SERUM BIOCHEMICAL INDICES AND LIPID PROFILE OF RABBIT DOES FED DIETS CONTAINING SUPPLEMENTAL LEVELS OF DATE (*Phoenix dactylifera* L.) FRUITS MEAL

***Tom, E. E., Solomon, I. P., Istifanus, E. F. and Ebe, I. A.**
Department of Animal Science, Faculty of Agriculture, University of Uyo, Uyo, Akwa Ibom State
*Corresponding author: ememdavid1@gmail.com

ABSTRACT
This study was carried out to assess the serum biochemistry and lipid profile in female rabbits fed dried date fruit meal (DDFM) as supplement in their diets. Thirty-six female rabbits (does) were used for the study. The does were randomly allotted to four experimental groups in a completely randomized design which had nine does in each treatment, and further replicated three times to have 3 rabbit does in each replicate. The four experimental diets containing dried date fruits meal at 0.00, 0.50, 1.00 and 1.50%, respectively were tagged T1, T2. T3, and T4. At the end of the study, two separate blood samples, 3ml each, were collected from each replicate for serum biochemistry and lipid profile determination. Data obtained were subjected to one-way analysis of variance. The results showed that the serum biochemistry of the does fed diets containing varying levels of DDFM revealed significant differences in total protein, globulin, albumin, urea, and alkaline phosphatase (ALP), while aspartate aminotransferase (AST), alanine aminotransferase (ALT), and glucose levels remained unaffected. Significant differences ($p<0.05$) were observed in triglyceride, total cholesterol, and LDL concentrations. Triglyceride levels were significantly higher in T2 (1.05 g/dL) than in T1 (0.80 g/dL), but comparable to T3 (0.95 g/dL) and T4 (1.00 g/dL), respectively. In conclusion, date fruits meal supplementation in female rabbits' diets up to 1.50% does not have deleterious effect on their serum chemistry and lipid profile.
Keywords: Female rabbits, Dates, Biochemical indices, Lipid profile, Mongrel rabbit

INTRODUCTION

Rabbits produce a nutritious white meat that is high in protein and low in fat and cholesterol than chicken, turkey, beef, or pork (Flanders, 2012). Compared with the meat of other species, Flanders (2012), stated that rabbit meat is richer in proteins and certain vitamins and minerals. According to Hassan *et al.* (2012), the rabbit's fast growth rate, high prolificacy, high genetic selection potential, high feed conversion efficiency and economic utilization of space make them suitable for increased animal protein production. Date fruit is nutritionally rich, providing a balanced mix of macronutrients, micronutrients, and bioactive compounds. Barakat and Alfheeaid (2023) highlighted the fruit's composition, noting that it is primarily composed of carbohydrates, fibre, and protein, with minimal fat content. Dates also contain an array of vitamins, minerals, and phytochemicals that enhance their value as a functional food.

MATERIALS AND METHODS

Experimental Site

The research was carried out at the Rabbit Unit of the Teaching and Research Farm, Department of Animal Science, University of Uyo, Akwa Ibom State.

Sourcing and Processing of Test Materials

Dried date palm fruits were procured from a local market in Itu Local Government Area, Akwa Ibom State. The fruits were subjected to air drying and subsequently milled using an electric grinding machine to obtain dried date palm fruit meal (DDFM).

Experimental Animals and Management

Thirty-six female growing rabbits aged between eight and ten weeks were utilized for the study. A two-week acclimatization period was implemented, during which the rabbits received a formulated ration. Subsequently, the rabbits were randomly assigned to four treatment groups, each receiving a diet containing varying levels of DDFM: 0.00% (control), 0.00%, 0.50%, 1.00 and 1.50%, respectively. Prior to the commencement of the experiment, prophylactic measures were taken to address internal and external parasites through subcutaneous administration of ivermectin injection (0.1 ml/rabbit). Throughout the 168-day (24-week) experimental period, the rabbits were provided with feed, water, and forages *ad libitum*. Weekly weights were taken to monitor growth progress.

Experimental diets

Four experimental diets were formulated to contain varying levels of DDFM: 0.00% (control), 0.50%, 1.00%, and 1.50%, designated as T1, T2, T3, and T4, respectively. The control diet (T1) served as a baseline, containing no DDFM.

