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Haematological and Biochemical Indices of Rabbits Fed Graded Levels Browse Forage *(Balanites aegyptiaca)* in Semi Arid Environment

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Abstract- The study was conducted to assess the effects of graded levels of browse forage (Balanites aegyptiaca) *leaves* inclusion in the diets of growing rabbits on haernatological and biochemical indices. Five diets were formulated, treatment 1(control), 2 3 4 and 5 in which Groundnut haulm was replaced with Balanites aegyptiaca at 0%, 5%, 10%, 15%, and 20% respectively. Thirty (30) four weeks old weaner rabbits of different breeds (chinchilla x California x New Zealand) used for the experiment were allotted to the five treatments (T_1, T_2, T_3, T_4, and T_5) with two rabbits per replicate and six rabbits per treatment in a randomized complete block design. The trial lasted for 9 weeks. Effects of the diets on haematology and serum chemistry were elicited on the results. The result shows that Balanites aegyptiaca supplementation at these levels had no adverse effect on red blood cell counts, white blood cell counts, packed cell volume and haemoglobin. All the parameters differ significantly ($P<0.05$) with the exception of mean corpuscular haemoglobin which show a significant difference among treatments. The cholesterol, creatinine and the blood urea levels were significantly \aried. In conclusion, Balanites aegyptiaca leaves supplementation in the diets of weaner rabbits could be included from 5% upto 20% without any adverse effects on the blood parameters, However, 20% inclusion was found to be the optimum, and there for recommended.

Keywords: balanites aegytiaca, rabbits, haematology, biochemistry.

I. Introduction

The need to increase livestock production as a means of alleviating the overwhelming shortage of animal protein is very vital to humanity, Fielding (1991). The demand for protein of animal origin in Nigeria is greater than the supply, Akinmutimi and Onwukwe (2002). There is therefore acute shortage of animal protein in the diet of many Nigeria, demanding that effort should be directed to livestock that are prolific and have short gestation interval such as rabbit. Fielding(1991) reported that in Nigeria, the rabbits are being used as a valuable source of animal protein in rural communities, and for' scientific research in academic institutions. Their small sizes with maximum weight less than 1.5 kg each make llemconsenient rations for one meal in a small family and invaluable laboratory animals for scientific research.

Browses are important in providing nutrient to grazing ruminants in arid and semi-arid environments where inadequate feeds are a major constraint for livestock production (Aganga and Tshwenyane, 2003). Tree fodders maintain higher protein and mineral contents during growth than grasses, which decline rapidly in quality with maturity (Shelton, 2004). Tree fodders are important source of nourishment for grazing ruminants and as supplements to improve the productivity of herbivores fed on low quality feeds. Browse forages form part of the complex interactions between plants, animals and crops (Aganga and Tshwenyane, 2003), the positive aspect of which is to help balance a plant-animal-soil ecosystem from which there is sustainable source of feeds (Devendra, 1994).

Balanites aegyptiaca is a specie of tree growing in different ecological conditions. It can thrive well in areas with 100 to 1000 mm annual rainfall and mostly distributed in semi arid and arid zones of tropical Africa (Von Maydell, 1983). This specie of tree is available in the Northern part of Nigeria with highest number in the Northeastern Nigeria. Balanitesaegyptiaca have been reported to have anti-inflamatory and analgesic, anthelmintic, antioxidant, antidiabetic, antinoceptic, hepatoprotective, antibacterial and larvicidal activities in animals (Dubey*et al.,* 2011). Balanites aegyptiaca like AcaciaSenegal, (Diallo, 1997) and *A.* nilotica (Tybirk, 1989) shows a synchronization between male (internal stamina cycle) and female phase (Ndoye*et al.,* 2004). Balanitesaegyptiaca being a browse plant have been reported to improve the feeding potential of ruminant animals in the semi arid (Njidda and Ikhimioya, 2010).

Haematological parameter is an important and reliable medium used to monitor and elevate health and nutrition status of animals, Gupta et al. (2007). Blood composition of animal might be influenced by certain factors such as nutrition, management, and great of

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animals, sex, age diseases and stress factors that might affect blood values (Schalm*et al.,* 1975).The hematological and biochemical indices are an index and reflection of the effects of dietary treatment on the animals in terms of the type and amount of feed ingested and were available for the animals to meet its physiological geochemical and metabolically necessities (Ewuola *et al.,* 2004) and also the level of anti-nutritional element of or factors present in the feed also influence the hematological and biochemical values (Akinmutimi, 2004).

