
Effects of Feeding Urea on Milk Composition in Lactating Goats

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Abstract :

Feeding of urea-treated wheat straw to lactating goats had significantly ($P < 0.05$) increased the percentage of fat, solid not fat, casein, titrable acidity, ash and decreased pH of milk compared to those fed with wheat straw. It is suggested that such effects may increase nutritive value of milk in addition to its good keeping quality.

Introduction :

Chemical treatment to improve the nutritive value of poor quality roughage like wheat straw has been proposed for enhancing greater and improved use (Sundstol *et al* 1978). Treatment of poor quality roughage with urea, which is converted to ammonia, has been proposed by many researchers

(Hadjipanayotou 1984; Dias-Da-Silva and Sundstol, 1986). Feeding ammoniated straw to growing bulls, dairy cows, steers, heifers and goats resulted in positive responses (Hadjipanayotou, 1984, Al-Shami and Al-Sultan 2006). It is reported that (Homer and Kreula 1974) found no effect of urea feeding to cows on composition of milk. Atramentova and Abragan (1974) however, reported an increase in some fatty acids composition of milk. Helmer and Bartley (1971) reported an adverse effect of milk composition of ewes fed urea .

In view of these conflicting reports, this study was carried out to investigate the effect of feeding urea-treated straw on milk composition of dairy goats.

Material and Methods :

Urea treatment of wheat straw (Tibin):

One ton of tibin was treated with 4% urea solution (4g of urea in 100ml of water) and subjected to urealysis by anaerobic storage for 8 weeks (Al-Shami and Al-Sultan 2006).

Animals and treatments:

Sixteen, 12-14 month old, female Ardi goats were used in this study.

Dairy goats were obtained at peak of their lactation . Animals were divided into two groups . Group 1 animals were given 500g / head / day concentrate and 200g / head / day wheat straw . Group 2 animals were given 500g / head / day concentrate and 200g/ head / day urea treated wheat straw . Rhodes grass and water were provided ad libitum .

Analysis of Samples :

Milk samples were immediately analysed for total solids (TS) and water (Pandey 1981), fat (ISI 1977), solid – not fat (SNF, by difference method), casein (Pal et al 1996), ash (Kirk and Sawyer 1991), titrable acidity (Scott 1986) and pH (Agnihotri and Pal 1996). Analysis of variance and Student t test were used to find significant difference between the groups (Snedecor and Cochran 1968)

Results and Discussion :

Results of effect of feeding urea treated wheat straw on composition of milk of goats are given in Table 1. The composition of milk in group 1 animals which was fed untreated straw was similar to published information on goat milk composition (Agnihotri and Parsad, 1993 Pal *et al* 1996, Pal and Agnihotri 1997, Agnihotri *et al* 2002), in animals reared under organized farm condition. The percent of water, fat, total solids, solid not fat, casein, titrable acidity, pH and ash significantly ($P < 0.05$) differed in milk collected from animals of group 2 that were fed urea – treated straw compared to animals of group 1. The composition of daily diet and its amount could result in significant changes in milk composition (Haenlein 1995). Indeed, feeding of urea to sheep has resulted in change of composition of milk (Farid *et al* 1979). Urea increased the solid not fat and pH of milk . Such properties would add to the buffering capacity and improves the keeping quality of milk (Joshi and Verdanayakam,1967).

Table (1)

Effect of feeding Urea treated wheat straw on milk composition in goats

Variable	Group 1	Group 2
Fat %	2.29 ± 0.31 a	3.91 ± 31 b
Solid not fat %	7.32 ± 0.22 a	8.86 ± 0.22 b
Ash %	0.73 ± 0.02 a	0.88 ± 0.02 b
Casein %	2.88 ± 0.13 a	3.52 ± 0.12
Titrate acidity (% Lactic acid)	0.15 ± 0.007 a	0.23 ± 0.007 b
Total solids %	13.22 a	17.17 b
Water content %	86.78 a	82.83 b
pH	6.60 ± 0.018 a	6.40 ± 0.017 b

Means bearing different letters in a row differ (P< 0.05) .

Milk fat and casein content are high after parturition then decrease thereafter (Chilliard *et al* 2000) . This is related to at least two phenomenon (Chilliard *et al* 2003): a dilution effect due to increase in milk volume until lactation peak, and a decrease in fat and protein mobilization that decreases the availability of plasma non esterified fatty acids and energy (protein) balance . Feeding of urea treated straw tended to correct such deficit. However the impact of such treatment on milk production and residues of urea – ammonia in milk of goats remain to be determined.

