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Comparative Evaluation on Carcass Yield in Rabbits Fed Under Four Different Diets

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Abstract

Rabbits (Oryctolagus Cuniculus) are non-ruminant forage consumers with high growth potential and fecundity. They require small rearing space and are preferred in rural households for improved nutrition and income generation, and eventual poverty reduction. The current study assessed the effect of supplementing Rhodes grass hay with four different forages. A Completely Randomized Design experiment was used with nine New Zealand White grower rabbits in 5 treatments as; (a): 40% Sweet potato vines (SPV) + 60% Hay(H), (b) 40% Mulberry(M) + 60% H, (c) 40% Sesbania (S) + 60% H, (d) 13.3% SPV + 13.33% S + 60% H, (e) H 100%. The rabbits were pre-treated with anthelmint: Aliseryl WSP ™.A Hydro-soluble, a mixture of antibiotics and vitamins. Seventy-seven days after the start of the study, two rabbits from each treatment were randomly selected, sacrificed, eviscerated and weighed. The results showed that formulating of rabbit feed using field forages played a major role towards improving hot carcass weights of the animals. The most effective forage that gave the highest ($p<0.05$) results of hot carcass yield consisted of treatment b (40% Mulberry leaves and 60% Hay). Hot carcass weights were: 0.43kg, 0.55kg, 0.36kg, 0.44kg, and, 0.31kg for treatments a, b, c, d and e respectively. Rabbits under treatment b had the highest ($p<0.05$) hot carcass weight of 0.55kg while treatment e had the lowest of 0.31kg. The nutritive value of Mulberry leaves in terms of digestible crude protein was fairly good as compared to the other forages such as sesbania and sweet potato vines. In conclusion, the dressing yield was highest when mulberry leaves were used in supplementation with Rhodes grass hay than when the other three feed supplements were used.

Key words: ***Forages, New Zealand White Rabbit, hot carcass weight***

Introduction

Feed shortage in the low income countries and their high cost result in deficiency such proteins in human diets, a fact that is majorly attributed to limited land resources and competition for high quality grains and protein supplements between humans and livestock (FAO, 2001). Persons living in the developing countries daily consume an average of 10g of proteins which is way below the recommended daily intake of 35 g. (FAO, 2001). Owing to these low amounts of proteins consumed, there has been a concerted effort to find solutions through the improvement of conventional resources and exploring other alternative feed sources (Lukefahr, 2007). A worldwide search for new additional feed sources has taken new directions

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with the exploitation of traditional crops such as sweet potatoes and Russian cumphrey due to its adaptability to prevailing climatic conditions and comparatively low input requirement for optimal growth (Cheeke, 2003).

As a result diminishing land holdings in the high agricultural potential areas, farmers have been encouraged to adopt the rearing of poultry, pigs, goats, bees and rabbits which require a small space (Kiptarus, 2005). These livestock have high feed conversion efficiency, require little space requirement and are fast maturity. Furthermore, they have been perceived to have the answer to nutrient deficiencies and New Zealand White rabbit is one of such animals (Wanjala, 2015).

Despite the rabbits' adaptability to a wide range of feedstuffs, nutritionists are still exploring feeding strategies that promote reduction of digestive disorders, increased feed efficiency, enhanced reproductive performance, lower feed cost and eventual total production costs (Gidenne & Garcia, 2006; Maertens, 2009; Xiccato & Trocino, 2010).

Objective of the Study

The objective of the current study was to evaluate the effect of supplementing Rhodes grass hay diet with sweet potato vines, mulberry and sesbania on hot carcass weight.

Materials and Methods

The Study Area

The study was carried out at Kapseret Sub-County of Uasin Gishu County, which forms part of the Great Rift Valley. Kapseret is one of the wettest areas of Uasin Gishu County and receives relatively higher amounts of rainfall as compared to other sub-counties within the County. Temperatures range from a minimum of 8.8ºC to a maximum of 25.6 º C. The average temperature is 18 º C during the wet season and a maximum of 25.6 º C during the dry season. January is the hottest month, while July is the coolest month (MoLD, 2006). Kapseret lies between longitudes 34^0 50" and 35^0 37" East and latitudes 0.03^0 and 0.55" North.

