Research Application Summary pp: 415 - 418

Proximate composition of potential plant feedstuffs for production of *Tilapia rendalli* in northern Malawi

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Abstract

The aquaculture sector in Malawi contributes two percent to nation's fish production. Availability of affordable quality feed is one of the most important problems that hamper aquaculture growth in Malawi. This study, therefore, aimed at investigating the nutritive value of locally available plant feedstuffs that can be used to produce a quality and affordable fish feed. Thirteen local plant feed ingredients were analysed for crude protein, moisture, crude fibre, energy, crude fat, phosphorus, cassium and potassium. Cassava (*Manihot esculenta*) leaves, Black jack (*Bidens pilosa*) and Cocoyam (*Colocasia esculenta*) leaves contained 21.17±0.56%, 24.35±0.7 % and 24.28±0.11% crude protein levels respectively. Energy levels were high in sweet potato leaf and cassava leaf meal at 29.7kj/g and 20.59 Kj/g respectively. Crude fibre contents ranged from 3.19±0.30% to 16.75±0.35%; minerals were 21.1±0.29 % to 0.19±0.16% for calcium, 2.20±0.14% to 0.19±0.02 % for potassium and 7.01±0.00% to 0.29±0.02 % for phosphorus. Findings suggest that plant feedstuff can be incorporated in fish diets and would markedly reduce cost of fish production.

Key words: *Bidens pilosa, Colocasia esculenta,* feed, fish

Résumé

Le secteur de l'aquaculture au Malawi contribue deux pour cent de la production halieutique de la nation. La disponibilité des aliments de qualité à prix abordable est l'un des problèmes les plus importants qui entravent la croissance de l'aquaculture au Malawi. Cette étude a donc pour objectif d'enquête de la valeur nutritive des aliments végétaux disponibles localement qui peuvent être utilisés pour produire des aliments de poisson abordable et de qualité. Treize ingrédients d'alimentaires végétaux locaux ont été analysés pour la protéine brute, de l'humidité, de fibres brutes, de l'énergie, de matières grasses brutes, le phosphore, le potassium et le calcium. Les feuilles de manioc (*Manihotesculenta*, Jack Black (*Bidenspilosa*) et les feuille d'igname (*Colocasiaesculenta*) contenaient respectivement 21,17 ± 0,56%, 24,35 ± 0,7% et ± 0,11% 24,28 des niveaux de protéines brutes. Les niveaux d'énergie sont élevés dans les repas des feuilles de patate douce et des feuilles de manioc à 29.7kj / g et 20,59 kJ / g respectivement. Les teneurs en cellulose brute variaient de 3,19 ± 0,30% à 16,75 ± 0,35%; les minéraux étaient de 21,1 ± 0,29% à 0,19 ± 0,16% pour le calcium, 2,20 ± 0,14% à 0,19 ± 0,02% pour le potassium et 7,01 ± 0,00% à 0,29 ± 0,02% pour le phosphore. Les

résultats suggèrent que la nourriture de l'usine peut être incorporé dans l'alimentation des poissons et réduirait sensiblement le coût de production de poissons.

Mots clés: *Bidens pilosa, Colocasiaesculenta*, aliments pour animaux, poissons

Background

The prevalent problem in the area is low fish production due to lack of quality affordable feed and most farmers rely on maize bran as feed for fish. This study was designed to identify locally available feed ingredients by investigating their nutritional composition then later isolate those ingredients that can be used in fish feeds to reduce cost of production and improve fish production levels.

Literature summary

One of the reasons for the low fish productivity in Malawi is the rising costs of inputs (feed and fertilizers) (Nagoli *et al*, 2013).It is against this background that Kan'gombe *et al*., (2009), Hecht and Maluwa (2003) advocates that available alternative feedstuffs would be sustainable in Malawi. At present, evidence exists that farmers in Malawi are still not fully aware of the benefits of using alternative inputs such as ,cassava leaves, sweet potato leaves, buffalo bean grass,, napier grass, mulberry leaves,, banana leaves, pawpaw leaves, cabbage leaves, (Hecht and Maluwa, 2003). The use of non-conventional feedstuffs has been reported to register satisfactory good growth and better cost benefit values (Abowei and Ekubo, 2011). Studies have been conducted using various sources of leaf meal proteins Reyes and Fermin (2003) on *Carica papaya* and others.

