Evaluation of Nutritional Quality of Moringa (*Moringa oleifera* Lam.) Leaves as an Alternative Protein Source for Tilapia (*Oreochromis niloticus* L.)

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Introduction

- Commercial aquafeeds have traditionally been based on fish meal
- Intensification of fish farming, especially in lesser developed countries
- Future competition for global supplies of fishmeal is likely to increase
- The identification and utilisation of alternative protein sources for fish feed formulation is urgently needed

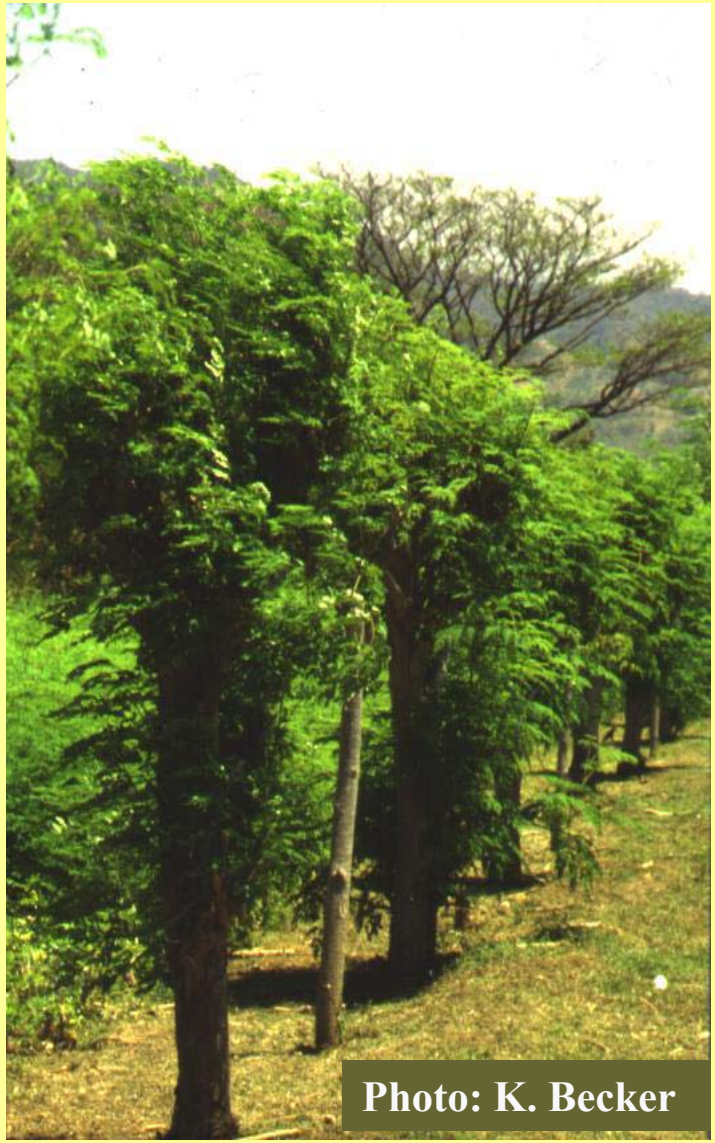
Introduction (con.)

- Research interest has been directed towards the evaluation and use of unconventional protein sources

- The present study reports results of inclusion of *Moringa oleifera* Lam. leaves in tilapia feeds

Moringa oleifera Lam.

- Family Moringaceae
- Fast-growing, drought-resistant and widely available in the tropics and subtropics
- Multi-purpose tree with a variety of potential economical, industrial and medicinal uses
- Leaves: rich in proteins, carotenoids, ascorbic acid and iron



Moringa oleifera

- Intensive leaf biomass production through densely grown moringa

Material and methods

- 84 fish (*Oreochromis niloticus*, 9-11g) were randomly selected and assigned to 12 groups of 7 fish (three replicates per treatment) stocked in 12 aquaria (45*l*) connected to a recirculatory system at 27±1°C

- Proximate composition of ingredients, diets and fish body were analysed according to AOAC (1990) standard methods

Material and methods

- Four isonitrogenous and isocalorific diets were formulated to include 35% total dietary protein
- The fish were fed at 15 g feed per kg metabolic body weight ($kg^{0.8}$) per day for 7 weeks
- Statistical analysis: one-way ANOVA and Duncan's multiple range test ($p<0.05$) were used

Materials and Methods

Proximate composition of ingredients (DM %)

Parameter	Moringa leaf meal	Wheat meal	Fish meal
CP	25.0	13.4	70.6
CL	10.6	1.1	11.8
CA	8.4	1.3	15.7
NDF	15.9	-	-

