

BIBLIOGRAPHY

ABLAYAN, VELAMIE A. March 2012. The Growth Performance of New Zealand Rabbit Fed with Different Forages as Feed. Benguet State University, La Trinidad Benguet.

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ABSTRACT

This study was conducted to find out the effect of different forages as feed supplement on the growth of rabbits. Specifically, the study was conducted to determine the performance of rabbit in terms of gain in weight, feed intake and feed conversion ratio using selected forages as feed.

Twelve one month old rabbit was used in the study. They were distributed randomly into three treatments using the three different feedstuffs namely: perennial peanut, kikuyu grass and sweet potato. They were assigned such that T₁ was the combination of kikuyu grass and sweet potato; T₂ was the combination of perennial peanut and sweet potato; and treatment 3 was the combination of the three feedstuffs. Results revealed that the rabbits had no significant differences in terms of gain in weight despite the feed intake of the rabbits fed with perennial peanut + sweet potato and the combination of the perennial peanut, sweet potato and kikuyu grass being higher on dry matter and as fed basis. On feed conversion ratio, the rabbits fed kikuyu grass and sweet potato had better efficiency than those fed kikuyu grass, perennial peanut and sweet potato. Meanwhile, the feed conversion



ratio of the rabbits feed perennial peanut and sweet potato was homologous to either groups.

Based on the findings, it is therefore concluded the best combination of forages is perennial peanut, kikuyu and sweet potato. Rabbit raisers may feed these forages upon their discretion.



INTRODUCTION

Almost 400,000 rabbits were used in research projects in the United States during 1991. They have been used for the production of disease fighting antibodies, studies reproduction and researches in several human diseases.

Rabbit is a non-ruminant herbivore, having an enlarged hind gut. This has considerable influence on its ability to utilize feedstuffs and dietary nutrient requirements. Rabbit stomach has a very low pH of about 1.6 which effectively kills ingested bacteria (Church, 1986).

Rabbit raising is a small enterprise but it has several advantages over other agricultural animals. It can easily be raised by anyone under any climatic condition. The facilities take up a little space compared to other agricultural animals such as cattle and hogs. They are also herbivores and can be fed with roughage diets. In developing countries, rabbit production is of interest because low grain diets based on roughages and by products can be used, so it is not directly competitive with human food needs. Rabbits are raised for several purposes, including meat and fur production, as laboratory animals, for show purposes, and as pets (Warren, 1995).

Additionally, raising rabbits are much cheaper, more efficient and more productive than raising chickens. Rabbit meat contains 18% protein and 8% fat compared to the protein and fat contents of pork and meat, thus, is a good source of protein for those who are in low cholesterol diet. It was to these observation the this study was formulated to evaluate possible feed combinations using available forages like kikuyu grass and perennial peanut that are sometimes being under-utilized.



Kikuyu grass (*Pennisetum clandestinum*) is a rhizomatous plant, in the Poaceae (grass) family, that has matted roots and a grass-like or herbaceous habit. Grass has high level of non-protein nitrogen (Marias, 2001) and this can potentially lead to an over-estimation of the available protein, as common analytical procedures for feedstuffs express the protein content as a function of its nitrogen concentration.

Arachis pintoi 'Golden Glory' (perennial peanut, pinto peanut) is established vegetative, with stolons or stem cuttings either sown directly or container grown and transplanted. The flowers of golden glory have slightly shorter stalks. This plant can be well eaten by all classes of animals, including chickens, ducks and pigs. Selected by cattle if animal exposed to the legume previously. This plant has nutritive value of 13-25% crude protein. 60-70% dry matter digestibility. It has relatively low level of condensed tannins (Bowman et al, 1998).

Finally, sweet potato (*Ipomoea batatas*) is a dicotyledonous plant that belongs to the family Convolvulaceae. The young leaves and shoots are sometimes eaten as greens. This plant is mainly fed to pigs in backyard raising. It can also be eaten by rabbits and guinea pigs.

This study was conducted to determine the growth performance of rabbits fed with different forages as feed supplement.

Specifically, it aimed to:

1. determine the performance of rabbit in terms of gain in weight, feed conversion ratio, and feed intake feed using selected forages as feed supplement; and
2. determine which treatment had the best performance in terms of feed conversion ratio.

