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Performance and Haemato-Biochemical Parameters of Weaner Rabbits Fed Diets Supplemented with Dried Water Melon Peel (Rind) Meal

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Abstract

A study was carried out to investigate the performance, hematological and serum biochemistry of weaner rabbits given feed formulated with dried water melon peel meal (WMR). Thirty rabbits of mixed breed aged 7-8 weeks with initial weight of 602-616g were used in a completely randomized design (CRD) with six replicates per treatment. The animals were fed varied levels of WMR at 0%, 2.0%, 4.0%, 6.0% and 8.0% to obtain five diets. The control diet was prepared to meet the nutritional standards of growing rabbits and it lasted for 12 weeks. Results revealed that there was no significant ($p>0.05$) differences in the values obtained for the growth performance among the treatments. Hematological and all the blood serum biochemical traits measured were not a significantly different by the dietary inclusion of WMR. It was concluded that dried water melon peels (WMR) can be included up to 8.0% in the diets of weaner rabbits without deleterious effect on the performance, hematological and serum biochemical parameters of rabbits.

Keywords: Water melon peels; Performance; Hematology; Blood; Weaner rabbits

Abbrevations: WMR: Water Melon Peel Meal; CRD: Completely Randomized Design; PCV: Pack Cell Volume; EDTA: Ethylene Diamine Tetra Acetate; RBC: Red Blood Cell; WBC: White Blood Cell; Hb: Haemoglobin Concentration; MCV: Mean Corpuscular Volumes; MCH: Mean Corpuscular Haemoglobin; MCHC: Mean Corpuscular Heamoglobin Concentration; SGOT: Glutamic Oxaloacetate Transaminase; SGPT: Glutamic Phosphatase Transaminase; AAS: Atomic Absorption Spectrophotometer

Introduction

Protein is the basic structural material from which all body tissues are formed and it has been reported its intake of most developing countries including Nigeria is very low due to the high cost of victual; With the rapid increase in the population rate, there have additionally been an increase in competition among feed stuffs which are also used in feed making with human beings, sundry efforts are been made by Animal nutritionist in order to provide solution to the low protein intake especially from animals to increment the caliber of animal protein intake of the populace by probing for alternatives that are more frugal sources of feed ingredients to procure prosperity in livestock management. The utilization of unconventional feedstuffs and forages which are not consumed by humans can be used to produce animal feeds [1]. Among such alternatives is the use of water melon peels which is found abundant in minerals/ vitamins and can be used to feed animals like rabbits due to fast growing characteristics and their ability to convert tropical forages and agricultural by products to human food (meat).

Water melon belongs to the family to the family Cucurbitaceae and the species Citrullus landaus. They are widely distributed in the tropics and subtropics [2,3]. It contains low energy and high level of micronutrients such as carotene, vitamin k, ascorbic acid, riboflavin, iron, iodine and other mineral elements. It has been established that water melon peels are found in many places in Nigeria Gin et al. [4]. Watermelon rinds may have additional medical benefits. Research by the Agricultural Research Service discovered that watermelon rinds contain citrulline. Citrulline creates arginine, an amino acid that makes proteins for the body and plays a role in the relaxation of blood vessels [5].

Rabbits (Oryctolagus cuniculus meat are rich in protein and other nutrients which are safe for human consumption [6]. It has a feeding habits with no appreciable competition with man, this is because it can subsist on green as basal diet. Rabbits can easily utilize waste to produce meat giving it an advantage over other animal species like poultry. Although extensive studies had shown that WMR had an appreciable quantity of phytochemical and antioxidant, proximate components and anti-nutritional factors of water Johnson et al. [7], on effect of water melon rinds on the nutrient composition, performance and carcass characteristics of albino rats [8], but there are no information on supplementing dried water melon rinds on the general performance and blood profile of rabbits. An experiment on WMR inclusion in animals (rabbits) will give a clue on its safety margin during dietary supplementation and as an alternative

unconventional agricultural feed stuff. The main aim of this study was to investigate the growth performance and haemato-biochemical parameters of growing rabbits fed varying inclusion levels of dried water melon peel (rind) meal (Figure 1).

