PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (12): 1915-1919, 2009
ISSN 1680-5194

Effect of Feeding Steam Treated Pith Bagasse on Body Change Weight, Milk Constituents and Blood Parameters of Lori Ewes in Khouzestan Province, Iran

R. Ebrahimi, M. Eslami, J. Fayazi and M.F. Jahromi
Department of Animal Science, Ramin University of Agriculture and Natural Resources, Ahwaz, Iran

Abstract: This experiment was done to evaluate the potential use of steam treated bagasse pith (SPB) in feeding of Lori Ewes. Forty eight ewes with similar condition from many flocks of autumn of Lori sheep were included in this experiment. The ewes divide into 4 groups of 12 sheep. The ewes allocated into 4 different levels of SPB (0, 5, 10 and 15%) for pre and post lambing in a completely randomized design. The diets were formulated according to NRC (1994) and had similar quality for protein, energy and high concentration of other nutrient. Concentrates were included amounts of 0, 10, 20 and 30 percent of SPB witch replaced with wheat bran and barely. Ewes live weight were measured before and at lambing and 2 weeks interval after that until weaning lamb. Milk sampling for determination of fat, Protein, carbohydrate and Solid Not Fat (SNF). Blood collected via jugular vein to indicate baseline (blood urea nitrogen, triglyceride, cholesterol and glucose). Statistical analysis with SAS program (1994) was indicated that, there were not significant differences between diets for milk composition percentage (fat, Protein, carbohydrate and solid not fat) ($p<0.05$). The effect of different levels of SPB on body change weight ewes and Average Daily Gain (ADG) lambs not significantly ($p<0.05$) different. Also there were not significant differences between diets for plasma cholesterol, BUN, triglyceride and glucose ($p<0.05$). In conclusion result of that could be SPB substituted instead of 30% concentrates (15% of whole diet) with no negative effects on physiological and productivity in pre and post lambing.

Key words: Steam treated pith bagasse, average daily gain, milk composition, blood parameter

INTRODUCTION

in many country sheep husbandry is for achievement milk and meat. Sheep is animal that has many use in Iran and it use for produces meat, milk, wool (Izadifard and Zamiri, 1998). At the base of FAO report (2005) 27% of total milk that produce is refers to sheep. In all sheep husbandry system milk is necessary for continuity life, increase resistant against internal parasite (Eddey, 1983) and growth lamb. Also it use as an income source and instead of material food for producer.

The use of by-products in animal nutrition is a necessity since it may increase the availability of food for mankind as well as avoid accumulation that contributes to environmental problems. A large amount of agriculture's byproduct is produced by food industries of Iran. One of these by-products is pith bagasse which produced in huge amount (about one million ton) from several sugar cane factories in south west of Iran. Poor intake, due to low density and low digestibility, are considered the main reasons for unsatisfactory performance of animals fed this roughage. The low Dry Matter Digestibility (DMD) of pith bagasse which is influence by high crude fiber content of this by-product is the main reason of their poor quality (Henrique and Baudel, 2004). It is claimed that low DMD could be improve by different processing methods. Steam treatment, known as auto-hydrolysis, objectives the cleavage of the bounds between lignin and the other components of the cell wall, in order to improve its degradability by the enzyme of the rumen microbial ecosystem. Better utilization of the fibrous portion would allow greater use of sugarcane bagasse. Steam treated pith bagasse is one of the by-products that it makes during produce sugar from sugarcane bagasse and it can be used for feeding (Donefer, 1986). The main limitation SPB as animal feeding is law digestibility, that it is because of junction lignin with cellulose and hemicellulose. Hens' researchers and nutritionalists probe to find ways to release and break cellulosic molecules in herbages. Microbiological, physical and chemical processing are the ways that we can improve nutritional value of by-products with level of technology chose and use one of these ways (Nour *et al*., 1987). Using of hydrolyzed Pith with vapor in cattle and lambs showed that it had higher digestibility than the none processing pith (Donefer, 1986). Also revealed that processing of pith can improve digestibility of this component. The processed the pith with H_2O_2 (Donefer, 1986).

We hypothesized that by replacing other ingredients in a standard diet with this low price new product could improve the profitability of dairy industries. Therefore The objectives of this experiment was to: 1) determine the appropriate levels of steam treated pith bagasse instead with concentration 2) investigation effects of different levels steam treated pith bagasse on body weight change, milk composition and blood parameter of Lori ewes pre and post lambing.

MATERIALS AND METHODS

Climatic conditions: This research performed in winter of 2006 at private safiabad from that it settle 14 km down of dezful city. In this area annual rainfall is 351 mm per year. Maximum temperature is 50°C, the minimum of this is 0°C, high of the sea is 80 m and mean relative humidity of 70.3%.

