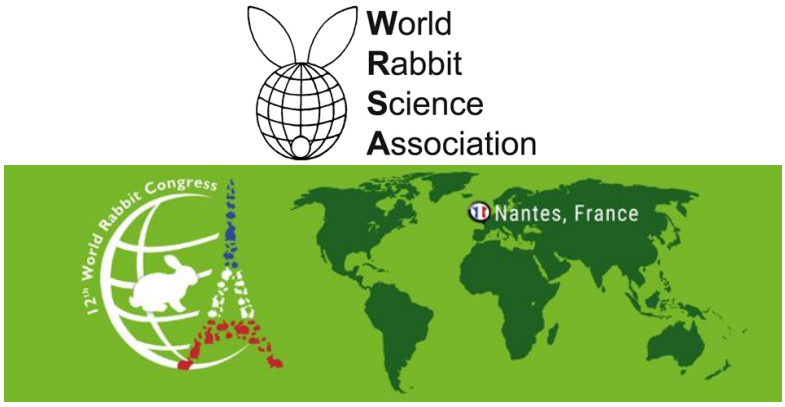

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EFFECT OF NON-CONVENTIONAL AND PELLETED FEED ON CALIFORNIAN RABBIT GROWTH PERFORMANCE IN SOUTH AFRICA

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ABSTRACT

Poverty in South Africa is increasing with the increase in unemployment, and households are failing to meet their daily nutritional needs. An alternative source of meat protein produce at low cost can decrease poverty. Feeding costs is the major cost in livestock production, making choice of feed a key in reducing feed costs. Poultry rely on grains for optimum growth whereas rabbits can utilize fibrous diets. The use of non-conventional feed sources to reduce feeding cost and increase profitability without affecting growth performance has been conducted in this study. Two groups of twenty (20) Californian rabbits were used in a feeding trial on a rabbit farm in Howick. Group one was fed commercial diet used for fattening fryers and group two was given a mixture of common grasses which served as nonconventional feed sources (experimental diet). The experimental diet had higher fiber (%) and protein (%) than commercial diet, dietary energy (ME) was unknown for both diets. After 6 weeks feeding trial, results concluded that rabbits that were fed commercial diets performed better than those fed with experimental diet. Carcass traits showed that yield and abdominal fat covering for experimental diet was less than commercial diet. Algometry correlations showed a positive relationship between live weight gain and body length and chest width development. The findings have shown that rabbits can be reared on low feeding costs without affecting its performance by more than 20%. Therefore, poor households can benefit by either marketing the meat or use it for own consumption. Farmers can increase their profits by considering non-conventional feed sources. Thus, proving the potential of rabbit farming in South Africa.

Key words: Feeding costs, Feed, efficiency, Growth performance, Rabbit meat

INTRODUCTION

Feeding cost is the highest expense in an agricultural production system which may account up to 70% (Maertens and Gidenne, 2016). Therefore, feed efficiency is an important key in reducing feeding costs and improving farm sustainability. Rabbits are capable of utilising high-fibre feeds better than poultry and have a better Feed Conversion Ratio (FCR) than cattle or sheep. Currently, the production costs of meat rabbits are almost twice than that of poultry and meat yield is similar in weight with poultry being cheaper (Maertens and Gidenne, 2016). For rabbits to be competitive, a reduction in feeding costs is essential. Therefore, the study aims to rear rabbits on non-conventional feed sources without significantly affecting growth rates and saving on feed costs. Pelleted feed is commercially formulated for rabbits to meet their nutritional requirements and the non-conventional feed sources (natural grasses and vegetation) contain unknown amounts of nutrients. In this study, it is assumed that rabbits on pelleted feed will perform better than rabbits on non-conventional feed.

