ENHANCING RABBIT PERFORMANCE AND CARCASS TRAITS: EXPLORING *FICUS EXASPERATA* AS A POTENT FEED ADDITIVE

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ABSTRACT
This study aimed to investigate the effect of Ficus exasperata as an additive on the performance and carcass traits of rabbits. A total of 36 mixed-breed rabbits were randomly distributed among four treatment groups, with each group comprising nine rabbits. Further, each group was replicated three times, with three rabbits constituting a replicate. Rabbits in Treatment 1 were fed a basal diet without any additive, while those in T2, T3, and T4 group received F. exasperata leaf meal at 3, 6, and 9 %, respectively. Results indicated that the inclusion of F. exasperata leaf meal in the diet significantly (P<0.05) affected both feed intake and weight gain of the rabbits. Rabbits in T4 group displayed the lowest (P<0.05) feed conversion ratio. As F. exasperata addition increased in the diet, there was a marked improvement (P<0.05) in carcass traits, signifying the animals' enhanced feed utilization. This study suggests that inclusion levels of up to 9 % can be fed to rabbits without adverse effects on the performance or carcass traits.
Keywords: Carcass, Essential nutrients, Feed additives, Feed utilization, Phytochemicals

INTRODUCTION

Rabbits serve as an important protein source for human consumption, not only in Nigeria but also worldwide. Their production in tropical regions holds great promise in bolstering food security, alleviating poverty among farming communities, and addressing the increasing need for high-quality protein-rich foods (Christopher *et al*., 2023). Rabbits exhibit high prolificacy, reaching puberty early and boasting a relatively short gestation period, typically around 29-30 days. Their ability to thrive on forages alone contributes to cost-effective production (Okon *et al*., 2023a). Similar to poultry and other livestock, the maintenance of rabbits relies on their consumption and efficient utilization of feed (Essien *et al*., 2022a). In recent times, there has been increasing interest in exploring alternative feed additives to enhance the nutritional quality of rabbit diets (Essien *et al*., 2022b, Essien *et al*., 2023). Among these additives, *Ficus exasperata*, commonly known as the African sandpaper tree, stands out for its potential to improve rabbit farming outcomes. This plant harbors diverse bioactive compounds, including polyphenols, flavonoids, and essential nutrients, making it a promising option (Bello *et al*., 2014). The leaves of *Ficus exasperata* have been recognized for their medicinal properties, such as treating ulcers, diabetes, fungal infections, and reducing lipid levels, as documented by Sonibare *et al.* (2006). The complex interaction of these bioactive compounds hints at potential advantages for animal health, growth, and the quality of carcasses. Nevertheless, despite its historical use, scientific knowledge is scarce regarding how integrating the plant into the rabbit diet affects their performance and carcass composition. Hence, the rationale for conducting this study.

MATERIALS AND METHODS

Study location

The study was conducted at the Department of Animal Science Teaching and Research Farm, Akwa Ibom State University, Obio Akpa Campus. The farm is situated between latitude 4°30'N and 5°00'N and longitude 7°30'E and 8°00'E (Wikipedia, 2022).

Sourcing and preparation of tested material

Fresh leaves of *Ficus exasperata* were harvested from the neighboring plantations surrounding the University. These leaves were washed using clean water before being sun-dried for four days. Once dried, the leaves were ground and introduced as an additive into the rabbit feed. Four distinct experimental diets were prepared. The control diet (T_1) did not contain any leaf meal while T_2, T_3, and T_4 comprised *Ficus exasperata* leaf meal at 3, 6, and 9 %, respectively. The basal diet was formulated to meet the nutritional requirements as recommended by National Research Council (NRC, 1977).

Experimental animals, Management and design

A total of 36 New Zealand White x Palomino crossbred rabbits aged 6 weeks were used for a 12-week study. The rabbits were acquired from a reputable farm in Uyo, Akwa Ibom State. They were weighed and randomly assigned to four treatments, each comprising of of 9 rabbits (4 males and 4 females) each in a randomized complete block design. The treatments were replicated three times with three rabbits per replicate. The animals were housed individually in a 3-tier hutch system and allowed to acclimatized for two weeks in the experimental environment before introducing the treatment diets. The feed and water were offered *ad libitum*. The rabbits were weighed at the beginning of the study and weekly thereafter.

Data collection

Growth Performance

Data were collected on feed intake and weight gain. Live weight gain was calculated as the difference between the previous weight and weights recorded in the following week. Feed intake was calculated as the difference between feed offered and spilled/leftover feed. The ratio of feed intake to weight gain was taken as the feed conversion ratio as described by Nuamah *et al*. (2019).

Carcass evaluation

On the 84th day, a total of 12 rabbits, (three per treatment) were fasted for 12 hours, stunned, exsanguinated, and allowed to bleed completely. Skinning was carried out according to the method described by Ekpo *et al*. (2022). Dressed weight, primal cuts and internal organs weights were taken accordingly as described by Okon *et al*. (2023b).