This present study is therefore carried out to determine the effects of graded levels of inclusion of Balanites aegvptiaca in the diets of weaner rabbits on their haematological and serum biochemical parameters.

II. Materials and Methods

Thirty rabbits (New Zealand white breed), 6-10 weeks of age, were randomly assigned to four dietary treatment groups with four rabbits per treatment.These rabbits in each treatment were housed in hutches measuring 45 x 30 x 42 cm. These rabbits were randomly divided into four equal groups and assigned to four experimental diets designed as T_1, T_2, T_3, T_4 and T_5 contained0 (control), 5, 10, 15, and 20% Balanites aegytiaca inclusion levels. (Table 1). The experimental diets were analyzed for dry matter (DM), crude fiber (CF), crude protein (CP), ether extract (EE) and ash according to AOAC (2002) methods (Table 2). The feeds were also analysed for neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) according to Van Soest*et al.,* (1991). The experimental diets and clean drinking water were supplied to the rabbits ad libitumthroughout the experimental period of nine weeks.

Blood samples with (EDTA) and without anticoagulant were collected from marginal ear veinbefore slaughter. From each treatment, the blood samples were collected in triplicate. Blood samples collected with EDTA were sued to determine packed cell volume (PCV), red blood cell counts (RBC), white blood cell (WBC) counts and the hemoglobin in blood samples. The PCV,

RBC, WBC and Hb values were determined using the Wintrobe'smicrohaematocrit, improved Neubauerhaemocytometer and cyanomethae- moglobin method respectively (Coles, 1986). The mean corpuscular hemoglobin (MCH) was calculated according to Bush (1991). Blood samples collected without anticoagulant were subjected to serum procurement which were then used to determine the biochemical components. Serum glucose and urea were estimated by methods described by WHO (1980) while total cholesterol was determined by colorimetric enzyme method as outlined by Bush (1975). Similarly, serum total protein, albumin and globulin concentration were determined by Biuret reactions (Bush, 1975).

III. Experimental design and treatments

Five experimental diets were compounded with diet 1 (control) containing 0 kg of Balanites aegyptiaca while diets 2, 3, 4 and 5 contained 5, 10. 15 and 20% of Balanites aegvptiaca respectively as shown in Table 1. Thirty Weaner Rabbits of mixed breeds (chinchilla x California x New Zealand white) of 4 to 5 weeks of age and weighing averagely 0.6 kg (0.5-0.7 kg) were randomly divided into five groups of six per group. The animals were assigned to the experimental diets in a complete randomized block design..

IV. Results and Discussion

The results of the chemical composition of the experimental diets are shown in Table 2. The results shows that the five diets adopted for the feeding trials had comparable chemical components despite the dietary inclusion of Balanites aegyptiaca at graded levels (0, 5, 10, 20%) in the diets fed to weaner rabbits. The values of crude fibre (CF), Acid detergent fibre (ADF), Neutral detergent fibre (NDF) and Dry matter (DM) digestibility were higher in Treatment 3. The Ether extract (EE) levels (4.49 to 6.35 g kg^{-1} DM) increased with increase in level of Balanites aegyptiaca leaves in the diets. The crude protein content (CP) ranged from 178.60 in T1 to 278.00 g kg^{-1} DM in T5 which is adequate for for growing rabbits. The values are similar to those reported by Njidda and Isidahomen (2010). The crude fibre levels of the diets were higher than the 25% recommended by Irbeck (2001) for growing rabbits though higher levels in this study does not seem to pose any problem. The fat component of the diets as represented by the Ether extract values were not within the range (20-25%) fat levels recommended for young rabbits by Irlbeck (2001). The dry matter content of the diet was observed to be higher in all the treatments with the highest value in T_3 (90.75%). The ADL values ranged from 51.6 to 62.6 g kg^{-1} DM. The values were much lower than those reported by Okoli*et al*. (2003) for southeastern browses of Nigeria. The values for NDF were observed to be significantly higher ($P<0.05$) in T_3. The NDF values are however lower compared to the values reported by Njidda (2011) for semi arid browse forages.

