

GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GROWING RABBITS FED DIETS CONTAINING MAGGOT MEAL AS REPLACEMENT FOR SOYBEAN MEAL.

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Abstract

The growth performance and carcass characteristics of growing rabbits fed diet containing maggot meal as replacement for soybean meal was investigated in a 56days feeding trial. Thirty unsexed mixed breeds (New Zealand white x California) rabbits were allotted on weight equalization basis into five dietary treatments where a standard basal diet (soybean meal without maggot meal) served as control (Diet 1) while diets 2, 3, 4 and 5 had soybean meal replaced with maggot meal at 25, 50, 75 and 100% levels respectively. Six rabbits were used per treatment having three replicates of two rabbits each. Feed and water were offered to the rabbits unrestrictedly. Performance parameters were collected weekly and carcass measurement was done at day 56. The growth parameter depicts significant difference ($p \leq 0.05$) in the total feed intake (TFI), daily feed intake (DFI), total weight gain (TWG), daily weight gain (DWG) and feed conversion ratio (FCR). The best FCR was noticed on diet 5. Meanwhile, all carcass parameters except the heart and spleen were significant. The highest value 0.85% of the lungs was observed on diet 4 but this does not depict any detrimental effect of the dietary composition. The highest dressing percentage (71.01%) was observed in treatment 5 while the least 56.06% was seen in the control (diet 1). No mortality was recorded across all the treatments.

Keywords: – Growth performance, carcass characteristics and soya bean meal.

Introduction

The post-Covid 19 pandemic reduction in the number of on-the-farm hands populace is a matter that requires an urgent intervention so as to meet the food requirement of the teeming populace. A major challenge at hand now is how to avert kwashiorkor and marasmus which are the result of in-balance in the human diet (Amaduruonye *et al.*, 2018). The low farm productivity in grains and the recently enacted anti-grazing law in Nigeria have reduced production of large ruminants thereby affecting protein availability for human consumption and this has also shifted farmer's attention to the production of micro-livestock. The earlier pressure on available conventional feedstuff such as soybean had drastically become escalated nowadays (Ebenebe *et al.*, 2018). Soybean which have served as a conventional livestock protein feedstuff is no longer available and or is un-affordable to feed millers (Samuel and Idris, 2021). Soybean meal contains 45-54% crude protein (Baker *et al.*, 2011). The quest for cheaper and available alternative for soybean have necessitated investigation into the use of suitable alternatives such as maggot meal. Maggot meal is made from the larvae of black flies which contains 55% crude protein, 27.65% ether extract, 8.33% ash, 3.37% crude fibre, 2.14 nitrogen free extract, 3955kcal/kg metabolizable energy (Ahmad and Sayed, 2022), gross energy of 20.10Mj/kg with 69% total tract digestibility (TTD), crude protein, 14.08% having 94% TTD, 8.59% crude fiber with 62% TTD and 94% TTD crude fat (Pieterse and Pretorius. 2013.) which made it a potential alternative for soybean meal. Unlike the case of soybean that has trypsin inhibitor, no anti-nutritional factor have hitherto been identified with maggot meal (Makinde, 2015). Maggot meal had been used in fish and poultry diets without any detrimental effect (Hwangbo *et al.*, 2009) but there are paucity of information on its usage in rabbit's diets. The rabbit is a faster source of animal protein because of its short gestation period and for being highly prolific (Mafimidiwo *et al.*, 2022). Rabbits has the ability to feed on 75% forage and as low as 25% concentrate. Rabbit meat is low in cholesterol which had been implicated in arteriosclerosis and other vascular diseases (Fortes *et al.*, 2020). The quest to produce fast, affordable and reliable meat leads to the hypothesis that maggot meal could serve as a replacement for soybean meal in rabbit's diet. Therefore this study investigated the growth performance and carcass characteristics of rabbits fed diets containing varying levels of maggot meal as a replacement for soybean meal.

Materials and methods

Thirty (unsexed) mixed breed (New Zealand x California) rabbits weighing about 750-758 grams were procured from a reliable farm in Ibadan and were acclimatized for seven days at the Teaching and Research Farm of the Department of Agricultural Technology, Yaba College of Technology, Epe

Lagos on latitude 3. 58° E and longitude 6. 47°N (Google Earth, 2022). They were offered feed and water ad-libitum and all pre-experimental medication were strictly adhere to.

