SOME-BIOCHEMICAL INDICES OF RABBITS RAISED IN THE UNIBEN ENVIRONMENT

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Wisdom Onoriode UGBODAGA

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DEPARTMENT OF ANIMAL SCIENCE

FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF ANIMAL SCIENCE, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN, BENIN CITY, NIGERIA

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ABSTRACT

The levels of serum biochemical indices have a direct association with the status and performance of animals at every given stage of its life. The current study was carried out in the University of teaching and research farm, Benin City to evaluate the relationship between some breed of rabbit, some biochemical parameters and weight of kits. The experimental animals were Dutch and NewZealand white rabbits. The design used for the experiment was Completely Randomized Design. Biochemical parameters measured where body weight of kits ALP, ALT and AST levels. The data collected were subjected to one way statistical analysis of variance. The results showed that ALP, ALT and AST levels were significantly affected ($P<0.05$) by breeds of rabbits. Dutch does had higher values for ALP (20U/L), ALT (17U/L) and AST (12.5U/L) compared to NewZealand does which recorded lowest for ALP (15U/L), ALT (5U/L) and AST (6U/L). All measured biochemical parameters of Dutch and NewZealand does had no significant effect ($P>0.05$) on body weight of kits. Body weight of NewZealand kits were numerically but not statistically higher than Dutch kits. The results showed that NewZealand kits recorded highest for body weight at week 6 (551.67), week 7 (576.67), week 8 (604.00), week 9 (631.67) and week 10 (641.67) compared to Dutch kits which recorded lowest for body weight at 6th (506.67), 7th (548.00), 8th (575.00), 9th (595.83 + 30.25) and 10th week (635.33) respectively. It was obtain from this study that the breed of an animal can significantly affect the levels of some biochemical parameters such as ALP, ALT and AST. Recommended as a result of this study is that NewZealand rabbits should be the genotype of choice for broiler rabbit production and the nee for more needed attention to be paid to the biochemical indices in animals.

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CERTIFICATION

This is to certify that this project work was carried out by Wisdom Onoriode Ugbodaga , Department of Animal Science, Faculty of Agriculture, University of Benin, Benin City, Nigeria, under the supervision of Professor A. M. Orheruata and co-supervision of Mr. Paul Aduba.

_____ _____

Professor A. M. Orheruata Date

(Supervisor)

_____ _____

Mr. Paul Aduba Date

(Co-supervisor)

_____ _____

Prof. J. M Omoyakhi Date

(Head of Department)

DEDICATION

This work is dedicated to my family for their overwhelming love and support throughout the course of my study in the University of Benin and to God Almighty for His loving Kindness that have seen me through these years of study.

ABSTRACT

The current study was carried out to evaluate the relationship between some breed of rabbit, some biochemical parameters and weight of kits. The experimental animals were Dutch and NewZealand white rabbits. The design used for the experiment was Completely Randomized Design. Biochemical parameters measured where body weight of kits ALP, ALT and AST levels. The data collected were subjected to one way statistical analysis of variance. The results showed that ALP, ALT and AST levels were significantly affected ($P<0.05$) by breeds of rabbits. Dutch does had higher values for ALP, ALT and AST compared to NewZealand does. All measured biochemical parameters of Dutch and NewZealand does had no significant effect ($P>0.05$) on body weight of kits. Body weight of NewZealand kits were numerically but not statistically higher than Dutch kits.

CHAPTER ONE

1.0 Introduction

Population growth in the developed countries is stabilizing while that of developing countries including Nigeria is still increasing rapidly (Mailafia *et al.,* 2010). This calls for increasing the production of livestock to meet the protein demand of the populace. In recent years there has been increased awareness of the advantages of rabbit meat production in Nigeria as a means to alleviate food shortages (Baruwa, 2014).

Production of rabbit is of great economic importance in livestock industry and its profitability solely depend on the performance of the rabbit stocks. Rabbit production for meat is an important livestock activity in many countries (Shewita *et al.,* 2012). Rabbits are characterized by small body size, short gestation period, high reproductive potential, rapid growth rate, genetic diversity, and their ability to utilize forages (Mailafia *et al*., 2010).

Biochemical indices plays significant role in animal performance. Some functions of biochemical indices in animal body includes: coagulation of blood, maintaining osmotic pressure, regulation of acid base balance, as reserved protein and antibodies (e.g albumin and globulin). Biochemical indices are also involved in catalyzing certain biochemical reactions in the body of man and animals according to Tasha (2014). Example of such reaction is the conversion of alanine to pyruvate where alanine aminotransferase (ALT) act as the catalyst. ALT enzyme catalyzes the transfer of amino groups from L-alanine to α-ketoglutarate, and the converted products are L-glutamate and pyruvate in the liver, which is a critical process of the tricarboxylic

acid (TCA) cycle (Zhengtao *et al.,* 2014). Alkaline phosphate is an enzyme which helps to break down protein in the body in different form (Aladin, 2017).

Although the importance of biochemical indices in rabbit performance cannot be overemphasized, literature reports established relationship between biochemical indices and animal performance are scanty. This research therefore aim at determining the role of feed intake and some biochemical indices in rabbit performance.

1.1 Statement of the Problem

Nigeria like many other developing country is faced with worsening situation of inadequate protein consumption (Adekunmi *et al.,* 2017). The increasing need to reduce protein deficiency has resulted to the establishment of various sector of the livestock industry of which rabbit production is a major segment. Despite the potential of livestock production in increasing household income and nutrition, its productivity is still low. And as noted by Abel *et al*. (2015), production of animals such as rabbits has not meet their full potential in Nigeria. This is due to the poor awareness of animal nutrition and biochemical indices among other factors. Challenges regarding rabbit farming still exist (Abe*l et al*., 2015). Sejian (2012) and Hangu *et al. (*2013) has shown that rabbit producers are faced with problems such as high mortality, miscarriages, low income from rabbit sales arising from poor growth and pest and diseases. Biochemical indices also play important role in determining the health performance of animals. High value of some biological parameters such as Aspartate Transaminase (AST), Alkaline Phosphate (ALP), Alanine Transaminase (ALT) and Albumin (ALB) has health implication which may affect animal performance. Abnormal levels of ALP in blood most often indicate malnutrition, kidney

cancer tumors, intestinal issues, a pancreas problem, or a serious infection (Ellen, 2019). There are very low awareness of the correlation between biochemical indices and animal performance by many farmers. Against this backdrop this study was carried out to investigate the impact of biochemical indices in animal (rabbit) performance.

