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The Effect of Intake of *Mansonia altissima* on the Haematology, Hormone Profile, and Serum Enzymes of Isa Brown Breeders

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ABSTRACT

An experiment was carried out in Port Harcourt to demonstrate the effect of dietary inclusion of *Mansonia altissima* on the hematology, hormone profile, and serum enzymes of laying hens and cocks, using a total of 60 birds consisting of 48 layers and 12 cocks in randomized treatment groups A, B, C, D each containing 5 birds of both sexes (4 females and 1 male). Birds in group A were used as control, while those in treatment B, C, D, were fed *M. altissima* at the rate of 30 g, 40 g, and 50 g per kilogram feed daily, respectively, for eight weeks. Results showed that *M. altissima* caused an increase in hemoglobin level, an increase in estrogen level but a decrease in testosterone level and an increase in serum glutamic oxaloacetic transaminase (SGOT) level in the treatment groups. It was therefore concluded that *M. altissima* can be used to increase weight gain and egg production but since it is seen to have a hepatotoxic effect at higher doses, its prolonged inclusion should be discouraged.

Key words: Hemoglobin, estrogen, testosterone, hepatotoxic, SGOT, hens, cocks

INTRODUCTION

The productivity of poultry can be greatly improved by studying the pathways and actions of substances that cause increased production of hormones and increased production of blood from their stem cells (hemopoiesis). Also, by monitoring the serum glutamic oxaloacetic transaminase (SGOT) level, stress can be reduced in slaughter animals and the deleterious effects of feed additives avoided in poultry production. Villee (1962) said that a hormone may affect metabolic processes in a number of ways. An increase in the number of circulatory erythrocytes will lead to increased deposition of nutrients in the cells and tissues thereby causing weight gain. Various trees, shrubs, and browses have been used in recent times to improve the productivity of chicken. Algeier *et al*. (1967) reported that *Mansonia altissima,* a West African timber tree which has been used in Ivory Coast for the treatment of leprosy, and as a stimulant and aphrodisiac in man, contains Mansonin and minute quantities of 30 other cardenolides all derived from strophanthidin, a tree which was many years later found to have growth effects on broilers and laying hens. *Mansonia altissima,* contains mansonin, a 2-3-di (0-methyl)-6-deoxy-B-D-glucopyranoside of strophanthidin. It also contains a series of haphthoquinones, one of which is mansonone E10, an optically active reagent (Wayne and Wege, 1981). Wekhe and Njoku (2000) demonstrated an increase in size of the gonads by the ingestion of pulverized *Alchornia cordifolia* by broilers. Wekhe (2000) reported that *M. altissima* has a growth promoting effect on broilers, and an enlargement of the testis and atrophy of the ovaries in the broilers. Uku (2002) reported that the response of testis to *Mansonia altissima,* by adult indigenous birds fed a diet at 10 g/kg feed and 20 g/kg feed inclusion levels, was not consistent but caused decreased egg production, fertility and hatchability. The objectives of this study were to investigate the effects of dietary inclusion of *Mansonia altissima,* in Isa Brown laying hens and cocks with respect to their haematology, SGOT, and hormone profile. Also the results of the study would provide data on haematology, SGOT, and hormone assay in chicken which at present are scarce.

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MATERIALS AND METHODS

A total of 60 birds consisting of 48 Isa-Brown layers and 12 cocks were completely randomized into four treatment groups, A, B, C, D of 15 birds each. The birds were reared in deep litter pens and the experiment lasted for 10 weeks with two weeks serving as adjustment period in the teaching and research farm of Rivers State University of Science and Technology, Port Harcourt, Nigeria.

Each treatment group was replicated thrice, each containing 5 birds of both sexes (4 females and 1 male). Birds in group A were used as control, while those in treatment B, C, D were fed *M. altissima,* at the rate of 30 g, 40 g, and 50 g per kilogram feed daily, respectively, for eight weeks. The feed used was TOP FEEDS layers mash. The exact quantity of feed consumed daily by each replicate or group was determined by weighing the left-over feed and subtracting it from the initial weighed quantity that was given. The initial weight of each bird was taken at a day-old using a mechanical table scale and subsequently the birds were weighed weekly. The final weights of the birds were taken on the last day of the experiment. Blood samples were collected at 4^{th} and 6^{th} weeks, and also at the end of the experiment, and were used for the analysis of haematological parameters and hormonal assays.

The *Mansonia altissima* barks were obtained from Nkpolu-Port Harcourt timber market. The quantity obtained was washed, sun-dried for two weeks, and ground into powder using motorized grinder at the Port Harcourt (Diobu, Mile 1) market. The pulverized *Mansonia altissima,* was weighed into required dosages of 10 g, 15 g 20 g, and 30 g for treatments 2, 3 and 4 respectively, for ease of administration, using Mettler Electro Balance Model AE 163 electronic weighing scale. The eggs laid per group were recorded and incubated using a table incubator. The data collected was subjected to statistical analysis using the analysis of variance (ANOVA) according to Steel and Torrie (1980) and where differences existed, means were compared using Duncan multiple range test (DMRT) according to statistical analysis system procedures (SAS, 1999).

