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Effect of Feeding Cotton Gin Trash on Haematological and Serum Biochemical Values in Mecheri Lambs

N. Sri Balaji[1], S. Ramakrishnan[2]*, J. Muralidharan[3], A.K. Thiruvenkadan[4], P. Vasan[5] and K. Sivakumar [6]

[1]Assistant Professor, Mecheri Sheep Research Station, Pottaneri-636453, (Tamil Nadu), India.
[2]Professor and Head, Department of Livestock Production Management,
Veterinary College and Research Institute, Salem-636112, (Tamil Nadu), India.
[3]Professor and Head, Mecheri Sheep Research Station, Pottaneri-636453, (Tamil Nadu),India.
[4]Professor and Head, Department of Animal Genetics and Breeding,
Veterinary College and Research Institute, Salem-636112, (Tamil Nadu), India.
[5]Professor and Head, Department of Animal Nutrition,
Veterinary College and Research Institute, Theni-625534, (Tamil Nadu), India.
[6]Professor and Head, Department of Livestock Production Management,
Veterinary College and Research Institute, Namakkal-637002, (Tamil Nadu), India.

(Corresponding author: S. Ramakrishnan)*
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ABSTRACT: Cotton gin trash is a by-product when cotton fibres are separated from cotton seed at the ginning factory. Sheep farmers in Karur and Tirupur districts of Tamil Nadu have started using these cotton gin trash to meet the energy and protein requirements of their sheep without knowing the nutritive value of cotton gin trash. To validate the usage of cotton gin trash feeding in Sheep, a trial was conducted with 32 weaned Mecheri lambs at the age of 3 months and formed into four groups of eight animals in each group to find out the effect of feeding cotton gin trash on hematological and serum biochemical values. In all four groups, the basal diet used for the experiment had roughage: concentrate in the ratio of 60:40 on dry matter basis depended on their body weight but in T_2, T_3, T_4 group the roughage diet was replaced with cotton gin trash at 25%, 50% and 75% inclusion level. The animals were reared up to 9 months of marketing age. The hematological and serum parameters were analyzed on 0 day, 90th day and 180th day of trial period. The hematological values were not significantly different in all T_2, T_3, and T_4 group in compared to T_1 control group on 0 day, 90th day and 180th day. The total protein in T_2, T_3 and T_4 were significantly (P>0.05) lower than T1 group (control group) on 90th day of trial and the value of AST in T3 and T_4 was 162.50 U/L and 152.87 U/L and it was significantly (P>0.01) higher than the control and T_2 group but it was within the normal range of Sheep serum biochemical parameters. From the study, it could be inferred that the haematological and biochemical values of Mecheri lambs were within normal range and it implies that the feeding of cotton gin trash up to 75% inclusion level as a roughage diet were not harmful to the animal.

Keywords: Cotton gin trash, Mecherilambs, blood and serum biochemical values.

INTRODUCTION

Cotton is one of the most important commercial crops cultivated in India. It plays a major role in sustaining the livelihood of farmers and millions of people engaged in related activities such as cotton processing and trade.

India is the largest cotton producing country in India. India covers 134.77 lakh hectare area for cotton production in the year 2020 and yielding of cotton around 460 kg/ha. It gives 340-370 lakhs bales (one bale is 170 kg) of cotton every year (Cotton Corporation India, 2020).

Cotton ginning is an interface between cotton farming and industrial sector from cotton to textile production and engaged in the process of separation of cotton fibres from cotton balls. In this process several by-products are generated. Cotton gin trash is a by-product when cotton fibres are separated from cotton seed at the ginning factory. It consists of residual plant parts from mechanical harvesting and remnant seeds and lint.

Cohen and Lansford (1992) stated that most cotton gin waste was disposed of by spreading on the land, composting, feeding to livestock, using landfill disposal method, incineration, conversion to energy, making pellets for fuel in heat stoves, building materials, and used for insulation.

The by-products are generally cheaper than conventional feedstuffs. Therefore, farmers can include the by-products into diets of animals provided that the by-products support acceptable animal performance (Meglas *et al*., 1991; Gaffari *et al*., 2014). As a result, farmers save money by using a less expensive by-product. Cotton gin trash is one such by-product from ginning industry and sheep farmers are using the cotton gin trash to meet the energy and protein requirements of their sheep as it has been used in ruminant diets in most parts of the world (Kennedy and Rankins, 2008).

Cotton gin trash makes up about 10% of each bale of cotton ginned, and therefore, results in several million tons of cotton gin trash generated yearly (Egbuta *et al.*, 2017).

