EVALUATION OF GRADED LEVELS OF TURMERIC (*curcuma longa*) ON CARCASS CHARACTERISTICS OF RABBIT

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Abstract
This study was conducted to evaluate the effect of Turmeric on carcass characteristics of weaner rabbits. Thirty two (8 weeks old) weaner rabbits with weight range of 600-800g was used for the study and were randomly assigned into 4 dietary groups containing 0, 0.5, 1.0 and 1.5% turmeric inclusion levels with each treatment having 4 replicates of 2 rabbits. Data were collected on live weight, eviscerated, dressed, major cuts and organs, and analysed using ANOVA while significant means were separated using Duncan's Multiple Range Test. Result showed rabbit on 1.5% level of turmeric inclusion had highest (P<0.05) dressing percentage. Highest (P<0.05) relative head weight (9.62%) and neck weight (4.19%) of the rabbits were obtained with control. Highest (P<0.05) hind limb (17.47%) and breast weight (7.28%) were obtained with rabbit on 1.5% turmeric supplement while highest (P<0.05) fore limb muscle (10.42%) was recorded with rabbit fed diet supplemented with 1.0% turmeric. Similarly, highest (P<0.05) back (9.62%) and loin (13.91%) weight was recorded with rabbit on 1.0% dietary inclusion. Liver and kidney weight varied (p<0.05) with turmeric inclusions with rabbit on 1.0% turmeric having highest liver (3.0%) and kidney (0.72%) weight. Rabbit diet could be supplemented with 1.0% turmeric for maximum returns of saleable parts.

Keywords: rabbit, turmeric, carcass

Introduction

One of the cheapest sources of protein which had been neglected in Nigeria is the rabbit. Rabbit meat is high in protein, (about 22%), low in fat, (4%) and cholesterol, (5%) and thus possesses health promoting qualities (Aduku and Olukosi, 1990). Rabbit meat is recommended by nutritionists to be consumed over other meats because of its valued nutritional properties, protein of high biological value, low cholesterol, lean carcass and high linolenic acid composition (Nistor *et al.*, 2013). The meat is thus recommended for people living with heart disease and diabetes (Lebas *et al.*, 1986). Nistor *et al.*, (2013) reported that rabbit meat is richer in calcium (21.4 mg/100g) and phosphorus (347 mg/100 g) than other types of meat. Rabbit meat can be evaluated for its carcass quality as to other livestock and this has to satisfy economic objectives such as saleable meat yield and attractiveness to consumer (Dalle and Zote, 2002). The dressing percentage is a very economic variable in the rabbit market. Some combinations of measurement such as retail cut weight or length measurement are necessary to predict lean percentage in the carcass. Moreover, commercial cutting techniques are easier to carry out than the determination of total lean content in the carcass (Fernandez and Fragas, 1996). Information on carcass characteristics is therefore helpful for the effective utilization of rabbit meat. Carcass and meat quality changes markedly with the animal's age and slaughter weight. Curcumin, the active component of turmeric *(Curcuma longa)* is a perennial herb and a member of the ginger family, Zingaberaceae. It has several pharmacological effects including antifungal (Wuthi-udomier *et al.*,2000) and anti-oxidative (Osawa *et al.*,1995). Curcumin reduces the activities of reactive oxygen species and elevate the antioxidant enzyme; superoxide dismutase, catalase and glutathione peroxidase levels in the blood (Joe and Lokesh, 1994). Laboratory studies also reveal that Curcumin induces programmed cell death of colon cancer cell and it also suppresses micro-inflammation in the gastro-intestinal tract associated with inflammatory bowel diseases. Moreover, Soni *et al.*, (1997) proved the protective effect of *Curcuma longa* food additives on aflatoxin-induced mutagenicity and hepatocarcinogenicity. However, as the demand for safe and qualitative meat in the market is considerably increasing nowadays, the producers are eager to use natural and safe non-chemical forage supplements such as turmeric, which positively affect animal health, increase their productivity and improve quantity as well as the quality of the products. Hence the need for suitable feed additive to be incorporated into livestock feed has arisen.

