

BIBLIOGRAPHY

CARIÑO, ALLEN A. APRIL 2013. Growth Performance of Rabbit Fed with Kangkong (*Ipomea aquatica*), Sweet potato (*Ipomoea batatas*) and Galinsoga (*Galinsoga parviflora*). Benguet State University, La Trinidad Benguet.

Adviser: Marlene B. Atinyao, Ph. D

ABSTRACT

This study was conducted to find out the effect of feeding kangkong, sweet potato vine and galinsoga 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 fed with galinsoga, sweet potato vine and kangkong.

Fifteen heads of two month old rabbit with the same breed were distributed randomly into three treatment namely: galinsoga (T₁), sweet potato (T₂) and kangkong (T₃).

Result revealed no significant differences in the total gain in weight and feed conversion ratio (as fed basis) of rabbits. However, in terms of feed intake in dry matter basis and feed conversion ratio, statistical analysis revealed significant differences.

Based on the result of the study, sweet potato vine effected the best growth performance in the rabbits. Rabbit raisers may use sweet potato as feed of choice for rabbits.



INTRODUCTION

Oryctolagus cuniculus popularly known as the rabbits belongs to order Lagomorphia in the family Leporidae (Templeton, 1968). Rabbits are easy to raise and have high reproductive rate. The gestation length of does is barely 31 days and is giving birth 5 - 8 kits per kindling so they can easily multiply in a short period of time.

Rabbits are raised for a variety of purposes, like meat, fur, wool and as laboratory animals or as simply kept as pets. Their feces too can be utilized as fertilizers.

As a source of food, rabbit meat has low cholesterol content and contains slight amount of uric acid, thus is suitable for a special diet (Maddul, 1999).

Even though the rabbits can easily multiply, there are other factors affecting rabbit production. One of these factors is high cost of feeds. This prompted rabbit raisers to resort to different alternative feedstuff to meet the nutrient requirement of growing rabbit.

Fortunately, rabbits are herbivores and therefore can be fed with available plant materials. Among the feed resources available includes Kangkong (*Ipomea aquatica*), Sweet potato (*Ipomoea batatas*) and Galinsoga (*Galinsoga parviflora*), Kangkong is an excellent source of vitamin A and calcium. Another good source of energy is sweet potato containing protein, starch and sugar.

This study aims to determine the effect of chopped kangkong, sweet potato and galinsoga leaves and stalk on the growth performance of rabbits; and to determine which of the three is the best feed for rabbits.

Result of this experiment can serve as benchmark data to rabbit raisers, researchers and students for further studies on better and cheaper feeds.

The study was conducted at Benguet State University Poultry Project, from July to September 2012.



REVIEW OF LITERATURE

Rabbits are herbivores but it is a common practice to give them concentrates before they are provided with their regular roughage diet (Bennet, 1979).

Cheeke (1987) stated that the reproduction, capacity of rabbit is legendary. Does can rebreed within 24hr of giving birth (kindling) and in fact this is the normal behavior of the wild rabbit.

According to Du Thanh Hang *et al.* (2009) as cited by Dup – et (2011) Sweet potato is the third important crop in Vietnam after rice and corn in 2001. The leaves have a protein content ranging from 26 to 33% in the dry matter (DM) and have been used successfully as supplementary feed for different classes of livestock.

Maddul (1999) as cited by Longbuan (2009) mentioned that the digestive system of rabbits allow the utilization of the forage based diets effectively despite its being a non-ruminant. Consequently, rabbits are well suited to low energy fibrous feedstuffs and less well - adapted to high energy ingredients of rabbit diet such as cereals and grains. Thus fibrous such as fodders or fresh forage are typically the basal ingredients of rabbit diets. For small scale rabbits raising, feeding green such as grass, vegetable tops, carrots and other succulent feeds may be feasible, but is not practical on commercial scale.

De Leon (1998) cited that the basic feed for rabbits is roughage and so they should be given a wide selection of grass, cover crops and any leafy plants. He also cited that to ensure fast growth, rabbits can be fed with pellets, growing mash, and corn or rice bran.