Table 1: Experimental Diets

Ingredients	T_1 (0.00% DDFM)	T_2 (0.50% DDFM)	T_3 (1.00% DDFM)	T_4 (1.50% DDFM)
Maize	45.00	45.00	45.00	45.00
Soybean cake	21.00	21.00	21.00	21.00
Wheat Offal	17.10	17.10	17.10	17.10
Rice offals	5.00	5.00	5.00	5.00
Palm Kernel Cake	8.00	8.00	8.00	8.00
Bone meal	3.00	3.00	3.00	3.00
Common salt	0.25	0.25	0.25	0.25
Vit-Premix	0.25	0.25	0.25	0.25
Lysine	0.20	0.25	0.25	0.25
Methionine	0.20	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00
Calculated Composition				
Metabolizable Energy (Kcal/Kg)	2806.30	2806.30	2806.30	2806.30
Crude Protein (%)	17.15	17.15	17.15	17.15
Crude fibre (%)	5.56	5.56	5.56	5.56
Ether Extract (%)	6.87	6.87	6.87	6.87

Data collection

At the end of the study, 3ml blood samples were collected from each replicate via the ear veins of the does into a plain sample bottle without anticoagulant for serum biochemical studies. Another 3ml was collected into collected from a random doe in each replicate for the determination of lipid profile in the rabbit does.

Statistical Analysis

The experimental data was subjected to analysis of variance (ANOVA) procedure using IBM Statistical Package for the Social Sciences (SPSS) version 21. Differences between treatment means were separated using Duncan's multiple Range Test of the same software.

RESULTS AND DISCUSSION

Serum Biochemistry of Rabbit Does Fed Diets Containing Dried Date Fruits Meal

The serum biochemistry of rabbit does fed diets containing varying levels of dried date fruits meal (DDFM) revealed significant differences ($p<0.05$) in total protein, globulin, albumin, urea, and alkaline phosphatase (ALP), while aspartate aminotransferase (AST), alanine aminotransferase (ALT), and glucose levels remained unaffected.

Table 2: Serum biochemistry of rabbit does fed diets containing dietary levels of dried date fruit meal

Parameters	T1	T2	T3	T4	SEM
Total protein (g/dL)	76.50^{a}	70.50^{b}	54.50^{c}	57.00^{c}	2.81
Globulin	39.00^{a}	36.50^{a}	23.50^{b}	23.50^{b}	2.23
Albumin	37.50^{a}	34.00^{b}	31.00^{b}	33.50^{b}	0.75
Urea (mmol/L)	5.15^{ab}	5.35^{a}	5.05^{ab}	4.80^{b}	0.07
AST ((µ/L)	44.50	64.00	53.00	58.50	3.51
ALP ((µ/L)	19.00^{b}	32.00^{a}	19.00^{b}	21.00^{b}	1.81
ALT ((µ/L)	19.00	1850	17.50	20.50	0.50
Glucose (g/dL)	3.10	2.90	3.00	3.10	0.04

AST - Alanine aspartate aminotransferase; ALP – Alanine amino phosphatase; ALT - Alanine aminotransferase; SEM – Standard error of means; Means with different superscripts are significant ($p<0.05$)

Total protein levels were significantly higher in T1 (76.50 g/dL) and T2 (70.50 g/dL) compared to T3 (54.50 g/dL) and T4 (57.00 g/dL). This observation aligns with the findings of Essien (2024), who reported improved serum protein concentrations in animals fed plant-based diets, emphasizing that higher protein levels reflect better protein metabolism and liver function. The decreased protein levels in T3 and T4, however, may indicate that excessive inclusion of DDFM could limit protein synthesis or increase protein utilization for growth, as noted by Malik *et al.* (2022). Globulin concentrations, an indicator of immune function, were significantly higher in T1 (39.00 g/dL) and T2 (36.50 g/dL) than in T3 (23.50 g/dL) and T4 (23.50 g/dL). Elevated albumin levels in T1 and T2 suggest better protein utilization and liver health, as also reported by Soetan *et al.* (2013).

ALP activity was significantly higher in T2 (32.00 µ/L) compared to T1 (19.00 µ/L), T3 (19.00 µ/L), and T4 (21.00 µ/L). ALP is associated with liver and bone metabolism, and its elevated levels in T2 may reflect increased bone activity or liver enzyme stimulation, as highlighted by Essien *et al.* (2024). Conversely, AST, ALT, and glucose levels remained within normal ranges and showed no significant differences across treatments, indicating that DDFM supplementation did not adversely affect liver integrity or glucose metabolism. These results align with Reece *et al.* (2015), who emphasized the stability of these parameters in healthy animals.

