WFL Publisher
Science and Technology

Meri-Rastilantie 3 B, FI-00980
Helsinki, Finland
e-mail: info@world-food.net,

Journal of Food, Agriculture & Environment Vol.5 (2) : 202-203. 2007 *www.world-food.net*

Effect of feeding urea–treated wheat straw on body weight gain and biochemical metabolites of young camels

S. I. Al-Sultan

Department of Public Health and Animal Husbandry, College of Veterinary Medicine and Animal Resources, King Faisal University, P. O. Box 11647, Al-Ahsa 31982, Saudi Arabia. e-mail: alsultan87@hotmail.com

Received 28 December 2006, accepted 2 April 2007.

Abstract

Spraying of urea solution (0.1g/ml) in water to wheat straw at a concentration of 40 g/kg resulted in two-fold increase in protein content of straw. Feeding of urea-treated straw to camels significantly increased weight gain compared to camels fed on straw only. Lack of adverse effect of feeding urea on liver, heart and muscle-specific enzymes suggested that feeding urea at this concentration could be tolerated.

Key words: Camel, urea-treated, wheat straw, enzyme

Introduction

Chemical treatment to improve the nutritive value of poor quality roughage has been proposed for enhancing greater and improved use. Sodium hydroxide was the first chemical used but is no longer recommended [5]. Treatment of low quality roughage with ammonia has been effectively tested in Scandinavian countries [10]. Unfortunately, the latter method of treatment cannot be applied in many countries due to the lack of infrastructure for delivering anhydrous ammonia. Alternative treatment of poor quality roughage with urea, which is converted to ammonia, has been proposed by many researchers [1, 2, 4, 9]. Wheat straw is the most abundant agricultural residue in Saudi Arabia. It is widely used as cheap source of bulk feed to ruminants. The feed value of wheat straw is, however, limited by its low available energy, low protein, minerals and vitamins [7]. It is now established practice in some parts of the world to upgrade the protein content of low quality roughage by urea treatment [9-12]. Spraying layers of the straw with urea solution of known concentration achieves the process of upgrading nitrogen content of poor roughages. Treated straw is subsequently stored under anaerobic conditions at temperatures between 30-60°C for variable durations. This promotes ureolysis and the release of ammonia gas. Some ammonia combines with the plant cell wall but most of it evaporates. There are conflicting reports about the optimal straw:water:urea ratios (urea treatment level) and optimal ureolysis period that would result in the highest crude protein content in treated straw [12]. These technologies have now been adopted in Saudi Arabia [1]. The objective of the study is to investigate the effect of feeding urea-treated wheat straw in young camels on body weight gain and plasma metabolites.

Materials and Methods

Wheat straw samples, weighing 3 kg each, were sprayed with urea solution (obtained by dissolving 5 g of urea in 40 ml of water) at 40 ml/100 g of straw. The urea-treated straw was then kept in air-tight container for 8 weeks [1].

Young camels at point of weaning were used in the study. Ten animals were divided into two groups. Group 1 animals were given daily 2 kg wheat straw, 2 kg Rhoda's grass and 2 kg concentrate. Group 2 animals were given daily 2 kg urea-treated wheat straw, 2 kg Rhoda's grass and 2 kg concentrate. Feedlot performance was estimated. Animals were housed individually in separate 4 x 4 pens. Animals were weighed every weak. Water and salt licks were available at all times of the trial period. Serum concentration of cholesterol and triacylglycerol and activities of aspartate aminotransferase, alkaline phosphatase, gamma glutamyl transferase and lactic dehydrogenase were determined by commercial kits. Chi-square was used to test the significance of difference. All statistical analysis followed the procedure of the Statistical Analysis System Institute [13].

Results and Discussion

The crude protein content of urea-treated straw was significantly ($P<0.05$) higher than that of untreated wheat straw (Table 1). This is in agreement with the findings of many workers [1, 2, 4]. Hadjipanayiotou *et al.* [6] reported 3.29-fold increase in crude protein for barley straw as a result of urea treatment. In this study, there was two-fold increase in crude protein of treated wheat straw as a result of ammoniation. The discrepancy between these studies in the magnitude of response to ammoniation of straw may be due to genetic causes, degree of soil fertilization and condition of urea treatment.

The feedlot performance is presented in Table 2. The average body weight gain of camels fed on urea-treated straw was significantly ($P<0.05$) greater than that of camels fed on straw. Feeding ammoniated straw to growing bulls, dairy cows, steers, heifers and goats resulted in positive responses [5, 6].

Table 1. Chemical analysis of feed used in the experiment.