1.2 Objectives of the study

The broad objective of the study is to evaluate the role of biochemical indices in the performance of rabbits.

The specific objectives are to determine:

1. Body weight rabbit does.
2. Body weight of the rabbit kits.
3. Some biochemical indices of the rabbits.

1.3 Justification of the Study

The purpose of this study is to examine the activities of some biochemical parameters in rabbits as it relate to performance. While different literatures has reported on the activities of some biological parameters in human and animals, there are little knowledge on it relationship with rabbits performance. As population increases progressively, there is a mandatory need to increase livestock production as a means of improving animal protein (Mailafia *et al.*, 2010). Rabbit production is one segment of the livestock industry that can help in achieving this goal due to its fast production cycle. Many studies have justified rabbit production as a desirable and profitable venture (Okojie *et al.,* 2004). It is very obvious that good health of the animal is

needed to achieve this goal. Results from biochemical analysis may be useful in determining the health status of animal as a means of preventing against poor performance and improving productivity. Therefore result from this study will provide useful information that can help in improving rabbit production.

CHAPTER TWO

LITERAURE REVIEW

2.1 A Review on Rabbit Production and Performance in Nigeria

Rabbit's production in Nigeria plays a significant role in the development and provision of food and materials for marketing purposes (Salihu *et al.,* 2020). Rabbit is micro – livestock producing about 47kg of meat per doe per year which enough to solely meat the animal protein requirement of medium sized family under small scale rural farming system (Adedeji *et al*., 2012). Baruwa (2014), also posited that rabbit production has gain recognition for having the significant potential of improving food security in Nigeria. Advantages of growing rabbits includes: high fertility rate, rapid rate of growth; high feed efficiency and early marketing age and high muscle-bone ratio (Shewita *et al.,* 2012).

Socio-economic characteristics of the rabbit's farmers consist of the distribution of farmers in age, gender, marital status, stock size and other characteristics. The distribution of rabbits farmers by occupation which was prove to be 33% of all farmers are government employees (civil servants, teachers, etc) while 39% and 28%represent private sector(artisans, business man, farmers, etc) and others (student, retirees, etc) respectively (Salihu *et al.,* 2020). This trend shows that those engaged in rabbit farming cut across all professions and walks of life in the society (Oseni *et al.,* 2008).

Also the distribution of rabbit farmers by person(s) in charge of the units by purpose for keeping rabbits is a significant proportion of the farmer, (60%) indicated that the primary reasons for keeping rabbits was for consumption with occasional sales of excess stocks according to Salihu

et al., 2020. this implies that rabbit keeping serves the primary goal of providing supplemental protein for the household. The management of rabbit is done on a small- scale by a peasant farmer is raised for many different uses, and they can play an important role in a small sustainable family operation. While the most common use in agricultural industries is for meat, rabbit also is raised for pelts, manure, show, and laboratory use.

Rabbit meat is high in protein. Samkol *et al.* (2008) reported that rabbit meat is high in protein and low in fat, calories, and cholesterol when compared to most of the meat consumed. Rabbit meat is cheap in terms production compared to beef, chicken and frozen fish (Abel *et al.,* 2015). Rabbits are prolific and will breed year-round in well managed Rabbitries. Does have been known to kindle (give birth) up to 23 kits at one time according to (Salihu *et al.,* 2020). With proper management, rabbits can be kindled more intensively. Rabbit are ready for market at four to five pounds. It usually takes eight weeks to reach this weight with proper care and feeding.

Rabbits have an efficient feed conversion ratio - the amount of feed consumed per pound of body weight gain. A doe can produce up to 10 times its own weight, or more in offspring per year according to Salihu *et al.,* 2020. Rabbit meat is one of the most nutritious meats available. It is the high in protein, low in fat and cholesterol. The meat is recognized has having high dietetic qualities, making rabbit production an attractive option for worldwide diversification of meat supply (Mcnitt *et al*., 2013)

2.2 Biochemical Indices and Animal performance

Biochemical profiles are being extensively used in veterinary medicine not only for individual Blood clinical evaluation, but also to assess animals populations, because when properly

interpreted these figures provide important information about animal's clinical status, nutritional balance, deficits situation, treatment evaluation and prognosis (Sharon *et al.,* 2015). Biochemical indices plays significant roles in animal performance. Some functions of biochemical indices in animal body includes: coagulation of blood, maintaining osmotic pressure, regulation of acid base balance, as reserved protein and antibodies (e.g albumin and globulin). Biochemical indices are also involved in catalyzing certain biochemical reactions in the body of man and animals according to Tasha (2014). Example of such reaction is the conversion of alanine to pyruvate where alanine aminotransferase (ALT) act as the catalyst. Biochemical parameters has standard normal levels depending on the parameter of concern. Values higher or lower than the normal range is an implication of medical concern. Tasha (2016) posited that an abnormal level of biological parameters indicate disease condition such as hepatitis, acute renal failure, cirrhosis of liver, heart attack, muscle injury inflammation of the pancreas and many more.

Recent research has established a relationship between biochemical indices and animal performance. Research conducted by Ghanem (2016), suggest that biochemical parameters had significant effects on animal performance such as growth and body conformation. Odetola *et al.* (2018) and several other literatures also had similar finding. *Sallam et al.* (2020) reported decreased in weight of New Zealand White and Baladi rabbits as the level of biochemical parameters such as alkaline phosphate (ALP), aspartate aminotransferase (AST), alanine aminotransferase (ALT) and serum protein increases although mortality was not affected significantly.