MATERIALS AND METHODS

Animals and experimental design

At the weaning age of 5 weeks, forty mixed sex Californian rabbits were used in this study. Rabbits with closely equal homogenous live body weight at the beginning of the experiment, were placed together in a set of 2 rabbits per cage. The experimental groups were classified as follows: Group 1:20 Californians fed greens. Group 2:20 Californians fed commercial diets served as control. The animals were raised inside a covered shed that had a concrete floor with galvanized hanging metal wire cages (60x60x60cm), each cage had feeders and automatic drinking system and nipples. The shed was kept under managerial and hygienic conditions.

This experiment was carried out at Camelot farm (29°25'32.7"S 30°11'12.5"E), Howick in Kwa-Zulu Natal, South Africa, during spring season. All rabbits were kept under a shed open from the sides, with traps that can be rolled down during extreme conditions. The distribution of the cages was at one side of the shed in a symmetrical way to get the same climatic conditions to all animals, no controlled temperature. Average temperatures for the region varied between a minimum of 16°C and maximum of 25°C. The trial was carried out in compliant to the ethical guidelines specified by the Certification of Authorization to Experiment on Living Animals provided by the UKZN Animal Ethics Committee.

Chemical Analyses

The two types of diets were supplied at *ad libitum* as well as fresh clean drinking water. Diet 1 was commercially formulated feed for rabbits and diet 2 was non-conventional greens and veggies found around the farm. Experimental diet was in the form of grasses and vegetable leaves present around the farm during the trail, the ingredients of this diet comprised of kikuyu (*Pennisetum clandestinum*), perennial ryegrass *(Lolium perenne),* Russian wildrye grass *(Psathyrostachys juncea),* beetroot leaves (*Beta vulgaris) and* white clover *(Trifolium repens).* These ingredients were handpicked and fed ad lib to the rabbits every day as fresh feed. The commercial feed was in the form of pellets with a diameter of 4mm. The nutritional composition was determined using the AOAC Official Method 934.01 for Dry matter, AOAC Official Method 990.03 for crude protein and Ankom Technology method for ADF and NDF, for each diet provided in Table 1. No medical probiotics were given at weaning.

Table 1: Nutritional composition of diets

Nutrient (%)	Greens	Pelleted feed
Dry matter	94,4 ± 0,3	91,18
Protein	24,3 ± 2,44	12,82
ADF	23,7 ± 5,7	24,9
NDF	49,8 ± 6,8	26,26

*Avg. composition of greens (means ± SE; n = 5). ADF levels are slightly similar for both diets. NDF and Protein are highest in experimental diets.

The experimental period was 6 weeks, corresponding to the fattening period of meat rabbits, from weaning to slaughter. The animals were weighted once a week during this period. The weekly measurements included live body Weight (LBW), body length (BL) and chest width (CW) and the average daily gain (ADG) was calculated during the experimental periods. LBW was measured using a digital 3 decimal point scale in kilograms, BL and CW was recorded using with a waist measuring tape in centimetres. At the end of the feeding trial, four rabbits from each treatment were weighted and slaughtered to complete bleeding, then carcasses weight (CBW) was recorded. Rabbits selected for slaughter were the smallest and the heaviest from each group to give an estimated mean of the two groups.

Statistical Analysis

Statistical significance was determined by one-way Analysis of Variance using GenStat 18th Ed. program. Data entered was LBW, BL, CW and CBW. Significant difference was considered at $P<0.001$ or $P<0.05$.

RESULTS AND DISCUSSION

Effect of feed on growth parameters at 6 weeks of age

The ADG of the Greens diet was half lower (13.7 g/d) compared with the pellet diet (30.7 g/d). In addition, the mortality was 40% higher ($P=0.007$) in the Greens diet. Body length and Chest width

