

BIBLIOGRAPHY

VENTURA, ARLYN J. April 2013. The Growth Performance of Pekin Ducks Given Chopped Watercress and Water Spinach. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to determine the effect of watercress and water spinach plus commercial feeds for growing Pekin ducks. This was conducted at Karao, Bokod, Benguet from December 2012 to February 2013 for a period of 50 days.

Forty eight one-month-old Pekin ducks were distributed into three treatments following the Completely Randomized Design. Each treatment was replicated four times with four birds per replicate. The different treatments were watercress plus 50% commercial feeds, water spinach plus 50% commercial feeds and 50g watercress, 50g water spinach and 50g commercial feeds. The initial weight of birds used in the study was 0.76 kg with a feed conversion ratio of 10.22%.

Statistical analysis showed no significant differences among treatments in the initial weight at 30 days of age, final weight at 80 days of age, gain in weight and feed conversion ratio. However, significant differences among treatments were observed in the total and daily feed intake of birds. The average total and daily feed intake of birds given water spinach with 50% commercial feeds were (8.35kg) and 0.16kg respectively. Than those



birds given 50g commercial feeds plus 50g watercress plus 50g water spinach with a total and daily feed intake of 6.95kg and 0.13 kg and the birds given 50% commercial feeds plus watercress has a total of 5.47kg and 0.10kg, respectively.

Likewise, return on cash expenses from the birds given 50% commercial feeds and watercress had the highest value of 16.82% followed by 50g commercial feeds plus 50g watercress plus 50g water spinach (13.34%) and the lowest value (10.09%) was obtained from the birds given 50% commercial feeds and water spinach.



INTRODUCTION

Duck raising is inexpensive, requires non elaborate housing facilities, little attention, and less space for rearing compared to chickens. Moreover, ducks are shown to be relatively hardy, resistant to common avian diseases, and subsist on a variety of feeds. The available feedstuffs that can be fed to ducks are the watercress (*Nasturtium officinale*) and water spinach (*Ipomea aquatica*).

Dean (2007) stated that “*Nasturtium*” means literally “twisting nose” and was the Roman name for peppery watercress. *Officinale* means it was approved in ancient Rome to be sold as food or medicine in special stores. The Greek name for it, Nerokarthamon, broadly translated, means “able to make Nero’s mind”. It was thought in ancient Greece Watercress could cure insanity.

Shipards (2007) stated that watercress (*Nasturtium officinale*) is a hardy perennial, creeping, hallow, fleshy, square stems to 30-50cm with many side stems of lush-green, oblong-ovate leaves. They are found growing in open running watercourses or near cool shallow springs, spring holes, spring fed stream margins, and brooks. Watercress contains significant amount of iron, calcium and folic acid, as well as vitamin A and C.

The common available feedstuffs for ducks that are found in Bokod are the watercress and water spinach. Since watercress and water spinach are rich in vitamins and minerals this can be fed to ducks to improve the growth performance of ducks and to act as an antiviral, antibiotic, and body detoxifier.

This study will give information to students, farmers and those who are engaged in poultry production on the benefits of feeding watercress and water spinach. It would also help the ducks raiser lessen their expenses and increase their income, as well. And



the study also serves as a guide in the proper use of watercress and water spinach for the ration of ducks. And to know the nutritional content of this feedstuff that was needed by the ducks.

Generally, this study aimed to determine the growth performance of ducks given chopped watercress and water spinach. Specifically, this study was conducted to:

1. determine the gain in weight, feed intake, and feed conversion ratio of ducks given watercress and water spinach; and,
2. determine the return on cash expenses and profitability of raising ducks.

The study was conducted at Karao, Bokod, Benguet on December 2012 to February 2013 for a period of 50 days.



