BIBLIOGRAPHY

SIGCOP, NGAYA-AN K. APRIL 2012. Carcass and Meat Characteristics of New Zealand White Rabbits Fed with Local Forages as Basal Diet. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted at the Animal Generic Resources (TANGERE) Project at Bektey, Puguis, La Trinidad, Benguet to determine the slaughter traits of the experimental rabbits in terms of dressing percentage, and percentage of offals. It also aimed to find out the meat traits of the rabbits in terms of proximate composition.

The dietary treatments involved are: galinsoga, talinum, and kangkong.

Results showed that kangkong as basal diet to rabbits produced the best carcass quality and highest dressing percentage. Galinsoga and kangkong resulted in higher percentage of skin and head than talinum. Except for lungs, internal offals were not significantly affected by the dietary treatments. The carcass length was significantly higher in rabbits fed with galinsoga and kangkong. Crude protein was similar in all treatments.

INTRODUCTION

Rabbit (*Oryctolagus cuniculus*) raising is already practiced in the Philippines and other developing counties. Households started to make use of the rabbit as farm animal for fur and meat. Rabbits can also be used as pets or biochemical research as laboratory animals. The importance and usefulness of rabbits to man could be due to the fact that almost all parts of the animal's body are useful for human use and consumption. In almost every rural house hold in the Philippines, rabbit raising is a very popular enterprise such that there is proliferation of backyard producers which dominates rabbit production. As a secondary source of income for families, rabbit raising is a home- based business in the Philippines which has the potential for high profits in a relatively short period of time.

Rabbit production offers great potential as means of converting tropical forages and agricultural by-products to human food. Practically, rabbits can be fed anything from the garden, forest or kitchen including banana and papaya (paw paw) peels, pineapple cores, corn stalks, weeds, vines from pulses, leaves (cabbage, lettuce, cauliflower, carrots etc.) (Moreki, 2007).

The study was conducted to come out with the data on the carcass and meat characteristics of New Zealand White rabbits fed with fodder trees and herbs. The results of this study can help or serve as a guide for rabbit raisers in using fodder trees and herbs for animals.

Studying rabbit generally is a very important aspect for people who want to learn or gain more knowledge on rabbit husbandry especially on veterinarians and animal science students and pet owners.

In addition, it can help vegetable farmers because they can utilize the galinsoga weeds which compete on growing crops as feeds to their rabbits and also utilize the leaves of ipil-ipil, malunggay, talinum and kangkong.

The general objective of this study is to determine the carcass yield and carcass and meat characteristics of New Zealand White rabbits fed with local forages as basal diet.

Specifically, this study aimed to determine the slaughter traits of the experimental rabbits in terms of dressing percentage, and percentage of offals, and find out the meat traits of the rabbits in terms of proximate composition.

The study was conducted at the Animal Genetic Resources (TANGERE) Project at Bektey, Puguis, La Trinidad, Benguet on December 2011.

REVIEW OF LITERATURE

Most animal feeds are coming from plants like fodder tree leaves such as mango and ipil-ipil. Herbs are also being given to animals as feeds. It is a garden plant that are grown and harvested for culinary, aromatic and medicinal uses. Fodder or animal feeds is any feedstuff that is used specifically to feed domesticated livestock such as cattle, goats, sheep, horses, chickens, rabbits and pigs. It includes hay, straw, silage, compressed and pellet feeds oils and mixed rations, and also sprouted grains and legumes.

According to Ishida (2000), the leaf meal has a high protein content of between 26 to 33%, with high amino acid score. It has good mineral profile and vitamins such as A, B2, C and E. The leaves of plants have been used in the tropics as a cheap protein sources in ruminant feeds.

Galinsoga (*Galinsoga parviflora*)

According to Damalas (2008), *Galinsoga parviflora* is an annual dicot species of the family *Asteraceae*, is a common herb that is often found in disturbed habitats and agricultural areas in many parts of the temperate and subtropical regions of the world. . *Galinsoga parviflora* is considered to be a common weed in several crops of major importance, such as wheat, corn, cotton, tobacco, sugar beet, tomato, pepper, potato, bean, onion, cabbage and others. It is frequently found in gardens and uncultivated areas. *Galinsoga parviflora* competes strongly, particularly with irrigated crops of short height, and it might also hinder crop harvest.

