

## PERFORMANCE ASSESSMENT OF RABBITS FED CONCENTRATES SUPPLEMENTED WITH MIXTURE OF BLENDED RIPE BANANA PEELS AND RIPE PAWPAW

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### *Abstract*

The study was conducted to evaluate the performance assessment of rabbits fed with concentrates supplemented with mixture of blended ripe banana peels and ripe pawpaw. This study was carried out in the Agriculture Laboratory of the Department of Animal Science, University of Uyo, Uyo, Akwa Ibom State. A total of twenty four (24) grower rabbits were assigned to four dietary treatments of six (6) rabbits each, replicated four times with two (3) rabbits per replicate in a completely randomized design (CRD). The experimental diets were formulated and fresh pawpaw leaf included in the diets across at the levels of 0%, 25% 50% and 100% in T1,T2,T3 and T4 respectively. The results of the study showed; Final Weight (FW), Average Daily Feed Intake (ADFI) and Average Daily Weight Gain (ADWG) were significantly different at ( $P < 0.05$ ). The values obtained were 28.84, 35.67, 68.00 and 85.50 respectively for T1,T2,T3 and T4, the highest value was recorded in T4 with value of 85.50 that contained 1.5% of Ripe Banana mixed with Ripe pawpaw (RBPM). Best performance for Feed Conversion Ratio (FCR) was recorded in T4 with 2.80 with Ripe Banana mixed with Ripe pawpaw (RBPM) and the poorest Feed Conversion Ratio was recorded in T3 with 3.31 FPL respectively. Hematological indices were carried out and White blood cell(WBC), Red blood cell(RBC),Hemoglobin (Hb), Mean Corpuscular Volume(MCV),Mean Corpuscular Hemoglobin Concentration (MCHC) were not significantly different among treatment groups( $P > 0.05$ ). It was concluded from the results obtained that Fresh Pawpaw Leaf (FPL) can be included in diets of grower rabbits at level of 25% with improved growth performance and no adverse effect on hematological indices.Implications and recommendations were made from the findings of the study

**Keywords:** Ripe banana Peels, Ripe Pawpaw, Performance characteristics, Rabbits.

### INTRODUCTION

Intensive rabbit production in Nigeria has been hampered by the perennial problem of feed availability. The high cost of conventional protein and energy ingredients have grossly undermine the potentials of rabbit production. This has made feed alone to account for about 70% of the total cost of rabbit production (Akinmutimi and Ezea, 2006 as cited in Machoko, 2019).Hence, the need to explore locally available, non-conventional, low cost but nutritionally adequate feedstuffs for rabbits (Akinmutimi and Obioha, 2010).The key to the success of raising rabbits is to be able to provide feed that meets nutrient requirements inexpensively using some agricultural waste products such as banana peels and ripe pawpaw. Banana peels (*Musa cv*) are an agro-industrial waste. They can be potentially used as a rabbit feed ingredient(Deblas et al, 2018). Feed is an important factor in livestock business and balanced nutrition in the feed is required. Utilize of banana peels in feed may be able to further maximize the use of feed for increasing livestock production. Bananas (*Musa sapientum L.*) fruit is the world 2nd largest fruit production after citrus while banana peel represents 40% by weight of the banana fruit (Alkarkhi et al., 2010; Mohapatra et al., 2010). About 18-20% of banana peels are wasted every

year (disposed or thrown) causing harms ecologically issue. Banana peels are wealthy resources and consist of starch 3%, crude protein 6-9%, crude fat 3.8-11% & total dietary fiber 43.2-49.7% (Emaga et al., 2008). Substitution of 15% plantain peel in place of maize had no considerable effect on weight gain of weaned rabbit (Omole et al., 2008). Sun dried ripe plantain peels could substitute up to 75% of maize (Ajasin et al., 2006). Combination of dried and ground ripe banana peels and yam peels (3:1) gave excellent performances in weaned rabbit and was the most valuable when it replaced 50% of the maize (Akinmutimi et al., 2006).

