EFFECT OF TIGER NUT OFFAL MEAL-BASED DIET ON BIOCHEMICAL PARAMETERS ON GROWER RABBITS

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ABSTRACT

The study was carried out to assessed the effect of tiger nut waste on serum biochemistry of grower mixed breed of Rabbit, A total number of 18 Rabbit were randomly allotted into a three dietary treatment consisting of six Rabbit per treatment and two Rabbit per replicate, The groups were control, 10% and 20% inclusion level of test ingredient respectively; Data collected on serum biochemical profile were subjected to one way analysis of variance. The data obtained in this study revealed that there were no significant (P>0.05) differences in urea, from which creatinine and chloride serum electrolyte were not significantly (P>0.05) affected in the study. However, the result revealed that there were significant (P<0.05) differences in plasma calcium and there was no significant (P>0.05) difference in aspartate Amino Transferase. The AST value obtained in this study is slightly above the normal range, the study indicates there were no significant (P>0.05) in Alanine Amino Transferase. It was observed that Tiger nut waste has significantly (P<0.05) influenced Alkaline Phosphatase in this study. And it will be concluded that Tiger nut waste could be incorporated into a Rabbit diet at 20% without an adverse effect on serum biochemistry.

KEYWORDS

tiger nut offal, biochemistry, grower rabbit

1. INTRODUCTION

The look for un-tap but known and beneath-used crops as creature bolster has been heightens to strike an adjust of competition between humans' populace development, animals nourishes and agrarian efficiency. This is majorly common in the tropical and subtropical zones of the world. The improvement has driven the required to tackle the possibilities of untap feedstuffs as portion or add up to substitution for maize, sorghum, millet and numerous more costly ones which caused the creature protein to be exceptionally costly with profoundly extreme costs (Nsa, *et al*., 2020). The non-conventional nourish fixings ought to be accessible all year circular, simple to secure and prepared into usable shapes and must have comparative taken a toll advantage over the ordinary feedstuffs (Asuquo, 1996). The display reality in numerous creating nations and world to source for non-conventional vitality sources to cereal based fixings has required the required to explore the possibilities of a few other vitality feedstuffs such as tiger nut that are cheap and promptly accessible with less competition with people and beer-brewing businesses compared to

maize in animals sustenance (Agbabiaka, *et al*., 2013). This tend to decrease the fetched of nourish and creature items such as meat and eggs among others for Nigerian populace. Tiger nuts is an under-utilized trim which has a place to the family Cyperaceae. It has crucial agronomic and wholesome possibilities as the ordinarily utilized vitality sources. There are two primary assortments of tiger nut; the yellow and the brown assortments in Nigeria. The yellow assortment is favored to all other assortments since of its inalienable properties counting its greater estimate, alluring color, fleshier body, more drain substance, lower fat, and tall protein and has less anti-nutritional components particularly polyphenols (Nsa, *et al*., 2020). In Northern Nigeria, tiger nut buildup (after drain extraction) is regularly disposed of by the refreshment businesses as squander. Later considers shown that buildup or the entire plant is tall in vitality, reasonable in amino acids composition with small or no-tolerable allergens and serves as a valuable fixing in animals bolsters (Archibong, *et al*., 2019). The Nut which is known as Aya by the Hausa tribe, 'Imumu' in Yoruba, as well as Ofio or Aki Hausa in Ibo (Ebojele and Ezenwanne, 2014). The nuts can be expended crude, broiled, dried, prepared or made into a reviving refreshment called 'kunnun aya' in Hausa dialect (Oladele and Aina, 2007). Tiger nuts is esteemed for its profoundly esteemed wholesome starch substance, dietary fiber and edible carbohydrate of monosaccharides, disaccharides and polysaccharides (Sanctuary *et al*., 1990). The nuts was moreover detailed to be wealthy in sucrose, protein, minerals and fat, which are safe to peroxidation (Rita, 2009). It was moreover detailed that tiger nuts can be taken by diabetics primarily for its sucrose and starch, and for its tall substance of arginine which is detailed to invigorate the generation of affront (Ebojele and Ezenwanne, 2014). The plant was appeared to be nutritious, and has anti-sickling action and may hence be supportive in the administration of sickle cell patients (Monago and Uwakwe, 2009). This reality is possibly of monstrous advantage as an antisickling specialist in hindering sickle cell hemoglobin polymerization, advancement of the oxidant status of sickle erythrocytes and enhancement of the oxygen liking. In this manner, tiger nuts are likely of significant dietary esteem as it has antisickling properties for the compelling treatment and administration of iron deficiency, Kwashiorkor, thalassemia, sickle cell malady and their complications (Nwaoguikpe and Nwazue, 2010). These and numerous other logical discoveries driven a few analysts to understudy the phytochemical composition of tiger nuts tuber, taking after which it was affirmed that the nuts contain Alkaloids, Cyanogenic glycosides, Gums, Tannins, Sterols, and Saponins (Ekeanyanwu *et al.,* 2010). There is shortage of data on the impact of tiger nut feast in rabbits. This think about was in this manner outlined to explore the execution, carcass characteristics and supplement digestibility of rabbits bolstered diets containing diverse levels of tiger nut meal.