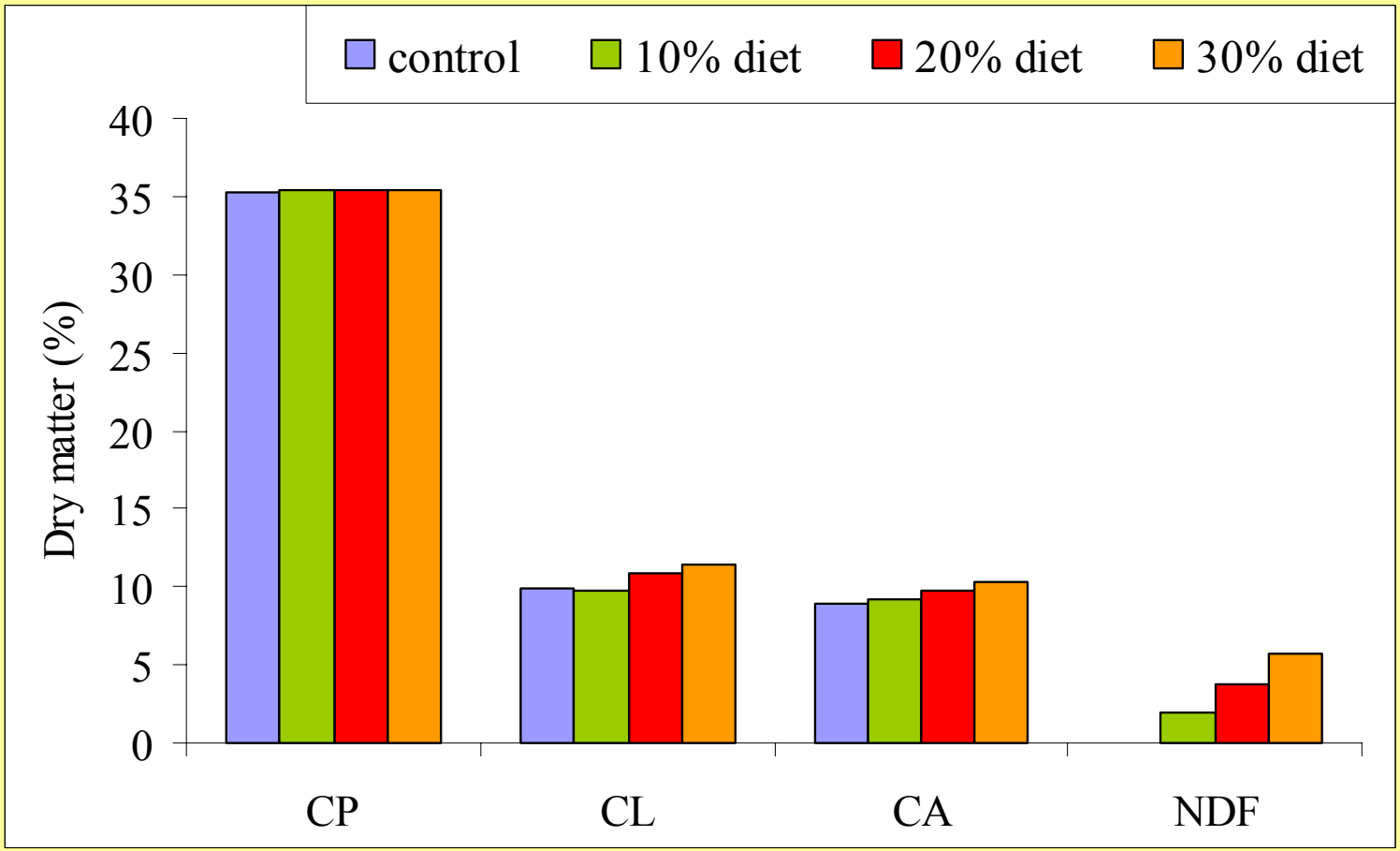
Materials and methods

Diet formulation (DM %)

Ingredients	Control	10% Diet	20% Diet	30% Diet
Wheat meal	52	43	34	25
Moringa leaf meal	0	12	24	36
Fish meal	40	37	34	31
Sunflower oil	4	4	4	4
Mineral mix	2	2	2	2
Vitamin mix	2	2	2	2

