GUT MORPHOLOGY AND SENSORY EVALUATION OF GROWING RABBITS FED UREA-MOLASSES TREATED MAIZE COB AS SUBSTITUTE TO WHEAT OFFAL.

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ABSTRACT
The gut morphology and sensory evaluation of thirty growing rabbits weighing about 700-800 gram was evaluated in an 84 days trials. Maize cob was treated with urea-molasses and incorporated at graded levels in the diets of growing rabbits. Six rabbits on weight equalization basis were allotted into five dietary treatments of 0, 25, 50, 75 and 100% urea-molasses treated maize cob substitute for wheat offal. A rabbit each per replicate were sacrificed at the 84th day and their gut morphological characteristics and sensory qualities were evaluated. The result reveals significant ($P< 0.05$) effect of the dietary treatments on gut morphological parameters measured except jejunum apical width. Growing rabbits fed control diet had better ($P<0.05$) duodenal villi height, apical width and basal width than same parameters of other dietary treatments. However, jejunum apical width were not significantly ($p<0.05$) different across all dietary treatments. Meanwhile, all the ileum parameters measured shows significant differences ($p<0.05$) but with an increasing trend on the ileum villi height. Varying dietary treatment did not significantly ($p<0.05$) influence meat juiciness and saltiness but an increasing order of overall flavor was observed across the treatments levels. The results reveals an elongation of the duodenum villi height, apical and basal width, jejunum villi height and basal width as well as lamina depth which implies an enhanced digestion and absorption of nutrients. Therefore, urea-molasses treated maize cob can successfully substitute for wheat offal in rabbit's diets without any impairment on its gut morphology and meat qualities and it is hereby recommended.
Keywords: morphology, maize cob, urea-Molasses, gut, juiciness

INTRODUCTION
The incessant increase in the cost price of wheat offal (Mafimidiwo *et al.,* 2022) as a result of shortage in its supply have had a toll on the geometric hike in livestock feed. Fiber is a major constituent of rabbits diet (Maertens, 1992) without which nutritional defect such as diarrhea, bloat and poor nutrient utilization may be observed in the rabbits and invariably stunted growth or mortality may ensue. The hitherto widely accepted fiber source round most single-stomach livestock is wheat offal. However, wheat offal demand cannot be met by the epileptic production of the few flour mills as a result of the high exchange rate in Nigeria because a bulk of the raw wheat used is imported. The production of adequate protein of animal origin at an affordable price is now almost a mirage in Nigeria. This is sequel to a geometric hike in the price of the available feed resources that can be fed to the livestock for their optimum growth and performance. It has now become expedient for research to be conducted to investigate the possibilities of utilizing the seldom agricultural waste in feeding livestock (Mafimidiwo *et al.*, 2022). Maize cob is the left-over of corn production and about 180kg of cob is yielded per thousand kg of maize (Adrian *et al* 2016). It is often grounded to make litters in poultry because of its high liquid absorbency. It is also used to set up cooking fire in most rural villages of Africa. Lately, maize cob is often fed to ruminant and swine as a fiber source. There is paucity of information on its utilization in rabbit's diets. Rabbit is another great source of animal protein with least hazardous nutritional effect and it is widely un-discriminated against. Therefore, this research investigated the utilization of urea-molasses treated maize cob (UMTMC) as substitute to wheat offal in growing rabbit's diets.

Materials and Methods: The experiment was carried out at the Teaching and Research Farm of Department of Agricultural Technology, Yaba College of Technology, Epe Lagos situated on longitude 6^{o}.25' 0''N and latitude 3^{o}3'0''E (Google Earth, 2023) along Epe-Ijebu-Ode road, Lagos.

Preparation of UMTMC: Maize cobs were collected from corn starch processing factory along Sagamu-Ijebu-Ode express way, Ogun State. They were sundried and milled using 2mm sieve and bagged in air tight sac pending usage. 5litres of water, 2kg weight of crystalline urea and 10kg weight of molasses were mixed together in a plastic bowl before 100kg grounded maize cob were added and

thoroughly mixed together. The brownish mixture was then air-dried for 2 days and later oven-dried at 65^{o}c for 30minutes to obtain the UMTMC (Mafimidiwo, 2018).