Animals, diets, experimental design and collection samples: Experimental animals include 48, 3 years old of Lori ewes that divided to 4 groups and each of groups had 12 ewes. Mating accrued in earlier fall. The diet include 50% roughage and 50% concentrate treatment organized with substituting zero, 10, 20 and 30% steam treated pith bagasse with concentrate. The diets formulated in order body weight of ewes and according animal nutrient requirement of ewes (NRC, 1994). Water and salt stone fed freely.

The weight of ewes measured 12 h after morning feeding and it done once 2 week during whole period, with using of vacuum pipes that had EDTA. The blood samples were got from jugular vein. The samples were centrifuged 20 min with 3000 rpm. then we gather separated plasma in plastically tubes and stored at -20°C till laboratorial analysis. Concentrate of cholesterol, triglyceride, glucose and blood nitrogen urea were measured with auto analysis according enzymatic methods. Sampling of milk were done at 5 states. In each state component of morning and afternoon sample sent to analyses with dairy lab 2 set at Ramin University of agriculture and natural resources. We use CRD with 4 treatments and 12 replicate.

Feeding and management: The sheep were housed in group stalls throughout the 120 days feeding period under a common roof, but were exercised for about 1 h each day in yard. Prior to the start of actual data collection the ewes were allowed a 15-day adjustment period to get used to the environment and experimental treatments. They were also dewormed with fenbenzole as routine procedure at a dosage of 3 ml/15 kg body weight.

Chemical analyses: Concentrates diets (pre and post lambing) sampled during week 4 of each month for experiment.

Statistical analysis: Performance of Lori ewes in this experiment were statistically analyzed by one-way analysis of variance. Differences among treatment means were tested using linear and quadratic contrasts at the 5% probability level (Steel and Torrie, 1980). Using the SAS Statistical Software Package.

RESULTS AND DISCUSSION

Dry matter intake: Dry matter intake of ewes that fed 1-4 treatments was 20.71, 20.8, 20.76 and 20.67 kg/day respectively. We can't analyses variation of this character because animals were fed together. Amount of dry matter intake influence with different factors. Such as live body weight, milk production, stage milking, body condition, moisture of diet, cell wall, ratio roughage to concentrate, fat, feed intake behaviors and habits, climate, way of feeding, times of feeding, frequency of feeding and access of feedstuff (Weiss, 1995). Don't differ in dry matter intake likely have relative with the same digestibility of feedstuffs. Van Soest *et al*. (1991) showed positive relation between digestibility and DMI. He showed that feed with high NDF and ADF reduce DMI, because this part of diet has slower passage than the other part of the diets. It's important that cellulose part of the feed when reduce the speed of passage. That process Physically effective Neutral Detergent Fiber (PeNDF). We didn't have different in PeNDF between the

Table 1: Chemical composition of bagasse and pith bagasse

Composition	Bagasse	Pith bagasse
Crude protein	1.75	1.8
Crude fiber	48.6	47.9
Ash	3.1	3.3
NFE	45.9	46.3
EE	0.7	0.8
TDN	28.1	47

Table 2: Chemical and nutrient composition of diets fed to ewes (pre-lambing)

Component	1	2	3	4
Barley	15	12.5	11	9
SPB	0	5	10	15
Wheat Bran	27	25	19	15
Soybean Meal	5	6	8	10
Straw	32	30.5	30	29
Alfa hay	20	20	21	21
Carbonate calcium	0.3	0.3	0.3	0.3
Salt	0.3	0.3	0.3	0.3
Min-vit	0.4	0.4	0.4	0.4
TDN	62.4	62	61.5	61
ME(Mcal/kg)	2.18	2.17	2.14	2.13
CP (%)	10.93	10.86	10.83	10.92
Ca (%)	0.58	0.59	0.6	0.62
P (%)	0.56	0.52	0.46	0.41

Table 3: Chemical and nutrient composition of diets fed to ewes (post-lambing)