The results of the haernatological indices are presented in Table 3. There was significant difference ($P< 0.05$) among treatment groups for all the haernatological parameters except for mean corpuscular haemoglobin (MCH). The PCV values (37.40 to 47.90%) were within the range of 33 to 50% reported by Hillyer (1994) for growing rabbits. The values obtained for all the treatment groups indicate

nutritional adequacy of all diets since values did not indicate mal-or-under nutrition (Church *et al*. 1984). The RBC values were within the range 3.07 to7.50 x10^6/mm3 as reported by Fudge (1999). The WBC ranges from 6.40 to 12.90 x10^3 mm^3 as reported by Hillyer (1994) for healthy young rabbits. This shows that the animals were healthy because decrease in number of WBC below the normal range is an indication of allergic conditions, anaphylactic shock and certain parasitism, while elevated values (leucocytosis) indicate the existence of a recent infection, usually with bacteria (Ahamefule *et al.,* 2008). The Hb values falls within the range of 9.0-17.4 g/dl by Njidda *et al*. (2006). Hackbath*et al*. (1983) found that there was a strong influence of diet on haernatological traits with PCV and Hb being very strong indication of nutritional status of animals. The value for MCV and MCHC were higher in T_2 and T_5 respectively. This may be due to the negative interaction between protein and energy levels in the diets. The values for MCH showed no significant difference among treatments.

The results of the blood chemistry arc presented in Table 5. The Globulin values, Albumin, Blood urea, Total protein, Creatinine and Cholesterol all showed significant difference ($P<0.05$) among treatments. The blood urea ranged from 2.5 to 4.2 mmol/l. The values were within the range (2.50 to 5.80 mmol/l) reported by Njidda and Isidahomen (2011) and 2.60 to 4.90 mmol/l reported by Njidda and Isidahomen (2010) who fed sesame seed meal and grasshopper meal to rabbit in tropical environment. The values were lower compare to that obtained in temperate regions (4.6 to 10.4) reported by Duncan and Prasse (1986). For cholesterol, T_3 has the highest mean value of 199mmol/l and differ significantly ($p<0.05$) from other treatments. The Globulin values for T_2 (0.2 g/dl) and T_3 (0.8 g/dl) were much lower than the values reported by Duncan and Prasse (1986) while that of T_1 (2.9 g/dl) falls within the range (1.94 to 2.26 g/dl) reported by Onifade and Tewe (1993) who fed various tropical energy feed resources to growing rabbits. The total protein values (4.0 to 7.2 g/dl) were within the range reported by Anon (1980) and the range (5.81to 6.75 g/dl) reported by Onifade and Tewe (1993). The normal values for albumin, total protein and globulin obtained in this study indicates nutritional adequacy of the dietary proteins for the rabbits. Abnormal serum albumin usually indicates an alteration of normal systematic protein utilization, Apata (1990), low dietary protein intake, Onifade and Tewe (1993). The cholesterol level (87 to 199 g/dl) was higher than the range (20 to 83 g/dl) reported by Njidda *et al.* (2006). The results for sodium, potassium, calcium, phosphorus and magnesium showed significant difference ($p<0.05$) among treatments. The values of these minerals in the blood were generally higher than the reported values of PGCVS (1990) and Njidda *et al.* (2006). The higher values may be attributed to high content of minerals in the browse forage. Tree and shrub fodders are an important source of supplementary protein, vitamins and minerals in developing countries and also important in providing nutrient for grazing ruminants in arid and semi-arid environments where inadequate feeds are a major constraint for livestock production (Aganga and Tshwenyane, 2003). These fodders maintain higher protein and mineral contents during growth than do grasses, which decline rapidly in quality with progress to maturity (Shelton, 2004).

V. Conclusion

The results obtained in this study suggest that inclusion of Balanitesaegyptiaca up to 20% in the diets does not have any negative effect on haematological and biochemical indices of growing rabbits.