Galinsoga is an erect, slender, soft, often branched, annual herd, belonging to the compositae. Galinsoga contains 90 – 95% moisture (Holm *et al.* 1977).



Galinsoga is an annual dicot species of the family Asteraceae, is a common herb that is often found in distributed habitats and agricultural areas in many parts of the temperate and subtropical regions of the world (Damalas, 2008).

Grubben et al. (2004) stated that galinsoga contains 88.4g water, 3.2g protein, 0.4g fat, 5.2g carbohydrates, and 1.1g fiber for every 100g of its edible portion.

Knott and Deanon (1986) reported that kangkong leaf is an excellent source of Vitamin A. It is fairly rich also in Vitamin C, calcium, Potassium and phosphorous.

Onwueme (1987) stated that the leaves and tender shoots of camote are used as vegetable food. The leaf contains a dry matter basis, 8% starch, 4% sugar, 27% protein and 10% ash, it also contain 56mg carotene per 100g matter, in sum, and the leaf is richer than the tuber in proteins, minerals and vitamins and therefore more nutritious.



MATERIALS AND METHODS

The materials that were used in the study were 15 new zealand rabbits with an age of 2 months, commercial feeds (pellet), kangkong leaves and stalk, sweet potato leaves and stalks, and galinsoga leaves and stalk, weighing scale, recording materials and cleaning tools. The kangkong, sweet potato and galinsogawas taken from a local farm in Tuel, Tublay, Benguet.

A total of 15 rabbits were used in the experiment. The animals were randomly allocated into 3 dietary treatments and it was replicated 5 times using the Completely Randomized Design (CRD).

The dietary treatments were the following:

T₁ - commercial feed + galinsoga

T₂ - commercial feed + sweet potato vine

T₃ - commercial feed + kangkong

Each cage was provided with feeding trough and a watering trough. The flooring was made of wire mesh to allow the feces to drop easily. The initial weight of the animals were taken before introducing them to their respective experimental diets. The rabbits were supplied with water *ad libitum*. The feeding trial ended when the animals reached a body weight of 2.0 kilogram. Rabbits were fed 25g commercial feed + 150g forage at 6:00 in the morning and fed also with 25g commercial feed + 150g forage at 5:00 in the afternoon. Kangkong, sweet potato, and galinsoga leaves and stalk were air dried and chopped before feeding to the animals. Kangkong, sweet potato vine and galinsoga were given to the animals after feeding the rabbits with pellets. All the treatments were subjected to the same care and management, except for the treatment imposed.



Data Gathered

The following data were gathered:

1. Initial weight (kg). This refers to the weight of the animals at the start of the study, at 60 days of age.
2. Number of days to reach 2.0 kg. This refers to the number of days required per rabbit to reach the target weight of 2.0 kg.
3. Amount of the concentrate and roughages consumed (kg). This refers to the quantity of kangkong, sweet potato and galinsoga consumed by the experimental animals.
5. Number of mortality. This refers to the number of dead rabbits during the experiment.
6. Number of morbidity. This refers to the number of sick rabbits during the experiment.
7. Dry matter of feeds. This refers to the drying of feed samples to constant weight.

Data Computed

From the data that was gathered, the following was computed:

1. Total gain in weight (kg). This was obtained by taking the difference between the initial weight and final weight of the rabbit.
2. Feed intake as feed basis (kg). This was obtained by getting the difference between the amount of feed refused and feed offered to the animal.
3. Percent dry matter in feed (%). This was obtained using the formula below

$$\% \text{ DM} = \frac{\text{Oven Dry Weight}}{\text{Fresh Weight}} \times 100$$



4. Feed intake in dry matter basis. This was determined by multiplying the feed intake as feed to the percent dry matter.

5. Morbidity rate (%). This was computed by dividing the number of the sick rabbit by the number of rabbits per treatment multiplied by 100.

6. Mortality rate (%). This was computed by dividing the number of the dead rabbit by the number per treatment multiplied by 100.

7. Feed efficiency. It was expressed as feed conversion ratio which is the amount of feed intake (DM basis) required to produce a kilogram gain in weight.