The maggot meal and other feed ingredients were procured from a feed processing company at Epe, Lagos. The rabbits were randomly allotted into five experimental diets on weight equalization basis. The diets comprises of a control diet (Diet 1) (soybean based without maggot meal) while diets 2, 3, 4 and had the soybean meal replaced with maggot meal at 25, 50, 75 and 100% levels respectively (NRC, 2012). Six rabbits were used per treatment having three replicates of two rabbits each. The feeding trial was conducted for 56days while feed were offered to the rabbits unrestrictedly.

Data collection and Analysis

Performance parameters were collected weekly and carcass measurement was done at day 56. Initial weight was taken at the commencement of the experiment, total weight gain, final weight, daily feed intake, daily weight gain, feed conversion ratio and mortality records were taken. At the end of the feeding trial, a rabbit per replicate were randomly selected for carcass evaluation. They were fasted for twelve hours before slaughtering. Records of the slaughtered weight, defurred weight, hot carcass weight, eviscerated weight, gastrointestinal tract (GIT), cut parts and internal organs weight were collected. All data collected were subjected to one way analysis of variance and the mean were separated using Duncan multiple range test (Duncan, 1955) and the level of significance was at 5%

Result and Discussion

Table 1: Gross composition of experimental diets (g/100g DM)

Ingredients (Kg)	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Maize	30.00	30.00	30.00	30.00	30.00
Maggot meal	0.00	6.25	12.50	18.75	25.00
Soybean meal	25.00	18.75	12.50	6.25	0.00
Wheat offal	20.00	20.00	20.00	20.00	20.00
Fish (72%)	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00	2.00
Premix	0.05	0.05	0.05	0.05	0.05
Salt (Nacl)	0.35	0.35	0.35	0.35	0.35
Lysine	0.05	0.05	0.05	0.05	0.05
Methionine	0.05	0.05	0.05	0.05	0.05
Molasses	5.00	5.00	5.00	5.00	5.00
Palm Kernel Cake	14.50	14.50	14.50	14.50	14.50
Total	100	100	100	100	100
Calculated analysis					
Metabolizable Energy (kg/kcal)	2538	2553	2570	2584	2596
Crude protein (%)	20.92	20.83	20.74	20.66	20.57
Crude fibre (%)	4.66	4.95	5.27	5.57	5.88

Table 2 showing the Performances of growing rabbit fed diets containing maggot meal as replacement for soybean meal.

Parameters	T1	T2	T3	T4	T5	SEM
Initial weight (g/rabbit)	753.33	751.70	750.00	758.33	756.70	0.22
Final weight (g/rabbit)	1850.00 ^{bc}	1675.00 ^c	1825.00 ^b	1825.00 ^b	1925.00 ^a	0.26
TWG (g/rabbit)	1096.67 ^b	923.30 ^c	1075.00 ^{bc}	1066.67 ^{bc}	1168.30 ^a	1.32
DWG(g/rabbit)	19.58 ^b	16.49 ^c	19.20 ^{bc}	19.05 ^{bc}	20.86 ^a	0.68
DFI (g/rabbit)	56.90 ^a	51.33 ^c	52.29 ^b	51.57 ^c	51.19 ^c	0.33

TFI (g/rabbit)	3185.95 ^a	2874.21 ^{bc}	2928.02 ^b	2887.86 ^{bc}	2866.34 ^c	15.43
FCR	2.91 ^a	3.11 ^a	2.72 ^{ab}	2.71 ^{ab}	2.45 ^b	0.14
Mortality (%)	0	0	0	0	0	0.00

TWG - Total weight gain; DWG – Daily weight gain; TFI – Total feed intake; DFI – Daily feed intake; FCR – Feed conversion ratio

^{abc} Means on the same row with different superscript are significantly different (P<0.05)

SEM: Pooled standard error of mean

Table 3: Carcass characteristics of growing rabbits fed diets containing maggot meal as replacement for Soybean meal