Furthermore, Pawpaw on the other hand, also has both nutritional and medicinal values to man and animals. Some studies conducted on pawpaw fruits reveals, that the fresh pawpaw fruits as well as the leaf is effective as anti-oxidant (it can flush out free radicals in the body system, thereby reducing abnormal growth or tumour), anti – microbial (it can fight secondary bacterial infection thereby enhancing feed efficiency and promote growth), diuretics (medications that are given to help the kidney get rid of excess water and salt from the body through urination) and as dysturia (it can cure painful urination) (Adewumiet. al., 2004). A preliminary report by Bittoet. al., (2006) affirmed the inclusion of 30% pawpaw peel in rabbit diets with no adverse effects on growth performance of female rabbits. Pawpaw (*Carica-papaya*) fruit is said to be a tropical herbaceous plant that grows between latitudes 32° North and South. It contains appreciable amount of macro and micro-nutrients required for rabbit growth and development such as protein, carbohydrate, minerals, vitamins and fat content in little amount. (FAO, 2001) Studies showed that pawpaw leaf proximate composition and functional properties suggest that Fresh Pawpaw Leaf (FPL) could be profitably utilize in rabbits feed but it is quite unfortunate that its usage as feed ingredient in developing countries has not been realized. (FAO 1995). Pawpaw (*Carica papaya*) leaf was analyzed for proximate composition functional properties, the meal was high in protein (32.4%) but moderate in available carbohydrates and some anti-nutritional component such as tannin and saponin which gives the unripe pawpaw a bitter taste and it causes reflex of the upper digestive tract which can lead to excessive heartbeat (Morton, 1977). Moreso, the fresh latex is acrid (having sharp or biting and pungent smell) which causes irritation to the eyes and nose and can provoke eye inflammation and blisters when in contact with the skin (Morton 1977). Combination of dried and ground ripe banana peels and yam peels (3:1) gave excellent performances in weaned rabbit and was the most valuable when it replaced 50% of the maize (Akinmutimi et al., 2006). The present study was designed to evaluate the performance assessment of rabbits fed concentrates supplemented with mixture of blended ripe banana peels and ripe pawpaw.

## METHODS AND MATERIALS

### Location of the study

This study was carried out in the Teaching and research Farm, University of Uyo, Uyo in Akwa Ibom State (16.14° N and 7.45° E). They lies in South-South zone of Nigeria with a prevailing high average rainfall ranging from 2400 to 3600mm. The average temperature of the area range from 26 – 280°C during the rainy season. The relative humidity range from 70 – 90% and 4.8 to 6.5 respectively. The state is bounded on the east with Cross River state, west with Rivers state and Abia state and on the South with Atlantic Ocean. The state has 31 local government areas and a population of 5-million people leaving in the state.

### Experimental Animals

A total of 24 growing rabbits of 5-6 weeks of age, with average weight of 500g was divided into 4 groups (6 rabbit per group). Rabbits was purchased from a local market and housed in cages measuring 360× 450× 310 mm separately under room temperature 20°C (Laudadio et al., 2009). Rabbits were adopted for 15 days before the start of experimental trail (56 days) to become familiar to feed and dewormed for endo-parasites. Four experimental diets T0, T1, T2 & T3 were formulated with fresh banana peel replacing maize grains at 0, 25, 50 & 100% respectively. The rabbits were allowed to water *ad libitum*.

### Collection and preparation of test ingredients

The ripe banana peels were obtained from eaten ripe banana fingers while ripe pawpaw was gotten from the agricultural research farm. At first, the ripe banana peels were washed and sundried for 14 days then grinded locally with a mortar to become blended. Later the ripped pawpaw were first cut into smaller pieces then also sundried for 14 days and also locally grinded to become blended. Thereafter, the blended ripe banana peels and blended ripe pawpaw were mixed equally with the ratio of 2:2 (forming ripe banana and pawpaw meal, RBPM) and then mixed with other ingredients at varying levels of 0%, 25%, 50% and 100% to formulate four dietary treatments: T1, T2, T3 and T4 respectively.

### Statistical analysis

Blood glucose levels were expressed in mg/dl as mean±SEM. The statistical analysis of data was done using one way analysis of variance (ANOVA), followed by Dunnett’s test using the software “PRIMER OF BIOSTATISTICS”. P value less than 0.05 was considered to be significant.

