

Effect of Non- Urea and Urea-Based Concentrate Supplements on Haematology and Blood Biochemical Parameters in Kids

N. Kurechiya^{1*}, M. K. Mehta², R. K. Jain³, K. Rawat⁴ and S. S. Mahour⁵

¹Assistant Professor, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, INDIA

²Professor, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, INDIA

³Professor, Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, INDIA

⁴Assistant Professor, Department of Veterinary Biochemistry, College of Veterinary Science and Animal Husbandry, Kuthuliya, Rewa, Madhya Pradesh, INDIA

⁵Assistant Professor, Department of Veterinary Gynecology and Obstetrics, College of Veterinary Science and Animal Husbandry, Mhow, Madhya Pradesh, INDIA

*Corresponding Author: dr.n.kurechiya@gmail.com

How to cite this paper:

Kurechiya, N., Mehta, M., Jain, R., Rawat, K., & Mahour, S. (2021). Effect of Non- Urea and Urea-Based Concentrate Supplements on Haematology and Blood Biochemical Parameters in Kids. *International Journal of Livestock Research*, 11(1), 157-161.

<http://dx.doi.org/10.5455/ijlr.20201028114613>

Received : Oct 19, 2020
Accepted : Dec 27, 2020
Published : Jan 31, 2021

Copyright © Kurechiya et al., 2021

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
<http://creativecommons.org/licenses/by/4.0/>



Abstract

Eighteen male kids (9.5 ± 0.24 kg BW) were divided into three equal groups viz. T1, T2 and T3 to study the effects of supplementation of concentrate mixture with and without urea on haematology and blood biochemical profile. The kids under all three groups were allowed 6-7 h of grazing daily. Additionally, besides grazing Group T1 was un-supplemented (control), Group T2 was supplemented with a non-urea-based concentrate mixture and group T3 was supplemented with a urea-based concentrate mixture. Both concentrate mixtures were isonitrogenous and isocaloric. At the end of 90 days experimental feeding haemato-biochemical traits were estimated. The hemoglobin (Hb), packed cell volume (PCV) and total erythrocyte count (TEC) were significantly ($P < 0.01$) higher in both the concentrate fed groups (T2 and T3) than sole grazing group (T1). However, the Mean corpuscles volume (MCV), Mean corpuscular hemoglobin (MCH & MCHC) total leukocyte count (TLC) and different leukocyte count (DLC) have not differed significantly irrespective of dietary treatments. Blood glucose and blood urea nitrogen (BUN) levels were significantly ($P < 0.01$) higher in T2 and T3 compared to T1 however, no differences were observed in serum levels of total protein (TP), albumin (A), globulin (G), A: G ratio, triglyceride and cholesterol. In conclusion, concentrate supplementation in local browsing kids reared under semi-intensive management significantly enhanced the haemato-biochemical parameters due to a higher plane of nutrition provided to the treatment groups. The urea-based concentrate mixture is equally effective as a traditional concentrate mixture and no adverse effect on parameters studied.

Keywords: Concentrate, Haemato- biochemical Parameters, Urea Goats

Introduction

Nutrients are of vital importance for health and productivity of goats. The goat fulfils their nutritional needs by browsing young leaves of trees and bushes. The majorities of goats belong to small and marginal farmers who have scanty knowledge of feeding and reared them in extensive system without supplementing concentrate. If good vegetation is available, healthy growth of kids can be obtained. In present circumstances the grazing or browsing, fully cannot support normal growth and development, resulting in poor health of animals (Singh *et al.*, 2010). Blood biochemical and haematological parameters serve as indicators of physiological state and true reflection of health status of animals, predisposed by nutrition, environmental factors and stress (Balikei *et al.*, 2007). It is often very difficult to assess the current health status of animals without detailed examination of blood. Supplementation of concentrate provides high energy, protein and micronutrient required for blood formation and body immunity. It maintains energy balance and dilutes the adverse effects of dietary tannin in the leaves. When given with browsing it boosts up the body immunity and blood formation. Supplementation of minerals in the form of balanced concentrate mixture is a recommended practice (Khadda *et al.*, 2018) and urea has been tried as non-protein nitrogenous (NPN) substance to replace part of proteins in ruminant diet (Aruwayo, *et al.*, 2016). Therefore, an attempt was made to evaluate the relative effect of existing feeding practices and extra allowances of concentrates (conventional vs. urea based) provided during the growing period on hemato-biochemical profiles in local goats.

