

Effect of Diets Containing Different Levels of Steam Treated Pith Bagasse on Performance and Carcass Characteristics of Fattening Arabi Lambs

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Abstract: The effect of dietary containing different levels of steam treated pith on performance and carcass characteristics in growing Arabi lambs were investigated during a period of 10 weeks (70 days) using 40 lambs of 3 months old with an average live weight of 18.25 kg. The dietary treatments were 100% barley (diet 1), 75% barley + 25% pith (diet 2), 50% barley + 50% pith (diet 3) and 25% barley +75% pith (diet 4), respectively. The total pith contents of diets 1-4 were 0, 11, 22 and 33% (pith), respectively. The lambs were allocated to the diets (10 lambs diet⁻¹) according to a completely randomized design. The diets formulated according NRC and had approximately, similar nutrients contents. Average Dry Matter Intake (DMI) of lambs fed diets 1-4 during whole period of experiment were 1400, 1441, 1389 and 1466 g day⁻¹, respectively. Average Daily Gain (ADG) of lambs for diets 1-4 during whole period of experiment were 267±19.3, 307±18.8, 251±42.1 and 226±28.3 g day⁻¹, respectively. Despite non significantly differences between ADG of control group with lambs fed diet 2 and 3, but lambs fed diet 4 had significantly ($p<0.05$) lower ADG than control group. The same trend was found for feed conversion ratio (F/G). Average F/G were 5.24±0.2, 4.7±0.2, 5.5±0.74 and 6.5±0.65, respectively for diets 1-4. The main carcass characteristics (composition and chops) were not affected by dietary treatments ($p>0.05$), but diet 2 had the best economic efficiency. This study suggests that lambs fed diet 3 had also better net return than control group, which is important for Iran condition. So, it is concluded that pith a by product of sugarcane has potential as an alternative feed source for ruminants, particularly for fattening lambs.

Key words: Steam treated pith bagasse, performance, average daily gain, average dry matter intake, feed conversion ratio, carcass characteristics, Arabi lambs

INTRODUCTION

Land limitations for growing natural and artificial pasture and preference of agricultural lands for strategic cultivation like cereal seeds to meet humans requirements has caused that most countries specially improving countries think about optimal utilization of agricultural byproducts (Dabiri, 1988; Hart, 1985; Jackson, 1978; Sudstol, 1985). But, these roughage because of their physicochemical nature don't have enough nutritive value in animal nutrition without some changes or processing and it is essential to improve their nutritive value with some special methods. Based on statistics more than half of 55 million tons of animal dry matter food in Iran is consisted of agricultural byproducts, whereas forage production from nature is only about 10 million tons. The most important agricultural byproducts based

on quantitative are cereal straw, corn stem and sorghum, corn stem head and sugar cane bagasse. Recently, sugarcane production has improved in Khuzestan province (Southwest of Iran) that caused to production of bagasse and pith bagasse as sugarcane byproduct. With considering the food ingredient in a ration based on sugarcane, even if growth rate of animal is less than standard diet, animal responses will be good and economic output also will be more (Dabiri, 1988; Foulkes, 1986; Hart, 1985; Sudstol, 1985). Pith bagasse is one of the sugar cane byproduct, which is produced from sugar cane when processing for sugar extraction and after separation of fiber from bagasse so its nutritive value is more than bagasse (Dabiri, 1988). Pith bagasse can be used in ruminant nutrition, but it has low digestibility and palatability and it is poor in protein so we must enrich our diets with high energy and protein supplementation and

vitamin-mineral premix to increase production rate (Preston *et al.*, 1976). By mixing pith with hydrolyzed steam and molasses, it converted to a high energy source as if we can substitute it as some part of expensive ingredients like barley in finishing diets and so reduce the pressure on pasture by taking lambs and cattle out of pasture sooner and making them ready for growing with diets consist of pith. Recently, some feed factories near the sugarcane industries have equipped with steam pressure hydrolysis system. There is limited information about the effect of hydrolyzed pith bagasse on performance of Iranian fattening lambs and particularly no works was done with Arabi lambs. So, the present study was conducted to investigation the effect of diets containing different levels of steam treated pith bagasse on performance and carcass characteristics of fattening Arabi lambs.

