The fish feed formulation experiment Report

Aim: Replacement of fish meal with cassava leaf as a protein source

1. Introduction

Aquaculture is the fastest growing food production system, due to the globally growing demand for high quality safe animal proteins (FAO, 2020)). And hence has a huge potential to contribute to development. However, successful domestication of fish is governed by several inputs including, water quality, and feed quality (Aruho et al., 2017). Feed(s) in aquaculture constitute over half of the total investment costs, which is attributed mostly on the availability of proteins (the most expensive ingredient) (Aruho et al., 2017; Kubiriza et al., 2017). Besides, there exist stiff competition for protein sources such as soy bean meal, fish meal and blood meal from other livestock production systems. Thus, making the cost of feed high for starting fish farmers (small scale farmers) in Nabuin Zone.

As such, utilization of alternative protein rich ingredients like soya bean, has been encouraged. Notwithstanding, the easy availability of cassava leaves in the Nabuin Zone especially Teso- sub region coupled with their high crude protein levels of 16.7% - 39.9% (Diarra et al., 2017), makes them suitable alternatives protein ingredients for fish feed formulations. However, despite the presence of naturally occurring plant protein sources, total replacement of fish meal does not result into the required growth performance of fish. Thus, partial replacement of fishmeal with relatively cheaper ingredients can prove to be economically rational (Toyosi et al., 2018). Therefore, this trial was carried out to determine the best substitution level of fish meal in catfish diet using cassava leaf meal.

2. METHODS

2.1 Processing of cassava leaves

Fresh Cassava leaves were collected from harvested gardens from Serere.

The leaves were soaked for 24 hours to minimize the concentration of hydrocyanides and tannins (Mahraomai et al., 2018). Then dried under shade and finally crushed into powder.

2.2 Ingredients Used in feed formulation

Fish meal (silver fish), soybean, maize bran, sunflower cake, cotton seed cake, vitamin premix, mineral premix, salt, cassava leaf.

Proximate analysis of the ingredients was carried out at ARDC Kajjansi

Four formulations (0%, 15%, 30% and 45% fish meal substitution of fish meal with cassava leaf meal) were made using the Creative formulation concepts software education version 8.01.

RESULTS

Table.1: Proximate analysis of Major ingredients

Sample description	**Sample code**		DRY MATTER	ASH	**CRUDE PROTEIN**	CRUDE FAT
			%	%	%	%
Fish meal	77	A	94.85	44.66	**53.30**	5.86
		B	95.14	46.01	**53.32**	6.19
		C	94.64	45.15	**52.94**	5.68
Soya	78	A	92.62	6.56	**44.04**	7.49
		B	92.68	6.70	**44.22**	7.65
		C	92.22	6.34	**44.21**	7.44
Cassava Leaf	79	A	92.80	5.39	**31.00**	7.06
		B	92.79	5.37	**31.33**	7.08
		C	92.68	5.57	**31.16**	7.37

Formulation for the different feed

Table 1 fish diets 0% fish substitution

	D. Energy	Protein	Fibre	Crude fat	Calcium	Phosphorus	Met	Ly	Cost/unit	**Inclusion**
Sunflower	2728.4	24.3	36.4	14.8	0.3	0.2	0.2	0.2	1800.0	**10**
Maize bran	3354.5	13.1	5.6	9.7	0.6	0.7	0.0	0.0	800.0	**19**
soya	3250.3	44.2	5.9	7.5	1.6	0.6	0.5	2.2	2500.0	**25**
cotton cake	2597.0	21.6	24.5	6.8	1.1	0.7	0.5	1.7	1700.0	**15**
Cassava leaf	3068.4	31.6	13.9	7.1	1.8	0.6	1.5	1.7	2000.0	**0**
fish	3137.0	57.8	0.9	10.5	2.5	2.1	1.7	5.0	3000.0	**30**
shells	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	500.0	**0.5**
Salt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1000.0	**0.3**
vit premix	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5000.0	**0.3**
Calculated	**3053.4**	**36.5**	**10.1**	**9.4**	**1.6**	**1.0**	**0.7**	**2.3**	**2132.5**	**100.1**
Required	3000.0	40.0	7.0	6.0	1.0	0.5	0.5	1.2		**100**