Experimental diets and animal Management: Thirty growing rabbits weighing 700-800g were procured from a reputable farm in Ibadan, Oyo State and were brought to the Teaching and Research Farm and allowed to stabilize for 7days. Recommended dosages of basic routine medication (Deworming and Delousing) were applied on them prior to the commencement of the experiment. They were maintained in rabbit hutches with wire mesh and wooden floors raised from concrete. Feeders and drinkers were provided in each of the hutches. The rabbits were allotted into five experimental diets (NRC, 2012) after stabilization on weight equalization basis. Experimental diets and water were offered to the rabbits' ad-libitum throughout the twelve weeks of the feeding trials. The experimental diets had wheat offal replaced at 25, 50, 75 and 100% with Urea-molasses treated maize cob (UMTMC). A wheat offal base diet (100% wheat offal) served as control as shown in Table1.

Table 1. Gross composition of Experimental diets (g/100gDM).

Ingredients (%)	0	25	50	75	100
Maize	40.00	40.00	40.00	40.00	40.00
Soybean meal (SBM)	18.00	18.00	18.00	18.00	18.00
Fish meal	0.50	0.50	0.50	0.50	0.50
Wheat offal	37.00	27.75	18.50	9.25	-
UMTMC	-	9.25	18.50	27.75	37.00
Bone meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.50	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25	0.25
Sodium Chloride	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated Analysis (%)					
Crude Protein	18.21	16.6	16.96	16.92	17.01
Crude Fiber	8.50	5.82	5.63	5.30	5.12
Ash	4.05	3.60	3.15	2.69	2.24ks
Ether Extract	4.62	4.22	3.84	3.42	3.01
Nitrogen Free Extract	35.38	30.24	29.58	28.33	27.38

At the end of the feeding trial, a rabbit per replicate were randomly selected and sacrificed for morphological studies. The gastrointestinal tract were removed and separated into intestinal segment; duodenum, jejunum and ileum. The duodenum was taken distally from the stomach to the end of the pancreatic loop. The jejunum was taken from the distal end of the pancreatic loop to the Meckel's diverticulum while the ileum was taken distally from Meckel's diverticulum to the ileo-caecal junction. They were measured in micrometers (Table 2). In evaluating the sensory qualities, samples of meat was collected, cut into chops and tagged for identification. The samples were placed inside a polythene bag and cooked in water for 30mins at 70^{0}c in a cooking bath. Sensory evaluation of samples of cooked meat were assessed by ten panelist, where some meat qualities such as colour, juiciness, meat flavor, tenderness, taste and overall acceptability were examined. Bite size (10g) portion were served at room temperature to ten panelist who were asked to comment freely on each sample served. For each parameter, the ten panelist awarded scores using a nine hedonic scale (9 = like extremely; 8 = like very much; 7 = like moderately; 6 = like slightly; 5 = neither like nor dislike; 4 = dislike slightly; 3 = dislike moderately; 2 = dislike very much; 1 = dislike extremely (Sanwo *et al*., 2011). The data collected were subjected to one-way analysis of variance (ANOVA) in a completely randomized design (CRD) arrangement. The significance means were separated and compared using SAS (1999) at 5% level of probability.

RESULT AND DISCUSSION:

Gut morphology of growing rabbits fed urea-molasses treated maize cob: Effect of urea-molasses treated maize cob on gut morphology of growing rabbits is presented in Table 2. The result revealed significant ($P<0.05$) effect of dietary treatments on gut morphology parameters measured except on jejunum apical width. Growing rabbits fed control diet had better ($P<0.05$) duodenal villi height than

all other diets. Duodenum apical and basal widths in rabbits fed diet with UMTMC substitution were decreased (P<0.05) than that of the control diet. This could be attributed to the urea added as levels, type of protein and particle size also affect the morphology of the intestine (Brunsgard 1998). Amidst varying substitution levels of UMTMC, rabbits fed diets containing 25% and 50% UMTMC had best (P<0.05) duodenum lamina depths. This increase entails increased digestion and absorption of nutrients (Montagne *et al.*, 2003).

Table 2: Effects of urea-molasses treated maize cob on gut morphology of growing rabbits.

