

罗非鱼低鱼粉饲料中脱酚棉籽蛋白替代鱼粉的研究

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Replacement of Fish Meal with Degossypolled Cottonseed Protein in Low Fish Meal Diets for *Oreochromis niloticus*LIN Shi-mei¹, MAO Shu-hong¹, GUAN Yong¹, PAN Yu¹, LUO Lin³, LUO Li^{1,2}

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摘要

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摘要 在实用饲料(含鱼粉6.0%,鱼粉粗蛋白质含量为64.5%)的基础上,用脱酚棉籽蛋白分别替代0、50%和100%的鱼粉,配制成3种等氮等能的试验饲料,以研究罗非鱼低鱼粉饲料中脱酚棉籽蛋白替代鱼粉的可行性。将270尾平均体重为50 g的雄性吉富罗非鱼随机分成3组(每组设3个重复,每个重复30尾),其中饲养替代水平为0的试验饲料的组为对照组。试验期为8周。结果表明:50%替代水平组罗非鱼的末重显著高于对照组($P<0.05$),而与100%替代水平组差异不显著($P>0.05$)。罗非鱼的特定生长率、蛋白质效率、饲料效率和摄食率组间差异不显著($P>0.05$)。随着脱酚棉籽蛋白替代水平的提高,罗非鱼内脏指数显著增加($P<0.05$),但肝胰指数、饱满度以及全鱼干物质、粗蛋白质、粗脂肪和灰分含量无显著变化($P>0.05$)。脱酚棉籽蛋白替代水平对罗非鱼的肝胰脏消化酶活性有显著影响($P<0.05$),其中胰蛋白酶活性以50%替代水平组最高,淀粉酶活性以100%替代水平组最高。随着脱酚棉籽蛋白替代水平的提高,各组罗非鱼的肝胰脏总抗氧化能力,谷草转氨酶、谷丙转氨酶、超氧化物歧化酶活性以及肝糖原含量显著降低($P<0.05$),而丙二醛含量则显著增加($P<0.05$)。由此得出,在罗非鱼低鱼粉饲料中,脱酚棉籽蛋白替代鱼粉的水平以不超过50%为宜,过高的替代水平对罗非鱼的免疫应答会产生负面影响。

关键词: 罗非鱼 低鱼粉饲料 脱酚棉籽蛋白 鱼粉

Abstract: In order to study the feasibility of replacement of fish meal with degossypolled cottonseed protein in low fish meal diets for tilapia (*Oreochromis niloticus*), three isonitrogenous and isoenergetic experimental diets were formulated by replacing 0, 50% and 100% fish meal with degossypolled cottonseed protein on basis of a practical diet (fish meal content was 6.0% and crude protein content in fish meal was 64.5%), respectively. A total of 270 male genetically improved farmed tilapia (GIFT) with an average body weight of 50 g were randomly divided into 3 groups with 3 replicates per group and 30 fish per replicate, and the fish in the control group were fed the experimental diet containing 0 degossypolled cottonseed protein. The experiment lasted for 8 weeks. The results showed as follows: the final weight of tilapia in the 50% replacement level group was significantly higher than that in the control group ($P<0.05$), but there was no significant difference between the 50% replacement level group and 100% replacement level group ($P>0.05$). No significant differences were found in special growth rate, protein efficiency ratio, feed efficiency and feeding rate of tilapia among all groups ($P>0.05$). With increasing replacement level of degossypolled cottonseed protein, the viscerosomatic index of tilapia was significantly increased ($P<0.05$), but no significant differences were found in hepatosomatic index, condition factor and contents of dry matter, crude protein, crude lipid and ash of whole fish ($P>0.05$). The replacement level of degossypolled cottonseed protein could significantly affect the hepatopancreas digestive enzyme activities of tilapia ($P<0.05$), and the highest values of trypsinase and amylase activities were found in the 50% replacement level group and 100% replacement level group, respectively. With increasing replacement level of degossypolled cottonseed protein, the total antioxidant capacity, activities of superoxide dismutase, glutamic pyruvic transaminase and glutamic oxaloacetic transaminase, and liver glycogen content in hepatopancreas of tilapia were significantly increased ($P<0.05$), while the malondialdehyde content was significantly decreased ($P<0.05$). In conclusion, the suitable replacement levels of fish meal with degossypolled cottonseed protein are not more than 50% in the tilapia low fish meal diets, and higher replacement levels can induce negative influences on immune response of tilapia.

Keywords: tilapia (*Oreochromis niloticus*), low fish meal diet, degossypolled cottonseed protein, fish meal

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