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EFFECT OF WATER HYACINTH (*EICHHORNIA CRASSIPES*) LEAVES MEAL SUBSTITUTION WITH MAIZE ON DIGESTIBILITY OF COMMON CARP (*CYPRINUS CARPIO*)

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Abstract

The objective of this study to determine the apparent digestibility coefficients (ADC) of dry matter and protein of six pelleted fish diet incorporated with different levels of water hyacinth (*Echhornia crassipes*), 0%, 5%, 10%, 15%, 20% and 25%) on performance of common carp fingerlings, using chromium dioxide as an inert bio- marker. Experimented diets were prepared to be iso protein (30.70%±0.20) and iso-caloric (375.00 ± 0.52 kcal/ 100gm). Proximate compositions of test diets, fecal matter and chromium contents also were determined. Results revealed the maximum value of ADCs for dry matter (DM) was found in treatment T4 (70.51%), while the minimum value was found in (T6) (60.56%). Similarly, the maximum ADCs values for crude protein content, in T4, while the minimum values were found in T6. The study has shown that common carp efficient maximum digestion to nutrients is only up to 20% of water hyacinth inclusion in the diet.

Key words **:** Water hyacinth, common carp, maize, digestibility

Introduction

Intensification of common carp production global wide has made it essential to develop nutritionally efficient and cost effective complete and supplemental feeds to be used for different carp culture systems (intensive, extensive, race way, pond and cage culture systems). Given the current level of per capita consumption of aquatic foods, it is projected that the world will require an additional 23 million tons by 2020 (FAO 2012). Feed production is the major problem face aquaculture practice in Iraq at present, it is highly needed to search for low cost and better nutrient component ingredients to replace partially or completely the costly ingredients, such as fish meal, as protein or energy source. Much critical analysis has been conducted in recent years on the requirement of fish for dietary protein (Abdel-Fattah and Mamdouh, 2008; Maina *et al.,* 2002; Perla *et al*., 2004; and Iluyemi *et al*., 2010) including carp. The nutritive value of mixed rations depends on the nutrient composition of the individual feed components and the ability of the animal to digest and absorb the nutrients (Smith, 1979; Kirchgessner *et al*., 1986). Relatively cheap energy yielding nutrients, such as fats or carbohydrates, have been found to reduce dietary requirement of protein. However, replacing maize which is being used in formulated fish feeds, by alternative, plant sources in aqua-feeds Plant feedstuffs present high fiber content; their amino acids and fatty acids profiles do not match fish dietary requirements (Steffens, 1989; Wilson, 1989) and presence of anti-nutritional factors. However, few studies were done on evaluating water hyacinth utilization. Digestibility is one of the most important methods in evaluating the efficiency of feedstuffs.

This study was aimed to determine the apparent digestibility of dry matter and crude protein of pelleted feed incorporated with different percentage of water hyacinth (*Echhornia crassipes*) levels on growth performance of common carp fingerlings.

Materials and Methods

Six iso-treatments (CP) with different levels of water hyacinth (*Echhornia crassippes*) (Table 1). Fish meal, were used as animal protein source while, soya meal was used as plant protein. maize was replaced gradually by water hyacinth. Chromic oxide was used.

Ingredients Used and Diets Preparation

Water hyacinth was collected from water canal next to University Bagdad, roots was removed and washed gently, cut into small pieces and oven dried (45 C/72hrs) powdered (2 microns) using motor grinder (FRITSCH, Puluersette 14, Germany) and store in room temperature for further use. Fish meal, soya meal, maize, wheat flour, millet and rice diets, was bought from the local market in Baghdad. Control and experimental diets were formulated to satisfy requirement of common carp (Thomas *et al*., 1995). Chromic oxide (Cr_2O_3, 1%) was used as an inert marker and incorporated into the control feed and experimental feed. Proximate composition was carried out for used ingredients prior to formulation of experimental diets (Table 2). Diet formulation was carried out in the diet formulation chamber attached to fresh water hatchery, Water and Fish oil were added to premixed ingredients and thoroughly mixed until homogenous in Bio Mixer, Sakura, China. 2.5mm diameter pellet were made using meat grinder (ORIMAS, model: TBS200, China), subjected to an open air for (15 minute), oven dried (50 C/24hrs) and stored frozen (-20 C), as described by Qi-Cun and Rong (2010).

Experiment Fish

A number of 200 common carp fingerlings (27.2±1 g/fish) were brought From the Suweira Fish hatchery in Baghdad

Feeding trials, feces collection and analysis

Prior to the start of the study, fish were acclimatized to the control diet in concrete tank for 4 weeks Fish were randomly distributed into 30-L glass transparent aquaria (5 fish per aquarium). Fishes were fed to the visual satiety twice daily and the feces were collected by siphoning method two hours after the feeding using a modified method of Qi-Cun and Rong (2010). The collected feces were pooled in a glass vials and store at -20 C (Nazura *et al*., 2003) for chromium

detection and proximate composition analysis (Food science laboratory). Feces were freeze dried after enough feces were gathered.

