Sargassum Muticum as Feed Substitute for Broiler

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Abstract- *Marine macroalgae are the potential renewable resource on the marine environment which has been reported to afford several beneficial effects. Chemical and nutritional composition of seaweeds varies with individuals, species, habitat, and maturity, and depends on geographical origin or area of cultivation, seasonal, environmental, and physiological variations and water temperature. The study was conducted to determine the effect of Sargassum muticum as feed substitute on the growth performance of broilers. A total of 60 broiler chicks were used in the study, randomly distributed into four treatments with three replications using the Randomized Complete Block Design. The study was conducted from November 8 to December 16, 2014, with a duration of 39 days. Results of the study show that the birds fed with Sargassum muticum have performed better in all growth parameters as compared to those fed with pure commercial feeds. The use of Sargassum muticum has improved the final weight, gain in weight, and feed consumption of the birds. Sargassum muticum is best used as a feed substitute for broiler up to 10% with increased profitability.*

Keywords: *Feed substitute, Sargassum muticum*

INTRODUCTION

Poultry is an important branch area of the agricultural economy. As of July 1, 2014, the total chicken population was 172.41 million birds or 2.50% lower than last year's headcount of 176.83 million birds, the inventory of broilers and layers also declined by 3.16% and 7.40% respectively. Total chicken production in the 1st half of 2014 went up by 2.24% compared last 2013. However, egg production decreased by 4.18% in the same year. Along with the increase in chicken production, the gross value at current prices for the 1st half of 2014 also went up by 8.11% or PhP 69.187 million compared with the same level of the year 2013 [1]. In broiler production, feed cost constitutes the largest operation cost. With this, many researchers focused their attention on how to reduce feed cost to realize a larger profit. The use of locally available materials as feed added to commercial feeds for broiler ration may be one solution to lower feed cost.

Seaweeds had been used for many years directly for human consumption and annual feed. It is also an ingredient for the global food and cosmetics industries and is used as fertilizer and as an animal feed supplements. Also, seaweeds are valuable sources of micro food nutrients and raw materials for the pharmaceutical industry. Seaweed has plenty of essential nutrients especially trace elements and several other bioactive substances. That explains why today seaweeds are considered as the food supplement for the 21st century as a source of proteins, lipids, polysaccharides, minerals, vitamins, and enzyme [Rimber as cited by 1]. *Sargassum muticum* (*S. muticum*) is a brown edible alga. *S. muticum* extract (SME) has various biological activities, including antioxidant, antimicrobial and anti-inflammatory properties [2, 3]. Sea weeds have been used in poultry to improve animal immune status to decrease microbial load in the digestive tract and for their beneficial effect on quality of poultry meat and eggs [4, 5]. Poultry diet can be added with seaweed meal up to 15% depending on the species and age of algae and the birds [6]. Inclusion up to 3% of the diet improves the hardness of the pellet [7].

Broilers are usually fed with quality commercial feeds to supply their nutrient needs for the normal growth and development. However, a lot of nutrients are not present, or if present, are not used or properly utilized by the birds, and sad to say, are just excreted in waste/fecal matter. Instead of just going to waste, they must be properly utilized. This is very reason of this study, to improve the performance of the birds through the use *Sargassum muticum* as a feed substitute.

This study aimed to determine the performance of broiler in different levels of Sargassum muticum as a fed substitute. Specifically, it aimed to: (1) Evaluate the growth performance of broiler fed with different

levels of seaweeds as feed substitute; and (2) Determine the economic viability of using sea weeds as feed substitute in broiler ration.

MATERIALS AND METHODS

Materials

The following materials were used in this study: 60 broiler chicken (day old), rearing cages; improvised feeding toughs(plastic bottle); weighing scale (10kg); 25 watts electric bulb; commercial feeds (broiler ration); improvised waterer (plastic bottle); Newspaper; and Sargassum muticum

Research Design

The Randomized Complete Block Design (RCBD) was used in this study. A total of 60 broiler chicks were used in the study with (4) treatments and (3) replications (5 chicks per replication).

