



Effect of Replacement of Conventional Feeds by *Prosopis juliflora* Pods and *Citrullus lanatus* Seed Cake on Haemato-Biochemical Parameters in Marwari Goats

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ABSTRACT

An experiment was conducted to observe the effect of incorporation of mesquite (*Prosopis juliflora*) pods and watermelon (*Citrullus lanatus*) seed cake in complete feed with sixteen male Marwari goat kids of uniform conformation and age, divided into four groups. Four complete feed designated as T₁, T₂, T₃ and T₄ were formulated. T₁ served as control having all the conventional ingredients; whereas, barley of control was replaced by mesquite pods in T₂, cotton seed cake was replaced by watermelon seed cake in T₃ and both barley and cotton seed cake were replaced by mesquite pods and watermelon seed cake in T₄, respectively. All the four complete feeds were iso-nitrogenous and nearly iso-caloric. Haemato-biochemical parameters viz. haemoglobin, PCV, total serum protein and blood glucose, were worked out at fortnightly interval for 105 days of all individual animals. All parameters were found well within the normal range, i.e. 8.38, 8.26, 8.09 and 8.11 for haemoglobin (%), 27.87, 27.59, 27.78 and 27.87 for PCV (%), 72.03, 72.63, 69.66 and 71.66 for blood glucose (mg/dl), 7.26, 7.29, 7.17 and 7.33 for serum protein (g/dl) in T₁, T₂, T₃ and T₄ groups, respectively. It was concluded that dietary treatments had no adverse effect, but highly significant effect of period on haemato-biochemical parameters were observed in Marwari goat kids. Thus, barley and cottonseed cake could be safely and effectively replaced by mesquite pods and watermelon seed cake alone or in combination in the complete feed of goats.

Key words: *Citrullus lanatus*, Haemato-biochemical parameters, Iso-nitrogenous, Marwari, Mesquite *Prosopis juliflora*

INTRODUCTION

The use of alternative feed resources which are adaptive to long dry seasons is important for animal production in arid areas worldwide (Gusha *et al.*, 2015). Agro-industrial byproducts and non-conventional feeds such as *Prosopis juliflora* pods and watermelon seed cake may be economically advantageous in reducing feeding costs and can play an important role in feeding of sheep and goats under various management systems (Obeidat and Shdaifat, 2013). Availability of *Prosopis juliflora* pods worldwide was estimated to be about 2-4 million metric tonnes (Sawal *et al.*, 2004), whereas global production of watermelons was 118 million tonnes (FAOSTAT, 2018). Though many of the farmers in the dry areas of Rajasthan do not utilize these pods for livestock feeding but the goats browse these entire pods and seeds while grazing in the field or are fed by some owners in the form of concentrate. Formulation of

complete feed having non-conventional ingredients replacing conventional ingredients in the feed has been worked out extensively (Talpada *et al.*, 2002; Abo-Zeid *et al.*, 2017). Use of biotechnology in this regard has not only improved the efficiency of the conventional ingredients, but also allowed scientists to use non-conventional feed resources that are often cheaper and readily available (Chharang *et al.*, 2019).

Prosopis juliflora or Vilayati babul is a very variable, evergreen tree or shrub distributed in the arid part of tropical and sub-tropical regions. The ripen highly palatable pods produced as fruit, are moderate in crude protein (12 %) and rich in free sugar (15-17 %) giving sweet taste to it. Studies have shown that it can be effectively used in the feeding of livestock and it has about 7 % DCP and 75 % TDN (Talpada *et al.*, 1979). Similarly, watermelon (*Citrullus lanatus*) previously called as *Citrullus vulgaris*, is also a naturally grown

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xerophytes found in abundance in hot arid and semi-arid areas. The seeds obtained from this plant are gaining commercial importance due to its high oil contents and cake is obtained as by product (Chharang *et al.*, 2005). After extraction of oil from seeds, huge edible biomass is available for the feeding of animals having about 20.42 % DCP and 52.73 % TDN (Pal and Mahadevan, 1968). Therefore, the objective of study was to evaluate the effect of incorporation of non-conventional feeds like mesquite pods and watermelon seed cake in complete feed on haemato-biochemical parameters of goats.

MATERIALS AND METHODS

Sixteen Marwari goat kids of 7-8 months age and of uniform conformation were selected and divided by completely randomized block design into four groups of four animals in each, were subjected to feeding trial of 105 day followed by a seven days duration digestibility trial. Four iso-nitrogenous and nearly iso-caloric complete rations were formulated (Table 1) on dry matter basis according to Indian feeding standards (ICAR, 1985) and were designated as T₁, T₂, T₃ and T₄. In T₁ (control), barley and cotton seed cake were incorporated in complete feed as conventional energy and protein sources. Whereas, in T₂ the barley of

control was replaced by non-conventional mesquite pods, in T₃ cotton seed cake of control was replaced by non-conventional watermelon seed cake and in T₄ both barley and cotton seed cake were replaced by mesquite pods and watermelon seed cake (Table 2).

