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GROWTH PERFORMANCE OF COBB BROILERS GIVEN VARYING CONCENTRATIONS OF MALUNGGAY (*Moringa oleifera* Lam.) AQUEOUS LEAF EXTRACT

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ABSTRACT: *A study was conducted to determine the growth performance of Cobb broilers supplemented with varying concentrations of Moringa oleifera Aqueous Leaf Extract (MoALE) via the drinking water. A total of four hundred day-old chicks were randomly distributed into four treatment groups, replicated four times with twenty-five broilers per replicate. The growth performance of broilers was evaluated based on their feed consumption, live weight, feed conversion ratio (FCR) and return of investment (ROI). Results of the study showed that at 90 mL MoALE (T_3), the feed consumption of broilers was consistently lower than the control group (T_0) and this was statistically significant ($P<0.01$). The live weight of broilers given 30 mL (T_1), 60 mL (T_2) and 90 mL (T_3) MoALEs were significantly higher than the control group (T_0) and this was also statistically significant ($P<0.01$). In terms of feed conversion ratio (FCR), the MoALE treated broilers (T_1-T_3) were more efficient converter of feeds into meat than the control group (T_0) and this was statistically significant ($P<0.01$). Furthermore, the return of investment (ROI) of MoALE treated broilers (T_1-T_3) was significantly higher ($P<0.01$) than the control group (T_0) with a revenue per peso invested of Php 0.62 in T_1 and T_2, and Php 0.63 in T_3 compared to Php 0.50 in T_0.*

ORIGINAL ARTICLE

Key words: *Moringa oleifera, Broiler, Feed consumption, Live weight, Feed conversion ratio*

INTRODUCTION

Chicken industry is one of the most dynamic of world agribusiness trade. Hence, research on meat production globally indicates poultry as the fastest growing livestock sector especially in developing countries. Philippines is not exempted since the outlook for Philippine chicken industry appears optimistic because the demand for chicken products is expected to increase along with population and income growth of the country. However, Philippine broiler industry faces threats from cheaper imports as a result of its higher cost of production system (Chang, 2007).

The continuing survival and growth of Philippine broiler industry depends on its ability to compete globally, which is therefore dependent largely on the efficiency of its production system. As an alternative to the desire of improving economic status in poultry production, researchers revolutionized the application of feed and water additives by focusing on organic or natural supplements instead of using synthetic medicaments (Zeweil et al., 2006).

Synthetic growth enhancers and supplements in poultry nutrition are expensive, usually unavailable and possess adverse effects in bird and human. Sub-therapeutic levels of antibiotics given to poultry as growth enhancer may result to the development of antibiotic-resistant bacteria, which are hazardous to animal and human health.

Meanwhile, the use of organic supplements such as probiotics and herbs, are generally believed to be safer, healthier, and less subject to hazards. Thus, herbs and herbal products are incorporated in livestock feeds and water instead of synthetic products in order to stimulate or promote effective use of feed nutrients which result in more rapid gain, higher production and better feed efficiency. Moreover, herbs contain active substances that can improve digestion and metabolism and possess bacterial and immunostimulant activities (Ghazalah and Ali, 2008).

Malunggay (*Moringa oleifera* Lam.) is one of the herbs containing bioceutical agents that could substitute synthetic growth enhancers and supplements in broiler and other livestock production. Some of the published studies pertaining to its potential involved the study of Lannaon (2007). He reported that performance of Starbro broilers given with Malunggay (*M. oleifera*) leaf decoction, revealed the improvement of feed consumption, daily weight gain, final weight and profit compared to the control group. Furthermore, Du et al. (2007) evaluated the effects of dietary supplementation of *Moringa oleifera* on growth performance, blood characteristics and immune response of Arbor acres strain broilers. It was found out that increasing supplementation of *Moringa oleifera*