Results

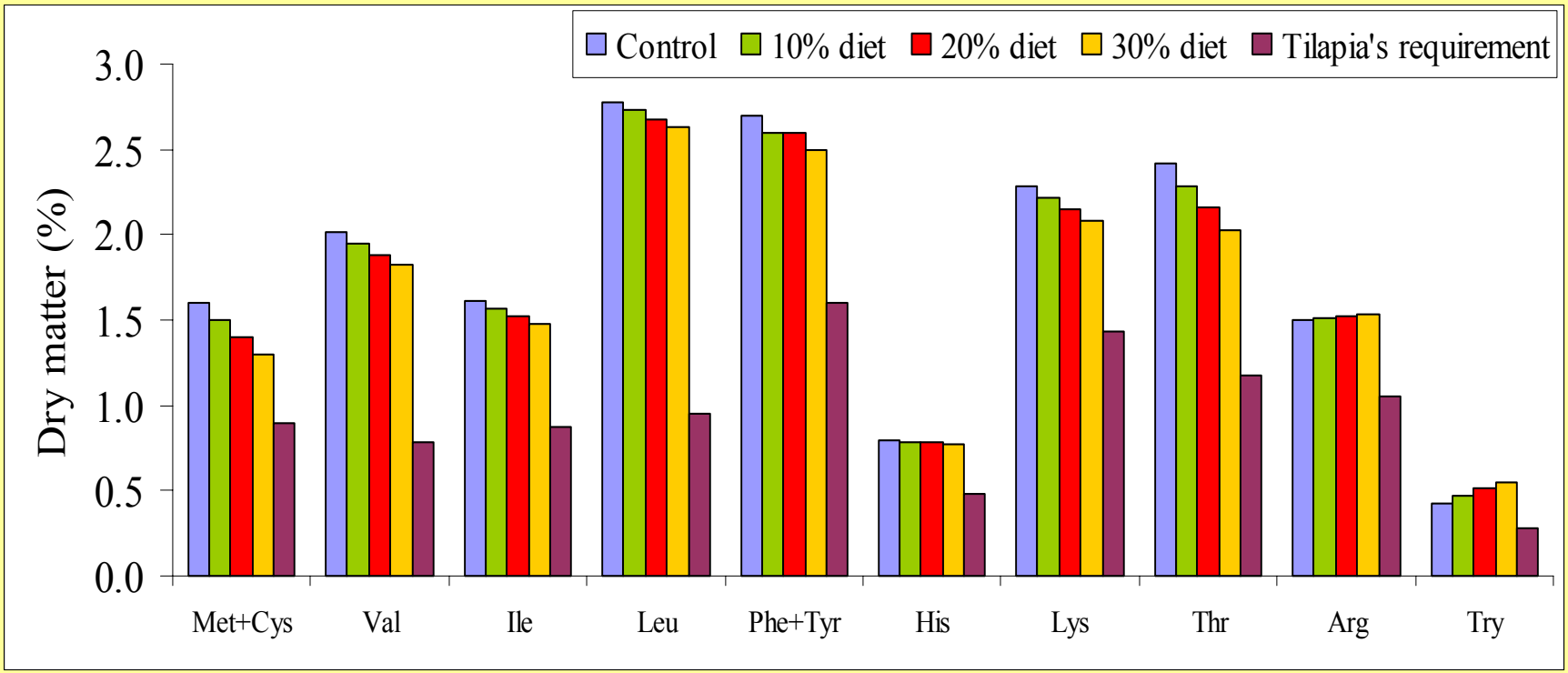
Proximate composition of diets



CP, crude protein, CL, crude lipid; CA, crude ash; NDF, neutral detergent fibre

Results

Amino acid composition of diets and tilapia‘s requirements



Results

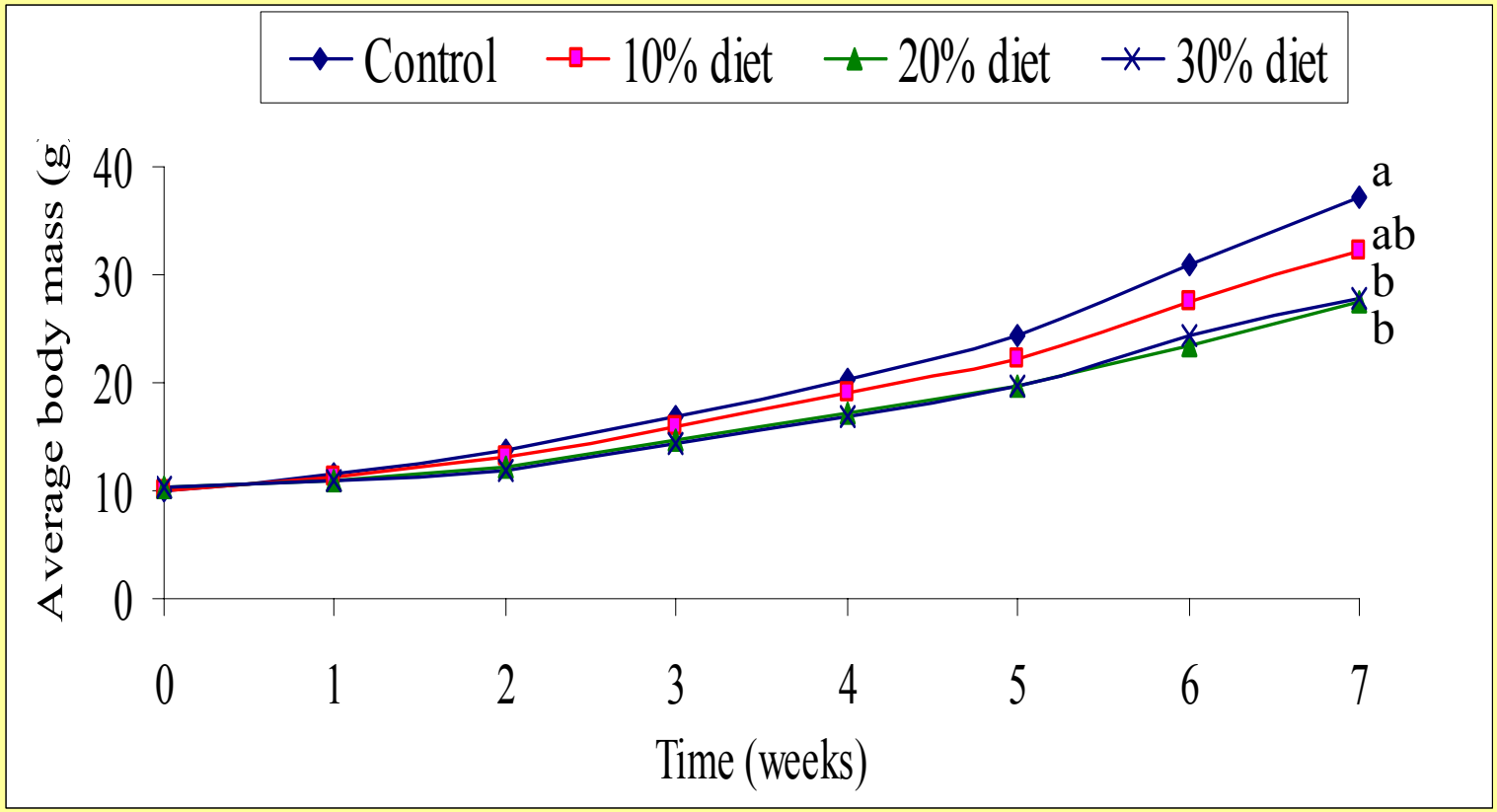
Antinutrient content of moringa leaves and experimental diets (% DM)

Antinutrient	Moringa leaf meal	10% diet	20% diet	30% diet
Total phenolics	2.7	0.3	0.7	1.0
Tannins	0.5	0.1	0.1	0.2
Condensed tannins	Trace	-	-	-
TI activity	ND	-	-	-
Phytic acid	2.3	0.3	0.5	0.8
Saponins	6.4	0.8	1.5	2.3