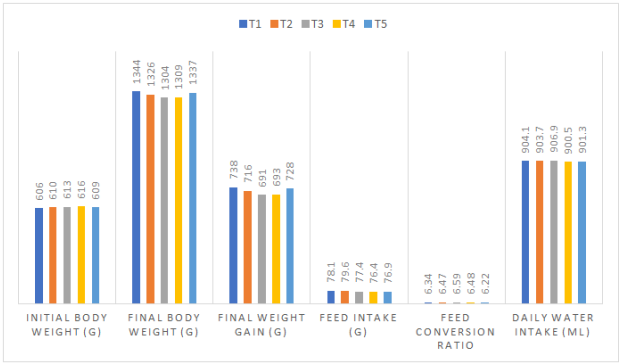

Figure 1: Performance chart of growing rabbits fed varying levels of WMR.

Methodology

Experimental Site

This study was carried out at the Livestock Teaching and Research Farm of University of Abuja, Gwagwalada, Abuja-Nigeria. Collection and processing of water melon rinds (WMR) Fresh healthy water melon fruit were collected from Gwagwalada, Abuja. The fruit was thoroughly cleaned remove sand particles after which they were sliced with cleaned knife to separate the rind from the pulp. The rind was cut into pieces and sundried for 6 days, the dried rinds were then milled in a hammer mill to form water melon rind meal (WMR).

Pre-experimental operations

A total of thirty, 7-8 weeks bucks cross breed rabbits (Chinchilla × New Zealand White) with an average weight of 602g and 616g were used for this experiment. They were individually housed in a an all wire cages measuring 50cm×35cm×40cm (width × length × height) and equipped with feeding and watering troughs. The cages were cleaned and disinfected before the arrival of the animals. The rabbits were allowed two week adjustment period during which they were fed with control diet and given prophylactic treatment of Oralmectin against endo and ecto- parasites before they were placed on the experimental diets.

Animal management, experimental diets and design

Five diets were formulated to meet the nutritional requirements of growing rabbits. Control diet (T1) did not contain WMR, while diets T2, T3, T4 and T5 contained WMR at 2.0%, 4.0%, 6.0% and 8.0% respectively. Experimental design used was a completely randomized design. The animals were fed twice daily at 7:30 hour and 14:30 hour, feed and clean water was supplied the performance of the rabbits in terms of feed intake and mortality were recorded daily and all management practices were strictly observed throughout the experiment which lasted for 12 weeks.

Blood Analysis

On the 12th week of the experiment, blood samples were collected from the marginal vein of three randomly selected rabbits per treatment. The blood samples were analyzed for some hematological and serum biochemical parameters; blood samples for hematology were collected into bottles containing Ethylene Diamine Tetra Acetate (EDTA). The hematological parameters such as Pack cell volume (PCV), Red blood cell (RBC), White blood cell (WBC), Haemoglobin concentration (Hb) and absolute counts of neutrophils, lymphocytes, monocytes and eosinophils were computed according to the method. The Mean corpuscular volumes (MCV), mean corpuscular haemoglobin (MCH), Mean corpuscular heamoglobin concentration (MCHC) were calculated according to Bush [9]. Blood samples that were meant for serum biochemistry were collected into other bottles free from any anticoagulant. The serum total protein, Albumin and Globulin were computed according to, Uric acid, Creatinine, Glutamic oxaloacetate transaminase (SGOT) and Glutamic phosphatase transaminase (SGPT) was determined according to Scott [10].

Laboratory Analysis

The proximate composition of experimental diets and WMR were analyzed according to AOAC (2000), while phytochemical analysis was determined according to Harbone [11]. The mineral analysis were carried out using Atomic Absorption Spectrophotometer (AAS). Vitamin content of WMR were analyzed using method reported by Onwuka [12].

Statistical Analysis

Data were analyzed using the general linear model procedures of Statistical Analysis Systems software with the model containing treatments. Differences between treatment means were separated using (SAS, 2009). Significant differences were declared at ($p<0.05$)

Results and Discussion

Table 1: 1Premix supplied per kg diet :- Vit A, 7,000 I.U; Vit E, 5mg; Vit D3, 3000I.U, Vit K, 6mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 20mg

Materials	Treatments				
	T1	T2	T3	T4	T5
Maize	15	15	15	15	15
Wheat offal	30	28	26	24	22
Groundnut cake	10.75	10.75	10.75	10.75	10.75
Soya meal	5	5	5	5	5
Palm kernel meal	35	35	35	35	35
Bone meal	2.5	2.5	2.5	2.5	2.5
Limestone	1	1	1	1	1

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Lysine	0.1	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1	0.1
1Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.3	0.3	0.3	0.3	0.3
WMR	0	2	4	6	8
Total	100	100	100	100	100

A: Percentage Composition of Experimental Diets.