Materials and Methods

The experiment was conducted on eighteen non-descript male kids (4-5) months of age with mean body weight of 9.5 ± 0.24 kg at the Indore district, Malwa region of Madhya Pradesh. All animals were in proper health and alert in appearance. The kids were dewormed before the start of the experiment. These animals were divided into three groups of six in each group on the basis of their body weights following randomized block design and reared under a semi extensive system of feeding. Apart from routine 6-7 hours grazing kids were assigned into three dietary treatments. Group T₁ was given no concentrate mixture (Control). Group T₂ was given 200 g non-urea-based concentrate daily. Group T₃ was given a 200 g urea-based concentrate mixture daily. The composition of the concentrate mixture is presented in Table 1. The composition of concentrate mixtures was computed in such a way that both were isonitrogenous (16% CP), isocaloric (70% TDN) and adequate in critical minerals.

Table 1: Composition of concentration mixtures

Ingredients (%)	T ₂	T ₃
Maize crushed	55	55
Maize flour	-	5
Soya DOC	17	-
Wheat bran	25	35
Urea	-	2
Mineral mixture*	2	2
Salt	1	1

*Composition per 250 g Ca 70. g, P 20. g, I 0.10g, Fe 0.75g, Zn 1.50g, Cu 0.20g, Co 0.045g, Vitamin A 5,00,000IU, D₃ 1,00,000IU, B₂ 0.2g, K 0.1g, B₁₂ 600µg

At the end of 90 days of experimental feeding hematological parameters and metabolites of blood in animals of supplemented and un-supplemented groups were estimated. About 10 ml of blood was collected from the jugular vein of each kid in the morning before watering and feeding, 8 ml blood was transferred to the centrifuge tubes without anticoagulant for the harvesting of serum. The remaining (2ml) blood sample is transferred to EDTA coated vacuumed tube for estimation of the haematological profile. Hemoglobin and PCV were estimated in whole blood immediately after the collection of blood by acid haematin method (Benjamin, 1985) and Wintrobe's tube (Hawk, 1965), respectively. The method used to calculate TEC, MCV, MCH, MCHC, TLC and DLC as per Jain (1986). Serum was harvested from blood as per the standard procedure. The serum biochemical parameters like glucose, total protein, albumin, globulin, BUN, triglyceride, and cholesterol concentrations were estimated by using a semi-auto biochemistry analyzer (Span diagnostic Ltd.) with standard kits. The data obtained were subjected to analysis of variance in a completely randomized block design. Treatment means were ranked using Duncan's multiple range test (Snedecor and Cochran, 1995) using SPSS version 22.

Results and Discussion

Haematological Profile

The results of the haematological parameter from the study are presented in Table 2, indicates that blood constituents are also affected by the level of nutrients in the ration. Total erythrocyte counts ($10^6/\mu\text{l}$) in the T₁ (control) group were 12.48, which was significantly ($P < 0.01$) improved to 14.63 in T₂ and 14.43 in T₃ although were within the normal range (8-18/ $10^6/\mu\text{l}$) as reported by Kaneko (1989). Similarly, hemoglobin and hematocrit were also significantly ($P < 0.01$) higher and within the normal range in concentrate supplement groups. The improvement in Hb, TEC and PCV might be due to better hematopoiesis as a result of improved availability of nutrients. Adamu *et al.* (2006) observed that feed composition had a significant effect on haematological values like PCV, Hb and RBC. Low values for haematological parameters could be due to the harmful effects of high dietary contents and the nutritional status of animals causes differences in values or TEC and PCV. Feeding animals with protein-deficient diets decrease the production of blood cells, leading to bone marrow hypoplasia and inducing structural alterations interfering with both innate and adaptive immunity (Etim *et al.* 2014). Similar results are accordance with earlier scientist studies. Gendley *et al.* (2015) reported that the Hb, TEC and PCV were improved in goats after 60 days when provided additional concentrate mixture or urea molasses mineral block along with a basal roughage diet. Similarly, improved haematological profiles of Mlabari kids' supplemented concentrate diet resulted in increased significant ($P < 0.01$) difference in the values of Hb, PVC, TEC and MCV by Prasad *et al.* (2017). Also, Singh *et al.* (2010) concluded that mineral supplementation significantly ($P < 0.01$) improved the hemoglobin concentration and packed cell volume in weaned kids. Mean corpuscular hemoglobin reported in this study was statistically similar in treatments groups.

