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EGGS LAYING PERFORMANCE AND BLOOD METABOLITES OF LOMAN BROWN HEN ADMINISTERED *Mamordica balsamina* SUBTITUTING LASOTA VACCINES (NCDV) IN SEMI-ARID ZONE OF NIGERIA

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ABSRACT

The study was carried out at University Research Farm of the Department of Animal Science, Kano University of Science and Technology, Wudil, to investigate the effect of substituting Lasota vaccine (NCDV) with *Garrafuni* on eggs laying performance and blood metabolites of Loman brown hen. The birds were randomly allotted into four treatment in a completely randomized design with one hundred and twenty five (125) chicks per treatment. Treatment 1 was given lasota vaccine (NCDV) at first, third, seven and seventeen weeks respectively. Treatment 2 was given *Garafuni* 0.5g per litre for six days in the week whereas Treatment 3, 1.0g per litre and Treatment 4, 1.5g per litre of *Garafuni* for four and two days in the week respectively. At the end of the study, blood samples were collected from ten birds from each treatment for hematological and blood chemistry. The result shows that, the median laying pause days (38 days) in birds treated with 1.5 g *Garahuni*. Highest value (12.23g/dl) for haemoglobins was recorded in birds under 0g while birds under 1.0g (T3) had the lowest mean (10.76g/dl). The result of blood chemistry indicated that highest value (6.04 mmol/L) for urea was recorded among the birds under 0g while birds under 1.0g had the lowest mean (4.82 mmol/L). There were significant ($P < 0.01$) differences among the treatment means in total protein. It was concluded that *Garahuni* could substitute lasota vaccine and can be used via drinking water up to 1.0g per litre for four days without any deleterious effect on performance.

Keywords: Eggs laying, blood metabolites, loman brawn, semi-arid zone

INTRODUCTION

Poultry (domestic chickens, turkeys, ducks, geese and certain other birds) are kept throughout the World. Poultry production involves egg and eat production from egg type and broiler chickens (Kumaravel *et al.*, 2012). Poultry meat and eggs offer considerable potential for meeting human needs for dietary supply of animal protein (Folorunsho and Onibi, 2005). Egg production in laying hens is a process that takes around 24 to 27 hours (Sturkie, 1976; Akbas, *et al.*, 2002). The Lohmann Brown strain of chicken is an early maturing hybrid bird which is among the best egg producers with good quality eggs and excellent feed conversion rate (Lohmann Tierzucht, 2015). The Lohmann Brown strains are easy to manage and are adaptable to all types of production systems with laying commencing at about 18 weeks of age, producing about 300 to 320 eggs in a year (Lohmann and Tierzucht, 2015). Eggs are the major business output in commercial egg production and the higher the egg production the better will be the profit (Farooq *et al.*, 2001). The economic significance of poultry varies considerably, although poultry production in many countries has become increasingly specialized and integrated into a dynamic industry of major national and international importance (Farooq *et al.*, 2001). World production of poultry meat represented 14.38b in 2018 whereas in 2000 23.7 (FAO, 2000). This represents an expansion of over 2% since 1986. Consumption per head, amounting to a world average of 7.9 kg, an expansion of 1.2 kg since 1986, was higher in countries with a developed market economy than in those with developing economies (FAO, 2003). Important factors in the continued growth of the poultry industry in many countries are the efficiency of poultry in converting vegetable protein into animal protein. In Nigeria, Feed cost is estimated to represent over 70% of the total cost of producing poultry intensively. The feed industry in Nigeria is currently faced with acute shortage and prices of feed ingredients this is presently responsible for increases in the cost of livestock feeds.

Mamordica balsamina L. commonly known as (African cucumber), Balsam Apple (or Balsam pear) and locally called "*Garahunii*" (Among the Hausa communities), belong to the family *cucurbitaleae.* The plant is a perennial herb with soft stems and tendrils that climb up shrubs, boundary fields and fences. The green leaves are deeply palmately 5-7 lobubed about 12cm Long, margin toothed, stalked. The plant produces spindle shaped fruits (dark green when unripe and bright to deep orange when ripe). The seeds are embedded into a sweet edible and fleshy pulb testing like water melon. In Northern part of Nigeria and Republic of Niger, the leaves are cooked as part of green vegetable soup for lactating mother, where it is believed to help the mother to regenerate lost blood at the period of parturition and enriched her breast milk. Medicinal value of *Marmordica balsamina* does not stop at satisfying the hunger but rather enhances the efficiency of gastro-intestinal tract and result to high rate of feed materials absorption in the GIT that subsequently promote rapid growth and development of hen. Despite the use of this plant for such purposes, the plant has not been given due research attention in terms of its nutritional value. The major technical objectives of this study was to find out whether and at what level the test material could be used as a substitute of Lasota vaccine in the study area without any deleterious effects on performance and blood metabolites of Loman brown hen.

