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Animal Feeding Trial on Formulated Rat Diet

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Abstract
This research focused on the feeding trial of formulated feed ration for albino rats and to know the effect of this feed on the rats, compare with those of control feed (Top feeds) by carrying out some analyses such as biochemical, haematological, and growth performance of the rats. The rats (16) were allocated into four dietary treatment groups and fed on a short term study with diet containing different proportions of feed. The outcome demonstrated or revealed that Group II had a mean weight of 131.7, PCV of 51 ± 2.2, WBC of 12727 ± 89.9 X 10^3 mm, AST of 181.4 ± 2.7u/l, ALT 128.3 ± 2.9 u/l, Total protein of 61 ± 1.4 and Cholesterol of 2.9 ± 0.1 g/dL had a positive effect on the growth performance of the rats when compared to the control group which has mean weight of 161.7, PCV of 50.3 ± 2.1, WBC of 12317 ± 164.99 X$10^{3/}$ mm, Cholesterol of 2.7 ± 0.2, Total protein of 61.2 ± 1.0 g/dL, ALT of 132.5 ± 6.6u/l, AST of 180 ± 1.7. But Group 1 with mean weight of 124.0, PCV of 52 ± 1.1, WBC of 15586 ± 241.2 X $10^{3/}$ mm, Cholesterol of 6.4 ± 0.6, Total protein of 74.9 ± 6.4 g/dL, AST of 182.1 ± 3.0u/l, ALT of 125.8 ± 2.7u/l has an increased in WBC which can lead to inflammation or infection while In Total protein can leads to liver disease due to high content of groundnut; while Group III with mean weight of 120.0, PCV of 51.4±1.6, WBC of 14190 ± 313.7 X$10^{3/}$ mm, Cholesterol of 3.6±0.4, Total protein of 81± 4.8 g/dL, AST of 183.4 ± 3.2u/l, ALT of 130.1 ± 2.6 which also increase.ALT and AST levels in Group l and III suggested liver damage due to increased in their blood serum. This finding strongly suggests the use of Group II's formulated feed diet as a substitute for rat feed.

Keywords: Wistar rats, formulated diet, feeding trial.

Introduction

Feed formulation is the process of quantifying the amount of feed that needs to be put together to form a single uniform (diet) for poultry that supplied their entire nutrient requirement. It is one of the central operations of the feed industry in view of its role in ensuring good nutrition. Feed cost account for more than 70% of the total production costs for most types of animal feed, so it is important that returns are maximized through use of adequate diets (www.Poultry.org).

Feed formulation is a central operations in animal feed production, ensuring that feed ingredients are economically used for optimum growth of rats and it requires a good knowledge of poultry and feed ingredients, so it is essential that formulation are accurate to ensure that large number of animal feeds are not adversely affected. For the animal production scientists, the manipulation of animal diet ingredients is the most effective way of regulating not only the animal growth rate but their reproduction and survival rates. In Nigeria, inadequate availability of ingredients for animal feed production is a major problem especially in the livestock industry. More than half the cost of raising meat farm animals is accounted for by the feed cost (Oyenuga 1969). In an attempt to keep peace with increasing demand for livestock for human consumption feed ingredient, feed scientist and nutritionists are always looking for cheap alternatives sources of feed ingredient that can raise livestock production to their desirable level.

A major setback to the use of non-conventional feed ingredient substitutes is the lack of concise nutritional information on the lesser known substitutes. Possible sources for non-conventional feed ingredients are millet, corn (carbohydrate) groundnut and crayfish (protein).

This present study was undertaken to find out the acceptability and digestibility of animal fed with feed formulation and to study the effect of its feeding on rats compared with those fed with control feed(Top feeds).

Materials And Methods

2.1 Formulation of feeds

The four different types of feeds (crayfish, millet, corn, and groundnut) to be formulated were purchased at Oje market at Ede Osun state. The feeds were grinded with machine to pellet size into different places and later mixed using different proportions to make 1000g.