2. MATERIALS AND METHODS

2.1. Experimental Site

The experiment was conducted at from Prof. Lawal Abdu Saulawa Livestock Teaching and Research Farm pasture productions unit, Department of animal science Federal University Dutsin-ma Katsina state Nigeria which lies between latitude 12°27`18` North and 17°29´29 East and 65 meters above the Sea level with an Average rainfall of 700mm Within the Sudan savannah zone, rainfall is between May and September with a peak in August. The estimated mean annual Temperature ranges from 29°C to 31°C with highest Air temperature which normally occurs sometimes in April/May and the lowest comes around December through the February (Abaje, *et al.,* 2014).

3. EXPERIMENTAL ANIMALS AND EXPERIMENTAL DESIGN

A total number of eighteen Rabbit (18) of equal body weight were used in a Completely Randomized Design (CRD). Rabbit was purchased from village Markets in Dutsin-Ma katsina State for the experiment. The animals were balanced for weight before being allotted to treatments. The animals were acclimatized for two weeks in the Teaching and Research Farm of the University. They were dewormed with Albendazole and levamisole to get rid of internal parasite, and Ivermectin administration to the animals against external parasite. The rabbits were managed and group fed with nut offal before the commencement of the experiment. The diet was offered to the rabbits in the morning and evening and the rabbitswere weighed the next day in the morning respectively.

4. EXPERIMENTAL DIET AND MANAGEMENT

The ingredients (Tiger nut offal) was sourced from the local marketers of kunun Aya processors within Dustin-Ma Local Government Area of Katsina State and sun- dried for 2-3 days.

Table 1: Gross Composition of Experimental Diet

Ingredients (%)	T1	T2	T3
Sorghum	13	13	13
Maize offal	55	45	35
Tiger nut	0.0	10	20
Ground nut hay	20	20	20
Cowpea husk	10	10	10
Bone meal	1	1	1
Salt	0.5	0.5	0.5
Premix	0.5	0.5	0.5
Total	100	100	100

Calculated analysis of the experimental diet

Parameters	T1	T2	T3
Crude protein	22.508	22.74	22.72
Crude fibre	57.85	55.70	53.83
Ether extract	7.8	10.6	10.95
Ash	11.976	9.042	29.303
(ME/kcal/kg)	4469.956	5821.49	6043.306

T1 = treatment 1, T2 = treatment 2, T3 = treatment 3 and ME/kg: metabolizable energy/kilo gram

5. FEED INTAKE MONITORING

Daily records of feed intake were taken throughout the weeks of feeding, by weighing feed offered and leftover the following day morning. The feed was offered to them in the morning and evening at 15% of their body weight. Water was served *ad libitum*.

6. BIOCHEMICAL PARAMETERS DETERMINATION

Blood samples were collected from two randomly selected animals from each of the treatments at the end of the experiment. The blood samples were collected from the jugular vein (Coles, 1986). To be able to collect blood sample for haematological determination, bleeding was conducted in the morning before feeding and about 3ml of blood sample was collected and placed in an EDTA

(Anti-coagulant) sampling bottle for the purpose of this study. The blood urea concentration was estimated by Nessler's reaction (Tannins and Naylor, 1968). The total proteins was estimated by using Biuret method as described by Henry and Stobel (1957). Albumin and Creatine were determined by using Bromo Cresol Green Method and Jaffe reaction (Sarre and Nierenkrankheifen, 1959; Grant, 1987) respectively. While globulin was determined by determining the differences between total protein and albumin.

7. STATISTICAL ANALYSIS

Data collected were subjected to Analysis of Variance (ANOVA) using the General Linear Model procedure of SAS (SAS 2001). The Treatments means was also separated with the use of Duncan Multiple Range Test by steel and Torie (1955).