For ascertaining physiological status of health associated with the effect of inclusion of non-conventional feeds, routine haematological and biochemical studies were made during the feeding trial of 105 days at fortnight intervals before feeding in animals of all treatment groups. The blood was drawn from jugular vein in sterilized test tubes. For haematological examination, EDTA was used as an anticoagulant at the rate of 1 mg per 5 ml of blood. Haematological studies were performed soon after collection of blood *viz.*, haemoglobin content (Hb) and packed cell volume (PCV) were determined by standard methods, as recommended by Jain (1986). For separation of serum, blood was collected in second tube, without anticoagulant, and kept in slanting position. These tubes were incubated for 1 hour at 37°C. Blood clots were broken and tubes were centrifuged at 2500 rpm for 30 minutes. The serum was analysed for total serum protein (Doumas *et al.*, 1981) and blood glucose (Oser, 1976). The statistical analysis for different

Table 1. Chemical composition of experimental complete feeds and different feed ingredients (per cent dry matter basis)

Feed ingredients	DM	OM	CP	EE	CF	NFE	Ash	Ca	P
Complete feeds									
T ₁	91.84	90.88	13.94	2.81	22.19	52.00	9.06	1.15	0.44
T ₂	92.48	90.28	14.05	3.16	25.85	47.28	9.66	1.22	0.41
T ₃	91.64	90.96	13.62	3.15	24.75	49.50	8.98	1.15	0.37
T ₄	92.28	90.36	13.73	3.50	28.41	44.78	9.58	1.22	0.34
Feed ingredients									
Sewan grass	91.81	92.49	4.62	1.78	32.82	53.07	7.51	1.27	0.05
Barley	88.70	95.79	11.62	1.75	4.51	77.91	4.21	0.16	0.33
Mesquite pods	91.88	92.78	12.16	3.48	22.78	54.36	7.22	0.51	0.19
Cottonseed cake	92.18	90.37	25.74	6.56	23.39	34.68	9.63	0.31	1.18
Watermelon seed cake	91.07	90.84	23.95	8.46	37.60	20.83	9.16	0.34	0.78
Guar korma	96.66	91.98	45.83	3.92	7.67	35.51	8.02	1.27	0.16
Min. mixture	96.78	-	-	-	-	-	96.78	29.60	12.35
Common salt	96.23	-	-	-	-	-	96.23	-	-

Table 2. Parts composition of experimental complete rations

Ingredients	T ₁	T ₂	T ₃	T ₄
Sewan grass	50	50	50	50
Barley	20	-	20	-
Mesquite pods	-	20	-	20
Cotton seed cake	18	18	-	-
Watermelon seed cake	-	-	18	18
Guar korma	10	10	10	10
Mineral Mix	01	01	01	01
Salt	01	01	01	01

parameters in this study was analyzed using conventional statistical procedure as suggested by Steel and Torrie (1980).

RESULTS AND DISCUSSION

The animals were in excellent condition throughout the experimental period without any signs of abnormal health. Feeding non-conventional feeds to the goat kids for 105 days did not affect their health or growth. It was observed that all the parameters *viz.*, Hb, PCV, blood glucose and total serum proteins estimated for four treatment groups were well within the normal range (Table 2 and 3).

The data when subjected to statistical analysis showed no significant effect of treatments *i.e.* replacement of conventional ingredients by non-conventional resources. The more or less similar values of haemoglobin content were recorded in this study for different treatment groups and were well within the normal range (Swenson, 1984). Similar non-significant

effect supporting the results of present investigation have also been noticed by Sastry *et al.* (1973); Talpada and Shukla (1988); Gujrathi *et al.* (1982); Swami (1995); Sharma (2001); Bhatt *et al.* (2007); Eldaw *et al.* (2016); Alagbe (2018) on replacing conventional energy and protein sources by mesquite pods and matira seed cake in the diet of ruminants.

Statistical analysis of data revealed non-significant effect of treatment and block and highly significant ($P<0.01$) effect of period. The findings of present investigation for PCV were in accordance with the findings of previous reports (Sastry *et al.*, 1973; Gujrathi *et al.*, 1982; Talpada and Shukla, 1988; Swami, 1995; Sharma, 2001; Daramola *et al.*, 2005; Eldaw *et al.*, 2016; Alagbe, 2018) involving replacement of conventional concentrate ingredients with mesquite pods and matira seed cake. The normal PCV values of experiment contradict the low PCV observed by Mahgoub *et al.* (2008) for sheep fed non-conventional

Table 3. Haemoglobin and PCV (%) at fortnight intervals in kids of all treatment groups