This study was conducted at the Benguet State University (BSU) Rabbitry House, Balili, La Trinidad, Benguet from December 2011 to January 2012.



REVIEW OF LITERATURE

Rabbits have much better ability to digest and utilize the protein in forages such as alfalfa meal. These animals adjust their feed intake to compensate for varying dietary energy levels, so a specific energy requirement in kcal/kg diet is meaningful. With the nature of the rabbit's digestive tract, large volumes of feed can be consumed. Most rabbits ration are low in digestible energy (DE) in comparison to diets for other non-ruminants. A level of 2,500 kcal/kg of DE is satisfactory. Rabbit thus, seen to be adopted to use of high roughage, low energy diets.

In addition, rabbit is a very efficient converter of low-cost raw material into valuable, top quality meat product. The efficiency with which the production unit functions is dependent upon the composition of raw material which is made available. Nutrients to be given must include protein, carbohydrates, fats, vitamins, minerals and water.

Forages and roughages are the primary feedstuffs for all herbivorous animals. They share the common property of being high in fiber and low in digestible energy. Harvested and stored forages (hays, silage, and other forms) and other roughages provide energy and other nutrients for animals from plants sources of limited or no value in human nutrition. Roughages are of primary value for ruminants and for non-ruminants that depend on fermentation of insoluble carbohydrates in the gastrointestinal tract (GIT) for most of their energy supply. Most forage is provided either as harvested grass legumes or as pasture (Cheeke, 1987).



Frona (1972) stated that the grasses contain appreciable amount of essential nutrients and are rich in unknown factors. Providing roughages daily to animals will keep them healthy, thereby reducing mortality.

Tuttle, *et al.*, (1969) proved in their study that improper selection of the most suitable feed combination caused malnutrition and even stunted growth. This was proven by their study using the rat colony as the experimental animals.

Gillespie (2002) stated that fresh green feeds such as grasses, palatable weeds, cereal grains and leafy vegetable crops may be fed. These feeds are high in vitamin, minerals and proteins. They are of special value when feeding breeding animals.

Peregrine (1973) found out that grasses especially young ones are highly digestible and are rich in protein, minerals, and vitamins as well as fairly high in starch content. Thus, they are recommended as good green feeds for the animals and a supplement to concentrate.

Templeton (1968) stated that green feeds are rich in protein, minerals, and vitamins especially vitamin A. These feeds are easily digested, beneficial in maintaining health and vitality, and variety and may lower as feed cost.

Pond, *et al.*, (1995) stated that rabbits are well suited to low-energy, fibrous feedstuffs and are less well adapted to the utilization of high energy ingredient such as the cereal grains. Thus fibrous ingredients such as alfalfa meal are typically the basis of rabbit diets. Other dried herbage such as grass meal can also be used if available. For small scale backyard rabbit raising, feeding greens such as grass vegetable tops, carrots and other succulent feeds may be feasible, but is not practical on the commercial scale.



Church (1986) stated that various clovers can be used in place of alfalfa meal in rabbit rations. Clovers are similar in composition to alfalfa meal, being good source of protein, fat-soluble vitamins, calcium trace minerals and indigestible fiber. Also stated that backyard rabbit raising on small scale, feeding of fresh greens can be advantageous. If palatable greens are fed free choice, the amount of pellets offered can be reduced by about half, with no adverse effect on performance. However, feeding green is sometime useful in stimulating the appetite of animals that have gone off feed.

Church (1991) stated that growing rabbits of 5-10 weeks of age will have an average daily dry feed consumption of 80-95g/kg body weight (2500kcal/kg). Feed conversion ratio varies widely among rabbit's breeds and managements. An average feed conversion for meat-producing rabbits should be 3:1 that is 3 kg of feed for each kg of live weight gain. Feed conversion decreases with increase in age, especially after 10 weeks of age. For good economic return it is important to produce rabbits that reach slaughter weight in the shortest time. Total feed utilized includes both feed consumed and feed efficiency. A good efficiency and average daily gain can be obtained through the good animal genetic selection, proper nutrition and health, good feeding practices and constant management improvement.

Watson, *et al.*, (1960) stated that rabbits will eat hay and dried grass with advantage and small of silage may also be fed. Kikuyu leaf content of 9.2 MJ/kg ME, stem 7.4 MJ/kg and crude protein leaf content of 21%, and 17% stem.

