HAEMATOLOGICAL PARAMETERS OF RABBITS FED GRADED LEVELS OF SUNFLOWER SEED (*HELIANTHUS ANNUS* L.) CAKE

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ABSTRACT
The research was conducted to evaluate the dietary inclusion levels of sunflower seed cake (SFSC) on the haematological parameters of weaner rabbits. Forty-five (45) weaner rabbits of mixed breeds and sexes weighing 867-870 g were used, and randomly allotted into five (5) dietary treatment groups with 9 rabbits per treatment and 3 per replicate in a completely randomized design (CRD). Five diets were formulated containing SFSC at 0, 10, 20, 30 and 40% as dietary inclusion levels. Feed and clean water were offered ad libitum and all other management practices were strictly observed throughout the experimental period. Three rabbits from each treatment were randomly selected, 2mL blood samples were collected and taken into EDTA bottles for haematological analysis. Data generated were subjected to analysis of variance (ANOVA) and means were separated using Dunnett's Test. Result on the haematological parameters showed significant P<0.05) effect in PCV, HB, RBC, WBC, eosinophil, lymphocyte, MCH and MCH. However, the values obtained were within the normal range values reported for healthy rabbits. The values obtained for all parameters measured in this study indicated that the up to 40% SFSC in the diets of rabbits did not have any deleterious effects and the process of blood formation were not interfered on the animal during the experimental period.
Keywords: Sunflower seed cake, Haematology, Rabbits

INTRODUCTION

The increasing competition between human and livestock for available gains and feed coupled with Nigeria's neglect of Agriculture, has led to high cost of available feed resources. Agunbade *et al.* (2000) noted that apart from the fact that these are keenly competed for by humans, they are being imported into the country resulting in a situation that degenerate into a continuous rise in the cost of feed for human and animal feeding. Non-conventional feed ingredient could be processed into a high-quality feedstuff that can favourably supplement protein and energy sources which currently plays the dual purpose of feeding man and his livestock. Sunflower seed cake (SFSC) is the most important oil seed after soybean, rapeseed and cottonseed (Oil world, 2011). It has been used as animal feed, organic fertilizer and soil compost and research are being conducted for its human consumption (Vasudha and Sarla, 2021). It is a valuable and safe product whose protein, fibre and oil contents are highly variable due to variations in oil extraction process (Golob *et al.,* 2002). According to Babiker (2012), SFSC has crude protein of 31.57%, crude fat 11.20%, crude fibre 27.34%, ash 5.32% and nitrogen free extract 20.94%. Liu *et al*. (2015) reported 91.48% DM, 33.52% CP, 3.11% EE, 27.23% CF and 6.85% ash. In many instances, the contradictory reports on the nutritive value of SFSC have impeded its broad use as an alternative protein feedstuff even in geographical areas where sunflower seed cake is produced cheaply and in substantial amount it can replace more conventional and expensive protein sources such as soybean meal and groundnut cake (Soliman, 1997). A preliminary feeding trial conducted by Taiwo *et al*. (2005) using 23% sunflower meal did not have adverse effect on the performance, nutrient digestibility and serum chemistry of rabbits.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Rabbitry Unit, Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Zaria. Zaria is within the Northern Guinea Savanna zone of Nigeria, with Latitude 11^0 09′ 01.78″N and Longitude 7^0 39′ 14.79″E at an altitude of 671m above sea level (Ovimaps, 2021).

Sources of experimental animals, materials and diets

The rabbits used for this study were sourced from a reputable farm in Samaru, Zaria. The sunflower seed cake was sourced from Product Development Research Programme, Institute of Agricultural Research (IAR), ABU, Zaria. Other ingredients were sourced from Labar Feed Mill and Samaru market, Samaru, Zaria. Five (5) experimental diets (0, 10, 20, 30 and 40%) SFSC inclusion, respectively were formulated to meet the requirements in accordance to rabbits in the tropics (Aduku and Olukosi, 1990).

Table 1: Composition of experimental diets

	Graded levels of sunflower seed cake (%)				
Ingredients	**0**	**10**	**20**	**30**	**40**
Maize offal	33.50	33.50	33.50	33.50	33.50
Full fat soybean	28.20	25.20	22.40	19.60	16.80
Sunflower seed cake	0.00	2.80	5.60	8.40	11.20
Rice offal	35.00	35.00	35.00	35.00	35.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Common salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated Analysis					
ME (Kcal/kg)	2692.00	2676.74	2661.48	2646.22	2630.96
Crude protein (%)	16.48	16.35	16.23	16.11	16.00
Crude fibre (%)	17.67	17.82	17.96	18.11	18.25
Ether extract (%)	7.58	7.13	6.68	6.23	5.78

Experimental design and management of animals

Forty-five (45) weaner rabbits of mixed breeds and sexes (867-870g) with age ranging from 7-8 weeks were randomly assigned to five dietary treatment groups 9 rabbits/treatment and 3/replicate in a completely randomized design (CRD). Rabbits were housed in metal cages measuring 55 cm x 40 cm x 40 cm. The study lasted for eight weeks (56 days) after an initial one-week adjustment period for the rabbits to get accustomed to the feed and confinement. Proper sanitation and necessary routine management was carried out. Feed and water were supplied *ad libitum.*

Haematological parameters

Three rabbits were selected from each treatment group, 2mls blood was collected through the ear vein from each rabbit. The blood was taken into a bottle containing EDTA (as anticoagulant) for haematology analysis. These were determined following the standard procedures described by Davice and Lewis (1991). MCV, MCH and MCHC were calculated using RBC, PCV and Hb counts (Smock, 2019). The analysis was carried out at the Clinical Pathology Laboratory, Faculty of Veterinary Medicine, ABU, Zaria.