High or low levels of biochemical parameters has some health implications in animals. For example celiac disease, scurvy and hypoproteinemia are accompanied by low levels of some biochemical parameters such has alkaline phosphate (ALP) and serum proteins (albumin and globulin). While disease conditions like rickets, bone tumors, liver cirrhosis, hepatitis and cardiovascular disease are accompanied by high levels of biochemical parameters like alkaline phosphate, albumin, globulin, glucose, aspartate aminotransferase and alanine aminotransferase. It is very obvious that animal health has significant impact on their performance. Research by Dena Jones (2018) suggest that the health of farm animal affects their productivity as well as safety and product of the animals. The variation in the performance of animals with high or low levels of biochemical parameters may be due to the health implication posed by the varied levels of biochemical parameters.

2.2.1 Usefulness of the Aminotransferases (Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST)

Transaminase enzymes, alanine aminotransferase (ALT) and aspartate aminotransferase (AST) catalyzes the conversion of the amino acid alanine and aspartate to pyruvate and oxaloacetate, respectively (Bestol, 2010). They are normally referred to as the aminotransferases. AST and ALT are commonly measured to detect liver injury; however, both enzymes are present in high concentrations in liver and several other tissues. AST activity is higher in kidney, heart, and skeletal muscle than liver, whereas ALT activity is highest in liver (Sharon, 2015). According Thrall (2007), ALT is a specific liver enzyme for animals, therefore, between liver function tests it is considered the most common and best for liver damage detection. ALT serum increased activity indicates a cell damage (Bestol, 2010).

In regard to animal performance, some literatures has reported on the influence of AST and ALT. AST and ALT elevated above normal level according to Medilab, (2019), has being found to indicate some disease conditions such as toric hepatitis, liver cirrhosis, inflammation of the pancreas, acute renal failure and loss of kidney functions. Research conducted by Mohamed *et al.* (2019) suggest that animals with high level of ALT and AST had slow growth performance than their counterpart. Low level of ALT and AST is also a medical concern and may be due to malnutrition, starvation and some other disease conditions.

While ALT is common with the liver, AST is also found in red blood cells, kidney cells and pancreas, and in smaller quantities, in cardiac and skeletal muscle cells. Increase in AST and ALT activity indicates severe damage to hepatocytes, with degeneration or necrosis (Bestol, 2010).

2.2.2 Usefulness of Alkaline Phosphate

Alkaline phosphatase (ALP) is a homodimeric protein enzyme of 86 kilodaltons (Wikipedia, 2021). Several literatures has shown that ALP has the physiological role of dephosphorylating compounds (Shipman *et al*., 2013). Alkaline phosphate is an enzyme which helps to break down protein in the body in different form depending on where it originate (Aladin, 2017). The normal range of alkaline phosphate in the blood is 40-125 U/L, (Aladin, 2017). Due to its widespread prevalence in these areas, its concentration in the bloodstream is used by diagnosticians as a biomarker in helping determine diagnoses such as hepatitis or osteomalacia (Dhruv *et al.,* 2017).

Ghanem, (2016) and Odetola *et al*., (2018) reported that animals with increased level of alkaline phosphate had poor growth response and body conformation compared to those with normal

levels. Research conducted by *Sallam et al.* (2020) also indicated that New Zealand White and Baladi rabbits with high level of alkaline phosphate showed lower weight. Decreased level of alkaline phosphate is also detrimental to both man and animals as it is associated with certain disease like celiac disease and scurvy according to Aladdin (2017) which can affects animal performance significantly.

The level of alkaline phosphatase in the blood is checked through the ALP test, which is often part of routine blood tests. The levels of this enzyme in the blood depend on factors such as age, sex, or blood type (Dhruv *et al.,* 2017).

It is believed that blood levels of alkaline phosphatase also increase during pregnancy as result of additional alkaline phosphatase produced by the placenta (Shipman *et al*., 2013). Additionally, abnormal levels of alkaline phosphatase in the blood could indicate issues relating to the liver, gall bladder or bones. Kidney tumors and infections as well as malnutrition have also shown abnormal level of alkaline phosphatase in blood (Healthline, 2017).

2.3 Effect of Feed Intake on Biochemical Indices

Nutrition plays a major role in animal metabolism. The type of feed and method used in feeding animals affect every performance of the animals from production, reproduction and health to the physical wellbeing of the animals. Several metabolic reactions in the body also need feed to function. For example glycolysis requires diet containing glucose to take place. Muhamed *et al.* (2016) earlier noted that nutrition among other factors had significant effect on small ruminant metabolism.

Several literatures has reported on the effect of feed intake on biochemical indices. Report from Washaya., *et al.* (2019) showed that feeding *Lablab purpureus* and *Vigna unguiculata* to goat had significant effect on albumin (ALB) and Alanine phosphate (ALP) at 95% confident level although there was no significant effect on Alanine Aminotranfserase (ALT) and Aspatate Aminotransferase (AST). It is evident that protein based diet can increased the level of globulin and alanine since both belong to the family of globular protein. Elamin *et al.* (2011) on the effect of different feed on performance and some blood constituent of local rabbits reported that albumin level varied significantly ($p<0.05$) between rabbits fed C. *ternatea* and Barseem. Data obtained by Shewita *et al.* (2012) indicated that blood serum total protein, albumin and globulin concentration of rabbits decreased significantly with increased level of allicin. It is therefore believed that different type of feed can affect the level of biochemical indices although may not posed harmful consequences according to Veronica *et al.* (2003)

2.4 Effect of Feed Intake on Performance of Different Breeds of Rabbit

Nutrition is the most important factor in livestock production and the growth and profitability of livestock depends on what and how the animals are fed in most cases. The causes of weight loss, mortality and miscarriage has been linked with some nutritional and managerial implications by several literatures. Sobri *et al.,* (2019) reported that post weaning rabbit fed with fibre rich diet recorded less mortality compare those fed with less fibres. Maringa (2013), also reported a positive correlation between feed nutrient and weight gain. Other literatures such as Rosell *et al.* (2016), and Abeer *et al*., 2011 also established that nutrition and management had significant

effect on rabbit performance. Although post- weaning feed intake limitation strategy in rabbit are now frequently employed in rabbit breeding system to reduce the incidence of post-weaning digestive trouble and improve feed efficiency (Thierry *et al.,* 2012). This therefore suggest that feed intake can significantly affect livestock performance.

