ABSTRACT.

The coefficients of digestibility of the crude protein and gross energy components of selected foodstuffs used in tilapia feeds in Jamaica were determined for the Nile tilapia Oreochromis niloticus (L.). These coefficients were used to formulate three diets containing similar levels of crude protein and increasing levels of digestible energy so as to investigate the effects of diets of varying protein-energy ratio (110.81; 121.21; and 141.12 mg crude protein/Kcal digestible energy) on the growth rates, food conversion efficiency, and body composition of these fishes.

Experiments were conducted indoors, in 130 litre aquaria, using the indirect method incorporating chromic oxide as an indicator substance, and in outdoor concrete tanks of 4.6 cu. metre volume. The quantities of moisture, crude protein, lipids, and gross energy in samples of the feed and faeces were estimated by standard methods of analysis (A.O.A.C., 1975), and the coefficients of digestibility and the digestible energy were calculated using formulae proposed by Maynard and Loosli (1962) and Page and Andrews (1973) respectively.

At 26 +/- 1.5 deg. C the coefficients of digestibility of crude protein in the foodstuffs tested were: fish meal 86%; poultry-offal meal 74%; soybean meal 91%; wheat middlings 76%; brewers grain 63%; ground corn 83%. The digestibility of the protein was high irrespective of the protein content of the foodstuff. The foodstuffs differed greatly with respect to their available protein, with fish meal containing the highest level (56%).

The estimated digestible energy values (cals/gm) of the foodstuffs were: fish meal 3840; poultry-offal meal 3642; soybean meal 2677; wheat middlings 2745; brewers grain 1415; ground corn 3100. In addition, an animal fat used to boost dietary energy levels contained 8675 cals/gm digestible energy.

Dramatic differences in the growth rate (measured as wet weight gain/unit time) and final body mass were evident between control fishes and those receiving the diets. Over a 12 week growing period in trials 1 and 3, the controls achieved a mean increase in wet mass of 40.72 gms (98%), while fishes receiving the diets achieved a mean increase of 148.86 gms (357%).

There was no significant difference in the final mean mass of fishes receiving the diets, and the growth curves of these fishes were similar.

Various estimates of the efficiency of food utilization, such as the food conversion ratio, the protein efficiency ratio, and the apparent net protein utilization also failed to discern differences in the growth performance of fishes receiving the diets. It was apparent that the food conversion ratio [(dry weight gain (gm)/food offered (gm))/time] and the protein efficiency ratio [(increment of body protein (gm)/protein offered (gm))/time] were greatest when the fish were small, decreasing as they increased in biomass. Values for the efficiency of food conversion ranged from 34 - 12% over the growing period, and it was apparent that the fish were maximally able to utilize only one-third of the food offered. The greatest gains in the weight of fish produced per unit of protein offered were realized in the

diets containing supplemental energy (52 - 53%), indicating the operation of a small (and insignificant) protein-sparing effect of energy on growth for these diets. The fish converted dietary protein into body protein at a level of efficiency of approximately 30%.

There were also great differences in the body composition of control fishes and those receiving the diets. Thus, the moisture content of control fishes was approximately 80% of the total body mass, while that of fishes receiving the diets was approximately 73%. The crude protein content of the control fishes ranged from 72 - 77% of the dry weight, while that of fed fishes ranged from 51 - 69% of the dry weight. The fat content of the control fishes was found to be from 2 - 6% of the dry body weight, while that of fed fishes ranged from 21 - 29%.

There was found to be little variation in the levels of carcass moisture between fishes fed the diets, but the regression of carcass moisture on dietary P-E ratio was significant, indicating that there was a significant decrease in the moisture content with increasing levels of dietary energy. The relationship was described by a linear equation of the type $Y = a + bX$, where Y is the dependent variable, X is the dietary P-E ratio, and a and b are regression constants.

The diets produced fishes which differed significantly in the crude protein content of their carcasses. However, while there was a trend towards a reduction in the levels of crude protein with increasing levels of dietary energy, the regression was not significant.

There was great variability in the levels of carcass lipid

between fishes receiving the diets, with a trend towards an increase in the levels of carcass lipid as the levels of energy in the diet increased. Again, the regression was not significant.

In addition, there were strong relationships of the type Y = a + bX between the carcass components of moisture, crude protein and fat, and the body parameter wet body weight. These relationships were: (1) moisture content (gm) = 3.253 + 0.715 * [wet weight (gm)]; (2) crude protein content (gm) = 1.063 + 0.125 * [wet weight (gm); and (3) fat content (gm) = - 10.350 + 0.126 * [wet weight (gm)].

In conclusion, it is thought that the present study has particular relevance to the growth of aquacultural technology, as it addresses interactions between the nutrient composition of the food, growth rates and other parameters of food utilization, and the nutrient composition of the cultured organism. It is noted that despite their status as one of the world's oldest, and most commonly cultured group of fishes, little precise information exists concerning the nutrient requirements of the tilapias.