2.2 Treatment of animals / monitoring

Feeding experiment was carried out with 16 Wister rats and they were weighed and randomly divided into four cages, groups 1 & 3 contained five rats while group 2 & control contained three. The rats were fed for 21days and for each diet 50g of feed was given to each Wister rats according to their daily allocated ratio. Cool fresh water was supplied daily and the cages were cleaned on a regular basis. The body weight changes were monitored by subsequently weighing every four days throughout the duration of the experiment.

2.3 Preparation of blood samples

After 20 days of feeding the rats with respective diets they were starved overnight and sacrificed using cervical dislocation method of Klaunberg et al (2004). Their blood samples was collected from the heart using needle and syringe into EDTA tubes for hematological analysis and some were collected into lithium heparinised bottle for other analyses. Blood was centrifuged at 3000g for 10mins to separate and obtain plasma. All chemicals and reagent were of analytical grade.

Haematological Analysis: PCV and WBC were carried out using Davis & Lewis (1991), while biochemical analysis which includes Total protein content was carried out using the method of Henry et al (1974), cholesterol carried out using Pearson (1996) which was revised by Randox (2010), Aspartate amino transferase (AST) and Alanine amino transferase (ALT) by Reitman & Frankel (1957) which was revised by Randox (2010).The efficiency of different types of feeds given to the rats was analyzed on the basis of consumption index, growth rate and efficiency of conversion of ingested feed as described by Waldbauer (1968).

Consumption index = $\frac{\text{weight of feed eaten}}{\text{Mean weight of animal X duration of experiment}}$

Growth rate (GR) = $\frac{\text{weight gained by animal}}{\text{Mean weight of animal X duration of feeding trial}}$

Efficiency of conversion Of ingested feed = $\frac{\text{weight gained by animal X 100}}{\text{weight of feed ingested}}$

Results And Discussion

This result shows that Group I & III consumed high quantity of food and their growth rate increased but when it got to the third fourth day it began to drop because most of the food they ate are passed out as faeces while little was ingested, while Group II and the control group eat less and their growth rate increased but when it gets to the fifth four days their growth rate drops but their efficiency of conversion of ingested food is high meaning they eat less and utilized the food this project agrees with (Devrajan et al 2004) which report decreased in ECI except in standard feed and lowest consumption index observed which might be result of poor acceptability of

3.1 DISCUSSION

On completion of this study, it was known that feed can be formulated for rats and this work showed that Group II which comprised of 600g of Corn, 200g of Millet, and 160g of Crayfish and 40g of groundnut had the lowest levels in PCV, WBC, and total protein, Cholesterol, ALT and AST. While Group I which comprises of 550g of Corn, 150g of Millet, 200g of Crayfish and 100g of Groundnut has increased level in cholesterol which is due to the fats that it contains high content of Groundnut. Group III comprises of 650g of Corn, 200g of Millet, 120g of Crayfish and 30g of Groundnuts which has high total protein which could attribute to kidney or liver diseases. And control feed.

The result of the packed cell volume in Table (4) shows that Group I has 52% of blood level while Group II has 51%, Group III has 51.4% and Control has 50.3% which means that their blood level are almost within the same range. That is the feed does not affect their blood level range because the PCV of rat was in the range of 36 – 54 % which agreed with the report of Ajanaku et al (2010) who reported normal PCV with rats fed with Brewery Spent Grains in dietary protein formulation in rats and disagreed with Andango et al.

(2007) who reported increased PCV. While the result shows that Group I had the highest white blood cell which was 15586, while Group II had 12727; Group III has 14190 while control had 12317. This indicated that Group II and Control groups have almost the same range while increase in Group l could attribute to infection in the cell of the liver.