TI, Trypsin inhibitor; ND, Not detected

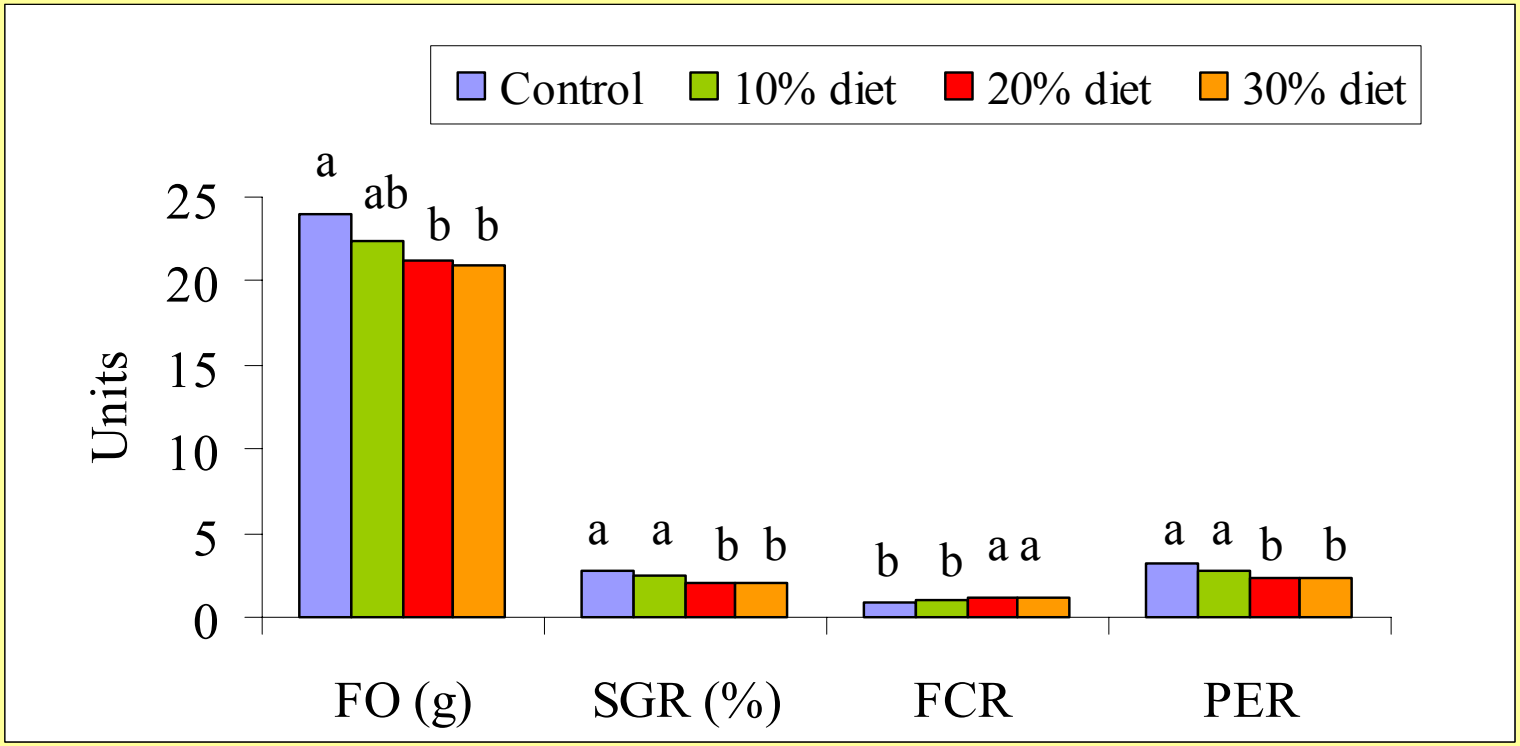
Results

Average body mass of fish fed experimental diets



Results

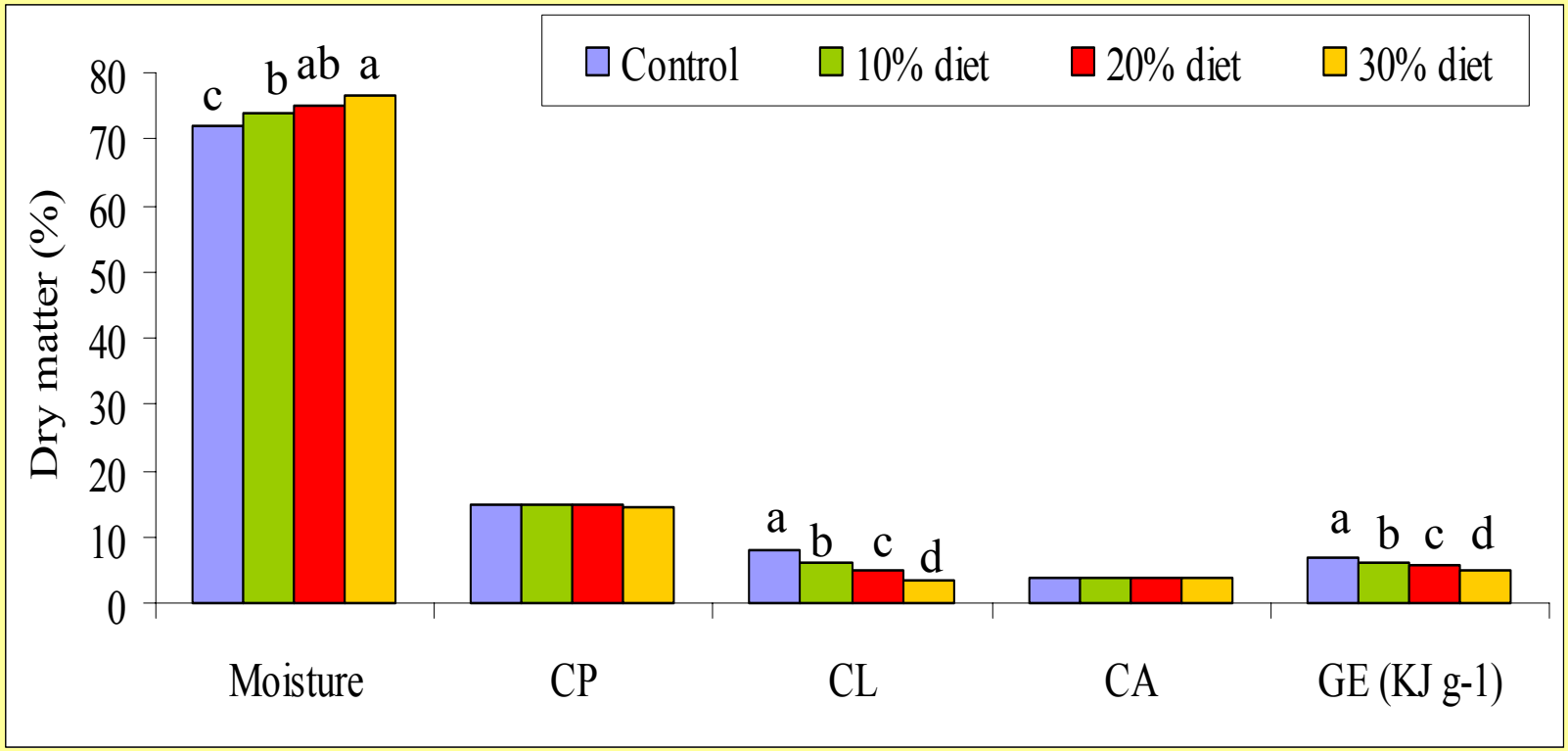
Growth performance of fish fed experimental diets