2.4.1 Effect of Feed Intake on New Zealand Rabbits

New Zealand white rabbit is one of the most important breed of commercial and experimental rabbits in the world (jiali *et al.,* 2020). Several literature reports has shown significant effect of feed intake on New Zealand rabbits. A study conducted by Amin et al. (2019), showed that weight gain and feed intake increased significantly when leuceana leaf meal was added to the diet fed to New Zealand white male rabbits. Amin et al., 2019 suggested that the reason for increased feed intake was due to the palatable nature of leuceana leaf to rabbits. Providing high quantity and quality meal to New Zealand white rabbits will increase their performance, although Maria *et al.* (2012) reported that feed restriction or manipulation does not really have adverse effect on grower's rabbit. Amin *et al*. (2019) reported 4.60 ± 0.55 for feed conversion ratio which corresponded with that reported by Statria (2008) with values ranging from 3.63 to 5.63. Report from Rizqiani (2011) showed that daily weight gain of New Zealand white rabbit was 17. 60g/day mean while Amin *et al.* (2019) recorded values ranging from 10.56 to 20.20 g/day.

2.4.2 Effect of Feed Intake on Dutch Rabbits

Dutch rabbits are light breed of rabbits with an average body weight of 1.6-2.5kg (Akpobasa, 2013). The coat fur is short with a characteristic white with black, blue or brown, chocolate steel. They are well furred with clear bright eyes free form spot and discoloration in the iris. As with

other breeds of rabbit, Dutch rabbits also respond to the effect feed intake. Results from Prebble et al. (2015) showed that Dutch rabbits fed hay diet where more active than those fed with muesli only. The higher activity levels and absence of abnormal behavior when hay was fed support recommendation that forage should form a significant portion of diet for domestic rabbits (Prebble *et al.,* 2015). Akpobasa 2013 posited that feed manipulation (restriction) can account for compensatory growth in growers Dutch rabbits even though it may result to weight loss.

2.4.3 Effect of Feed Intake on Hyla Rabbits

Hyla rabbit is a genetically modified broiler rabbit bred to have fast growth and reach a table size within 3 months. Hyla rabbits can reach an average body weight of 2kg. It is a pure white with pink eyes. Hyla rabbits are fery fertile although as noted by Christine *et al.* (2011), hot and humid climate can significantly affect some reproductive trait of Hyla doe. Hyla is a breed that has fast growth and high feed conversion as well as large litter size and high survival rate (Want *et al*., 2016).

Literature reports on the efdect of feed intake on the performance of Hyla rabbits are scanty. However, Wang *et al*. (2017) reported that a short term feed restriction improved feed conversion ratio in a lasting way, transiently alters serum and IFG-1 levels and lead to compensatory growth in growing dutch rabbits.

2.4.4 Effect of Feed Intake on Baladi Rabbits

Baladi rabbit breed is an Egyptian domestic rabbit breed (Mostafa *et al*., 2020). It is used primally for meat production. Baladi rabbits comes in three coat colors: black, red or white. This rabbits weigh approximately 2.7 kg and a typical litter consist of about 5 to 6 kits. Elamin *et al*. (2011) reported that he daily weight gain of Baladi rabbit was 9 gram/day. This is in line with result obtained by Akinmutimi *et al*. (2008) who recorded 9.04 gram/day.

Elamin *et al.* (2011) also reported a significant difference in feed intake when Baladi rabbits were fed different type of diet. The highest intake was observed for Barseem (64.17g/day) and the lowest intake was observed for sweet potato and ternatea (61.30 and 56.53g/day respectively)). Shanti *et al*. (2018) also found that dry matter feed intake and growth of Baladi rabbits decreased linearly but 1.16 +_ 0.080 g/day and 0.998+_ 0.062g/day respectively.

2.5 Effect of breed on biochemical indices

It has been known for long that the breed an animal belongs to can influence their performance and also the way and manner of certain biochemical reactions. Although it is obvious that biochemical indices varies from one animal family to another, not too many literatures however has being able to establish significant differences for animal belonging to the same family but different breed. Research conducted by Nkeke *et al*. (2020) on the effect of different breed of chickens on biochemical parameters showed no significant difference in the level of albumin, cholesterol, total protein and aspartate amino transferase among breeds. Alkaline phosphate however differ significantly among the breeds of chickens. Fedrick *et al*. (2018) also reported significant difference in the level of biochemical parameters of different breeds of guinea fowl.

2.6 Reference value of Biological parameters for Some Animals

The values of biological parameters varies from one animal to another. Some literatures has been able to establish values for these parameters in different species of animals although, these values varies among different literatures.

Table 1: Reference values of biological parameters for some animal species

Species **Parameters**	**Glucose(mg/dL)**	**ALB (mg/dL)**	**ALT (mg/dL)**	**AST (mg/dL)**	**ALP (mg/dL)**	GLB **(mg/dL)**
Cattle	82-116	34-42	13-17	80-160	79-172	15-23
Goat	49-76	44-63	40-100	27-52	21-165	31-36
Rabbit	81-183	20-41	14-46	13-47	21-48	35-43
Chicken	73-106	18-22	19-66	18-40	32-43	16-21
Deer	67-89	33-37	19-25	78-90	66-72	33-42
Sheep	51-78	45-64	40-120	22-49	32-60	33-40
Human	72-130	35-48	17-21	40-80	53-128	23-35

ALB =Albumin, ALT = Alanine Aminotransferase, AST= Aspartate Aminotransferase, ALP = Alkaline Phosphatase, GLB = Globulin. Reference values extracted from Shami (2003), Karwan *et al.* (2016), Samira *et al*., 2016), Hajarah *et al*. (2020), Ajayi *et al.,* 2012 and Wikipedia (2021).

2.7 Relationship between Biochemical Parameters and Reproductive Traits

Most mammals show a seasonal pattern in reproductive activity that is shaped by biochemical activities in the body. Some reports has it the level of some biochemical parameters such as ALP increases during pregnancy. Biochemical estimates of blood serum can also be used for semen evaluation since using semen characteristics alone are not completely satisfactory for semen appraisal in the current practice of commercial artificial insemination (Lincoln *et al.,* 1990).

