

学 位 論 文 要 旨

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題目	Studies on utilization of ω 3 rich oilseed Camelina (<i>Camelina sativa</i>) in diets for red sea bream (<i>Pagrus major</i>) マダイ飼料におけるカメリナ (<i>Camelina sativa</i>) の利用性に関する研究

Feed costs account to 60 % of total production costs in aquaculture due to expensive ingredients such as fish oil and fish meal. *Camelina sativa* thrives in winter to spring seasons and rotate with wheat in Europe. Camelina oil (CO) containing high amounts of 18:3n-3 and vitamin E and camelina meal (CM) has 38-43% crude protein and 9 each of essential and non-essential amino acids. The present study was designed to investigate implications of utilizing CO and CM as a replacement of fish oil (FO) and fish meal (FM) in diets of red sea bream on growth response, contents of nutrient, physiology and health condition. Based on the nutritional contents of CO and CM, diets were formulated and fed to red sea bream juveniles for 56 and 60 days respectively. All diets were formulated to contain similar crude protein and lipids. Each diets were fed to fish in triplicate tanks which were selected randomly. Results show that CO with EPA,DHA and soybean lecithin supplementations can replace fish oil in feeds for red sea bream with no detrimental impact on growth or feed utilization efficiency (feed intake, feed conversion ratio and fatty acid digestibility), lipid profiles and blood chemical parameters. In addition, 100% FO replacement with CO did not affect oxidative status in plasma and muscles of fish. In contrast, 100 % CO resulted in slightly higher liver oxidative stress but it not affects growth response. Histomorphology of liver showed that 100% CO resulted into increased size of lipid droplet which reflects oil deposition in TAG storage form. However, histology analysis did not show signs of pathological defects on the liver that would impede growth. Furthermore, results showed that up to 20.5% of CM can replace FM in diets of red sea bream juvenile without deleterious effects on growth performance, nutrient digestibility, digestive enzyme activity, growth related genes, stress and oxidative capacity and non specific immunity. 33% CM inclusion in diets of red sea bream resulted in diminished growth responses, feed efficiency, digestion, immunity, expression of growth related genes and stress variables. In addition, at 33% CM supplementation there were observable low protein levels and higher lipid level than at 0 and 20.5% CM level, while dry matter and ash were uniform in the carcass of red sea bream. Besides that, 33 % CM inclusion level were associated with low feed intake, poor feed utilization ratio due to the anti- nutritional factors in CM. This is the first study to determine utilization of CM and CO in marine fish in Japan. The results obtained in this study leading to improvement of low fish meal and fish oil feed for aquaculture. We recommend that further studies must be conducted for longer duration to identify the definite level of CO and CM in diets of red sea bream and other marine animals.