Component	1	2	3	4
Barley	0.27	0.25	0.23	0.21
SPB	0	0.05	0.1	0.15
Wheat Bran	0.17	0.12	0.075	0.028
Soybean Meal	0.09	0.11	0.125	0.147
Straw	0.17	0.17	0.17	0.17
Alfa hay	0.29	0.29	0.29	0.285
Carbonate calcium	0.003	0.003	0.003	0.003
Salt	0.003	0.003	0.003	0.003
Min-Vit	0.004	0.004	0.004	0.004
TDN	66.48	65.87	65.2	64.4
ME (Mcal/kg)	2.39	2.36	2.3	2.3
Cp (%)	12.8	12.8	12.7	12.7
NDF	40.56	40.56	42.1	42.7
ADF	25.1	25.1	28.8	30.5
EE	2.46	2.35	2.25	2.13
Ash	6.49	6.76	7.03	7.3
Ca (%)	0.7	0.69	0.7	0.7
P (%)	0.5	0.45	0.4	0.4

treatments and because of that we can explain the non significant amount of DMI. Researcher revealed that processing of steam treated pith bagasse increase rate of passage. Also increase digestibility to 69% that it can explain the no reduces in DMI (Castro and Machado, 1990). Researchers cited that increasing level of NDF, decrease DMI, because of relation between NDF and filling rumen (Van Soest *et al*., 1991). Robinson and Mcqueen (1997) concluded that in addition amount of NDF, digestibility and weight modification of ewes in pre-lambing.

The analysis variation weight modification of ewes in pre-lambing for difference weeks showed in (Table 4). According revealed comparisons means none significance difference (p>0.05). Between treatment during whole period of pre-lambing. From weaning to parturient the score of body condition is increasing. In this period nutrient requirements of fetus is priority than the mother. In 2, 4 and 8 last weeks gain of the fetus is respectively 25, 50 and 80% of the body weight at birth. Maybe occur abortion if feeding were not adequate. During this experiment we didn't see abortion in late pregnant, it shows that feeding in this sensitive period in all treatments were well and feeding with 3 levels of SPB, didn't have negative effects on fetus growth.

Body weight changes in post lambing: Analysis body weight of ewes showed in Table 5. Post-lambing body weight didn't show significant differences between treatments (p>0.05) and all of them had a same physiological conditions. Generally between energy requirements, energy consumption and energy balance have an important interrelationship. Body weight changes most of the time is an index for condition or balance of energy, but in earlier milking body weight change are incorrect. This is because of increasing in feed consume in this period. Using of body condition score is an alternative way to assess energy balance (Rattry and Jayusch, 1977).

Birth weight of lamb: Mean of lamb's birth weight in treatments 1-4 was 4.5, 4.3, 4.6 and 4.2 kg respectively (showed in Table 6). Means of this character weren't significant differences (p>0.05). Birth weight influenced with genetic and environment effect and in environment factors, feeding is one of the most important. Low differences between percent of milk fat between treatments and low increasing in percent of milks protein, we can relate it to the decreasing of daily milk production. Absence of significant differences between treatments showed that condition of experiment. Genetically and environmentally were same for treatments. Researches showed that weight of weaning and amount of growth till weaning influenced by birth weight of lambs (Amini, 1994). Hart *et al*. (2000) cited that effect of birth weight on daily gain of kids weren't significant.

Daily gain of lambs: Analysis of daily gain variances cited in Table 6 and we didn't have significant differences between treatments (p>0.05). Whereas we didn't significant differences between daily gains, but with increasing percentage of SPB we showed decreasing of daily gains. Decreasing of milk production maybe because of low digestibility of SPB in compare with other parts of the diet. Decreasing digestibility prepare inadequate energy to produce milk and finally decrease it.

Table 4: Effect of SPB content of the diets on ewe body change weight (pre lambing)

	Mean of treatment					
Component	1	2	3	4	SE	Significant
42 days prelambing (kg)	55.78	57.8	55.3	57	1.19	NS
28 days prelambing (kg)	57.8	59.4	59.6	59.3	1.24	NS
14 days prelambing (kg)	60.8	61.2	60.5	60.03	1.27	NS

Table 5: Effect of SPB content on ewe body change weight (post lambing)

	Mean of treatment					
Component	1	2	3	4	SE	Significant
Weight of parturition (kg)	55.6	55.7	55.6	56.14	1.11	NS
30 day after the parturition (kg)	54.6	54.5	55	55.48	1.21	NS
60 day after the parturition (kg)	53.6	54	54.5	55.2	1.70	NS

Table 6: Effect of on lamb performances

	Mean of treatment					
Component	1	2	3	4	SE	Significant
Birth of weight (kg)	4.5	4.3	4.6	4.2	0.16	NS
Weaning weight (kg)	23.5	22.2	21.8	21.4	0.51	NS
ADG (gr)	0.229	0.228	0.218	0.215	0.005	NS

Weaning weight of lambs: Statistical analysis of this character revealed that experimental diet didn't have significant effect on weaning weight ($p>0.05$). In this experiment lambs used milk till 2 months old when their mother was fed with 4 experimental treatments. Absence of significant effect on weaning weight showed that alternate SPB in different treatment could secure the desire level of milk producing. Most of researchers recommend 6-8 week old to weaning (Schichowski *et al*., 2008). Whereas its possible earlier. If the physiological ability let us to do it.