Data Analysis

Data were analyzed using the Analysis of Variance appropriate for Complete Randomized Design (CRD). Treatment Means were compared using the Duncan Multiple Range Test (DMRT).



RESULTS AND DISCUSSION

Initial Weight

The mean initial weight of the experimental rabbits in different treatments is shown in Table 1. Statistical analysis showed no significant difference in the initial weight of the experimental rabbits in the three treatments.

Rabbit fed with 50g commercial feed + 300g galinsoga had a mean initial weight of 0.772 kg, rabbits fed with 50g commercial feed + 300g sweet potato vine had a mean initial weight of 0.837 kg and rabbits fed with 50g commercial feed + 300g kangkong had a mean initial weight of 0.815 kg. The average initial weight of rabbits was 0.808 kg.

Results showed that all experimental animals were similar in body weight as required by the experimental design.

Number of Days to Reach a 2.0 kg Body Weight

Table 2 showed the mean number of days to reach a 2.0 kg body weight of the rabbits. Statistical analysis revealed highly significant differences among treatment means. Rabbits fed with 50g commercial feed +300g sweet potato vine had the shortest time to reach 2.0 kg with mean of 48 days.

Table 1. Initial weight of the rabbits at 60 days of age

TREATMENT	INITIAL WEIGHT (kg)
Galinsoga	0.772 ^a
Sweet potato vine	0.837 ^a
Kangkong	0.815 ^a

Means with a common letter(s) are not significantly different at 0.05 level of DMRT

Growth Performance of Rabbit Fed with Kangkong (Ipomea aquatica), Sweet potato (Ipomoea batatas) and Galinsoga (Galinsoga parviflora)
CARIÑO, ALLEN A. APRIL 2013



Table 2. Number of days to reach 2.0 kg body weight

TREATMENT	NUMBER OF DAYS
Galinsoga	60 ^a
Sweet potato vine	48 ^c
Kangkong	51 ^b

Means with a common letter(s) are not significantly different at 0.05 level of DMRT

Followed by rabbits given 50g commercial feed + 300gkangkong with a mean of 51 days while rabbits fed with 50g commercial feed +300g galinsoga had the longest time to reach 2.0 kg with a treatment means of 60 days.

The result of the study showed that rabbits fed with sweet potato vine attained 2.0 kg 3 days earlier than those fed with kangkong and 12 days earlier than rabbits fed with galinsoga. It appears that sweet potato contains more nutrients required for growth by rabbits compared to kangkong and galinsoga. While galinsoga is the most common forage for rabbits, it may be worth considering sweet potato instead of galinsoga particularly when the latter is available.

Gain In Weight

Table 3 showed total gain and daily gain in weight of rabbits in different treatments. Statistical analysis revealed there were no significant differences among treatment means in total gain in weight of the experimental animals. The total gain in weight was not significantly different since rabbits were grown to attain the target weight of 2.0 kg body weight.



Table 3. Total and average daily gain in weight

TREATMENT	TOTAL GAIN IN WEIGHT (kg)	DAILY GAIN IN WEIGHT (kg)
Galinsoga	1.228 ^a	0.020 ^b
Sweet potato vine	1.163 ^a	0.023 ^a
Kangkong	1.185 ^a	0.023 ^a

Means with a common letter(s) are not significantly different at 0.05 level of DMRT

As for daily gain in weight, statistical analysis revealed significant differences between treatment means. Rabbits given 50g commercial feed + 300g galinsoga had a lower in average daily gain (ADG) of 0.020g compared to rabbits given 50g commercial feed + 300g sweet potato vine and 50g commercial feed + 300g kangkong with an ADG of 0.023g.

As Onwueme (1987) opined, kangkong and sweet potato vine are good source of vitamins, proteins, minerals which are essential for the growth and development of the animal body.

Total Feed Intake as Fed and Dry Matter Basis

Table 4 showed total feed intake as fed and dry matter basis. Statistical analysis showed significant difference among treatment means in the feed intake of rabbits, both as fed and dry matter basis.

