

## **BIBLIOGRAPHY**

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## **ABSTRACT**

The experiment was conducted at Poblacion, Tuba, Benguet from August to October 2012 for a period of fifty days. This study aimed to determine the effect of parsley, peppermint, and yellow weed on the growth performance and feed intake; effect on morbidity and mortality rates; and to determine the final weight of experimental rabbits after fifty days of experimentation.

A total of 15 weanling rabbits were randomly assigned following the Completely Randomized Design to the following treatments: 50 g commercial feed + galinsoga (T<sub>1</sub>); 50 g commercial feed + parsley (T<sub>2</sub>); and 50 g commercial feed + peppermint (T<sub>3</sub>).

Rabbits fed with galinsoga attained the highest final weight of 1.68 kg at 110 days of age. None of the rabbits fed with galinsoga got sick or died during the conduct of the study. Rabbits fed with parsley and peppermint had the lowest final weight of 0.99 kg and 0.92 kg respectively. On the sixth week, all the rabbits given parsley and peppermint suffered from diarrhea which led to the death of one rabbit in each of the treatments.

It is concluded that parsley and peppermint given continuously and solely to rabbits had detrimental effect resulting in diarrhea.



## INTRODUCTION

Rabbits are unique among the other animals. They are not only used for pets nowadays but are also raised for meat, fur or wool, and laboratory use. Rabbit meat contains 18% protein and 8% fat, which is better than the protein and fat contained in poultry meat (Church and Pond, 1974). The meat is desirable for individuals who may have difficulty in chewing their food and people who are on cholesterol diet (Warren, 2002).

As to this case, rabbit industry is getting popular. Large commercial operations keep hundreds or thousands of rabbits for meat production. Combined, it is estimated that approximately 200,000 producers market 6-8 million rabbits for meat purposes annually (Damron, 2003). However, industries have traditionally faced competition for feed ingredients from other animal industries. This situation gives rise to a need to search for alternative feed ingredients. Fortunately, rabbits are herbivores and therefore can be fed with locally found plant materials.

Parsley and peppermint are among the special crops (herbs) being cultivated but the use in human diet is limited and surplus production occur. While yellow weed, potato weed, or gallant soldier (*Galinsoga parviflora*) is commonly found in any place in Cordillera and to other places. It is widely known as a weed. And as to this, it is commonly fed to rabbits.

With the current farming program in the Cordillera over production of these herbs often occur resulting in low price and some are often thrown away or rejected. Instead of these herbs being wasted, perhaps they can be better used as animal feed.

Parsley and peppermint are used as garnishing when serving food but maybe there could be another use of these herbs. For farmers that produces parsley and peppermint,



raising rabbits to consume excess produce would likely be a source of additional income.

This study generally aimed to evaluate performance of rabbits given parsley, peppermint, and yellow weed:

Specifically, the study aimed to.

1. determine the effect of parsley, peppermint, and yellow weed in the growth rate and feed intake of the rabbits; and,
2. effect of parsley, peppermint, and yellow weed in morbidity and mortality rates in rabbits.

This study is beneficial in terms of exploring how to utilize potential feed resources like parsley and peppermint that could otherwise go to waste. Both herbs are rich in vitamins and minerals which are essential in strengthening the immune system of the animal as well as to their growth performance.

Availability of parsley and peppermint is not a problem. Both herbs are fast growing and can easily be raised in the backyard, even in pots. This study can provide information on the effects of these herbs to the growth of rabbits.

This study was conducted at Bontiway Poblacion, Tuba, Benguet from August 2012 until October 2012.



## REVIEW OF LITERATURE

Rabbits are herbivores and require a ration containing predominantly fresh green plants. In general, rabbits love fresh herbs and they are an amazing source of vitamins and minerals (Warren, 2002).

Rabbits are hindgut digesters. This means that most of their digestion takes place in their large intestine and cecum. The unique musculature of the cecum allows the intestinal tract of the rabbit to separate fibrous material from more digestible material; the fibrous material is passed as feces, while the more nutritious material is encased in a mucous lining as a cecotrope.