Milk composition: Mean of milks fat percent in ewes that fed with 1-4 treatments were 6.44, 6.45, 6.14 and 6.19 respectively. This differences weren't significant ($p>0.05$ Table 7). Like other ruminants, milks fat is the most variable part of milk that it relate with breed, level of feeding, whether and season, stage of milking and age of animal. Castro and Machado (1990) showed that SPB produce lower acetate than the rare Pith bagasse, it can be reason decrease of milks fat in treatments 3 and 4 (Table 7). One of the increasing reason is the being soybean meal in diet that has good biological value. Increasing proteins store with form of portable protein in body in last pregnant of ruminants body, could increase milk production, protein and fat milk. This occurs because in addition of dietary protein, body's protein also is used to produce milk of protein. Botts *et al.* (1979) estimated that stores of portable protein is 25% of total body protein's. means of carbohydrates in treatments 1-4 were 4.6, 4.45, 4.56 and 4.57 respectively and the differences between them weren't significant ($p>0.05$). In this experiment the percent of SNF weren't significant different ($p>0.05$). According weren't significant effect in these characters, using this feedstuff decrease current cost of produce that it is because of decreasing cost of diet.

Blood parameters: In ruminants carbohydrates of diet that most of them is cellulose is fermented in rumen and produce volatile fatty acid. During gluconeogenesis 85% of ruminants' glucose is produced and 15% is produced by kidney (Dukes, 1996). We should pay attention that only propionic acid from VFA's can be used by gluconeogenesis the level of glucose in ruminants blood is 30-60 mg for physiologically process (Dukes, 1996). We didn't reveal significant different between level of glucose of blood in treatments it. Shows that all ewes could produce glucose that is most fuel for fetus (Table 8). In other researches pregnant ewes that were in bad condition of feeding also could maintain level of glucose with sparing in use of glucose and producing glucose from source other than diet (especially endogenous amino acids), for supplying fetus requirement (Pourjafar *et al*., 2004). Fisher *et al*. (1974) reported that the concentrations of blood glucose is respectively the preferred indicators of adequacy of diets in terms of energy. Based on the different dietary regimes it could be concluded that the efficiency of utilization of available dietary protein and energy were responsible for the variations in the concentration of blood glucose of the Lori ewe. Proteins are catabolized in small intestine and convert to ammonia. The ammonia is going liver via intestinal-liver pathway and inters the urea cycle and current to urea. The used expansions by kidney from body (Dukes, 1996). The amount of blood urea nitrogen in ewes blood didn't have significant different after parturition ($p>0.05$). McNeill *et al*. (1997) cited that increasing level of blood were is one of the sign of feed deficiency in last pregnant. Priver and they found that heavy embryo is one of the reasons for increasing blood's urea. In this case high level of protein is catabolized and their amino acid inter the gluconeogenesis to produce glucose for embryo and because of determination their level of urea increase in blood. It means that produced glucose is at a result of catabolizing amino acids that it's not rational.

Table 7: Fat, protein, carbohydrate and Solid Not Fat percent in ewes

	Mean of treatment					
Component	1	2	3	4	SE	Significant
Fat (%)	6.44	6.45	6.14	6.19	0.06	NS
protein(%)	5.41	5.5	5.58	5.61	0.03	NS
carbohydrate(%)	4.6	4.45	4.56	4.57	0.03	NS
Solid Not Fat(%)	10.67	10.68	10.5	10.59	0.05	NS

Table 8: Blood urea nitrogen, cholesterol, triglyceride and glucose concentrations (sampled on lambing and days 60) in ewes

	Mean of treatment					
Component	1	2	3	4	SE	Significant
Glucose (mg/dl)	47.57	47.7	46.88	47.87	0.45	NS
cholesterol (mg/dl)	44.88	44.88	46.82	44.62	0.66	NS
tryglyserid (mg/dl)	24.85	25.79	24.9	24.64	0.45	NS
Blood Urea Nitrogen(mg/dl)	37.38	37.54	37.92	38.77	0.53	NS

Level of plasma's cholesterol during experiment didn't show a know tendency between treatments (Table 8) and the triglyceride of plasma also didn't show known tendency too. Based of these results we could say that the amount of promote (mobilization) of fat stores in a groups weren't significant different (Table 8).