FO, feed offered; SGR, specific growth rate; FCR, food conversion ratio; PER, protein efficiency ratio

Results

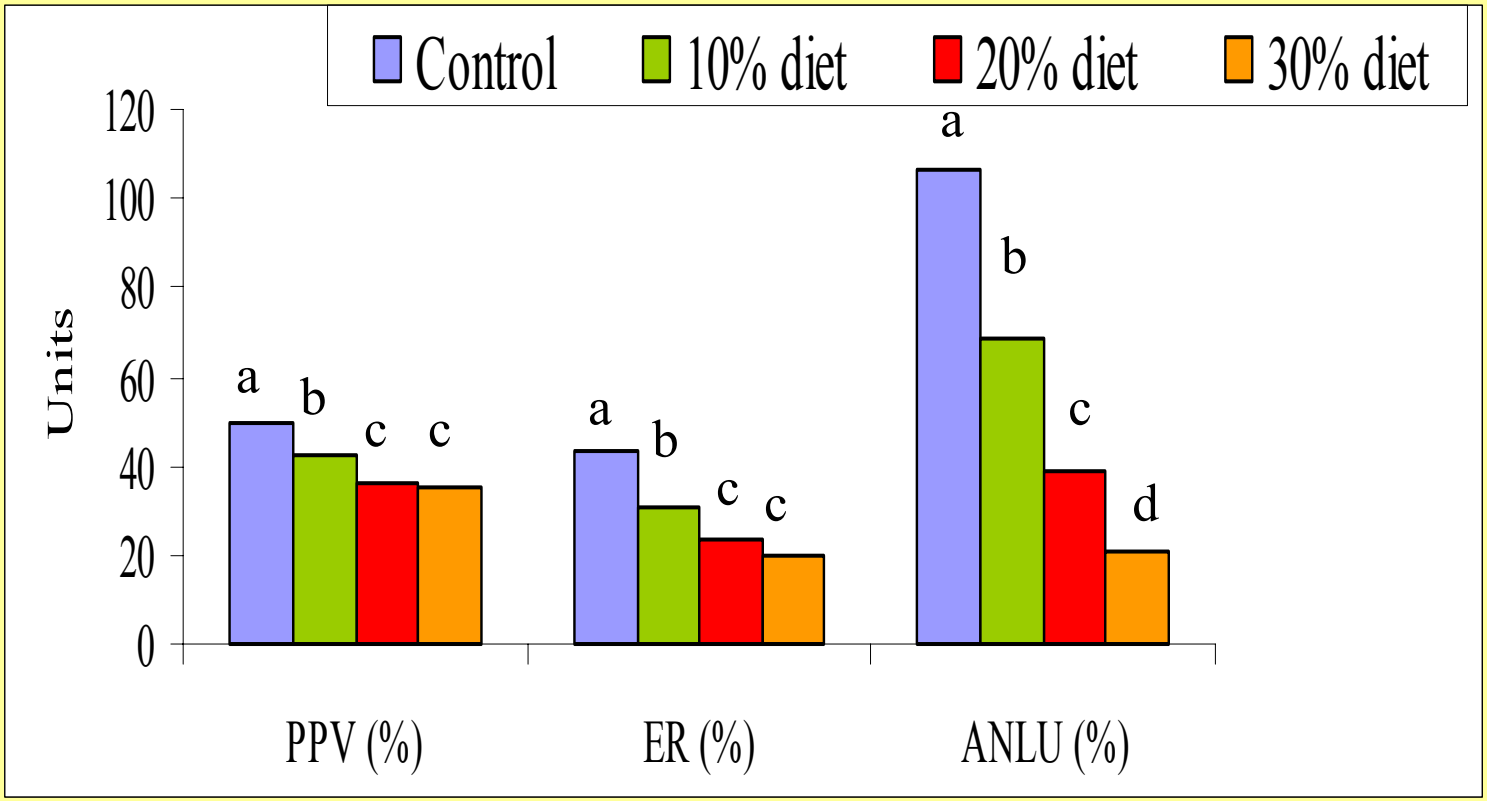
Whole body composition of fish at end of experiment