Cecotropes, sometimes called night feces, are high in minerals, vitamins and proteins that are necessary to the rabbit's health. Rabbits eat these to meet their nutritional requirements; the mucous coating allows the nutrients to pass through the acidic stomach for digestion in the intestines. This process allows rabbits to extract the necessary nutrients from their food (Warren, 2002).

Rabbits need about 2100 kcal per kilogram feed for their maintenance, 14% crude protein in their diet, 5% fat content, 12%-22.5% crude fiber, and varieties of different vitamins and minerals in their diet (Aprez, 2010).

These nutrients are needed for their fast growth and development, lower than what are recommended will give negative effects to the rabbit (Church and Pond, 1974). And as to these, parsley and peppermint which has good amount of different nutrients can be used as supplement for rabbits and as well as the use of yellow weed which is usually fed to rabbits in the locality.



## Parsley

Parsley is a nutrient powerhouse containing high levels of beta carotene, vitamin B<sub>12</sub>, folate, chlorophyll, calcium, more vitamin C than citrus fruits, and just about all other known nutrients. Parsley contains two types of unusual components that provide unique health benefits. The first type is volatile oil components—including myristicin, limonene, eugenol, and alpha-thujene. The second type is flavonoids—including apiin, apigenin, crisoeriol, and luteolin (<http://skipthepie.org/spices-and-herbs/spices-parsley-dried/>).

Parsley's volatile oils, particularly myristicin it have been shown to inhibit tumor formation in animal studies, and particularly, tumor formation in the lungs. Myristicin has also been shown to activate the enzyme glutathione-S-transferase, which helps attach the molecule glutathione to oxidized molecules that would otherwise do damage in the body. The activity of parsley's volatile oils qualifies it as a "chemoprotective" food, and in particular, foods that can help neutralize particular types of carcinogens, like the benzopyrenes that are part of cigarette smoke and charcoal grill smoke (<http://skipthepie.org/spices-and-herbs/spices-parsley-dried/>).

Several studies were done to parsley because of its potential as a cure for several diseases and for its good benefits when ingested. Parsley contains the following nutrients per 100 g:energy, 151.00 kJ;carbohydrates, 6.30 g;sugars, 0.90 g;dietary fiber, 3.30 g;fat, 0.80 g;protein, 3.00 g; thiamine, 0.10 mg; riboflavin, 0.20 mg; vitamin A, 320.00 iu; vitamin B<sub>6</sub>,0.10 mg; vitamin C, 133.00 mg;vitamin K, 1640.00 µg; calcium, 138.00 mg;iron, 6.20 mg;magnesium, 50.00 mg;phosphorus, 58.00 mg;potassium, 554.00 mg; and 1.10 mg of zinc (<http://skipthepie.org/spices-andherbs/spices-parsley-dried/>).



It shows high amount of vitamins and minerals which is essential for immunity in diseases and promotes a healthy body. The high Vitamin C, beta carotene, chlorophyll and essential fatty acid content render parsley an extraordinary immunity enhancing multi-vitamin and mineral complex in green plant form and one of the most important herbs for providing vitamins to the body. With such components present, it should be one of the feed that should be given to rabbits as much as possible.

### Peppermint

Mint (*Minta spicata*) is a plant that has been long known in diverse cultures, such as India, Middle East and Europe, because of its rich aroma, soothing flavor and curative properties. It is cultivated all across the globe, in different forms of environments, and comes in many varieties, like peppermint, pineapple mint, pennyroyal, foxtail, spearmint, etc. Generally, mint has a sweet flavor, with a cooling after-sensation. Both, fresh and dried mint finds its usage in preparing a large number of recipes, including curries, soups, chutneys, salads, juices, juleps, candies and ice creams. While *Mentha piperita*, a popular flavoring for gum, toothpaste, and tea, is also used to soothe an upset stomach or to aid digestion. It is also an ingredient in chest rubs, used to treat symptoms of the common cold (<http://lifestyle.iloveindia.com/lounge/benefits-of-mint-1808.html>).