Chemical Analysis

Crude protein, moisture, gross energy, ether extract, ash, drymater and fiber content in experimental diets and feces (Crude protein and dry mater) were determined following standard method of (AOAC, 1995). Chromic oxide content of feeds and feces were measured according to the method of Furukawa and Tsukahara (1966).

Digestibility Determination

Apparent digestibility coefficients of dry matter (ADC)and protein (APDC), were performed by indirect method, using the chromic oxide as inert marker method as described by Cho *et al*. (1982). The apparent digestibility coefficients (ADC) for the nutrients of the test and reference diets were calculated as follows:

App. nutrient digestibility(%)

= 100–[100×{% nutrient in feces/% nutrient in diet}

× {% Cr2O3in feed/% Cr_2O_3 in feces}].

Statistical Analysis

The obtained data were subjected to statistical analysis including analysis of variance (one way ANOVA) and significance of differences between means was tested according to Duncan (1995), using SAS Program.

Results and Discussion

The acceptance of diet by all groups of fish was observed as fish were actively fed when offered feed at each feeding time. All ADCs values for dry matter and nutrients were significantly different (P<0.01) among studied diets with different level of water hyacinth (WH) content (Table 1). The control diet with 15% WH was found to be efficiently utilized by fish and of highest digestibility values, while the experimental diet with 25% WH showed the minimum value of digestibility among experimental groups. The diet 6 (25%) had the least values of digestibility for dry matter and protein among all feeds. However, the digestibility for protein was recorded to be the highest, while the dry matter digestibility was the lowest.

Table 1 : Ingredients and proximate composition of experimental diets (on %dry matter basis)

	T1	T2	T3	T4	T5	T6
fish meal	20	20	20	20	20	20
Soya meal	35	35	33	32	30	28
maize	25	20	15	10	5	0
Water hyacinth	0	5	10	15	20	25
Wheat flour	7	5	5	5	7	9
millet	5	7	9	10	10	10
Rice diets	5	5	5	5	5	5
Fish oil	1	1	1	1	1	1
V/M Premix	1	1	1	1	1	1
salt	1	1	1	1	1	1

Table 2 : Proximate composition (on dry matter basis)

	T1	T2	T3	T4	T5	T6
Crude protein	30.52	30.97	30.76	30.88	30.72	30.50
Ether extract	5.78	5.65	5.26	5.38	5.24	5.09
Ash	7.15	7.88	8.53	9.11	9.52	10.94
fiber	7.01	7.38	7.69	7.90	8.14	8.31
NFE	42.59	41.26	41.18	40.09	39.84	38.89
Moisture	6.95	6.86	6.58	6.64	6.54	6.27
Gowth Energy (Kcal/100gm)	387.18	383.12	378.16	375.53	372.40	366.07

Table 3 : Apparent digestibility coefficients of dry matter and protein, for experimental groups with different level of water hyacinth

Parameters	Contents	
	Digestibility dm	Digestibility cp
T1 (0% WH)	d 65.82 ± 0.01	c 72.19 ± 0.01
T2 (5% WH)	c 67.22 ± 0.01	d 72.03 ± 0.02
T3 (10% WH)	b 68.71 ± 0.01	b 72.34 ± 0.01
T4 (15% WH)	a 70.51 ± 0.00	a 73.43 ± 0.01
T5 (20% WH)	e 63.21 ± 0.01	e 70.41 ± 0.01
T6 (25% WH)	f 60.56 ± 0.01	f 66.19 ± 0.005

Note: a, b, c, d, e, f significance at P ≤ 0.01.

The present study demonstrated that WH is a potential partial substitute for maize meal and could be incorporated up to 15% (on dry weight basis) in feed of common carp without negatively affecting growth performance and digestion process. The feeds acceptability and palatability was observed as all groups of fish consumed the offered feeds and no rejection of any of the feeds was recorded. Digestibility of the feeds rate were significantly high with the

increase in WH amount in the studied feed up 15%, but decline when the inclusion rate of WH reached 20 and 25% (replacement) in test feed, and that could be referred to the fiber content. The fine grinding of WH and the other ingredients and formulation method may also play role in improving the digestibility of the feeds. However, the inclusion of 20 and 25% WH or more might be possible only to be utilized as supplementary feed in fish farming system. The results are in agreement with the finding of many authors despite the fact that different methodologies and fish species are used. For example, with respect to the form of WH used, how incorporated in the fish diets and carp species was used, Abdel-Fattah (2008) has observed that at 20% of WH inclusion level in fish feed, fish performance was reduced, and there no report regarding the digestibility of the tested feeds at all tested levels.

Conclusion

The study finding indicates that fresh water hyacinth can be used with accepted level of nutrients digestibility is up to 15% in feeding the common carp.

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