Effect of Feeding Rations Containing Different Levels of Mesquite Pods on growth and Carcass Characteristics of Sudanese Nubian Goats

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Abstract

A seven weeks feeding trial was conducted to evaluate the nutritive value of dry mesquite pods (Prosopis juliflora) for goats. Every six male Nubian kids (average body weight 11.0 kg) were randomly allotted to four experimental groups of six according to randomized-bloc design. We fed kids in groups 1, 2, 3 and 4 a concentrate mixture containing dry powder of mesquite pods at 0, 10, 20 and 30 g/100 g by replacing bersem hay, wheat bran and molasses in the diet for 7 weeks, respectively. Final body weight, total body weight gain, and percentages of carcass muscles, bones and fat did not vary significantly among experimental groups. Dry matter intake was significantly higher in groups 2 and 3 than in group 1. Daily intake of metabolizable energy (ME) was significantly higher in groups 2, 3 and 4 than in group 1. Group 1 showed significantly higher dressing percentage than other groups. These results indicated that P. juliflora pods can be added up to 30% to usual Sudanese local feed for goats.

KEY WORDS: - Prosopis juliflora, goat, feed intake, growth, energy, dry matter

Introduction:

Prosopis spp. (mesquite) are ever green leguminous trees. Prosopis species grow in arrays of environments and are not restricted by soil type, pH, salinity or fertility. (Burkart 1976). *P. Juliflora* was for the first time introduced to Sudan and planted in Khartoum in 1917 (Broun and Massey, 1929). The tree flowers all year-round in Sudan. The fruiting period (December to June) coincides with the dry season. The ability of *P. Juliflora* to tolerate drought and fix sand dunes encouraged the introduction of the tree into various plasces in Sudan especially to dry areas. The tree was planted in shelterbelts around farms, irrigated schemes and banks along the Nile. Now mesquite has become a noxious weed threatening bio-diversity, invading natural range lands, water courses, flood plains and irrigated schemes (Babiker, 2006). Pods of mesquite are attractive to animals (El Tayeb, Mahir and El Hassan, 2001). Pods of *P. Juliflora* were used successfully for fattening rations for goats (Ibrahim and Gaili, 1985; Mahgoub *et al*., 2005) and sheep (Obeidat, 2005) at different levels. As the eradication of mesquite is hard, the utilization of mesquite is one of the proposed strategies to control mesquite. Accordingly, this study investigated the potential of mesquite pods as feed for local breeds of small ruminants in Sudan.

Materials and Methods:

Experimental rations

The mesquite pods were collected from Gheetina Town, (White Nile State), Sudan. The pods were air-dried, ground and incorporated in the feed. Crude protein (CP) (Table 1) and metabolizable energy (ME) (Table 2) of the feed ingredients were calculated according to A.O.A.C. (1990). Four rations containing 0 (control), 10, 20 or 30 g/100 g feed of dried mesquite pods were added to the feed by replacing bersem hay, wheat bran and molasses to make all feeds iso-nitrogenous and iso-caloric.

Animals

Twenty-four Sudanese male Nubian goats kids of an average age of six months were purchased at local markets. On arrival all kids were weighed, ear-tagged and dosed against internal and external parasites.

Feeding trial

One-way randomized bloc design was adopted with six blocs and four experimental groups corresponding to four feeding groups. The kids were first assigned into 6 blocs from the highest to the lowest body weight. Then, kids in each bloc were divided randomly into four groups. Kids were housed individually in pens of 1.0 x 1.5 meter equipped with a plastic bucket and galvanized feeder. All pens were under one and the same overhead shade. Kids in the same group were given one of the control or experimental rations for two weeks of adaptation period followed by 7 weeks of feeding trial at 8a.m.. Water, minerals and salt mixture were available all the time. Feed intake was recorded daily. The animals were weighed weekly after 12hours fasting

Table 1 Ingredients of experimental rations

Raton / Ingredient	**1**	**2**	**3**	**4**
Mesquite	0	10	20	30
Dura	30	30	30	28
Brseem hay	25	25	20	10
Ground Nut Cake	10	10	15	17
Wheat bran	20	15	5	8
Molasses	13	8	8	5
Lime	1	1	1	1
Nacl	1	1	1	1
Total	**100**	**100**	**100**	**100**

Table 2 Crude protein and metabolizable energy from each ingradient in experimental rations