References References References

1. Aganga, A. A. and Tshwenyane, S.O. (2003). Feeding values and Anti-nutritive factors of forage tree legumes. *Pakistan Journal Nutrition* 2 (3): 170-177.
2. Ahamefule FO, BE Obua, I A, Ukweni, MA Oguike and RA Amaka, 2008. Haematological and biochemical profile of weaner rabbits fed raw or processed pigeon pea seed meal based diets. Afr J Agric Res, 3: 315-319.
3. Akinmutimi, A.H (2004). Evaluation of sword bean (Canavalia gladiate) as an alternative feed resources for broiler chickens. phD thesis MichealOkpara university of Agriculture, Umudike, Nigeria.
4. Akinmutimi, A.H. and C.C. Onwukwe, 2002. Effect of cooking with various concentrations of potash on Nutrient composition of lima beans. J. Agri. Biotech 1: 1 – 3.
5. AOAC, 2002. Official Methods of Analysis of the Official Analytical Chemists. (W. Horwitzed) 17th Ed, Association of Official Analytical Chemists, Washington DC USA.
6. Apata, D. F. (1990). Biochemical, nutritional and toxicologiclal assessment of some tropical legume seeds. PhD Thesis, University of Ibadan, Nigeria 247Pp.
7. Azab, M.E and Abdal-Maksoud, H.A (1999). Changes in some Haematological and biochemical parameters during pre-partum and post-partum periods in female Baladi goats. Small Ruminant Research 34:77-85.
8. Bush, BM, 1975. Veterinary Laboratory Manual. William Heineman Medical Books Ltd., London, UK.
9. Bush, B. M. (1991). Interpretation of Laboratory results for small Animal Clinicians. Blackwell Scientific Publications. London, UK, pp: 32 – 67.