## RESULT AND DISCUSSION

**Table 1. Composition of Experimental Diet for Rabbits**

Ingredients	T1 (0%)	T2(25% )	T3 (50% )	T4 (100%)
Maize	100.00	25.00	50.00	0.00
RBPM	0.00	25.00	50.00	100.00
Wheat Offal	34.10	34.72	34.51	34.25
Bone Meal	1.50	1.50	1.50	1.50
Limestone	2.00	2.00	2.00	2.00
Weaner Premix*	0.25	0.25	0.25	0.25
Salt	0.35	0.35	0.35	0.35
Ronozyme**	0.20	0.20	0.20	0.20
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
<b>Calculated Analysis</b>				
<b>Dry Matter</b>	92.00	89.23	88.83	87.28
<b>Crude Protein (%)</b>	<b>19.00</b>	<b>21.00</b>	<b>23.00</b>	<b>25.00</b>
<b>Ether extract</b>	<b>7.48</b>	<b>5.19</b>	<b>4.58</b>	<b>2.60</b>
<b>ME(Kcal/Kg)</b>	<b>2878</b>	<b>2857</b>	<b>2835</b>	<b>2813</b>
Fibre (%)	5.35	6.99	8.63	10.26
Ash (%)	5.94	9.11	12.34	15.57
NFE	36.23	40.23	42.48	44.25
NDE	70.21	65.43	54.06	46.32
ADL	46.01	34.23	25.28	33.23
Cellulose	34.00	23.98	13.32	22.99
Hemicellulose	26.32	28.86	26.99	13.34

RBPM: Ripe banana peel mixed with ripe pawpaw

Table 1 above is the percentage and chemical composition of the experimental concentrate diets. The dry matter ranged from 87.27% - 92.00%. The high dry matter values observed in

this study implied that they can be stored all-year round and used as feeds for all non-ruminant livestock. The crude protein values of the experimental diets increased as the inclusion level of RBPM increased across the dietary treatment. This might be as a result of the high crude protein of malted sorghum sprout in the diet. The crude protein values observed in this study were higher than 10 to 12% crude protein moderate level required by ruminants for minimum growth performance. The highest percentage of NDF, ADF and ADL was obtained in T while T had the lowest percentage of NDF and ADL. The lowest value of ADF was obtained in T3. The fibre fraction NDF, ADF, ADL and Cellulose were observed to decrease with increasing levels of RBPM. This might be as a result of low fibre content of MSPW in the diet.

**Table 2: Composite Proximate of Experimental Diets**

Description	DM (%)	CP (%)	CF (%)	EE (%)	ASH (%)	Nitrogen extract Kg
T1	97.0	24.50	8.50	10.00	8.50	45.00
T2	95.00	26.10	11.90	10.80	8.90	36.00
T3	93.00	28.80	8.90	11.90	7.90	35.00
T4	91.00	34.20	12.80	7.00	14.60	17.00

CP=Crude protein CF=Crude fibre DM= Dry Matter EE= Ether extract ME=Metabolizable energy, T1= Control group, T2= 25%, T3= 50%, T4=100%.

The analysed results for the proximate composition of the experimental rabbits are presented in Table 3. The proximate values for Crude Protein (CP) for the experimental rabbits were found to be 24.5, 26.1, 28.8 and 34.2 representing the values for T1, T2, T3, and T4 respectively. The Crude Fibre(CF) showed 8.5%, 11.9%, 8.9% and 12.8% for T1, T2, T3, and T4 respectively. The Ether Extract (EE) values were 10.0%, 10.8%, 11.9% and 7.0% presenting T1, T2, T3, and T4 respectively. The Ash content obtained for the grower rabbit diets according to treatments were 8.5%, 8.9%, 7.9% and 14.6% for T1, T2, T3, and T4 respectively, the nutrient value for the Nitrogen Free Extracts (NFE) were 45.0%, 36.0%, 35.0% and 17.0% for T1, T2, T3, and T4 respectively. The Metabolizable Energy (ME) obtained for each treatment diet using Ponzengaequation (1985) were 2829kcal/kg, 2823kcal/kg, 2817kcal/kg and 2811kcal/kg for T1, T2, T3, and T4 respectively.

The percentage Crude Protein (CP) is above the recommended values as cited by NRC (1977) and Lebas (1980) recommended 12-13% Crude Protein (CP) for maintenance, 15-16% for growth, 15-18% for gestation and 17-18% for lactation. Cheeke et. al., (1982) and Ranjhan (1993) reported Crude Protein (CP) levels of 12, 15, 16 and 17% for maintenance, normal growth and pregnancy, normal growth and fattening and lactation, respectively, in rabbit diets for optimum performance. The ME from T1, T2, T3, and T4 decreased from T3, and T4 as the Fresh Pawpaw Leaf inclusion levels increase. The T1 had the highest ME (2829kcal/kg). The values are slightly higher than the recommended value of ME required by rabbit from growing stage to adult stage of 1500 - 2390 Kcal/Kg or 2600-2700Kcal/Kg Metabolizable Energy respectively, (Fielding 1991). The same author indicated that the physiological state of the animal (maintenance, pregnancy, growth, lactation etc.) determines the energy requirement of the rabbit and this energy can be supplied mainly from carbohydrate and fat. Aduku and Olukosi (1990) reported that the energy requirement of rabbits ranged from 2390 - 2500Kcal/kg. Anugwaet. al., (1982) stated that, the digestible energy requirement for growth and optimal productivity of rabbits in the temperate climates is 2500kcal/kg, while in the tropical climates, the digestible energy for growth and development is given as 2800 kcal/kg of feed. The Crude Fibre(CF) content of grower rabbit in the experimental diet range from 8.5% - 13.0% which is

