

## 学 位 論 文 要 旨

氏 名

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題 目

Nutritional studies on the interactive effects of selected amino acids and lipid-related additives on marine fish

海産魚類におけるアミノ酸および油脂関連添加物の交互作用に関する栄養学的研究

This study was conducted to clarify the interactive effects of selected amino acids and lipid related functional additives for marine fish such as Japanese flounder and red sea bream. To provide the proper rations of functional amino acids and additives, it is necessary to reveal the interactions between those compounds.

First part of the study was aimed to determine the interactive effects of two alkaline amino acids such as arginine (Arg) and histidine (His) for Japanese flounder. Two levels of Arg combined with three levels of His were added as a 2×3 experimental design. Significant interactive effects between two amino acids were detected on growth parameters such as body weight gain (BWG) and specific growth rate (SGR). Low dietary Arg together with low dietary His increased the plasma GOT and GPT, but decreased lysozyme activity. The phenomenons were mitigated by either increase dietary Arg or His levels. The optimal ration of Arg and His for Japanese flounder when fed the diets containing low fishmeal was 2.70 g/100g diet and 1.56 g/100g diet, respectively.

Second part of the study was conducted to evaluate the interaction of two large neutral amino acids such as methionine (Met) and tryptophan (Trp) for Japanese flounder. Six experimental diets were formulated with two supplementation levels (0.8 and 1.8% of diet) of Met combined with three supplementation levels (0.12, 0.3 and 0.5% of diet) of Trp, respectively. Significantly interactive effects of Met and Trp were found on final body weight (FBW), BWG, plasma glucose, GOT, free Trp of the body and fresh water tolerance. The highest growth parameters were found in fish fed the diet containing the highest levels of Met and Trp.

In the third part, two feeding trials were contributed on two sizes of Japanese flounder to assess the interactions of leucine (Leu) and valine (Val). Fishes were fed with diets containing two levels of Leu (1.6 and 5.0% of diet) with three levels of Val (1.2, 1.8 and 2.5% of diet, as a 2×3 experimental design) and the control diet. Not only antagonism was observed in high level of Leu groups, but also the synergetic effect of increased Val in low Leu level groups. Interactions were also found on plasma parameters.

The forth part was to determine the interaction between two dispensable amino acids taurine (Tau) and glutamine (Gln) for Japanese flounder. Beside the fishmeal based diet, six diets supplemented with two levels (0 and 2% of dry diet) of Tau combined with three levels (0, 1 and 2% of dry diet) of Gln were formulated. No interactive effect is shown in the selected parameters of Japanese flounder in this study. On the other hand, some growth parameters and FI were significantly affected by both Tau and Gln.

The last part of this study was focused on the effects of additives associated with dietary oxidized oil. A 30-day feeding trial was conducted to investigate the anti-oxidative effects of rosemary acid and lactoferrin on red sea bream fed with diets containing oxidized oil. Dietary oxidized oil did not significantly affect the growth performances. However, it significantly decreased the hemoglobin of red sea bream, and the hemoglobin level was increased when added either rosemary acid or lactoferrin in the diets.

Overall, functional or chemically related dietary micronutrients could affect the determination of optimal supplementation levels. It is very important to clarify the proper amino acids rations in aqua-feed. Further studies need to further understand the mechanisms of related amino acids interactions in fish.