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Effect of Differently Processed Manihot Esculenta Crantz (Cassava) Leaves on the Growth Performance of Weaner Rabbits

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ABSTRACT--- ***A study was carried out to evaluate the effect of differently processed Manihot esculenta crantz (cassava) leaves on the growth performance and hematological parameters of weaner rabbits. The processed leaves were as follows: shade dry (SHD), per boiled and shade dry (PBSHD), sun-dry (SND) and fresh (FH). The control group was given spinach leaves. The proximate analysis and the anti-nutritional factors of the experimental leaves were determined. Twenty rabbits were used for the experiment in which they were randomly assigned to five treatments. There were four rabbits per treatment and each treatment was replicated twice with 2 rabbits per replicate. Concentrate rabbit feed, the experimental leaves and water were given ad-libitum to each group. The proximate analysis shows that PBSHD and SHD was significantly ($P<0.05$) higher in dry matter than the rest of the treatments. The PBSHD is also higher in crude protein than the rest. The SND is higher in crude fibre and ether extract. The method of processing did not affect the Ca and P level since there was no significant difference ($P>0.05$) among treatments. The values for anti-nutritional factors was significantly higher ($P<0.05$) in the fresh leaves than in the treated leaves. The weight gain was significantly higher ($P<0.05$) in the control than other treatments. The least performance was observed among those fed fresh leaves. Feed consumption was higher for PBSHD and SND. The cost per kilogram gain was significantly ($P<0.05$) higher for the control treatment. The feed to gain ratio was better for the control followed by the PBSHD and SND. Mortality was not affected by the methods of treatment of the experimental leaves.***

Keywords--- Cassava, Rabbits, Anti-nutritional, Ad-libitum

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1. INTRODUCTION

The constant increase in the cost of protein and energy concentrates coupled with the scarcity of most feed ingredients make research into replacement of concentrate with forage imperative in the third world (Okonkwo *et al* 2010). Rabbit as micro-livestock is an economy animal that could bridge the wide gap in dietary protein in Nigeria. This is because it is socially acceptable on the combined basis of space requirement and absence of religion taboo as well as peculiar digestive physiology which permits the use of forages and agro-industrial by-products. (Ojebiyi *et al* 2010). They also provide an inexpensive source of meat that is lower in cholesterol with a value of 169mg/g (dry matter basis) when compared with beef which is 200mg/g dry matter and pork 223 mg/g dry matter. They have high fecundity and short generation intervals (Aduku et al 1988). Cassava is one of the most cultivated root crops in Nigeria. It is the third largest source of carbohydrate for human food in the world and has been grown extensively for use as an important economic crop in South, East Asia, Tropical Africa and Central America, (Fauquet and Fargette 1990). It is capable of providing high yields of energy per hectare about 13 times more than maize or guinea corn (Oke, 1978).

Nigeria is still leading in the production of cassava in the world (FAO 2008). Various parts of cassava have been used in feeding livestock (Balogopalamn 2002). It is known simply as a food security crop Odoemene and Otanwa 2011, Toluwase and Abdu-Raheem 2013). In almost all cassava producing countries in Africa the leaves constitute a major by-product of cassava tuber harvest and significant sources of dietary protein (14-40% dry matter), vitamin B_1, B_2, C and carotenes (Adewusi and Bradbury, 1993). It is also rich in mineral. Apart from the lower methiorine, Lysine and Isoleusine content, cassava leaf compares favourably with those of milk, cheese, soya beans, fish and eggs in terms of amino acid profile. The major drawback however, is the cyanide scare and other anti-nutritional factors like tannin and phytin (Reeds et al 1982).

For the full nutritional potential of cassava leaves to be realized research effort must focus on the development of simple low cost and more efficient techniques that would rid or reduce to the barest minimum the anti-nutritional factors in the leaves such as cyanide, tannin and phytic acid. This research is therefore aimed at accessing the growth performance and the hematological parameters of rabbits fed differently processed cassava leaves.

2. MATERIALS AND METHODS

The experimental cassava leaves were processed as follow: sun drying (SND): Freshly cut cassava leaves were spread under the sun for 4-5days with turning of leaves twice a day to ensure complete dryness and to prevent any fungal growth until a constant weight was obtained. The dried leaves were carefully packaged in clean polythene bags and labeled.