Galinsoga parviflora contains 88.4 g water, 653 KJ energy, 3.2g protein, 0.4g fat, 5.2g carbohydrates, and 1.1g fiber for every 100 g of its edible portion (Grubben *et al*, 2004). The leaves of gallant soldier contain per 100 g edible portion: water 88.4 g, energy

653 kJ (156 kcal), protein 3.2 g, fat 0.4 g, carbohydrate 5.2 g, fibre 1.1 g, Ca 284 mg, Mg 60 mg, P 58 mg, Fe 5.3 mg, Zn 1.3 mg, carotene 4 mg, thiamin 0.08 mg, riboflavin 0.21 mg, niacin 1.21 mg, ascorbic acid 6.7 mg (Wehmeijer, A.S. & Rose, E.F., 1983). The plant is grazed by livestock and used as a feed for chicken, rabbits and pigs (Schippers, 2004).

Talinum (*Talinum triangulare*)

Schippers (2004) said that waterleaf (*Talinum triangulare*) is a non-conventional vegetable crop of the *Portulacea* family which originated from tropical Africa and is widely grown in West Africa, Asia, and South America.

Iheukwumere (2008) stated that the average litter sizes at birth weaning weight were similar (P > 0.05) between 40:60 (40% *Talinum Triangulare* + 60 % Forage) and 60:40 (60% *Talinum Triangulare* and 40% Forage) combinations but, they differed significantly (P < 0.05) from 20:80 and 80:20 concentrate and forage combinations. However, 20:80 diets differed significantly (P < 0.05) from 80:20 diet combinations. In terms of average litter weight gain the combination of 60% *Talinum triangulare* + 40% forage attened the highest followed by 80:20 concentrate. From the economic stand point, therefore, diet with 60:40 concentrate and forage combinations could be considered optimum, based on result on litter sizes, litter weight at weaning and mortality.

Ipil-ipil (*Leucaena leucocephala)*

Cook et al (2005) stated that *Leuaena* is a fast growing, evergreen, thorn less shrub, reaching 5m to 20 m the Hawaiian type (FAO, 2001*). Leucaena* is a long lived perennial legume. It has a deep taproot and is highly branced. Leaves are bipinnate, bearing numerous leaflet 8mm to 16 mm long.

Mutayoba et al, (2003) said that based on analysis the crude protein and crude fiber of *leucaena* leaf meal is 20.6 and 18.9% respectively, whereas the nitrogen free extract was only 34.6 %. *Leucaena* leaf meal contained about 16.5MJ dry matter gross energy. The result of the study in terms of growth rates of birds declined as the *leucaena* leaf meal levels increased in the diet. The highest overall gain was observed in birds fed with optimum energy 0% LLM diet and the lowest in birds fed the high-energy 20%LLM. Overall feed intake decreased with increasing LL% in both energy levels, the rate of decline being highest in birds given high energy and high 20% LLM diets. The feed conversion increased with increasing LLM levels in the diets at both energy levels. Carcass weight declined with increase in LLM. There is no difference in carcass weight between energy levels.

Kangkong (*Ipomoea aquatica*)

The final live weight and daily gain of rabbit is higher when fed 50% and 75% water spinach leaves compared to rabbits fed with para grass alone and 25% water spinach leaves. Therefore, it was concluded that levels from 50% to 75% of water spinach leaves supplemented to para grass diets give higher economic benefits for small farmers (Kim Dong *et al*, 2008).

In rabbits fed a concentrate diet, fresh sweet potato vines resulted in a slightly lower intake and daily gain (21.1 g/day) than water spinach (Ipomoea aquatica). The best performances were obtained when adding Guinea grass (Megathyrsusmaximus) to sweet potato vines, water spinach or a mixture of both forages, though the digestibility of the diets was lower (Doan Thi Gang, 2006).It may be fed fresh, dried or ensiled, and makes make a very palatable silage with a pleasant fruity smell (Lebot, 2009).

Malunggay (*Moringa oleifera*)

The slaughter weight, hot carcass weight, dressed weight and dressing percentage increased numerically as the Moringa leaf meal level was increased in the diet. There was a significant positive correlation between slaughter weight and dress weight ($r=0.9306$, $P<0.05$). Similarly, the slaughter weight correlated positively with dressing percentage ($r=0.5365$, $P<0.05$). The moringa leaf meal improved meat quality by increasing the ($p<0.01$) protein content and reducing ($p<0.01$)fat level in the meat (Nuhu, 2010).

Tedonkeng *et al*, (2005) stated that the result of his study showed that multi-nutrients blocks had a high value of protein which is 37.4% compared to *moringa oleifera* which is 26.37%. *Moringa oleifera* was richer in cellulose (19.16%) than multi-nutrients (4.76%). No significant difference ($P>0.05$) was observed between weights of the females before birth. The weight of the young group supplemented with multi-nutrients blocks was statistically higher ($P>0.05$) than those of the other groups.