Rabbits fed with 50g commercial feed + 300g galinsoga had the highest feed intake with a mean of 15.760 kg as fed basis and 3.155 kg in dry matter basis, rabbits given 50g commercial feed + 300g kangkong had a mean of 14.540 kg as fed basis and 3.2340 kg as



dry matter basis and those given 50g commercial feed + 300g sweet potato vine had the lowest feed intake of 13.180 kg as fed basis and dry matter of 2.2556 kg.

The highly significant difference in feed intake dry matter basis is a direct effect of the highly significant difference in feed intake, as fed basis, and also because the feedstuffs have different dry matter contents thus the statistical analysis is significantly different.

Comparison of means by DMRT revealed that there were no significant differences between feed intake of rabbits fed with 50g commercial feed + 300g galinsoga and 50g commercial feed + 300g kangkong, as fed basis. This showed that the rabbits consumed almost the same amount of sweet potato and kangkong.

Table 4 also showed the commercial feed intake of rabbits. The dry matter of the commercial feed given to rabbits was 87%. Rabbits fed with galinsoga had the highest commercial feed intake with a mean of 3.04 kg, followed by the feed intake of rabbits given kangkong with a mean of 2.55 kg, and those that were fed with sweet potato with a mean of 2.43 kg.

Table 4. Total feed intake as fed and dry matter basis

TREATMENT	AS FEED (kg)		DYR MATTER BASIS (kg)	
	COMMERCIAL FEED	FORAGE	COMMERCIAL FEED	FORAGE
Galinsoga	3.04 ^a	15.76 ^a	2.642 ^a	3.1550 ^a
Sweet potato vine	2.43 ^b	13.54 ^b	2.108 ^b	2.4556 ^b
Kangkong	2.55 ^b	14.18 ^b	2.214 ^b	3.2340 ^a

Means with a common letter(s) are not significantly different at 0.05 level of DMRT



Rabbits fed with galinsoga had the highest commercial feed intake because it took these rabbits more days to reach a 2.0kg thus they consumed more commercial feeds compare to the two other treatments.

Feed Conversion Ratio

The feed conversion ratios of rabbit are shown in Table 5. Statistical analysis revealed no significant difference in feed conversion ratio as fed basis with an average of 12.21 kg.

As for dry matter basis, statistical analysis revealed significant differences among treatment means. Rabbits fed with 50g commercial feed + sweet potato (2.1266 kg) are the most efficient in converting feed into gain compared to the rabbits feed with 50g commercial feed + galinsoga (2.5808 kg) and 50g commercial feed + kangkong (2.740 kg). This means that rabbits fed with sweet potato need a smaller amount of sweet potato vine (2.1266 kg) to gain weight.

Comparison of means using DMRT revealed that the FCR of rabbits given 50g commercial feed + galinsoga (2.5808 g) was not significantly different with those given 50g commercial feed + 300g kangkong (2.7400 g). However, the FCR of rabbits given galinsoga and those given kangkong was significantly different with the FCR of rabbits fed with 50g commercial feed + 300g sweet potato.

Morbidity and Mortality Rate

The good health of the experimental rabbits was maintained all throughout the experimental period. There were no mortality and morbidity observed during the conduct of the study.



Table 5. Feed conversion ratio of the rabbits at 2.0 kg body weight

TREATMENT	FEED CONVERSION RATIO	
	AS FED BASIS (kg)	AS DM BASIS (kg)
Galinsoga	12.904 ^a	2.5808 ^a
Sweet potato vine	11.726 ^a	2.1266 ^b
Kangkong	12.020 ^a	2.7400 ^a

Means with a common letter(s) are not significantly different at 0.05 level of DMRT



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to determine the effect of galinsoga, sweet potato and kangkong on the growth performance of rabbits and to determine which of the three forage is best feed for rabbits. Specifically, to determine also the gain in weight, feed conversion ratio, morbidity and mortality of the rabbits.