Experimental Animals and Management

Forty five weaned New Zealand white rabbits used in this study were obtained from a local farmer. The rabbits were mainly homogenous population between six to six and a half weeks old with their live weights ranging from 500g to 550g. Rabbits were randomly distributed into 5 treatments. The study was conducted for 77 days. The rabbits were de-wormed with Wormazine Hydro-soluble Anti-helmintic at a dosage of 10g in 10 litres of drinking water, Aliseryl™ WSP (Hydro soluble mix of antibiotics and vitamins) and served as anti-stress factor.

The rabbit house measuring 6m by 2m by 2.5m was constructed, roofed with iron sheets and walls partitioned using ply wood. A weighing machine and a notebook were ensured to be in place for weighing and recording purposes.

The rabbits were weighed before the trial and initiation treatment diets were gradually given to the rabbits to replace the feed they were used to for a week in order to allow the rabbits to adjust to the experimental diets. The rabbit house and cages were thoroughly cleaned and disinfected before placing the rabbits in the cages with dimensions of 76cm by 50cm by 45cm. The house and cages were cleaned daily. Earthen bowls were used as feeders. The feeding was done at 8.00 hours of the morning. Clean water was supplied to the Rabbits *ad libitum* in earthen bowls. The feeders and drinkers were washed with clean water daily before new feed and water were offered.

Nutrient Contents Analysis

Sample collection area for Rhodes grass was 1 square meter whereby 1kg was taken. Sample leaves for the fodder trees were randomly collected from the trees within a 20m × 10m area. The 3 legumes and the Rhodes grass were compounded into rations that formed the 5 dietary treatments. From each sample 1Kg were collected and taken to Kenya Agricultural and Livestock Research Organization - Naivasha for nutrient content analysis.

The forages were chopped and sun dried to obtain a forage legume meal which was used in the diet formulations.

Experimental Diets

Rhodes grass hay, Sweet potato vines, Mulberry and Sesbania were harvested at 70 % flowering stage from a farm at Kapseret Sub-County. To cure them, they were sun-dried on racks to reduce moisture content to between 16-18%, chopped to about 1-1½ cm length, then packaged in gunny bags for storage. Prior to feeding in earthen bowls, the Rhodes grass hay, Sweet potato vines, Mulberry and Sesbania were sprayed with molasses diluted with water at the ratio of 5:1 water to molasses respectively (to improve palatability) and then fed. The feeds offered to the rabbits were weighed separately daily for each treatment.

Rhodes Grass (Chloris Gayana) is a native African grass species but is found throughout the tropical and subtropical world as a naturalized species. It is a tufted perennial, usually stoloniferous with a foliage of 0.5-1.2m, and tillers from 0.9–2m tall and can be conserved as hay, or grazed in the field. It grows in many habitats such as open woodland and grassland, riverine and lake margins, and seasonally waterlogged plains, Rhodes grass can grow under a wide range of soils with a rainfall range of 650-1200mm and is persistent to drought.

Sweet Potatoe (*Ipomea Batatas*) is grown in tropical, sub-tropical and warm temperate regions. Its tubers are a staple food or an alternative food in many developing countries while its vines can be used for animal feeding. Sweet potato forage is 70% dry matter (DM) with a dry matter degradability ranging between 40-50% and about 70% protein degradability but with a comparatively lower non-degradable dietary protein. Raharjo, Cheeke and Yuhaeni (1988) reported that sweet potato vines were more degradable in rabbits than *Leucaena Leucocephala* and the foliage of other legume trees.

Sesbania (*Sesbania Sesban*) is a relatively short-lived (6-7 years) shrub or a small tree that grows up to 6 metres high in an altitude of 2000-2400 M above sea level. It is considered to contain fodder that is second only to Leucaena. Most species of Sesbania can be described as soft or slightly woody, 1- 4 metres tall perennial nitrogen fixing plants with outstanding feature being its extremely fast growth rate, especially during the first 3 or 4 years after planting.