Protein (%)	17.81	16.97	16.56	16.48	16.4
Crude fibre (%)	10.24	10.45	10.52	10.88	11.01
Ether extract (%)	2.52	2.41	2.35	2.28	2.12
Ash (%)	6.11	5.67	5.37	5.25	5.19
ME (kcal/ kg)	2638.5	2634.7	2633.1	2630.9	2603.1

B: Nutrient Composition (calculated).

The proximate results obtained for the experimental diets is presented in Table 1. The crude protein, crude fibre, ash, ether extract and energy in the diet ranges from 16.40% - 17.81%, 10.24%-11.10%, 5.19% – 6.11%, 2.28% – 2.52% and 2603.1 – 2638.5 (MEkcal/kg) respectively. In the current study Crude fibre shows an increasing trend as increasing of inclusion level of WMR. This was in agreement with the findings. However, proximate composition in the experimental diets was within the range recommended for growing rabbits NRC (1977); Adaku & Olukosi [13]; Anugwa et al. [14]; Alagbe et al. [15] and Ibrahim et al. [16].

Table 2: Proximate Composition of WMR.

Parameters	% Composition
Crude protein	7.45 ± 0.01
Crude fibre	18.57 ± 0.03
Ether extracts	10.44 ±0.78
Ash	3.22 ±0.12

The results on the proximate composition of WMR is presented in Table 2. WMR contained 7.45% crude protein, 18.57% crude fibre, 10.44% ether extract and 3.22% ash. The current study is in line with the findings of Feumba et al. [17] and Johnson et al. [7] who reported similar results on chemical evaluation of many dried fruits.

Table 3: Phytochemical Analysis of WMR.

Parameters	(%) Composition
Flavonoids	1.03 ± 0.01
Alkaloids	1.01 ± 0.04
Tannins	0.79 ± 0.12
Saponins	2.12 ± 0.01
Phytate	1.23 ± 0.88

Table 3 reveals the phytochemical analysis of water melon rinds (WMR), the phytochemical components are 1.03% flavonoids, 1.01% alkaloids, 0.79% tannin, 2.12% saponins and 1.23% phytate respectively while those of minerals are 0.47mg copper, 1.31mg iron, 1.02mg zinc, 30.02mg calcium, 1.44mg magnesium, 1.12mg potassium, 0.77mg sodium, 131.1mg phosphorus, 1.18mg manganese and 0.13 mg selenium respectively as presented in Table 4. The trend of mineral concentration in WMR in decreasing order is P> Ca>Mg>Fe>K>Mn>Zn>Na>Cu>Se, this mineral trend agrees with the report of Gladvin et al. [2]; Olayinka & Etejere [18], on the mineral and vitamin content in water melon peel.

Table 4: Mineral composition of WMR

Parameters	(%) Composition
Copper	0.47 ± 0.00
Iron	1.31 ± 0.01
Zinc	1.02 ± 0.03
Calcium	30.02 ± 3.10
Magnesium	1.44 ± 0.01
Potassium	1.12 ± 0.03
Sodium	0.77 ± 0.02
Phosphorus	131.3 ± 1.22
Manganese	1.18 ± 0.04
Selenium	0.13 ± 0.01

Onwuka [12] and Adeyeye [19], reported that Minerals is always required for efficient metabolic processes. Calcium and phosphorus are major components of the skeletal system, magnesium is a component of the bone, a cofactor of several enzyme activity and is involved in the transmission of nerve impulses, copper is significant in iron and energy metabolism while sodium and potassium play key roles in the acid-base regulation of the blood and other body fluids Amy E Halls [20].