A total of 15 rabbits at 2 months of age were used in the study. Following the Completely Randomized Design (CRD), the rabbits were randomly distributed into three dietary treatments. Each treatment was replicated five times with 1 rabbit per replicate. The different treatments were as follows: 50g commercial feed + 300g galinsoga; 50g commercial feed + 300g sweet potato vine; 50g commercial feed + 300g kangkong.

Result of the study showed that rabbit fed with 50g commercial feed and 300g sweet potato vine have the shortest time to reach 2.0 kg with a mean of 48 days. Statistical analysis revealed significant differences among treatments in daily gain, Rabbits given 50g commercial feed + 300g galinsoga had a lower in average daily gain (ADG) of 0.020g compared to rabbits given 50g commercial feed + 300g sweet potato vine and 50g commercial feed + 300g kangkong with an ADG of 0.023g. As for dry matter basis of FCR of the rabbits, statistical analysis revealed significant differences among treatment means, where rabbits fed with 50g commercial feed + sweet potato (2.1266 kg) are the most efficient in converting feed into gain compared to the rabbits feed with 50g commercial feed + galinsoga (2.5808 kg) and 50g commercial feed + kangkong (2.740 kg).

The total feed intake as fed basis and as dry matter basis had a highly significant differences. Rabbits fed with 50g commercial feed + 300g galinsoga had the highest feed



intake with a mean of 15.760 kg as fed basis and 3.155 kg in dry matter basis, rabbits given 50g commercial feed + 300g kangkong had a mean of 14.540 kg as fed basis and 3.2340 kg as dry matter basis and those given 50g commercial feed + 300g sweet potato vine had the lowest feed intake of 13.180 kg as fed basis and dry matter of 2.2556 kg.

Conclusion

Based on the result, it could be concluded that the treatment fed with sweet potato vine resulted to faster growth.

Recommendation

Sweet potato vine as feed for rabbits is recommended for faster growth and better feed efficiency among rabbits.



LITERATURE CITED

- BENNET, B. 1979. *Rising Successfully*. Williamson Publication Co. Charlotte. P. 79.
- CHEEKE, K. P. 1987. *Rabbit Feeding and Nutrition*. San Diego, Academy Press, Inc. Pp. 4-5.
- DAMALAS, C.A. 2008. *Distribution Biology and Agricultural Importance of Galinsoga Parviflora Weed Biology and Management*. Pp. 147 – 153.
- DE LEON, M.V. 1998. *Basic Agriculture. A practical Guide for Students*. Phoenix Publishing House, Inc., Quezon City. P. 165.
- DUP – ET, R. R. A. 2011 *Performance of native pigs given sweet potato foliage and banana peelings as supplement*. Unpublished BS thesis. Benguet State University. La Trinidad, Benguet. P. 1.
- GRUBBEN, G.H, O.A Denton, C.M. MESSIAEN and R.R. SCHIPPERS. 2004. *Plant Resources of Tropical Africa, Volume 2: Vegetables*. PROTH Foundation/ Backhuys Publisher/ CP. Wagenengen, Netherlands.
- HOLM, L, J.Y. PANCHO, J.P. HEBERGER AND D.L. PLUCKNEFT. 1977. *The world's worst weeds: Distribution and Biology*. University Press of Hawaii. Honolulu, Hawaii. Pp. 280 – 284.
- KNOTT, J. E. and J.P. DAENON. 1986. *Vegetable Production in Southeast Asia*. University of the Philippines, Los Baños, Laguna. Pp. 239 - 300.
- LONGBUAN, K. P. 2009. *Growth performance of Rabbit Fed with Selected Weeds*. Unpublished BS Thesis. Benguet State University. La Trinidad, Benguet. P. 2.
- MADDUL, S. B. 1999. *Lecture Manual on Rabbit Production*. BSU, La Trinidad, Benguet.
- ONWUEME, I.C. 1987. *The Tropical Crops*. University of the Ile – ife Nigeria, John Welley and son. Ltd. P. 189.
- TEMPLETON, G.S. 1968. *Domestic Rabbit Production*. Danville, Illinois, The Interstate Printers and Publishers, Inc. Pp.96 - 97.