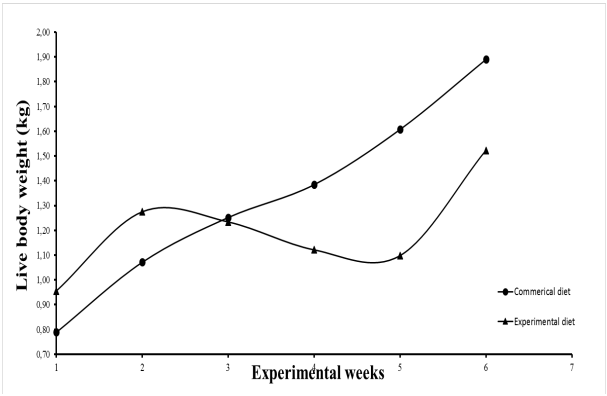
were significantly higher by 6% and 9% respectively for pellet diet than rabbits on green diet. Body length also indicates a positive relationship ($r^2 > 0.5$) with body weight. This means that an increase in weight gain also result in body length increase and chest width development. Weight gain is controlled but feed intake and quality of feed, so the results mean that the algometry growth and development of the rabbit is dependent on the diet type. Levels of feeds and type of diet can influence the evolutionary change in body composition (Randriamandratondrakotonirina *et al.*, 2016).
Individual body weights ranged between 1.6 kg to 2.2 kg for commercial diet, and 1.3 kg to 2.0 kg for experimental diet. North *et al.* (2017) recommends slaughtering at 13 weeks of age (~ live weight of 2.2 kg) and Coniglio rabbit meat company market their fryers at 12 weeks of age weighing 2.1 to 2.3 kg. The group fed commercial diet on average weighed 10% below the minimum recommended slaughter weight (2.1 kg) and green fed diet was 28% below.

Table 2: Effect of different feeds on average group growth parameters after 6 weeks of fattening

	Experimental diets		
Parameters	**Pelleted feed**	**Non-conventional greens**	P-value
ADG (g/d)	30.7 ± 4.2	13.7 ± 13.6	0.265
Live body weight (kg)	1.9 ± 0.1	1.5 ± 0.1	<.001
Body Length (cm)	31.5 ± 0.2	29.7 ± 0.7	0.004
Chest width (cm)	29.5 ±0.4	26.8 ± 0.7	<.001
Mortality rate (%)	15.0 (3/20)	55.0 (11/20)	0.007

*ADG, Average Daily Gain; MEAN ±*S.E. of rabbits alive at the end of the experiment (except for ADG)*
In brackets:(no. of dead/no. of rabbits at the beginning of the trial)

Figure 1: Live body weight growth curve during fattening period



Green fed rabbits did not depict a linear growth rate as with the commercial diet (Figure 1). The growth curve started decreasing after 7 weeks of age until 10 weeks of age (week 2 to week 5 of feeding trail). This decrease in weight gain resulted in more than 50% mortality of 20 rabbits, this may be due to the high protein to fibre ratio in the greens diet. The type of feed may also influence mortality rate (Lounaouci-Ouyed *et al.*, 2014). During the whole experiment, a mortality rate of 35% (14 of 40 rabbits), 15% and 55% for commercial diet and experimental diet, respectively. The mortality of the rabbits was noticed across the whole farm, including non-experimental rabbits

Effect of Feed composition

Fibre (in the form of ADF and NDF) was higher in experimental diet than control diet. High fibre diets are known to reduce feed efficiency and nutrient digestibility (Osho *et al.*, 2013). Fibre intake affects gut microflora yield in rabbits (Oso *et al.* 2011) and a balance between dietary fibre and energy is essential for optimal growth and health (Osho *et al*, 2013). Osho *et al.* (2013) found that a diet comprising of high fibre results in highest weight gain compare to other diets with various fibre content. The present study gave different results, were rabbits receiving more fibre had lower growth rates than rabbits fed a low fibre diet. The results obtained could be caused by the higher protein levels in the Greens diets. Protein content for experimental diet was two times more than that of commercial diet. Higher protein levels in a diet increases ADG (Wang *et al.*, 2012), which was not the case in the Greens diet. A possible cause might be the imbalance with the other nutrients, and under such unbalanced feed the growth is impaired. Growth performance on commercial pellets was much higher (30.7 g/d) than rabbits on fed green feed (13.7 g/d). This indicated that commercial feeds was well nutritionally balanced and met rabbit's requirements for growth.