MATERIALS AND METHODS

The materials that were used in the experiment include 36 New Zealand White mature rabbits, weighing scale, cages, crocks for drinking water, record book and different fodder tree leaves and herbs to be tested.

Methods

The completely randomized design of an experiment was used. A total of 12 experimental rabbits were involved using the same animals from the feeding trial fed with the following forages:

T_1= Galinsoga (*Galinsoga parviflora*) (control)

T_2= Talinum (*Talinum triangulare*)

T_3= Kangkong (*Ipomoea aquatica*)

To lessen variation, the test foliages were obtained from the same source or origin. Only part of foliage that seemed to be preferred by rabbits was gradually increased each week. Body weight was measured at the start and end of the experiment and at weekly intervals.

Each individual rabbit was fed twice a day with 300 g of feedstuffs at 7:30 am and 4:30 pm. Water was available at all times in an earthen jar. The study was focused on the slaughter and meat characteristics of experimental rabbits.

All experimental animals were slaughtered following the prescribed slaughtering procedures. Approved practices in slaughtering rabbits include the following:

1. Stunning. This is the process of making the animals unconscious, prior to bleeding. A rabbit was held at the small of the back with its head down. A metal was used to strike at the center of the skull with a strong blow.

2. Hoisting. The unconscious rabbit is suspended with a hook inserted between the achilles tendon and the tibia or bone above the hock in both hind legs. The rabbit is hoisted facing the butcher.

3. Bleeding. A cut is made at the neck immediately behind the head to drain the blood from the carotid artery.

4. Skinning. Ripping cuts are made on the skin around the hock joints of both suspended hind legs. From the cuts, a slit is made down the hocks at the inside of the thighs to the anus and genitals. The tail is cut at the base and also the front legs at the carpal point. With two hands, the skin is pulled down the carcass.

5. Evisceration. This involves the opening of carcass up to the complete removal of the internal organs from the body cavity.

6. Fabrication. This is the cutting of the carcass into wholesale portions such as neck, front quarter, back and hind quarter.

Data to be Gathered:

1. Slaughter Data

1.1. Slaughter weight (kg). This is obtained by weighing the animals prior to slaughter using a weighing scale.

1.2. Skin weight (g). This is the weight of the pelt.

1.3. External offals (g). This is the weight of the head and four legs weighed individually.

2. Carcass Data

2.1. Carcass weight (kg). This is the weight of the carcass without the head, feet and the entrails.

2.2. Carcass length (cm). This is taken by measuring from the first rib to the base of the tail on the suspended carcass in centimetres.

2.3. Internal offals. The individual weight of the heart, lungs, kidney, liver, gastro-intestinal tract (GIT), and blood.

3. Meat Data

3.1. Proximate composition. The amount of moisture, crude protein, fat, ash, energy, and carbohydrates were analyzed at the Regional Standard and Testing laboratory of the DOST-CAR

Data to be Computed:

$$\text{Dressing Percentage} = \frac{\text{Carcass Weight}}{\text{Slaughter Weight}} \times 100$$

Statistical Analysis of Data

All data were subjected to analysis of variance (ANOVA) for a completely Randomized Design (CRD) experiment. Duncan's Multiple Range Test (DMRT) was used to compare treatment means.

RESULTS AND DISCUSSION

Slaughter Weight, Carcass Weight and Dressing Percentage

Table 1 shows the mean slaughter weight, carcass weight, and dressing percentage of the rabbits as affected by the different treatments.

In the slaughter weight, rabbits given with kangkong have the heaviest mean of 2.08 while the rabbits given with galinsoga have a mean of 1.94 and the rabbits given with talinum have a mean of 1.58. In terms of carcass weight, rabbits given with kangkong have the heaviest mean of 1.02 and the rabbits given galinsoga have a mean of 0.92 while the rabbits given with talinum have a mean of 0.66. Also in the carcass weight, rabbits fed with kangkong have the best carcass quality and meat has less fat. These means that slaughter weight and carcass weight of the different treatments are significantly different as revealed by the statistical analysis which implies that the different treatments have high differences to each other.

This result supports Kim Dong (2008) who stated that final live weight and daily gain of rabbit is higher when fed water spinach leaves compared to rabbits fed with para grass alone.

On the dressing percentage, rabbits given kangkong have a dressing percentage of 49.03 while the rabbits given with galinsoga have a dressing percentage of 46.98 and the one given with talinum has a dressing percentage of 42.14. The rabbits supplemented with kangkong have the heaviest dressing percentage.