The Sheep farmers in Karur and Tirupur districts of Tamil Nadu started using this cotton gin trash as a roughage supplement feed to their sheep without knowing the nutritive value of cotton gin trash. To validate the feeding of cotton gin trash in Sheep and its effect on production performance, and health a trial was conducted in Mecheri lambs to find out the effect of cotton gin trash feeding as a roughage replacement on haematological and serum biochemical values.

MATERIALS AND METHODS

A trial was conducted with 32 weaned Mecheriram lambs at 3 months of age with uniform body weight and formed into four groups of eight animals in each group. All the group of animals were fed on dry matter requirement basis at 4 percent of their body weight and the feed requirement was calculated at every fortnightly interval according to their body weight changes.

In all four groups, the basal diet used for the experiment had roughage: concentrate in the ratio of 60:40 depended on their body weight. The T_1 was considered as control group and in T_2, T_3, T_4 group the roughage diet was replaced by cotton gin trash at 25%, 50% and & 75% inclusion level respectively. All the experimental animals were fed 3 times a day and fresh drinking water was always made available in the water trough.

The animals were reared up to nine months of marketing age. The blood parameters like complete blood count, total plasma protein, albumin, calcium phosphors were analysed for all the experimental animals at 0, 3 months and 6 months interval with liver function test likes ALT and AST.

The Proximate composition of experimental feeds are as follows:

Nutrient	Sorghum stover	Cotton gin trash	Concentrate mixture
Moisture	6.11 %	8.49 %	11.19 %
Crude protein	6.99 %	15.72 %	18.35 %
Crude fibre	33.56 %	31.96 %	9.57 %
Ether extract	2.46 %	7.58 %	1.96 %
Gross energy	3763 Kcal/kg	4070 Kcal/kg	3597 Kcal/kg
Total ash	6.04%	6.58%	9.12 %

Haematology: Blood samples were taken on in each group by jugular vein puncture using clean, dry syringe after proper antiseptic precautions in K_3EDTA coated vacutainer. Haematological parameters like total erythrocyte counts (TEC), haemoglobin (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), platelet count (PLT) and total leucocyte count (TLC) were analysed using haematology analyser VetScan HM2, USA.

Differential leucocyte counts (DLC) like neutrophils, eosinophils, basophils, lymphocytes and monocytes were determined from the blood smears prepared manually.

Serum biochemistry: Blood samples were collected before from jugular vein in plain vacutainer. They were allowed to clot for about 20 min and then serum was separated by centrifuging at 1500 rpm for 15 min.

Serum biochemical parameters like total plasma protein, albumin, calcium phosphorus, alanine transaminase (ALT), aspartate transaminase (AST), using M/s Biosystems A50, India.

RESULTS AND DISCUSSION

The haematological values of each experimental group on the 0 day, 90th day, 180th day of the trial are shown in the Table 1, 2 and 3 respectively.

Table 1: Mean (± SE) haematological values of Mecheri lambs on 0 day of trial.

Sr. No.	Haematological parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	TEC (x10^6/µL)	11.22±0.39	10.98±0.41	11.12±0.48	10.71±0.43	0.84
2.	Hb (g/dL)	10.10±0.55	10.90±0.43	10.20±0.74	9.80±0.30	0.53
3.	PCV (%)	31.00±1.71	32.75±1.08	30.62±2.3	29.25±0.41	0.47
4.	MCV (fL)	23.37±0.70	28.75±3.00	24.87±0.95	28.12±2.08	0.17
5.	MCH (pg)	8.73±0.19	9.35±0.43	8.85±0.26	9.52±0.28	0.23
6.	MCHC (g/dL)	37.11±0.65	33.76±0.16	35.85±0.37	34.41±1.28	0.16
7.	RDW (%)	25.48±0.80	26.05±0.89	25.40±0.82	24.16±0.76	0.44
8.	PLT (x10^3/µL)	514.62±63.37	430.00±56.26	507.15±63.90	353.87±49.21	0.19
9.	TLC (x10^3/µL)	11.28±0.51	12.15±0.63	11.28±1.07	10.75±1.18	0.79
10.	Neutrophils (%)	33.25±3.04	29.00±3.22	29.87±2.43	30.87±3.92	0.80
11.	Eosinophils (%)	2.12±0.29	2.75±0.41	2.12±0.44	2.25±0.49	0.67
12.	Basophils (%)	0	0.12±0.12	0.12±0.12	0	0.58
13.	Lymphocytes (%)	62.75±3.43	67.00±3.02	66.87±2.19	65.87±3.60	0.75
14.	Monocytes (%)	1.87±0.58	1.12±0.12	1.00±0.18	1.00±0.00	0.16

Table 2: Mean (±SE) haematological values of Mecheri lambs on 90th day of trial.