10. Church, J. P., Judd, J. T., Yong, C. W., Kebay, T. L. and Kim, W. W. 1984. Relationship among dietary constituents and specific serum clinical components of subjects eating self- selected diets. Amer. J. Clin. Nutri. 40: 1338 – 1344.
11. Coles EH, 1986. Veterinary Clinical Pathology. 4th Ed., W.B. Saunders, Philadelphia, USA.
12. Devendra, C. (1994). Composition and nutritive value of browse legumes, pp. In: Forage tree legumes in tropical agricultures 49-65.
13. Diallo, I. (1997). Biologiefloraleetpollinisation chez Acacia Senegal (L.) Wild. Acta bot. Gallica. 144 (1). 73 – 82.
14. Dubey, P. K., Yogi, M., Bharadwaj, A., Soni, M. L., Singh, A. and Sachan, A. Kr (2011). Balanites aegytiaca (L.) Del., a semi arid forest Tree: A Review. Academic Journals of `Plant Scioence 4(4): 12 – 18.
15. Duncan, J. R. and Prasse, K. W. (1986). Veterinary Laboratory Medicine, 2nd ed., Iowa State University Press.
16. Ewuola E.O., Falayan O.A, Cibore, F.A., Adebunmi, A.I Akanji R.A., Ogunlade J.T. and Adeneye J.A (2004). Physiological response of growing west African Dwarf goats fed groundnut shell-based diets as concentrate supplements. BOWEN J. Agric 1 (1): 61-69.
17. Fielding D, 1991. Rabbits. The Tropical Agriculturalist. CTA. Macmillan Education Ltd. Macmillan Publishers London, UK, pp: 16–17.
18. Fudge, C. S. (1999). Laboratory Medicine: Avian and Exotic Pets. WB Saunders, Philadelphia, USA.
19. Guinand Y and Lemessa D. (2001). Wild Food Plants in Ethiopia: Reflections on the Role of Wild Foods and Famine Foods at a time of Drought. In Kenyetta C. and Henderson A. 2001. The potential of Indigenous Wild Foods. Workshop proceedings. USAID/OFDA, Mombassa, Kenya.
20. Gupta, A.R., Putra, R.C, Sani, M. Swarup, D. (2007). Haernatology and Serum Biochemistry of Chital (Axis axis) and Backing Deit (MuntiacusMuntiyax) Reared in semi-Captivity. Veterinary Research Communication, 3 1:801-808.
21. Hackbath, H., Buron, K. and Schimansley, G. (1983) Strain differences in inbred rats: Influence of strain and diet on haematological traits. Lab. Anim. 17: 7 – 12.
22. Hillyer EV, (1994). Pet Rabbits. The Veterinary Clinics of North America, Small Animal Practice, 24(1):25-65.
23. Iribeck NA, (2001). How to Feed the Rabbit (OrytolagusCuniculus) *Gastro-Intestinal Tracts J.* AnimSd*, 79* (Suppi): 343-346.
24. Ndoye, M., Diallo, I. and Gassama/Dia, Y. K. (2004).Reproductive Biology in Balanites aegytiaca (L.) Del., a semi arid forest tree. African Journal of Biotechnology 3(1): 40 – 46.
25. Njidda AA, JU Igwebuike and CE Isidahomeh, (2006): Haematological parameters and carcass characteristic of weanlig rabbits fed graded levels of molasses. Global J AgriSci, 5: 167– 172.
26. Njidda A A and C E Isidahomen, 2011. Hematological parameters and carcass characteristics ofweanling rabbits fed sesame seed meal (Sesamumindicum) in a semi-arid region. Pak Vet J, 31(1): 35-39.
27. Njidda A A and C E Isidahomen, 2010. Hematology, Blood chemistry and carcass characteristics of growing rabbits fed grasshopper meal. Pak Vet J, 30(1): 7 - 12.
28. Njidda, AA. (2011). Evaluation of the potential nutritive value of browse forages of semi-arid region of Nigeria. Ph D Thesis, Department of Animal Science, Ambrose Alli University, Ekpoma Nigeria. 219pp.
29. Njidda, A. A. and I. Ikhimioya (2010). Nutritional evaluation of some semi-arid browse forages leaves as feed for goats. *European Journal of Applied Science* 2(3): 108-115.
30. Okoli, I. C., Maureen, O., Anunobi, O., Obua, B. E. and Enemuo, V. (2003). Studies on selected browses of southeastern Nigeria with particular reference to their proximate and some endogenous anti-nutritional constituents. *Livestock Res. Rural Dev.* 15 (9): 3-7.
31. Onifade, A.A., and Tewe, O. (1993). Alternative tropical energy feed resources in rabbit diets: Growth performance, diets digestibility and blood composition. World Rabbit *Science* 1: 17-24.
32. Post Graduate Committee in Veterinary Science, PGCVS (1990). Rabbits and Rodents – Laboratory Animal Science, Proceedings No 142, Postgraduate Committee in Veterinary Science, University of Sydney, Sydney, Australia.
33. Shelton, H.M. (2004). The importance of silvopastroal systems in rural livelihoods to provide ecosystem services. Proc. Of the 12th International Symposium on Silvopastoal Systems. In: 't. Marnietje, L., Ramirez, L., Ibrahim, M, Sandoval, C. Ojeda, N and Ku, J. (eds). Universidad Antronoma de Yucatan, Merida, Yucatan, Mexico, 2004. pp. 158-174.
34. Schalm O.W, Jain, N. C and Carrol E. J. (1975). Veterinary Haematology. 3rd edition Lea Febiger Philadelphia USA. Pp 13-167.
35. Tybrik, K. (1989). Acacianilotica in Kenya: aspects of flowering, pollination, seed production and regeneration. Special reports Botanisk Institute, 75p
36. Van Soest, P. J., Robertson, J. D. and Lewis, B. A. (1991). Methods of dietary fiber, neutral detergent fiber and non-starch polysaccharides in relation to animal nutrition. Journal of Dairy Science 74:3583-3597.

37. Von Maydell H. J. (1983). Arbresetarbustes du sahel: leurscaractéristiques et leurs utilizations. Eschborn: GTZ, 531p.

38. WHO 1980. Manual of Basic Techniques for a Health Laboratory. World Health Organization, Geneva,Switzerland.

Table 1: Composition of Rabbits Experimental Diets (%)

	Treatments				
Ingredients (%)	T_1	T_2	T_3	T_4	T_5
White maize	37.35	37.35	37.35	37.35	37.35
Groundnut cake	15.00	15.00	15.00	15.00	15.00
Groundnut haulm	20.00	20.00	20.00	20.00	20.00
Maize bran	10.00	10.00	10.00	10.00	10.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Balanites aegyptiaca	0.00	5.00	10.00	15.00	20.00
Wheat Offal	10.00	10.00	10.00	10.00	10.00
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.15	0.15	0.15	0.15	0.15
Total	100	100	100	100	100