2.7.1 Some Biochemical Parameters and Semen Characteristics

Biochemical evaluation of blood and its relationship with physical characteristics are still completely unknown (Gündoğan *et al.,* 2009). With better knowledge of reproductive physiology, more accurate andrological evaluation could be conducted, which would improve reproductive efficiency and enhance breeding schemes and the rate of genetic gain. Seminal lipids play significant roles in the membrane structure of spermatozoa, sperm metabolism, sperm capacitation, and fertilization of the female gamete (Kelso and Redpath, 1997) Cholesterol is a precursor in the synthesis of sex hormones. The concentration of transaminase enzymes (AST and ALT) in semen is a good indicator of semen quality because it measures sperm membrane stability (Corteel, 1980). Furthermore, many studies have correlated the AST level in semen with sperm concentration (Zedda and Bini 1996).

Research conducted by Gundogan *et al.* (2009), established as Positive relationships between percentage of abnormal spermatozoa and AST level, and AST/ALT ratio in blood serum ($P < 0.01$) (r: 0.595) and a negative correlations were found with sperm concentration, AST level, and AST/ALT ratio ($P < 0.01$) (r: − 0.613).

2.7.2 Some Biochemical Indices during Pregnancy

Interpretation of laboratory investigations relies on reference intervals. Physiological changes in pregnancy may result in significant changes in normal values for many biochemical indices. Several studies have documented the physiological changes that occur in many biochemical laboratory tests in pregnancy (Klajnbard *et al*., 2010, Abbassi *et al.,* 2009). Stephanie and Adam (2018), reported that a negative relationship exist between pregnancy time and the level of ALT and AST. Pregnancy is associated with mild falls in alanine aminotransferase and aspartate aminotransferase (AST) (Stephanie and Adam, 2018). Pregnancy is also associated with a fall in serum albumin beyond what would be expected from the increase in circulating volume, and despite a 50% increase in albumin synthesis in the liver, and it has been hypothesised that there might be albumin catabolism to improve delivery of amino acids to the fetus (Klajnbard *et al*., 2010).

Alkaline phosphatase however increases with increase in pregnancy period. Levels of alkaline phosphatase (ALP) rise due to production of the placental isoenzyme, as well as a significant increase in bone isoenzyme in third trimester (Stephanie and Adam, 2018). The level of ALP need to be checked during pregnancy. An acute rise in ALP may signify placental damage or

infarction. Elevated placental ALP may also be seen with antiphospholipid syndrome. (Delluc *et al.,* 2008).

2.7.3 Biochemical Parameters and other Reproductive Traits

Biochemical indices plays significant roles in animal performance. Some functions of biochemical indices in animal body includes: coagulation of blood, maintaining osmotic pressure, regulation of acid base balance, as reserved protein and antibodies (e.g albumin and globulin). Biochemical indices are also involved in catalyzing certain biochemical reactions in the body of man and animals according to Tasha (2014).

Although biochemical indices plays significant role in animals, excess or deficiency of it has been correlated with some reproductive traits. Abigail *et al.* (2008), revealed that levels of alanine aminotransferase (ALT) and gamma glutamyltransferase (GGT) decreased linearly as birth-weight increases. Same report also established that alkaline phosphatase (ALP) levels increases as birth-weight decreases. No evidence was found for associations of birth-weight with aspartate aminotransferase (AST) and albumin. Svjetlana *et al.* (2016), also found a positive correlation between ALP and abnormal fetus, and premature death of fetus. Some research has also explained that dramatic elevation in placental alkaline phosphatase is associated with right upper quadrant pain during the third trimester of a pregnancy complicated by gestational diabetes. This may be the reason for abnormal birth of fetus.

Research conducted by Mohamed *et al.* (2019) reported no correlation between levels of ALT and AST and conception rate, weaning weight and survival rate of young kids. Ghanem, (2016)

though observed a negative correlation between ALP and weaning weight and survival rate. Odetola *et al.* (2018) reported no correlation between ALP and Survival rate and conception rate . Research conducted by *Sallam et al.* (2020) also indicated that New Zealand White and Baladi rabbits with high level of alkaline phosphate showed lower birth-weight and weaning weight. AST and ALT has a negative correlation with fertility in male (Gundogan *et al.,* 2009).

CHAPTER THREE

MATERIALS AND METHOD

3.1 Experimental Location

The experiment was conducted in University of Binin teaching and research farm Edo State. It is located between latitude 60^{o}E and 30^{o}N of the greenish meridian of the forest zone with a temperature of 27.6^{oc}. Annual rainfall ranges from 1498 to 3574mm with the mean value 2162mm. The relative humidity ranges between 63.3 and 81.71% and daily sunshine is between 5.85 and 7.5 hours with mean value of 72.5 and 6.8 hours respectively (NAA, 2015).

3.2 Experimental Animals

Seven rabbits were sourced form a reputable source and used for the experiment. The experimental animals consist of Dutch rabbits (male and female) and New Zealand (male and female). The animals were kept separately in different hutches in the University of Benin farm house.

3.3 Experimental feed

The experimental Animals were fed concentrate feed (top feed finisher) and grass (*Panicum maximum).* The concentrate feed was fed to the animals using a hanging feeder. The forage was chopped into smaller size before being fed to the animals.

3.4 Experimental Design and Model

The experimental animals were randomly assigned to different hutches according to their breeds. The design for the experiment is completely randomized design. The model for the experiment is given bellow:

$H_{ij} = \mu + A_i + \varepsilon_{ij}$

Where μ = Population mean

A_i = the i^{th} animal receiving the jth treatment

ε_{ij} = Random error associated with the experiment.

3.5 Data collection and statistical analysis

The data on weight gain of doe and body weight of kit were collected on weekly basics. Data were also collected for Aspartate Transaminase (AST), Alkaline Phosphate (ALP) and Alanine Transaminase (ALT). The data collected were subjected to one way statistical analysis of using SPSS. Significant means differences were separated using the Duncan multiple range test technique.

CHAPTER FOUR

RESULTS

4.1 Results

Tab 1: shows the means of some biochemical parameters of NewZealand and Dutch breeds of rabbits. The one way analysis of variance showed that breed had significant effect at 5% confident level ($P<0.05$) on the levels of Alkaline Phosphatase (ALP), Aspartate Transaminase (AST), and Alanine Transaminase (ALT). Dutch rabbit rabbit recorded highest for Alkaline Phosphatase (ALP) with average value of 20 U/L, while NewZealand rabbits recorded lowest for Alkaline Phosphatase (ALP) with average of 15U/L. Alanine Transaminase (ALT) was highest in Dutch rabbits (17U/L) and lowest for NewZealand breed of rabbits (5U/L). Dutch rabbit also recorded highest for Aspartate Transaminase (AST) with average of 12.5U/L.