Generally, in case the commercial concentrates or home-mixed ingredients are not available, green feeding composed of 50% legumes and 50% of other grasses will suffice in providing a minimum dietary requirement especially for dry does and bucks. In addition, forages greatly economize the amount of concentrate feed (Sicwaten, ND).



MATERIALS AND METHODS

Statistical Design and Treatment

Twelve one-month-old rabbits were used as experimental animals in the study. Each rabbit was assigned at random into three treatments using completely randomized design (CRD). Each treatment was replicated four times. The treatments are as follows.

T₁ –50% kikuyu grass+ 50% camote

T₂ –50% perennial peanut + 50% camote

T₃ –25% perennial peanut + 25% kikuyu grass +50% camote

Housing, Feeding, and Care Management

The pens/cages were cleaned and disinfected one week before the study started. The experimental animals were fed twice a day between 6:00 to 7:00 in the morning and 4:00 to 5:00 in the afternoon. Feeding management was done in two ways: interval feeding and in between feeding. In such a way, that the roughages were given every morning and afternoon feeding or the vice versa. Clean water was provided at all times. This was done throughout the study. The roughages were washed thoroughly with clean water then air dried for eight hours, weighed and recorded before giving to the animals. Cleaning of the cages was done every before feeding. Cleanliness was observed.

Data Gathered

1. Initial weight (kg). This was obtained by weighing the animal at the start of the study.
2. Final weight (kg). This was obtained by weighing the animal at the end of the study.



3. Feed offered (kg). This refers to the amount of the diet consumed by the animal.
4. Feed left-over (kg). This refers to the amount of diet/ration not consumed by the animal.
5. Morbidity. This refers to the animals that got sick during the study.
6. Mortality. This refers to the animals that died during the study.

From the data to be gathered, the following were computed:

1. Feed intake (kg). This was taken by getting the difference between the amount of feed offered and the amount of feed left-over.

2. Total gain in weight (kg). This computed by getting the difference between final weight and initial weight.

3. Total feed consumption (kg). This computed by getting the sum of the amount of feed consumed by the animals from the start to the end of the study.

4. Daily feed intake (kg). This was done by using the formula

$$\text{Daily Feed Intake} = \frac{\text{Feed Intake}}{\text{No. of Days on Test}}$$

5. Feed conversion ratio (%). This was computed using the formula

$$\text{Feed conversion ratio} = \frac{\text{Total Feed Intake}}{\text{Total Gain in Weight}}$$

6. Morbidity rate (%). This was taken by getting the quotient of the number of animals that got sick by the total number of animals per replicate then multiplied by 100 %.

7. Mortality rate (%). This was taken by getting the quotient of the number of the animals that died by the total number of replicate then multiplied by 100%.



RESULTS AND DISCUSSION

Weight of the rabbits

Table 1 shows the initial weight and the final weight of rabbits in the different treatments. It was observed that rabbits assigned in different treatments had almost the same weight at the start of the study.

Final weight shown in Table 1 that rabbits fed with perennial peanut and sweet potato as feed had the mean value of 1.49 kg as compared to rabbits fed with kikuyu grass and sweet potato having 1.33 kg. Statistical analysis revealed that there were no significant differences among different treatments.

Based on the result, it can be deduced that any of the combination of forages can be produced the same effect in terms of body weights of rabbits. No advantage was seen whether a two or three forage combination was fed.

Table 1. Weight of the rabbits at 30 and 50 days of age

TREATMENT	BODY WEIGHT (kg)	
	INITIAL	FINAL
kikuyu grass + sweet potato	0.41 ^a	1.33 ^a
perennial peanut + sweet potato	0.41 ^a	1.49 ^a
kikuyu grass + perennial peanut + sweet potato	0.41 ^a	1.40 ^a

*Means with the same letter superscripts are not significantly different at 5% level of significance by DMRT.



Gain in Weight

Although there were no statistical differences among treatment used, it is interesting to note that rabbits fed with perennial peanut and sweet potato obtained the higher numerical gain in weight with a mean of 1.08 kg. Rabbits given a combination of kikuyu grass and sweet potato and the combination of kikuyu grass, perennial peanut and sweet potato had means of 0.91, and 0.99 kg, respectively.

Based on findings, the gain in weight of the rabbits was not adversely affected by any of the forage combinations. It may also prove that the different green feeds combined had more or less the same effect.