Crude protein (%)					**Metabolizable energy MEKcal/g DM**			
Ingredient	**0%**	**10%**	**20%**	**30%**	**0%**	**10%**	**20%**	**30%**
Mesquite	0	0.734	1.468	2.202	-	0.104	0.208	0.313
Dura	3.969	3.969	3.969	3.704	0.431	0.431	0.431	0.402
Brseem	4.753	4.753	3.802	1.901	0.177	0.177	0.141	0.070
G.N. Cake	4.358	4.358	6.537	7.408	0.155	0.115	0.172	0.195
Wheat Bran	3.366	2.524	0.842	1.346	0.209	0.157	0.052	0.083
Molasses	0.457	0.281	0.281	0.176	0.131	0.081	0.081	0.051
Lime	-	-	-	-	-	-	-	-
Salt	-	-	-	-	-	-	-	-
Total	**16.9**	**16.6**	**16.9**	**16.7**	**10.6**	**10.7**	**10.9**	**11.1**

Carcass characteristics:

Rondomly selected 3 animals from each group were slaughtered at the end of the feeding trial for 7 weeks. These animals were slaughtered at the slaughterhouse of the Animal Production Research Center of Sudan University of Scicence and Technology according to the method described by Gaili (1979) for slaughter and carcass analysis. The warm carcass was weighed immediately. Thereafter, the carcass was chilled at +4°C for 24 hours and weighed. Each carcass was split longitudinally into two equal halves. The left half was dissected into muscles, bones, inter-muscular fat and connective tissue to measure the weight of these tissue parts.

Statistical analysis

Quantitative data were expressed as means with pooled standard deviation, i.e. square root of error mean square of analysis of variance (ANOVA). Means were compared by Tukey's HSD test based on the error mean square of ANOVA using JMP 8.0.1 software (SAS Institute Inc.) on a Macintosh computer. Bloc effect was involved in the analysis of weekly body weight data. The between-group difference was considered significant at error probability less than 0.05.

Results

The animals did not show any signs of illness due to inclusion of mesquite pods in their feed. (Table 3) However, goats fed rations containing 10% and 20% pods, or 10% pods were significantly heavier than goats fed a ration without pods (control) on weeks 6 or 7, respectively. ($p<0.05$). Final body weight and weight gain did not vary significantly among the four groups. The daily intake of dry matter (DM) and ME of the control group were significantly ($P<0.05$) lower than that of all other groups; also the control group showed significantly($P<0.05$) lower CP intake than the group fed 20% mesquite pods. No significant differences were observed among the groups other fed mesquite in their daily intakes of DM, ME or CP. The control group showed significantly higher dressing percentage and carcass connective tissue than all the other groups. ($P<0.05$) (Table 4) No differences were obtained among all the experimental animals for the percentages of carcass muscle, carcass bone and carcass fat.

Table (3) Initial and final body weight, body weight gain, dry matter intake, crude protein intake, metabolizable energy intake and feed requirement in goats fed diets with different levels of dried mesquite (*Prosopis juliflora*) pods for 7 weeks.

Pods (g/100 g)	0	10	20	30	Pooled stanndard eviationd
Initial body weight (kg).	13.03	13.10	13.12	12.98	0.27
Final body weight (kg).	17.75	17.88	17.58	16.57	0.29
Body weight gain (kg)	4.72	4.78	4.47	3.58	0.27
Dry matter intake (g/day)	699 [b]	745 [a]	756 [a]	743 [a b]	9.44
Crude protein intake (g/day)	118 [b]	123 [a b]	128 [a]	124 [a b]	1.57
ME intake (MJ/day)	7.41 [b]	7.97 [a]	8.24 [a]	8.25 [a]	1.13
Feed intake (kg) /weight gain (kg)	7.6	8.1	9.7	11.2	0.7

Means not sharing a superscript within a row differ significantly ($P<0.05$).

Table(4) Carcass weight, dressing percent, and the relative weight of muscle, bone, intermuscular fat and connective tissue in goats fed ration with different levels of mesquito (*Prosopis juliflora*) pods for 7 weeks. (Means with pooled standard error, n=3).

Pods (g/100 g)	0	10	20	30	pooled SD
Warm carcass (kg)	6.7	8.1	6.3	6.5	0.32
Warm carcass (kg/100 kg live weight)	47. 7 [a]	45.3 [b]	45.0 [b]	45.6[b]	0.39
Muscles (kg/100 kg live weight)	31.0	29.6	33.0	28.5	0.27
Bone (kg/100 kg live weight)	15.3	13.3	16.5	13.7	0.18
Intermuscular fat (kg/100 kg live weight)	3.7	2.9	4.1	2.6	0.14
Connective tissue (kg/100 kg live weight)	0.59	0.87	0.57	0.86	0.07

Means not sharing a superscript within a row differ significantly ($P<0.05$).

