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Hematological Profile of Pekin *Duck (Anas platyrhynchos* F*)* Fed with *Moringa Oleifera* leaf meal as soybean oil meal substitute under mixed orchard farming system

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Key words: Hematological Analysis, Pekin Duck, Moringa Oleifera Leal Meal (MOLM), Mixed Orchard Farming System.

Abstract

The study was conducted to determine the hematological profile of pekin ducks fed different levels of *Moringa oleifera* leaf meal (MOLM) as soybean oil meal (SOM) substitute. A total of 150 F_1 growing Pekin ducks were randomly distributed into 15 ranged pens under mixed orchard equally representing 5 dietary treatments to evaluate the haematological profile of ducks. The study was undertaken from February 6 to March 5, 2016 at Sanchez Mira, Cagayan, Philippines. The treatments were: Treatment T_0 (control) 100% SOM as protein source, T_1-25% MOLM substitution of SOM, T_2-50% MOLM substitution, T_3-75% MOLM substitution, T_4-100% MOLM. The study was done in CRD with three replications per treatment. Treatment 3 (75 % MOLM) recorded the highest RBC count followed by T_4, T_1, T_2 and T_0. Although there were differences in the mean values, the RBC counts of the different treatments were within the normal range of values of RBC in ducks. The same trend as with the RBC count has been observed in the PCV values wherein all PCV means of the different treatments were within the reference or normal rate. Results from RBC count and PCV indicate that the birds were not suffering from any disease like anemia which is the decrease number of functional erythrocytes which might be due to deficient blood formation because of poor nutrition including dietary deficiencies of iron, vitamins and amino acids.

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Introduction

Improving the productivity of any animal necessitates the understanding of its physiology including hematological characteristics. Hematological studies are usually undertaken to establish the diagnostic baselines of blood characteristics for routine management practices of farm animals (Orgi, Okeke & Ojo, 1986). For example, hematological constituents usually reflect the physiological responsiveness of the animal to its external and internal environments and thus serve as a veritable tool for monitoring animal health (Pascalonpekelniczky, Chauve & Gauthey, 1996).

In commercial poultry production system, profit can be maximized by minimizing feed cost which accounts the major cost of production. In the Philippines, the major sources of protein for poultry production are Fishmeal (FM) and Soybean Meal (SOM). However, these are imported and becoming more scarce, expensive and used extensively by other livestock and humans. Prices of these conventional protein sources have soared so high in recent times that it is becoming uneconomical to use them in poultry feeds. There is a need therefore, to look for locally available and cheap sources of feed ingredients. One possible source of cheap protein is the leaf meal of tropical legumes. Many studies have been conducted using various sources of leaf meal proteins for broilers (Iheukwumere *et al*., 2008; Wude and Berhan, 2009; Onyimonyi *et al*., 2009). Leaf meals do not only serve as source of protein but also provides some necessary vitamins, minerals and oxycarotenoids (D'Mello *et al*., 1987; Opara, 1996). One plant that can serve as source of leaf meal in the diet of poultry is *Moringa olifera* tree (Kakengi *et al*., 2007; Olugbemi *et al*., 2010b).

Moringa oleifera leaves are packed with nutrients important both for humans and animals. A crude protein percentage of 25- 27% is suggestive that the leaves are a good source of protein for livestock. *Moringa* tree is indigenous to many provinces in the Philippines. This tree thrives well in Sanchez Mira, the site of this study because of its being a coastal area with sandy loam and clay loam types of soil.

Moringa tree is drought tolerant, it is resistant to most diseases and pests, it has a high biomass yield per hectare, it can grow well in marginal areas and it has a high protein value which can support livestock production. All these facts make it a cheap feed source compared to soyabeans, which is a cash crop and it is expensive to produce by the small-scale farmer in marginal areas. Under such conditions, *Moringa oleifera* becomes the crop of choice to explore in livestock production.

In poultry production, the raising of chickens and other species organically by free range or pasture management is now becoming popular because of its higher demand. Health conscious consumers prefer organically grown poultry than commercial broilers because of its satisfying flavor and aroma. Recent researches revealed substantial increases in nutritional value of pastured poultry, particularly in Omega-3 Fatty Acids and Vitamin A, and a significant decrease in total fat thus becoming better food to eat (Lee, 2001). *Moringa oleifera* leaf meal must be verified if what levels of its inclusion in the diet could significantly affect the growth, carcass yield, meat quality, and profitability of ranged pekin ducks. This study will benefit poultry raisers especially duck growers because they would be given options to lower down their production cost through the use of alternative protein source for feeds. Likewise, the consumers because of healthy, better tasting and possibly cheaper poultry meat from duck produced in the range and fed with nutritious *Moringa oleifera*.

Since strong differences are reported between hematological characteristics of local breeds of ducks from different geographical and agricultural zones of the world (Sturkie, 1986, Warren, 1972), there is the need to establish the diagnostic blood profile or characterize the hematological baselines for ducks.

