EFFECT OF *FICUS EXASPERATA* AS FEED ON MEAT QUALITY OF RABBITS

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ABSTRACT
Edge row plants are common trees used as wind breakers in homesteads and farms. In recent times, their uses have been reported as feed for ruminants. However, the use of these plants has not been properly reported for rabbits. Therefore, this study was carried out to investigate the effect of Ficus exasperata as an additive on the quality of rabbits' meats. All groups were fed on basal diet with T_1, T_2, T_3, and T_4 supplemented with 0, 3, 6, and 9 % levels of F. exasperata leaf meal respectively in a completely randomized design. A total of 36 rabbits (707.5±0.20 g) were used for the study which lasted 12 weeks. A total of 12 rabbits, one from each replicate was slaughtered and the biceps femoris muscle was excised for proximate and meat quality assessment. Results revealed a significant ($P<0.05$) influence of F. exasperata in the ash, fat, and crude protein contents of the meat. Mineral and protein was highest with supplementation of the leaf meal while a corresponding reduction in fat was observed across the treatments. Although meat pH was not significantly ($P>0.05$) affected by F. exasperata, water holding capacity as well as cooking loss in the meat were significantly ($P<0.05$) better in groups receiving different supplemental levels of F. exasperata. Juiciness and overall acceptability of the meat were influenced significantly ($P<0.05$) by the additive. It was concluded that up to 9 % of Ficus exasperata can be added to the diets of rabbits for improved meat quality.
Keywords: *Biceps femoris*, Bioactive compounds, Meat processing, Proximate, Sand paper tree

INTRODUCTION
Rabbits are renowned for their significance in providing high-quality, lean meat with favourable nutritional attributes, making them a valuable protein source in many parts of the world (Okon *et al.,* 2022). As global demand for nutritious and superior-quality protein sources continues to rise, optimizing rabbit husbandry practices to enhance meat quality has become pivotal in alleviating poverty in farm families, especially those in Nigeria and other developing countries (Christopher *et al*., 2023). The meat quality attributes of rabbits encompass multifaceted characteristics such as color, pH, drip loss, cooking loss, texture, and chemical composition. These attributes not only influence consumer preferences but also signify the nutritional value, tenderness, and overall palatability of rabbit meat (Okon *et al*., 2023a). The utilization of unconventional feed additives such as phytogenic has been in existence for decades. Different biological properties have been attributed to these plants, including antioxidative (Okon *et al.,* 2023b), antimicrobial (Essien *et al.,* 2022a), antilipidemic (Ekpo and Okon 2022, Ekpo and Okon, 2023) properties, and as growth promoters (Nuamah *et al*., 2019) etc. Among these plants' source of additives, *Ficus exasperata*, commonly known as the African sandpaper tree, holds immense potential. The leaf extract of *F. exasperata* has been reported to have many medicinal values, in treating diseases such as high blood pressure, rheumatism, bleeding, and wounds. The roots and leaves are utilized in the treatment of asthma, ulcers, diabetes, fungal infections, and venereal diseases (Sonibare *et al*., 2006). The lipid-lowering ability, antiarthritic and antioxidant properties of the leaves have been well documented (Abotsi *et al*., 2010). The leaves of *F. exasperata* provide nutrients including protein (about 18.39 %), calcium, iron, etc. (Hernandez *et al.*, 2004; Obour *et al.,* 2017). Despite these properties, there exists a significant research gap concerning its influence on the meat quality attributes of rabbits. In this study, we hypothesized that *Ficus exasperata* supplementation could improve the proximate composition and sensory properties of rabbits' meat. This study, therefore, aims to investigate the effect of incorporating *Ficus exasperata* as a feed additive on the meat quality attributes of rabbits.

MATERIALS AND METHODS

Study location, animals, design, and diets

The study was carried out at the Animal Products Laboratory, Department of Animal Science, Akwa Ibom State University, Obio Akpa Campus. The area is situated between latitude 4°30'N and 5°00'N and longitude 7°30'E and 8°00'E (Wikipedia, 2022). A total of 36 New Zealand White x Palomino crossbred weaned rabbits (6 weeks old, average weight of 707.5±0.20 g) were allotted to 4 experimental groups in a completely randomized design. Three rabbits made up each replicate amounting to nine rabbits per treatment. All rabbits were housed individually and raised on a basal diet with those in treatment groups T_2, T_3, and T_4 supplemented with 3, 6, and 9 % of *Ficus exasperata* leaf meal respectively for 12 weeks. The basal diet was formulated according to the National Research Council (NRC, 1977) recommendations to meet or exceed the nutritional requirements.

Carcass and meat quality assessment

At the end of the experiment, three rabbits were selected from each of the treatments for slaughter. Upon slaughtering, skinning was carried out according to the method described by Ekpo *et al*. (2022), and the *biceps femoris* muscle was immediately removed for meat quality assessment. Proximate analysis was carried out according to the method described by AOAC (2015). The pH of the meat samples was measured using a digital pH meter (MP230, Mettler Toledo, Switzerland) (Sanwo *et al.*, 2020). A sample of 50 g of the *biceps femoris* from each replicate was weighed, wrapped in separate air-tight polythene nylon, and cooked in a water bath for 15 minutes at a temperature of 70°C (Sanwo *et al*., 2020). Residual moisture was removed from each of the meat samples after cooking and were allowed to cool to room temperature. The meat samples were reweighed and cooking loss was calculated using the formula:

$$\text{Cooking loss (\%)} = \frac{\text{weight of sample before cooking (g)} - \text{weight of sample after cooking (g)}}{\text{weight of sample before cooking (g)}} \times 100$$

A 12-man panel comprising of students and staff served as panelist for sensory evaluation. The parameters assessed include colour, tenderness, juiciness, flavour, and overall acceptability using a nine-point hedonic scale of 1 = dislike extremely to 9 = like extremely as outlined by Ekpo *et al*. (2022).