The white blood cell count (TLC) and type (DLC) were not differing significantly indicating that feeding patterns do not adversely affect the immune system and animal apparent health. The haematological parameters of kids were not significantly different in T₂ and T₃, indicates that concentrate supplementation with 2% urea in concentrate mixture did not portend any threat to growing male kids. A similar response of urea-based feeding was observed in growing Sokoto red kids by Aruwayo *et al.* (2016) reported that 30% inclusion of urea treated rice milling waste were not adversely affect haematological traits and supplied nutrients needed by the animals.

Table 2: Effect of concentrate supplementation on haematological parameters

	T ₁	T ₂	T ₃	SEM	Significance
Haemoglobin (g/dl)	8.73 ^a	10.34 ^b	10.34 ^b	0.93	$P < 0.01$
Hematocrit (%)	26.26 ^a	31.51 ^b	31.27 ^b	2.96	$P < 0.01$
Red blood corpuscles ($10^6/\mu\text{l}$)	12.48 ^a	14.63 ^b	14.43 ^b	1.19	$P < 0.01$
Mean corpuscles volume (fl)	21.03	21.55	21.67	0.34	NS
Mean corpuscular Hb (pg)	6.99	7.07	7.16	0.08	NS
Mean corpuscular Hb (g/dl)	33.24	32.82	33.08	0.21	NS
White blood corpuscles ($10^3/\mu\text{l}$)	8.85	8.47	8.66	0.19	NS
Neutrophil (%)	28.33	28	27.5	0.42	NS
Eosinophils (%)	4	3.66	3.5	0.25	NS
Basophils (%)	1.16	0.83	0.86	0.19	NS
Monocyte (%)	2.83	3.33	3	0.51	NS
Lymphocytes (%)	64.16	64.27	65.16	0.58	NS

Biochemical Parameter

The average serum biochemical parameters of kids supplemented concentrate with or without urea in browsing condition is presented in Table 3. In our study, serum glucose concentration increased significantly ($P < 0.01$) in supplemented groups than non-supplemented control animals. This increase in blood glucose level was probably due to increased dietary protein and increased digestibility of nutrients which might have provided more gluconeogenic precursors (Das *et al.*, 2012). Similar observations of increased blood glucose level due to supplementation of concentrate were reported by (More *et al.*, 2008; Das *et al.*, 2012; Mondal and Kakati, 2013). Our finding contradicts with Gendley *et al.* (2015) reported blood glucose level was significantly ($P < 0.05$) higher in the basal roughage diet-fed group compared to the other two supplemented groups. Suggesting hypoglycaemic effect, low fibre content of UMMB might have changed the ratio of VFA subsequently lowering the blood glucose

level.