CP, crude protein; CL, crude lipid; CA, crude ash; GE, gross energy.

Results

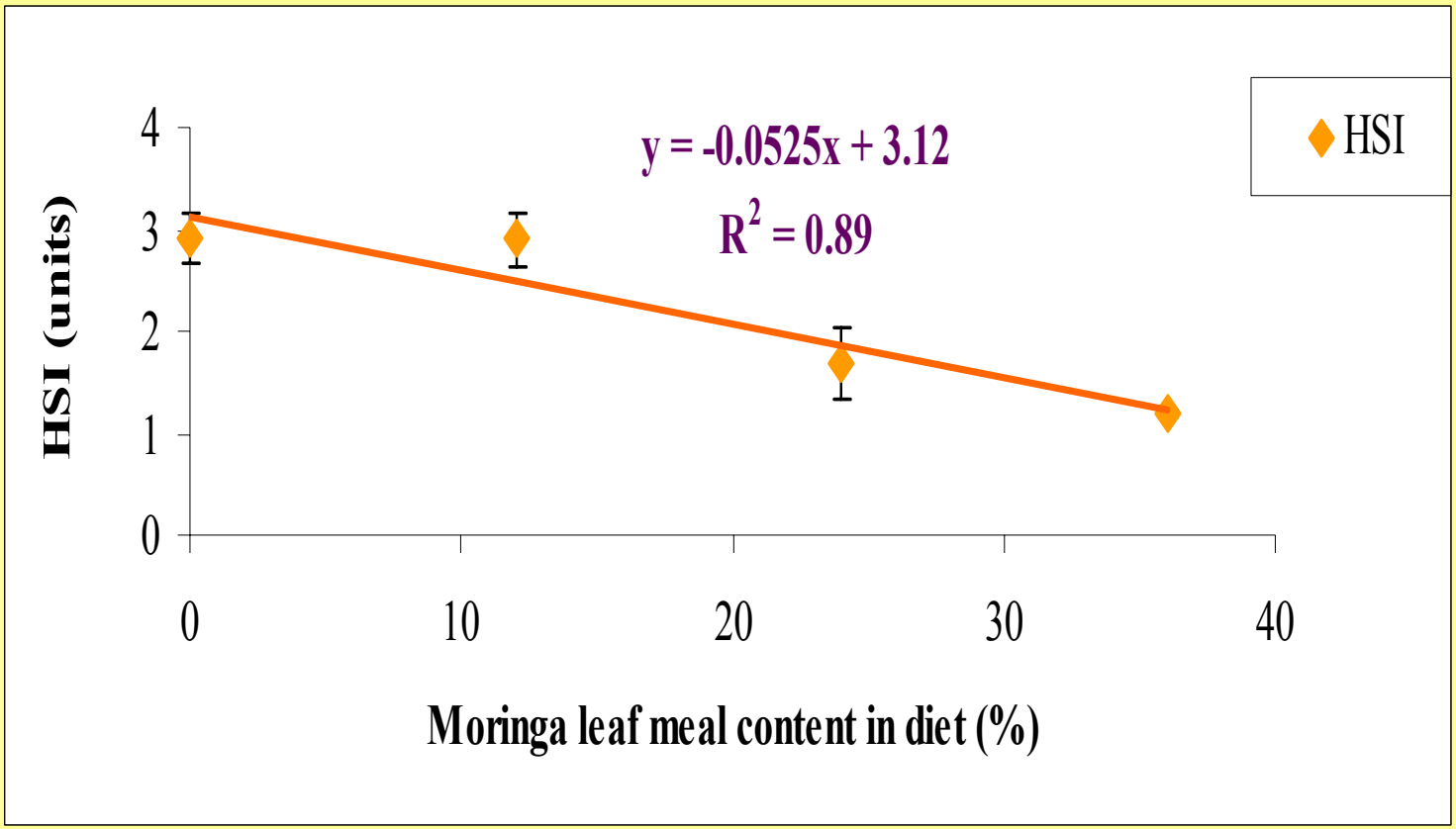
Protein, energy and lipid conversion of fish fed experimental diets



PPV, protein productive value; ER, energy retention; ANLU, apparent lipid utilisation.