between the valuesopinedby (Coudert et. al., 1983) for growing rabbits of 13% - 14% Crude Fibre (CF).

**Table 3: Growth Performance characteristics of rabbits fed experimental diet**

Parameters	Levels of inclusion (%)				SEM (±)
	0	25	50	100	
Ave. initial weight(kg)	9.05	8.98	9.00	9.01	
Ave. final weight(kg)	28.84 <sup>b</sup>	35.67 <sup>a</sup>	68.00 <sup>c</sup>	85.50 <sup>d</sup>	0.46
Ave. total weight gain(kg)	12.52 <sup>b</sup>	23.79 <sup>a</sup>	34.00 <sup>d</sup>	40.50 <sup>cd</sup>	0.44
Ave. daily weight gain(kg)	2.07 <sup>b</sup>	2.40 <sup>a</sup>	4.86 <sup>c</sup>	6.78 <sup>cd</sup>	0.04
Feed intake(kg)	35.00	38.00	40.00	42.00	0.01
Feed conversion ratio	2.41 <sup>c</sup>	2.06 <sup>d</sup>	2.69 <sup>b</sup>	2.80 <sup>b</sup>	0.68
Protein efficiency ratio	2.18 <sup>b</sup>	2.52 <sup>a</sup>	3.95 <sup>c</sup>	4.88 <sup>cd</sup>	0.08
Mortality (%)	-	-	-	-	-

a, b, c, d, e means along the same row with different superscripts are significantly ( $p < 0.05$ ) different from each at her, Ave: Average, SEM: Standard error of mean.

The effect of experimental diets on productive performance of grower rabbits are as shown on Table 3. The result showed that there was significant difference ( $P > 0.05$ ) among the treatments with respect to Average Daily Feed Intake (ADFI), Average Daily Weight Gain (ADWG), Feed Conversion Ratio (FCR) and Final Weight (FW). Rabbits fed diets supplemented with Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) at T4 (100%) consumed more feed and recorded the highest intake of feed (85.50kg) compared to rabbits on other treatment groups. This result is in line with the observation by Adenola et. al., (2008) that Ripe Banana peel mixed with Pawpaw Meal is a potential feed source for rabbits. Rabbits on diet T4 gained more weight than those on T2 and T3 while rabbits on T1 had the lowest weight. The highest final weight was recorded on rabbits fed T4 diet. The result obtained on final weight support the results by Adenola, et al., (2008). The result obtained on final weight support the results by Adenola, et al., (2008). In all the various percentages of Ripe Banana peel mixed with Pawpaw Meal in the diet there was no mortality recorded. This indicates the suitability of Ripe Banana peel mixed with Pawpaw Meal as feed ingredients for feeding grower rabbits.

**Table 4: Hematological indices of parameter of grower rabbits fed with Ripe Banana peel mixed with Pawpaw Meal (RBPM)**

Parameters	A	B	C	D	SEM
HB(g/dl)	8.97	8.77	9.68	9.73	0.88
PVC (%)	33.08	31.63	31.88	31.88	2.66
RBC(x10 <sup>6</sup> /UL)	2.56	2.59	2.69	2.53	0.27
MCV (fl)	131.98 <sup>a</sup>	125.18 <sup>b</sup>	126.85 <sup>ab</sup>	126.85 <sup>ab</sup>	5.23
MCH (pg)	38.88 <sup>a</sup>	38.88 <sup>b</sup>	37.53 <sup>b</sup>	37.53 <sup>b</sup>	1.19
MCHC (%)	29.03 <sup>b</sup>	31.02 <sup>a</sup>	29.33 <sup>b</sup>	29.55 <sup>ab</sup>	1.38
PLT (x10 <sup>3</sup> /UL)	22.67 <sup>a</sup>	20.83 <sup>a</sup>	18.33 <sup>a</sup>	20.50 <sup>a</sup>	1.37
WBC (x10 <sup>3</sup> /UL)	83.78 <sup>a</sup>	73.13 <sup>ab</sup>	82.00 <sup>ab</sup>	75.33 <sup>b</sup>	6.15
LYM(%)	77.67 <sup>c</sup>	83.83 <sup>abc</sup>	81.00 <sup>bc</sup>	87.67 <sup>ab</sup>	7.76
NEUT (%)	22.33 <sup>a</sup>	16.17 <sup>abc</sup>	19.00 <sup>ab</sup>	12.33 <sup>bc</sup>	8.00