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decreases contents of uric acids, triglycerides and albumin/globulin ratio in the serum of broilers. Hence, immune response of broilers increases significantly. Yang et al. (2007) evaluated the effect of *Moringa oleifera* on the growth performance, immune function, and ileum microflora in broilers. Results showed that dehydrated leaves of *Moringa oleifera* when given in the diet, revealed significant enhancement of duodenum traits, increased *Lactobacillus* counts in ileum while reducing *E. coli* and enhancement of immune system in broilers were observed. Fuglie (2008) reported the study conducted by BIOMASA using *Moringa oleifera* as poultry feed, swine feed and cattle feed. Study showed that nutrient value of *M. oleifera* as poultry and swine feed could be further increased through addition of an enzyme phytase to break down phytates in the ration. This will result to increased utilization of some minerals and absorption of phosphorus found in *Moringa oleifera.* In addition, Price (1985) as cited by Davis (2000), reported that chicken will not voluntarily consume Moringa leaves and leaf powder when given as feed. However, processing the leaves will give twenty two percent protein content desired for chicken ration. A simple process reported was done by mixing the leaves with water and running the mixture through a hammer mill, then mashing it to 70^{0}C for 10 minutes. The proteins will then clump and settle in the bottom, ready for freeze drying. The dried products are incorporated to chicken ration. Moreover, Food and Agriculture Organization (1996) included *Moringa oleifera* as one of the protein substitutes derived from plants in the form of leaf meal for non-ruminant animals aside from *Leuceana leucocephala, Manihot esculenta, Trema orientalis, Morus indica and Sesbania rostrata.* These leaf meals are reported to be produced industrially and used widely in animal feed. In poultry and swine industry, these leaf meals are mainly used to supplement vitamins and trace minerals.

This study was proposed to determine the growth performance of Cobb broilers given varying concentrations of *M. oleifera* aqueous leaf extract through infusion process, where the bioactive compounds of plants are extracted without destroying it like what happen in decoction or boiling (Fernandez, 1990). The study aims to determine the weekly feed consumption, live weight and feed conversion ratio, and to find out the return of investment for one cropping of Cobb broilers supplemented with *Moringa oleifera* aqueous leaf extract (MoALE).

Results of the study could provide insights to pharmaceutical companies on developing organic supplements from plant source. Likewise, this could provide awareness to the broiler industry on the use of *M. oleifera* aqueous leaf extract via drinking water to improve growth performance of broilers.

MATERIALS AND METHODS

Broiler Management

Sixteen pens, with an area of twenty-five ft^2 each and can accommodate twenty-five broilers, were constructed at the CVM-Broiler Production Unit. The walls and floors of pens were disinfected with Lysol after washing with detergent and water. Litter materials made of old newspapers were used for the first two weeks of chicks. Clean and disinfected feeders and waterers were set in a place accessible to the birds. Each pen was properly labeled for easy identification of each treatment groups. In addition, a 25-watt electric bulb was placed at the center of each pen, one foot above the floor. The distance of the bulb was adjusted by pulling it away from the floor based on the response of chicks, weather condition and feather growth. The bulb was removed during the third week or when feathers are fully grown. In terms of feeding, booster mash was given during the first two weeks and full grower mash during third week. Full Finisher mash was given during fourth week of age or one week before the harvest of broilers. Feeds were given *ad libitum* and shifting from one form of feeds to another was done gradually to avoid digestive disorder. During feeding, a predetermined amount of feeds as well as the leftover has been weighed and recorded.

Malunggay Leaf Extraction

Mature leaves of Malunggay were selected and used in this experiment. The leaves were gathered in one area and were subjected to air-drying so that 20% of moisture was left. Air-dried mature green leaves of Malunggay were pounded using mortar and pestle prior to extraction. Infusion technique was applied in extracting bioactive substances present in Malunggay leaves. The leaves were soaked in distilled water for 24 hours using 1:2 ratio (weight/volume) (Fernandez, 1990). The preparation was then filtered to separate the debris and filtrate. The filtrate was processed in Rotary Evaporator (60^{0}C) until become concentrated into 20mL. The concentrated extract was placed in a sealed, clean container and then refrigerated (4^{0}C) until needed. The concentrated extract was diluted using distilled water (volume/volume) into 30mL/1000mL, 60mL/1000mL and 90mL/1000mL H_2O.