Table 2. 15% Substitution of fish meal with cassava leaf

	D. Energy	Protein	Fibre	Crude fat	Calcium	Phosphorus	Met	Ly	Cost/unit	**Inclusion**
Sunflower	2728.4	24.3	36.4	14.8	0.3	0.2	0.2	0.2	1800	**10**
Maize bran	3354.5	13.1	5.6	9.7	0.6	0.7	0.0	0.0	800	**19**
soya	3250.3	44.2	5.9	7.5	1.6	0.6	0.5	2.2	2500	**25**
cotton cake	2597.0	21.6	24.5	6.8	1.1	0.7	0.5	1.7	1700	**15**
Cassava leaf	3068.4	31.6	13.9	7.1	1.8	0.6	1.5	1.7	2000	**4.5**
fish	3137.0	57.8	0.9	10.5	2.5	2.1	1.7	5.0	3000	**25.5**
shells	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	500	**0.5**
Salt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1000	**0.3**
vit premix	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5000	**0.3**
Calculated	**3050.4**	**35.4**	**10.7**	**9.2**	**1.6**	**1.0**	**0.7**	**2.2**	**2087.5**	**100.1**
Required	3000.0	40.0	7.0	6.0	1.0	0.5	0.5	1.2		**100**

Table 3. 30% Substitution of fish meal with cassava leaf

	D. Energy	Protein	Fibre	Crude fat	Calcium	Phosphorus	Met	Ly	Cost/unit	**Inclusion**
Sunflower	2728.4	24.3	36.4	14.8	0.3	0.2	0.2	0.2	1800	**9**
Maize bran	3354.5	13.1	5.6	9.7	0.6	0.7	0.0	0.0	800	**19**
soya	3250.3	44.2	5.9	7.5	1.6	0.6	0.5	2.2	2500	**27**
cotton cake	2597.0	21.6	24.5	6.8	1.1	0.7	0.5	1.7	1700	**14**
Cassava leaf	3068.4	31.6	13.9	7.1	1.8	0.6	1.5	1.7	2000	**9**
fish	3137.0	57.8	0.9	10.5	2.5	2.1	1.7	5.0	3000	**21**
shells	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	500	**0.5**
Salt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1000	**0.3**
vit premix	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5000	**0.3**
Calculated	**3059.0**	**34.6**	**10.8**	**9.0**	**1.6**	**0.9**	**0.7**	**2.1**	**2057.5**	**100.1**
Required	3000.0	40.0	7.0	6.0	1.0	0.5	0.5	1.2		**100**

Table 4 45% substitution of fish meal with cassava leaf

	D. Energy	Protein	Fibre	Crude fat	Calcium	Phosphorus	Met	Ly	Cost/unit	**Inclusion**
Sunflower	2728.42	24.30	36.40	14.80	0.29	0.21	0.18	0.24	1800	**11**
Maize bran	3354.53	13.12	5.55	9.71	0.62	0.69	0.00	0.00	800	**14**
soya	3250.34	44.16	5.90	7.53	1.59	0.61	0.51	2.21	2500	**30**
cotton cake	2597.01	21.62	24.50	6.79	1.06	0.71	0.50	1.70	1700	**14**
Cassava leaf	3068.42	31.60	13.91	7.15	1.80	0.63	1.50	1.70	2000	**13.5**
fish	3137.03	57.78	0.90	10.49	2.55	2.08	1.70	5.00	3000	**16.5**
shells	0.00	0.00	0.00	0.00	35.00	0.00	0.00	0.00	500	**0.5**
Salt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1000	**0.3**
vit premix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5000	**0.3**
Calculated	**3040.29**	**34.59**	**12.01**	**8.88**	**1.58**	**0.83**	**0.73**	**1.98**	**2083.5**	**100.1**
Required	3000.00	40.00	7.00	6.00	1.00	0.50	0.50	1.20		**100**

The four-feed made will be fed to catfish juveniles to investigate the growth response of (performance of these fish). Afterwards, the best performing formula will be compared with the commonly used commercial catfish feed before, final recommendations to fish farmers can be done. Such growth performance attributes like, survival, specific growth rate (SGR), body weight gain (BWG), food conversion ratio (FCR) and Length weight relationship (condition factor) will be evaluated.

Thus, if successfully done, the current work will contribute to the development and promotion of a more sustainable protein ingredient that could be used as a replacement for fish meal in juvenile African catfish.

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