Study description

Between February – March 2014, a survey was conducted in Mpamba area in NkhataBay district, northern Malawi to identify locally available non-conventional sources of fish feed for proximate analysis to ascertain their potential for use in *Tilapia rendalli* production. The Samples for several plant feedstuffs were then collected on the basis of availability and abundance. The collected plant feedstuffs were dried for three days to reduce Anti nutritional factors. Anti- nutritional factors can adversely affect digestion, absorption and physiological (Murry *et al*., 2010). According to Francis *et al*., (2001), however, numerous anti-nutritional factors can be inactivated or reduced by heat treatment, sun drying, dehulling, germination and other processing steps. The dried feedstuffs were milled to powder form using a mortar and a pestle before being sieved using a wooden sieve. The powdered plant ingredients were analyzed for crude protein, crude fiber, crude fat, and energy, moisture and minerals (Phosphorus, Potassium and Calcium) following the A.O.A.C (2000). One way analysis of variance (ANOVA) was used to analyze data in SPSS for windows version 16.0. The significant differences were considered at 0.05 alpha level. R statistical software version 2.15 .3 was used to test differences between treatment means and Duncan's Multiple Range Test was employed to separate significantly different means.

Research application

Tables 1 and 2 show selected results of proximate analysis. The findings in Tables 1 and 2 of this study are anticipated to be an indicator in the selection of plant feedstuffs that can be used in formulation of high quality and affordable feed for *Tilapia rendalli.*

Table 1. Proximate composition of plant ingredients from Mpamba (Mean±SE) expressed as percent (%) dry matter.

Ingredient analysed	Moisture	Ash	Protein	Fibre	Fat	Energy Kj/g
CL	11.97±0.75^{a}	13.6±0.65^{b}	21.17±0.56^{a}	16.35±0.75^{a}	3.16±0.00^{b}	20.59
SPL	10.89±0.31^{a}	85.75±0.0^{a}	8.40±0.10^{c}	9.16±0.70^{c}	2.98±0.25^{b}	29.7
BJ	20.79±0.71^{d}	23.1±0.91^{c}	24. 35±0.7^{d}	6.40±0.75^{b}	5.65±0.93^{b}	12.4
CYL	7.08±1.56^{a}	14.84±0.45^{b}	24.28±0.11^{d}	3.95±0.15^{b}	7.23±1.52^{c}	19.54
MZB	8.87±0.90^{a}	3.72±0.32^{b}	11.81±0.11^{c}	3.40±0.15^{b}	7.28±1.90^{c}	15.72
SPM	9.67±0.11^{a}	85.7±0.15^{a}	11.97±0.45^{c}	3.19±0.30^{b}	3.2±0.45^{b}	15.32

Values (Mean±SE) in a column with different superscript letters are significantly different (P<0.05); Where; CL: Cassava Leaf, SPL: Sweet Potato Leaf, CYL: Cocoa yam, BL: BJ: Black Jack, MZB: Maize Bran, SPM: Sweet potato meal.

Table 2. Mineral composition of plant ingredients from (Mean±SE) Mpamba expressed as percentage (%) dry matter.

Ingredient analysed	Calcium	Potassium	Phosphorus	Vitamin C
CL	1.62±0.04^{c}	1.11±0.01^{a}	0.29±0.02^{a}	5.55±0.75^{a}
SPL	21.1±0.29^{a}	1.33±0.01^{a}	0.88±0.03^{a}	12.3±0.05^{b}
BJ	4.66±0.00^{d}	2.20±0.14^{b}	7.01±0.00^{c}	5.07±0.75^{a}
CYL	0.23±0.10^{c}	0.19±0.02^{c}	0.55±0.00^{a}	12.4±0.15^{b}
MZB	0.55±0.01^{c}	0.33±0.00^{c}	0.56±0.02^{a}	1.30±0.00^{a}
SPM	19.0±0.16^{b}	1.64±0.00^{e}	1.04±0.06^{a}	2.80±0.00^{c}

Values (Mean±SE) in a column with different superscript letters are significantly different (P<0.05); Where; CL: Cassava Leaf, SPL: Sweet Potato Leaf, CYL: Cocoa yam, BJ: Black Jack, MZB: Maize Bran, SPM: Sweet potato meal.

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