Feed Intake

The green feeds of the rabbits in all treatments were given *ad libitum*. The rabbits were allowed to eat as much as they could. The result showed that the different treatments differed significantly in the amount of feed consumed. The control group given kikuyu grass consumed the lowest amount of feed. In terms of dry matter basis, rabbits fed with combination of perennial peanut, kikuyu grass and sweet potato had the mean value of 1.98 kg while as rabbits fed with kikuyu grass and sweet potato had the lowest mean value of 1.46 kg in terms of dry matter. Perennial peanut, being a high-protein feedstuff may have enhanced the palatability of the feeds offered since it was observed that it was common in the two treatments that has higher feed intake.

Based from this result, perennial peanut, kikuyu grass and sweet potato was the best combination of green forages and it is the most palatable to rabbits while the combination of kikuyu grass and sweet potato was the least palatable to rabbits.



Feed Conversion Ratio

The result showed that feed conversion of rabbits in the different treatments varied significantly on dry matter feed basis. Rabbits fed with kikuyu grass and sweet potato had the best conversion ratio of 1.4463, followed by rabbits fed with perennial peanut and sweet potato and the rabbits fed with perennial peanut, sweet potato and kikuyu grass with mean values of 1.7063 and 2.0370, respectively. Interestingly, the group which consumed the most amount of feed had the least efficient feed conversion ratio.

As stated by Church (1991), an average feed conversion for meat-producing rabbits should be 3:1 that is 3 kg of feed for each kg of live weight gain. Feed conversion decreases with increase in age, especially after 10 weeks of age. Since the rabbits were just 50 days of age, their feed conversion ratio was at optimum.

Table 2. Total gain in weight of the rabbits after 50 days of feeding

TREATMENT	GAIN IN WEIGHT (kg)	
	TOTAL	DAILY
kikuyu grass + sweet potato	0.91 ^a	0.0183 ^a
perennial peanut + sweet potato	1.08 ^a	0.0243 ^b
<u>kikuyu grass + perennial peanut + sweet potato</u>	<u>0.99^a</u>	<u>0.0200^a</u>

*Means with the same letter superscripts are not significantly different at 5% level of significance by DMRT.

** Means with the different letter superscripts are significantly different at 5% level of significance by DMRT.



Table 3. Total feed intake of the rabbits

TREATMENT	FEED INTAKE	
	AS FED	DRY MATTER
kikuyu grass + sweet potato	10.51 ^b	1.46 ^c
perennial peanut + sweet potato	11.14 ^a	1.82 ^b
kikuyu grass + perennial peanut + sweet potato	11.34 ^a	1.98 ^a

*Means with different letter superscripts are significantly different at 5% level of significance by DMRT.

Table 4. Feed conversion ratio of the rabbits at 50 days of age

TREATMENT	FEED CONVERSION RATIO	
	FRESH WEIGHT BASIS	DRY MATTER BASIS
kikuyu grass + sweet potato	11.5172 ^a	1.4463 ^b
perennial peanut + sweet potato	10.4627 ^a	1.7063 ^{ab}
kikuyu grass + perennial peanut + sweet potato	11.6627 ^a	2.0370 ^a

**Means with different letter superscripts are significantly different at 5% level of significance by DMRT.



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

Results showed that rabbits given the combination of perennial peanut, kikuyu grass and sweet potato consumed the amount of forage which is 1.98 kg dry matter and 11.34 kg fresh followed by rabbits given the combination of perennial peanut and sweet potato and those given the combination of kikuyu grass and sweet potato with 1.82 kg (11.14 fresh kg) and 1.46 kg (10.51 kg fresh) of dry matter, respectively.

The amount of green forages consumed by rabbits in the different treatments failed to effect significant differences in their rate of growth as indicated by their parallel final weight and gain in weight after seven weeks of feeding. However, the rabbits fed with a combination of kikuyu grass and sweet potato had better efficiency based on feed conversion ratio.

Conclusion

It is therefore concluded that rabbits fed with kikuyu grass and sweet potato had the best performance among the treatments. However, it can also be stated that rabbits can be given of perennial peanut, kikuyu grass and sweet potato without detrimental effect on growth.

Recommendation

Based from the results of this study, rabbit raisers may use any combination of kikuyu grass, perennial peanut and sweet potato without negative effect to the performance of their animals.



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