Lipid Profile of Rabbit Does Fed Diets Containing Dietary Levels of Dried Date Fruits Meal

The lipid profile of rabbit does fed diets containing varying levels of dried date fruits meal (DDFM) is presented in Table 4.4. Significant differences ($p<0.05$) were observed in triglyceride, total cholesterol, and LDL concentrations. Triglyceride levels were highest in T2 (1.05 g/dL) and significantly higher than those in T1 (0.80 g/dL), but comparable to T3 (0.95 g/dL) and T4 (1.00 g/dL). Triglycerides, the primary form of lipid storage, are transported as lipoproteins and play critical roles in energy metabolism (Frandson *et al.*, 2009). However, contrasting results from Awan *et al.* (2019) showed reduced triglycerides in rats fed dates, highlighting possible species-specific differences in lipid metabolism. The total cholesterol levels were highest in T2 (3.00 g/dL) and T1 (2.90 g/dL), significantly higher than T3 (2.15 g/dL) and T4 (2.35 g/dL). The lowest LDL value was found in T4 (0.80 g/dL), which was significantly lower than the other treatments, which had comparable values: T1 (1.25 g/dL), T2 (1.50 g/dL), and T3 (1.50 g/dL). However, no significant differences were observed in HDL and VLDL levels across all treatments, with values of 1.15, 1.05, 1.00, and 1.05 for T1, T2, T3, and T4, respectively, and 0.50 and 0.45 for VLDL in T1, T2, T3, and T4, respectively. This stability may indicate that DDFM inclusion does not adversely affect HDL production, which aligns with findings by Ansari *et al.* (2020) who observed consistent HDL levels in animals fed plant-based supplements.

Table 3: Lipid profile of rabbit does fed diets containing dietary levels of dried date fruit meal

Parameters	T1	T2	T3	T4	SEM
Triglyceride	0.80^{b}	1.05^{a}	0.95^{ab}	1.00^{a}	0.03
Total cholesterol	2.90^{a}	3.00^{a}	2.15^{b}	2.35^{b}	0.11
HDL	1.15	1.05	1.00	1.05	0.03
VLDL	0.50	0.45	0.50	0.45	0.01
LDL	1.25^{a}	1.50^{a}	1.50^{a}	0.80^{b}	0.09

CONCLUSION

Conclusively, dates fruits meal supplementation in female rabbits' diets at up to 1.50% does not have deleterious effect on the serum chemistry and lipid profile of rabbit does.

REFERENCES

Ansari, R. A., Rabiu, K. M., Ayuba, V. and Omolabake, O. O. (2020). Review on *Jatropha tanjorensis* (Hospital too far); significance as an anti-anaemia plant. *International Blood Research and Review;* 11(4):1–7

Awan, K. A., Butt, M. S., Ashfaq, F., Munir, H. and Suleria, H. A. R. (2019). Effect of date fruit supplemented diet on serum lipidemic and oxidative stress biomarkers in rodent experimental modelling. *International Food Research Journal,* 26(4): 1143-1153

Barakat, H. and Alfheeaid, H.A. (2023). Date Palm Fruit (*Phoenix dactylifera*) and Its Promising Potential in Developing Functional Energy Bars: Review of Chemical, Nutritional, Functional, and Sensory Attributes. *Nutrients*, 15, 2134. https:// doi.org/10.3390/nu15092134

Essien, C. A., Sam, I. M. and Okon, U. M. (2024). Effect of date palm waste on growth performance, and nutrient digestibility of weaner rabbits. *Proceedings of 49th Annual Conference of Nigerian Society for Animal Production, 24 – 27 March, 2024, University of Ibadan, Nigeria.*

Flanders, F.B. 2012. Exploring Animal Science. *Delmar Cengage Learning 5 Maxwell Drive Clifton Park*, NY 12065-2919 USA

Frandson, R. D., Wilke, W. L. and Fails, A. D. (2009). Anatomy and physiology of farm animals seventh edition. *Wiley-Blackwell, A John Wiley & Sons, Inc., Publication*

Reece, W. O., Erickson, H. H., Goff, J. P. and Uemura, E. E, (2015). Dukes' Physiology of Domestic Animals Thirteenth Edition. *Wiley Blackwell, John Wiley and Sons, Inc*., Publication

Soetan, K. O., Akinrinde, A. S., and Ajibade, T. O. (2013). Preliminary studies on the haematological parameters of cockerels fed raw and processed guinea corn (Sorghum bicolour) *Proceedings of 38th Annual Conference of Nigerian Society for Animal Production*. 49-52