**Composition of premix (Bio-mix) supply the following per kg diet: Vitamin A 500,000 I.U. Vitamin D, 800,00IU, Vitamin E, 12,000mg Vitamin K, 5000mg, Biotin 10,000mg, Vitamin B, Biotin 10,000mg, Vitamin B2 200mg, Vitamin B6 15000mg, Niacin, 12,000mg, Panthothenic Acid, 20,000mg, Biotin 10m000mg, Vitamin B12, 30,000mg, Folic Acid, 150,000mg, Cholride, 60,000mg, Manganese 10,000mg, Iron 15,000mg, Zinc 80,000mg Copper 400mg, Iodine 80,000mg Selenium 8,000mg.*

Table 2 : Chemical Composition of Experimental Diet (G Kg^{-1} DM)

	Treatments					
Ingredients (%)	T_1	T_2	T_3	T_4	T_5	Ba
Dry matters	898.60	889.60	907.50	912.30	896.20	92.20
Ash	76.80	81.10	79.20	82.30	81.00	18.00
Crude Protein	178.60	269.30	262.80	267.50	278.00	183.10
Ether Extact	44.90	56.20	58.70	61.80	63.50	20.00
Crude Fibre	284.70	291.60	300.90	296.20	287.60	145.00
Acid Detergent Fibre	331.10	352.40	361.20	342.60	333.00	257.40
Neutral Detergent Fibre	416.40	442.30	451.10	431.60	421.80	364.30
Acid detergent Lignin	61.10	57.60	54.30	51.60	62.60	137.50

Ba=Balanites aegytiaca

Table 3 : Haematological Parameters of Weaner Rabbits Feed Balanite Aegyptiaca

	Treatments					
Parameters	T_1	T_2	T_3	T_4	T_5	SEM
RBC ($x10^6$ /mm^3	5.55^b	4.84^b	4.68^b	4.55^b	7.04^a	2.02
WBC ($x10^3$/mm^3)	12.90^a	6.40^b	5.20^{bc}	6.50b	12.90^a	1.39
PCV (%)	38.20^c	43.80^b	41.70	37.40^c	47.90^a	2.68
Haemoglobin (g/dl)	11.70^b	10.00^b	10.40^b	10.20^b	15.50^a	2.11
MCV (fl)	68.80^b	90.00^a	89.00^a	82.20^a	67.90^b	3.12
MCH (pg)	21.0	20.7	22.1	22.5	22.0	2.32^{NS}
MCHC (%)	30.6^b	22.9^d	24.9^d	27.4^c	32.5^a	1.14

a, b, c means in the same row with different superscript are significantly different (P<0.05), NS = Not Significant different (P<0.05).

Table 4 : Biochemical Parameters of Weaner Rabbits Fed Balanites Aegyptiaca

	Treatments					
Parameters	T_1	T_2	T_3	T_4	T_5	SEM
Blood Urea (mmol/L)	4.0^{b}	3.1^{d}	3.3^{c}	2.5^{c}	4.2^{a}	0.46
Total Protein (g/dl)	6.3^{b}	5.3^{c}	4.9d	7.2a	4.0^{c}	0.27
Cholesterol (mmol/L)	162^{b}	155^{c}	199^{a}	100^{d}	87^{e}	2.06
Albumin (g/dl)	3.4^{c}	5.1^{a}	4.4^{b}	3.1^{c}	3.2^{c}	0.33
Globulin (g/dl)	2.9^{c}	0.2^{c}	0.5^{b}	4.1^{b}	0.8^{a}	0.02
Potassium (mmol/L)	4.8^{a}	5.5^{a}	3.3^{b}	4.0^{a}	3.6^{b}	0.94
Sodium (mmol/L)	132^{c}	144^{a}	129^{d}	137^{b}	140^{a}	2.36
Calcium(mmol/L)	7.3bc	9.1a	8.8b	10.0a	5.3d	0.76
Phosphorus (mmol/L)	4.0a	$3.1a^{b}$	4.3^{a}	2.9^{c}	3.8^{a}	0.89
Magnesium (mmol/L)	5.0^{a}	4.7^{b}	3.8^{c}	4.8^{b}	5.3^{a}	0.34

a, b, c means in the same row with different superscript are significantly different ($p<0.05$)