Tab 1: Some biochemical parameters of different Dutch and NewZealand does

Breed	ALP	ALT	AST
DT	20^{a}	17^{a}	12.5^{a}
NZ	15^{b}	5^{b}	6^{b}
LSD	2.238^{**}	2.818**	3.190**

DT = Dutch deo, NZ = NewZealand doe, LSD = Least Segnificant Differences , ALP = Alkaline Phosphatase, AST = Aspartate Transaminase, and ALT = Alanine Transaminase, ** = significant.

compared to Neazealand with the lowest record (6U/L).

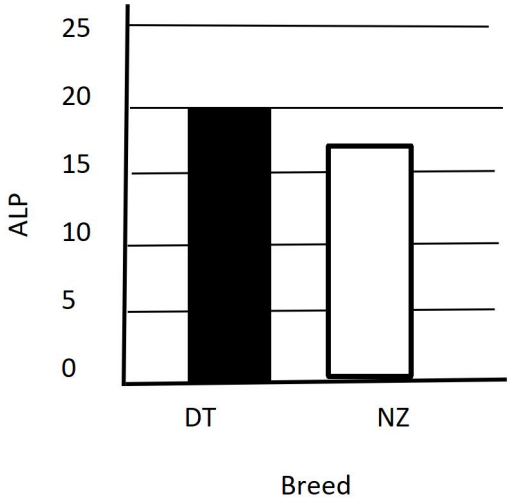

Fig 1: Average ALP of Dutch and NewZealand rabbits

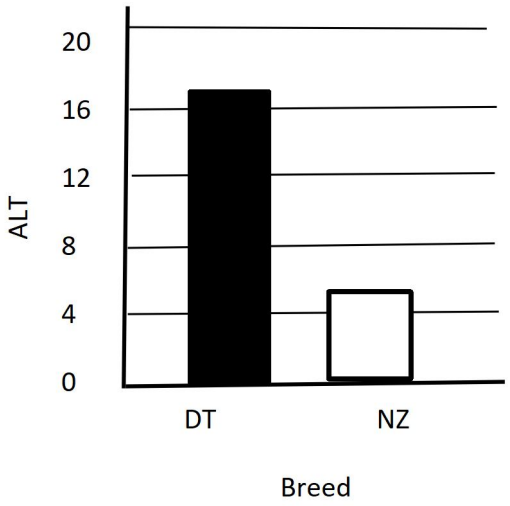

Fig 2: Average ALT of Dutch and NewZealand rabbits

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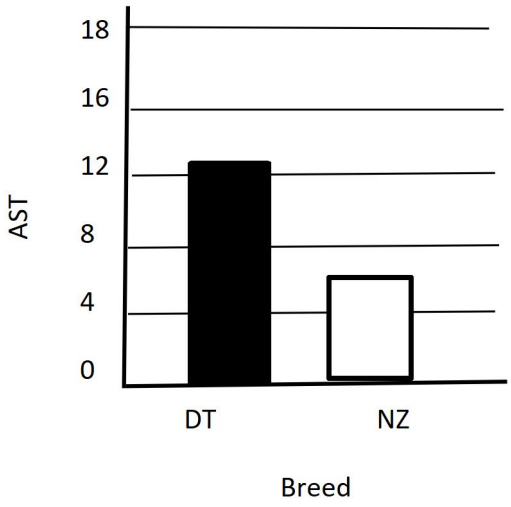

Fig 3: Average AST of Dutch and NewZealand rabbits

Tab 2: shows the effect of some biochemical parameters on the weekly body weight of kits of different. The results showed that the levels of ALP, ALT and AST had no significant effect (P>0.05) of the weekly body weight of Dutch and NewZealand kits.

The analysis of variance showed that NewZealand kits with the lowest levels of ALP, ALT and AST recorded highest for body weight at week 6 (551.67), week 7 (576.67), week 8 (605.00), week 9 (631.67) and week 10 (641.67) compared to the body weight of Dutch kits which recorded lowest for body weight at 6th (506.67), 7th (548.00), 8th (575.00), 9th (595.83) and 10th week (635.33) respectively. Although NewZealand kits had the highest record for body weight for all the weeks compared to Dutch kits, the results from the one way analysis of variance showed that the differences between the means were not statistically significant (P>0.05).

Tab 2: Effect of some biochemical parameters of does on body weight of kits

	BREED	WOKAW6	WOKAW7	WOKAW8	WOKAW9	WOKAW10
ALP						
20	DT	507	548	575	596	635
15	NZ	552	577	605	632	642
	LSD	131.7^{NS}	116.1^{NS}	117.6^{NS}	107.2^{NS}	107.1^{NS}
ALT						
17	DT	507	548	575	596	635
5	NZ	552	577	605	632	642
	LSD	131.7^{NS}	116.1^{NS}	117.6^{NS}	107.2^{NS}	107.1^{NS}
AST						
17.5	DT	507	548	575	596	635
6	NZ	552	577	605	632	642
	LSD	131.7^{NS}	116.1^{NS}	117.6^{NS}	107.2^{NS}	107.1^{NS}

WOKAW6, 7, 8, 9 & 10 = Weight of kits at week 6, 7, 8, 9 and 10 respectively, DT = Dutch deo, NZ = NewZealand doe, LSD = Least Segnificant Differences , ALP = Alkaline Phosphatase, AST = Aspartate Transaminase, and ALT = Alanine Transaminase, NS = Non Significant.