	Levels of substitution with UMTMC (%)					
Parameters	**0**	**25**	**50**	**75**	**100**	
SEM						
Duodenum (µm)						
Villus height	1015.95^{a}	663.80^{d}	668.63^{cd}	694.16^{c}	717.83^{b}	9.03
Apical width	167.49^{a}	65.41^{b}	63.33^{b}	61.65^{b}	56.80^{b}	8.42
Basal width	211.30^{a}	116.67^{b}	113.32^{b}	116.52^{b}	117.99^{b}	8.48
Lamina depth	85.51^{b}	113.73^{a}	118.00^{a}	82.50^{b}	70.86^{b}	8.53
Jejunum (µm)						
Villus height	273.98^{c}	288.45^{bc}	315.59^{b}	318.33^{a}	320.82^{a}	9.02
Apical width	53.80	52.71	57.29	61.13	63.37	8.78
Basal width	113.50^{ab}	94.93^{b}	112.66^{ab}	134.48^{a}	113.37^{ab}	8.00
Lamina depth	63.11^{c}	96.51^{b}	116.15^{a}	112.56^{ab}	133.04^{a}	8.69
Ileum (µm)						
Villus height	284.10^{c}	313.83^{b}	466.25^{a}	483.93^{a}	487.12^{a}	8.21
Apical width	53.55^{b}	64.97^{a}	57.31^{ab}	53.33^{b}	53. 33^{b}	8.27
Basal width	96.25^{b}	137.27^{a}	136.29^{a}	95.75^{b}	95.55^{b}	8.26
Lamina depth	196.96^{a}	166.09^{b}	160.40^{b}	97.08^{c}	118.79^{bc}	8.38

$^{abc:}$ Means in the same row with different superscripts differ significantly (P<0.05)
SEM= Standard Error of Means.

Sensory evaluation of rabbit meat fed urea-molasses treated maize cob: Sensory evaluation of growing rabbit as affected by urea-molasses treated maize cob substitution is shown in Table 3. Varying dietary treatment did not significantly (P>0.05) influence juiciness and saltiness of rabbit meat. Significant difference (P<0.05) in meat color and meaty flavor observed in the rabbits indicates that appearance and taste influences food appreciation by consumers (Egege, 1994). Colour was better (P<0.05) in rabbits fed control diets. The values observed were comparable to the values of 4.40 reported by Akinnusi *et al*, 2007 as human eyes has a remarkable fine qualitative discrimination for colour. Superior (P<0.05) tenderness was obtained in rabbits fed diet substituted with 25% UMTMC. Dalle-Zotte (2002) opined that tenderness and flavor influences consumer's choice.

Table 3: Effect of the urea-molasses treated maize cob on sensory evaluation of rabbit meat (0-12wks)

Levels of substitution (%)						
Parameters (%)	**0**	**25**	**50**	**75**	**100**	
SEM						
Colour	9.00^{a}	8.00^{b}	7.00^{c}	7.33^{c}	6.33^{d}	0.13
Juiciness	7.00	7.33	6.33	6.83	7.33	0.27
Meaty flavor	8.00^{a}	7.33^{c}	7.67^{b}	7.80^{b}	8.00^{a}	0.13
Tenderness	6.33^{b}	7.67^{a}	6.00^{b}	6.67^{b}	6.83^{b}	0.27
Saltiness	7.33	7.00	7.00	7.00	7.00	0.07
Overall flavor	6.33^{b}	7.00^{a}	7. 00^{a}	7.50^{a}	7.80^{a}	0.07
Overall acceptability	8.00^{a}	7.33^{c}	7.60^{b}	7.80^{b}	8.00^{a}	0.07

$^{abc:}$ Means in the same row with different superscripts differ significantly (P<0.05)
SEM= Standard Error of Means.

CONCLUSION AND RECOMMENDATION:

It is imperative that the higher villi height, apical width, basal width and laminal depth observed in the duodenum are indications of better nutrient digestibility which is also revealed in their meat colour, meat flavor and overall acceptability. Therefore, Urea-molasses treated maize cob can therefore replace wheat offal up to 50 % in the diet of growing rabbits and it is hereby recommended.

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