Mulberry (*Morus Alba*) is a flowering deciduous plant, that grows wild and under cultivation in many temperate world regions. Mulberry is high quality forage which is palatable to both monogastric and ruminant livestock (Sánchez, 2002a). The nutrient composition of Mulberry leaves shows that it is a formidable forage for monogastric with 70 - 90% palatability and 15 to 28% essential amino acid profile depending on the variety (Sánchez, 2002b) and has a high mineral content with no known anti-nutritional factors. Fibre fractions are low in mulberry leaves compared to other forages. Shayo (1997) reported lignin (acid detergent lignin) contents of 8.1% and 7.1% for leaves and bark respectively. Mulberry forage leaves have a high palatability of ≥90%.

Treatments

Rabbits were distributed into five dietary treatments. All experimental diets were formulated to contain adequate levels of nutrients for growing New Zealand white rabbits. Treatment a = Hay 60% + sweet potato vines 40%, Treatment b = Hay 60% + Mulberry leaves 40%, Treatment c = Hay 60% + Sesbania leaves 40%, Treatment d = Hay 60% + Sweet Potato Vines 13.3% + Mulberry 13.3 % + Sesbania 13.3 % and Treatment e = Hay 100% only (Control).

Research Design

The current study used completely randomized design (CRD) to allocate the rabbits into the various treatments with the model provided below.

Model:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{1j}$$

Where:
Y_{ijk} = the total observation on the j^{th} sampling unit of the i^{th} treatment.
μ = overall population mean
α_i = effects due to i^{th} treatment
ε_{ij}= random error associated with Y_{ij}

Data Collection

At the end of the feeding period, two rabbits from each treatment were randomly selected and their live weights taken before they were sacrificed. The carcass weights were taken, then data set compared to those of the control treatment. The slaughtered animals were a representative of the corresponding experimental group as per the parameters of interest and variability.

Slaughtering Procedure

The slaughter of animals was carried according to the procedure developed by Blasco and Ouhayoun (1996). The humane pre-slaughter handling and stunning of the experimental rabbits were applied (Stokes, 2002). The selected rabbits were weighed before slaughter then stunned with a sharp blow to the base of the neck which results in instant death of the animal. Killing the rabbit humanely is critical. Stress during the butchering process may result in release of stress hormones reported to negatively affect flavor of rabbit meat and to toughen it. The rabbits were slaughtered by severing both the jugular vein and the carotid arteries below the jaw. The carcasses were allowed to bleed for 10 minutes then the rabbit was skinned immediately and hung again for maximum bleeding for another 20 minutes. The data collected and analyzed were live weight and dressing weight percentage.

The carcasses were dissected in accordance with the norms of the World Rabbit Science Association (Blasco and Ouhayoun, 1996). The head, the viscera, and the thoracic organs were removed. The carcass was cut between the 7^{th} and 8^{th} thoracic vertebrae and between the 6^{th} and 7^{th} lumbar vertebrae. Reference carcass part (fore, intermediate and hind part) and peritoneal fat were weighed.

Data Analysis

The data generated was subjected to Microsoft Spread Sheet Excel (2007). Statistical analysis was determined through analysis of variance (ANOVA) using a mixed model procedure of GenStat.14 version and significant differences were separated using Turkeys test (Tables 1 and 2).

Table 1
Rabbit Live Weights, Dressed Weight and Hot Carcass Percentage in Treatments

Treatment	Live Weight Kgs	Carcass Weight Kgs	Hot Carcass %
a.	1.00	0.43	43
b.	1.06	0.55	55
c.	0.86	0.36	36
d.	1.05	0.44	44
e.	0.76	0.31	31

Table 2
Tukey's Post hoc Test for Hot Carcass Percentage

	Tukey's (P<0.05)
Treatment	**Mean**
e.	0.3100^{a}
c.	0.3588^{ab}
d.	0.4275^{bc}
a.	0.4375^{bc}
b.	0.4575^{c}

Findings

Rabbit Live Weights, Dressed Weight and Hot Carcass Percentage in treatments

The findings in Table 1 shows the dressing weights of the rabbits managed under the different treatment regimes. Rabbits under treatment b had the highest dressing out weight of 0.55kg while treatments a and c had 0.43kg and 0.36kg respectively. Treatment e had the lowest dressing yield of 0.31kg and treatment d had the second highest at 0.44kg. The differences in carcass weights of the rabbits were statically significant ($p = 0.006$) hence, explains the differences ($p<0.005$) in the carcass yield of the rabbits under the feeding regimes.