Data analysis

Data collected were subjected to one-way analysis of variance (ANOVA) using SPSS version 20.0 for Windows. The differences among various groups were examined with Duncan's multiple comparisons range test at a 95% confidence interval (Duncan, 1955).

RESULTS AND DISCUSSION

Table 1 presents proximate composition and meat quality attributes of meats from rabbits fed *Ficus exasperata* as a feed additive. Notably, the proximate composition showed significant differences ($P<0.05$) in ash, fat, and crude protein contents. Ash content was observed to be higher ($P<0.05$) in the meat of rabbits supplemented with *Ficus exasperata* leaf meal but lower in the control group. This may be attributed to the high mineral content in the plant. Studies by Obour *et al.* (2017) highlight the rich nutrient profile of *Ficus exasperata* and the current study agrees with this posits. Likewise, the crude protein content of rabbit meat increased ($P<0.05$) across treatments with the highest value recorded for T_4 group. This may be attributed to the high protein content of the plant. Studies by Hernandez *et al*. (2004) and Obour *et al.* (2017) have reported that the *Ficus exasperata* provides good-quality protein. This protein, upon utilization by the animal, must have gone far in building and depositing more protein in the muscle. Fat on the other hand was observed to reduce with increasing levels of *Ficus exasperata* supplementation. This observation could be a result of the bioactive compounds present in *Ficus exasperate,* which may have influenced the observed lowering of the fatty content present in the meat of the rabbits. *Ficus exasperate* according to Abotsi *et al.* (2010), is well-documented for its lipid-lowering ability. The current findings agree with the findings of Essien

et al. (2022b), Ekpo and Okon (2022), and Okon *et al*. (2023c) in broiler chickens, pigs, and rabbits respectively. In addition, the pH of the meat was not affected (P>0.05) by *Ficus exasperate* supplementation. According to Jang *et al.* (2007), meat is considered to have a very good quality at a pH of 6.2 and becomes uneatable at a pH above 6.7. In this study, the pH values fell within the range where meat is considered to be of good quality, indicating the cessation of glycolysis and the onset of rigor mortis. Significant (P<0.05) differences were however observed in the water-holding capacity and cooking loss of rabbit meat. Rabbits in the T_4 group recorded the highest WHC value while the control recorded the least which may be attributed to the binding properties of the bioactive compounds in the *Ficus exasperata*. This result agrees with Kyakma *et al*. (2022) in broiler chickens. Cooking loss was observed to decrease across treatment while the control group recorded the highest value. This may be attributed to the nutrient and bioactive component of the leaf meal which enabled the meat to retain water during processing. This agrees with the findings of Kolodzej-Skalaska *et al*. (2011) who fed curry extracts to broiler chickens. The result of the sensory evaluation of meat from rabbits fed *Ficus exasperata* as an additive is presented in Table 2. The results revealed that supplementing *Ficus exasperata* to the basal diets of rabbits had no detrimental impacts (P>0.05) on the colour, flavour, and tenderness of the meat. Nevertheless, juiciness and overall acceptability were positively influenced (P<0.05) by the additive. The meats from rabbits in groups supplemented with *Ficus exasperata* were seen to record higher values for juiciness and overall acceptability. These observations may be attributed to the moisture retained in the meat during processing for rabbits fed the additive, hence leading to a heightened overall acceptability. This result agrees with Waskar *et al*. (2011) who reported improved juiciness and overall acceptability of broiler chickens supplemented with herbs in their diets.

Table 1: *Ficus exasperata* additive on Proximate composition and quality of meat from rabbit

Parameters	T_1 (0% FELM)	T_2 (3% FELM)	T_3 (6% FELM)	T_4 (9% FELM)	SEM
Moisture	71.89	72.22	72.29	71.39	0.43
Ash	5.59^{b}	6.37^{a}	6.63^{a}	6.82^{a}	0.16
Fat	3.69^{a}	3.33^{a}	2.69^{b}	2.27^{b}	0.18
Crude protein	18.85^{c}	19.63^{bc}	20.57^{b}	22.28^{a}	0.42
Carbohydrate	12.84	12.34	12.73	13.15	0.28
pH	6.07	6.09	5.93	6.05	0.05
Water holding capacity	60.41^{b}	61.90^{ab}	62.07^{ab}	63.57^{a}	0.45
Cooking loss (%)	24.21^{a}	20.64^{ab}	18.58^{b}	18.48^{b}	0.98

abc Means across treatments bearing different letter superscripts are significantly different (P<0.05).
FELM = *Ficus exasperata* leaf meal

Table 2: Sensory evaluation of meat from rabbits fed *Ficus exasperata* as an additive

Parameters	T_1 (0% FELM)	T_2 (3% FELM)	T_3 (6% FELM)	T_4 (9% FELM)	SEM
Colour	6.24	6.45	6.40	6.13	0.10
Flavour	6.60	6.47	6.70	6.63	0.07
Tenderness	6.20	6.20	6.33	6.43	0.08
Juiciness	6.43^{b}	6.73^{ab}	6.93^{a}	7.07^{a}	0.09
Overall acceptability	7.35^{b}	7.41^{b}	7.78^{ab}	8.63^{a}	0.19

ab Means across treatments bearing different letter superscripts are significantly different (P<0.05).
FELM = *Ficus exasperata* leaf meal

CONCLUSION

The study showed that up to 9 % of *Ficus exasperata* can be added to rabbit diets for improved meat quality.

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