnitine by up-regulating BBOX1 gene expression when fish fed the high plant protein diet.

## Reference

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