Treatments

The following treatments (T) were used in the study: T0 - pure commercial feeds; T1 - 5% of Sargassum muticum and 95% of commercial feeds; T2–10% of Sargassum muticum and 90% of commercial feeds; and T3-15% of Sargassum muticum and 85% of commercial feeds

Care and Management Practices

Before the arrival of the chicks, the cages were cleaned and disinfected to prevent the possible spread or occurrence of diseases. After the arrival of the chicks, they were provided with pure water mixed with sugar to relieve the chicks from stress due to transport and were placed later in the brooder. The chicks were fed with Integra 1 adlibitum throughout the brooding period. The temperature of the brooder house was adjusted based on the behavior of the chicks. If the chicks crowd themselves around the bulb, it would mean that the temperature is low, but if they are evenly scattered around the brooder, it means that the temperature is alright.

After the brooding period, the birds were fed with the mixture as specified in the treatments. Feeding was done three times a day; 5:00 in the morning, 12:00 at noon, and 5:00 in the afternoon.

The birds were given equal care and management throughout the study to ensure that their good performance. Feed rations were provided daily to the experimental birds. The birds were provided with clean water every day. Vetracin was mixed with water and administered every two weeks to protect the birds from pest and diseases.

The experimental house was cleaned thoroughly and regularly to avoid the occurrence of pest and disease. The chicken dung was disposed of far from the experimental area to prevent the breeding area from organisms that would bring pest and diseases.

Preparation of the Feed Substitute

Fresh seaweeds were collected from the seashore. The collected seaweeds were washed three times to remove dirt such as sands and other matters. After washing, the seaweeds were placed under the shade and air dried for 3 days. After drying, stems were cut and shredded using a bolo. The S. mutimum were added to commercial feeds as specified in the treatments.

RESULTS and DISCUSSION

Regarding initial weight, birds under T1(95% commercial feeds+5% *Sargassum muticum*), T2-(90% commercial feeds+10% *Sargassum muticum*), and T3-(85% commercial feeds+15% *Sargassum muticum*) have the same initial weight of 0.23 kg. Initial weights of the birds were not significantly different with each other. Birds are in homogeneous conditions for the experiment.

Table 1. Growth Performance of Broilers as Affected by *Sargassum muticum*

Treatment	Initial Weight (kg)	Final weight (kg)	Gain in Weight (kg)	Feed Consumption (kg)	Feed Conversion Efficiency	ROI
T0-(Control)	0.21	1.75a	1.54a	3.14a	2.17	0.32
T1-(95%CF+5%Sm)	0.23	2.15b	1.93b	3.76b	2.01	0.54
T2-(90%CF+10%Sm)	0.23	2.18b	1.96b	3.59b	1.88	0.69
T3-(85%CF+15%Sm)	0.23	2.20b	1.97b	3.68b	1.98	0.72
p-value	0.214	0.012	0.009	0.000	0.514	
C.V.	8.08%	10.18%	11.20%	9.66%	14.17%	

Means marked with the same letter are not significantly different at 0.05 level of significance.

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Birds under T3-(85%commercial feeds+15% *Sargassum muticum*) have the heaviest final weight after 38 days with a mean of 2.20 kg. On the other hand, birds under T0-Control (pure commercial feeds) have the lowest final weight of 1.75 kg. Analysis of variance on the mean final weight of the birds showed no significant differences exist among treatments means.

Results of the study showed that the final weights of the birds in all treatments are below the expected weight which is 2.282 kg after 38 days as per Premium Feeds Poultry Feeding Guide Standard. However, the final weight of the birds fed with *Sargassum muticum* is close to the expected weight of the birds after 38 days, higher than the final weight of the birds fed with commercial feeds.

Birds under T3 (85%commercial feeds+15% *Sargassum muticum*) have the heaviest gain in weight with a mean of 1.97 kg followed by birds in T2 (90%commercial feeds+10% *Sargassum muticum*). On the other hand, birds under T0-Control (pure commercial feeds) have the lowest gain in weight of 1.54 kg. Analysis of variance on the mean gain in weight of the birds showed no significant differences among treatments means. The gain in weight of the bird increases as the percentage of *Sargassum muticum* was increased in the feed ration of the birds.

It has to be noted that birds under T3 have the heaviest final weight while those under T0 have the lowest final weight. Thus, the pattern of the gain in weight was observed.

It was observed that's birds under T1 (95%commercial feeds+5% *Sargassum muticum*) has registered the highest feed consumption with a mean of 3.68 kilograms while those under T0 (Control - pure commercial feeds) have the lowest feed consumption with a mean of 3.14 kilograms. Analysis of variance on the feed consumption of the birds showed no significant differences among treatment means.