REVIEW OF LITERATURE

Shipards (2007) stated that Pliny who lived from 23-7AD listed over 40 medicinal uses for watercress, and include the belief that the smell of watercress would drive away snakes and neutralize scorpion venom! A Persian tradition was to feed it to their children to increase strength and stature. African tribes believed watercress could cause temporary sterility, but note, they also regarded it as an aphrodisiac! Watercress was renown in herbal history as a spring-cleaning herb for purifying the blood and toning the whole system. Many of the great herbalists wrote of the revitalizing powers of watercress. Early Romans revered the health benefits of watercress, while the Greeks believed it was valuable brain food and strengthened the nervous system. Persian king Xerxes fed watercress to his soldiers, to keep up strength and stamina.

Monash medical centre's leading research nutritionist, Shipards (2007) reported that watercress was one of a number of foods, including green tea and soy products, which could interrupt one of the key pathways of developing lung, breast and bowel cancer. Watercress is a powerful cleanser of the body, especially the bloodstream. It has properties that help dissolve fatigue-causing fibrin, coagulated in the blood vessels. Watercress contains more sulphur than any other vegetables, except horseradish. Sulphur rich foods play an important part in protein absorption, blood purifying, cell building and healthy hair and skin.

Deane (2007) stated that man is not the only consumer of watercress. It is eaten by ducks, muskrats, and deer, who know a good thing when they find it. Watercress contains significant amounts of iron, calcium and folic acid, as well as vitamin A and C.



The Greeks thought it was good for the brain in thinking. Many benefits have been attributed to eating watercress, such as that it is a mild stimulant, a source of photo-chemical, a diuretic, an expectorant, a digestive aid and anti-cancerous. Research in Iran has shown it to have antioxidant potential as well as able to lower cholesterol and triglycerides. Research in United States suggests that it has a role in preventing or treating cancer.

Deane (2007) stated that nutritionally, watercress has 19 calories per 100g and is 93.3% water. However it has 2.2g protein; 0.3g fat; 3g carbohydrate; 0.7g fibre; 1.2g ash; 151mg calcium; 54mg phosphorous; 1.7mg iron; 0mg magnesium; 52mg sodium; 282mg potassium; 2940mg A; 0.08mg thiamine (B1); 0.16mg riboflavin (B2); 0.9mg niacin; and 79mg C.

Water spinach is a good source of carotene, which in turn, can be converted to Vitamin A by the body. Water spinach is beneficial most especially to people suffering from hypertension. When ingested roughage it helps eliminate fatty deposits in the alimentary canal that would otherwise lodge in the blood vessels. So, for those who are hypertensive, you can get the most out of the health benefits of water spinach, for less and even no price at all. Green leafy vegetables have been recognized as rich source of micro nutrients (minerals and vitamins) and antioxidant (Kala and Prakash, 2004). The high ash content of *Ipomea aquatica* leaves ($10.83 \pm 0.80\%$) is an indication that the leaves contain nutritionally important. The value recorded in this study is low compared to 14.44 % (on dry weight basis mineral elements) in *Ipomea aquatica* leaves grown in Vietnam (Ogle et al., 2001) and 17.8% found in leaves of *Ipomea aquatica* sp. Grown in Swaziland (Ogle



and Grivetti, 1985). In contrast, the value is higher than that of *Ipomea batatas* leaves (1.8g/100g dry weight) as reported by Asibey-Berko and Tayie (1999).

The proximate composition of water spinach as well as mineral elements was determined. The leaves were found on dry weight basis to have high moisture (72.83±0.29%), ash (10.83±0.80%), crude lipid (11.00±0.50%), crude fiber (17.67±0.3%) and available carbohydrate (54.20±0.68%), but low in crude protein content (6.30±0.27%). The leaves also have energy value (300.94±5.31 kcal/100g) that is within the range reported in some Nigerian leafy vegetables. The mineral element content was high with remarkable concentration of Potassium (5,458.33±954.70mg/100g) and Iron (210.30±2.47 mg/100g). Also the leaves content moderate concentration of Sodium (135.00±2.50mg/100g), Calcium (416.70±5.77mg/100g), Magnesium (301.64±12.69mg/100g) and Phosphorous (109.29±0.55mg/100g), with low Copper (0.36±0.01mg/100g), Manganese (2.14±0.22 mg/100g) and Zinc (2.47±0.27 mg/100g) contents. It was showed that the plant leaves is good source of potassium, manganese and iron for all categories of people, while Magnesium is adequate enough for adult female and children. From the result, *Ipomea aquatica* Forsk leaves could be used for nutritional purposes; due to the amount and diversity of nutrients it contains (Umar et al., 2007).