Period (105 days)	Haemoglobin (%)				PCV (%)			
	T ₁	T ₂	T ₃	T ₄	T ₁	T ₂	T ₃	T ₄
0	6.80±0.09	6.97±0.09	6.85±0.20	6.85±0.18	24.50±2.60	24.00±1.47	24.75±1.80	25.00±1.96
15	7.42±0.08	7.32±0.11	7.30±0.18	7.37±0.05	25.75±2.53	25.25±1.11	25.50±1.89	26.25±1.38
30	7.60±0.10	7.52±0.16	7.53±0.15	7.57±0.06	27.00±2.35	26.50±0.87	26.50±1.85	27.00±1.47
45	8.25±0.29	8.22±0.31	7.88±0.17	7.93±0.12	28.00±1.96	27.25±0.85	27.00±1.68	27.50±1.19
60	8.63±0.37	8.57±0.42	8.18±0.15	8.18±0.18	28.25±1.80	28.00±0.71	27.50±1.55	28.00±1.47
75	8.92±0.49	8.88±0.51	8.55±0.19	8.45±0.23	28.75±1.38	28.75±1.11	28.75±1.11	29.00±1.47
90	9.37±0.31	8.98±0.46	9.03±0.27	8.95±0.33	29.25±1.38	30.25±0.63	30.75±1.44	29.75±1.31
105	10.08±0.41	9.63±0.56	9.43±0.36	9.55±0.36	31.50±0.65	30.75±0.75	31.50±1.26	30.50±1.19
Overall Mean ±SE	8.38±0.21	8.26±0.19	8.09±0.16	8.11±0.16	27.87±0.70	27.59±0.50	27.78±0.64	27.87±0.55

Table 4. Blood glucose (mg/dl) and total serum proteins (g/dl) at fortnight intervals in kids of all treatment groups

Period (105 days)	Blood glucose (mg/dl)				Total serum proteins (g/dl)			
	T ₁	T ₂	T ₃	T ₄	T ₁	T ₂	T ₃	T ₄
0	57.25±3.09	49.25±6.86	60.25±2.69	57.25±2.39	5.83±0.28	5.93±0.25	6.00±0.15	7.17±0.15
15	68.75±5.95	71.25±2.72	65.75±2.10	78.50±0.29	6.43±0.23	6.45±0.19	6.53±0.19	6.80±0.12
30	74.00±2.89	79.75±1.60	74.50±2.63	79.25±2.32	7.11±0.11	7.08±0.16	6.88±0.21	7.11±0.11
45	79.50±3.52	85.50±3.12	79.50±0.96	84.00±3.24	7.38±0.14	7.37±0.19	7.02±0.25	7.30±0.09
60	81.00±3.54	82.75±3.12	73.75±0.85	78.75±3.75	7.65±0.09	7.48±0.09	7.41±0.22	7.66±0.08
75	73.00±3.03	73.00±3.85	69.25±0.85	65.00±4.38	7.79±0.04	7.89±0.05	7.75±0.08	7.72±0.05
90	70.75±3.30	69.75±3.82	67.75±1.65	65.75±3.75	7.92±0.05	8.04±0.07	7.88±0.09	7.89±0.04
105	72.00±3.03	69.75±2.69	66.50±3.80	64.75±4.61	8.02±0.09	8.10±0.09	7.92±0.10	7.99±0.09
Overall Mean ±SE	72.03±1.67	72.63±2.22	69.66±1.22	71.66±1.92	7.26±0.14	7.29±0.14	7.17±0.13	7.33±0.11

diet. However, it was noticed that with the increase in the haemoglobin content there was a correspond increase in PCV.

The statistical analysis of data did not reveal any significant effect of treatment and block but revealed highly significant ($P<0.01$) effect of period on glucose level. The blood glucose level obtained in present investigation for different treatment groups were found to be well within the normal range of 40-80 mg/100 ml reported by Swenson (1984) and were in line with the results of earlier replacement studies conducted by Sastry *et al.* (1973); Gujrathi *et al.* (1982); Talpada and Shukla (1988); Swami (1995); Sharma (1997); Sharma (2001); Dhanotiyo (2004); Okonkwo, *et al.* (2010); Babeker and Elmansoury (2013) reported no significant effect on inclusion of non-conventional ingredients in the diet of kids and other ruminants on blood glucose.

The statistical analysis of data revealed non-significant effect of treatment but highly significant ($P<0.01$) effect of block and period. The values for total serum proteins obtained in this investigation regarding non-significant effect of treatment are in corroboration with the earlier findings of Sastry *et al.* (1973); Gujrathi *et al.* (1982) and Swami (1995) in calves, and Sharma (1997) in sheep, Sharma (2001) in goats, Eldaw *et al.* (2016) in goats and Alagbe (2018) in rabbits.

CONCLUSIONS

On the basis of the results, it appears that incorporation of mesquite pods and watermelon seed cake alone or in combination in the complete feed of goats is quite safe. There was no change in haemoglobin, PCV, blood glucose and total serum protein values observed.

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