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E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

ORGANS WEIGHT AND CARCASS QUALITY CHARACTERISTICS OF GROWING PIGS FED GRADED LEVELS OF WATER HYACINTH (*EICCHORNIA CRASSIPES*)

[1]G. Akpvbovbo, [2]P. K. Ajuogu and [2]A.O. Ekine

[1]Department of Animal Science,
Faculty of Agriculture, Rivers State University of Science and Technology,
Nkpolu Orowurukwu Diobu,
Port Harcourt, Rivers State, Nigeria.
[2]Department of Animal Science,
Faculty of Agriculture,
University of Port Harcourt,
PMB 5323 Choba, Port Harcourt Nigeria.

Abstract

An experiment was conducted 'to determine the impact of feeding water hyacinth based diets on the organ weights and carcass quality characteristics of weaner pigs. Twenty four (24) cross bred (large white and hand race) weaner pigs (male and female) of average initial weight of 10-12kg, were randomly assigned to dietary treatment, in a completely randomized experimental design (CRD). The plant (water hyacinth) was freshly harvested, dehydrated, ground and used to formulate pig diets at different levels of inclusion. The weaner pigs were fed water hyacinth (*Eicchornia crassipes*) based meal at dietary levels of 0%, 10%, 20% and 30% inclusion Levels to replace SBM in the experimental diets. After the 70 days duration of exposure to the treatments, samples from each replicate were sacrificed; data on organ (liver, heart, kidney, spleen and lungs) weights and carcass quality characteristics (percent dress out, lean fat and back fact thickness) were collected and exposed to analysis of variance. The result of the organs (Liver heart, kidney, spleen and lungs) and carcass weights revealed no significant difference (P> 0.05) between the treatment groups and the control,. The result of the lean fat deposit and back-fat thickness showed significant difference among the pigs used in the study. The control diet (0%WH) had the highest fat content and diet IV (30%WH) had the least fat content. Since the lean fat deposit and back-fat thickness are reflection of the fat deposits in the pig water hyacinth produced better (lean fat) pork than Soya bean meal. It was therefore concluded that water hyacinth had no poisonous impact on organs. Also SBM has better significant influence in terms of fat deposit than water hyacinth.

Key words: Water Hyacinth, Carcass Quality, Weaner Pigs, Organ weights.

INTRODUCTION

Water hyacinth (*Eicchornia crassipes*) is a free-floating aquatic plant, which grows up to 1metre in height. It has thick waxy rounded glossy leaves, which rise above the water surface on stalks

(Grodowitz 1998). The plant can grow and survive in takes streams, rivers, points ditches and in any water way. It has been a long term enemy in water ways. There is need to investigate a viable economic and environmental friendly long term solution to solve this problem. This can be achieved by converting / processing the plant into a feed ingredient for pigs instead of seeing it as an enemy. However not much has been done in terms of the utilization of this abundantly invasive, all season plant in the Niger Delta for livestock feeds. Boyd (1990) reported crude protein value of 20 — 22%, Aletor and Omodara (1994), 21 —25%.

Swine production in Nigeria has been growing in recent years and has contributed immensely to the upliftment of the nutritional plane of many Nigerians particularly the non-Muslims. Madubuike (1984) recommended massive commercial pig production in Nigeria as one of the measures to reduce the animal protein gap among Nigerians because of its high prolificacy, fast rate of growth, high dressing percentage, excellent nutritional value of the pork and the ability to excellently utilize and convert agricultural by-products and unconventional feed ingredients to high quality meat (pork).

Accurate methods for estimating the composition and quality of live animals are essential in improving the efficiency of production and quality of the final product (Spurlock *et al.,* 1998). Spurlock *et al* 1998 reported that practical methods of evaluating pigs for carcass quality should be uitab1e for wide spread use, inexpensive and accurate in predicting carcass composition. Hazel (2002) developed a simple and inexpensive mechanical graduated probe pin for measuring back fat thickness in pigs. Robin *et al* (2002) reported that back fat thickness and carcass yield are the best indicators of carcass quality in pig. Blaxier (2001) observed that growth rate and carcass yield of animals is a function of their mature body size. Pigs at maturity have a very high carcass dress-out percentage of 70 — 80% (Robin et a! 2002). Anyaehie (1998) in his study of carcass characteristics of grower pigs reared to 30 — 40kg live weight on varying dietary level of sun dried layer droppings reported the following values for the various organs of the pigs: Liver (546-583.15kg); Spleen (22.31-27.1 5g); Empty Stomach (385-401.68kg); Lung (433.36-452.65kg); Heart (115.51-126.63kg); Kidney (83.43-85.76g); Lean-fat (16.1-20.15g) and Carcass dress out percentage (50-60%).

Scanty information abounds on carcass characteristics of pigs fed water hyacinth. It is therefore the objective of this work to assess the carcass characteristics of weaner pigs fed graded levels of water hyacinth as a measure of its suitability as feed ingredients for pigs to determine viable and sustainable control measure of water hyacinth through its utilization by pigs.