Ducks enjoy all kinds of plants unless they are very hard because ducks do not have teeth. We can feed ducks with lettuce, apple, watermelon, melon, tomato, and fruits (Inak, 2010).



MATERIALS AND METHODS

Materials

The materials used were 48 one-month-old Pekin ducks, feedstuff such as watercress, water spinach, and commercial feeds. The other materials included were 6000 pieces sticks for pens, grass, straw, wooden post, waterer, feeder, disinfectant, weighing scale, cleaning materials, record book and ballpen.

Methodology

Pre-experimental design. Before the purchase of the stocks, the newly built pens at the open field measuring 6m x 3m each pen was thoroughly cleaned and disinfected to reduce the incidence of diseases. The roofing was covered with grasses and the sides of the pen are covered with sticks to conserve the heat inside.



Figure 1. The Experimental House

Experimental design. After the arrival of the stocks, the experimental ducks were weighed individually to obtain their initial weight, distributed at random following the completely randomized design into 3 treatments with 4 replicate each. Each replicate were composed of four birds. The birds were tagged individually at their leg to trace the individual gain in weight of the experimental birds.

The treatments were the following;

T1= 50% CF + watercress (*Nasturtium officinale*)

T2=50% CF + water spinach

T3=50g CF + 50g watercress + 50g water spinach

Preparation of the ration. Fresh watercress and water spinach were gathered, thoroughly washed, chopped into 1.5 cm sized weighed and given directly to the ducks. The 50g broiler ration commercial feeds was given 7:30 in the morning.





Figure 2. The experimental Birds

Care and management. All experimental ducks were fed *adlibitum* and subjected to the same care and management except for the fixed amount of 50g grower commercial feeds given to them. Drinking water was made available at all times. The final weight was recorded on the 50th day or at the end of the study.

Data Gathered

1. Initial weight (kg). It was taken by weighing the experimental birds at the start of the study.
2. Final weight (kg). It was taken by weighing the experimental birds at the end of the study.
3. Number of experimental days. The 50 days of feeding trial.

4. Amount of feed offered, dry matter basis (kg). It was taken by weighing the total feed offered to the experimental birds from the start and at the end of the study.
5. Cost of Inputs (Php). It was determined by recording all the expenses incurred in the study.
6. Mortality. It was taken by the total number of dead ducks during the time of the study.
7. Number of birds at the end of the study. It was determined by the number of birds at the end of the study.

Data Computed

1. Amount of dry matter in feed (DM). It was determined by the amount of dry matter in the feedstuff was computed as:

$$\% \text{ DM} = \frac{\text{Dry weight of feed sample after drying}}{\text{Fresh weight of the feed samples before drying}} \times 100$$

2. Feed intake dry matter basis (kg)

- a. Total feed intake (kg). It was determined by subtracting the total feed offered from the amount of feed left over.
- b. Daily feed intake (kg). It was determined by dividing the total feed intake by the number of experimental days.

3. Gain in weight (kg).

- a. Total gain in weight (kg). It was determined by subtracting the final weight from the initial weight of the ducks.
- b. Average daily gain in weight (kg). It was determined by dividing the total gain in weight to the number of experimental days.



4. Feed intake dry matter basis (kg).

a. Total feed intake (kg). It was determined by subtracting the total feed offered from the amount of feed left over.

b. Daily feed intake (kg). It was determined by dividing the total feed intake by the number of experimental days.

