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Original Research

Influence of Periodic Administration of Garlic Extract on Blood Parameters of Grazing Lambs

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ABSTRACT: **The study was carried out to investigate the effects of periodic administration of garlic extract drench on haematology and serum biochemistry of grazing lambs. Twelve West African dwarf sheep with an average weight of 12.00 ±0.77 kg were allotted to 3 treatment groups with 4 animals per group in a completely randomized design which lasted for 10 weeks. Treatment 1 (T1) served as control with no garlic extract, Treatment (T2) were given 5ml garlic extract weekly and Treatment T3 received 5ml garlic extract every 2 weeks. Results of haematological analysis showed that PCV significantly (P<0.05) differs among treatment groups while RBC, MCV, WBC, LYM and GRA all show no significant (P>0.05) difference. The lowest PCV of 19.68% was observed in T1 while T2 recorded the highest PCV of 29.68%. The results from serum biochemical indices shows that cholesterol and ALT differ significantly (P<0.05) among treatment groups while total protein, albumin, globulin, glucose, urea and AST all show no significant (P>0.05) difference among treatment means. The lowest serum cholesterol value of 0.78 was observed in T2 while the control group recorded the highest value of 1.30. The study suggests that garlic extract could be used to reduce the level of serum cholesterol in grazing lamb thereby improving meat quality.**

KEYWORDS: Garlic Extract, West African Dwarf Sheep, Haematology, Biochemistry.

INTRODUCTION

The contribution of the livestock industry to the Gross Domestic Product in countries like Nigeria witnessed a drastic fall from 19% in 1983 to 6% in 2004 as reported by the apex Bank. The situation in Nigeria manifests low level of development of the livestock industry in developing countries (CBN, 2007).

The production of small ruminants play important role in the development of livestock subsector of the Nigerian agricultural economy (Lakpini *et al*., 2002). Sheep is an important livestock species in the socio-economic lives of people around the world including Nigerians (Yakubu and Ibrahim, 2011). Sheep has the advantage of being able to survive on grasses without any supplement and do not compete for grains and concentrate protein feeds with human beings like monogastric animals (Johnston, 1983). The most common breed of Sheep found in the humid zone of Nigeria is the West African Dwarf (WAD) because of its resistance to trypanosomiasis which is prevalent in the zone. It is therefore an important source of animal protein to the people (Jahnke, 1982).

Even though sheep plays an important role in the supply of Animal protein, consumers generally reject sheep meat due

to its high fat content (Nielson, 2001). The rejection of fatty meat is because consumers are increasingly becoming aware of the need to reduce fat intake which could lower the risk for cardiovascular heart disease by 10% (Latta, 1990; Chilliard *et al.*, 2001). Consumption of saturated fatty acids has been associated with increased serum cholesterol concentrations which is a risk factor for coronary heart disease (Keys, 1970). The level of plasma lipids and lipoprotein determines the extent of adipose tissue deposition which affects fat composition of meat (Lewington *et al.,* 2007).

Garlic is a natural antioxidant that has the capability to decrease plasma cholesterol, esterified cholesterol, high density lipoprotein cholesterol and low density lipoprotein as observed by of Kumar *et al.* (2000).Ogunbajo *et al.* (2009) suggested that nutritional studies should not be limited to performance alone, but the effect on the blood constituents is also vital tools that help to detect any deviation from normal in the animal's body. However, there is lack of convincing information on quantity and interval of supplementing garlic on blood parameters of grazing Lambs. It is against this background that this study was conducted to evaluate the effect of periodic garlic extract drench on haematological indices and biochemical parameters of grazing lambs.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Teaching and Research farm, Animal Production Department, Faculty of Agriculture, University of Ilorin, Kwara State of Nigeria. It is located on latitude 82^0 9' N, and longitude 43^0 5' E, with a relief of about 305m above sea level. The average annual rainfall is about 1234.4mm and the mean annual temperature is 27^0c (Olofintoye and Salami, 2011).

Preparation of garlic extract

About 200g of dried garlic cloves are soaked overnight in 200ml of distilled water to allow easy removal of cuticles and extraction of the juice. The cloves still immersed in water are pounded until they are completely mushy. The crushed material is left to stand for 2 hours and later filtered. The garlic juice is used as soon as possible because the active compound Allicin is prone to rapid decomposition. The garlic juice is then diluted in water at the ratio of 8:2 making a concentration of 80% according to Masamha *et al.* 2010.

Experimental animal management and design

Twelve (12) West Africa dwarf lambs with an average body weight of 12.00 ±0.77 were randomly divided into Three (3) groups of four (4) animals per group in a Completely Randomized Design (CRD). Treatment 1 (T1) is the control group with no garlic extract drench, Treatment 2 (T2) were given 5 ml garlic extract weekly and treatment 3 (T3) received 5ml garlic extract every 2 weeks. The lambs were allowed to graze naturally every day with no supplementation and given access to fresh drinking water ad-libitum. Animals were treated against ecto and endo-parasites before the commencement of the experiment. Lambs were tagged, weighed weekly with a hanging scale and a sack before going out for grazing. The experiment lasted for 12 weeks.