MATERIALS AND METHODS

Experimental Design and Technical Procedures

Twenty four (24) healthy and proven large White and Landrace weaner male and female pigs with initial weight of 10-12kg were randomly allocated into four dietary treatments designated A, B, C and D in a completely randomized design (CRD) and later replicated thrice with Two (2) pigs per replicate.

The pigs were reared under intensive system of management. Lush-green fresh samples of water hyacinth (*Eichornia crassipes*) were harvested, washed clean and the roots and petioles removed and discarded. The leaves were immediately chopped to an average size of about 2cm in length, sun dried until crispy while still retaining the greenish colouration and then later grounded to pass 0.5mm mesh screen. The ground leaves were thereafter incorporated into the basal diet at different levels of inclusion to replace soya bean meal (SBM) kilogram for kilogram as follows:

Treatment A (control) -0% SBM replacement with water hyacinth
Treatment B - 10% SBM replacement with water hyacinth
Treatment C - 20% SBM replacement with water hyacinth
Treatment D - 30% SBM replacement with water hyacinth

The animals were acclimatized for 2 weeks before exposing them to treatment diet.

Routine management operations such as regular cleaning and disinfection of pens were carried out and provision of feed and water were offered ad - *libitum*.
The analysis was based on general linear model => Xij = Ti + Eij
Where Li = unknown constant, the population mean common to all treatment
Ti = Treatment effect
Eij = Error Term
Xij = Value of any observation

Table 1: Percentage Ingredient and Composition of Experimental Diets

Parameters	Dietary Treatment			
	A (0%)	B (10%)	C(20%)	D(30%)
Maize	46	46	46	46
Soyabean	30	20	10	0
Water Hyacynth	0	10	20	30
Palm Kernel Cake	20	20	20	20
Bone Meal	2.5	2.5	2.5	2.5
Salt	0.5	0.5	0.5	0.5
Vitamin/Mineral Mix	0.5	0.5	0.5	0.5
DL-Methionine	0.25	0.25	0.25	0.25
DL- Lysine	0.25	0.25	0.25	0.25
TOTAL	100	100	100	100
	CHEMICAL COMPOSITION			
Crude Protein(%)	20.80	18.91	17.02	1`5.12
Energy (DEKcal%)	2824.64	2807.61	2790.58	2773.55
Either extract(%)	4.09	4.23	4.37	4.52
Crude Fibre (%)	5.27	6.12	6.96	7.81
Calcium (%)	1.03	1.27	1.52	1.76
Phosphate(%)	0.63	0.61	0.92	0.91
Lysine (%)	1.33	1.22	1.23	1.02
Methionine(%)	0.59	0.63	0.71	0.77

Vitamin / Mineral Premix (Animal Care Product).
The following were present 1kg. Vit A — 10,000,000 I.U, D -2,000,000I.U, B
B Nicotinic acid — 25g, Calcium panthothenate 1.5g. B - 0.015g, K-2.5g, E-25g,
Biotine -0.4g, Folic acid - 8g, Iron-32g, Iodine -0.8g. Manganese -Mg and Zinc — 40.

Technical Procedures And Parameter Measurements

(1) **Back Fat Thickness**: This was determined at the end of the experiment by using a probe meter or probe pin to measure the amount of fat deposited in the "LOIN EYE AREA" according to Hazel (2000) and Erusebio (2000).

(2) **Carcass Dress Out Percent**: This was measured by sacrificing two pigs selected at random from each treatment group. This were weight alive first, and the weight taken

thereafter, the were killed to allow the blood to bleed out, after which the brittles were removed by the aid of hot water, and then the carcass weighed. The carcass yield for each treatment group was calculated by dividing the mean carcass weight by the mean live weight of each treatment representative and multiplied by 100 (expressed as percentage of the live weight).

(3) **Organ Weight:** This was determined by weighing the organs i.e. liver, lungs, heart, spleen, lean fat and the mean back fat thickness of three (3) representative samples from each treatment replicate and the mean recorded for the respective treatments, expressed as percentage of the final live weight.

DATA ANALYSIS

The data collected from organ weights, carcass dress out percentage and lean fat and mean back fat thickness of the samples were analyzed using SAS (2001) and its mean separated using DMIR according to Duncan (1955).

RESULTS

Organ Weight of Pigs Table 2A

Parameters	Treatments			
	A (Control)	B	C	D
Liver(g)	586.17 +0.04	586. 60+0.33	586.60+0.39	586.07+0.93
Spleen	25.05+0.06	25.70+0.18	24.95 +0.01	24.93+0.01
Lungs	4440.46+0.60	440.30+ 0.57	440.30+0.57	440.30+ 0.57
Heart	108.45+ 0.31	108.37+0.70	108.44+ 1.02	108.40+0.21
Kidney	86.16+0.35	86.07+0.68	86.19+0.70	86.14+0.38

Within rows mean ± SEM with different superscripts differs significant at P<0.05

Table 2B: Organ Weight as a Percent of Body Weight of Pigs Fed-Graded Levels of Water Hyacinth

Parameters	Treatments			
	A (Control)	B	C	D
Liver(g)	1.8	1.8	1.8	1.8
Spleen	0.08	0.08	0.08	0.08
Lungs	1.39	1.39	1.39	1.39
Heart	0.34	0.34	0.34	0.34
Kidney	0.25	0.25	0.25	0.25

Statistical analyses of the mean values of organs weight are presented in table 2A above. From the results, liver weight differed not significantly between the control and the treatment groups (P > 0.05) and the percent of the liver to the body weight in all the treatments is 1.8%.