Materials and methods

The study was conducted at the Rabbitary unit of Federal College of Agriculture Livestock Farm, Ibadan while the carcass analysis was carried out at the meat quality laboratory of the Department of Animal Production and Health of Federal University of Agriculture, Abeokuta. Thirty two (8 weeks old) weaner rabbits with were used for the study and were randomly assigned into 4 dietary groups designated A, B, C and D in a completely randomized design (CRD) with each treatment having 4 replicates of 2 rabbits each. Treatment A without turmeric was the control while treatment B C and D contained 0.5, 1 and 1.5% levels of turmeric inclusion respectively. Before stocking, the rabbits were checked for any infection. The hutches were cleaned and disinfected thoroughly and the animals were treated against endo and ecto parasites. Fresh Feed and water was supplied *ad libitum* daily while all other routine management practices were observed. The experimental rabbits were maintained with commercial grower mash containing 18% Crude Protein (CP) and 2500 Kcal/kg Metabolizable Energy (ME) while Turmeric powder was added at different graded levels as treated diet.

Three rabbits per treatment whose weights are close to the average of the rabbits were weighed and slaughtered, and the carcasses were obtained and dissected in accordance with the norms of the World Rabbit Science Association (WRSA) (Blasco & Ouhayoun 1993). The rabbits were weighed to determine the hot carcass weight after which the internal organs were removed, chilled and weighed to determine the chilled carcass weight. The dressing out percentage (Eviscerated carcass weight/live weight) was calculated. The head, liver, kidneys, and thoracic viscera were removed and weighed to obtain the reference carcass weight.

Data collected were subjected to analysis of variance by a Completely Randomized model (Gill 1978), using one way ANOVA. Significant means was separated at ($P<0.05$) using Duncan Multiple Range Test as contained in SAS (2000).

Results and Discussion

The results of effect of graded levels of turmeric (*curcuma longa*) on the carcass traits, major cuts and organs of rabbit is shown in Table 1 and 2. The results showed that carcass characteristics evaluated were significantly ($p<0.05$) influenced by the dietary treatments. The live-weight and eviscerated weight were highest in rabbits fed diet supplemented with 1.5% turmeric inclusion. This result was not unexpected since the average daily weight gain of rabbit in this treatment was comparatively higher than those in the other dietary group. There was significant difference ($P<.0.05$) in live weight with rabbits supplemented with 1.5% and 1.0% turmeric having the highest live weight (1631g and 1579g). Highest bled weight (1535g and 1595g) was recorded at 1.0% and 1.5% while rabbit on 0.5% had the least bled weight (1350.50g). Highest sieging weight (1550.00g) eviscerated weight (1146.65g) and dressing out % (70.23%) was also recorded at 1.5% turmeric inclusion and the lowest (1320.00g, 908.90g and 65.29%) was recorded at 0.5% respectively. The significant increase in weight gain, final live weight, eviscerated weight and dressing percentage in accordance with increase in turmeric inclusion could be due to optimum antioxidant level of Turmeric (*Curcuma longa)* which aid protein synthesis in the rabbit. This result was in agreement with findings of Osawa *et al.*, (1995) who reported that antioxidant activity of turmeric promotes growth and increase weight gain.

The cut parts (fore limbs, hind limbs, loin, neck and head) varied ($P<0.05$) across the treatments (Table 2). There was significant difference ($p<0.05$) on head and neck weight of rabbits, however highest head (9.62%) and neck (4.19%) weight was recorded with rabbit on treatment A. The highest fore limbs (10.42%), loin weight (13.91%) and back weight (9.62g) was recorded in rabbits in treatment C while the highest breast (7.28%) and hind limb (17.47%) weight was recorded in animals on treatment D. These values were higher than the result reported by Elamin *et al.* (2012), Ekpo *et al.* (2009).