5. Feed conversion ratio. It was determined by dividing the total feed intake to the total gain in weight.

6. Feed cost per kg gain. It was determined by multiplying the FCR to the feed cost per kilogram of feeds.

8. Return on Cash Expenses (%). It was determined using the formula;

$$\text{RCE} = \frac{\text{Total sales} - \text{Total cost production}}{\text{Total cost of production}} \times 100$$

Data Analysis

All data were subjected to the Analysis of Variance appropriate for Completely Randomized Design of an experiment. Treatment means were compared using the Duncan's Multiple Range Test (DMRT).



RESULTS AND DISCUSSION

Body weight

The initial and final weight of the Pekin ducks per treatment was presented in Table 1. The initial weights of the birds were recorded on the 1st day or at the 30 days old. Slight differences were observed in the initial weight of the experimental birds as shown in the table but the gap was very minimal to be a basis of significant difference among the treatments. The statistical analysis shows that there were no significant differences observed in the initial and final weight of the experimental birds. This simply means that the initial weights of all experimental birds in the different treatments were more or less the same.

Final weight of the birds was recorded during the 50th day of feeding trial or 80 days old. Statistical analysis also shows that there were no significant differences in the final weight of all experimental birds in the different treatment. This means that incorporation of watercress and water spinach substitute in the diet of growing Pekin ducks does not increase nor decrease the final weight of the birds.

Table 1. Initial weight of the ducks at 30 days and final weight at 80 days of age

TREATMENTS	BODYWEIGHT	
	INITIAL	FINAL
T1=50 % CF + watercress	0.764	1.47
T2=50 % CF + water spinach	0.764	1.44
T3=50g CF +50g watercress + 50g water spinach	0.746	1.44

Means with common letters are not significantly different at 5% level of significance (DMRT)



Gain in Weight

The total gain in weight of experimental birds in different treatments was presented in Table 2. There are numerical differences among the treatment means however statistical analysis revealed no significant differences. The total gain in weight of birds given commercial feeds plus water spinach as feed obtained higher gain in weight of 0.710kg respectively. Birds given 50g commercial feeds, 50g watercress and 50g water spinach has a total mean of 0.698 kg and the birds given water spinach has a total mean of 0.672kg. Results showed that giving of water spinach meal in ducks ration resulted to higher average of total gain in weight of birds.

This simply means that those ducks given watercress, water spinach and commercial feeds are good source of vitamins, proteins, minerals, which are essential for the growth and development of the animal body.

Total Feed Consumption

The total and daily feed consumption of experimental birds was presented in Table 3. Statistical analysis showed highly significant difference among the treatments. Ducks fed with commercial feeds and water spinach has a total and daily feed intake of

Table 2. Total gain in weight of ducks from 30 days to 80 days of age

TREATMENTS (kg)	TOTAL GAIN (kg)
T1=50% CF + watercress	0.710
T2= 50 % CF + water spinach	0.672
T3= 50g CF +50g watercress + 50g water spinach	0.698

Means with common letters are not significantly different at 5% level of significance (DMRT)



8.356kg and 0.167kg, respectively. The daily fed intake of birds given commercial feeds, watercress and water spinach has a total and daily feed intake of 6.953kg and 0.139 kg. While the birds given commercial feeds and watercress has a total mean of 5.477kg and 0.109kg.

Table 3. Total and daily feed consumption of the ducks (kg) as feed

TREATMENTS	FEED CONSUMPTION	
	TOTAL	DAILY
T1=50 % CF + watercress 0.109		5.447
T2=50 % CF + water spinach	8.356	0.167
T3=50g CF + 50g watercress + 50g water spinach	6.953	0.139

Means with common letters are not significantly different at 5% level of significance (DMRT)

The crude protein content of water spinach was 30.66 % with a dry weight of 30g; watercress has 32.68% with a dry weight sample of 30g while the watercress plus the water spinach was 32.47 % with 30g dry sample. This was obtained from the Department of Science and Technology Cordillera Administrative Region Km.6, La Trinidad, Benguet.

