

HAEMATOCRIT, HAEMOGLOBIN, TOTAL PROTEIN AND WHOLE BLOOD
COAGULATION TIME OF THE MALLARD DUCK
(*Anas platyrhynchos*)

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SUMMARY

The study was performed on a total of one hundred and nineteen apparently healthy mallards, reared under the traditional extensive management system with the aim of establishing the base-line values of packed cell volume (PCV), haemoglobin (Hb), total protein (TP) and whole blood coagulation time (WBCT) of these birds in Funtua, North Central region of Nigeria. The overall mean values for PCV, Hb, TP and WBCT were 40.12 0.58%, 13.37 0.20g %, 6.60 0.21g/dl and 3.60 0.13 min, respectively. Although the mean values of 41.46 0.78%, 13.82 0.26g % and 3.70 0.20 min obtained for PCV, Hb and WBCT, respectively in the male were higher than the corresponding values of 39.00 0.83%, 13.00 0.28g % and 3.52 0.17 min recorded for the female, there were no significant differences ($P>0.05$) between these values. On the other hand, the mean value of 7.83 0.28g/dl obtained for TP in the female was significantly higher ($P<0.05$) than the value of 5.14 0.16g/dl obtained in the male. The correlation coefficient between PCV and TP was negative and significant ($r = -0.371$, $P<0.05$), while the relationship between the PCV and WBCT was negative and insignificant ($r = -0.119$, $P>0.05$). On the other hand, the correlation coefficient between the TP and WBCT was positive, but insignificant ($r = 0.121$, $P>0.05$). It was concluded that this study has provided for the first time the base-line values for PCV, Hb, TP and WBCT of the mallard, reared under the traditional extensive management system in Funtua, North Central region of Nigeria. It is hoped that the results obtained from this study will give insight into using blood parameters to develop efficient comprehensive herd-health management programme for prophylaxis and therapy of poultry diseases, especially those involving circulatory disturbances in this part of the country.

KEY WORDS: Blood coagulation, Mallard, Haematology

INTRODUCTION

The mallard is an important poultry species in the agricultural life of some rural people of northern Nigeria. It is predominantly kept by the rural dwellers under the traditional extensive management system as source of meat. Therefore, increase production of mallard may contribute towards improvement of human nutrition, and particularly in preventing protein malnutrition.

The mallard is naturally a wild and migratory water bird which became domesticated. The mallard is believed to be the ancestor of almost all breeds of domestic ducks (Ehrlich *et al.*,

1988). It breeds with feral domesticated ducks and also mates with other ducks, which breed throughout the temperate and sub tropical areas of North America, Europe and Asia (Peterson, 1990). It is also common in Central America and the Caribbean and has been introduced into Australia, New Zealand and Africa (Ehrlich *et al.*, 1988).

The significance of blood in humans and domestic creatures has long been appreciated. Haematological parameters, such as PCV, Hb, TP, and WBCT have been shown to be important indices of poultry health and production (Oyewale and Fajimi, 1988; Oladele *et al.*, 2005a). Packed cell volume, for example, is a

reliable indirect index of Hb and of the number of circulating erythrocytes (Benjamin, 1985); while changes in plasma TP, and especially of plasma globulins, may reflect the severity of disease processes in birds, and thus serves as basis for prognosis (Hawkey *et al.*, 1983; Oladele *et al.*, 2005b).

For many years, criteria such as colour of mucous membrane and clotting time were used to assess the health status of animals. This is because one of the most important properties of blood is its ability to coagulate or clot outside the blood vessels. Clotting is one of the most important blood defence mechanisms in animals, and is essential for wound healing; therefore, failure of blood clotting is pathologic and is found in several conditions, such as haemorrhagic and circulatory disturbances (Sullivan *et al.*, 1994).

The fact that there are rural dwellers that are interested in raising this species of birds, for meat in this part of the country makes it important for the study of the haematology of this species of bird raised in the hot tropical climate, and compare the values with what have been established in the temperate countries of the world, where the mallard is believed to originate from (Ehrlich *et al.*, 1988). This is because it has been established that environment among other factors have effect on the haematology of poultry (Hawkey *et al.*, 1983).

The knowledge of the haematology of the mallard may help in understanding its nutritional and pathological status under various conditions, and also help in developing efficient herd-health management programmes for prophylaxis and therapy of diseases of the mallard.

From available literature, this may be the first time base-line values of some haematological parameters of the mallard are established in Funtua, North Central region of Nigeria. The objective of this study was to determine the base-line values for PCV, Hb, TP and WBCT of apparently healthy mallards, reared under the traditional extensive management system. in Funtua, Katsina State, North Central region of Nigeria.