Shade dry (SHD): The drying of fresh leaves was done under the shade for 7-9 days with turning twice a day. The longer days of drying were to ensure that the leaves were properly dried since it was done under the shade. After a constant weight was attained the leaves were packaged in polythene bags and labeled.

Per boiled and Shade Dry (PBSHD): Fresh cassava leaves were placed in boiling water for 5-7 minutes. The leaves were drained of excess water and were allowed to dry under the shade for 7-9 days. Turning was also done twice a day to avoid fungal growth. When a constant weight was achieved, the leaves were properly packaged in polythene bags and labeled.

Fresh leaves (FH): Freshly collected leaves were given directly to the rabbits without any prior processing.

The proximate analysis and the anti-nutritional factors of each experimental leaves was determined at the Biochemistry laboratory, Department of Animal Science, Ahmadu Bello University Zaria, Nigeria. Twenty (20) male weaner rabbits between the ages of 6-9weeks were used for the experiment. Their average weight was between 0.60 – 0.70kg. They were randomly assigned to five experimental diets (Control, SND, SHD, PBSHD and FH). Spinach leaves replaced cassava leaves in the control diet. There were four animals per treatment and each treatment was further divided into two replicates with two rabbits per replicate. Feed and water were provided ad-libitum. Equal amount of concentrate feed was served with equal weight of each experimental leaves. Weighing of rabbits was done every other week and the feed consumption was determined from the feed weighed back (left over feed from the last weighing). This was to determine the weight gain and the feed to gain ratio.

Before the commencement of the experiment, routine management practices were carried out where each animal was de-wormed using piperazine, coccidiosis outbreak was controlled using embazine-fork while Neofuraceryl was administered to prevent bacterial infection.

At the end of the feeding trial, the animals were starved for 24hrs before blood samples were collected from one rabbit per replicate for hematological analysis. 1mm of the blood was collected via the jugular vein puncture from each rabbit using a sterilized disposal 2ml syrings with a 23G needle. Prior to bleeding, a cotton swap soaked in spirit was used to dilate the vein to prevent infection. The blood samples were collected into a labeled sterile universal bottles containing enthylene-diamine-Tetra-Acetic Acid (EDTA) as anti coagulant. The hematological components were determined within an hour of blood sample collection. All the data collected were subjected to a statistical analysis using (SAS, 1990). Differences in means were separated using Duncan multiple range Test (Steel and Torie 1980).

3. RESULTS

Results of proximate analysis shows that PBSHD and SHD is significantly ($P<0.05$) higher in dry matter than all other treatments. This is followed by SND. The least Dry matter value was observed in the fresh (FH). The crude protein value is higher for the PBSHD. There was no significant difference ($P>0.05$) between SND and FH for the crude protein value. The least CP value was seen in the control leaves. The crude fibre was seen to be significantly different ($P<0.05$) between FH and SHD. Other extract was significantly higher ($P<0.05$) for SND while the least value was seen in the control leaves. The Ash is however higher in the control than all other treatments. The NFE was significantly higher ($P<0.05$) for the SHD and the control than all other treatments. There was no significant difference ($P>0.05$) for Ca and P value among all the treatments.

The phytate level in the fresh leaves (FH) was significantly higher ($P<0.05$) than all other treatments. The least phytate level was observed in the per-boiled and shade dry (PBSHD). The same trend was observed for cyanide, saponin and Tanin which were significantly higher ($P<0.05$) in fresh leaves (FH) than in other treatments. In terms of weight gain, the control gave a significantly ($P<0.05$) better results. There was no significant difference ($P>0.05$) between the values for PBSHD and SND. The least weight gain was seen in the FH. Feed consumption did not follow a specific pattern. It is however higher in PBSHD and SND. The highest feed cost was seen in the control diet followed by the PBSHD. There was no mortality in all the treatments.

4. DISCUSSION

The result of the proximate analysis and mineral content of the cassava leaves showed their potential as food resource. From table 1 the crude protein range of 16.89-18.45%, crude fiber of 22.18-24.56 and Ash of 5.32-6.38 for the cassava leaves compares favorably with those reported for most legumes except groundnut and soyabeans as observed by Aletor and Aladejimi (1989) and is higher than several leguminous browse plants (Aletor and Omolara 1994) and several tropical leafy vegetables (Aletor and Adeogun 1995).

