http://www.pjbs.org

PJBS

ISSN 1028-8880

# Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

*Pakistan Journal of Biological Sciences, 1 (1): 55-59, 1998*

# Study on Effect of Poultry-Litter-Based-Silage on Serum Chemistry of Fattening Lambs

F. Rizvi, A.D. Anjum and S. Akhtar
*Department of Veterinary Pathology, University of Agriculture, Faisalabad-38040, Pakistan*

**Abstract**
Thirty lambs of approximately equal age were divided into three groups. Group A (control) was given farm ration, Group B was given (Poultry-litter-based-silage) and group C was given simple silage and concentrate for a period of six weeks. Liver function tests and other biochemical parameters were determined. At 3 and 6 weeks post-treatment serum alanine transaminase, glucose, urea and calcium content did not differ significantly between the control lambs and lambs fed poultry-litter-based silage or simple silage and concentrate. At three weeks post-treatment serum total bilirubin, serum aspartate transaminase and cholesterol did not differ from the control but these increased significantly in lambs fed poultry-litter-based-silage at six weeks post-treatment. Serum total proteins, serum globulins and uric acid decreased significantly in experimental lambs as compared to the control lambs at three weeks post-treatment but differed non-significantly from the control at six weeks post-treatment. Serum albumin concentration did not differ significantly between the control lambs and lambs fed poultry-litter-based silage at three weeks post-treatment but these decreased significantly at six weeks post-treatment. The changes in serum biochemistry were not associated with any clinical signs. The study shows that poultry-litter-based silage can be used as partial nitrogen source for fattening of sheep without any ill effects.

**Key words:** Lambs, sheep, poultry-litter-based-silage, serum chemistry

## Introduction

Agriculture-by-products and grains institute the only source of nutrition for food-animals, particularly ruminants, in Pakistan. In the face of human population explosion and increasing number of animals, proper feeding of animals like sheep has become a challenge. Because of inadequate nutrition their maximum production potential is seldom achieved. This demands employing specific techniques as well as exploding new feed resources in livestock production. Poultry litter currently used as a fertilizer, is a potential valuable as a feed ingredient than as a fertilizer (Smith, 1974; Arndt *et al*., 1979). Economic value of poultry litter as feed component in balanced diets for ruminants is three to 10 times greater than their value as plant nutrient (Smith and Wheeler, 1979). Poultry droppings is a good nitrogen source, to improve the quality of fodder or silage for feeding live stock but its harmful effects, if any, have not been investigated. In this study the changes in serum biochemistry of fattening lambs fed on silage prepared with poultry droppings were investigated.

## Materials and Methods

### Animals

Thirty lambs of approximately equal age and weight were obtained and maintained Sheep Farm of Nutrition Department, University of Agricultural, Faisalabad. The lambs were randomly divided into three groups having 10 in each group.

### Preparation of silage

Silage was prepared from Sudax (Sadabahar) fodder using poultry litter as nitrogen supplement. Fodder was chaffed to a particle size of 2-3 cm with an electric chaff cutter and poultry litter mixed at the rate of 30 percent. The litter was procured from a commercial broiler farm in which the birds were kept on sawdust and reared on standard commercial rations. Molasses were added as a source of fermentable energy and ensiled in airtight polythene bags for 30 days.

### Experimental design

Group 1 (control) lambs were given Farm Ration. The composition of farm ration in given in Table 1. Group 2 lambs were given poultry-litter-based-silage. The poultry-litter-based-silage consisted of Sudox 64 percent broiler litter 30 percent and molasses 6 percent. Group 3 lambs were given simple silage and concentrate mixture A. The composition of concentrate mixture A is shown in Table 1. The experiment was conducted for a period of six weeks.

Table 1: Concentration of treatment ration

| Ingredients | Farm ration | Concentrate mixture A |
|---|---|---|
| Cotton cake (un-decorticated) | 20 | 80 |
| Maize oil cake | 21 | - |
| Guar meal | 6 | 20 |
| Wheat bran | 5 | - |
| Rice polishing | 8 | - |
| Molasses | 14 | - |
| Wheat straw | 25 | - |
| Total | 100 | 100 |

**Serum proteins and blood urea**
Blood was drawn from jugular vein of lambs using sterilized disposable syringes at weeks and 6 weeks post-feeding. It was allowed to clot at room temperature and kept in a refrigerator at 4°C for 30 minutes. The clotted blood was centrifuged at 800 g for 10 minutes. Supernatant serum was separated and stored in aliquots at −20°C unit analysed. Serum proteins, glucose, blood urea, uric acid, calcium, cholesterol and triglycerides were determined using commercial kits (Randox, UK). Liver function tests including total bilirubin, alanine and aspartate transaminases and alkaline phosphatase. The data thus collected were subjected to analysis of variance using a statistical package 'MSTAT-C' on an IBM-compatible personal computer.

