

EFFECT OF BANANA STEMS (*Musa sapientum* L) FERMENTED WITH MOLASSES, BIOCHAR AND WITH OR WITHOUT VINASSE ON WEIGHT GROWTH OF MUSCOVY DUCK (*Cairina moschata*)

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ABSTRACT

The experiment was carried out on 72 healthy muscovy ducks starting at 28 days old to assess the effect of banana stems (*Musa sapientum* L) fermented with molasses, biochar and with or without vinasse on weight growth of muscovy duck (*Cairina moschata*). Four treatments and three replications made up a completely randomized design (CRD) of the experiment. Each batch is an experimental unit, each experimental unit consists of 6 muscovy ducks.

Four treatments correspond to 4 different diets: Treatment 1: 30% mixed banana with molasses + 70% mixed feed; Treatment 2: 30% mixed banana with molasses and 1% Biochar + 70% mixed feed; Treatment 3: 30% mixed bananas fermented with molasses + 55% mixed feed +15% vinasse; Treatment 4: 30% mixed banana with molasses and 1% Biochar + 55% mixed feed + 15% vinasse.

Experimental results: Treatment 4 had the lowest feed conversion ratio (5.87), followed by Treatment 3 (6.85), Treatment 1(6.99), and the highest belonged to Treatment 2 (7.12). However, these variations were not statistically significant ($P>0.05$). In 4 experimental treatments, Treatment 3: 30% mixed banana fermented with molasses + 55% mixed feed +15% vinasse was more effective than other treatments in terms of weight gain and feed consumption.

It was concluded that vinasse and banana stems can be used for silage with molasses as a good feeding source for muscovy ducks. The addition of Biochar or the absence of Biochar in the diet did not significantly affect the weight gain of ducks at the end of the experiment.

Keywords: *Muscovy duck, fermented banana, vinasse, biochar*

INTRODUCTION

Banana plant parts can be used as cattle and poultry feed. After being harvested, banana tree stalks are also chopped and given to cattle and poultry by farmers, or they can be combined with rice bran (Dao Le Hang, 2007).

However, the post-harvest banana stem's chamber primarily contains water and has low levels of other nutritious components. Therefore, silage was the preferred approach to supply some extra nutrients, facilitate digestion, and prolong food preservation. Despite having little sugar, the banana stem gradually makes meals sour by producing lactic acid (Dao Thi My Tien et al., 2010). Therefore, it was necessary to add more ingredients to quickly increase the amount of sugar to facilitate lactic fermentation (Nguyen Xuan Trach, 2003).

One possible addition is molasses. Additionally, breeders frequently mix biochar with microbial products to provide padding for the production of poultry or use biochar to freshen up the barn. In addition, because biochar also had the effect of absorbing pollutants, it can be added to the diet (Nguyen Dang Nghia, 2014).

Mustard was a product of the winemaking process that is fermented by microorganisms. Farmers have known for a long time the application of hummus as a supplementary food for cattle (Nguyen Cong Oanh et al., 2015).

Since then, the research project "Effect of diet of chain feed (*Musa sapientum* L) incubated with molasses, biochar, and with or without wort supplement on weight gain of Siamese duck

(*Cairina moschata*)" has been completed. To determine the effect of the diet of the banana stem (*Musa sapientum L*) incubated with molasses, biochar and with or without the addition of wort on the weight gain of Siamese duck (*Cairina moschata*)".

MATERIALS AND METHODS

Location and time

Experimental period: from January 2020 to April 2020.

The experiment was carried out at Trung Thanh Hamlet, My Thoi Ward, Long Xuyen City, An Giang Province.

Research Materials

Feeds

Experimental food consisted of ingredients: Banana stem, Molasses, Biochar, Vinasse and Mixed feed. Therein, Banana stems collected from farmers near Long Xuyen city, An Giang province; Molasses, Vinasse is bought from farmers in Long Xuyen city, An Giang province, who make rice wine and cane sugar; Biochar is created in a lab setting under anaerobic circumstances.

Banana stems are cut up and exposed to the sun to dry. After doing so, depending on the treatment, continue to incubate with 15% molasses and 1% biochar. Finally, place the mixture in a plastic bag and seal it within a plastic container. After 5-7 days can be used for feeding;

Mixed feed, which is used in the experiment from Uni-President Company.

Table 1. Chemical composition of the ingredients

Norm (%)	Banana stem	Molasses	Biochar	Mixed feed
DM	8.91	69.07	63.13	86.00
CP	3.09	2.92	4.67	16.00
CF	23.77	-	-	7.00
OM	89.94	91.72	55.66	-



Picture 1. Fresh bananas before brewing



Picture 2. Mixed banana

Experimental design

Four treatments and three replications made up a completely randomized design (CRD) of the experiment. Each batch is an experimental unit, each experimental unit consisting of 6 muscovy ducks (3 Male and 3 Female).