Also spleen, the lungs heart and kidney did not reveal significant difference (P> 0.05) between the treatment groups. The mean spleen weight in the control ratio was 25.05g and ranged from 25.07g, 24.95 and 24.93 for diets B, C and D respectively seen table 2a above.

Also average lung weight of the pigs in the control group was 44046g and the value for treatment B, C and D were 440.30,440.57 and 436.63 respectively. The mean weight of the heart in the control and treatment groups are 108.45g, 108.37, 108.44 and 108.40 respectively for treatment A (Control), B, C and D.

The mean kidney weight of the pigs on the groups were 86.l6g, 86.07g. 86.19g. and 86.1 4g for treatments A (Control), B, C and D respectively (Table 2a and b above).

Table 3: Carcass Quality Characteristics of Pigs Fed Graded Levels of Water Hyacinth

Parameters	Treatments			
	A (Control)	B	C	D
Mean Percent dress out (%)	62.30+0.09	62.19+0.06	62.25+0.17	62.23+0.22
Mean lean Fat (g)	22.47+ 0.21	21.85 0.03	21.45+ 0.01	21.19+0.34
Mean Back Fat Thickness(cm)	1.41+0.03	1.28 +0.06	1.16+0.67	1.09+ 0.06

The result of carcass quality characteristics of pigs fed water hyacinth are presented in Table 3 above. From the results, analysis of variance of the effect of water hyacinth on mean percent dress out showed no significant difference ($P > 0.05$) between the treatment groups. The mean values of percent dress out are 62.30%, 62.19%, 62.25% and 62.23% respectively for treatments A, B, C and D. the mean lean fat and back-fat thickness was significantly affected ($P < 0.05$) by the treatments according to the decreasing levels of the water hyacinth.
The highest and lowest values of lean-fat and back fat thickness recorded in treatments A (22.47g, 1.41cm) and D (21.1 9g, 1.09cm) respectively (Table 3 above).

DISCUSSION

Organ Weights

The organs weight (the liver) which showed No significant difference between the treatment groups ($P> 0.05$) could mean that there was no adverse toxic nutritional effect of water hyacinth. The liver for instance is the energy reservoir for the pigs; therefore any toxic substance in water hyacinth would be expected to hinder the animal's ability to metabolize the nutrients from the liver. This would have resulted in poor weight gain and carcass yield of the pigs. And this agrees with the report of NRC (1978) and Parr *et al* (1996) that water hyacinth does not contain any toxic substance. The livers of the pigs used in the study were of normal size as there was no liver enlargement. The size of the liver of the pigs used agreed with the normal values reported by Anyanchie (1998).
Also, the kidney is a very important organ in general toxicity studies in animals (Brown and Terris 1996). There were no toxins or anti-nutritional factors in the water hyacinth based diets, it would have resulted to atrophy / hypertrophy of the kidneys as results of the toxic substance stressor effect. This would have negatively affected the kidneys resulting in kidney dysfunction, causing accumulation of toxins in the body, which would have led to mortality of the pigs. Brown and Terris (1996) observed that escape of urine with poisonous toxins into the interstitial tubules elevates the inter-renal pressure which causes total collapse of the lobules thereby leading to atrophy of the kidney. However none of those things happened among the animals exposed to the treatment diets.
A Healthy and normal heart supplies the necessary nutrients to all parts of the pigs body that is needed to carry out its normal metabolic and physiological functions. The results did not show any abnormal size and weight of the heart of the pigs used for the study.
The spleen acts as a reservoir for erythrocytes, when released, increased the oxygen carrying capacity of the animal. It functions in the production of anti-bodies and anti-toxins (Ross and Wilson 2002). The results of the study agreed with the report of Ross and Wilson (2002) as evidenced by the healthy conditions of all the pigs used for the study. The lungs weights were not affected by size or weight.

Carcass Quality Characteristics

Lack of significant difference between the treatment groups ($P > 0.05$) on carcass quality characteristics is an indication that water hyacinth does not contain anti-growth substances. This would have resulted in reduced feed intake, suppression of growth and consequently poor carcass yield. This collaborates with NRC (1978) and Parr *et al.* (1996) who asserted that there

is no toxic or anti-nutritional factor in water hyacinth. It also agrees with Blaxter (2001) who observed that the growth rate and carcass yield of pigs are functions of their mature body sizes. The pigs in the different dietary treatments had above 62% carcass yield.

The results of the lean fat deposit and back-fat thickness which showed better fat contents on pigs in the control diets than the treatment groups according the decreasing levels of water hyacinth, agrees with the report of Parr *et al* (1996), NRC (1978) that soya bean meal has a higher content of fat than water hyacinth. Also Erusebio *et al* (2000) also reported that fat contents of pork are correlated with the type of diets fed to them.

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