Sr. No.	Haematological parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	TEC ($x10^6/\mu L$)	12.58±1.02	11.770.7±0	10.48±0.18	10.56±0.27	0.78
2.	Hb (g/dL)	10.50±0.44	10.80±0.45	10.90±0.32	11.10±0.44	0.81
3.	PCV (%)	31.62±1.33	33.12±1.25	33.75±1.09	34.00±0.92	0.46
4.	MCV (fL)	29.00±2.96	25.62±1.08	28.25±2.09	26.62±0.70	0.6
5.	MCH (pg)	9.65±0.39	9.01±0.23	9.58±0.28	9.28±0.13	0.35
6.	MCHC (g/dL)	34.53±1.91	35.51±0.65	34.66±1.28	35.11±0.63	0.94
7.	RDW (%)	25.76±0.96	24.65±0.86	24.28±0.70	23.18±0.51	0.16
8.	PLT ($x10^3/\mu L$)	413.12±71.50	544.87±55.95	401.12±73.02	488.87±69.35	0.41
9.	TLC ($x10^3/\mu L$)	10.86±0.42	11.51±0.69	11.86±0.62	10.83±0.44	0.49
10.	Neutrophils (%)	38.87±2.91	37.75±4.81	31.62±4.10	32.50±4.63	0.52
11.	Eosinophils (%)	2.25±0.45	2.50±0.26	2.50±0.46	2.26±0.45	0.94
12.	Basophils (%)	0	0	0.12±0.12	0	0.40
13.	Lymphocytes (%)	57.12±3.22	57.62±5.35	64.50±4.15	63.87±4.79	0.51
14.	Monocytes (%)	1.75±0.49	2.12±0.66	1.25±0.411	1.37±0.37	0.60

Table 3: Mean (±SE) haematological values of Mecheri lambs on 180th day of trial.

Sr.No.	Haematological parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	TEC ($x10^6/\mu L$)	11.03±0.58	10.73±0.54	10.65±0.35	10.70±0.36	0.93
2.	Hb (g/dL)	9.20±0.46	8.80±0.39	9.00±0.35	9.40±0.44	0.78
3.	PCV (%)	27.62±0.86	26.87±0.87	27.62±1.29	27.87±0.81	0.89
4.	MCV (fL)	25.12±0.87	25.37±0.82	27.25±0.88	28.25±2.28	0.32
5.	MCH (pg)	9.03±0.18	8.92±0.22	9.30±0.31	9.45±0.32	0.5
6.	MCHC (g/dL)	36.15±0.72	35.36±0.32	34.25±0.49	34.32±1.5	0.41
7.	RDW (%)	24.16±0.79	24.76±0.64	24.01±0.57	25.13±0.81	0.65
8.	PLT ($x10^3/\mu L$)	392.87±49.21	433.25±39.68	409.50±47.42	487.00±67.82	0.60
9.	TLC ($x10^3/\mu L$)	10.98±0.79	11.55±0.63	11.65±0.88	10.71±1.06	0.85
10.	Neutrophils (%)	32.50±3.84	36.12±2.86	35.75±4.27	34.75±3.32	0.89
11.	Eosinophils (%)	2.00±0.53	2.62±0.26	2.12±0.47	2.37±0.49	0.77
12.	Basophils (%)	0.12±0.12	0.12±0.12	0	0	0.58
13.	Lymphocytes (%)	64.12±3.82	60.00±2.73	60.87±4.08	61.65±3.4	0.86
14.	Monocytes (%)	1.25±0.25	1.12±0.12	1.25±0.25	1.25±0.41	0.98

The values of total erythrocyte count (TEC), haemoglobin (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), red cell distribution width (RDW), platelet count (PLT) and total leucocyte count (TLC) were not significantly different (P>0.05) from each other in all T_1, T_2, T_3 and T_4 group on 0 day, 90th day and 180th day of the trial and they were a in the normal range reported for Sheep (Coles, 1986; Swenson, 1990; Dacie and Lewis 1991; Selvaraj *et al.*, 2004; Rahman *et al.*, 2018).

The neutrophils, eosinophils, basophils, lymphocytes and monocytes count in all the treatment groups on 0 day, 90th day and 180th day were also within the normal range as reported by Coles, (1986); Rahman *et al.*, (2018) and it was not significantly different (P>0.05) from each other.