The superior feed to gain ratio observed for PBSHD and SND in table 3 may be as a result of processing method. It was observed that heating and or sun drying degrade the hydrolytic enzymes of glucosides and prevents the release of free cyanide. For example Gormez *et al* (1984) indicated that more than 86% of the cyanide present in cassava was lost during sun-drying. The average feed consumption did not show any significant difference (P>0.05) between the dietary treatments.

The feed cost N/kg for the control that was significantly higher (P<0.05) than for all other treatments was due to the fact that the control leaf is the normal spinach popularly used by man as vegetable food. Whereas cassava leaves are by-products of cassava tuber harvest and have no cost except for transportation. There was additional cost for the PBSHD when compared to other processed leaves due to cost of energy for the boiling.

The hematological parameters measured in this experiment were within the normal physiological ranges reported for rabbits. For example, a range of hemoglobin 8.0 – 17.5g/dl; packed cell volume 30.0 – 50.0; RBC 4.0 – 8.0 x 10^6 /µl; WBC 5.0 – 12.0 x 10^3/dl was reported by Jenkins (1993) and Hulyer (1994). It was reported that hematological characteristics of livestock suggest their physiological disposition to the plane of nutrition (Madubuike and Ekyenyem, 2006). It can be concluded that differently processed cassava leaves given to the rabbits were sufficient in their nutritive content to support growth performance and maintain the normal hematological profile of the rabbits.

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Table 1: Proximate analysis and the mineral composition of the experimental leaves

	%DM	%CP	%CF	%EE	%ASH	%NFE	%Ca	%P
PBSHD	95.63^{a}	18.42^{a}	22.18^{c}	0.28^{b}	6.38^{b}	52.74^{b}	0.15	0.08
SND	94.89^{ab}	17.36^{b}	24.56^{a}	0.36^{a}	6.19^{bc}	51.53^{c}	0.11	0.04
FH	69.99^{c}	19.98^{b}	23.11^{b}	0.11^{e}	5.88^{c}	52.92^{b}	0.16	0.08
SHD	95.52^{a}	16.89^{c}	23.10^{b}	0.16^{d}	5.32^{d}	54.53^{a}	0.14	0.05

Means along the same column having the same superscript letters are not significantly different ($P>0.05$)

Table 2: Anti-nutritional factors of the cassava leaves

	Phytate Mg/100g	Cyanide Mg/100g	Saponin Mg/100g	Tanin Mg/100g
PBSHD	0.14^{c}	0.62^{d}	0.12^{d}	0.06^{d}
SND	0.16^{bc}	0.99^{c}	0.18^{c}	0.12^{cd}
FH	0.62^{a}	3.16^{a}	1.20^{a}	0.86^{a}
SHD	0.18^{b}	1.46^{b}	0.24^{b}	0.18^{c}

Means along the same column having the same superscript letters are not significantly different ($P>0.05$).

Table 3: Performance of rabbits fed differently processed cassava leaves

	Wt gain (Kg)	Feed Consumption (Kg)	Cost (N/Kg gain)	Feed to gain Ratio	Mortality
Control	0.46^{a}	4.19^{c}	664.05^{a}	10.98^{a}	0.00
PBSHD	0.34^{b}	4.36^{a}	261.78^{c}	7.80^{b}	0.00
SND	0.33^{b}	4.35^{a}	131.82^{e}	7.06^{b}	0.00
FH	0.16^{d}	4.16^{c}	194.29^{d}	3.85^{d}	0.00
SHD	0.23^{c}	4.23^{b}	184.68^{d}	5.44^{c}	0.00

Means along the same column having the same superscript letters are not significantly different ($p>0.05$)

Table 4:Haematological Parameters of rabbits fed with differently processed cassava leaves

	PCV%	Hbc/g/dl	RBCx10^{6}/µ/	WBC x 10^{3}/dl
Control	29.50^{c}	9.83^{d}	6.39	7.37
PBSHD	36.50^{a}	12.17^{a}	6.72	7.61
SND	35.00^{ab}	11.67^{b}	6.34	7.53
FH	31.00^{b}	10.34^{c}	6.77	7.88
SHD	31.50^{b}	10.50^{a}	6.47	7.45

Means along the same column having the same superscript letters are not significantly different ($P>0.05$).