ACKNOWLEDGMENT

The Authors wish to acknowledge the Iranian Sugarcane Company Development, Zarkesht Paydar Company and Livestock Research Centre of Khuzestan Province and Ramin Agricultural and Natural Resources University through the government of Iran for their financial support in conducting this project. Thanks Also Dr Ali, Nikkhah for his assistance.

REFERENCES

Amini, F., 1994. Investigation of reason loss of growth in the flock. Pajouhesh and Sazandegi No. 4: 105-107.

Botts, R.L., W. Hemken and L.S. Bull, 1979. Protein reserves in the lactation dairy Cow. J. Dairy Sci. 62: 433-440.

Castro, F.B. and P.F. Machado, 1990. Feeding value of steam-treated sugar cane bagasse in ruminant rations. Livest. Res. Rural Devel., 2: 1-6.

Donefer, E., 1986. Sugarcane pith (sugar-fith) as animal feed. Sugar cane as feed, FAO. org. ISBN 92-5-002721-4.

Dukes, H.H., 1996. Physiology of domestic animals. 11th Edn. Ithaca and London; pp: 320, 425-640. Dukes, H.H.; Swenson, M.J.; Reece, W.O. ISBN 08-014-28041.

Eddey, T.N., 1983. A course manual in tropical sheep and goat production. Published by Australian Universities, International Development program (AUIDP). pp: 83-100. ISBN 0864030401.

FAO, 2005. Production year book FAO, Rome (cited in Treacher. T.T., 1987. MILK. In: I.F.M. Marai and J.B. Owen (Editors). New Techniques in Sheep Priduction Butterworth, London, pp: 25-337.

Fisher, L.J., P.E. Donnelly, J.B. Hutton and D.M. Duganzich, 1974. Relationship between levels of feeding and certain blood metabolites in dairy cows in mid lactation. J. Agric. Sci., 84: 29- 37. {Provide Digital Object Identifier (DOI):} doi:10.1017/ S0021 859600071847.

Hart, S.P., T. Gipson and E.N. Escobar, 2000. Effect of sex and initial body weight on stocker goat performance, In: Proc. Of 7th Inter. Conf. on goats, Tours, France, pp: 171.

Henrique, N. and M. Baudel, 2004. improving the value of sugarcane bagasse waste via integrated chemical production system: an environmentally friendly approach. Industrial crops and products. 201: 309-315.

Izadifard, J. and M.J. Zamiri, 1998. Lactation performance of two Iranian fat-tailed sheep breeds. Small Rum. Res., 24: 69-76.

McNeill, D.M., R. Slepetis, R.A. Ehrhardt, D.M. Smith and A.W. Bell, 1997. Protein requirements of sheep in late pregnancy: partitioning of nitrogen between gravid utrrus and maternal tussues. J. Anim. Sci., 75: 809-816.

National Research Council, 1994. Nutrient Requirements of Goats. Natl. Acad. Sci., Washington, DC.

Nour, A.M., S.M. zahran and M.A. Naga, 1987. Effect of different methods of sodium hydroxide treatment on nutritive value of rice straw. Agric. Res. (in press).

Pourjafar, M., A.R Mohammadnia, I. Karimi, A. Jafari Dehkordi and R. Fatahian Dehkordi, 2004. The effects of experimentally induced lactic acidosis on serum glucose, BUN, Serum electrolyte (K, Na, P, Ca), hematocrit, rumen pH, rumen microflora and pathological changes of ruminal epithelium in Lori sheep. Pajouhesh-va- Sazandegi, 62: 27-37.

Rattry, P.V. and K.T. Jayusch, 1977. Energy cost of protein deposition in the pre-ruminant and young ruminant lamb. Proceeding of the New Zealand Soc. Anim. Sci. Prod., 37: 167-172.

Robinson, P.H. and H.E. Mcqueen, 1997. Influence of level of concentrate allocation and fermentability of forage fiber on chewing behavior and production of dairy cows. J. Dairy Sci., 80: 681-691.

Schichowski, C.E., Moors and M. Gauly, 2008. Effects of weaning lambs in two stages or by abrupt separation on their behavior and growth rate. J Anim. Sci., 86: 220-225.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics. A Biometrical Approach, second ed. McGraw-Hill Book Co., New York, NY, USA. ISBN-13: 9780070610286.

Van Soest, P.J., J.B. Robertson and B.A. Lewis, 1991. Methods for dietary fiber, neutral detergent fiber and nonstarch polysaccharides in relation to animal nutrition. J. Dairy Sci., 74: 3583-3597.

Weiss, W.P., 1995. Full lactation Response of cows Fed Diets with Different sources and Amounts of Fiber and Ruminal degradable protein. J. Dairy Sci., 78: 1802-1814.