The serum biochemical parameters like total plasma protein, albumin, calcium phosphors, alanine transaminase (ALT), aspartate transaminase (AST) were not significantly different (P>0.05) from each other on the 0 day of trial as shown in the Table 4.

Table 4: Mean (±SE) serum biochemical values of Mecheri lambs on 0 day of trial.

Sr. No.	Biochemical parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	Total protein (g/dL)	6.97±0.34	6.88±0.28	6.41±0.23	6.85±0.35	0.58
2.	Albumin (g/dL)	3.1±0.06	2.97±0.02	3.13±0.04	3.13±0.03	0.80
3.	ALT (U/L)	24.87±4.57	25.37±4.14	25.87±2.24	26.12±2.94	0.99
4.	AST (U/L)	150.00±6.17	130.37±7.2	147.62±7.78	148.25±8.4	0.23
5.	Calcium (mg/dL)	12.35±1.20	10.07±1.03	13.46±0.72	13.16±1.06	0.10
6.	Phosphorus (mg/dL)	6.86±0.23	6.45±0.48	7.15±0.53	6.67±0.70	0.80

The total protein in T_2, T_3 and T_4 were significantly(P>0.05) lower than T_1 group (control group) on 90th day of trial as shown in the Table 5 but that was within in the normal range between 6.22g/dl and 6.33g/dl as comparable to the result of Ramprabhu and Dhanabalan (1997); Viswanathan *et al*., (2000) in sheep. The observed albumin level ranged between 2.97g/dl and 3.13g/dl in all the treatment groups on 90th day of trial and were not significantly different (P>0.05) from each other. This is comparable to the results of Ramprabhu and Dhanabalan (1997); Rameshkumar *et al.*, (2003).

Table 5: Mean (±SE) serum biochemical values of Mecheri lambs on 90th day of trial.

Sr. No.	Biochemical parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	Total protein (g/dL)	7.01±0.13[b]	6.33±0.09[a]	6.28±0.19[a]	6.22±0.11[a]	0.00
2.	Albumin (g/dL)	3.13±0.04	3.08±0.07	2.97±0.02	3.1±0.06	0.90
3.	ALT (U/L)	28.00±2.72	25.12±6.09	27.25±5.59	37.37±5.78	0.37
4.	AST (U/L)	130.12±4.98[a]	133.50±1.94[a]	162.50±9.20[b]	152.87±5.40[b]	0.00
5.	Calcium (mg/dL)	11.42±1.08	12.60±0.44	10.35±0.53	11.01±1.29	0.37
6.	Phosphorus (mg/dL)	6.13±0.27	7.27±0.27	6.88±0.51	7.06±0.63	0.33

Means with same superscripts within a row do not differ (P>0.05) from each other

The value of AST in T_3 and T_4 was 162.50 U/L and 152.87 U/L and it was significantly (P>0.01) higher than the control and T_2 group but it was within the normal AST level as reported by Jagatheesan *et al.*, (2003); Rahman *et al.*, (2018).

The serum biochemical parameters like total plasma protein, albumin, calcium, Phosphors, alanine transaminase (ALT), aspartate transaminase (AST) were not significantly different (P>0.05) from each other on the 180th day of trial as shown in the Table 6.

Table 6: Mean (±SE) serum biochemical values of Mecheri lambs on 180th day of trial.

Sr. No.	Biochemical parameters	T_1 (Control)	T_2	T_3	T_4	P Value
1.	Total protein (g/dL)	7.16±0.14	7.51±0.20	7.61±0.17	7.83±0.38	0.93
2.	Albumin (g/dL)	3.02±0.04	2.97±0.02	3.13±0.04	3.05±0.02	0.78
3.	ALT (U/L)	24.12±5.70	26.50±4.12	29.75±4.65	37.12±5.73	0.31
4.	AST(U/L)	135.87±6.80	125.25±6.62	149.12±10.17	151.12±8.00	0.10
5.	Calcium (mg/dL)	12.98 ± 0.93	12.23 ± 0.68	12.35 ± 0.94	12.44 ± 0.18	0.900
6.	Phosphorus (mg/dL)	6.67±0.70	6.75±0.41	5.81±0.42	5.87±0.29	0.37

CONCLUSION

From the present study, it concluded that the haematological and biochemical values of Mecheri lambs were within the normal range and it implies that the feeding of cotton gin trash up to 75% inclusion level as a roughage diet were not harmful to the Mecheri lambs and further study can be conducted in adult animals to find out the effect of feeding cotton gin trash on blood parameters if any.

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Conflict of Interest. None.

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