MATERIALS AND METHODS

Forty fattening male lambs with similar conditions (18.25 kg body weight and 90±5 days of age) from a flock of autumn lambing of Arabi sheep of the Ramin Agricultural and Natural Resources University were used in this study. The lambs were divided into four equal groups. Four diets were formulated. Diet 1 (control diet) formulated according to NRC (1985) for 300 g daily gain as a standard. In diets 2-4 barley replaced by 25, 50 and 75% hydrolyzed pith bagasse, respectively. In the other hand, total hydrolyzed pith bagasse content in diets 1-4 were 0, 11, 22 and 33%, respectively. The ingredient composition and analysis of the basal diet are shown in Table 1.

The diets were offered ad libitum to all groups. The Body Live Weight (BLW), Average Daily Gain (ADG), Dry Matter Intake (DMI) and Feed Conversion Ratio (FCR) of lambs were measured two weeks interval, until 10 weeks. At the end of the experiment, three lambs for each treatment (close to the mean pen weight) were fasted for 14-16 h (water was allowed), weighted and slaughtered. After dressing and storing refrigerated for 24 h at 3°C, carcasses were weighted according to Method of standard and industrial research institution of Iran (1995) guidelines and sectioned into two symmetric halves. The right half was divided into the cuts: neck + proximal thoracic limb + steaks + brisket, lumbar + abdominal region, proximal pelvic limb and weights of each cut were recorded. The weights of liver, kidney, visceral fat and carcass meat, bone and fat tail percentage were measured separately.

Performance and carcass characteristics of lambs were analyzed as a completely random design using the GLM procedures of SAS Institute (1999) using the

Table 1: Ingredient composition and calculated analysis (g kg⁻¹) of the basal diets (DM basis)

Ingredients	1	2	3	4
Barley	440	330	220	110
Soybean meal	130	130	140	140
Corn grain	105	105	105	105
Wheat bran	110	90	75	75
Sugar beet pulp	100	110	105	100
Alfalfa hay	30	30	30	30
Molasses	0	70	80	80
Straw	55	0	0	0
Pith	0	110	220	330
Limestone	10	8	4	5
Sodium bicarbonate	5	5	5	5
Salt	5	2	2	2
Supplement (v + m)	5	4	4	4
Urea	5	6	10	14
Total	1000	1000	1000	1000
ME (kcal kg ⁻¹)	2.8	2.7	2.6	2.5
CP (%)	16.7	16	16.1	16

model $Y_{ij} = \mu + \tau_j + \epsilon_{ij}$. In these instances Duncan's test for treatment mean comparison to control at ($p < 0.05$) was used.

RESULTS AND DISCUSSION

Growth performance: Effect of dietary containing different levels of steam treated pith on performance in fattening Arabi lambs (BLW, DMI, ADG and FCR) shown in Table 2. Total ADG for each lamb in 4 treatments was 267, 307, 251 and 226 g day⁻¹, respectively. These figures show that lambs in treatments 2 and 4 had the most and the least weight and the difference were significant (it means the difference in body weight gain is 80 g). On the other hand, except for treatment 2 (11% pith), body weight gain was decreased with increasing the level of pith enriched with steam. Although, the lambs in control group (diet without pith) had significant preference ($p < 0.05$) in body weight gain compared to lambs in group 4 (diet consist of 33% pith). The average of body weight gain for lambs in all periods was 263±27.1 g day⁻¹ that is more than the amount reported by Dabiri (1997 and 1988) and this might be due to different condition of nutrition and breeding. This result is agreement with the results of Azarfard and Dabiri (2007) and Heydari and Dabiri (2008). DMI figures for each lamb in 4 treatments were 1400, 1441, 1389 and 1499 g day⁻¹, respectively. These figures suggest that food intake in the lambs fed with treatment 4 (75% pith and 25% barley) was more than other groups. Mean of food intake through the experiment was 1.4 kg, which is agreement with the results of Dabiri (1997), Azarfard and Dabiri (2007) and Heydari and Dabiri (2008) results. FCR in 4 treatments was 5.24±0.2, 4.7±0.2, 5.5±0.74 and 6.5±0.65, respectively that only treatment 4 had significant difference with other treatments ($p < 0.05$). The most and the least FCR was for treatments 2 and 4,