## Results

### Liver Function Tests

**Total bilirubin**
At 3 week post-treatment, total bilirubin did not differ significantly between the three groups (Table 2). At 6 week post-treatment however, serum total bilirubin was significantly lesser in lambs fed simple silage and concentrate than the control lambs or lambs fed poultry-litter-based-silage ($p<0.05$). Serum bilirubin increased significantly from 3 to 6 weeks post-treatment in the control lambs as well as in lambs fed poultry-litter-based-silage. At 3 as well as 6 weeks post-treatment, direct bilirubin and indirect bilirubin did not differ significantly between treatments (Table 2). Direct bilirubin showed a significant rise in lambs fed poultry-litter-based-silage compared with the control from 3 to 6 weeks post-treatment.

**Serum alanine transaminase (SALT)**
SALT did not differ significantly between the three groups and there was no significant effect of time (Table 2).

**Serum aspartate transaminase (SAST)**
At 3 weeks post-treatment, SAST did not differ significantly between the three treatments (Table 2). At 6 weeks post-treatment SAST was significantly higher in lambs fed poultry-litter-based-silage or simple silage and concentrate than the control ($p<0.05$). There was significant rise in SAST from 3 weeks to 6 weeks post-treatment in all the three groups of lambs ($p<0.05$).

**Alkaline phosphatase (AP)**
At 3 weeks post-treatment, AP did not differ significantly between the three groups. At 6 weeks post-treatment AP was significantly lesser in lambs fed simple silage and concentrate than the control lambs or lambs fed poultry-litter-based-silage ($p<0.01$). There was a significant increase in alkaline phosphatase in lambs of all the three groups from 3 weeks to 6 weeks post-treatment (Table 2).

### Serum Proteins

**Serum total proteins**
At 3 weeks post-treatment, serum total proteins were significantly lesser in lambs fed poultry-litter-based-silage than the control lambs ($p<0.01$). At 6 weeks post-treatment serum total proteins were significantly lesser in lambs fed simple silage and concentrate than lambs fed simple silage and concentrate than the control of lambs fed poultry-litter-based-silage (Table 3).

**Serum albumin**
At 3 week pos-treatment, serum albumin did not differ significantly between the three groups. At 6 weeks post-treatment, serum albumin was significantly lesser in lambs fed farm ration or poultry-litter-based-silage (Table 2).

**Serum globulin**
At 3 weeks post-treatment, serum globulin concentration was significantly lesser in lambs fed poultry-litter-based-silage than the control lambs but it did not differ significantly from the lambs fed simple silage and concentrate (Table 3). At 6 weeks post-treatment, serum globulin concentration did not differ significantly between the three groups.

### Other Biochemical Parameters

**Glucose**
At 3 weeks as well as 6 weeks post-treatment, serum glucose did not differ significantly between the three treatments (Table 4). In all the three groups of lambs serum glucose concentration decreased significantly from 3 weeks to 6 weeks post-treatment ($p<0.001$).

**Blood urea**
At 3 weeks as well as 6 weeks post-treatment, blood urea in lambs fed poultry-litter-based-silage or simple silage and concentrate were significantly lesser than the control lambs (Table 4, $p<0.001$). There was no significant effect of time on blood urea.

**Uric acid**
At 3 weeks post-treatment, serum uric acid concentration was significantly lesser in lambs fed poultry-litter-based-silage or simple silage and concentrate than the control lambs ($p<0.001$). At 6 weeks post-treatment serum uric acid concentration did not differ significantly between the three groups (Table 4).

**Calcium**
At 3 weeks as well as 6 weeks post-treatment serum calcium concentration did not differ significantly between the three groups (Table 4).

**Cholesterol**
At 3 weeks post-treatment, serum cholesterol concentration did not differ significantly between the three groups. At 6 weeks post-treatment, serum cholesterol concentration was significantly higher in lambs fed poultry-litter-based-silage than the control lambs or lambs fed simple silage and concentrate (Table 4).

**Triglycerides**
At 3 weeks as well as 6 weeks post-treatment, triglycerides did not differ between the treatments (Table 4).

