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Evaluation of Carcass Quality of Growing Rabbits (Oryctolagus cunniculus) Fed Soybean (*Glycine max*), Cowpea (*Vigna unguiculata*) and Pigeon Pea (*Cajanus cajan*)

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Abstract:

Rabbit responses to Pigeon pea (PP), Cowpea (CoP) and Soybean (SB) as sources of protein for growing rabbits were determined. Flemish Giant (FG), California Black (CB) and New Zealand White (NZW)) were fed Soybean (Glycine max), Pigeon pea (Cajunus cajan) and Cowpea (Vigna unguiculata) as protein sources in the ration. Eighteen rabbits weaned at six weeks of age were used for each breed (a total of 54 rabbits) out of which six of them were assigned to Ration 1 (containing 31.6 % sSoybean), six rabbits to ration 2 (containing 72 % Cowpea) and the last six to Ration 3 (containing 70.18 % Pigeon pea). The rabbits were randomly assigned to fifty four cages in a 3 x 3 factorial experiment. The three legume grains were roasted before rations were compounded. Raw Legume Grains (RaLG), Roasted Legume Grains(RoLG) and the three Rations (1, 2 and 3) were analyzed for tannin content (TC). TC was significantly ($p<0.05$) higher in CoP and Ration 3. Average daily feed intake (ADFI) was significantly ($p<0.05$) higher for FG. Rabbits fed SB based ration had significantly ($p<0.05$) higher growth rate than rabbits fed either CoP or PP based rations. Rabbits offered PP based ration demonstrated a significantly ($p<0.05$) higher growth rate than rabbits consuming the CoP based ration. Dressing-out percentage was

significantly ($p<0.05$) higher for the FG than for either NZW or CB. The study revealed that SB and FG were superior legume and breed, respectively in terms of carcass quality.

Key words: Rabbit; Legume grains; Tannin content; Feed intake; Weight gain; Dressing-out

Introduction

Grain legumes (except for Soybeans) are potential sources of energy and amino acids for rabbits, but their use is still limited because of uncertainty about the amount and effect of any anti-nutritional factors (ANF) that they may contain. The most commonly found ANF in legumes are protease (trypsin and chymotrypsin) inhibitors, tannins, lectins, amylase inhibitors, glycosides, phytate and alkaloids. An increasing human demand for protein in developing countries and a relatively high cost of imported ingredients has turned the attention of animal nutritionists to the exploitation of non-conventional ingredients and by-products which these regions have in abundance. Other grain legumes are potential substitutes for Soybean meal because of the similarity of their amino acid profiles. Other legume grains could totally replace Soybean meal without adversely affecting weight gain provided suitable processing methods are established. The ingredients included will vary between countries and between districts within countries depending on the potential availability of the ingredients for particular livestock species. Traditionally, maize and Soybean are used as primary ingredients in most countries. However, the potential of other legume grains in rabbit rations has not been investigated and little is known about their effectiveness relative to Soybeans (Cheeke 1987). McNitt (2000) reported that many problems still remain unsolved in rabbit meat production and less information is available on optimal feeding, breeding, disease prevention and management systems. Concentrates especially of leguminous origin are high in crude protein and gross energy when compared to non-legume forages such as *Bidens pilosa* and *pennisetum purpureum* which are commonly fed to rabbits (Fielding 1991).

Natural feed stuffs contain most of the nutrients needed by rabbits; but do not meet rabbit nutrient requirements when offered individually. The purpose of the study was to evaluate the potential of pigeon pea and cowpea as alternative sources of protein for growing rabbits.

The study was specifically designed to:

1. To evaluate the effect of pigeon pea, cowpea and Soybean on carcass quality as single sources of protein for growing rabbits.
2. To compare the carcass quality of Flemish Giant, New Zealand White and California Black pure-bred rabbits under similar management system.

Materials and Methods

Study site

The study was conducted at Bunda College of Agriculture in Malawi from February 2001 to February 2002. The study area was located between 14 º11'S latitude and 33 º46'E longitude. The area lay 1100 m above sea level.