Table 5: Composition of Vitamins in WMR

Parameters	(%) Composition
Vitamin A	56.81± 6.31
Vitamin B1	1.22 ± 0.01
Vitamin B2	2.33 ± 0.06
Vitamin B3	5.01 ± 0.10
Vitamin C	58.12 ± 0.05

Phytochemical results of WMR in this current study was also consistent with report of Egbonu [21]; Ella et al. [22] and Hanan et al. [23]. According to Bako et al. [24] phytochemicals vary in distribution within the plant parts as well as in their occurrence within the plant species and have also been reported to reduce the risk of some diseases due to their protective and therapeutic roles Adesanya & Sofowora [25]. According to Adisa et al. [26], tannins are known to possess antibacterial and anti-viral activity, saponin plays a significant role in maintaining blood cholesterol levels [27]. Adesanya & Sofowora, [25] reported that phenol plays a vital role in red blood cell modifier. Results on the

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vitamins composition of WMR (Table 5) revealed that Vitamin A contains 56.81mg, 1.22 vitamin B1, 2.33mg B2, 5.01 mg B3 and 58.12 mg C respectively. Vitamin C had the highest number followed by vitamin A, B3, B2 and B1.

Table 6: Performance traits of growing rabbits fed varying inclusion levels of WMR.

Parameters	T1	T2	T3	T4	T5	
	0%	2%	4%	6%	8%	S/L
Initial live wgt (g)	606±31.4	610±22.1	613±27.2	616±40.4	609±41.4	Ns
Final live wgt (g)	1344±24.6	1326±34.3	1304±30.6	1309±41.1	1337±39.8	Ns
FWG (g)	738±3.02	716± 5.31	691±7.80	693±4.41	728±6.12	Ns
Feed intake (g)	78.1±1.31	79.6±3.01	77.4±2.53	76.4±2.61	76.9±1.77	Ns
FCR	6.34±0.43	6.47±0.32	6.59±0.01	6.48±1.10	6.22±0.78	Ns
DWI (ml)	904.1±1.23	903.7±1.02	906.9±0.07	900.5±0.19	901.3±0.21	Ns
Mortality	0/6	0/6	0/6	0/6	0/6	

Ns: No significant (p>0.05) difference

Generally, Vitamins are very vital components in food because of their role in proper functioning and body metabolic activity [28]. Vitamin C protects the body from oxidative stress and maintains the immune system, their synergistic combination with other vitamins allows proper growth, high reproductive performance and enzymatic activities. The results obtained for WMR is in agreement with the reports of Collins et al. [29]; Leterme et al. [30]; Moon and Shibamoto [31] as presented in Table 6. Supplementation of (WMR) at different levels in growing rabbits showed no significant effect on their feed intake, body weight change and feed conversion ratio (FCR) in the current study. This was similar with the finding of Alagbe J O [32]; Haruna & Muhammad [33].

Table 7: Hematological parameters of growing rabbits fed varying inclusion of WMR.

Parameters	Treatments	T2	T3	T4	T5	
	T1	T2	T3	T4	T5	S/L
Pack cell volume (%)	39.06±0.21	41.91±0.3	57.11±0.11	57.22±0.41	57.32±0.12	Ns
Hemoglobin (g/dl)	8.13±0.09	11.3± 0.05	13.13±0.07	13.15±0.10	13.44±0.17	Ns
RBC (×106/L)	6.11±0.19	7.01±0.17	7.11±0.15	7.18±0.45	7.33±0.56	Ns
MCV (fl)	60.11±0.87	63.12±0.66	68.10±0.1	69.14±0.09	70.19±1.22	Ns
MCH (pg)	19.18±1.22	19.45±1.34	20.14±1.82	20.44±1.09	20.66±1.54	Ns
MCHC (%)	30.10±0.56	31.23±0.97	31.77±0.87	32.10±0.37	32.51±0.66	Ns
WBC (×106/L)	10.02±0.89	10.66±0.78	11.03±0.80	11.35±0.91	12.10±0.82	Ns
Lymphocytes (%)	50.12±0.34	51.71±0.54	52.13±0.65	52.33±0.80	52.36±0.36	Ns
Monocytes (%)	1.31±0.05	1.28±0.01	1.23±0.03	1.27±0.00	1.20±0.03	Ns
Neutrophils (%)	33.12± 1.10	33.03±1.26	33.18±1.14	33.27±1.53	33.10±1.10	Ns
Basophils (%)	0.72±0.05	0.67±0.01	0.58±0.00	0.71±0.02	0.69±0.01	Ns
Eosinophils (%)	5.11±0.04	4.54±0.18	4.32±0.01	4.59±0.02	5.01±0.06	Ns

Ns: No significant (p>0.05) difference.