Table 1. Mean slaughter weight, carcass weight, and dressing percentage

TREATMENTS	SLAUGHTER WEIGHT (kg)	CARCASS WEIGHT (kg)	DRESSING PERCENTAGE (%)
Galinsoga	1.94[ab]	0.92[a]	46.98[ab]
Talinum	1.58[b]	0.66[b]	42.14[b]
Kangkong	2.08[a]	1.02[a]	49.03[a]

Means with the same letter are not significantly different at 0.05 by DMRT

Statistical analysis revealed that the treatments are significantly different in terms of dressing percentage. This implies that the rabbits have high difference in dressing percentage.

Percentage of the Skin and External Offals

Table 2 presents the percentage of the skin and external offals as affected by the different treatments.

In the percentage of the skin, rabbits given kangkong have a percentage of 9.83 while the rabbit given with talinum has a percentage of 9.41 and the one given with galinsoga has a percentage of 8.63. In the percentage of the head, rabbits given with talinum have a percentage of 9.89, while the rabbits given with kangkong have a percentage of 9.10, and the rabbits given with galinsoga have a percentage of 8.84.

On the front and hind legs percentage, it is observed that there are similarities which mean that these are not significant to each other and less comparable.

These table shows that there are differences that are observed, statistical analysis revealed that there is 1 significant and 2 not significant differences between treatments in

Table 2. Mean percentage of the skin and external offals (%)

TREATMENTS	SKIN	HEAD	FRONT LEGS	HIND LEGS
Galinsoga	8.63[ab]	8.84[ab]	0.67[a]	1.75[a]
Talinum	9.41[b]	9.89[b]	0.84[a]	2.02[a]
Kangkong	9.83[a]	9.10[a]	0.71[a]	1.85[a]

Means with the same letter are not significantly different at 0.05 by DMRT

the external offals. These shows that rabbits fed with these two selected feedstuffs talinum and kangkong are comparable to each other.

It reveals that feeding talinum and kangkong into the rabbits slightly affect the weights of the skin but not the external offals.

Internal Offals of Rabbit

Table 3 shows the mean weight of the internal offals of rabbits as affected by the different treatments.

Rabbits given with talinum have mean weight of 7.75 in terms of the heart while the rabbits given with galinsoga and kangkong have the same weight of 7.25. On the weight of the lungs, the rabbit given with kangkong have the heaviest mean weight of 9.75 while the one given with galinsoga have a mean of 9.5 and the rabbits given with talinum have a mean of 8.25.

In the weight of the kidney, rabbits fed with galinsoga have a mean of 14.25 and the rabbits fed with kangkong have a mean weight of 13.0 and the rabbits given with talinum have a mean of 12.25. In terms of the live weight the rabbits given with galinsoga

have the heaviest mean of 57.00, the rabbits given with kangkong have a mean weight 51.50 and the rabbits given with talinum have a mean of 49.5.

On the weight of the full GIT , the rabbits fed with kangkong has a mean of 414.50 which is the heaviest while the rabbits fed with talinum has a mean of 413.25 and the rabbits fed with galinsoga has a mean weight of 408.25. In the weight of empty GIT, the rabbit given with kangkong has a mean weight of 160.50, the rabbits given with galinsoga have a mean of 150.25 and the rabbits given with talinum have a mean weight of 148.25.

In terms of the weight of the blood, the rabbits given with kangkong have the heaviest mean weight of 40.75 followed by the rabbits given with galinsoga with a mean of 39 and the rabbits given with talinum have a mean of 30.75.

The mean of the internal offals of the different treatments are not significantly different except the lungs which is significant as revealed by the statistical analysis. These means that rabbits fed with these feedstuffs do not adversely affect the weight of the internal offals. These reveals that rabbits fed with these different feedstuffs are comparable to each other.

Table 3. Mean weight of the internal offals (g)

TREATMENTS	HEART	LUNGS	KIDNEY	LIVER	GIT W/ Full	GIT Empty	BLOOD
Galinsoga	7.25[a]	9.50[a]	14.25[a]	57.00[a]	408.25[a]	150.25[a]	39.00[a]
Talinum	7.75[a]	8.25[b]	12.25[a]	49.50[a]	413.25[a]	148.25[a]	30.75[a]
Kangkong	7.25[a]	9.75[a]	13.00[a]	51.50[a]	414.50[a]	160.50[a]	40.75[a]

Means with the same letter are not significantly different at 0.05 by DMRT

Carcass Length of Rabbits

Table 4 shows the mean carcass length of the slaughtered rabbits as affected by the different treatments.