Experimental Design

The experiment was laid out in a Completely Randomized Design (CRD). There were 400 broilers randomly distributed into four treatment groups and were replicated four times, with 25 birds per replicate. Sexing was conducted on day 1, such that each treatment contained 50% male and 50% female samples of birds. Control group (T_0) was given with Dan Way Inc. Medication Program; T_1, T_2, and T_3 were treated with 30 ml, 60 ml and 90 ml of Malunggay aqueous leaf extract per 1000mL of water, respectively.

Statistical Design

The data on the feed consumption, actual live weight, feed conversion ratio and return of investment were analyzed using One-way Analysis of Variance (ANOVA). Significant differences among treatment means was analyzed using Tukey Honestly Significant Difference (Tukey HSD).

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RESULTS

MoALE (*Moringa Oleifera* Aqueous Leaf Extract)

There was an observable voluntary intake of broilers given their respective treatments of MoALE from day one to harvest. The physical characteristics of MoALE can be described as an extract with remarkable dark greenish brown color, slightly sticky in consistency, moderately bitter and a distinctive smell.

Feed Consumption (FC)

Results during harvest showed that feed consumption (FC) of T_1 (30 ml MoALE) and T_2 (60 ml MoALE) were higher than T_0 (control group) (Table 1). But the FC of T_0 was higher than T_3 (90 ml MoALE). The highest feed consumption was observed in Cobb broilers treated with 30 ml MoALE while the lowest FC was observed in broilers treated with 90mL MoALE.

Actual Live Weight (LW)

Results during harvest revealed that MoALE treated birds (T_1-T_3) have better LW than T_0 (Control group). But there was no significant difference observed among LWs of MoALE treated groups (T_1-T_3) (Table 1). The highest LW numerically was seen in 90 ml MoALE treated broilers.

Feed Conversion Ratio (FCR)

The feed conversion ratios (FCR) of MoALE treated birds (T_1-T_3) were better than T_0 (Control group). But there was no significant difference observed among FCRs of MoALE treated groups (T_1-T_3) (Table 1). The best FCR numerically was observed in broilers treated with 90 ml MoALE.

Table 1 - Weekly feed consumption, actual live weight and feed conversion ratio of Cobb broiler given with varying concentrations of MoALE (*Moringa oleifera* Aqeous Leaf Extract) from day 1 to harvest

Treatment Groups	Week	Feed Consumption	Actual Live Weight	Feed Conversion Ratio
T_0 (DWMP)	1	3650.00^{d}	4012.50^{a}	0.911^{b}
T_1 (30 ml MoALE)		3550.00^{b}	4100.00^{a}	0.866^{ab}
T_2 (60 ml MoALE)		3525.00^{a}	4200.00^{a}	0.8340^{a}
T_3 (90 ml MoALE)		3637.50^{c}	4225.00^{a}	0.861^{ab}
T_0 (DWMP)		12337.50^{b}	9725.00^{a}	1.269^{b}
T_1 (30 ml MoALE)	2	12450.00^{d}	10375.00^{b}	1.202^{ab}
T_2 (60 ml MoALE)		12300.00^{a}	10600.00^{b}	1.161^{a}
T_3 (90 ml MoALE)		12400.00^{c}	10562.50^{b}	1.174^{a}
T_0 (DWMP)		26025.00^{b}	18858.75^{a}	1.381^{b}
T_1 (30 ml MoALE)	3	26187.50^{d}	20650.00^{b}	1.269^{a}
T_2 (60 ml MoALE)		26100.00^{c}	20662.50^{b}	1.264^{a}
T_3 (90 ml MoALE)		25950.00^{a}	21738.50^{b}	1.194^{a}
T_0 (DWMP)		44900.00^{b}	29216.25^{a}	1.537^{b}
T_1 (30 ml MoALE)	4	45062.50^{d}	31217.50^{b}	1.444^{a}
T_2 (60 ml MoALE)		44975.00^{c}	31662.50^{b}	1.422^{a}
T_3 (90 ml MoALE)		44825.00^{a}	31445.00^{b}	1.426^{a}
T_0 (DWMP)	33rd	59900.00^{b}	39332.50^{a}	1.524^{b}
T_1 (30 ml MoALE)	Day	60062.50^{d}	42135.00^{b}	1.426^{a}
T_2 (60 ml MoALE)	(Harvest)	59975.00^{c}	41945.00^{b}	1.430^{a}
T_3 (90 ml MoALE)		59825.00^{a}	42420.00^{b}	1.412^{a}