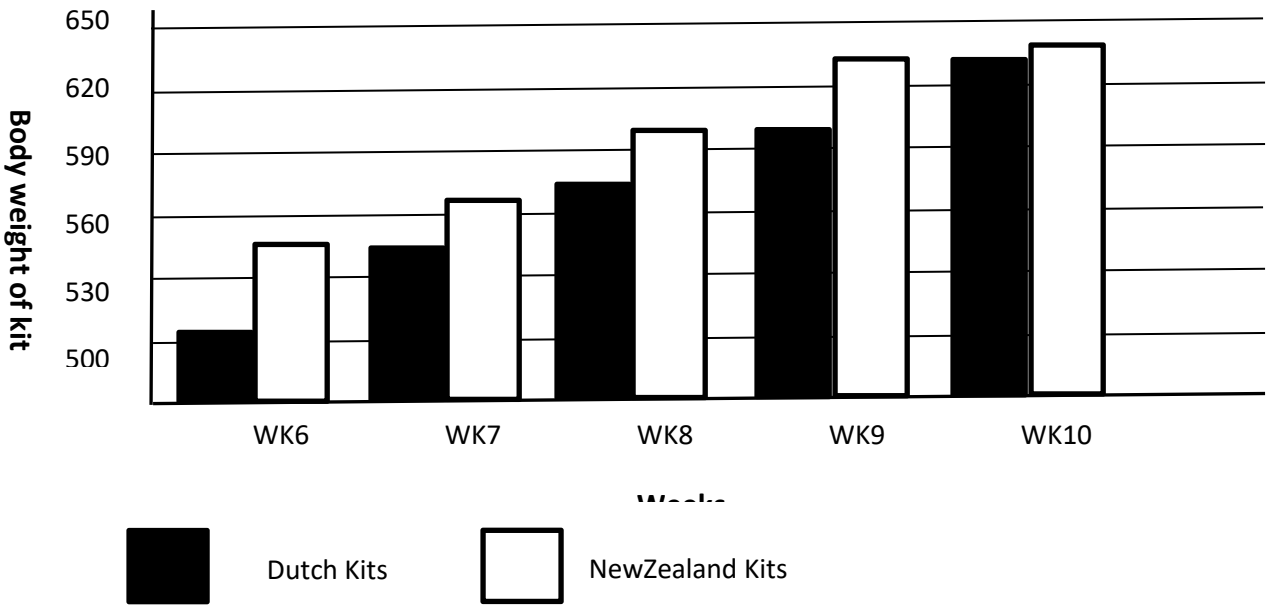

Fig 4: Mean body weight of Dutch and Newzealand kits at 6th, 7th, 8th, 9th 10th weeks of age as affected by ALP levels.

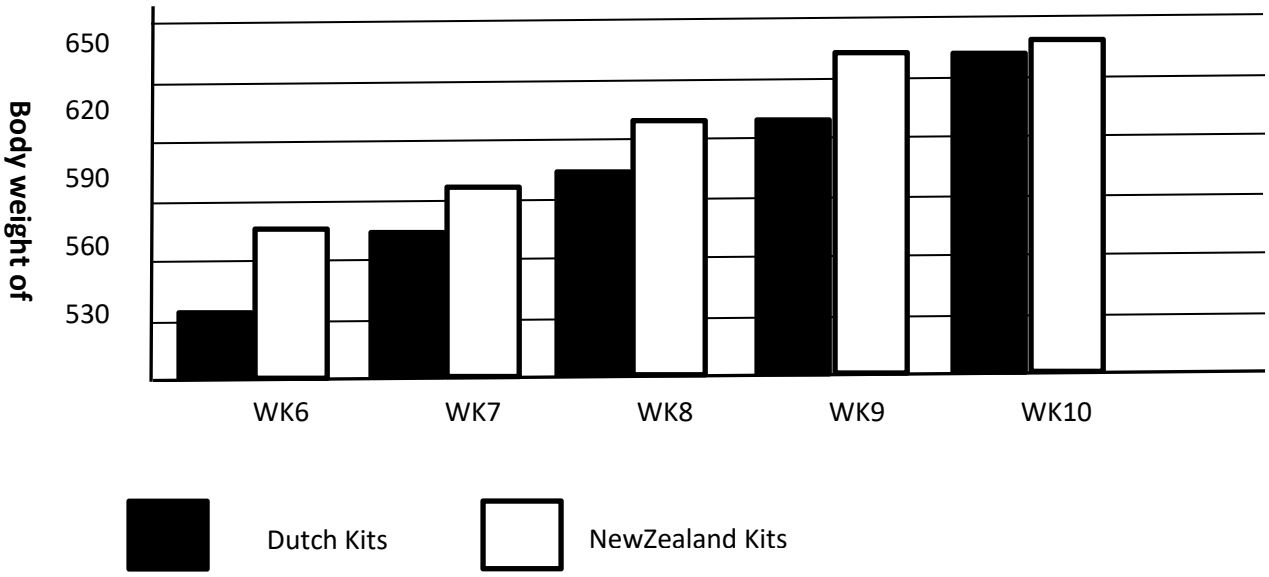

Fig 5: Mean body weight of Dutch and Newzealand kits at 6th, 7th, 8th, 9th 10th weeks of age as affected by ALT levels.

