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Determination of Optimum Level of Steam Pressure Hydrolyzed Pith Bagasse in Feeding of Crossbred Beef

M. Sabbagh Zade, N. Dabiri, J. Fayazi and M. Boujar Pour
[1]Department of Animal Science, Faculty of Animal Science and Food Technology,
[2]Department of Animal Science, Karaj Azad University,
P.O. Box 6341733877, Mollasani, Ahwaz, Iran

Abstract: The effect of dietary containing different level of steam pressure hydrolyzed pith on performance and carcass characteristics in crossbred beef were investigated during a period of 20 weeks (140 days) using 24 beef of 3-5 month old with an average live weight of 157.5 kg. The dietary treatment were respectively 44% barley (diet1), 33% barley + 11%pith (diet2), 22% barley + 22% pith (diet3) and 11% barley + 33% pith (diet4). The beef were allocated to the diets according to complete block randomized design. The diet formulated according NRC and had approximately similar nutrition contents. Average Dry Matter Intake (DMI) of beef fed diet 1-4 during whole period of experiment were 6.62, 6.53, 6.48 and 6.34 kg day^{-1}, respectively. Average Daily Gain (ADG) of beef for diets 1-4 during whole period of experiment were 1.07±0.06, 0.98±0.06, 0.86±0.07 and 0.77±0.07 kg day^{-1}, respectively. Despite non-significantly difference between ADG of control group with beef fed diet 2 and 3, but beef fed diet 4 had significantly ($p<0.05$) lower ADG than control and treatment 2 groups. A significantly difference between feed conversion ratio (F/G) of control group with beef fed diet 4 was observed. Average F/G was, respectively 6.25±0.5, 6.67±0.5, 7.59±0.6 and 8.4±0.6 for diets 1-4. The main carcass characteristics were not affected by dietary treatment ($p<0.05$). This study suggests that beef fed diet 3 (22% barley + 22% pith) had also lower cost of production than control group which is important for Iran condition. So it concluded that pith a by product of sugar cane has been potential as an alternative feed source for ruminant.

Key words: Crossbred beef, hydrolyzed pith bagasse, performance, carcass characteristics, alternative feed

INTRODUCTION

Many part of by-product will to produce by food industry factories. One of these by-products that will be concluding during sugar production (from sugar cane) is sugarcane pith bagasse (Guo *et al*., 2002). Recently, production of sugarcane in Iran, because of water sources and fit environment, has been remarkable increase due to produce wide volume bagasse and pith bagasse. Pith bagasse can be use in ruminant nutrition (Nicolson, 1981; Castro, 1994). Pith bagasse is a product with high fiber, low protein and weak palatability. Before processing, its lignin influences the nutrient availability (Satter, 1983). Pith bagasse has a low digestibility but this value can be increase as the results of steam pressure hydrolyze (Abaza *et al*., 1981). If steam pressure hydrolyzed pith bagasse compound with molasses, we have an energetic feed that can be replace with part of expensive feed in feedlot ration of ruminant (De la Cruz, 1990; Harris *et al*., 1983). So make use of pith for cattle nutrition to cause decrease pressure in the pastures. We can comparison the nutrient value of enriched pith bagasse and wheat bran or sugar beet pulp (Medeiros *et al*., 1993) and even can be replace with fit concentrate feed like barley in ruminant nutrition (Machado, 1993).

MATERIALS AND METHODS

Animals, diets and experimental design: This experiment was conducted at the Ramin Agriculture and Natural Resources University in Ahvaz-South Western of Iran. According to initial weight, 24 head of crossbreed beef with an average live weight 157.5 kg (approximately 3-5 month old) were divided to two blocks and four treatments containing different level of steam pressure hydrolyzed pith bagasse. A high concentrate ration to gain maximum beef growth had been formulated as control treatment (treatment 1). Treatments 1-4 included, respectively 0, 11, 22 and 33% pith bagasse of whole ration. Rations had approximately similar nutrition contents (Table 1). Experimental rations formulated according NRC (1996) for 1 kg daily gain. Cattle in per