Blood urea nitrogen was significantly ($P<0.01$) differ among treatment groups this indicated that concentrate supplementation had an effect on serum urea level. As in the treatment groups, a higher plane of protein is fed, which might be responsible for higher production of ammonia and urea so its concentration in blood has significantly increased, although it is within the normal range for this species. Muralidharan *et al.* (2012) observed a similar trend of BUN level in Micheri lambs, found UMMB supplemented group had higher values followed by the concentrate supplemented group than control group and concluded that additional protein supplied through concentrate feed and addition of urea as NPN source in UMMB might have increased the BUN values through metabolism. The findings in the present study are in variance with earlier workers. Mondal and Kakati (2013) reported BUN was significantly ($P<0.05$) decreased in supplemented groups credibly due to meeting the proper nitrogen and energy ratio required to the ruminal microbes for their optimum growth and thereby ruminal excess nitrogen used efficiently as compared to the unsupplemented group. Sahu *et al.* (2015) observed that serum urea concentration was significantly higher in the supplemented group after 60 days of feeding. This might be due to nitrogen quality availability between treatments groups resulted in different rates of body catabolism (Tainturier *et al.*, 1984).

The overall mean values of serum triglyceride, cholesterol total protein, albumin, globulin and A:G ratios were found to be similar ($P<0.05$) in treatment groups and were within the normal range (Kaneko, 1989) indicating that supplementation of concentrate did not have an ill effect on the health status of kids resulted from no influence on these parameters. Similar observations were also reported by Das *et al.*, 2012 for (TP & albumin), Mondal and Kakati, 2013 for (TP, triglyceride and cholesterol) and Gendley *et al.*, 2015 for (TP, albumin & globulin). The present findings are not in agreement with the findings of Mellado *et al.*, 2020 who opined that serum total protein and cholesterol concentrations were lower in un-supplemented than supplemented crossbred adult goats, which shows that un-supplemented animals had some degree of malnutrition.

Table 3: Effect of concentrate supplementation on biochemical parameters

	T ₁	T ₂	T ₃	SEM	Significance
Blood Sugar (mg/dl)	47.16 ^a	59.00 ^b	57.66 ^b	6.48	P<0.01
Total protein(g/dl)	7.98	8.11	8.01	0.22	NS
Albumin (g/dl)	4.3	4.46	4.33	0.26	NS
Globulin (g/dl)	3.67	3.65	3.67	0.01	NS
Albumin: Globulin	1.17	1.25	1.18	0.04	NS
BUN (mg/dl)	21.83 ^a	26.86 ^{ab}	27.66 ^b	3.15	P<0.01
Triglyceride (mg/dl)	15.96	16.37	16.58	2.25	NS
Cholesterol (mg/dl)	113.33	122.66	122.83	5.35	NS

Conclusion

It may be concluded that the production system had a significant influence on the haemato- biochemical traits of local male kids due to a higher plane of nutrition provided to the treatment group. A minimum amount of 200g concentrate mixture is offered daily to browsing kids; it fulfills the nutritional deficiencies of the natural vegetations. Isonitrogenous substitution of urea for true protein does not have a biochemically determinable disadvantage to their counterparts fed soybean meal as a protein source.

Acknowledgement

The authors thankfully acknowledge Dean, College of Veterinary Science and Animal Husbandry, Mhow, Indore, India for providing facilities for conducting this research work.

Conflict of Interests

There is no conflict of interest.

Publisher Disclaimer

IJLR remains neutral concerning jurisdictional claims in published institutional affiliation.