The study generally aimed to establish the haematological profile of pekin ducks ranged under mixed orchard given pelletized formulated rations with different levels of *Moringa oleifera* leaf meal (MOLM) as substitute for soybean meal (SBM).

Materials and methods

Experimental Animals

One hundred fifty 14-day old pekin ducklings, meat type were randomly selected and distributed to treated and control groups 10 animals per group. The ducks are placed in individual open-ranged pens under mixed orchard farming system. To ensure uniformity of stocks, the experimental birds were purchased from Superior F1 Genetic Enterprise owned by free-range poultry specialist Dr. Erwin J. S. Cruz.

Experimental Treatments and Design

A completely randomized design (CRD) was used with 5 dietary treatments (control, and 4 levels of MOLM substitute diets) with three replications per treatment. For each of the replication, there were 10 randomly selected pekin ducks in each of the 15 pens (total of 150 heads). The birds were fed according to the type of experimental diet assigned to each treatment as follows: T0 – Control - 100% SOM as protein source, T1–25% MOLM substitution of SOM, T2–50% MOM substitution of SOM, T3–75% MOLM substitution of SOM, and T4–100% MOLM as protein source.

Statistical Analysis

Statistical analysis (ANOVA) in Completely Randomized design (CRD) was carried out using computer programs e.g. Statistical Tool for Agricultural Research (STAR). The statistical model included effects of treatments, with the experimental unit being the pen. The mean values that were obtained for the pekin duck fed soybean meal as protein source were compared with those fed malungay leaf as protein source diets at the 5% and 1% level of significance using a protected Fisher's least significant difference test (Fisher, 1949).

Experimental Area

The experimental animals were ranged under mixed orchard to partly cover the birds from direct sunlight. The area is an ideal site to raise ranged poultry with coconut as the predominant crop, and other trees such as citrus, gmelina, molave, and mahogany. In addition, under the trees are mixture of native grasses and edible weeds, which are good sources of other nutrients for the birds' growth. The appearance and vegetation of the area is uniform.

Brooding & Rearing Area

An existing house was used for the brooding of ducklings for two weeks. A rearing house with a dimension of 1.0m x 1.5m was constructed for each replication to accommodate 10 heads during the experimental period. The structure was built using wood, bamboo and G.I sheet. Five inches deep rice hull was provided as litter materials. The rearing area served as shed for the birds during night time and inclement weather.

Preparation of the Experimental Area

The range area is four (4) sq m. per bird. A total of 150 heads of ducks was used for the whole duration of the study. The total area used in this study is 600 square meters which was divided into 15 experimental units to come up with 40 square meters per experimental unit. The experimental area was enclosed and divided with poultry nets to prevent transfer of birds to other groups and likewise protect them from predators.

Sources of Feed Ingredients

The ingredients such as SOM, fish meal, coco oil, molasses, DL-methionine, L-Lysine, diCal.Phos, and vitamin premix were bought at Decena Feed Mill in Enrile, Cagayan. Salt, copra meal, and yellow corn were purchased locally. *Moringa oleifera* leaves were collected from the locality, sun dried to 13-14% and milled to form into MOLM.

Physical Appearance

The pekin ducks used in the study are F1 meat-type, fast growing that are procured from F1 Superior F1 Genetic Enterprise owned by free-range poultry specialist Dr. Erwin J. S. Cruz. This strain of duck is usually raised in confinement. During the experimental period, they grew fast even when in range and achieved an average of 2.4 kilograms in five weeks. Ducks fed with MOLM exhibited faster growth than the control group.

Pigmentation

During the study, ducks fed with MOLM have more prominent yellow beak and shank than the ducks fed with full soybean. Likewise, ducks fed with *Moringa* have cleaner and smoother feathers than the control group. *Moringa oleifera* leaf meal does not only serve as protein source but also provide some necessary vitamins and oxy carotenoids which cause yellow color of broiler skin, shank and egg yolk (www.United caribbean.com. 2003).

The yellow pigment is highly visible in the skin of dressed ducks fed with *moringa* than the control group which exhibited slightly yellow skin. Generally, there was a pronounced intense yellowish coloration of the beak, legs, carcass cuts, abdominal fat and feathers of broilers that received dietary MOLM than birds that got no MOLM. This presumably may be due to the high content of beta-carotene in MOLM. The yellow color in the body and products of broilers observed in this study is an indication of the efficient absorption and utilization of the pigment xanthophyll present in MOLM. Similarly, Ayssiwede *et al.* (2011) observed that dietary MOLM inclusion to have produced yellow coloration of the skin and abdominal fat of growing indigenous chickens. The birds were experiencing yellow colouration of body parts which was mainly attributed to the presence of xanthophylls and carotenoid pigments in MOLM as in other tree and shrub leaf meals as outlined by Austic and Neishen (1990).