Corresponding Author: M. Sabbagh Zade, Department of Animal Science, Faculty of Animal Science and Food Technology, Karaj Azad University, P.O. Box 6341733877, Mollasani, Ahwaz, Iran

Table 1: Ingredients feed percent of trial's diets (Dry matter)

Feed	Control	1 (11% pith bagasse)	2 (22% pith bagasse)	3 (33% pith bagasse)
Barley	44.0	33.00	22.00	11.00
Beet sugar pulp	10.0	10.00	10.50	10.65
Molasses	0.0	8.00	8.75	9.00
Canola meal	1.5	1.50	1.50	1.50
Sunflower meal	3.5	3.50	3.50	3.50
Cottonseed meal	7.0	7.45	8.00	9.00
Wheat bran	18.0	14.40	14.40	14.5.0
Wheat straw	9.0	4.00	2.00	0.00
Hydrolyzed pith bagasse	0.0	11.00	22.00	33.00
Urea	1.0	0.70	0.50	0.60
Salt and mineral	2.0	1.70	1.40	1.50
Total	100.0	100.00	100.00	100.00

block divided to 4 groups randomize, so they put in 8 monotonous places. After adaptation period (14 day), main experimental period have done for 20 weeks (140 days). Calves weight had been recorded at the beginning of experimental and then every 4 week before feeding. Finally two head of calves from per treatment, which have been nearest weight to their average, selected and slaughtered. The beef were allocated to the diets according to complete block randomized design that include 2 block and 4 feed treatment. Reached data for dry matter intake, feed conversion ratio, average daily gain, carcass characteristics percent and weight of different part of carcass had been analyzed by SAS software. Averages were comparison by Duncan's multiple range tests.

RESULTS AND DISCUSSION

Feedlot performance

Initial weight and final weight: No significantly difference between initial weight of experimental groups was observed ($p>0.05$). Therefore, initial weight correction in this test was not necessary. At the end of main period, final weight (Table 2) of calves feeding under treatment 1 (control) and treatment 2 (diet containing 11% pith bagasse of total DMI) was relatively and both of them showed significant statistical difference with treatment 4 (diet containing 33% pith bagasse of total DMI) ($p<0.05$).

Average daily gain: The average daily gain of all experimental is presented in Table 3. Average Daily Gain (ADG) of beef for diets 1-4 during whole period of experiment were 1.07±0.06, 0.98±0.06, 0.86±0.07 and 0.77±0.07 kg day^{-1}, respectively. Data show that calves in treatment 1 (control) had maximum ADG and calves in treatment 4 had minimum ADG and difference between them is significantly ($p<0.05$). These two groups had been 300 g grow diversity. Whereas, calves that feeding under treatment 2 had a small difference of ADG. Also ADG of other groups had no significant difference with 1 and 2 ($p>0.05$). Limit published reports in respect levels of steam pressure hydrolyzed pith bagasse in feedlot diets were available, but a few study about feedlot diet of sheep (Dabiri, 1997) and buffalo calves (Dabiri *et al*., 1999) that had been used pith bagasse and bagaase silage up to 30% of diet were available. No significant difference between experimental groups about final weight found. At the other study, ADG of calves that feeding with diets containing 0, 14 and 30% of steam pressure hydrolyzed bagasse have been reported 1.1, 1.33 and 1.44, respectively and showed that calves feeding under diet include 46% bagasse had a lower ADG (Pate, 1982). Other results showed that we can not utilize processing bagasse up to 15% in feedlot lambs diet. Average daily gain in this study was 0.904 kg. So published reports in relation Iranian crossbred calves are not available but attained results of this study and reported results of Holstein and indigenous calves is analogical. Alikhani (2004) ADG of Holstein calves (initial weight 250 kg) reported 0.662 kg. Also Vali (1998) replacing apple pulp with sugar beet pulp in Holstein beef diet (average initial weight 170 kg) and get 0.816 kg as ADG.

