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Research Application Summary

Effect of dietary protein, lipid and androgen (11 - ketotestosterone) levels on the progeny of *Oreochromis andersonii* (castelnau, 1861) broodstock

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Abstract

The study on the effect of dietary protein, lipid and 11 – Ketotestosterone (11 – KT) levels on the progeny quality of *Oreochromis andersonii* broodstock will be conducted at National Aquaculture Research and Development Centre, Kitwe, Zambia. Factorial experiments will be set in order to investigate the effect of lipid (5%, 10% and 15%) and protein (20%, 30%, and 40%) from soybeans on the reproduction of *O. andersonii*. Furthermore, effect of 11 – KT (30, 60 and 90mg/kg of feed) will be investigated on progeny quality, sex ratios and hormone degradation. Optimal lipid, protein and 11 – KT levels that can be incorporated into the broodstock and fry diets of *O. andersonii* will be known by the end of the study.

Key words: 11 – Ketotestosterone, lipid, protein, sex ratio

Résumé

L'étude sur l'effet des niveaux des protéines, des lipides et de 11 - Ketotestostérone (11 - KT) alimentaires sur la qualité de la descendance des géniteurs *Oreochromis andersonii* sera effectuée au centre national de développement et de la recherche en aquaculture, à Kitwe, en Zambie. Les tests factoriels seront établis afin d'étudier l'effet des lipides (5%, 10% et 15%) et des protéines (20%, 30% et 40%) de graines de soja sur la reproduction de *O. andersonii*. En outre, l'effet de 11 - KT (30, 60 et 90 mg / kg d'aliment) sera étudié sur la qualité de la descendance, les rapports de sexe et de la dégradation hormonale. Les niveaux optimaux des lipides, de protéines et de 11 - KT qui peuvent être incorporés dans les géniteurs et les régimes alimentaires des alevins de *O. andersonii* seront connus d'ici la fin de l'étude.

Mots clés: 11 – Ketotestostérone, lipides, protéines, le rapport de sexe

Background

Annual capture fisheries output per person in Zambia has declined from 11.4 kg in the 1970s to 8 kg in 1990s and 5.8 kg in 2009. In the absence of improvement, aquaculture remains

the only option to ensure adequate fish consumption (ADP, 2008). However, aquaculture production remains very low as it stands at around 8, 500 tons annually. One of the major constraints to aquaculture production is lack of quality fingerlings. Effective fish seed production demands a good understanding and in particular of broodstock nutrition which significantly affect fecundity, survival, egg size and egg and larval quality.

This study is investigating the effect of varying protein, lipid and the incorporation of the androgen 11 - Keto testosterone (11 – KT) into the broodstock feed administered to *Oreochromis andersonii* (the most important local species for culture in Zambia) broodstock on fecundity, size and quality of the eggs and their influence on the growth of the progeny.

Literature Summary

The fertilized eggs rely on the nutritional components of the yolk especially lipids, carbohydrates and proteins. A study on rainbow trout showed that rations size affected fecundity (Hardy, 1985). A shortage of food has also been observed to reduce fecundity in fish such as plaice (*Pleuronectes platessa*) and salmonids (Billard *et al*., 1981).

Lokman *et al.* (2007) found that treatment of ovarian fragments with 11 – KT resulted in a significant increase in the diameter of eel oocytes implying that the androgen can exert direct effects on eel ovary, resulting in an increase of the size of the previtellogenic oocytes. This study is examining effect of dietary protein, lipid and androgen levels on the progeny of *O. andersonii*.

Study Description

The study will be conducted at National Aquaculture Research and Development Centre (NARDC), Kitwe, Zambia. A factorial experiment (2 x 3) in a Complete Random Design (CRD) will be set with sixteen (16) hapas (6 x 2 x 0.9m) fixed in semi – concrete ponds (750m^2) with three treatments; 5, 10 and 15% for lipid; and 20, 30 and 40% protein. Fish will be stocked at 2 fish/m^2 in a sex ratio of 3 : 1 (females : males). Nine (9) diets will be formulated after proximate analysis of ingredients. The source of the lipid and protein will be soybean. Fish will also be fed with the diet with or without 11 – KT incorporated at 30, 60 and 90mg/kg of feed at 10% body weight.

After three months female fish will be selected randomly and dissected to remove the ovaries and liver under sterile conditions (Lokman *et al.*, 2007). The stage of gonads will be classified

according to Balarin (1993). The gonads and liver will be weighed immediately using a digital scale to the nearest gram. Proximate analysis of liver and ovary for protein and lipid will be done according to AOAC (2002). Lipid classes will be determined by High Performance Thin Lipid Chromatography (HPTLC) using double chromatography. The total lipid prepared will then be used for Fatty Acid Methyl Esters (FAME). Amino acid analysis will be determined using an appropriate amino acid analyzer (Madalla, 2009).

Research Application

The effect of lipid, protein and androgen 11 – KT that can be incorporated in brood stock feed for reproductive characteristics such as egg size, fecundity, fertilization rates, hatchability rates and sex ratio will be understood in order to improve the fish seed production. Furthermore, the influence of lipid, protein and 11 – KT levels on the growth of the *O. andersonii* progeny will be known. The degradation period of the 11 – KT will be determined to ascertain the safety of eating fish administered with this hormone.

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