Experimental treatments

The experiment was conducted with 4 treatments 4 corresponding to 4 diets:

Treatment 1 (BM): 30% of mixed bananas (BM) + 70% of mixed feed (BM mixture: banana stem (B) + 15% molasses (M))

Treatment 2 (BMb): 30% of banana blend mixed with Biochar (BMb) + 70% mixed feed (BMb mix: banana stem (B) + 15% molasses (M) and 1% Biochar (b))

Treatment 3 (BM-H): 30% mixed banana ferment (BM) + 55% mixed feed + 15% vinasse (H)

Treatment 4 (BMb-H): 30% of banana mixture incubated with Biochar (BMb) + 55% mixed feed + 15% vinasse (H).

Procedures

Ducks were used for the experiment when they were 28 days of age, and they were housed in 12 cages in total. Experimental feeds included: Banana stalks that had been sliced and dried in the sun. Then, depending on the treatment, incubated with 15% molasses and 1% biochar. Finally, place it in a plastic bag and place it in a plastic container, squeezing out all the air and fastening it. Feeding was possible after 5-7 days.

Ducks were fed with 4 different diets, based on a mixed percentage of silage bananas, mixed feed, and wort. Feeding twice a day at 7 AM and 2 PM, free and clean drinking water.

Leftovers were collected every day in the morning.

Methods of data collection

Criteria measurements included:

Live weight

Weight gain

Food consumption

Feed conversion ratio (FCR)

How to collect data

Over several weeks, Muscovy ducks' average weight was: Once a week, on a set day, experimental Muscovy ducks were weighed and their weight was estimated using the formula below:

Average weight of duck:

$$\text{Average weight of duck} = \frac{\text{Total weight of duck (g)}}{\text{Total number of ducks}}$$

Increase in weight of experimental ducks was determined:

$$\text{Increase in weight of ducks} = \text{Final live weight} - \text{Initial weight}$$

Consumption of food/duck/day over the weeks:

$$\text{Feed intake (g/duck/day)} = \frac{\text{Total amount of feed to consume} - \text{Total amount of leftovers}}{\text{Total number of ducks} \times 7 \text{ days}}$$

Feed conversion ratio:

$$\text{Feed conversion ratio} = \frac{\text{Feed consumption for the week}}{P(\text{the last day of the week}) - P(\text{the beginning of the week})}$$

Statistical analysis

The data were generated and statistically evaluated to assess the differences between treatments, with 95% confidence, at the P level, with a cut off of 0.05, using the preliminary processed and stored in EXCEL spreadsheets. Statistical significance was determined using the MINITAB software, version 16.1.0 (2010).

RESULTS AND DISCUSSION

Live weight of Muscovy ducks over age stages.

The results of the weight of Muscovy ducks raised over the experimental weeks are shown in Table 2.

Table 2. Average live weight of Muscovy ducks over weeks of age (g/duck)

Week of age	Treatment				SE	P
	TM1 (BM)	TM 2 (BMb)	TM 3 (BM-H)	TM 4 (BMb-H)		
Initial weight	666	673	680	680	0.01	0.21
5	1,026	1,020	993	1,006	0.02	0.79
6	1,413	1,413	1,360	1,347	0.04	0.54
7	1,760	1,720	1,713	1,660	0.08	0.87
8	1,987	1,947	1,980	1,920	0.10	0.96
9	2,273	2,133	2,120	2,060	0.10	0.59
10	2,370	2,237	2,213	2,180	0.12	0.71
11	2,447	2,303	2,283	2,253	0.12	0.68
12	2,517	2,390	2,373	2,337	0.13	0.77

Note: Treatment 1: (mixed banana with mixed feed); Treatment 2: (mixed banana with Biochar and mixed feed); Treatment 3: (mixed bananas with mixed feed and vinasse); Treatment 4: (mixed banana with Biochar, mixed feed and vinasse.)

According to Table 2, the initial weight in the experiment was roughly comparable throughout the four treatments: 666 g for Treatment 1, 673 g for Treatment 2, 680 g for Treatment 3 and Treatment 4. Because at the beginning of the experiment, the treatments were arranged with the same relative weight, so there was no statistical difference ($P > 0.05$). Duck weight increased over the course of the experiment in all 4 experimental treatments, from week 1 to week 12. Treatment 1 increased from 666 g to 2,517 g, Treatment 2 increased from 673g to 2,390 g, Treatment 3 increased from 680 g to 2,373 g, and Treatment 4 increased from 680 g to 2,337 g.