MATERIALS AND METHODS

The study was carried out in Funtua, Katsina State, located in the North Central region of Nigeria. A total of 119, 1-3 year old apparently healthy mallards, comprising 54 males and 65 females, reared under the traditional extensive management system, served as subjects of the experiment.

About four ml of blood was aseptically collected, using sterile 23-gauge hypodermic needles and syringes from the wing vein of each mallard into two sets of Bijou bottles. One set of bottles contained ethylene diaminetetra acetic acid (EDTA), while the other set of bottles had no EDTA. Blood containing EDTA was used to determine the values of PCV, Hb and TP, according to the methods of Benjamin (1985), while blood samples without EDTA were used to determine the values of WBCT, according to the procedures of Hall (1972).

All data obtained were subjected to statistical analysis, using Student's t-test and correlation analyses. Values of ($P < 0.05$) were considered significant.

RESULTS

The overall mean values for PCV, Hb, TP and WBCT were 40.12 0.58%, 13.37 0.20g %, 6.60 0.21g/dl and 3.60 0.13 min., respectively. The mean values of PCV (41.46 0.78%) and Hb (13.82 0.26g %) in the male were higher, but not significantly ($P > 0.05$) different from the corresponding values of 39.00 0.83% and 13.00 0.28g % recorded for the female. On the other hand, the mean TP value of 7.83 0.28g/dl recorded for the female was significantly higher ($P < 0.05$) than the mean value of 5.14 0.16g/dl obtained from the male (Table 1)

The minimum PCV value recorded during the experiment was 21.00%, while the maximum value for PCV was 51.00%. The minimum and maximum values for Hb were 7.00g % and 17.00g %, respectively, while the minimum and maximum time of blood coagulation

outside the blood vessels for the mallard were 1.00 minute and 8.00 minutes, respectively (Table 1).

The correlation coefficient between WBCT and PCV was negative and insignificant ($r = -0.119$, $P > 0.05$). On the other hand, the relationship between WBCT and TP was

positive, but insignificant ($r = 0.121$, $P > 0.05$). The correlation coefficients between Hb and TP, and between PCV and TP were negative, but significant, while the relationship between Hb and PCV was positive and highly significant ($r = 0.980$, $P < 0.001$) (Table II). Table III shows the values of PCV and Hb in the present and previous studies on the haematology on the mallard and other varieties of ducks.

TABLE 1: Comparative values of packed cell volume haemoglobin, total protein and whole blood coagulation time of male and female mallards (Mean SE)

	PCV (%)	Hb (g%)	TP (g/dl)	WBCT(min)
Male	41.46 0.78 ^a (n = 54)	13.82 0.26 ^a (n = 54)	5.14 0.16 ^a (n = 54)	3.70 0.20 ^a (n = 54)
Female	39.00 0.83 ^a (n = 65)	13.00 0.28 ^a (n = 65)	7.83 0.28 ^b (n = 65)	3.52 0.17 ^a (n = 65)
Overall Mean	40.12 0.58 ^a (n = 119)	13.37 0.20 ^a (n = 119)	6.60 0.21 ^a (n = 119)	3.60 0.13 ^a (n = 119)
Overall Minimum Value	21.00	7.00	3.50	1.00
Overall Maximum Value	51.00	17.00	15.00	8.00

a,b = Data along the same column with the same superscript alphabets are not statistically ($P > 0.05$) different, while data with different superscript alphabets are statistically ($P < 0.05$) different.

TABLE II: Correlation coefficients (r) between blood parameters of the mallard

Blood Parameters	r Value	P Value
WBCT versus PCV	- 0.119	$P > 0.05$
WBCT versus Hb	- 0.119	$P > 0.05$
WBCT versus TP	0.121	$P > 0.05$
Hb versus TP	- 0.373	$P < 0.05$
Hb versus PCV	0.980	$P < 0.001$
PCV versus TP	- 0.371	$P < 0.05$

$P < 0.05$ = Significant correlation
 $P > 0.05$ = Non-significant correlation

TABLE III: Values of packed cell volume and haemoglobin of the mallard and other varieties of ducks in the present and previous studies