Means with different letters are statistically significant ($P<0.01$)

DISCUSSION

On the average, the feed consumption (FC) of MoALE treated broilers decreases as the concentration given increases. This pattern could be due to the considerable amount of Vitamin C in MoALE, which is in agreement with Rajput et al. (2009) who reported the significant lower FC with broilers supplemented with Vitamin C. On the other hand, it appears that lower feed consumption did not affect the live weight (LW) of broilers though LW is dependent in FC. Thus, MoALE treated broilers are heavier compared to control. This could be attributed to complete amino acids, considerable amount of vitamins, minerals, antioxidants, immunostimulants and antibacterial compounds such as pterygospermin (Anwar et al., 2007; Fahey, 2005; Makkar and Becker, 1997). The complete nutritional components and some growth stimulating compounds of *Moringa oleifera* probably compensated to the enhancement of the live weight. In addition, the few amount of anti-nutritional factors that affect palatability of feeds (Kakengi et al., 2007) were not implicated to compromise the bioavailability of nutrients and growth stimulating compounds present in *Moringa oleifera* leaves (Foidl et al., 2001). Consequently, lower FC but higher

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LW resulted to better feed conversion ratio. This suggests that MoALE treated groups were efficient converter of feeds into meat. Thus, better return of investment was achieved by MoALE treated groups.

The crude extract of *Moringa oleifera* like other herbal drug may contain digestion enhancing properties and stimulates favorable growth of good bacteria while decreasing bad microorganisms. But the mechanism by which this herbal product influences the growth performance and gut microflora of poultry are poorly understood (Hernandez et al., 2004). Meanwhile, base on the result of the present study, MoALE could be a potential cheap source water supplement for broilers. However, further research is needed to validate the potential of MoALE as a substitute to synthetic supplements such as antibiotics in improving broiler production. Moreover, *Moringa oleifera* aqueous leaf extracts have a promising outcome to the broiler industry in terms of achieving optimum growth performance and better return of investment. Hence, results of the study will provide additional contribution to the dynamic researches on the effect of *Moringa oleifera* on the performance of broilers.

CONCLUSION

Based on the results of the study, the supplementation of 30 ml and 60 ml concentrations of *Moringa oleifera* aqueous leaf extract had improved feed consumption of Cobb broilers. Likewise, supplementation of 30 ml, 60 ml and 90 ml concentrations of *Moringa oleifera* aqueous leaf extract had improved the actual live weight, feed conversion ratio (FCR) and return of investment (ROI) of Cobb broilers. In general, *Moringa oleifera* aqueous leaf extract given via drinking water significantly improved growth performance of Cobb broilers, regardless of the concentrations given.

RECOMMENDATIONS

It is recommended to study the immune system and general performance of broilers artificially or naturally infected with a particular disease. Furthermore, it is recommended to conduct field trial on MoALE as supplement to commercial poultry.

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