8. RESULTS AND DISCUSSIONS

Table 2 Proximate composition of experimental diet

Parameters	T1	T2	T3
Moisture content (%)	5.04	6.50	6.13
Lignin (%)	11.89	9.86	12.26
Dry matter	94.96	93.50	93.87
ADF	29.55	31.00	29.36
NDF	59.23	59.14	57.98
CP	18.51	15.03	18.69
CF	22.26	21.72	21.49
OIL	5.00	5.12	5.26
ASH	8.06	8.33	9.50
NFE	40.33	40.30	38.93

^{abc} means within rows bearing differentsuperscripts differs significantly at p > 0.05
ADF = detergent fibre, NDF = nitrogen detergent fibre, CP = crude protein, and CF = crude fibre,

The table 2 of the proximate composition of the experimental diet revealed that there is no statistical (P>0.05) differences across all the treatments. This means that the inclusion of tiger nuts at different concentrations level (10% & 20%) does not affect or alter the dietary composition of the diets. Even though, the variation on the inclusion level of the tiger nuts tends to depressed and suppressed at some point but it does not statistically indicate any significant when compared with the control group. The inclusion level of 10% tiger nuts in T2 tends to lower or reduced crude protein content of the diets when compared to control (T1) and T3. This depression of the crude protein of the diets also affects the lignin content of T2. The finding of this study is in accordance with the result of Nsa, *et al.* (2020) who reported that the presence of anti-nutritional factors in the tiger nuts has been proven to reduce growth rate of livestock due to reduce protein and specific amino acids utilisation. In contrast, Nsa, *et al.* (2010) reported that an increase in the dietary level of tiger nut meal indicates an increase in the dietary fibre. Though high dietary fibre increased feed intake to meet the dietary needs for energy and other nutrients, excessive level of fibre as revealed by the proximate composition of tiger nut meal (27.82%) could equally impair feed utilisation and consequently growth rate (Belewu and Belewu, (2007).

Table 3 Effect of Tiger Nut Varying Level on Serum Biochemical of Mixed Rabbit Bucks

Parameters	T1	T2	T3	SEM	LOS
Urea	9.250[a]	8.150[a]	8.650[a]	0.585	NS
Creatinine	1.300[a]	0.750[a]	1.200[a]	0.184	NS
Chlorine	97.560[a]	93.600[a]	94.450[a]	3.809	NS
Calcium	5.440[b]	6.285[a]	6.380[a]	0.175	*
AST	54.650	53.200[a]	53.200[a]	3.673	NS
ALT	27.600[a]	27.800[a]	21.400[a]	2.626	NS
ALP	55.600[a]	52.850[b]	52.600[b]	0.554	*
Total protein	6.050[a]	6.550[a]	7.200[a]	0.646	NS
Albumin	4.100[a]	3.900[a]	4.500[a]	0.294	NS
Globulin	1.950[a]	2.650[a]	2.900[a]	0.452	NS

[abc] means within rows bearing differentsuperscripts differs significantly at p > 0.05
SEM=standard error of the mean, LOS = level of significant. Note: the results are expressed in percentage (%). ALT = Alanine aminotransferase, AST = Aspartate aminotransferase and ALP = Alkaline phosphatase.

The result on the effect of varying level of inclusion of tiger nut waste on serum biochemical of mixed rabbit breeds bucks were presented in table 3 below. The result showed that there were no significant (P>0.05) differences in urea. The urea values obtained in this study fall within the normal urea values of healthy rabbits reported by Amaza *et al.* (2020) who reported urea value ranges from 7.40-11.87mg/dl. The result showed that creatinine and chloride serum electrolyte were not significantly (P>0.05) affected by the tiger nuts. There are significant (P>0.05) differences between T1 (control) and T2 and T3 with regard to calcium level of the diet. This means that the inclusion of tiger nuts to the diets have increased the level of calcium content of the diets. There was no significant (P>0.05) differences in terms of Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) across all the treatments while significant (P>0.05) difference was observed on alkaline phosphatase (ALP). Total protein, albumen and globulin are statistically the same. Meaning, there is no significant (P>0.05) differences among all the treatments.