Variable (%)	Concentrate	Untreated straw	Urea-treated straw
Dry matter	91.8	73.0	72.0
Fibre	7.02	30.02	30.02
Crude protein	14.8	6.8	13.5
Fat	3.64	0.84	1.34
Ash	6.76	15.86	11.96

Feeding of urea-treated straw to camels did not affect the activities of enzymes studied (Table 3). Aspartate aminotransferase, alkaline phosphatase and gamma glutamyl transferase are indices of liver damage [3]. Increased lactic dehydrogenase is an indication of cardiac and skeletal muscle injury [8]. Likewise serum cholesterol and triacylglycerol did not increase in animals fed urea-treated straw suggesting that feeding of urea at this level could be tolerated in these camels. However, ammonia and urea nitrogen did increase signficantly ($P<0.05$) due to consumption of urea. Exceeding in serum threshold of urea may result in toxicity by urea and or ammonia in these animals.

Table 2. Feedlot performance of camels fed urea-treated straw (mean ±SD).

Item	Untreated straw	Urea-treated straw
Initial body weight (kg)	107±7	105±7
Final body weight (kg)	125±9	145±8
Body weight gain (g/day)	600±16	1333±26

Table 3. Serum metabolites and enzymes at the end of trial in control and urea-treated straw camels (mean ± SD).

Parameter	Control	Urea-treated straw
Ammonia nitrogen (µg/100 ml)	288±16	420±20*
Urea nitrogen (mg/100 ml)	38±7	48±6*
Cholesterol (mg/dl)	50±5	52±6
Triacylglycerol (mg/dl)	16±3	18±2
Creatinine (µmol/l)	100±11	110±10
Gamma glutamyl transferase (µg/l)	20±3	22±2
Alkaline phosphatase (µg/l)	62±5	65±6
Aspartate aminotransferase (U/l)	55±5	52±6
Lactic dehydrogenase (µg/l)	200±12	210±14

* $P<0.05$

Acknowledgements

The author would like to thank the Deanship of Scientific Research and SABIC for financial support.

References

[1]Al-Shami, S.A. and Al-Sultan, S.I. 2006. Effect of treating wheat straw with urea on its crude protein content. Journal Animal Veterinary Advance.

[2]Cloete, S.W.P. and Kritzinger, N.M. 1985. A laboratory assessment of various treatment conditions affecting ammoniation of wheat straw by urea. The effect of physical form, moisture level and prolonged treatment period. South African Journal of Animal Science **15**:17-141.

[3]Cornelius, C.E. 1989. Liver function. In Kaneko, J.J. (ed.). Clinical Biochemistry of Domestic Animals. 4th edn, Academic Press, San Diego, U.S.A., pp. 364-397.

[4]Dias-da-Silva, A.A. and Sundstøl, F. 1986. Urea as a source of ammonia for improving the nutritive value of wheat straw. Animal Feed Science and Technology **14**:67-79.

[5]Hadjipanayiotou, M. and Economides, S. 1997. Assessment of various treatments conditions affecting the ammoniation of long straw with urea. Livestock Research for Rural Development **9**(5),http://www.cipav.org.co/ lrrd/lrrd9/5/milt952.htm.

[6]Hadjipanayiotou, M., Verhaege, L., Kronfoleh, A.R., Labban, L.M., Shurabi, A., Amin, A., Merawi, A.R., Harries, A.K., Houssein, M., Malik, G. and Dassouki, M. 1993. Feeding ammoniated straw to cattle in Syria. Livestock Research for Rural Development **5**(3), http://www.cipav.org.co/Irrd5/3/Syria.htm.

[7]Mange, M. 2000. Recent trends in upgrading and utilization of crop residue for animal feeding. Proceeding Workshop on Improved Utilization of By-Products for Animal Feeding in Vietnam. NUFU PROJECT-3/2000. sp_Pape/spec_5_4 2001_23.htm.

[8]Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. 1990. Harper's Biochemistry. 22nd edn, Appleton and Lange, East Norwalk, C.T.

[9]Saaddullah, M., Haque, M. and Dolberg, F. 1981. Effectivenes of ammonia-treated straw in feeding of dairy cows and growing cattle. Agric. and Envir. **6**:267-271.

[10]Sundstøl, F., Coxworth, E. and Mowat, D.N. 1978. Improving the nutritive value of straw and other low quality roughage by treatment with ammonia. Wld Animal Rev. **26**:13-21.

[11]Verma, M.L. 1982. Chemical treatment of straw. Paper presented at the Seminar on Maximum Livestock Production on Minimum Land. Bangladesh Agriculture University, Feb.1981, 2-5.

[12]Chenost, M. and Kayouli, C. 1997. Roughage utilization in warm climates. FAO Animal Production and Health Paper 135.Food and Agriculture Organization of the United Nations, Rome.

[13]SAS Institute Inc. 1990. SAS Procedures Guide, Version 6, 3rd edn.