When compared with the report of Lam Minh Thuan and Che Minh Tung (2004), the duck results at 28 days (the beginning of the experiment) were higher in all treatments. According

to Lam Minh Thuan and Che Minh Tung (2004), the weight of local Muscovy duck at 28 days is 420 g. For experimental ducks of this stage, all were higher than 246 g, 253 g, 260 g, and 260 g in Treatment 1, Treatment 2, Treatment 3, and Treatment 4, respectively.

At week 8, the average weight of ducks of the experimental treatments was 1496g higher than the average weight of Muscovy ducks reported by Lam Minh Thuan and Che Minh Tung (2004). Higher than 491g, 451g, 484g, and 424g in Treatment 1, Treatment 2, Treatment 3, and Treatment 4.

When considering at week 12, the average weight reported by Lam Minh Thuan and Che Minh Tung (2004) is 2,376 g. The average live weight of ducks at week 12 in a present experiment showed that Treatment 1 was higher than 141g, Treatment 2, Treatment 3, Treatment 4 had a difference but not significant ($P>0.05$).

Weight gain of Muscovy ducks over the weeks of age

Weight gain is a crucial production indicator for **Muscovy ducks** since it shows the animals' potential for growth. Table 3 displays the weight gain of Muscovy ducks over weeks of age.

Table 3. Weight gain of Muscovy ducks over the weeks of age (g/duck/day)

Week of age	Treatment				SE	P
	TM1	TM2	TM3	TM4		
5	51.43	49.52	44.76	46.67	3.78	0.62
6	55.24	56.19	52.38	48.57	3.19	0.38
7	49.52	43.81	50.48	44.76	7.62	0.89
8	32.38	32.38	38.10	37.14	7.60	0.92
9	40.95 ^a	26.66 ^{ab}	20.00 ^b	20.00 ^b	3.66	0.01
10	13.81	14.76	13.33	17.14	2.70	0.76
11	10.95	9.52	10.00	10.48	1.01	0.77
12	10.00	12.38	12.86	11.90	2.17	0.80
AVG	33.04	30.65	30.24	29.58	3.73	0.92

Note: Treatment 1: (mixed banana with mixed feed); Treatment 2: (mixed banana with Biochar and mixed feed); Treatment 3: (mixed bananas with mixed feed and vinasse); Treatment 4: (mixed banana with Biochar, mixed feed and vinasse.)

^{a,b}Data from the same row that share at least one symbol are not different at $P<0,05$

Overall from Table 3, the highest weight gain of the 4 treatments was at week 6. The highest weight gain of week 6 was Treatment 2 56.19 g/duck/day, followed by Treatment 1 55.24 g/duck/day, Treatment 3 was 52.38 g/duck/day and finally Treatment 4 was 48.57 g/duck/day, then gradually decreased to week 12.

According to Table 3, the best weeks for duck weight gain across four treatments were weeks 5 and 6. Weeks 7, 8, and 9 showed a gradual decline in duck weight gain, and weeks 10, 11, and 12 indicated a start to weight stabilization. As a result, the weight gain of experimental ducks was less rapid than in earlier weeks, rising from 10 g/duck/day to 14 g/duck/day. According to the rule of growth and development for poultry, it is true that the early stages (young poultry) are when the duck's body experiences the most rapid growth and metabolism, which increases its size, as a result, the highest weight was week 6. By the time the bird reached maturity, its internal organs were fully developed, and growth was slow, especially in

terms of sexual development, week 7, 8, 9 decreased, and week 10, 11, 12 stabled. This outcome was in line with Quach Cong Tho's research (2009).

Weight gain at week 5 of Treatment 1 was the highest at 51.43 g/duck/day, followed by Treatment 2 at 49.52 g/duck/day, Treatment 4 at 46.67 g/duck/day, and lastly with Treatment 3 at 44.76 g/duck/day. This was the first phase of the experiment, ducks in the treatments were just beginning to adapt to the experimental feed, so there was no difference between treatments. The treatments had different weight gain but the difference was not statistically significant ($P>0.05$).

Weight gain at the last stage of experimental Muscovy ducks from 5 to 12 weeks (g/duck/day) was 10.00; 12.38; 12.86 and 11.90 are equivalent in Treatment 1; Treatment 2; Treatment 3 and Treatment 4. This result is lower than that of Nguyen Thuy Linh et al. (2020) on local Muscovy ducks at the age of 9-12 weeks with an increase in weight (g/duck/day) of 12.5; 13.3; 15.5 and 17.1. This may explain why our experimental treatments reared with a diet containing 30% banana silage mixture are different from those of Nguyen Thuy Linh et al. (2020).