VARIETY	PCV (%)	Hb (g %)	AUTHOR
Mallard duck	40.12 ± 0.58	13.37 ± 0.20	Present study
Domestic duck	32.70 ± 0.35	10.95 ± 1.52	Oladele <i>et al.</i> (2001)
White Pekin duck	41.38 ± 4.08	15.10 ± 1.14	Oyewale and Ajibade (1990)
Mallard and Black Dabbling duck	43.00	18.00	Bond and Gilbert (1958)
Canvasback and Redhead diving duck	37.00	18.00	Bond and Gilbert (1958)
White Pekin duck	47.00	-	Didisheim <i>et al.</i> (1959)
White Pekin duck	33.00 0.13	-	Soliman et al (1966)

DISCUSSION

The result shows that the values of PCV and Hb were higher in the male than the female mallard. This result is in line with the findings of various authors (Oyewale and Ajibade, 1990, Awotwi and Boohene, 1992; Oladele *et al.*, 2001, 2005a) that mature male birds generally have higher values of PCV and Hb than their female counterparts. The rise in these blood parameters in the male has been attributed to the hormone androgen which is believed to stimulate erythropoiesis, and thus increases the number of circulating erythrocytes and consequently, PCV and Hb values (Donkoh, 1989; Villiers and Dunn, 1998).

The overall mean PCV value obtained in the present study is lower than the value recorded by Bond and Gilbert (1958) in the mallard and black dabbling ducks, and the value recorded by Didisheim *et al.*, (1959) in White Pekin ducks reared in the temperate region of the world. However, the overall mean value for PCV obtained in this present study was higher than the value obtained by Oladele *et al.*, (2001) in the domestic duck, and the value recorded for White Pekin duck by Soliman *et al.*, (1966).

The overall mean Hb value in the present study was lower than the value recorded for mallard and black dabbling ducks, and mixed Canvasback and Redhead diving ducks by Bond and Gilbert (1958), and in White Pekin duck by Oyewale and Ajibade (1990). The variations in the values of PCV and Hb in the present and previous studies further confirm the fact that broad range of haematological values of different varieties of ducks is a frequent occurrence. Sex, age, species, environmental and seasonal factors have been attributed for the great divergence of haematological parameters of poultry (Amand, 1986; Onyeyili *et al.*, 1991; Olowookorun and Makinde, 1998).

The effect of some of these factors was demonstrated by Rodman *et al.*, (1957) who found PCV of White Pekin ducks to be 38% and 39% in the females, and 44%, 40%, 41% and 49% in four sets of males. Similarly, Bond and Gilbert (1958) reported PCV values of mallard and black dabbling duck, and mixed Canvasback and Redhead varieties to be 43% and 37%, respectively.

The variations in the values of PCV and Hb obtained in this study and those obtained in other parts of the country and beyond could also be as a result of diet and different management systems these birds were subjected to. For example, the domestic ducks that Oladele *et al.* (2001) worked on have been fully domesticated; as a result, their diets were limited to available feed in form of grains or vegetables present in their local environment. On the other hand, the mallard ducks although primarily vegetarians, also eat insects, crustaceans, mollusks, small fish, tadpoles, fresh water snails, fish eggs and small frogs (Ehrlich *et al.*, 1988; Peterson, 1990). The protein obtained from these aquatic animals could have enhanced the level of blood formation, and consequently, higher PCV and Hb values than other varieties of ducks that have been studied. The same reason may be advanced for the higher maximum values of PCV and Hb recorded in this study.

The results of the present study also show that there were higher TP values in the female than the male. The increase in TP values in the female could be attributed to physiologic role of egg production in the adult female mallards (Amand, 1986). Mitchell and MacLeod (1983) observed a rise in circulating plasma lipid and phosphoproteins in female birds during laying period.

The overall mean WBCT of 3.60 ± 0.13 min obtained in this study is higher than the values of 3.30 - 5.0 min and 1.40 - 2.20 min reported for domestic ducks and chickens, respectively (Ayo *et al.* 2002). The result of this investigation is in agreement with the findings of Byars *et al.* (1976), who demonstrated that there were variations in WBCT of different animal species.

There was no significant difference ($P > 0.05$) between the mean WBCT values of the male and female mallards. This result is also in agreement with the findings of Haymenko *et al.* (1990), Ayo *et al.* (2002), and Oladele and Samuel (2006), who observed no variation due to sex in the values of WBCT of some domestic animals and poultry species.

CONCLUSION

In conclusion, this study has provided for the first time the base-line values for PCV, Hb, TP and WBCT of the mallard, reared under the traditional extensive management system in Funtua, North Central region of Nigeria. It is hoped that the results obtained from this study will give insight into using blood parameters to develop efficient comprehensive herd-health programme for prophylaxis and therapy of poultry diseases, especially those involving circulatory disturbances in this part of the country.

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