Animals and diets

Three pure bred rabbits, *Oryctolagus cunniculus* (Flemish Giant, California Black and New Zealand White) were used in the study. Twenty four does and six bucks were estimated to breed the 54 weaners (18 of each breed) required for the experiment. The kits were weaned at 6 weeks of age. The 54 weaners with an average weight of 0.761 kg selected for fattening were identified using ear tattoos. The difference in age between the youngest and the oldest kits was 2 weeks. The average litter size was four kits per doe. The 54 weaners (18 of each breed) were offered the test rations namely: Soybean, pigeon pea and cowpea. The three test rations of Soybeans, Pigeon peas and Cowpeas were identified with numbers 1, 2 and 3 respectively. Six weaners of each breed were randomly allocated to each of the three rations by picking lots. Soybean (*Glycine max*), Cowpea (*Vigna unguiculata*), Pigeon pea (*Cajanus cajan*), Maize (*Zea mays*) and Madea (*Zea mays*) were

used as the major feed ingredients for this experiment. Ocepara, V418 and Royes were the varieties of Soybean, Cowpea and Pigeon pea used in the study, respectively. The major protein sources in the rations were roasted prior to grinding and mixing to reduce trypsin inhibitor. The trypsin inhibitor in raw and roasted Soybean, Cowpea and Pigeon pea was determined by the laboratory procedure developed by Kalade et al. (1974). The rations were formulated to meet the basic energy and nutrient requirements of growing rabbits (NRC, 1996). The rations were formulated to contain 17 % CP and 2500 kcal/kg using the Linear Programme with Bounds (BLP88) computer package (1987).

Proximate Analysis

Samples of Soybean, cowpea, pigeon pea, maize and madea used in the rations were first analysed for chemical composition. The samples were ground to pass through a 1mm sieve and analysed for Gross Energy (GE), Crude protein (CP), Ash, Dry Matter (DM), Ether Extract (EE), Nitrogen Free Extractives (NFE), Neutral Detergent Fiber (NDF), Crude Fiber (CF), Acid Detergent Fiber (ADF), Available Lysine, Calcium (Ca) and Phosporus (P).

Feeding Trial

Rabbits were weighed at the start of the feeding trial. The average weight for the 54 kits was 0.761 kg. The weaners were fed on the test feeds for 7 days so that they could adapt to the new feeds before data collection started. Each rabbit was weighed at the end of the adaptation period and this was taken as the initial weight for the feeding period of 84 days. The three grower rations were replicated twice in the experiment. The rabbits were offered 100g of feed once daily during morning hours (07.00 hours) over a 24-hour period and the rejected feed was weighed the following morning (07.00 hours). The difference was taken as the feed consumed by each rabbit per day. Rabbits were weighed individually weekly (every Friday) to obtain weekly body weight from which average daily weight gain and weekly body weight gain were calculated. Weekly body weights were recorded until the rabbits reached the targeted

average weight of 2.5 kg. Clean water and feed were provided everyday using drinkers and feeders mounted in each cage. Each rabbit was offered 7 g of Leucaena leaf meal (LLM) as a source of fiber twice a week. Because of high mortality observed in rabbits fed Cowpea the grains of the three legumes were tested for tannin content.

Carcass Analysis

Rabbits were slaughtered and the carcasses were evaluated for quality according to the procedure described by Diestre and Kempstre (1990). The chilled carcasses were weighed and the weights recorded. The carcasses were split by sawing longitudinally down the midline from the posterior end through the anterior end. The left side of each carcass was used for selected measurements. The parameters used for evaluation were:

- Carcass length (cm)
- Lean proportion (%)
- Dressing-out percentage (%)
- Total fat percentage (%)

Statistical Analysis

Data were analysed using the General Linear Model (GLM) procedures of Statistical Analysis System (SAS, 1989). Treatment means within and between breeds were tested for differences using Least Significant Means (Montgomery, 1984).

Results

Table 1, shows the effect of breed and treatment on lean proportion for the three breeds fed on diets containing either Soybean, Pigeon pea or Cowpea. The three breeds were similar in lean proportion. However, the influence of feed type on lean proportion was significantly ($p<0.05$) higher for rabbits fed on cowpea and pigeon pea than for rabbits fed on Soybean.