One animal study has suggested that peppermint may have radio protective effects in patients undergoing cancer treatment. The aroma of peppermint has been found to enhance memory. As such, it can be administered by instructors to their students before examinations, to aid recall (<http://lifestyle.iloveindia.com/lounge/benefits-of-mint-1808.html>).



Peppermint has high menthol content, and is often used medicinally, as flavoring for food, and cosmetics (for fragrance). The oil also contains menthone and menthyl esters, particularly menthyl acetate.

The essential oil of peppermint is mostly made up from menthol, menthone (10 to 30%), menthyl esters (up to 10%) and further monoterpene derivatives (pulegone, piperitone, menthofurane). Menthol and menthyl acetate are responsible for the pungent and refreshing odor; they are mostly found in older leaves and are preferentially formed during long daily sunlight periods (Mitra, 2009).

Peppermint contains the following nutrients per 100 g: energy, 48.00 kcal; protein, 4.80 g; fat, 0.60 g; moisture, 84.90 g; fiber, 2.00 g; carbohydrate, 5.80 g; calcium, 200.00 mg; phosphorus, 62.00 mg; iron, 15.60 mg; carotene, 1620.00µg; vitamin C, 27.00 mg; magnesium, 60.00 mg; manganese, 0.57 mg; and 0.44 mg of zinc (Ehrlich, 2011).

### Yellow Weed

*Galinsoga parviflora* is an herbaceous plant in the Asteraceae (daisy) family and it is an annual herb found in most temperate and subtropical regions of the world as weed of many crops and waste land (Kagima, 2000). In Colombia it is used as a spice herb in soups. It can also be used as an ingredient in leaf salads. But in much of the world it is considered as a weed (Thomas, 2012).

As to the nutrient contents of the proposed supplements, they are almost the same but with this study, it would give a more detailed answer as to what effect does it give to rabbits. As Cullison and Lowrey (1987) stated, the proper feeding of farm animals is for the most part a matter of supplying them with the right amount of chemical elements and compounds essential for carrying on their different life processes.



## MATERIALS AND METHODS

### Materials

The materials that were used are 15 rabbits (New Zealand White), cages, commercial feeds, curled parsley, peppermint, yellow weed, feeding and water devices, weighing scale, notebook, and a pen.

### Experimental Design

Rabbits were randomly distributed to three treatments with five replications per treatment following the completely randomized design. The treatments were as follows:

T<sub>1</sub> = Galinsoga

T<sub>2</sub> = Parsley

T<sub>3</sub> = Peppermint

Rabbits were subjected to these feeding regimes starting at two months of age and had lasted for fifty days. Each rabbit was given 50 g of commercial feed per day. Commercial feeds were offered before giving them their appointed supplements. Galinsoga, parsley and peppermint were given *ad libitum* for the rest of the study period. Supplements were weighed, washed and air dried before giving it to the experimental animals. Left-overs have been collected and weighed before feeding time.

### Preparation of Parsley, Peppermint and Yellow Weed

Fresh parsley and peppermint were harvested before feeding time in a farm in Poblacion. It was cleaned, washed thoroughly, and then air dried before offering it to the experimental animals. The leaves including the stalks of the parsley and peppermint were





given. As to the yellow weed, it was collected from different areas where the study has been conducted or to other places where it is available; it was prepared and offered just like the parsley and peppermint before giving it to the experimental animals. This process was done two times a day, at 6:00 am and at 4:00 pm.

### General Care and Management

All experimental units were given the same care and management for the rest of the experimental period, except for the dietary treatments that were given. The general care and management of the study included house preparation, regular cleaning and proper water and feeding management.

House preparation. Before the arrival of the weanling rabbits, cages were constructed in the vicinity of a residential area in Poblacion. Wire mesh or other similar materials were used to construct the flooring of the cages to facilitate urine and manure disposal. After construction, the cages were properly cleaned and sanitized.