A 38 day-old broiler must consume 3.85 kg of feeds as reflected in the Premium Feeds Poultry Feeding Guide Standard. Results of the study showed that the feed consumption of the birds under T0 is below the standard feed consumption. Moreover, although the feed consumptions of the birds under T2 and T3 are lower than the expected feed consumption, the feed consumptions of the birds are almost the same as the expected. However, the feed consumption of the birds under T1 is higher than the expected feed consumption. Results show that the substitution of 5% *Sargassum muticum* has increased the feed consumption of the birds.

Birds under T0-Control (pure commercial feeds) have the poorest feed conversion efficiency wherein; the birds need 2.17 kg of feed ration to produce 1 kilogram of meat. On the other hand, birds under T2-(90%commercial feeds+10% *Sargassum muticum*) have the best feed conversion efficiency, the birds need 1.88 kg. of feeds to produce 1 kilogram of meat. Analysis of variance on the feed conversion efficiency showed no significant differences exist among treatment means. However, birds substituted with S. muticum better convert feeds to meat than those fed with pure commercial feeds. The better feed conversion capacity of the birds fed with S. muticum could be attributed to the minerals in seaweed meal which include potassium, phosphorus, magnesium, calcium, sodium, chlorine, and sulfur as well as the trace elements (elements required in trace amounts) zinc, cobalt, chromium, molybdenum, nickel, tin, vanadium, fluorine, and iodine.

Sargassum muticum is added to poultry diet to improve the immune system and to decrease the microbial load in the digestive tract of the birds. The inclusion of S. muticum also improves the quality of meat and egg [5,6]. *S. muticum* extract (SME) has various biological activities, including antioxidant, antimicrobial and anti-inflammatory properties [3,4]. The aforementioned properties of *Sargassum muticum* have contributed to the improved performances of the birds substituted with S. muticum as compared to the birds fed with pure commercial feeds.

Highest return of investment was computed under T3 (85% Commercial feeds + 15% Sargassum muticum) with an ROI of 0.72 which imply that for every 100 piso invested, a profit of 72 pesos will be realized. The use of T2 and T1 followed with ROIs of 0.69 and 0.54. On the other hand, the ROI in using pure commercial feeds was 0.32.

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Table 2. Carcass Quality of the Birds as Affected by Sargassum muticum

Treatment	Carcass Quality	
	Fat Pads Color	Meat Color
T0-(Control)	Yellowish	Yellowish
T1-(95%CF+5%Sm)	Yellowish	Yellowish
T2-(90%CF+10%Sm)	Yellowish but minimal	Slightly Reddish
T3-(85%CF+15%Sm)	No fat pads	Reddish

Regarding fat pads color, it was observed that birds fed with pure commercial feeds (T0) and 95% Commercial Feeds + 5% Sargassum muticum (T1) have yellowish fat pads while those fed with 90% Commercial Feeds + 10% Sargassum muticum (T2) have yellowish but minimal fat pads. On the other hand, those fed with 85% Commercial feeds + 15% Sargassum muticum were found to have no fat pads.

In terms of meat color, it was observed that birds fed with pure commercial feeds (T0) and 95% Commercial feeds + 5% Sargassum muticum (T1) have yellowish meat while those fed with 90% Commercial feeds + 10% Sargassum muticum (T2) have slightly reddish meat while those fed with 85% Commercial feeds + 15% Sargassum muticum (T3) have reddish color of the meat.

The observed meat color could be attributed to the fact that the fat pads of the birds decrease when the amount of Sargassum muticum in the feed ration increases. The absence of fat pads for the birds fed with 90% Commercial feeds + 10 % Sargassum muticum, and 85%Commercial feeds + 15% Sargassum muticum have resulted to the reddish meat color of the birds.

CONCLUSION

Feeding the birds with *Sargassum muticum* at increasing level reduce the fat pads of the birds. The carcass quality was improved due to the reduction of fats. However, with the absence of fat for those feed with 10% and 15% *Sargassum muticum*, the meat color becomes not so attractive due to its reddish appearance.

Seaweed meal can be added to poultry diets up to 5-15% of the diet, depending on the species of algae and the species and age of the animal as a pellet binder [7]. *Sargassum muticum* is best used as the feed substitute for broiler up to 10% with increased profitability.

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