Table 2: Effect of feeding dietary containing different levels of pith bagasse on the performance fattening Arabi lambs

Items	Pith (%)			
	0	11	22	33
Lambs (n)	10	10	-	10
BLW (kg)				
Initial	18.4±2	18.3±2	18.1±2	18.3±2
Final	37.38±3 ^{ab}	40.3±3 ^a	35.12±3 ^{ab}	34.62±3 ^b
DMI (g day⁻¹)				
01-42	1246	1270	1216	1239
43-70	1631	1697	1647	1806
Total	1400	1441	1389	1466
ADG (g day⁻¹)				
01-42	273.8±38 ^{ab}	218.5±39 ^a	262.2±32 ^{ab}	208.2±25 ^b
43-70	258.9±30	290±44	236.7±78	254.4±38
Total	267.7±19 ^{ab}	307±19 ^a	251±42 ^b	226.1±28 ^b
FCR				
01-42 days	5.25±0.3 ^{ab}	4.1±0.3 ^a	4.6±0.3 ^b	6±0.5 ^a
43-70 days	6.4±1	5.85±1	6.96±4	7.09±1
Total	5.24±0.2 ^b	4.7±0.2 ^b	5.5±0.7 ^b	6.5±0.6 ^a

^{a-c}Means in row with different superscripts differ significantly (p<0.05)

Table 3: Effect of feeding dietary containing different levels of pith bagasse on the carcass characteristics fattening Arabi lambs

Traits (%)	Pith (%)			
	0	11	22	33
Dressing	43.36±3.6 ^{ab}	48.20±1.4 ^a	46.00±2.5 ^{ab}	41.90±1.0 ^b
Boneless meat	59.48±1.5	57.15±5.0	56.00±4.3	57.23±1.2
Carcass bone	29.83±1.1	29.96±3.2	31.37±2.0	33.22±1.0
Carcass fat	10.70±2.5	12.87±7.6	12.62±3.0	9.54±1.0

^{a-b}Means in row with different superscripts differ significantly (p<0.05)

respectively. Different animal, environment and diets can cause different result in studies. Overall mean of FCR in this study was 5.5 that is less than Dabiri (1997). This is due to different nutritive conditions in this experiment. We used a diet with high level of energy and protein whereas in Dabiri study, a large part of diet was consisted of agricultural byproduct enriched with urea. These results show that the type of diet has a significant effect on growth and performance of lambs within strain. Although, the results are in agreement with Azarfard and Dabiri (2007) and Dabiri (1988) results but FCR in Heydari and Dabiri (2008) reported was less and this is related to addition of ionophores in her study.

Carcass traits: The results obtained for some carcass characteristics are shown in Table 3. Overall mean of lamb carcass efficiency was 44.86, which confirm previous report Heydari and Dabiri (2008), but it is in contrast with Azarfard and Dabiri (2007) study. Overall mean of carcass fat was 11.5 that are much less than figure reported by Azarfard and Dabiri (2007). With considering similar nutrition in both experiments, the only reason for this variation in carcass fat is the difference in length of finishing period. The length of finishing period in this study was 10 weeks but in Azarfard and Dabiri (2007) study it was 12 weeks. These data suggest that it is better to reduce finishing period to maximum 10 weeks to have a carcass low in fat that is more desirable for consumers. The figures show there wasn't any significant difference

between treatments in meat, fat and bone weight and also meat, fat and bone percentages. Similar results have been shown in previous studies with lambs fed with different level of bagasse enriched with urea (Dabiri, 1997, 1988). Carcass percent has followed a similar trend to live body weight, as if for lambs in treatment 2, carcass percent was significantly more than treatment 4 (p<0.05), but the difference between other treatments was not significant (p>0.05).

CONCLUSION

This study suggests that lambs fed diet 2 (containing 11% pith bagasse) had the best performance. Moreover, until 50% of barley of diet3 (containing 22% pith bagasse) can be replaced by hydrolyzed pith bagasse without any negative effects but utilization over than this level (diet 4 containing 33% pith) lead to decrease in FCR and ADG of lambs. So, it can be concluded that hydrolyzed pith bagasse a byproduct of sugar cane has potential as an alternative feed source for ruminant.

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