MATERIALS AND METHODS

Source of Experimental Birds

The experimental birds were sourced from SOVET International Company at Tarauni in Kano. Five hundred (500) healthy Lohmann Brown chicks were purchased and transported early in the morning to the experimental site.

Experimental Location and Duration of Study

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science Kano University of Science and Technology, Wudil (GPS coordinates: N11.97643°, E008.42995°) for the periods of ten (10) month.

Experimental Design and Treatment

The experiment was laid in a Completely Randomized Design, comprising four treatments with one hundred and twenty five birds (125) per treatment. The four treatments were 0, 0.5, 1.0 and 1.5g of Garahuni per litre. These doses were administered via drinking water.

Health Management

The pen was washed and disinfected thoroughly using Izal containing Saponated Cresol (Izal®, Nath Peters Hygean Ltd, India/Medreich Ltd, India) two weeks before the arrival of the experimental birds. Upon arrival of the experimental hens, they were given Multivitamins (Anupco Vitalyte Extra®, Anglian Nutrition Products Company, UK) at 0.5 mg per litre to serve as anti-stress and Oxytetracycline Hydrochloride powder (Oxywin®, Sellwell Pharmaceuticals Ltd, India) at 1 g per litre to guard against secondary bacterial infections. The drugs are in powdered form and were administered orally via drinking water during the 2-week adaptation period.

Nutrition

Experimental birds were fed using Sovet feeds at starter and grower phase. Similarly, at 22 weeks of age and 5% eggs production was attained Sovet Layer Mash® was also used, it contains 16.0 % crude protein, 5.0 % fat, 6.0 % fibre, 3.5 % calcium, 0.4 % phosphorus, and 2600 kcal/kg energy. The birds were fed *ad libitum* and supplied with clean and fresh water throughout the experimental period.

Egg Collection

Eggs laid by the experimental birds were collected between 8:00 am and 6:00 pm daily. The eggs were labeled using a marker and arranged in a plastic crate according to treatments

Haematology and serum chemistry

Blood Sample Collection

Ten (10) ml of blood sample was collected from ten birds in each treatment using sterile syringe and needle, placed in a sample bottle and then taken to Haematology Laboratory (for haematological analysis) and Chemical Pathology Laboratory (for biochemical analysis) at the Aminu Kano Teaching Hospital, Kano. The blood sample was drawn via wing vein after restraining the bird. Three (3) ml of the blood was placed in a sterile sample bottle containing Ethylene Diamine Tetracetic Acid (EDTA) for haemotological studies and the remaining 7 ml (without anticoagulant) was used for blood chemistry (serum metabolites) as described by Coles (1986).

Haematological Indices Determination

The haematological parameters measured were Haemoglobin (Hb) content using cyanmethaemoglobin method (Coles, 1986). Packed cell volume (PCV), red blood cell, white blood cell and its white cell count (leucocytes), lymphocytes and neutrophils were determined as described by Coles (1986). Mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) were calculated using the formula described by Haold and Amstutz, (1998).

$$\text{MCV (fl)} = \frac{\text{Haematocrit (\%) x 10}}{\text{RBC in millions/mm}^3}$$

Mean Corpuscular Haemoglobin (MCH) was calculated using the formula as follows

$$\text{MCH (pg)} = \frac{\text{Hb in g/100ml blood x 10}}{\text{RBC in millions/mm}^3}$$

The mean corpuscular hemoglobin concentration (MCHC) was calculated as follows.

$$\text{MCHC (g/dl)} = \frac{\text{Hb in g/100ml blood x 10}}{\text{Haematocrit}}$$

Serum Chemistry Analysis

Blood urea concentration was estimated by Nessler reaction (Tanis & Naylor, 1968). Serum total protein was estimated by the Biuret method as described by Kohen & Allen (1995). Albumin was estimated by Bromocresol Green (BCG) method (Peter *et al.,* 1982) whereas globulin concentration was determined by finding the difference between total protein and albumin. Albumin: globulin ratio was calculated by dividing albumin value by the calculated globulin value. Aspartate aminotranferase (AST), alanine aminotransferense (ALT) and alkaline phosphatase (ALP) activities were estimated using spectrophotometric method as described by Hoder and Rej (1983). Blood glucose was determined by glucose oxidase method as described by Esonu *et al.* (2001) whereas total bilirubin was determined using orbital technique as described by Stone (1954).