Ouhayoun (1999) reported that allometric coefficient of each organ of the rabbit varied during growth and usually decreases with the exception of adipose tissue and the skin. The values obtained for visceral organs varied ($p<0.05$) with turmeric inclusion with bucks on treatment C having highest ($p<0.05$) liver (3.08%) and kidney (0.72%) weight while bucks on D recorded lowest liver (2.39%) and B the least kidney weight (0.51%).However, heart, lungs and spleen of did not show any significant difference ($p>0.05$). The results of cut-off parts and organs obtained did not follow a definite pattern that can be attributed to treatment effect and it supports the report of Onu (2010) who stated that the addition of turmeric did not affect the development of certain body organs. The observed organ weight in this study was greater than the weight previously reported by Pascual and Pla (2007), which is likely because these researchers studied younger and

Table 1: Effect of Turmeric inclusion on carcass trait of Rabbit

	Inclusion Level of Turmeric %			
Parameters	0	0.5	1.0	1.5
Live weight	1449.00±1.15^{b}	1392.00±10.39^{b}	1579.50±44.18^{a}	1631.00±35.79^{a}
Bled weight	1414.50±4.33^{b}	1350.50±6.06^{b}	1535.50±43.01^{a}	1595.50±31.47^{a}
Sieging weight	1370.00±5.77^{b}	1320.00±11.55^{b}	1500.00±46.19^{a}	1550.00±40.41^{a}
Eviscerated weight	987.05±5.80^{b}	908.90±9.41^{a}	1090.70±15.93^{a}	1146.65±50.43^{a}
Dressing %	67.91±0.57^{ab}	65.29±0.19^{b}	69.11±0.92^{a}	70.23±1.55^{a}

Table 2: Effect of Turmeric inclusion on Major cuts (Cut parts) of Rabbit

Inclusion Level of Turmeric %				
Parameters	0	0.5	1.0	1.5
Cut Part (%)				
Head	9.62±0.08^{a}	8.84±0.09^{bc}	9.45±0.41^{ab}	8.58±0.15^{c}
Fore limb	8.92±0.01^{b}	9.14±0.20^{b}	10.42±0.11^{a}	10.04±0.15^{a}
Hind limb	15.55±0.14^{b}	16.51±0.18^{ab}	16.82±0.68^{a}	17.47±0.18^{a}
Breast	6.81±0.31^{ab}	6.03±0.09^{ab}	5.21±0.52^{b}	7.28±0.73^{a}
Neck	4.19±0.05^{a}	3.50±0.23^{b}	3.26±0.16^{b}	3.45±0.24^{b}
Tail	0.37±0.00	0.48±0.03	0.42±0.00	0.47±0.08
Back	8.75±0.09^{b}	8.82±0.13^{ab}	9.62±0.28^{a}	9.39±0.38^{ab}
Loin	13.70±0.17^{a}	11.98±0.05^{b}	13.91±0.38^{a}	13.50±0.71^{a}
Organ (%)				
Liver	2.93±0.11^{ab}	2.99±0.18^{a}	3.08±0.12^{a}	2.39±0.24^{b}
Kidney	0.67±0.03^{ab}	0.51±0.02^{c}	0.72±0.00^{a}	0.61±0.02^{b}
Heart	0.24±0.01	0.23±0.00	0.24±0.01	0.24±0.01
Lungs	0.57±0.02	0.58±0.02	0.59±0.01	0.57±0.02
Spleen	0.06±0.00	0.08±0.01	0.05±0.00	0.06±0.00

abc: means in the same row by factor with different superscripts differ significantly ($p<0.05$)

lighter rabbits, and age is known to affect the development of specific tissues and organs (Ouhayoun 1999).

Conclusion

The study revealed that positive relationship did exist between increase in turmeric inclusion and carcass characteristics of rabbit therefore 1.0% turmeric powder could be included in rabbit production for excellent carcass and organs yield.

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