References

1. Adamu, S., Thomas, A., Iseh, N. M., Fatihumi, M. Y., and Esieno, K. A. N. (2006). Normal values of haematology of Nigeria adopted albino rats (*Rattus norvegicus*) in Zaria. In Proceeding of 31st Annual Conference of the Nigeria Society for Animal Production, 12th–15th March.
2. Aruwayo, M.A., Yahaya, M.A. and Garuba, M.G., (2016). Biochemical and Heamatological Characteristics of Growing Sokoto Red Kids fed Untreated and Urea Treated Rice Milling Waste in Katsina State, *International Journal of Advances in Agricultural and Environmental Engineering*, 2349-1531.
3. Balikei E, Yildiz A, and Gurdogan F. (2007). Blood metabolite concentrations during pregnancy and postpartum in Akkaraman ewes. *Small Ruminant Research*, 67(2-3), 247-251.
4. Benjamin, M. M. (1985). In: *Outline of Veterinary Clinical Pathology*, 3rd Ed. Kalyani Pub., New Delhi: 233-254.
5. Das, U.M., Swain, R.K., Mishra, S.K., Dehuri, P.K. and Dash, S.K. (2012). Effect of supplementation of concentrate on growth performance of grazing Ganjam goats in its native tract. *Animal Nutrition and Feed Technology*, 12(3), 335-342.
6. Etim, N. A. N., Akpabio, U., Okpongete, R. O., and Offiong, E. E. (2014). Do diets affect haematological parameters of poultry? *Current Journal of Applied Science and Technology*, 1952-1965.
7. Gendley, M. K., Tiwari, S. P., Dutta, G. K., Kumari, K., and Ratre, H. (2015). Effect of urea molasses mineral block on hematological and biochemical blood parameters in adult goats. *Indian Veterinary Journal*, 92(5), 98-100.
8. Hawk, P. B. (1965). In: *Hawk's Physiological Chemistry*. 14th Ed. McGraw Hill Book Co. London.
9. Jain, N.C. (1986). In: *Essentials of Veterinary Haematology*. Lea and Febiger Publishers Malvern, Pennsylvania: 57-62.
10. Kaenko, J. J. (1989). In: *Clinical Biochemistry of Domestic Animals*. 4th Ed. Academic Press.
11. Khadda, B. S., Lata, K., Kumar, R., Jadav, J. K., & Kalas, P. (2018). Effect of supplementary feeding on the growth and economics of feeding of kids under semi-arid conditions. *Journal of Agriculture and Ecology*, 5, 61-66.
12. Mane, S.H., Desai, B.G., Bhambure, C.V. and Patil, A.S. (2006). Evaluation of complete feed for goats. *Indian Journal of Animal Nutrition*, 23(3), 179-180.
13. Mellado, M., Rodríguez, I. J., Alvarado-Espino, A., Véliz, F. G., Mellado, J., and García, J. E. (2020). Reproductive response to concentrate supplementation of mixed-breed goats on rangeland. *Tropical Animal Health and Production*: 1-5.
14. Mondal, G. and Kakati, B.K. (2013). Effect of Supplementation of Concentrate on Performance of Crossbred Lambs in Kargil. *Indian Journal of Animal Nutrition*, 30(1), 12-16.
15. More, A. D., Deshpande, S. D., and Jinke, M. R. (2008). Serum glucose, total lipid and total cholesterol levels in yearling Osmanabadi goats. *The Indian Journal of Small Ruminants*, 14(1), 110-113.
16. Muralidharan, J., Jayachandran, S., Selvaraj, P., Visha, P. and Saravanakumar, V.R., (2012). Effect of concentrate and urea molasses mineral block supplementation on blood biochemical profile of Mecheri lambs. *Indian Journal of Small Ruminants*, 18(1), 75-79.
17. Prasad, C. K., Abraham, J., Balusami, C., Roshin, A. J., and Murugan, S. S. (2017). Haemato-biochemical profiles of Malabari kids fed broiler concentrate diet. *Indian Journal of Small Ruminants*, 23(1), 94-96.
18. Sahu, S., Babu, L. K., Karna, D. K., Behera, K., Kanungo, S., Kamal, R., and Upadhyay, D. (2015). Effect of prepartum concentrate supplementation on blood biochemical profiles of pregnant Ganjam goat. *Indian Journal of Animal Research*, 49(4), 487-490.
19. Singh, T., Mehta, M.K., Jain, R.K. and Jain, A. (2010). Effect of Supplementing Deficient Trace Minerals on Hematological Parameters and Plasma Micro Mineral Status in Kids. *Animal Nutrition and Feed Technology*, 10(1), 115-119.
20. Snedecor, G. W. and Cochran W.G. (1995). In: *Statistical method*, 8th Ed. Oxford and IBH Publishing Co., Calcutta, India.
21. Tainturier, D., Braun, J. P., Rico, A. G., and Thouvenot, J. P. (1984). Variations in blood composition in dairy cows during pregnancy and after calving. *Research in Veterinary Science*, 37(2), 129-131.
