ROLE OF THYROID HORMONES IN THE REGULATION OF GROWTH IN THE MALABAR GROUPER *Epinephelus malabaricus*

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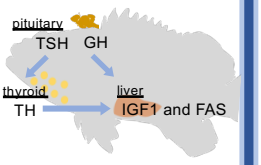
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Introduction

Thyroid hormone (TH)

Thyroxine (T4) and triiodothyronine (T3) are involved in basal metabolic rate, appetite, and food intake in mammals.

TSH: Thyroid-stimulating hormone
GH: Growth hormone
IGF1: Insulin-like growth factor 1
FAS: Fatty acid synthase



- ✓ Effect of TH administration on growth performance is different among species
- ✓ Understanding the endocrine system is important to maximize and optimize the growth of the target species.

This study aimed to examine the effects of THs and thiourea on the growth of Malabar grouper, which is an important species in aquaculture in southern Japan

Feeds containing TH and/or an anti-thyroid agent (Thiourea; TU) were prepared and given to juveniles to clarify the effect of TH on growth and metabolism in this species.

Materials and Methods

◆ Materials Malabar grouper (*Epinephelus malabaricus*)



- Juveniles (n = 40) obtained from Sea Framing Center, Okinawa, Japan

Total Length (TL): 142.1 ± 3.28 mm
Body Weight (BW): 38.7 ± 4.22 g

◆ Methods

- ✓ T4 (50 mg/kg pellets; T4 group), TU (2 g/kg pellets; TU group), T4 and TU (T4+TU group), and Vehicle only (ethanol; Control group) were sprayed onto the commercial pellets and dried.
- ✓ Fish were fed once a day at 3% of BW for 4 weeks.



Experimental design

- ✓ After anesthetizing with 2-phenoxyethanol, fish were scarified and weighed. Liver mass was recorded.
- ✓ The pituitary gland and liver were taken and immersed in Tripure.
- ✓ The transcript levels of *TSH* and *GH* in the pituitary gland and *IGF1* and *FAS* in the liver were measured by qPCR.
- ✓ Pieces of liver were fixed in Bouin's solution for histological observation of hepatocytes.

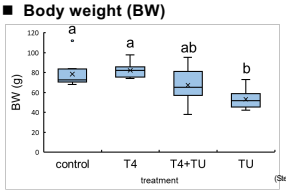
Growth indicator

- ✓ Condition factor (CF), Specific growth rate (SGR), Feeding efficiency (FE), and Hepatosomatic index (HSI) were calculated.

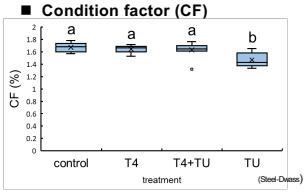
Results

▶ Growth indicators and Hepatocyte histology

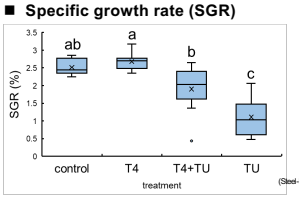
■ Body weight (BW)



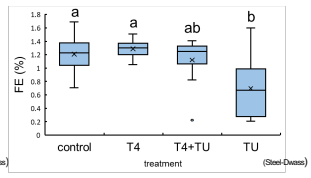
■ Condition factor (CF)



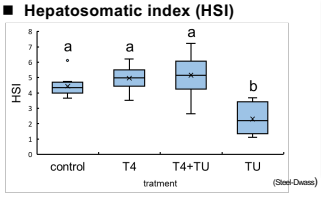
■ Specific growth rate (SGR)

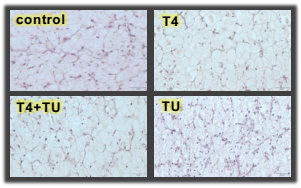


■ Feeding efficiency (FE)



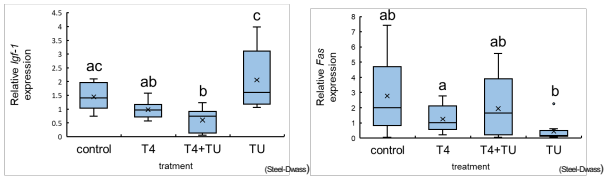
■ Hepatosomatic index (HSI)





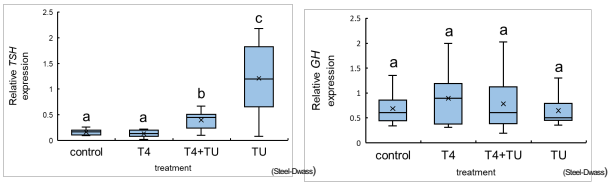
- ✓ All growth indicators in the TU group significantly decreased.
- ✓ No significant difference in growth indicators between the T4 group and Control group was observed.
- ✓ The unstained area and diameter of hepatocytes in the TU group decreased.

▶ Gene expression (*IGF1* and *FAS*) in the liver



- ✓ *IGF1* was significantly higher in the TU group than in the T4 and T4+TU groups.
- ✓ *FAS* was significantly lower in the TU group than in the T4 group.

▶ Gene expression (*TSH* and *GH*) in the pituitary gland



- ✓ *TSH* was significantly higher in the TU and T4+TU groups than in the T4 and Control groups.
- ✓ Difference in *GH* expression was not significant among the treatment groups.

Discussion

◆ Role of THs in Malabar grouper

TU lowered all growth parameters

The hormone network associated with TH synthesis and secretion is involved in the growth of this species through the regulation of growth-related genes in the liver.

T4 administration

No significant difference between the control and T4 groups.

→ Endogenous T4 may mask the effect of exogenous T4 on growth indicators and gene expressions.

TSH in the pituitary gland

TU treatment stimulated *TSH* expression in the pituitary gland.

→ Lack of THs in the blood circulation stimulated the synthesis and secretion of TSH in the pituitary gland.

IGF1 and *FAS* in the liver

TU treatment had an upward effect on *IGF1* but not *FAS*

→ Lack of THs caused low metabolic and digestive activity and induced a starved status. This state of starvation may stimulate IGF1 synthesis in the liver.