Table 1. Effect of Treatment, Breed and Sex on Lean Proportion (%) of Rabbits

Source of variation	n	LSmeans	Stderr
Treatment			
Soybean	9	81.72[a]	1.54
Pigeon pea	9	85.47[b]	1.52
Cowpea	9	86.84[b]	1.53
Breed			
California Black	9	84.27	1.54
Flemish Giant	9	85.21	1.50
New Zealand White	9	84.56	1.53
Sex			
Male	13	85.62	1.53
Female	14	83.94	1.51

[a b]Means with different superscripts are significantly different ($p<0.05$)
CV=4.6 %, n=number of rabbits

Table 2. shows Lsmeans for dressing-out percentage for the three breeds. The Flemish Giant had a significantly ($p<0.05$) higher dressing-out percentage than either of the other two breeds.

Table 2. Effect of Treatment, Breed and Sex on Dressing-out (%) of Rabbits

Source of variation	n	LSmeans	Stderr
Treatment			
Soybean	9	59.52[a]	2.82
Pigeon pea	9	53.44[b]	2.79
Cowpea	9	46.74[c]	2.75
Breed			
California Black	9	50.02[a]	2.82
Flemish Giant	9	57.20[b]	2.77
New Zealand White	9	52.47[a]	2.81
Sex			
Male	13	53.20	2.71
Female	14	53.25	2.73

[a bc] Means with different superscripts are significantly different ($p<0.05$)
n=number of rabbits, CV=13.66 %

Discussion

In the present study there were little differences in most carcass parameters among the three breeds used. Differences between breeds or live weight groups in meat quality tended to be small, implying certain consistency in rabbit meat. Results of this study support results obtained by Hernandez et al. (1998). Most carcass traits used for carcass quality evaluation did not differ significantly except for fat percentage and dressing-out percentage. Total fat was observed to vary with breed, sex and feed type. Fat is a late developing tissue and its content increases with age. Fat percentage was significantly ($p<0.05$) higher for the Flemish Giant than for either New Zealand White or California Black. All breeds had higher but non-significant fat deposition in the abdomen and lower on the carcass. With regard to feed type, fat content was significantly ($p<0.001$) higher for rabbits fed Soybean than for rabbits fed either pigeon pea or cowpea. Fat percentage tended to increase with the weight of the animal and was significantly ($p<0.05$) higher in female rabbits. Results of this study are in agreement with those of Andrae et al. (2001) who reported higher fat content in females (79.17g) than in males (60.23g) in New Zealand White rabbits. Rabbit meat is considered lean meat and its carcass fat percentage is much lower than pork, beef or lamb (Enser et al. 1996). Lean proportion was high, on average 84.7 % irrespective of breed or feed type, showing certain constancy in rabbit meat. This implies that rabbit meat lean percentage would be similar at different market weights and that it would not be seriously changed by selection on growth rate. Results of this study agree with results observed by Hernandez et al. (1996) who reported lean proportion of 84.25 % for rabbits. Dressing-out percentage is an important economic variable in the meat market and the commercial criterion used in rabbits is a slaughter yield between 56 % and 58 % from chilled carcass (Pla et al., 1998). Results of this study support results reported by Gomez et al. (1998) and Pla et al. (1998) who observed dressing-out percentages ranging from 55.56 % to 59.72 % for growing rabbits.

Conclusion

Apart from fat percentage and dressing-out percentage, results of this study suggest a certain consistency in meat quality among the three rabbit breeds. The meat from the three breeds was found to be lean (84.7%) on average. Generally, the Flemish Giant was observed to be superior (numerically) in fat percentage, carcass length and dressing-out percentage. Across feeds, the California Black and New Zealand White did not differ significantly ($p<0.05$) in fat percentage. However, the New Zealand White was superior in dressing-out percentage than the California Black. It was also observed that fat deposition in rabbits occur in the abdomen as evident from the high average abdominal fat values. The study further revealed that feed type was more influential on fat content. While other carcass parameters were not affected by feed type, fat content was significantly ($p<0.05$) higher for rabbits fed Soybean than for rabbits fed pigeon peas or cowpeas.

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