Table (6) shows that Group l has the highest cholesterol which is 6.43m/mol while Group II has 2.90m/mol, Group II has 3.60m/mol and Control group has 2.73m/mol. This means that Group II (2.90m/mol) and Control group (2.73m/mol) are of the same range which means they have low cholesterol and according to Ganz & Nemeth (2006) reported reduced cholesterol in rat fed with iron fortified rice which may be caused by NaFeEDTA which has lowering effect and acts by decreasing the capacity of serum to transport cholesterol. High level of cholesterol (hypercholerestromia) in the serum of Group I could be due to the high content of groundnut in the feed which damage arteries and are potentially linked to disease such as those associated with the cardiovascular system (heart disease).

The results in Table 6 revealed that Group I had 74.9g/dl of protein, Group II had 60.5g/dl, and Group III had 81g/dl and Control group 61.2g/dl. This shows that Group I and Control group value were of the same range while Group I and III could attribute to kidney or liver diseases and this results agree with Ajanaku *et al* (2010) on the Histological studies of Brewery spent Grain in dietary protein formulation in donryu rats.

The serum AST and ALT levels in the different groups (Table 6) shows that the ALT levels in Group I (125.8u/l), Group II (128.3u/l), Group III (130.1u/l) control groups (132.5u/l) are normal compared to the control groups (132.5u/l). This agreed with the report of Ebuehi & Asonye (2011) who reported decrease in their activity which indicated proper functioning of the liver ; while the serum AST levels in the different groups showed slight increases i.e. Group I (182.1u/l), Group II (181.4u/l), Group III (183.4u/l) compared to the control group (180u/l) which might be due to liver damage. Increase in AST levels in the serum of the rats could attribute to liver damage at cellular level (Drotman & Lohorn 1978) and also to increased plasma membrane permeability (Ramazzatto & Carlin 1978). It is apparent from the study that Group I & III has the highest level of AST followed by Group II.

A perusal of results on consumption index (C.I), growth rate (G.R), and efficiency of conversion of digested food (E.C.I) revealed that maximum weight gain was recorded in Group II and control group while the lowest weight gain was observed in Group I & III. This result shows that Group I & III consumed high quantity of food and their growth rate increased but when it got to the third four day it began to drop because most of the food they ate was passed out as faeces while little was ingested, while Group II and the control group ate less and their growth rate increased but when it gets to the fifth four days their growth rate dropped. The efficiency of conversion of ingested food is high in Group II and control group and decreased in consumption index (C.I) which means they eat less and utilized the food this project agrees with (Devrajan et al 2004) which reported decrease in ECI.

Conclusion

It can be concluded that Group II which comprises of 650g of Corn, 200g of Millet, 120g of Crayfish and 30g of Groundnut is highly recommended as diet feed for rats because according to this study it simulated the reference diet (Top Feeds).

This study suggests Group II's formulated feed as feed diet for rats.

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BIOGRAPHY

Table 1 Proximate Analysis Of Formulated Feed

PROXIMATE ANALYSIS	MEAN ± S.D
MOISTURE	12.96 ± 0.3
LIPID	8.83 ± 1.77
PROTEIN	28.11 ± 1.57
ASH	3.37 ± 0.15
FIBRE	6.74 ± 1.57
CARBOHYDRATE	52.94 ± 4.52

(**UNPUBLISHED OBSERVATIONS**)

Table 2 Feed Analysis (A)

Parameters	GROUP I	GROUP II	GROUP III	CONTROL
C.I	7.13	6.86	7.77	4.63
G.R	1.68	2.1	3.03	0.88
E.C.I	25.6	3.4	45.6	25.0
			(B)	
C.I	6.56	6.18	6.65	4.48
G.R	3.76	2.40	3.16	1.40
E. C. I	69.6	44.4	56	44.4
			(C)	
C.I	10.78	10.90	11.30	8.29
G.R	1.70	2.19	2.04	1.30
E.C.I	18.3	22.4	20	19.76
			(D)	
C.I	9.91	9.77	10.20	7.78
G.R	1.81	2.45	2.03	1.88
E.C.I	21.28	28.34	22	29.56
			(E)	
C.I	9.05	8.63	9.21	7.1
G.R	1.38	1.60	1.31	1.74
E.C.I	16	23.8	16.67	28.51
			(F)	
C.I	8.47	7.97	8.68	6.50

G.R	1.35	1.60	1.21	1.72
E.C.I	16	33.33	14	44.70

KEY: C.I= Consumption index, **G.I** = growth rate, **E.C.I**= efficiency of conversion of ingested food.