Dry matter intake: The average Dry Matter Intake (DMI) of calves feeding by treatment 1-4 is presented in Table 3. These numbers show that DMI difference between various groups was very insignificant and did not be decrease by enhancement of hydrolyzed pith bagasse. It means that application of 33% hydrolyzed pith bagasse had no negative track. The average dry matter intake in this trial was 6.44 kg that was similar with reported results for Iranian Holstein calves. At the study to determination the influence enzyme on alfalfa fed by Holstein beef (Alikhani, 2004) dry matter intake reported 5.82 kg. Several studies reported similar deal (Abesht, 1998; Vali, 1998).

Feed conversion ratio (kg feed intake to kg daily gain): The average Feed Conversion Ratio assessed on 4 trial diets containing different levels of hydrolyzed pith bagasse and these results showed in Table 3. According these results a significantly difference between control group and beef fed diet 4 was observed ($p<0.05$), but no

Table 2: Final weight of crossbred calves fed by diet containing various level of pith bagasse

Treatment	Control	1 (11% pith bagasse)	2 (22% pith bagasse)	3 (33% pith bagasse)
Final weight	301.3±10.8[a]	299.63±10.8[a]	274.61±11.9[ab]	266.7±11.9[b]

Table 3: Effect of various diets on Average Daily Gain (ADG), Dry Matter Intake (DMI) and Feed Conversion Ratio (FCR)

Treatments	Control	1 (11% pith bagasse)	2 (22% pith bagasse)	3 (33% pith bagasse)
ADG (kg)	1.07±0.065[a]	0.98±0.065[a]	0.86±0.072[ab]	0.77±0.072[b]
DMI (kg)	6.62	6.53	6.48	6.34
FCR	6.25±0.556[a]	6.67±0.556[ab]	7.59±0.612[ab]	8.41±0.612[b]

Table 4: Carcass characteristic

Treatments	Control	1 (11% pith bagasse)	2 (22% pith bagasse)	3 (33% pith bagasse)
Carcass weight (kg)	151.5±4.32[a]	151.1±4.32[a]	138±4.32[ab]	132±4.32[b]
Carcass percent	50±0.56	50.84±0.56	48.64±0.56	48.5±0.56
Carcass length (cm)	152±5.5	146.5±5.5	146.5±5.5	152.5±5.5
Eye muscle area (cm^2)	100.65±12.3	87.5±12.3	87±12.39	87.53±12.3
Inside fat	1.88±0.35	1.85±0.35	1.88±0.35	1.12±0.35

significant difference have seen between other feed treatment. Animal variety, environment and diet cause to catch distinct result for feed conversion ratio. Published reports in relation Iranian crossbred calves are not available. The average feed conversion ratio in this trial was 7.33 kg that was similar with reported results for Iranian indigenous calves, but more than Holstein calves (Khaldari, 2004; Abesht, 1998; Vali, 1998).

Carcass characteristic: Different feed treatment of carcass percent, carcass length and other carcass characteristic had no significant difference ($p>0.05$), but treatment 1 (control) and 2 (include 11% pith bagasse) about carcass weight had a significantly difference with treatment 4 (include 33% pith bagasse). Carcass weight and percent in various groups had a similar trend with daily gain. Calves fed treatment 4 had minimum carcass weight like daily gain (Table 4).

CONCLUSION

To determination of optimum level of steam pressure hydrolyzed pith bagasse in feeding of crossbred beef, economic surveyed for as much as daily gain. Cost of per kg feed intake in diets 1-4 calculated and observed that treatment 2 (containing 22% pith bagasse) had lowest cost of feed to produce 1 kg live weight and control treatment had topmost cost. Also least variable gain per head as for calves that fed by 4 feeding treatment (containing 33% pith bagasse). According to above accounts, it recognized that utilize of steam pressure hydrolyzed pith bagasse, that is a autochthon by-product, not only due to further gain for animal husbandry but also replacing pith bagasse with barely that is an import feed send us to autonomy. Therefore application steam pressure hydrolyzed pith bagasse up to 22% of diet (treatment 3) extremely suggested to feedlot cattle diets.

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