Table 2: Liver function test in experimental fattening lambs

| Parameters | Week post-feeding | Means±SE | | |
|---|---|---|---|---|
| | | Group I | Group II | Group III |
| Bilirubin | 3 | 0.195±0.015 | 0.199±0.013 | 0.176±0.030 |
| | 6 | 0.263±0.020a | 0.309±0.043a | 0.199±0.001* |
| Direct bilirubin | 3 | 0.104±0.010 | 0.103±0.012 | 0.088±0.014 |
| | 6 | 0.151±0.016 | 0.194±0.026a | 0.115±0.024 |
| Indirect bilirubin | 3 | 0.102±0.019 | 0.096±0.015 | 0.062±0.028 |
| | 6 | 0.112±0.026 | 0.096±0.022 | 0.093±0.015 |
| Serum alanine transaminase | 3 | 26.34±3.03 | 24.74±2.727 | 28.24±3.082 |
| | 6 | 24.26±2.727 | 28.23±1.853 | 21.58±1.762 |
| Serum asparate transaminase | 3 | 129.54±4.237 | 135.00±8.28 | 117.50±5.783 |
| | 6 | 178.78±16.45a | 226.10±8.39*a | 225.80±8.731*a |
| Alkaline phosphates | 3 | 171.19±12.28 | 212.139±18.92 | 165.67±11.70 |
| | 6 | 850.40±150.74a | 693.02±74.05a | 380.40±42.87**a |

Table 3: Serum proteins in experimental fattening lambs

| Parameters | Week post -feeding | Means±SE | | |
|---|---|---|---|---|
| | | Group I | Group II | Group III |
| Total Proteins | 3 | 6.96±0.149 | 6.31±0.113** | 6.52±0.073 |
| | 6 | 7.160±0.218 | 7.06±0.206a | 6.50±0.159* |
| Albumin | 3 | 3.547±0.082 | 3.598±0.072 | 3.567±0.090 |
| | 6 | 3.82±0.091 | 3.86±0.085 | 3.361±0.104 |
| Globulin | 3 | 3.414±0.198 | 2.717±0.103* | 2.953±0.095 |
| | 6 | 3.330±0.174 | 3.20±0.194 | 3.11±0.104 |

Group I: Lambs feed farm ration (control) Group II: Lambs fed poultry-litter-based-silage
Group III: Lambs feed simple silage and concentrate mixture
*$p<0.05$, **$p<0.001$ compared with the control a significant time effect $p<0.05$

**Discussion**

Poultry litter and cage excreta are high in crude protein (Charles, 1975). Therefore, such material could be safely and profitably used in ruminant feed without endangering animal and human health. In the present study and attempt was made to use poultry litter as nitrogen supplement in silage. The nutritive value of poultry-litter-based-silage was compared with farm ration and simple plus concentrate with reference to changes in serum biochemistry.

Liver function test revealed that serum total bilirubin, serum direct bilirubin, indirect bilirubin, SALT and alkaline phosphates in poultry-litter-based-silage fed lambs did not differ from the lambs fed farm ration (Table 1). However, SAST showed a significant rise in poultry-litter-based-silage fed lambs than the lambs fed farm ration at 6 weeks post-treatment (Table 2, $p<0.05$). But SAST in poultry-litter-based-silage fed lambs did not differ from the lambs fed simple silage and concentrate. Therefore, the rise in SAST

Table 4: Some biochemical parameters in fathening lambs

| Parameters | Week post -feeding | Means±SE | | |
|---|---|---|---|---|
| | | Group I | Group II | Group III |
| Glucose | 3 | 36.10±1.464 | 39.20±1.191 | 36.50±1.551 |
| | 6 | 18.50±1.327a | 14.72±0.913a | 18.36±1.706a |
| Blood urea | 3 | 64.80±3.158 | 52.50±2.32*** | 44.20±2.015*** |
| | 6 | 62.50±2.291 | 50.20±4.86*** | 43.20±2.015*** |
| Uric acid | 3 | 0.865±0.104 | 0.428±0.034*** | 0.335±0.065*** |
| | 6 | 0.467±0.038a | 0.408±0.028 | 0.477±0.032 |
| Calcium | 3 | 8.150±0.192 | 8.52±0.236 | 7.68±0.541 |
| | 6 | 7.50±0.159 | 7.00±0.155a | 7.50±0.184 |
| Cholesterol | 3 | 47.98±1.622 | 49.52±2.97 | 48.69±6.101 |
| | 6 | 67.80±2.55 | 83.70±3.65** | 57.70±3.57 |
| Triglycerides | 3 | 49.60±5.477 | 34.50±4.104 | 37.00±3.05 |
| | 6 | 46.20±4.809 | 47.50±4.44a | 50.40±4.36 |

Group I = Lambs feed farm ration (control) Group II = Lambs fed poultry-litter-based-silage
Group III = Lambs feed simple silage and concentrate mixture
*p<0.05, **p<0.01, **p<0.001 compared with the control a significant time effect p<0.05

seems to be associated with silage whether based on poultry litter or supplemented with concentrate and does not seem to have any clinical significance.