Blood samples collection and analysis

Blood samples were collected from each animal at the last day of the study before terminating the experiment. Blood samples were collected by jugular-vein puncture of each animal using disposable syringes and sterile needles (18 gauge inches). Prior to feeding in the morning, bleeding was done and an average of 10ml of blood was collected from each animal. The blood samples were placed in two different containers. One is containing ethylene diamine tetra-acetic acid (EDTA) for haematological studies as described by Al-Eissa and Alkahtani (2011). While the second universal bottles without anticoagulant were used to collect the remaining blood sample and allowed to stand for about 2 hours at room temperature. The universal bottles were thereafter centrifuged at 700xg for 15 minutes, the serum separated were decanted and stored in a freezer at -10°C for blood biochemical parameters test as reported by Gambo *et al.* (2011).

Statistical Analysis

Data obtained were subjected to one way analysis of variance (ANOVA) using SPSS (2007) and Significant difference between treatments means were separated using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Haematological Indices

The haematological parameters of West African Dwarf Sheep given garlic extract drench are presented in Table 1. The values of Packed Cell Volume (PCV) differ significantly (P<0.05) between the treatment groups and the control. The control group (T1) which have the lowest value of 19.68% while T2 which received weekly garlic extract drench recorded the highest value of 29.68%. The PCV obtained in the study falls within the normal range of PCV for healthy sheep (27 – 45%) as reported by Jain. (1993). Packed Cell Volume is important in the diagnosis of anaemia (Chineke *et al.,* 2006). The higher PCV values obtained in this study might likely be a sign of healthier sheep. The values of Haemoglobin, Red blood cell count, mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV), white

Table 1: Effect of garlic extracts on haematological Indices of West African sheep

Parameter	T1	T2	T3	S.E.M
PCV (%)	19.68[a]	29.68[b]	25.90[b]	1.523*
HGB (g/L)	9.93	9.95	9.95	0.116
RBC (x10^{12}/L)	9.33	8.95	8.48	0.172
MCH (pg)	24.19	19.05	22.01	1.640
MCV (fL)	46.69	50.48	48.10	0.879
WBC (x10^9/L)	11.73	11.83	6.04	1.651
Lymphocytes (%)	54.05	40.39	43.29	3.191
Granulocytes (%)	6.55	12.58	8.66	2.041

Means without letters are not significantly different (P>0.05) while those with different letters (a, b, c) are significantly different (P<0.05).

blood cell count (WBC), lymphocytes and granulocytes all show no significant difference (P>0.05) among treatment groups. The results of Haemoglobin obtained in this study are 9.93, 9.95 and 9.95 for T1, T2 and T3 respectively which fall within the normal range (8 – 16g/d*l*) of haemoglobin for healthy sheep (Greenwood, 1977). The Red blood cell count obtained for T1, T2 and T3 are 9.33, 8.95 and 8.48 respectively. These values are in line with RBC values for lamb (4.44 – 8.69 g/dl) reported by Njidda *et al.* (2014).The values of mean corpuscular haemoglobin obtained in the study are 24.19 for T1, 19.05 for T2 and 22.01 for T3 as shown in Table 1. The results of MCH obtained in T1 and T3 which are 24.19 and 22.01 respectively slightly higher than the values for lamb (12-20 pg) as reported by Njidda *et al.* (2014). MCV values obtained for T1, T2 and T3 are 46.69, 50.48 and 48.10 respectively which are also higher than the normal physiological MCV range for sheep (35.3 – 43.7f*l*) reported by Borjesson *et al.* (2000). The higher MCH and MCV values may be due to age and sex (Egbe Nwiyi, 2000). Red blood cell indices provide information about the haemoglobin content and size of red blood cells. Abnormal values indicate the presence of anaemia and which type of anaemia it is (Gernsten, 2009). The values of MCV and MCH are very important in the diagnosis of anemia and also serve a useful index of the capacity of the bone marrow to produce red blood cells (Awodi *et al.*, 2005). The lowest White blood cell count was of 6.04 observed in T3 while T2 recorded the highest value of 11.83. The control group maintained an intermediate value of 11.73. These values of WBC are in accordance with the normal range (6.93 – 12.66 x 10^9/L) of White blood cell as observed by Fadiyimu *et al.* (2010). A high white blood cell count could be caused by infection, immune system disorders or stress while a low number of WBCs may be due to bone marrow deficiency or failure,

disease of the liver or spleen, radiation therapy or exposure (Bagby, 2007). The white blood cell differentials (lymphocytes and granulocytes) are comparable within treatment groups. The lymphocytes ranges from 40.9 in T2, 43.29 in T3 and the control group T1 recorded the highest value of 54.05 (Table 1). These fall within the ranges reported by RAR (2009) of 40-70 (%) for sheep. The major functions of the white blood cell and its differentials are to fight infections, defend the body by phagocytocis against invasion by foreign organisms and to produce or at least transport and distribute antibodies in immune response. Thus, animals with low white blood cells are exposed to high risk of disease infection, while those with high counts are capable of generating antibodies in the process of phagocytocis and have high degree of resistance to diseases (Soetan *et al.*, 2013).