A = first four days B= second four day C = third four day D = fourth four day E= fifth four days F = sixth four days

Table 3 Mean Body Weight

DAYS	**GROUP I (g)**	**GROUP II (g)**	**GROUP III (g)**	**CONTROL (g)**
0 day	73.6	76.5	67.6	113.3
1st	80.0	85.0	79.0	118.3
2nd	97.4	96.3	93.0	126.7
3rd	106.0	107.5	103.0	135.0
4th	116.0	121.7	114.0	148.3
5th	124.0	131.7	121.0	161.7

- Each value represents weight changes every 4th day

Table 4 Mean Body Weight Gain

DAYS	GROUP I	GROUP II	GROUP III	CONTROL
4th	6.4 ± 4.45	6.8 ± 3.47	11.4 ± 5.81	5 ± 0
8th	15.4 ± 3.88	13.8 ± 3.71	14.0 ± 5.83	8.3 ± 2.36
12th	8.6 ± 1.96	12.5 ± 7.50	12.0 ± 2.65	8.3 ±2.36
16th	10.0 ± 3.16	15.0 ± 4.08	11.0 ± 9.70	13.3 ± 2.68
20th	10.0 ± 5.92	8.3 ± 2.36	7.0 ± 5.10	13.3 ± 2.68

Table 5. Haematological studies of Formulated Rat diet

PARAMETERS	**GROUP I**	**GROUP II**	**GROUP III**	**CONTROL**
PCV (%)	52.0 ± 1.1	51.0 ± 2.2	51.4 ± 1.6	50.3 ± 2.1
WBC ($X10^3/mm^3$)	15586 ± 241.2	12727 ± 89.94	14190 ± 313.69	12317 ± 164.99

PCV = Packed cell volume (%), WBC = White blood cell ($x10^3/mm^3$), S.D = Standard deviation.

Table 6. Biochemical studies of Formulated Rat diet

PARAMETERS	**GROUP I**	**GROUP II**	**GROUP III**	**CONTROL**
CHOL (mmol/l)	6.43 ± 0.63	2.87 ± 0.05	3.55 ± 0.37	2.73 ± 0.15
TP (g/dL)	74.9 ± 6.4	60.5 ± 1.41	81 ± 4.84	61.2 ± 1.03
AST(ul)	125.8 ± 2.69	128.3 ± 2.94	130.1 ± 2.55	132.5 ± 6.63

ALT(u/l)	182.1 ± 3.03	181.4 ± 2.66	183.4 ± 3.16	180 ± 1.71

CHOL = Cholesterol (mmol/l), TP = Total protein (g/dL), AST = Aspartate amino transferase (u/l), ALT = Alanine amino transferase (u/l).