The mean live weights in Table 1 of the rabbits under the different treatments showed a significant difference in weights. Moreover, the rabbits under the experiment had similar weights at the onset of the experiment the differences in the weights at the end were attributable to the treatment regimes administered to the rabbits. An ANOVA analysis conducted to determine the differences in the live weights of the rabbits under the different treatments showed - ($p = 0.025$) – statistical significance in explaining the live weights. This indicated that the difference in the weights was attributable to the treatment regimes administered to the rabbits.

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The Tukey's Post Hoc Test (Table 2)

The rabbits under treatment b had the highest hot carcass weight of 0.55kg, treatments a and c had 0.43kg and 0.36kg respectively, while treatment e had the lowest hot carcass weight of 0.31kg and treatment d, a carcass weight of 0.44kg. Analysis of the results showed significant differences in the Hot carcass weight ($p<0.05$) of the rabbits .and this indicated that the differences in the hot carcass weights were attributable to the treatment regimes administered to the rabbits, This corroborates the reports on influence of diet on rabbit meat by Dalle Zotte, (2002a). Hot carcass weights of the animals fed on Rhodes grass solely were the least and this could be due to the high crude fibre and this is in agreement with Blasco and Ouhayoun, (1969), who posit that diets with high fibre content levels invariably decreases growth rates but when such a rate is unimpaired by fibre increase the slaughter yield remains the same.

The effect on carcass weights showed the highest in treatment b (mulberry) and showed a significant difference in the hot carcass weights ($p<0.005$) of grower rabbits on different diet evaluation. However, the other forage supplements in; a (Sweet potato vines), c (sesbania) and d (feed combination) were just as good, though second to b (mulberry).

The current findings agree with those of Kandylis, Hadjigeorgiou and Harizanis (2009) who reported that Mulberry leaves had high digestibility and palatability, while Benavides (2000) affirmed that the protein content ranges between 18 and 25% in DM and 75 to 85% range in-vivo DM digestibility (Bamikole Ikhatua, Ikhatua & Ezenwa 2005)**.** Further**,** Sánchez, (2002) reported that mulberry leaves had 70 - 90% digestibility. Bamikole, *et al.*, (2005) also reported that mulberry leaves can support good feed intake and digestability, thus promote a satisfactory weight gain in rabbits.

Evidently, sweet potato vines also had a comparatively moderate to high effect as indicated by the study. The weights of rabbits in treatment a, with sweet potato vines, were second to those of the mulberry leaves and these current findings agreed with those of Abonyi, Iyi, and Machebe (2012) who mixed sweet potato vines with concentrates and though with some moderate differences in average weekly weight gains, a fact attributable to nutritive contents of the concentrates. The Mulberry leaves therefore do have the potential to replace supplementation with concentrates or sesbania, sweet potato vines or lucern and are definitely helpful in economic rabbit production.

Conclusion and Recommendations

The comparative evaluation on carcass yield in rabbits fed under sweet potato vines, mulberry, sesbania and their combination showed significant difference ($p<0.005$). Concerning the effect on carcass yields, the study found that treatment with mulberry showed highest results as compared with the other treatments a, c, d and e.

The effect on hot carcass percentage showed the highest in treatment b ($p<0.005$), though the other forage supplements were just as good.

The mulberry leaves therefore do have the potential to replace supplementation with concentrates or sesbania, SPV or lucerne and definitely helpful in economic rabbit production.

The present study was terminated when the rabbits were 16 weeks of age a period not included in the experiment.

Reference

Abonyi, F. O., Iyi, E. O. & Machebe, N. S. (2012). Effects of feeding sweet potato (Ipomoea batatas) leaves on growth performance and nutrient digestibility of rabbits. *African Journal of Biotechnology Vol. 11*(15), pp. 3709-3712

Bamikole, M. A., Ikhatua, M. I. Ikhatua, U. J., Ezenwa, I. V. (2005). Nutritive value of
mulberry (Morus Spp.) leaves in the growing in Nigeria. Pakistan Jouurnal of Nutrition 4:231-236.