Biochemical Indices

The table below shows the various serum biochemical parameters observed in the study. Serum cholesterol and ALT(Alanine Aminotransferase) shows significant (P<0.05) difference between the treatment group and the control while total protein, albumin, globulin, glucose, urea and AST((Aspartate Aminotransferase) were not influenced (P>0.05) by administration of garlic extract. The lowest serum cholesterol value of 0.78 was observed in T2, the intermediate in T3 (1.13) while the control group recorded the highest value of 1.30. The reduction in serum cholesterol suggests the ability of garlic to lower some of the risk factors associated with the development of cardiovascular diseases in animals. (Ademola *et al.*, 2009). The values of cholesterol obtained in the study are in line with the normal range (1.33 – 1.95mmol/*l*) reported for healthy sheep (Cox-Anser *et al.*, 1994). Total protein values ranges from 53.20 in T1, 53.20 in

Table 2: Effect of garlic extracts on biochemical Indices of West African sheep

Parameter	T1	T2	T3	S.E.M
Total Protein (g/L)	53.20	53.63	56.20	1.061
Albumin (g/L)	19.80	18.25	20.33	0.821
Cholesterol (Mmol/L)	1.30[b]	0.78[a]	1.13[ab]	0.087*
Globulin (g/L)	33.68	34.20	34.48	0.570
Glucose (Mmol/L)	4.93	5.03	5.15	0.113
Urea (mg/dl)	2.37	2.84	2.51	0.154
ALT (µ/L)	13.28[b]	7.26[ab]	3.72[a]	1.824*
AST (µ/L)	9.57	11.28	9.68	1.275

Means without letters are not significantly different (P>0.05) while those with different letters (a, b, c) are significantly different (P<0.05). AST=Aspartate Aminotransferase; ALT= Alanine Aminotransferase

T3, and 53.63 in T2 (Table 2). These results are slightly lower than the physiological range of total protein (60 – 93g/*l*) values for sheep (Borjesson *et al.,* 2000). The lower values may be due to breed differences. Collectively, serum total protein including albumen is mainly involved in: the maintenance of normal water distribution between tissue and the blood, responsible for maintaining the pressure of plasma and is used to transport many substances including macromolecules (Rastogi, 2008). Results of Serum Albumin are also comparable among treatment means with 18.25, 19.80 and 20.33 observed in T2, T1 and T3 respectively. Milne and Scott (2006) have reported a normal physiological range of 30 – 38g/*l* for albumin content in sheep which is relatively higher than the one observed in the study. Albumen also helps to carry some medicines and other substances through the blood and is important for tissue growth and healing (WebMD, 2009). The lowest globulin value of 33.68 was obtained in T1 while the highest value of 34.48 was observed in T3 which agrees with the normal globulin content of sheep (30-60 g/L) according to Njidda *et al.* (2014). Rastogi (2008) has also reported that globulins carry the lipid fraction of proteins and contain antibodies for generating immune response. The values of the blood glucose as shown in table 2 are 4.93, 5.03 and 5.15 for T1, T2, and T3 respectively. These values are slightly higher than those obtained by Njidda *et al.* (2014) who reported 2.0-3.0 (mMol/L). When glucose is lower than the normal range is an indication of hypoglycemia while very high levels are indication of hyperglycemia (Olorunnisomo, 2012). Urea values obtained in the study shows that T2 has the highest value of 2.84 while T1 recorded the lowest value of 2.37.

The urea value obtained was below the normal range of 8 to 20 (mg/dl) as reported by Baneejee (2007). The decrease in the blood urea concentration of the sheep may be due to the low protein intake because animals are under grazing without supplement. Kaur and Arora (1995) observed that low blood urea are related to low dietary intake of protein which results in the recycling of urea from blood back to the rumen. Blood urea is used as a diagnostic tool to analyse biological to protein or energy supplementation, change in pasture or forage on offer, or change in pasture management (Hammond, 2006). ALT values observed in the experiment differ significantly (P<0.05) between the treatment and the control with T1 having the highest value of 13.23 while T2 and T3 have 7.26 and 3.72 respectively. AST shows no significant difference among treatment means with values of T1, T2 and T3 as 9.57, 11.28 and 9.68 respectively. The normal ranges of AST and ALT for healthy sheep as reported by Njidda *et al.* (2014) are 20-50 and 8-50 (iu/L) respectively. The AST fall within the normal range while ALT is below the normal range. AST value in the blood can be high under disease and morbid conditions involving injuries (Ikhimioya and Imasuen, 2007).

Conclusion

The administration of garlic extract drench in grazing lamb has decreased serum cholesterol level which can help in reducing the deposition of fat in mutton thereby improving meat quality. Weekly drenching has been observed to have more effect in reducing serum cholesterol than bi-weekly. It has also lead to an increased packed cell volume which is an indication of improved health of the animals without any obvious adverse effect.

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