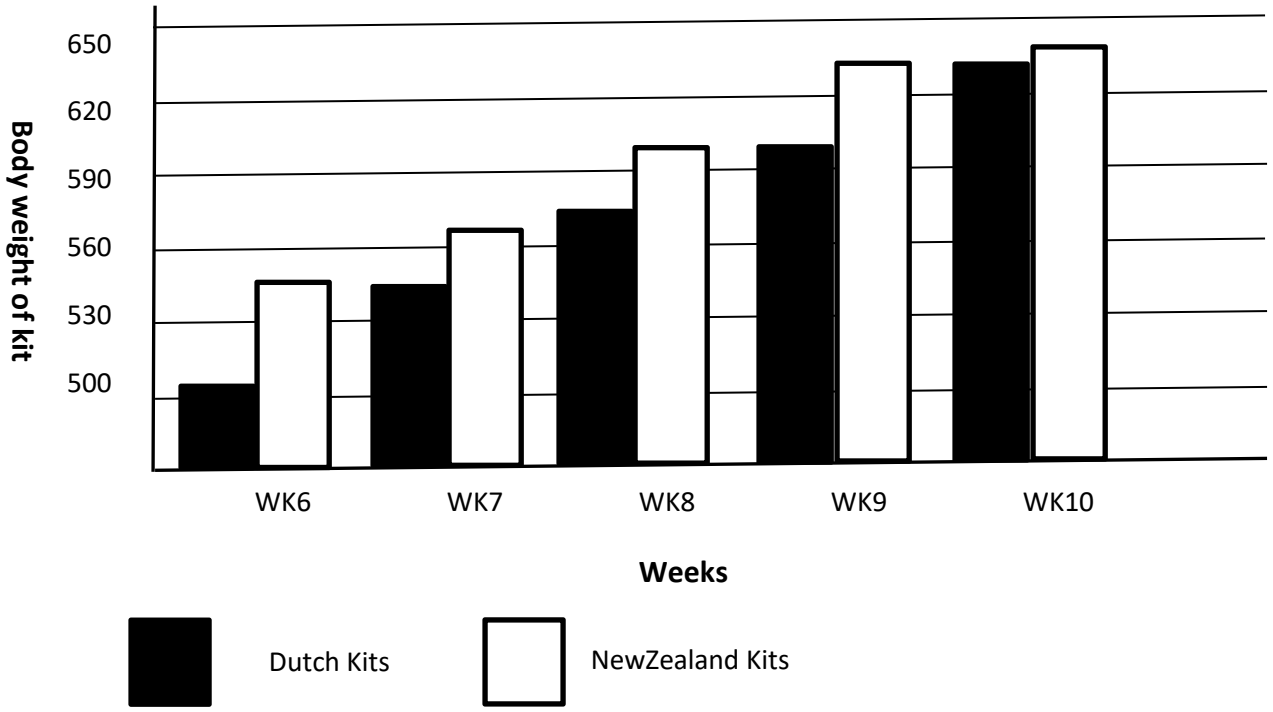

Fig 6: body weight of Dutch and Newzealand kits at 6th, 7th, 8th, 9th 10th weeks of age as affected by AST levels

CHAPTER FIVE

DISCUSSION

5.1 Discussion

As presented in **Tab 1,** breed of rabbit had significant effect at 5% confident level (P<0.05) on the levels of Alkaline Phosphatase (ALP), Aspartate Transaminase (AST), and Alanine Transaminase (ALT) of Dutch and NewZealand does. Result from this study showed that does belonging to the Dutch breed were highest for ALP (20U/L), ALT (17U/L) and AST (12.5U/L) as compared to NewZealand does which recorded lowest for ALP (15U/L), ALT (5U/L) and AST (6U/L). The values of all biochemical characteristics measured in this study for NewZealand doe were bellow the physiological range reported by Archetti *et al.* (2008), Ibrahim *et al.* (2018) and Sobhy *et al*. (2020) whose ranges were within 40 to 48U/L. Result from this study revealed that breed significantly affect the levels of some biochemical parameters such ALT, ALP and AST. This is consistent with the finding of Fedrick *et al.*, 2018. In agreement with this study, Sobhy *et al*. (2020) also reported significant difference (P<0.05) between values of AST, ALP and ALT of different breeds of rabbits. Contrary to this study, Nkeke *et al.* (2020) reported that values of biochemical parameters do not vary among breeds. Henry *et al*. (2016). also had similar findings. This discrepancy among literature results may be due to several factors that includes the condition and diet of the animals. Washaya., *et al.,* (2019) established from their findings that the diet of animals can significantly affect the level of albumin (ALB) and Alanine phosphate (ALP). It is believed that different type of feed can affect the level of biochemical indices although may not posed harmful consequences according to Veronica *et al.* (2003).

As presented in **Tab 2**: body weight of Dutch and NewZealand kits did not vary significantly (P>0.05) at 6, 7, 8, 9 and 10th weeks of age. ALP, ALT and AST levels of does did not have significant effect (P>0.05) on weekly body weight of dutch and NewZealand kits. Results obtained showed that NewZealand kits recorded highest for body weight at week 6 (551.67), week 7 (576.67), week 8 (604.00), week 9 (631.67) and week 10 (641.67) compared to Dutch kits which recorded lowest for body weight at 6th (506.67), 7th (548.00), 8th (575.00), 9th (595.83 + 30.25) and 10th week (635.33) respectively. The values for NewZealand kits were numerically but not statistically higher than those of Dutch kits. Ajayi *et al*. (2018) also reported higher values of body weight for NewZealand rabbits compared to Dutch rabbits. Dutch does with higher values of ALP, ALT and AST recorded lowest for body weight. Although Dutch does had the highest levels of ALP, ALT and ALT, the kits however had lower values for body weight compared to NewZealand kits although the differences where not statistically significant. . Although biochemical indices plays significant role in animals, excess or deficiency of it has been correlated with some reproductive traits. Abigail *et al.* (2008), revealed that birth-weight of progeny increased linearly as levels of alanine aminotransferase (ALT) of parent decreases. Several other reports also established that alkaline phosphatase (ALP) levels increases as weight of kits decreases although no evidence however were found for associations of birth-weight with aspartate aminotransferase (AST) (Abigail *et al.,* 2008). Research conducted by *Sallam et al.* (2020) also indicated that New Zealand White and Baladi rabbits with high level of alkaline phosphatase showed lower weight of kits.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The weekly body weight of kits and some biochemical parameters of two breeds of rabbits viz Dutch and NewZealand were evaluated. The result showed that breed had significant effect on the body weight and biochemical parameters such as ALP, ALT and AST. ALP, ALT and ALT values were higher in Dutch does compared to NewZealand does. Kits weight of NewZealand were numerically but not statistically higher than kits weight of Dutch.

Lots of literature has it that increased level of biochemical parameters can have effect animal performance negatively due to health implications. The variation in the performance of animals with high or low levels of biochemical parameters may be due to the health implication posed by the varied levels of biochemical parameters. Research by Dena Jones (2018) suggest that the health of farm animal affects their productivity as well as safety and product of the animals. Result from this study therefore suggest that relationship exist between biochemical parameters (such as ALP, ALT and AST), breed of rabbit and their performance.

6.2 Recommendations

From the findings of this study, it is recommended that NewZealand rabbits should be the genotype of choice for better production. It is also recommended that more attention should be

given to biochemical indices in animals in order to avoid the consequences that comes along with its excess and deficiency.

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