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References :

1. Agnihotri, M.K. and Pal U.K. (1996). Quality and shelf life of goat milk in refrigerated storage. *Small Ruminant Research* 20: 75-81.
2. Agnihotri, M.K. and Parsad, V.S.S. (1993). Biochemistry and processing of goat milk and milk products. *Small Ruminant Research* 12: 151-70
3. Agnihotri, M.K., Singh, N. and Babjim, Y. (2002). Milk composition of goats reared under field condition. *Indian J. of Anim Sci* 72: 1019-1021 .
4. Al-Shami, S.A. and Al-Sultan, S.(2006). Effect of treating wheat straw with urea on its crude protein content. *J of Animal Veterinary Advances* 45: 440-44.
5. Atramentova, V.G. and Abramyan, S.M. (1974). Quality of milk fat from cows fed granulated urea. *Dairy Sci. Abstr.* 36: 561.
6. Chilliard, Y., Ferlay, A., Mansbridge, R.M. and Doreau M. (2000). Ruminant milk fat plasticity: nutritional control of saturated and poly unsaturated, trans and conjugated fatty acids. *Ann Zootech* 49: 181-205.
7. Chilliard, Y., Ferlay A., Rouel, J. and Lamberet G. (2003) A Review of nutritional and physiological factors affecting goat milk lipid synthesis and lipolysis. *J. Dairy Sci* 86: 1751-1770.
8. Dias-Da-Sliva, A.A. and Sundsotl, F. (1986). Urea as a source of ammonia for improving the nutritive value of wheat straw. *Animal Feed Science and Technology* 14: 67-79.
9. Farid, M.F.A., Hassan N.I., Zein G.N., Moussa A.A. and Ghita E.I. (1979). Effect of feeding urea to lactating ewes on fatty acids and composition of milk lipids . *World Rev. of Anim Production* 15: 17-21.
10. Hadjipanayiotou, M. (1984). The value of urea – treated straw in diets of lactating cow. *Livestock Research for Rural Development* 9: 1-12.
11. Haenlein, G.F.W. (1995). Topics of profitable feeding and milking of dairy goats. Department of Animal Sciences and Agriculture Biochemistry, University of Delaware, Bulletin pp. 110, 117.
12. Helmer, L.G., and Bartley, E.E. (1971). Progress in the utilization of urea as a protein replacer for ruminants. A review. *J. Dairy Sci.* 54: 25.
13. Homer, D.R. and Kreula, M. (1974). Polyunsaturated fatty acids of milk fat from cows fed rations devoid of protein. *Finn. Chem. Lett.*, 5, 197. Cited from *Biol. Abstr.* (1975), 59: 5636 .
14. ISI. (1977). Determination of fat in whole milk, evaporated (unsweetened) milk, separated milk, skim milk, butter milk and cream by Gerber method, IS: 1224 (Part I). Bureau of Indian Standards, New Delhi, pp. 1-10.
15. Joshi, C.H., and Vedanayakam A.R. (1967). Buffer value of goat milk. *Indian Veterinary Journal* 44: 673-78.

16. Kirk, R.S., and Sawyer, R. (1991). Pearson's composition and analysis of foods. pp. 541. Addison- Wesley, California.
17. Pal, U.K. and Agnihotri, M.K. (1997). Effect of milking time on yield and composition of goat milk. *International Journal of Animal Sciences* 12: 269-71
18. Pal, U.K. Saxena, V.K, Agnihotri, M.K. and Roy R. (1996). Effect of season, parity and stage of lactation on the composition of Jamunapari goat's milk. *International Journal of Animal Sciences* 11: 245-48.
19. Pandey, D.N. (1981). *A Textbook of Animal Nutrition and Dairy Chemistry*. pp. 277-79. Jaiprakash Nath, Meerut.
20. Scott, R. (1986). *Cheese Making Practice*. pp. 104. Elsevier, London.
21. Snedecor, G.W. and Cochran, W.G. (1968). *Statistical Methods*. 6th ed. pp. 299-338. Oxford and IBH Publishing Co., New Delhi.
22. Sundstol, 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.

تأثير إطعام اليوريا على محتويات الحليب في الماعز المرصعة

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قسم وظائف الأعضاء والكيمياء الحيوية والأقربائين
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الخلاصة:

لقد نتج عن إطعام تبين القمح المعالج باليوريا للمعز المرضع عن زيادة ذات قيمة معنوية في مكونات الحليب مثل الدهن والبروتين والمواد غير الدهنية والحوامض والرماد ونقص في الاس الهيدروجيني. لقد تم استنتاج بأن هذه الخواص قد تزيد من القيمة الغذائية للحليب وتحسن من الاحتفاظ بخواصه الجيدة.