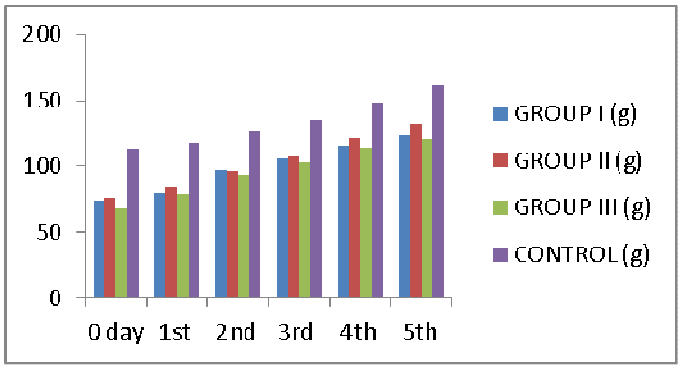

Figure 1 Mean Body Weight of Control And Test Group Rats

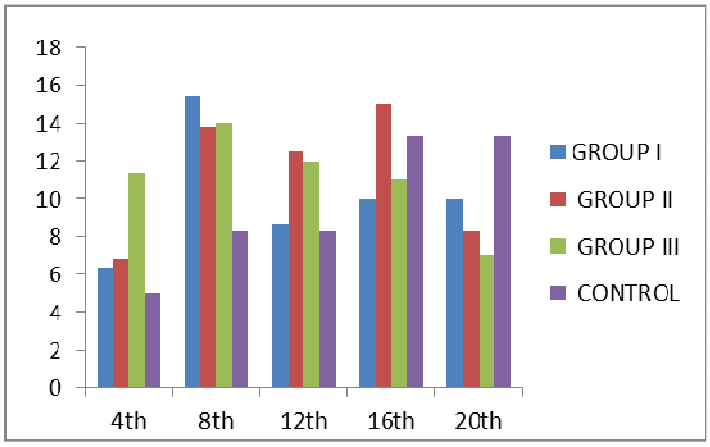

Figure 2 Mean Body Weight Gain Of Control And Test Group Rats

This graph shows the mean body weight gain which can be compared to the mean body weight. Control group shows appreciable weight gain i.e. there is increase in weight changes from 4^{th} to 8^{th} and 12^{th} to 16^{th}. Group I shows that there is heavy increase from 4^{th} to 8^{th} but decrease on the 12^{th} and increase on the 16^{th}. Group II shows that there is increase from 4^{th} to 8^{th} and 12^{th} to 16^{th}, while

Group III shows that there is increase from 4^{th} to 8^{th} but decrease from 8^{th} to 20^{th}.