Livability

The ducks stayed on range from day 15 to day 37 under mixed orchard. There was no mortality observed during the experimental period even though there was intermittent rain and the temperature was very cold. This means that the feeds given and the range system of raising them have no adverse effect on their livability. However, it was observed that in the control group, feed consumption decreased on the 1st to 2nd day of the 2nd week of rearing, but recovered on the 3rd day of that week. In the treatment groups, there were no cases of any sickness even there was an adverse conditions experienced by the ducks in their range environment. This implies that the birds were easily acclimatized to their environment after they were transferred from the brooder to the range area.

Feeding and Grazing Behavior

Feeds are given at 6:00 in the morning for all the treatment replications throughout the study period. Refill of feeds was done any time when necessary or if they already consumed their feed allotment for the day. On their first day at the range area, the birds appeared to be very nervous and huddled together around their rearing houses. As the day progress, they tend to adapt their new environment as they started to feed and graze. Throughout the study period, the birds generally exhibited normal feeding and grazing behavior. They fed and graze in the range alternately during the day and back to the rearing house to roost at night time. Lights were not provided at the rearing houses.

Results and Discussion

Red Blood Cell Count and Packed Cell Volume

A three milliliter of blood was drawn via the wing vein with a 3ml syringe and a gauge 24 needle. Prior to puncture, the area was sanitized by a 70% isopropyl alcohol. The blood was placed in purple top vacutainers containing EDTA as anticoagulant.

Red blood cell count was performed using the hemocytomer method. A portion of the anticoagulated blood was drawn into a hematocrit tube. After which it was centrifuged for 5 minutes at a rate of 10,000rpm. The tubes were removed and result was read using the hematocrit tube reader.

Table 1. Red blood Cell Count and Packed Cell Volume.

Treatments	RBC Count(cells/microliter)	PCV (%)
To	3.39	35
T1	3.65	36
T2	4.22	38
T3	3.40	36
T4	3.85	37

* 40.24±4.21 cells/µL: RBC Reference Value *36±1.5%: PCV Reference Values from Berl Munch Tierarztl Wochenschr 1996 Aug; 109(8):324.

Table 1 shows the mean RBC count of the different treatment groups. It can be observed that T2 recorded the highest RBC count at 4.22 cells/µL followed by T4 (3.85 cells/µL), T1 (3.65 cells/µL), T3 (3.40 cells/µL) and To at 3.39 cells/µL. Although there were differences in the mean values, the RBC counts of the different treatments were within the normal range of values of RBC in ducks which is 40.24±4.21 cells/µL. Also reflected in the table is the mean PCV values in percentage of the different treatment groups. The same trend as with the RBC count has been observed in the PCV values wherein all PCV means of the different treatments were within the reference rate of 36±1.5%.

These results indicate that the birds were not suffering from any disease like anemia which is the decrease number of functional erythrocytes which might be due to deficient blood formation because of poor nutrition including dietary deficiencies of iron, vitamins and amino acids. Also, packed cell volume (PCV) is an indirect way of measuring the volume of the animal's erythrocytes as a percent of the whole blood. A low haematocrit and erythrocyte count indicate the presence of anemia while a high PCV can indicate dehydration (Coles, 1986).

Red blood cells functions primarily in the oxygen and carbon dioxide transport between the tissues and the lungs. Results show that the treatments have normal functioning RBC which may be attributed to the reported large amount of iron component of Moringa oleifera (Zvinorova *et al.,* 2014). Also, Djakalia *et al.,* (2011) reported that the protein present in moringa are readily degraded and absorbed in the body as amino acid sources for the growth and maintenance of the an.

Conclusion and recommendation

The study was conducted to haematological profile of pekin duck fed different levels of *Moringa oleifera* leaf meal as soybean substitute under mixed-orchard farming system. The study was laid out in completely randomized design with three replications for the growth performance, carcass yield parameters. Results revealed that Treatment 3 (75 % MOLM) recorded the highest RBC count followed by T_4, T_1, T_2 and T_0. Although there were differences in the mean values, the RBC counts of the different treatments were within the normal range of values of RBC in ducks. The same trend as with the RBC count has been observed in the PCV values wherein all PCV means of the different treatments were within the reference or normal rate. Likewise, results from RBC count and PCV indicate that the birds were not suffering from any disease like anemia which is the decrease number of functional erythrocytes which might be due to deficient blood formation because of poor nutrition including dietary deficiencies of iron, vitamins and amino acids

For the recommendations, substituting 25% MOLM for SOM as protein source on the diet of pekin duck is recommended under mixed-orchard farming system because it had the best results on all growth and income parameters. It is also recommended that a similar study be conducted substituting fishmeal with different levels of MOLM as protein source in the diet of pekin duck and also to broiler and laying chickens. Likewise, a study on the anthelmintic property of moringa on poultry is also recommended. Result of the this study should form important reference data for the routine diagnosis and management of diseases and nutritional problems of Pekin duck in the Philippines.

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