Statistical Analysis

Data on eggs laying performance, Kruskal-Wallis Test was used whereas blood metabolites SAS package version 2:1 (2000) was used. Where significant effects exist, mean rank differences were compared using Duncan Multiple Comparisons Test. Graphpad Instat package (Graphpad InStat®, version 3.05, 32 bit for Win 95/NT, Graphpad Software Inc., 2000) was used for the statistical analysis.

RESULTS

Laying pause days

The effect of various levels of *Garahuni* on laying pause days in Lohmann Brown hens is presented in Table 1. Median laying pause days (38 days) in birds treated with 1.5 g *Garahuni* was significantly (P<0.01; mean rank difference = -14.000; Kruskal-Wallis Statistic = 15.257) longer than median pause days (4 days) in the control birds. Also, median laying pause (38 weeks) in 1.5g *Garahuni*-treated birds was 7 days longer (P<0.01; mean rank difference = -11.000; Kruskal Wallis Statistic = 15.257) than median laying (21 weeks) pause in birds administered 1.5g *Garahuni*.

Table 1 Summary Statistics, KW Statistic and Selected Pairs Dunn's Multiple Comparisons Test for Number of Eggs Laid as influenced by levels *Mamodica balsomina* Substituting Lasota vaccine of Lohmann Brown Hens

Mamodica balsomina (g)	N	Median	Minimum	Maximum	Sum of Ranks	Mean of Ranks	Kruskal-Wallis (KW) Statistic, corrected for ties
0	3	34.0	33	35	48.0	16.000	
5	3	30.0	32	30	39.0	13.000	15.257**
1	3	32.0	31	31	21.5	11.167	
1.5	3	15.5	21	21	21.0	10.500	

Comparison	Mean Rank Difference	Level of Significance
0 g *vs*. 1.5g	14.000	**
5 g *vs*. 1.5 g	11.000	*

**P<0.001, *P<0.05

Haematological Parameters of Loman brown hen as influenced by various levels of *Garahuni* substituting lasota vaccine

Data on haematological parameters of Loman brown hen are presented in Table 2. The result showed non- significant differences among the treatments means. Haemogloblins, packed cell volume and mean corpuscular volume. Highest mean value (12.23g/dl) for haemoglobins was recorded in birds under 0g (Control) whereas birds under 1.0g (T3) had the lowest mean (10.76g/dl). There was significant (P < 0.05) difference in red blood cell in which birds under 1.0g had the highest mean ($9.98x10^6$/ul) whereas birds under 1.0g (T3 had the lowest mean ($6.70x10^6$/ul). No significant (P > 0.05) difference was observed for monocyte among the birds under different levels of inclusion even though highest mean (4.37%) was recorded in birds under 1.0g whereas birds under 0.5g had the lowest value (1.60%) as presented in Table 5.

Table 2: Heamatological Parameters of Loman brown hen as influenced by various levels *Garahuni* Substituting Lasota vaccine of Lohmann Brown Hens

	Inclusion levels of *Mamodica balsomina*					
Parameters	0g	0.5g	1.0g	1.5g	SEM	Reference Values
Hb (g/dl)	12.23	11.98	10.76	12.13	0.72	9-l5
PCV (%)	41.33	42.33	37.89	40.33	2.86	27-45
RBC ($x10^6$/ml)	7.00^b	8.33^b	7.06^b	13.56^a	0.79	11-15
MCV (fl)	84.33^{ab}	6.70^b	9.89^a	7.56^{ab}	7.54	28-40
MCHC (g/dl)	16.00	14.33	15.30	15.67	12.48	31-54
MCH (pg)	88.33^a	72.70^b	76.90^{ab}	84.69^{ab}	6.79	31-34
White blood cell (%)	17.49	18.00	18.91	19.47	1.32	8-12
Neutrophils (%)	20.13^b	20.56^b	24.54^a	23.54^a	1.02	10.-50
Lymphocytes (%)	40.82	53.55	42.10	42.69	6.21	40-75
Eesinophils (%)	7.00^a	6.00^{ab}	5.11^b	6.00^{ab}	0.67	1-15
Basophils (%)	2.50^{ab}	1.66^b	2.88^a	2.00^{ab}	0.39	0-3
Monocytes (%)	2.67	1.60	4.37	3.99	0.96	0-6

^{abcd} Means within the same rows with different superscript are significantly(P < 0.05), SEM = Standard error of mean.