Feed Conversion Ratio

Table 4 presents the average feed conversion ratio and feed cost to produce a kilogram in weight of birds at 30 days of age to 80 days of age per treatment of ducks. The result showed that the water spinach meal may be included as high in the duck ration without detrimental effect on the feed conversion ratio.

In terms of feed conversion ratio and feed cost per kg gain in weight, experimental birds fed with 50% commercial feeds and water spinach obtained the



highest cost of 13.255 and Php477.196 this is due to the cost of water spinach meal. Birds given 50g commercial feeds, 50g watercress and 50g water spinach had a feed conversion ratio and feed cost per kg weight of Php9.972 and Php395.008 and watercress had a feed conversion ratio of Php7.425 with a feed cost per kg gain of Php267.316, respectively.

Table 4. Feed Conversion Ratio

TREATMENT	FCR	FEED COST PER KG GAIN (Php)
T1= 50 % CF + watercress	7.425	267.316
T2= 50 % CF + water spinach	13.255	477.196
T3= 50g CF +50g watercress + 50g water spinach	9.972	359.008

Means with common letters are not significantly different at 5% level of significance (DMRT)

Return on Cash Expenses

The Return on Cash Expenses was presented in Table 5. Although this was not subjected to statistical analysis, the result revealed that the highest Return on Investment was realized from experimental birds fed with watercress and commercial feeds with a total mean of 16.78%. The birds fed with 50g commercial feeds, 50g watercress and 50g water spinach meal has a total mean of 13.34% return on investment. The lowest return on investment was obtained from experimental birds fed with 50% commercial feeds and 50g water spinach 10.09% this is due to the cost of water spinach meal.



Table 5. Return on Cash Expenses (%)

TREATMENT	COST OF PRODUCTION (Php)	GROSS SALES	NET INCOME	ROI (%)
T1=50 % CF + watercress	4,110	4,800	690	16.82
T2=50 % CF+ water spinach	4,360	4,800	440	10.09
T3=50 g CF +50g watercress +50g water spinach	4,235	4,800	565	13.34



SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the growth performance of Pekin ducks given chopped watercress and water spinach, and to determine the watercress and water spinach meal could be profitable feed supplement to growing ducks.

Forty eight 1month old Pekin ducks was distributed into three treatments following the Completely Randomized Design. Each treatment was replicated four times with 4 birds per replicate. The treatment used were 50% commercial feeds and watercress, 50% commercial feeds and water spinach and 50g commercial feeds plus50g watercress and 50g water spinach meal.

Statistical analysis showed that there were no significant differences between treatments in initial, final, gain in weight, and Feed Conversion Ratio. However, there is significant difference in the feed intake of the birds. Birds given water spinach per gram of commercial feeds had the highest feed intake of 8.356kg followed by birds given watercress, water spinach with a gram of commercial feeds with a total of feed intake of 6.953kg, and those birds given watercress with a gram of commercial feeds with a total feed intake of 5.477kg.

The average initial and final weight at 80 days of age was 0.76kg and 1.45kg respectively. The total gain in weight of birds given commercial feeds and watercress, commercial feed and water spinach, and commercial feeds, watercress and water spinach meal were 0.69kg respectively. The average Feed Conversion Ratio was 7.425, 13.255 and 9.972 with a total grand mean of 10.22. For Return on Cash Expenses, the birds fed with



watercress and 50% commercial feed had a higher Return on Cash Expenses of 16.82% followed by birds fed with watercress plus water spinach and commercial feeds with Return on Cash Expenses of 13.34%. The lowest Return on Cash Expenses was realized from birds fed with and water spinach commercial feeds with Return on Cash Expenses of 10.09%.

Conclusion

From the result of the study, watercress and water spinach can be given *ad libitum* in addition to commercial feeds ration without any adverse effect on the performance of ducks.

Recommendation

Based on the study it is recommended that chopped watercress and water spinach can be used as feed for ducks to improve the growth performance of birds.



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