Total serum proteins were significantly decreased in poultry-litter-based-silage fed lambs than in the farm ration fed lambs at 3 weeks post-treatment (Table 3, p<0.01). This decrease was mainly due to significant decrease in serum globulin concentration (Table 3, p<0.05) although at 6 weeks post-treatment this difference was not significant. It indicates that the poultry-litter-based-silage fed lambs took sometime to adjust to new ration compared with the farm ration fed lambs. Simple silage and concentrate fed lambs had significantly lesser serum total proteins than the farm ration fed lambs at 6 weeks post-treatment (Table 3, p<0.05). The decrease in concentration of serum albumin in simple silage and concentrate fed lambs is of concern because hypolabuminemia, if beyond a certain extent, can lead to ascities (Benjamin, 1978). In this respect poultry-litter-based-silage proved better than simple silage and concentrate ration. Angus *et al*. (1978) also reported hypolabuminemia and ascities in weaned lambs which were given dried droppings from hen in batteries at the rate of 45 or 60 percent in barely based diet.

Parameters like glucose content, calcium concentration and triglycerides in serum were not affected by poultry-litter-based-silage. Other parameter like blood urea, uric acid and cholesterol were significantly lesser in poultry-litter-based-silage fed lambs at 3 to 6 weeks post-treatment. Blood urea decrease probably reflects lesser nitrogenous wastes of protein metabolism of poultry-litter-based-silage compared with simple silage and concentrate or the farm ration. However, this aspect needs further investigation.

In a previous study it is reported that weight gain and blood picture were not affected in lambs fed poultry-litter-based-silage (Rizvi *et al*., 1994). The findings of the present study further suggest that sheep can tolerate continuous use of poultry-litter-based-silage without any ill effects. This is in congruence with observations made by other workers. Bhattacharya *et al*. (1971) and Gihad (1976) observed non-significant difference in average daily weight gain, feed intake and feed efficiency between the control and litter fed sheep. Non-significant changes in average daily gain and feed efficiency were also observed by partial substitution of soybean meal with poultry wastes in sheep ration by Smith (1974). Feed conversion efficiency was impaired

when proportion of poultry litter exceeded in fattening concentrate mixture (Tagari *et al*., 1976) but this effect was not seen in the present study when poultry litter was used in silage. Flachowsky (1985) reported daily live weight gain in sheep fed poultry litter on average 13 G per daily higher than that of the control.

In conclusion the changes in serum biochemistry are of no clinical significance and that poultry-litter-based-silage can be used as a nitrogen supplement for fattening of sheep.

**References**

Angus, K.W., N.F. Suttle, C.S. Munro and A.C. Field, 1978. Adverse effects on health of including high levels of dried poultry waste in the diets of lambs. J. Comp. Pathol., 88: 449-466.

Arndt, D.L., D.L. Day and E.E. Hatfield, 1979. Processing and handling of animal excreta for refeeding. J. Anim. Sci., 48: 157-162.

Benjamin, M.M., 1978. Outline of Veterinary Clinical Pathology. 3rd Edn., Iowa State University Press, Ames, IA., USA., ISBN-13: 9780813812304, Pages: 351.

Bhattacharya, A.N., F. Abu-Izzeddin and F.J. Schwulst, 1971. Poultry litter as a source of protein and energy for ruminants. Proceedings of the 1st Asian Congress of Nutrition, January 22-February 2, 1971, Hyderabad, India.

Charles, O.W., 1975. The economic feasibility of processed animal waste. World's Poult. Sci. J., 31: 271-275.

Flachowsky, G., T. Ayalew, T. Negesse and K. Banjaw, 1985. Feeding poultry litter to grazing Boran Zebu bulls and Ogaden sheep in Ethiopia. Archiv Tierernaehrung, 35: 507-514.

Gihad, E.A., 1976. Value of dried poultry manure and urea as protein supplements for sheep consuming low quality tropical hay. J. Anim. Sci., 42: 706-709.

Rizvi, F., A.D. Anjum, S. Qaiser and S. Akhtar, 1994. Effect of poultry litier-based silage on body weight and haematology of sheep. Pak. J. Agric. SA, 31: 215-219.

Smith, L.W. and W.E. Wheeler, 1979. Nutritional and economic value of animal excreta. J. Anim Sci., 48: 144-156.

Smith, L.W., 1974. Dehydrated poultry excreta as a nitrogen supplement for ruminants. J. Anim. Sci., 39: 139-140.

Tagari, H., D. Levy, Z. Holzer and D. Ilan, 1976. Poultry litter for intensive beef production. Anim. Prod., 23: 317-327.