RESULTS AND DISCUSSION

There were noticeable changes both in the composition of the erythrocytes and leucocytes (Table 1). There was an increase in Hb (g) % in both male and female, respectively, as observed in B (10.9, 9.1), C (11.4, 7.4), D (13.7, 8.0) at the end of the experiment, whereas at the beginning of the experiment Hb (g) % were 9.7, 6.3 for male and female, respectively (A, control). There were no marked differences in PCV and MCHC composition in B, C and D compared with A (Control). Egg production figures were: A (Control), 83 eggs; B, 126 eggs; C, 88 eggs and D, 177 eggs. Results showed that group D (50 g/kg feed) laid the highest number of eggs. However, there was a decrease in the total number of leucocytes (leucopenia) in groups C and D, respectively. From the serological examination, SGOT, testosterone, and estrogen levels showed various pictures when estimated at week 2 and week 6 of the experiment, respectively. SGOT showed an increase in group B males (6 μ/l) and group C females (15 μ/l) whereas in the Control, A, it was 2 μ/l, 3 μ/l for male, female, respectively. Testosterone level decreased from 8.0 μg/ml n group A (Control) to 5.0 μg/ml in group D which received *M. altissima* at the rate of 50 g/kg feed, whereas the estrogen level increased from 100 pg/ml in A (Control) to 105 pg/ml in B, in the 2^{nd} week, and increased further to 150 pg/ml in B, C and D, respectively in the 6^{th} week (Table 2). The increase in Hb % observed in groups B (75/62), C (78/51) and D (94/55) for males and females, respectively whereas that of group A (Control) is 66/43, suggests that *M. altissima* has anabolic effect. Similarly the increase in Hb (g) % observed suggests anabolism. The phenomenon is further strengthened by the observation that *M. altissima* caused an increase in weight of the birds of groups B, C, and D. This means that administration of *M. altissima* at dosages of 30 g/kg, 40 g/kg, and 50 g/kg feed will not cause anemia but rather erythrocytosis, which will lead to anabolism (signified by the weight gain observed in the experiment). It is an indication that *Mansonia altissima* could be useful in convalescence, chronic diseases and fattening animals for market, and combating stress as the high Ash (Mineral) content of 8.1% and Crude Protein of 7.2% support this observation (Table 4). The blood neutrophil level remained essentially the same in week 6, even at the dosage of 50 g/kg feed (D), and since it is known that their principal function is phagocytosis, as seen in large numbers in pyogenic bacterial infections, it could therefore be said that the birds did not recognize *Mansonia altissima* as an infection. There was an increase in the number of eosinophils (eosinophilia) a situation which is normally observed in an allergic or parasitic infection which means that *Mansonia altissima* was recognized as foreign. Similarly, lymphocytosis was observed and since their major function is to participate in the immune mechanisms (Smith, 1974), their presence in large numbers signifies that the birds recognized *M. altissima* as foreign, and increased the synthesis of phagocytes against it. The slight decrease observed in the level of testosterone in group D cocks is indicative of a degenerative condition of the testis, and low fertility. This corroborates the findings of Uku (2002) that birds fed a diet at 10 g/kg feed and 20 g/kg feed inclusion levels, respectively, showed low fertility and hatchability. The rise of estrogen level in the blood stream in the group D hens suggests a stimulation of ovarian activity. The rise in estrogen level was seen to be consistent in all the treatment groups, B, C, D. The level of estrogen did not vary with *M. altissima* concentration after the initial rise,

Table 1. Haematology of Isa brown breeders fed *Mansonia altissima*

Week	Treatment group	Sex	Hb (%)	Hb(g) (%)	PCV (%)	MCHC (%)	WBC (mm)	Neut (%)	Lymph (%)	Mono (%)	Eoisin (%)	Baso (%)
2	A	M	66	9.7	32	30	2700	42	50	8	–	–
		F	43	6.3	23	27	5600	44	52	4	–	–
	B	M	–	–	–	–	–	–	–	–	–	–
		F	51	7.4	26	38	5000	56	38	6	–	–
	C	M	66	9.7	32	30	3800	24	72	4	–	–
		F	47	6.8	25	27	4900	48	52	–	–	–
	D	M	–	–	–	–	–	–	–	–	–	–
		F	51	7.4	26	28	3000	40	56	4	–	–
6	A	M	66	9.7	32	30	3800	40	52	8	–	–
		F	43	6.3	23	27	6400	40	52	6	2	–
	B	M	75	10.9	34	32	3500	48	48	4	–	–
		F	62	9.1	30	30	5000	40	60	–	–	–
	C	M	78	11.4	36	32	3600	64	32	4	–	–
		F	51	7.4	26	28	3000	46	52	2	–	–
	D	M	94	13.7	42	33	2900	32	56	4	8	–
		F	55	8.0	27	30	4000	32	60	8	–	–