Discussion

The addition of mesquite pods up to 30% in the ration showed no adverse effect to growing goats in the present study. Examination of the alimentary tract and other internal organs of the slaughtered animals did not disclose any abnormalities. A previous paper (Ibrahim and Gaili, 1985) reported lower intake of feed containing mesquite pods at higher content than the present study (Table 3). They suggested the addition of molasses to the pods to improve their palatability. Mahgoub *et al.* (2005) fed Omani goats rations containing mesquite pods at 100, 200 and 300 g/kg and observed a daily feed intake of 399, 463, and 291g, respectively. They attributed the low feed intake to a poor palatability of the mesquite pods. The higher feed intake and the better increase in body weight in our present study (Table 3) may be due to the increased palatability and digestibility of pods by the grinding of dried pods and the addition of molasses. Furthermore, grinding prevented the selective feeding and spreading of seeds through the faeces. The latter constitutes a major dispersal avenue for mesquite.

Ibrahim and Gaili (1985) reported a daily weight gain of 26 or 33 g/day in Sudanese goats fed mesquite pods at 500 or 700 g/kg, respectively, which was lower than those in the present study (Table 3). This difference may be due to the lower feed intake in Ibrahim and Gaili (1985) very likely caused by the larger amount of mesquite pods in their rations than in the present study.

The addition of mesquite pods at 100 or 200 g/kg in the present study resulted in a live weight gain and feed conversion ratio comparable to those of the control group. (Table 3) Assia *et al.* (2011) also obtained a food conversion ratio in castrated Nubian kids fed 100 or 200 g/kg mesquite rations comparable to that of control animals. The feed conversion ratio in the present study was comparable to or better than that for goats kids kept under browse and feedlot systems (Soliaman and Sharmark, 2009), for Sudanese female goats (Yagoub and Babiker, 2009) and for Nilotic goats (Adam *et al.*, 2010) without mesquite pods.

The inclusion of mesquite pods in the ration showed no significant effect on the dressing percentage in the present study. (Table 4) The obtained dressing percentage was comparable to that in Mahgoub *et al.* (2005) and higher than in Daskiran *et al.* (2006). The proportion of muscle, bone, fat and connective tissue in the

carcass did not vary among the experimental groups in the present study (Table 4). Thus, the inclusion of mesquite pods up to 30% may not have an adverse effect on the quality of carcass.

In conclusion the present study demonstrated the potential of mesquite pods to be included in livestock rations especially. The low cost of mesquite pods is also favorable for farmers. Further work is needed to include mesquite pods in the ration in a form that will not lead to the dispersion of the seeds in places where the plant is considered a weed.

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Summary of previous studies findings for goats' feedlot performance

Parameters / Authors	Final Wt (Kg)	Daily Wt.gain (g/day)	DM intake (g/day)	CP intake (g/day)	ME intake (Kcal /day)	FCR
Ibrahim & Algaili (198)		26 – 33				
Mahgoub et al (2005)		21– 43.76	291-500			0.072– 0.093
Daskiran et al (2006)	26.1±1.47	133.3±11.1	604			
Gursoy et al (2009)	21.28 – 42.1					4.65– 5.23
Yagoub &Babiker(2009)	25.67±1.01	87.14 – 87.1	1161±43			13.36±0.67
Soliman & Shoemaker (2009)	25.9±35.1	46.2 – 124.1	610.90 – 978.9			13
Adam et al (2010)	16.36 – 17.37	54.39 – 60.88	461.62– 464	92.43– 93.62	5 – 5.62	5.87– 10.74
Nasr et al.(2011)	17.5±3.5	103.5±14.09				7.8±0.88
Dilva et al (2011)	17.73 – 18.43	19 – 40				

Summary of previous studies findings of goats' carcass characteristics

Parameters / Authors	Warm carcass Wt.(Kg)	Dressing %	Muscle %	Bone %	Intera muscular fat%	Connective tissue
Mahgoub et al (2005)	9.5, 10.4, 8.2	46.7, 47.6, 47				
Daskiran et al (2006)	10.1±0.72	42.9±0.48	46.4±0.89	38.9±1.69	6.4±0.8	
Gursoy et al (2009)	16.25–19.68	45.78 – 48.64				
Adam et al (2010)	7.21–7.83	44.73– 48.2				
Dilva et al (2011)	7.83–8.78	45.53– 47.45				