CONCLUSIONS

This paper suggests that fryers can be fed exclusively green based diets without adverse performance on growth performance and carcass traits **provided** that the nutrients are well balanced. An effective feeding strategy can include commercial feeds as a supplement to boost growth performance. In the field, e.g. rural communities, rearing rabbits on non-conventional feeds is feasible on low feeding cost. Thus, showing a great potential of rabbit farming in alleviating poverty. To completely reduce feeding costs in a rabbitry, further research must be done on reproduction performance.

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Effect of non- conventional and Pelleted feed on Californian rabbit growth Performance

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Rabbits can be reared on low feeding costs (by more than 20%) without affecting performance. The objective was to assess the effects of rearing rabbits on non-conventional feed sources on the growth rates and feeding costs.

Methods: Forty mixed sex Californian rabbits with closely equal homogenous live body weight were placed together in a set of 2 rabbits per cage. Classified as follows: Group 1:20 Fed greens. Group 2:20 Fed commercial diet served as control.

Table 1: Nutritional composition of diets given

Nutrient (%)	Greens	Pelleted feed
Dry matter	94.4 ± 0.3	91.18
Protein	24.3 ± 2.44	12.82
ADF	23.7 ± 5.7	24.9
NDF	49.8 ± 8.8	28.26

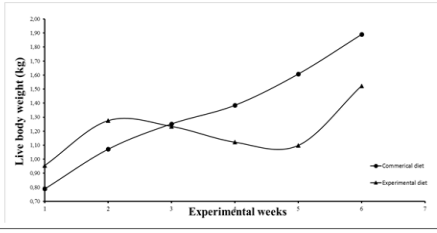
*Avg. composition of greens (means ± SE; n = 5). ADF levels are slightly similar for both diets. NDF and Protein

Results: High fiber diets reduced feed efficiency and nutrient digestibility Pelleted diets indicated that commercial feeds were nutritionally balanced and met rabbits' requirements for growth.

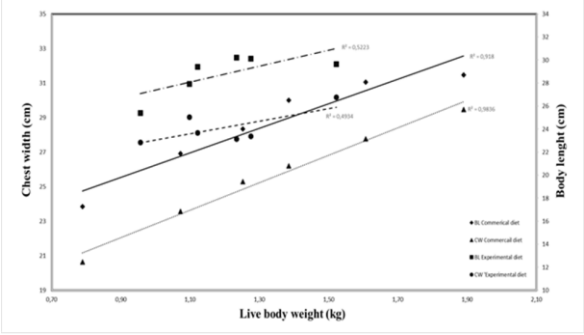
	Experimental diets		
Parameters	Pelleted feed	Non- conventional greens	P -value
ADG (g/d)	30.70 ± 4.22	13.68 ± 13.56	0.265
Live body weight (kg)	1.88 ± 0.05	1.52 ± 0.1	<.001
Body Length (cm)	31.47 ± 0.24	29.67 ± 0.65	0.004
Chest width (cm)	29.47 ±0.37	26.78 ± 0.67	<.001
Mortality rate (%)	15 (3/20)	55 (11/20)	0.007

*ADG, Average Daily Gain
MEAN ± S.E. of rabbits alive at the end of the experiment (except for ADG)
In brackets:(no. of dead/no. of rabbits at the beginning of the trail)

Figure 1: Live body weight growth curve during fattening period



Rabbit can be fed exclusively green based diets without adverse effect on growth and carcass traits



Take home message: An effective feeding strategy can include commercial feeds as supplement to boost growth. Rearing rabbits on non – conventional feeds (low feeding cost) is feasible, thus showing a great potential of rabbit farming in alleviating poverty.