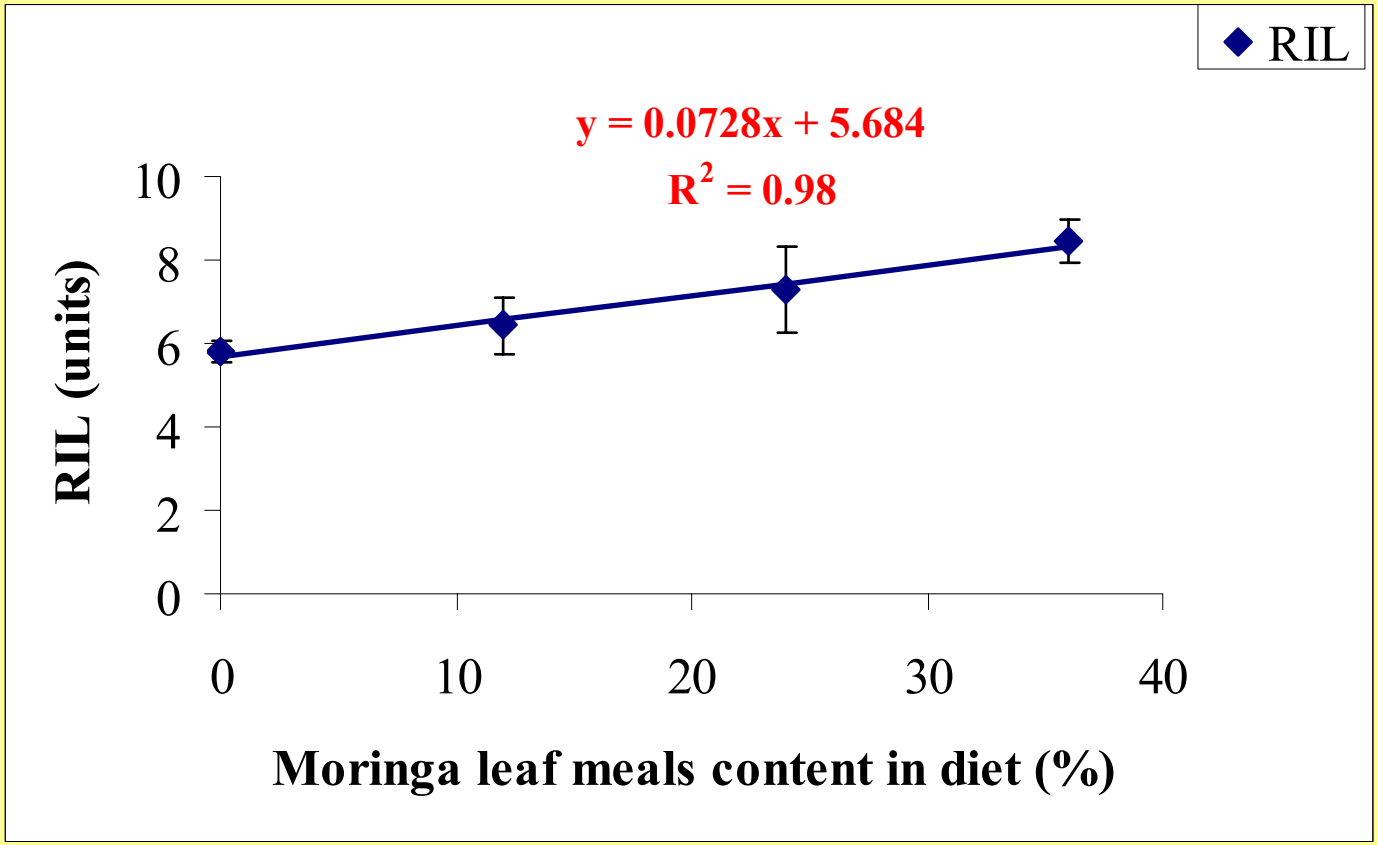
Results

Relationship between hepato-somatic index (HSI) and percentage of moringa leaves in diets



Results

Relationship between relative intestine length (RIL) and percentage of moringa leaves in diets



Conclusions

- Replacement of 10% of total dietary protein in fish feed is feasible
- Negative growth might be attributed to the presence of high concentration of saponins, NDF and probably phenolics
- To make the 30% inclusion level equivalent to the fish meal diet, further work on elimination and/or inactivation of antinutrients is in progress at our Institute

Thank you very much for your kind attention