a,b,c Means in the same row with different super script are significantly different. PCV = Packed Cell Volume HB = Hemoglobin RBC = Red Blood Cell WBC = White Blood Cell MCHC = Mean Corpuscular Hemoglobin Concentration

Results of hematological parameters is shown in Table 4, this showed no significant different ( $P < 0.05$ ) for all the parameters (PCV, Hb, RBC, WBC, MCHC, MCV and MCH) analyzed. The result obtained signifies that inclusion of Ripe Banana peel mixed with Pawpaw Meal (RBPM) in grower rabbits' diet to a level of 1.5% had no adverse effect on the Hematology of the Rabbits. The hemoglobin values of the experimental animals on 0% to 100% RBPM inclusion level were

in agreement with the reports of (Daramola et al, 2005; Lazorro et al, 2014; Belewu et al, 2016). Since haemoglobin function as a carrier of oxygen to target organs by forming oxyhaemoglobin hence animals on 0% to 1000% MSPW inclusion are at advantage. The values of red blood cell (RBC) reported herein agreed with the values reported by (Beliwu, 2010; Orheruata et al, 2014) for similar animal. The value of the white blood cell (WBC) obtained in this study supported the reports of (Beliku, 2014) that WAD rabbits possess a protective system providing a rapid and potent defense against any infectious agent and this probably form the physiological basis for the adaptation of the West African eco-zone which is characterized with high prevalence of diseases.

## CONCLUSION

The study was conducted to evaluate the performance assessment of rabbits fed with concentrates supplemented with mixture of blended ripe banana peels and ripe pawpaw. The study was carried out in the Agriculture Laboratory of the Department of Animal Science, University of Uyo, Uyo, Akwa Ibom State. A total of twenty four (24) grower rabbits were assigned to four dietary treatments of six (6) rabbits each, replicated three times with two (2) rabbits per replicate in a completely randomized design (CRD). The experimental diets were formulated and fresh pawpaw leaf included in the diets across at the levels of 0%, 25% 50% and 100% in T1,T2,T3 and T4 respectively. The study utilized a randomized design and the statistics used in analyzing the result in the study were mean+ stem and one way Analysis of variance (ANOVA).

The results of the study showed; Final Weight (FW), Average Daily Feed Intake (ADFI) and Average Daily Weight Gain (ADWG) were significantly different at ( $P < 0.05$ ). The values obtained were 28.84, 35.67, 68.00 and 85.50 respectively for T1,T2,T3 and T4, the highest value was recorded in T4 with value of 85.50 that contained 1.5% of Ripe Banana mixed with Ripe pawpaw (RBPM). Best performance for Feed Conversion Ratio (FCR) was recorded in T4 with 2.80 with Ripe Banana mixed with Ripe pawpaw (RBPM) and the poorest Feed Conversion Ratio was recorded in T3 with 3.31 FPL respectively. Hematological indices were carried out and White blood cell(WBC), Red blood cell(RBC),Hemoglobin (Hb), Mean Corpuscular Volume(MCV),Mean Corpuscular Hemoglobin Concentration (MCHC) were not significantly different among treatment groups( $P > 0.05$ ).

From the results obtained, it is evident that Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) is a good fiber source for formulating diets for production of grower rabbits. It can be included in the diets of rabbit at level of 1.5% with better growth performance and no adverse effect on hematological parameters of grower rabbits. Therefore, an inference can be drawn Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) can be included in the diet of grower rabbits for better growth performance and normal blood parameters.

Based on the results obtained from the research work, it is recommended that:

- i. Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) can be regarded as suitable feed ingredient which can be included without any deleterious effects on Grower Rabbit Diet.
- ii. Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) can be incorporated in grower rabbits diets at level of 1.5% and will be safe and improve growth performance and hematological indices.

- iii. From the results obtained the idea of including Ripe Banana peel mixed with Ripe Pawpaw Meal (RBPM) in Grower Rabbit Diets can be introduced to small-scale rabbit farmer to improve production.

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