Data analysis

Data collected were subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980) and mean separation was indicated using Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Table 1 presents the impact of incorporating *Ficus exasperata* feed additive on the performance of the rabbits. significant differences ($P<0.05$) were observed in final weight, total weight gain, average daily weight gain, and average daily feed intake. The T_4 group exhibited the highest values (1988.51 g, 746.57 g, 11.42 g, 127.65 g) across all evaluated parameters (final weight, total weight gain, average daily weight gain and average daily feed intake) respectively, whereas the T_1 group showed the lowest values (1789.43 g, 632.87 g, 9.12 g, 103.86 g). The elevated weight gain and feed intake observed across the treatments could potentially be attributed to the influence of bioactive compounds, notably flavonoids, present in the plant. These compounds might have enhanced taste and stimulated the animals' appetite, contributing to the increased feed intake as shown in the Table 1, thus, the increase in weight gain observed. This aligns with the findings of Okon *et al*. (2022) in rabbits, Ekpo and Okon (2022) and Ekpo and Okon (2023) in pigs, both fed phytogenic feed additives. Reports indicate that bioactive compounds found in leaves can enhance livestock performance by improving nutrient digestion, absorption, and utilization (Essien *et al.*, 2023).

Table 1: Performance of rabbits fed *Ficus exasperata* as an additive

Parameters	T_1 (0%)	T_2 (3%)	T_3 (6%)	T_4 (9%)	SEM
Initial weight (g)	707.00	707.00	708.00	708.00	0.20
Final weight (g)	1789.43^{d}	1814.80^{c}	1895.48^{b}	1988.51^{a}	23.49
Total weight gain (g)	632.87^{d}	675.78^{c}	712.09^{b}	746.57^{a}	12.91
Average daily weight gain (g)	9.12^{c}	9.19^{c}	10.58^{b}	11.42^{a}	0.26
Average daily feed intake (g)	103.86^{d}	111.08^{c}	119.30^{b}	127.65^{a}	2.69
Feed conversion ratio	11.39^{b}	12.09^{a}	11.28^{c}	11.18^{d}	0.11

abcd Means in the same row bearing different letter superscripts are significantly different ($P<0.05$).

The feed conversion ratio showed significant differences, with rabbits in the T_4 group displaying the lowest value (11.18) and those in the T_2 group exhibiting the highest (12.09). The decreased feed conversion ratio implies that as the inclusion levels of leaf meal increased, the animals were more efficient in converting feed into muscle. This finding supports the report by Okon *et al*. (2023c), highlighting that integrating plant-based additives into livestock diets can enhance their feed conversion ratio. However, these results contrast with the findings of Benante *et al*. (2020), who

observed decreased performance in quails with increased *F. exasperata* leaf meal in their diets. Rabbits, known for their proficiency in utilizing fibrous feed, might have contributed the favourable performance showcased in this study.

Table 2 presents the carcass traits of rabbits fed *Ficus exasperata* as an additive. The results revealed significant differences (P<0.05) in live and dressed weights, dressing percentage, and major cuts (such as hindleg, loin, and thoracic cage) among the different treatment groups. It was observed that as the inclusion of *F. exasperata* increased, carcass yield of the rabbits improved in each treatment group. Additionally, the increased feed intake among rabbits fed *F. exasperata* likely contributed to improved carcass traits. The findings align with Oko and Etukudo (2011) who observed a significant (P<0.05) improvement in the carcass characteristics of broiler chickens when fed single-leafy spice. It goes further to support Ekpo *et al*. (2020) in weaned pigs. The result of this study further substantiates the assertion of Essien *et al*. (2022) regarding the relationship between carcass yield, feed quality and utilization in monogastric animals. Values for the internal organs of the rabbits showed no significant differences (P>0.05) across treatments, indicating that the *F. exasperata* additive had no adverse effects on the rabbits' organs (Okon *et al*., 2022).

Table 2: Carcass traits of rabbits fed *Ficus exasperata* as an additive

Parameters	T_1 (0 %)	T_2 (3 %)	T_3 (6 %)	T_4 (9 %)	SEM
Live weight (g)	1753.50^{d}	1803.25^{c}	1885.00^{b}	1975.50^{a}	25.41
Dressed weight (g)	1539.65^{d}	1618.00^{c}	1683.85^{b}	1810.15^{a}	29.89
Dressing %	87.80^{b}	89.73^{b}	89.33^{b}	91.63^{a}	0.49
Hindleg	248.25^{d}	267.33^{c}	273.20^{b}	285.10^{a}	4.02
Foreleg	160.18	163.38	166.15	172.39	4.02
Loin	241.33^{d}	258.67^{c}	268.33^{b}	280.00^{a}	4.27
Neck	122.33	129.00	128.33	131.00	1.74
Thoracic cage	208.00^{d}	218.33^{c}	234.00^{b}	241.67^{a}	3.97
Heart	4.00	4.00	4.00	4.00	0.14
Liver	37.00	37.00	36.00	36.00	0.15
Kidney	8.00	8.00	8.00	8.00	0.15

abcd Means in the same row bearing different letter superscripts are significantly different (P<0.05).

CONCLUSION AND RECOMMENDATION

Ficus exasperata improved the performance and carcass traits of rabbits in this study. It presents itself as a viable feed additive and can be used up to 9 % in the feeding of rabbits without any adverse effect. However, further investigation is necessary to determine the threshold at which *F. exasperata* might negatively impact rabbits.

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