According to Ojabo et al. [34] the use of Sweet orange peel in the diet of growing rabbits produced no significant increase in feed intake, final body weight and FCR when compared to a control diet but contrary with the reports of Ishaya B. Kaga [35] on the performance of rabbits fed Delonix regia meal. The water intake values obtained are practically the same and mortality was recorded throughout the experimental period, this could be due to proper hygiene, biosecurity measures and the safety margin of including WMR in the diet of the animal as presented in Table 7.

Table 8: Serum biochemical profile of growing rabbits fed varying inclusion levels of WMR.

Parameters	Treatments	T2	T3	T4	T5	
	T1	T1	T1	T1	T1	S/L
Total protein (g/dl)	4.45±0.67	4.74±0.74	4.57±0.55	4.82±0.63	4.87±0.44	Ns

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Albumin (g/dl)	2.34±0.45	2.61±0.31	2.47±0.65	2.66±0.12	2.56±0.18	Ns
Globulin (g/dl)	2.11±0.03	2.13±0.08	2.09±0.61	2.16±0.80	2.31±0.01	Ns
Uric acid (mg/l)	10.4±0.01	10.1±0.04	10.7±0.91	11.2±0.06	11.5±0.03	Ns
Creatinine (mg/l)	7.12±0.12	8.87±0.18	8.90±0.44	9.10±0.39	9.22±0.83	Ns
SGOT (U/L)	14.60±0.01	12.23±0.03	12.54±0.21	12.32±0.14	12.03±0.03	Ns
SGPT (U/L)	8.44±0.33	8.41±0.26	8.23±0.00	8.03±0.35	8.01±0.66	Ns

Ns: No significant ($p>0.05$) difference.

Results on the blood hematological parameters of weaner rabbits fed diets supplemented with water melon peels is presented in Table 8. The values of PCV obtained is between 39.06% - 57.32%, hemoglobin values of 8.13 – 13.44 (g/dl) while RBC values are 6.11 – 7.33 ((×106/L). The PCV values fall within the normal ranges of 35-60% previously reported by Aduku and Olukosi [20]; Flecknell [36]. All the hematological parameters obtained in this study showed that were not significantly ($p>0.05$) influenced by the dietary inclusion of WMR. The PCV, Hb, RBC, MCV, MCHC and WBC values obtained slightly increased from diet 1 to 5 though not at a significant level. The parameters observed in this study were within the normal ranges for rabbits reported by Mituka and Rawnsley [37].

Togun and Oseni [38] reported that hematological analysis is useful in disease diagnosis and nutritional stress. It also provides the opportunity to clinically investigate the presence of several metabolites and other constituents in the body (Doyle, 2006). Nutrition and dietary contents affect the blood profile of healthy animals [39]; Addass et al. [40]. Esonu et al. [41] posited that haematological parameters like haematocrit value, hemoglobin concentration, white blood cell count, red blood cell count are dictate the level of oxygen in the blood. Blood parameters are excellent medium for measurement of potential biomarkers, because its collection is relatively non-invasive and it shows an enormous range of physiological process in the body at any given time. Changes in blood profile can be due to disease and nutritional stress Afolabi et al. [42], age and sex [43] and breed.

Table 8 shows the serum biochemistry of rabbits fed diets supplemented with WMR. The results revealed that the values obtained in this study were not significantly ($p>0.05$) different by the dietary inclusion of WMR across the treatment. The total protein values obtained is 4.45 – 4.87 (g/dl) which fall within the normal ranges of 5.40-7.50 (g/dl) previously reported by Medirabbit [44], this shows that the protein level in the diet is in line with the nutritional requirement of the animal, which will assist in tissue and cell rebuild after stress. Uric acid values obtained are 10.4, 10.1, 10.7, 11.2 and 11.5 (mg/l) for diets 1, 2, 3, 4 and 5 respectively while those of creatinine (mg/l) are 7.12, 8.87, 8.90, 9.10 and 9.22 for diets 1, 2, 3, 4 and 5 respectively. The values of SGOT obtained ranges between 12.03 and 14.60 (U/L) while those SGPT (8.01 – 8.44U/L) fall within the normal ranges reported by Ozkan et al. [45], on the normal biochemical parameters of New Zealand white rabbits [46-52]. This therefore implies that the test material (WMR) inclusion in the diet did not affect the liver of the animals [53-56].

Conclusion

WMR could be included in the diet of weaner rabbits up to 6% without any deleterious effect on the health and general performance of rabbits without causing any pathological abnormalities in their blood profile.

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