Blood Serum Chemistry of Lohmann Brown Hens as Influenced by various levels *Garahuni* Substituting Lasota vaccine
Highest value (6.04 mmol/L) for urea was recorded among the birds under 0g (Control) while birds in group of 1.0g had the lowest mean (4.82 mmol/L). There were non-significant > 0.05) differences among birds under different inclusion levels of *Garahuni* with respect to urea, calcium and alanine aminotransferase. Similarly, there were significant (P < 0.05) differences among the treatment means in total protein.

Table 3: Blood Serum Chemistry of Lohmann Brown Hens as Influenced by various levels *Mamodica balsomina* Substituting Lasota vaccine

	Inclusion levels of *Mamodica balsomina*					
Parameters	0g	0.5g	1.0g	1.5g	SEM	Ref. Values
Urea (mmol/L)	5.10	5.63	4.87	6.04	0.62	3.7-9.3
Sodium (mmol/L)	129.67^a	125.33^{ab}	128.78^a	120.22^b	3.89	142-166
Potassium (mmol/L)	3.74^b	4.03^{ab}	4.27^a	4.10^{ab}	8.21	4.3-6.3
Hydrogen carbonate (mmol/L)	21.78^c	31.33^a	27.00^b	26.44^b	1.39	20-27
Chloride (mmol/L)	102.00	100.60	100.00	100.10	2.2.52	101.113
Creatinine (mmol/L)	76.66^b	54.33^c	83.22^a	69.66^b	3.62	76-174
Glucose (mmol/L)	4.62^a	3.22^b	4.16^a	4.05^a	0.29	2.4-4.5
Total cholesterol (mmol/L)	2.63	3.66	4.19	3.99	0.29	1.1-2.3
High density lipoprotein (mmol/L)	0.63^c	0.89^{bc}	1.20^{ab}	1.35^a	0.19	0.8-2.6
Triglyceride lactatedehydrogenase	0.72^b	1.55^a	1.54^a	1.61^a	0.22	0.5-2.8
Low density lipoprotein (mmol/L)	2.61	2.45	2.91	1.99	1.02	0.8-4.3
Alkaline phosphatase (u/L)	26.00^{ab}	30.33^a	24.56^{ab}	23.78^b	2.81	27-156
Alanineamintransferase (u/L)	26.55	27.00	24.67	24.22	1.75	42-110
Aspartaaminotransferase (u/L)	72.78^b	111.67^a	74.89^b	70743^b	3.79	49-123
Bilirubin: total (g/l)	5.94^a	1.37^b	6.09^a	6.44^a	0.62	4-18
Bilirubin: direct (g/l)	2.11^b	5.00^a	2.37^b	2.69^b	0.64	0-7
Total Protein (g/l)	67.11	70.00	68.22	62.33	5.06	59-78
Globulin (g/l)	40.89^a	35.00^b	28.55^b	30.33^b	1.97	2.1-2.28
Calcium (mmol/L)	2.11	2.09	2.14	2.11	0.11	0.9
Inorganic Phosphate (mmol/L)	1.29^b	1.27^b	1.72^a	1.40^b	0.07	1.70

^{abcd} Means within the same rows with different superscript are significantly(P < 0.05), SEM = Standard error of mean.

DISCUSSION

There were no much studies on the use of traditional herbs in poultry production especially in the semi-arid zone of Nigeria (Bennet, 2002). However, in the current study, Garahuni was used as a substitute of lasota vaccine on actively laying Lohmann Brown hens in order to evaluate its effect on number of eggs laid. The results obtained in this study was consistent with the findings of Liu *et al*. (2001); Bacon and Liu (2004) who reported that Chronic administration of progesterone has been shown to increase baseline concentrations of progesterone and result in arrested laying and disrupted distribution of hierarchical follicles in turkeys. High concentrations of organic substances in arrested hens might have negative feedback on the ability of the hypothalamus to secrete surges of GnRH and subsequently surges of LH, or on the ability of the pituitary to respond to surges of GnRH secretion if they occur (Liu *et al*., 2001; Bacon & Liu, 2004; Liu & Bacon, 2005). As the level of *Garahuni* is increasing eggs laying performance was drastically reduces as shown in Table 1 above, this results was supported by the findings of Alkan (2008) who reported that an increase in the dosage of exogenous had a significant effects on embryo development eggs laying and thickness of the shell. It was observed in this study that high level of *Garahuni* in laying chickens favored heamatological parameters of loman brown hens this is consistent with the report of Johnson (2002) who observed that as the level of organic substances is increasing have a significant effect on blood chemistry more importantly urea electrolytes especially within the age of 30 to 38 weeks. Similarly, the result also concur with the findings of Muhammad *et al.,* (2005) who reported that high dosage of organic substances on laying birds had detrimental effect on laying performance , liver function and may result to high level of blood pH and subsequently lead to death.

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