Table 2. Some hormone levels of Isa brown breeders fed *Mansonia altissima*

Week	Treatment group	Sex	SGOT (μ/l)	Testosterone (ng/ml)	Estrogen (pg/ml)
2	A	M	12	8	Nil
		F	6	Nil	100
	B	M	15	5	Nil
		F	3	Nil	105
	C	M	–	–	–
		F	–	–	–
	D	M	12	6	Nil
		F	3	Nil	90
6	A	M	2	6	Nil
		F	3	Nil	100
	B	M	6	8	Nil
		F	2	Nil	150
	C	M	2	8	Nil
		F	15	Nil	150
	D	M	3	5	Nil
		F	3	Nil	150

Source: Serological analysis of the Isa brown breeders used in the experiment

ostensibly due to the feed back mechanism acting via the hypothalamus (Fraser, 1974). It could then be seen that *M. altissima* stimulated hormonal production by the ovary and induced the rise in estrogen level. It also stimulated increased blood flow to this organ, all of which had a combined effect of causing increased ovarian activity (the increased egg production observed). However, in group D, testosterone level decreased to 5 μg/ml at week 6,

which may have led to reduced spermatozoa production and consequently decreased fertility because of its degenerative effect on the testis. This effect is probably responsible for the finding in this experiment that even though egg production increased significantly ($p<0.05$) at the dosage level of 50 g/kg feed, egg fertility reduced because of

Table 3. Effect of *Mansonia altissima* on weekly egg production

Week	A (0 g/kg/feed) (kg)	B (0 g/kg/feed) (kg)	C (0 g/kg/feed) (kg)	D (0 g/kg/feed) (kg)
1	7.33 ± 0.33	7.00 ± 0.57	5.00 ± 0.57	8.00 ± 0.57
2	6.00 ± 1.00	9.00 ± 0.57	6.33 ± 0.57	10.67 ± 0.67
3	3.00 ± 1.05	5.33 ± 1.33	5.00 ± 2.51	10.00 ± 1.73
4	3.67 ± 1.85	6.00 ± 1.09	6.33 ± 2.06	10.67 ± 1.76
5	4.00 ± 1.52	8.00 ± 1.15	3.67 ± 0.33	10.33 ± 2.02
6	3.67 ± 0.33	6.67 ± 0.02	3.00 ± 2.08	9.33 ± 0.33
Overall final mean	5.00 ± 1.00^{c}	7.00 ± 1.00^{b}	5.00 ± 1.00^{c}	10.00 ± 1.00^{a}

Values are mean ± SEM; $^{a, b, c}$ means along the same row with different superscripts are significantly different ($p<0.05$)

Table 4. Proximate composition (%) of pulverized bark of *Mansonia altissima*

Proximate composition	%
Moisture content	7.3
Ash	8.1
Fat	5.3
Crude protein (N × 6.25)	7.2
Total available carbohydrate	12.6
Crude fibre	59.5

Source: Department of Food Science and Technology, Rivers State University of Science and Technology, Port Harcourt, Nigeria; Ref.: Association of Analytical Chemists (AOAC, 1990)

reduction in the production of testosterone and spermatozoa. The degenerative and inhibitory effect noticed on the testis at the dosage of 50 g/kg feed suggests that *M. altissima* could contain an active principle that is toxic to the testicular tissue thereby causing degeneration with attendant reduction in function. Serum glutamic oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) are enzymes that show the functioning of the heart and liver. According to Widmann (1974) when hepatic cells are damaged, serum SGOT and SGPT levels rise. These enzymes occur early in the disease, whether damage is due to infections or toxic hepatitis. The initial rise and subsequent fall of SGOT (15 μ/l to 3 μ/l) in the blood of both male and female birds which received *M. altissima* following 6 weeks of administration suggests that *M. altissima* had an initial hepatotoxic effect which latter reduced as the birds were adjusting to the high level being administered (50/kg feed). It could be that at higher doses than those reported in this experiment, SGOT levels would show higher increases. The significance of this finding which is consistent with that reported by Widmann (1974) is that the liver of the birds can cope with perhaps moderately toxic levels of *M. altissima.* So, the toxic level of *M. altissima* that the liver can no longer cope with should be the subject of further research.

CONCLUSION AND RECOMMENDATION

M. altissima could be included in the feed to increase weight gain and increase egg production, but it is seen to have a hepatotoxic effect at higher doses, so its prolonged inclusion should be discouraged.

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