This shows that rabbits given kangkong have the heaviest mean of 31 while the rabbits given talinum have a mean of 29.38 and the rabbits given galinsoga have a mean of 27.63. Statistical analysis revealed that the treatments are significantly different in terms of carcass length.

As shown in the table, the carcass length of the rabbits fed with kangkong has the longest carcass measurement which means that water spinach is good to rabbits for better carcass measurement, carcass weight, and gain in weight which is proven in table 1 and the previous study of Kim Dong (2008).

Meat Composition of Experimental Rabbits

Table 5 presents the proximate analysis of the breast part of the rabbit meat samples as analyzed at the (DOST-CAR) Department of Science and Technology Laboratory, La Trinidad, Benguet.

Table 4. Mean carcass length

TREATMENTS	LENGTH (cm)
Galinsoga	27.63[b]
Talinum	29.38[ab]
Kangkong	31.00[a]

Means with the same letter are not significantly different at 0.05 by DMRT

Table 5. Proximate analysis of rabbit meat samples

TEST	T1 GALINSOGA	T2 TALINUM	T3 KANGKONG
Ash (%)	1.25	1.16	0.97
Carbohydrate (%)	0	0	0
Crude Fat (%)	0.54	0.05	9.82
Crude Protein (%)	23.89	22.55	23.21
Moisture (%)	74.35	77.16	70.26
Energy (kcal/150g)	100	91	181

Percent ash. The gravimetric method was used in obtaining the ash percentage of the meat samples of the different treatments.

The ash content of the meat samples obtained from the rabbit given Galinsoga is the highest having a percentage of 1.25 while the meat sample that given Talinum has a percentage of 1.16 and the one given kangkong have the lowest percentage of 0.97.

Crude fat. Table 5 shows the crude fat contents of the meat samples derived from the rabbits under the different treatments. A high different was observed between the crude fat of the meat samples derived from the birds given kangkong compared to the crude fat of the meat samples derived from the rabbits given Galinsoga and Talinum. These mean that Kangkong increases the crude fat level of rabbit meat compared to Galinsoga and Talinum.

Crude protein. As shown in Table 5, the crude protein of the meat samples of the different treatments has a little difference. The meat sample from the rabbits given

Galinsoga has the highest percentage of crude protein which is 23.89 while the rabbits given Kangkong has a crude protein percentage of 23.21 and the meat sample from the rabbits given with Talinum have the lowest percentage of 22.55.

The Crude protein of the different meat samples was obtained using the Kjeldahl method.

Moisture content. Oven method was used in obtaining the moisture content of the different meat samples of the different treatments.

Table 5 shows the moisture content of the meat samples obtained from the rabbits given talinum which has the highest percentage of 77.16 and the meat samples from the rabbits given galinsoga has a percentage of 74.35 while the meat samples from the rabbits given kangkong has the lowest percentage of 70.26.

Energy. The energy content of the meat samples derived from the rabbits seem to be more or less different. The meat samples from the rabbits given kangkong gave an energy content of 181 kcal, while the meat sample from the rabbits given galinsoga has energy content of 100 kcal, and the meat sample from the rabbits given talinum has energy content of 90 kcal.

As observed in Table 5, the higher the fat content of the meat the energy is also higher which means that the fat is the one that affects the percentage of the energy on the meat.

Statistical analysis revealed that carbohydrate is absent in the meat samples of the rabbits.

All the results of the data from percent ash to moisture content were obtained from breast part of rabbit meat samples having a weight of 150 grams.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the carcass and meat characteristics of New Zealand White rabbits fed with local forages as basal diet. It was conducted at the Animal Generic Resources (TANGERE) Project at Bectey, Puguis, La Trinidad, Benguet on December 2011. The treatments used are the following: Galinsoga Parviflora (control), Talinum, and Kangkong. The treatments were replicated four times. Twelve rabbits were used in the study using Completely Randomized Design (CRD).

Results of the study showed that rabbits fed with kangkong recorded the heaviest slaughter weight and carcass weight of 2.08 kg and 1.02 kg respectively. Also, the rabbits fed with kangkong had the highest dressing percentage of 49.03. Statistical analysis revealed that there are three significant and two not significant results in the slaughter data. Carcass data has two significant and seven not significant results. This means that most of the data are comparable to each other.

Conclusion

Based on the results, it could be concluded that kangkong as basal diet for rabbits resulted to higher dressing percentage.

Recommendation

Kangkong as basal diet to rabbits is recommended for heavier and better slaughter and carcass weight among rabbits.

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