Water and feed management. Clean water was made available to the experimental units at all times. It has been changed daily or more frequently as the need arises as well as the water containers that were cleaned regularly. To ensure continuous supply of parsley and peppermint, it was grown in the same place where the study has been conducted.

### Data Gathered

The following data were gathered:

1. Initial weight (kg). The weight of the individual animal at two months of age.
2. Total feed consumption (kg). This was the total amount of feeds consumed by the animals from the start until the end of the study.



3. Morbidity. This refers to the number of experimental animals that got sick per replicate.

4. Mortality. This refers to the number of experimental animals that died per replicate.

5. Feeds offered (kg). This refers to the amount of feed given to the experimental animals

6. Feed left-over (kg). This refers to the amount of feed that has not been consumed by the experimental animals.

### Data Computed

From the data that has been gathered, the following were computed:

1. Daily gain in weight (kg). This was obtained by subtracting the final weight from the initial weight of the experimental units divided by the experimental period (days).

2. Feed intake (kg). This was obtained by subtracting the total amount of left-over feeds from the total feed offered.

3. Feed conversion ratio. This parameter measured the amount of feed consumed to produce a kilogram gain. It was computed by dividing the total feed intake by the initial gain in weight of the experimental units.

4. Morbidity rate (%). This was computed by dividing the number of experimental animals that are sick by the total number of experimental animals per replicate multiplied by 100%.



5. Mortality rate (%). This was computed by dividing the number of dead experimental animals by the total number of experimental animals per replicate

#### Statistical Design and Analysis

Data were analyzed using Analysis of Variance (ANOVA) for Completely Randomized Design (CRD). Treatment means were compared using the Duncan's Multiple Range Test (DMRT).



## RESULT AND DISCUSSION

### Weight of the Rabbits

Table 1 presents the final weights of the rabbits. Statistical analysis revealed that the significant difference in the final weights of rabbits between treatments fed with galinsoga had the highest final weight of 1.68 kg after 50 days of feeding, followed by rabbits fed with parsley and peppermint with final weights of 0.990 kg and 0.929 kg respectively.

Rabbits fed with galinsoga had the best performance due to their good appetite all throughout the duration of the experiment that led them to gain weight at a better pace than the rabbits fed with parsley and peppermint. During the first month of the study, rabbits fed with parsley and peppermints were performing well but on the last 2 weeks of the experiment, all the rabbits started to have watery feces.

All rabbits that were fed with parsley and peppermint suffered from diarrhea which led them to lose appetite and eventually lose in weight. This also led to the death of two rabbits, one each for treatments fed with parsley and peppermint. No antibiotics or any similar drugs were given to the experimental units.

Table 1. Initial and final weight of rabbits at 60 days and at 110 days of age

TREATMENT	BODY WEIGHT (kg)	
	INITIAL	FINAL
Galinsoga	0.772 <sup>a</sup>	1.680 <sup>a</sup>
Parsley	0.737 <sup>a</sup>	0.990 <sup>b</sup>
Peppermint	0.730 <sup>a</sup>	0.929 <sup>b</sup>

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



## Gain in Weight

Table 2 presents the total and daily gain of rabbits. Statistical analysis revealed significant difference in the total and daily gain of rabbits. Rabbits fed with galinsoga had the highest mean total gain of 0.908 kg and mean daily gain of 0.015 kg, followed by rabbits fed with parsley having a mean total gain and mean daily gain of 0.255 kg and 0.004 kg respectively. Rabbits fed with peppermint had the lowest mean total gain and mean daily gain of 0.193 kg and 0.003 kg respectively.

Rabbits fed with parsley and peppermint had the worst performance due to diarrhea. Which occurred during the last two weeks of the experimentation, they only ate a minimal amount of commercial feeds and consumed more water than usual at the start of their sickness. The feeding period lasted for 50 days.