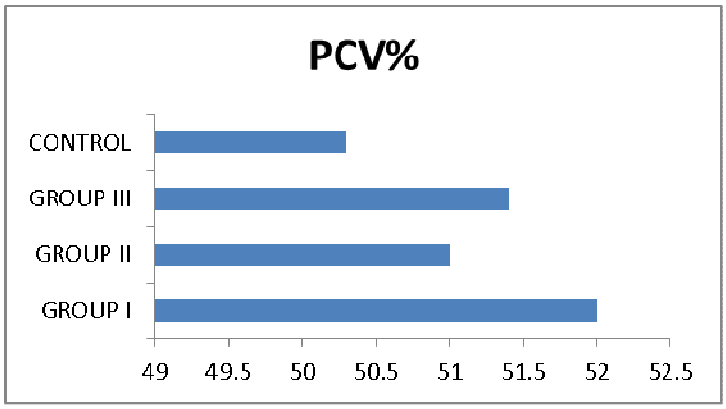

Figure 3 PCV% Chart

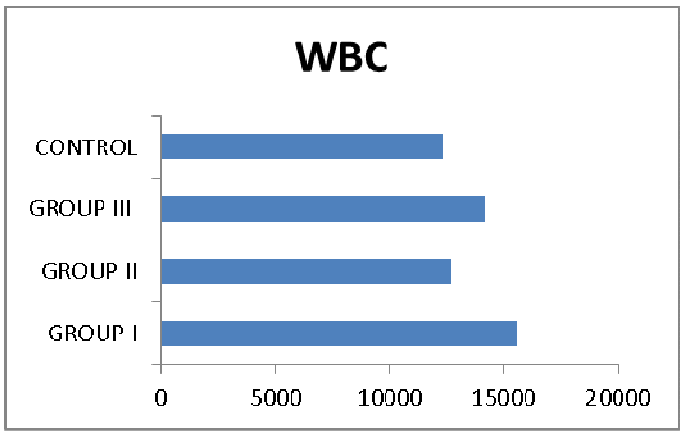

Figure 4 White Blood Cell Chart

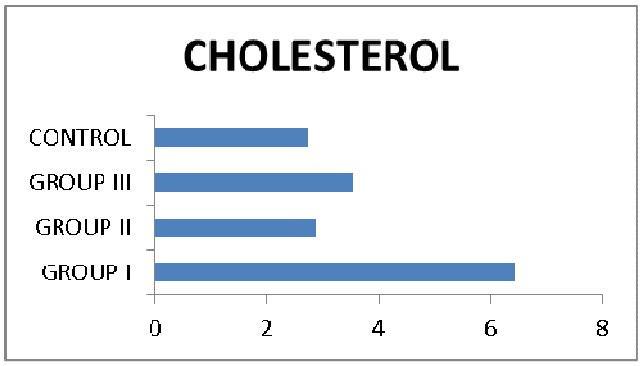

Figure 5 Cholesterol Content

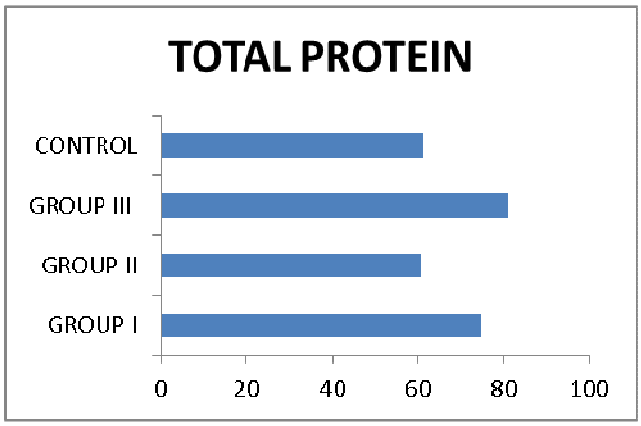

Figure 6 Total Protein Of Control And Test Rats

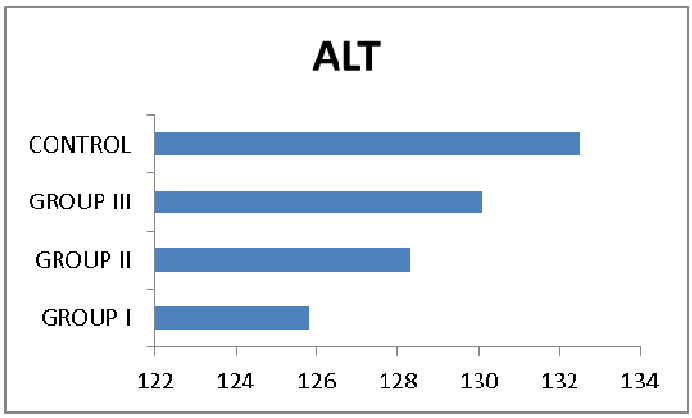

Figure 7 Showing ALT Values of Control And Test Rats

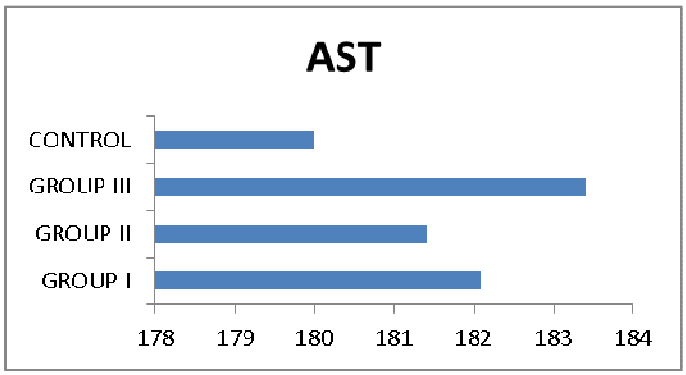

Figure 8 Showing AST Values Of Control And Test Rats