9. DISCUSSION

It was observed that urea level of the diets was not statistically affected by the nut's inclusion. However, the results obtained from this research was higher than the values obtained by Agbabiaka *et al.* (2013), they reported that the urea values of the groups were 4.40, 4.60, 4.90, 4.90, and 4.90mg/dl for 0%, 25%, 50%, 75% and 100% tiger nut inclusion levels. There was no significant difference between values obtained from control group (P>0.05) and birds fed 25% tiger nut diet. However, a significant difference (P>0.05)was among birds fed 0% and 25% tiger nut diets and those birds fed tigernut at 50%, 75% and 100% inclusion levels. From this research, it was observed that creatinine values decrease as the inclusion levels of tiger nuts increases. This is contrary to the findings of Agbabiaka *et al.* (2013), There were significant difference (P>0.05) in creatinine concentration among the treatment groups. The values of 54.00, 61.00, 66.00, 65.00 and 62.00mg/dl were obtained from birds on dietary treatments 0%, 25%, 50%, 75% and 100% respectively. Agbabiaka *et al.* (2013) further stated that lowest value was recorded in control group whereas in the present study, the highest values recorded was in the control group.

The increased value observed in the ALT level could be attributed to the presence of phytochemicals properties which are also anti-nutrient substances that are found in the diet. Among the plants extracts, some are known to have contained different concentrations of hepatotoxicity which depends mainly on the levels of anti-nutrients inherent in the plants (Sofowora, 1993). The mechanisms of action of alkaloids and saponins are similar and it involves

complexing with cholesterol to form pores in cell membrane bi-layers (Wink, 1993; Francis *et al.*, 2002). This might possibly be the mechanism by which *Cyperus esculentus* acted on the liver cells to bring about the observed increase in the level of alanine aminotransferase in this study.
The AST values obtained in this study are slightly above ranges reported by (Amaza *et al.*, 2020) who reported AST value from 43.33-47.33iu/L AST is enzyme released in to the blood when certain organ or tissues, particularly the liver and the heart are injured (Brosnan, 2003). The result further indicates that there were no significant ($P>0.05$) differences in Alanine aminotrasaminase. It was observed that tiger nut waste was significantly ($P<0.05$) Influence Alkaline phosphatases in this study, Where T1 has the highest value of (55.600 iu/L) followed by T2 and T3 with 52.850 iu/L and 52.600 iu/L respectively. In contrast to the findings of Obojele and Ezenwanne, (2014) who reported in their work that the increase in serum AST concentration can also be attributed to the presence of alkaloids and saponins and the mechanism of action is similar to that described for ALT. An increase in plasma aminotransferase activity is a sensitive indicator of damage to the cytoplasm or the mitochondrial membranes of the hepatocytes. Hence, the increase in alanine and aspartate aminotransferases, which are specific for the liver cells, indicate some level of hepatotoxicity (Dial, 1995).

It could be denoted from the result of this study that there was an observed decreased in ALP of T2 and T3 which was lower than the control group. The decreased in the ALP may be attributed to the normal functioning of the liver. Normally, when there is an injury in the liver, the ALP swinged into action by raising enzymes levels in the blood stream and therefore, sending a message to the liver of possible damage. The enzymes deployed to assess the hepatocellular damage in the liver are ALT, AST and ALP. In contrast, Crook (2006) stated that the increase in serum ALP is known to be a reliable indicator of cholestasis and possibly, bile duct obstruction. An increase in ALP could also be extrahepatic since ALP is known to be present in high concentrations in most of the organs. Moreover, an increased ALP is also an indication that there could be active bone formation occurring, especially that the ALP was a known by-product of osteoblast activity (Sabokbar, 1994; Crook, 2006). However, Obojele and Ezenwanne, (2014) ascertained that the increase in ALP serum concentration observed in their study might be as a result of an effect of the administered extract since a similar increase in ALP level was observed in the control group. It is possible that this is indicative of active bone formation and growth occurring during the period. Alkaline phosphatase is believed to be by-product of osteoblast activity (Sabokbar, 1994), therefore the increased volume in the ALP concentration seen in all the groups, including the control, might have been due to the osteoblast activity since there was a general increase in weight and possibly bone growth Obojele and Ezenwanne, (2014) reported. For the total protein, albumin and globulin, it increases as the concentration increases. The higher values of total protein, albumin and globulin was observed on T2 and T3 while the lowest values was observed on T1 (control). This indicates that tiger nuts meals was greatly utilized by the rabbits at lower dietary inclusion.

10. CONCLUSION

Conclusively, the result of the study showed there was no significant ($P>0.05$) differences in all the treatments. Hence, the inclusion of tiger nut meal in the rabbits does not have any detrimental effect or influence on the serum biochemistry properties of rabbit bucks. Base on this findings, it can therefore be concluded that the tiger nut meal can be included into the diets of rabbit bucks at different concentrations.

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