## Feed Intake

Table 4 presents the mean total feed intake of rabbits. Results showed that rabbits fed with galinsoga had a significant difference among rabbits fed with parsley and peppermint. Rabbits fed with galinsoga had a total feed intake of 3.653 kg as dry matter basis. While rabbits fed with parsley and peppermint had a total feed intake of 2.929 kg

Table 2. Total and daily gain in weight of rabbits in fifty days of feeding

TREATMENT	GAIN IN WEIGHT (kg)	
	TOTAL	DAILY
Galinsoga	0.908 <sup>a</sup>	0.015 <sup>a</sup>
Parsley	0.255 <sup>b</sup>	0.004 <sup>b</sup>
Peppermint	0.193 <sup>b</sup>	0.003 <sup>b</sup>

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



and 2.291 kg respectively as dry matter basis. Table 3 also presents that rabbits fed with parsley and peppermint had no significant difference just among the two.

Treatments fed with parsley and peppermint consumed the lowest amount of feed due to diarrhea that they got during the last two weeks of the experimentation, and led them to lose appetite resulting to a poor intake of feed. In terms of dry matter basis, rabbits fed with galinsoga consumed the highest amount of forage that has a mean value of 1.478 kg while as rabbits fed with parsley and peppermint which consumed the lowest forage which has a mean value of 1.319 kg and 0.851 kg respectively. As to the commercial feed intake of the rabbits, treatment fed with galinsoga consumed all of the

Table 3. Pellet and forage intake of rabbits in fifty days of feeding

TREATMENT (kg)	PELLET INTAKE (kg)		FORAGE INTAKE	
	AS FED	DM BASIS	AS FED	DM BASIS
Galinsoga	2.500 <sup>a</sup>	2.175 <sup>a</sup>	14.755 <sup>a</sup>	1.478 <sup>a</sup>
Parsley	1.850 <sup>b</sup>	1.610 <sup>b</sup>	7.740 <sup>b</sup>	1.319 <sup>a</sup>
Peppermint	1.650 <sup>b</sup>	1.440 <sup>b</sup>	7.413 <sup>b</sup>	0.851 <sup>b</sup>

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

Table 4. Total feed intake of rabbits in fifty days of feeding

TREATMENT	TOTAL INTAKE (kg)	
	AS FED	DM BASIS
Galinsoga	17.255 <sup>a</sup>	3.653 <sup>a</sup>
Parsley	9.590 <sup>b</sup>	2.929 <sup>b</sup>
Peppermint	9.063 <sup>b</sup>	2.291 <sup>b</sup>

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



pellets that were offered. While treatments fed with parsley and peppermint had not consumed all due to lack of appetite during the last two weeks of the experiment.

Galinsoga, parsley, and peppermint were subjected to crude protein analysis using Kjeldhal method in the Department of Science and Technology, Regional Standards and Testing Laboratory. Results showed that galinsoga, parsley, and peppermint had 20.16%, 27.83%, and 23.76% crude protein respectively.

Rabbits were fed with, parsley having a 17.04% DM and an ash content of 96.378%, peppermint having a 11.480% DM and 96.359% ash content, and galinsoga having 10.02% DM. Forages were offered *ad libitum* to the experimental animals.

Experimental rabbits were also given commercial feed, which has a composition of 87% dry matter; 16% crude protein; and 10% crude fiber as indicated on the label of the feed stuff, that were given fifty grams a day per rabbit.

### Feed Conversion Ratio

Table 5 presents the feed conversion ratio of rabbits. Statistical analysis revealed that the differences among the treatments are highly significant. Rabbits fed with parsley and peppermint had a poor feed conversion ratio of 6.964 kg and 5.788 kg respectively as

Table 5. Feed conversion ratio of rabbits as dry matter basis

TREATMENT	FEED CONVERSION RATIO AS DRY MATTER BASIS (kg)
Galinsoga	1.728 <sup>c</sup>
Parsley	6.964 <sup>a</sup>
Peppermint	5.788 <sup>b</sup>

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



dry matter basis. While rabbits fed with galinsoga had 1.728 kg on dry matter basis. Rabbits fed with parsley and peppermint had the poorest feed conversion ratio loss of appetite which led them to consume just a minimal amount of feed including more water at the start of their illness.