Blasco, A., & Ouhayoun, J. (1996). Harmonization of criteria and terminology in rabbit meat research. Revised proposal. *World Rabbit Sci*.; *4*:93–98. Google Scholar.

Cheeke, P. (2003). *Feeding systems for tropical rabbit production emphasizing root, tubers and bananas.* Food and Agriculture Organisation. http://www.fao.org/3/T0554E/T0554E16.htm

Dalle Zotte, A. (2002a). Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality. *Livestock Production Science*, *75*(1), 11-32.

FAO, (2001). Dietary protein quality evaluation in human nutrition. *Report of an Expert Consultation.* ISSN: 0254-4725. Accessed from http://www.fao.org/ag/ humannutrition/35978-02317b979 a686a57aa4593304ffc17f06.pdf

Genstat. (2014). *VSNI. GenStat for Windows*. 14th Edition,VSN. International, Hemel Hempstead.

Gidenne, T., & Garcia, J. (2006). Nutritional strategies improving the digestive health of the weaned rabbit. *Recent Advances In Rabbit Sciences*, 229-238.

Kandylis, K., Hadjigeorgiou, I., & Harizanis, P. (2009). The nutritive value of mulberry leaves (*Morus alba*) as a feed supplement for sheep. *Trop Anim Health Prod 41*:17–24

Kiptarus, J. K. (2005). *Focus on livestock sector: supply policy framework strategies status and links with value addition*. Paper Presented at a *Workshop on Value Assess Food and Export Investment*, held at *Grand Regency Hotel*, *Nairobi*, Kenya.

Linga, S. S., Lukefahr, S. D. & Lukefahr, M. J., (2003). Feeding of lablab purpurens
forage with Molasses, blocks or sugarcane stalks to rabbit fryers in Sub-Tropical South Texas. *Livestock Production Science, 80*, 201–209

Lukefahr, S. D. (2007). Strategies for the development of small- and medium-scale rabbit
farming in South-East Asia. *Livestock Research for Rural Development, 19* (138). http://www.cipav. org.co/ lrrd/ lrrd19/9/luke19138.htm

Maertens, L. (2009). Possibilities to reduce the feed conversion in rabbit production. *Giornate di Coniglicoltura ASIC 2009*, (pp. 1-10). Forli, Italy.

MoLD. (2004). *Annual report, department of livestock production.* Nairobi; Ministry of Livestock Development document number.

Raharjo, Y. C., Cheeke, P. R., & Yuhaeni, S. (1988). Evaluation of tropical forages and by-product feeds for rabbit production. PhD. Dissertation. *Evaluation of Tropical Forages and By-product feeds for Rabbit Production*, 108.

Sánchez, M. D. (2002a). Mulberry: an exceptional forage available almost worldwide. SÁNCHEZ*, MD Mulberry for animal production. Roma: Food and Agriculture Organization (FAO) of United Nations*, 271-289.

Sánchez, M. D. (2002b). World distribution and utilization of mulberry and its potential for animal feeding. *Animal production and health paper, (147)*, 1-8.

Shayo, C. M. (1997). Uses, Yield and nutritive value of mulberry (Morus Alba) trees for ruminants in the semi-arid areas of Central Tanzania. *Tropical Grasslands*, *31*, 599-604.

Stokes ,W. S. (2002). Humane endpoints for laboratory animals used in regulatory testing. *ILAR Journal, Vol. 43*(1).

Wanjala, F. N. (2015).*Performance And Cost of Production of New Zealand White, California White Rabbit (Oryctolagus Cuniculus) Breeds and Their Cross Under Two Feeding Regimes*. Msc. University of Nairobi.

Xiccato, G., & Trocino, A. (2010). *Feed and energy intake in rabbits and consequences on farm global efficiency.* 6th International Conference on Rabbit Production, (pp. 1-18). Assiut, Egypt