Overall, the mean weight gain in the treatments had different weight gain. However, this difference was not statistically significant ($P>0.05$).

Feed consumption and feed conversion ratio

Feed consumption was the amount of feed ducks eat in a day and night calculated by the amount of feed fed minus the number of leftovers. The feed consumption of ducks through the stages is shown in Table 4.

Table 4. Feed consumption (g/duck/day) of Muscovy ducks over weeks of age and feed conversion ratio (g/duck/day)

Week of age	Treatment				SE	P
	<i>TM1</i>	<i>TM2</i>	<i>TM3</i>	<i>TM4</i>		
5	139.4 ^a	137.4 ^{ab}	123.7 ^b	126.6 ^{ab}	3.35	0.02
6	147.7	142.5	140.7	136.8	7.62	0.78
7	170.2	169.5	153.4	147.4	7.52	0.15
8	168.2	151.5	142.2	131.0	8.55	0.07
9	136.1	139.3	124.0	113.0	11.60	0.41
10	136.7	137.6	113.5	108.8	8.40	0.08
11	142.6	140.0	125.7	122.1	5.50	0.07
12	139.4	151.1	131.1	116.8	8.99	0.12
AVG	147.5 ^a	146.1 ^a	131.8 ^b	125.3 ^b	3.43	0.01
FCR	6.99	7.12	6.85	5.87	0.92	0.77

Note: Treatment 1: (mixed banana with mixed feed); Treatment 2: (mixed banana with Biochar and mixed feed); Treatment 3: (mixed bananas with mixed feed and vinasse); Treatment 4: (mixed banana with Biochar, mixed feed and vinasse.)

^{a,b} Data from the same row that share at least one symbol are not different at $P<0,05$

According to Table 4, the treatments' feed consumption peaked at week 7, and Treatment 1 consumed the most feed at 170.2 g/duck/day, followed by Treatment 2 at 169.5 g/duck/day,

Treatment 3 at 153.4 g/duck/day, and Treatment 4 at 147.4 g/duck/day. Week 7 exhibited higher feed consumption because the ducks were in the weight increase phase compared to the other weeks in all 4 treatments,

In general, from week 6 to week 12, feed consumption of the treatments was different, but this difference was not statistically significant ($P>0.05$). Particularly at week 5, the food consumption of the treatments had a statistically significant difference ($P<0.05$). Feed consumption in Treatment 1 was 139.4 g/duck/day, Treatment 2 was 137.4 g/duck/day, Treatment 3 123.7 g/duck/day, and Treatment 4 126.6g/duck/day. Food consumption in Treatment 1 was statistically different from Treatment 3 with ($P<0.05$), but not different with Treatment 2 and Treatment 4 ($P>0.05$). Because the 5th week is the first week, ducks are acclimatized to the experimental feed, so at this stage in Treatment 3 and Treatment 4 the change in the mixed diet decreased to 55% compared to Treatment 1 and Treatment 2 was 70%, ducks eat more, so feed consumption is higher than Treatment 3, Treatment 4.

When the average for the entire period was examined, it was discovered that Treatments 1 and 2 had high average feed consumption (147.5 g/duck/day and 146.1 g/duck/day, respectively), but also high average weight increase. When compared to Treatments 3 and 4, there aren't many differences. As a result, Treatment 1 (6.99) and Treatment 2 (7.12) had higher feed conversion ratios than other treatments (Treatment 3 and Treatment 4). Due to the ducks' higher digestibility, increased weight, and decreased feed consumption, both Treatments 3 and 4 employed diets that contained 55% mixed feed and additional wort, resulting in lower feed conversion ratios than Treatments 1 and 2. However, Treatment 3 (6.85) is slightly greater when compared to Treatment 4 (5.87) with Biochar added to the mixed banana, but this difference is not statistically significant ($P>0,05$). This demonstrates that the capacity of experimental ducks to gain weight was unaffected greatly by the addition of Biochar to the mixed banana incubated in the diet.

CONCLUSIONS AND RECOMMENDATIONS

The preliminary findings from the analysis of the experimental ducks were as follows:

Banana stalks can be used to silage with molasses as feed for Muscovy ducks quite effectively;

Vinasse is another ingredient that can be added to the diet of ducks to increase weight;

Adding Biochar to the diet or not to the diet had no significant impact on the weight gain of the ducks in the experiment;

Results of weight gain, live weight and feed consumption of the diet containing 30% mixed bananas, 55% mixed feed, and 15% vinasse (Treatment 3) tended to be better in treatment 1

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