### Mortality and Morbidity Rates

Rabbits fed with parsley and peppermint had a 100% morbidity rate. It started during the last two weeks of the experimental period which led to the death of two rabbits, one for each treatment fed with parsley and peppermint. During the first six weeks of the experimentation, there was no adverse effect on the performance of the rabbits that would have affected the growth of the rabbits. Just during the start of the seventh week that the rabbits began to show sign and symptoms of having diarrhea. Rabbits had watery feces; mushy or runny stool sticking to the rabbit's anal area that created a nasty and stinky scent; loss of appetite; decrease in body weight; and high consumption of water. They had this disease two weeks before the end of the experimentation.

Rabbits fed with parsley and peppermint had diarrhea even though the cages were cleaned daily and even the feeding and water devices were cleaned daily or as the need arises. Rabbits from this point had no appetite to eat but they consume water more frequently. As a result rabbits fed with parsley and peppermint lost weight significantly. No antibiotic were used or any similar medicine to treat the rabbits.

According to Krempels (2009), if the intestine is moving too slowly, or if the rabbit is getting a diet too rich in digestible carbohydrates and too low in crude fiber, the complex population of bacteria in the cecum can become unbalanced resulting to runny or mushy stool. In addition, according to Crum *et al* (2003), rabbits requires high amount of fiber,





the fiber recommendation for rabbits is a crude fiber level of 13-20% with a level of 12.5% indigestible fiber; feed low in calcium, the dietary level recommendation for rabbits of calcium is 0.6-1% higher than this may result to digestive disorder; and low in carbohydrates, the overload of rapidly digestible carbohydrates in the large intestine increases the likelihood of digestive upset.

Parsley has a composition of 2% digestible carbohydrates, 13% crude fiber, and 8% calcium per 100 g (<http://nutritiondata.self.com/facts/vegetables-and-vegetable-products/2513/2>). Parsley is also high in different vitamins and minerals, that according to Crum this may cause digestive disorder due to high amounts of nutrients that is taken in by the rabbit which is too much for the rabbit.

As well as the peppermint that has 5% digestible carbohydrates, 1% calcium, 7% protein (<http://nutritiondata.self.com/facts/spices-and-herbs/225/2>), and is also high in different vitamins and minerals. Rabbits had diarrhea because of the continuous consumption of these herbs which is high in different vitamins and minerals which led the rabbits to have digestive problems during the last two weeks of the experimentation.



## SUMMARY, CONCLUSION, AND RECOMMENDATIONS

### Summary

The experiment was conducted at Poblacion, Tuba, Benguet from August to October 2012 for a period of fifty days. A total of 15 weanling rabbits were randomly assigned and fed with the following treatments as follows: 50 g commercial feed + galinsoga (T<sub>1</sub>); 50 g commercial feed + parsley (T<sub>2</sub>); and 50 g commercial feed + peppermint (T<sub>3</sub>). The experiment was laid in a Completely Randomized Design (CRD).

Results of the study showed that rabbits fed with galinsoga consumed the highest amount of forage with a mean DM intake of 1.478 kg and as fed intake of 14.755 kg, followed by rabbits fed with parsley and peppermint having a DM intake of 1.319 kg (7.740 kg fresh) and 0.851 kg (7.413 kg fresh), respectively. The low feed intake of rabbits given parsley and peppermint was due to loss of appetite as a result of diarrhea during the last two weeks of the experimental period. Statistical analysis revealed highly significant difference in final weights. Rabbits fed with galinsoga had a higher final weight of 1.680 kg, while those fed with parsley and peppermint had a final weight of 0.990 kg and 0.929 kg respectively.

### Conclusion

It is therefore concluded that rabbits fed with galinsoga effected better growth of rabbits than parsley and peppermint.

### Recommendations

Based from the results of this study, rabbit raisers should not use parsley and peppermint as a primary diet for their rabbits due to the adverse effects on the digestive system of rabbits. It is also recommended that studies on acceptability and palatability of parsley and peppermint be conducted.



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