Statistical analysis

All data collected were subjected to analysis of variance (ANOVA) using General Linear Model (GLM) procedure of Statistical Analysis System (SAS, 2008). Significant differences among treatment means were separated using Dunnett's Test.

Result and Discussion

The result of haematological parameters of rabbits fed diets containing graded levels of SFSC is presented on Table 2. There were significant ($P<0.05$) differences in packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), white blood cell (WBC), eosinophils, lymphocyte, mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) values measured. The PCV values obtained were within the normal range of 33 – 50 % reported by Medirabbits (2011) and 30.00 - 50.00 % by Onifade and Tewe (1993). This indicated that the diets were suitable and adequate for the rabbits. PCV has been described as the most accurate means of determining RBC and could also be used to deduce Hb levels in the blood (Ogbuewu, 2012). The Hb concentration (10.81 – 14.28 g/dl) observed in this study indicated that the rabbits had sufficient blood pigment for proper transportation of oxygen. The lower Hb concentration in the blood may result to poor efficiency of oxygen

transportation and hence poor respiration (Solomon *et al.,* 2008). The RBC values obtained were within the range reported by Medirabbits (2011). The highest RBC value was obtained from rabbits fed 10%. Brown *et al*. (2000) opined that increased RBC values are associated with high quality dietary protein and with disease free animals. This also implies better utilization of the SFSC and that up to 40% inclusion level do not have any deleterious effect on erythropoietic tissues of rabbits. It is also an indication that the experimental rabbits had the ability to transport higher number of oxygens in their system which enhanced their health status. WBC are meant to fight diseases; the higher the WBC, the better for the animals (Ogbuewu *et al*., 2013). The values (9.40 – 11.80 x10^9/L) obtained suggested an adequate defense against infectious organisms and prevalent disease conditions. This result indicated that the rabbits were healthy because decrease in number of WBC below the normal range may be partly attributed to reduction of protein intake (Murray *et al*., 2003), an indication of infection of allergic conditions and certain parasitism while elevated values indicated the existence of a recent infection, usually bacteria (Jiwuba *et al*., 2016).

Table 2: Effect of feeding sunflower seed cake-based diet on haematological parameters of rabbits

	Graded levels of SFSC (%)						
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**	**Reference Value**
Packed Cell Volume (%)	38.67^a	40.00^a	35.00^b	35.00^b	35.33^b	0.83	33-50
Haemoglobin (g/dL)	12.33^b	14.28^a	12.70^b	10.81^c	12.60^b	1.00	9.4-17.4
Red blood cells (10^6/mm^3)	5.30^b	6.40^a	6.17^a	5.70^{ab}	6.17^a	0.34	3.8-7.9
White blood cells (10^9/L)	11.80^a	10.33^{ab}	11.67^a	9.40^b	11.80^a	0.74	5-13
Neutrophils (%)	43.67	44.00	42.67	41.33	42.00	1.16	25-60
Eosinophils (%)	1.67^a	1.33^a	1.67^a	1.33^a	1.00^b	0.16	0-2
Monocytes (%)	1.67	2.00	2.00	2.00	1.67	0.37	1-9
Lymphocytes (%)	57.00^a	57.67^a	53.67^b	53.00^b	52.67^b	1.00	43-80
MCV (*fl*)	72.89^a	63.54^b	65.40^b	61.40^b	57.75^b	3.18	50-75
MCH (pg/cell)	23.28^a	22.82^a	19.47^b	18.95^b	20.45^b	0.95	18-24
MCHC (%)	31.96	36.03	37.18	30.87	35.54	2.96	27-35

^{abc}: Means with different superscript on the same row differ significantly at P<0.05 SEM: standard error of mean Reference value: Medirabbits (2011)
SFSC: sunflower seed cake MCV: mean corpuscular volume MCH: mean corpuscular haemoglobin MCHC: mean corpuscular haemoglobin concentration

The significant (P<0.05) effect for eosinophil indicated that the rabbits were not affected by any serious disease. This agrees with Fradson (1986) who reported that increase in the number of eosinophils indicated chronic disease such as infection with parasites and also allergic reactions. There was significant (P<0.05) effect for lymphocyte values obtained implies that the rabbits across the treatments had adequate immune response status implying that the inclusion of SFSC at higher levels reduced the propensity of the rabbits picking infection and their immune system may have produced sufficient cytokines for combating some kind of infection as reported by Adeyemo and Longe (2007); the least values of these counts were observed in 40 % SFSC. The MCV, MCH and MCHC are useful for the diagnosis of anaemia in most animals (Njidda *et al.,* 2006) and the values obtained were within the range reported by Medirabbits (2011). The values obtained for all parameters measured in this study indicated that the diets did not have any deleterious effects and the process of blood formation were not interfered on the animal during the experimental period.

CONCLUSION

It is concluded that up to 40% inclusion level of sunflower seed cake do not have any deleterious effect on the haematological parameters of rabbits

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