Parameters	Diet 1 (0%)	Diet 2 (25%)	Diet 3 (50%)	Diet 4 (75%)	Diet 5 (100%)	SEM
Average Live weight (g)	1650.00 ^b	1650.00 ^b	1800.00 ^{ab}	1815.00 ^{ab}	1905.00 ^a	9.57
Dressed weight (g)	925.00 ^c	1150.00 ^b	1255.00 ^{ab}	1269.00 ^{ab}	1352.74 ^a	13.02
Dressing (%)	56.06 ^c	69.70 ^b	69.72 ^b	69.92 ^{ab}	71.01 ^a	5.06
Retail cut parts						
Fore Limbs (%)	9.38 ^c	9.68 ^b	10.48 ^a	9.78 ^{ab}	10.45 ^a	2.23
Hind Limb (%)	16.35 ^c	17.42 ^a	16.89 ^b	16.00 ^c	18.07 ^a	0.44
CTR (%)	10.15 ^b	12.27 ^a	12.21 ^a	9.19 ^c	10.89 ^{ab}	1.02
LSR (%)	15.70 ^b	15.86 ^{ab}	15.03 ^c	18.54 ^a	17.11 ^a	0.87
Loin (%)	4.58 ^a	3.84 ^{ab}	3.51 ^{ab}	2.92 ^b	4.43 ^a	0.03
Carcass by-products						
Head (%)	9.73 ^{bc}	5.59 ^c	10.92 ^a	10.32 ^b	11.15 ^a	0.04
Trotters	2.34 ^{bc}	2.17 ^c	2.53 ^b	3.12 ^{ab}	3.28 ^a	0.03
Organ weight						
Total GIT	22.23 ^{ab}	20.97 ^b	19.22 ^c	19.89 ^{bc}	26.38 ^a	1.10
Heart (%)	0.23	0.28	0.21	0.30	0.34	0.02
Lungs (%)	0.74 ^a	0.55 ^b	0.69 ^{ab}	0.85 ^a	0.78 ^a	0.02
Liver/ Gall bladder (%)	2.74 ^c	3.13 ^b	3.14 ^{ab}	3.67 ^{ab}	3.96 ^a	0.03
Spleen (%)	0.07	0.06	0.06	0.05	0.07	0.01

CTR – Cervical Thoracic Region; LSR – Lumbar Sacral Region; GIT - Gastro Intestinal Tract

^{abc} Means on the same row with different superscript are significantly different ($P < 0.05$)

SEM: Pooled standard error of mean

The result of the feeding trial reveals that the replacement of soybean with maggot meal improves the dressed weight and dressing percentage (1352.74 and 71%) respectively as well as positively affecting the DWG, DFI and FCR of the rabbits as the level of replacement increases. This was in contrast with the findings of Awoniyi *et al* (2003) who observed that weight gain, feed consumption and feed efficiency reduces as maggot meal inclusion increases in the diets of broiler chicken. The improved weight gain observed in this work could be ascribed to the possibility of the high gross energy cum total tract digestibility of the nutrients in the maggot meal (Pieterse and Pretorius 2013). However, the increased liver and lungs reported in this work was in tandem with Mafimidiwo *et al* (2022) who observed similar increases in liver and kidney when urea-molasses treated maize cob was used to replace wheat offal in growing rabbit's diets. The higher 3.96% weight of the liver may not necessarily be a result of any detrimental effect of the component of the diet but a response to microbial activities in the gastro-intestinal tract of the rabbits. The zero mortality percentage observed in this work is an indication of no possibility of disease transmission from the maggot meal to the rabbits (Hwangbo *et al.*, 2009).

Conclusion and Recommendation

From the result of this experiment, it could be inferred that the increased metabolizable energy of the diets as maggot meal inclusion increases had influenced the rabbits to meet up with their energy requirement leading to a reduction in their feed intake, while the available protein was then made for tissue accumulation observed as higher daily weight gain and better feed conversion ratio of the rabbits. Therefore, maggot meal can successfully be used to replace soybean meal up to 100% level without any adverse effect on the weight gain, dressing percentage and health of growing rabbits. It is therefore recommended that soybean meal could be substituted with maggot meal in the diet of growing rabbit's diet.

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