

PERFORMANCE OF HOLSTEIN CALVES ON DIETS CONTAINING CONVENTIONAL AND UNCONVENTIONAL ITEMS.

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(Received 12-6-2008, Accepted 5-9-2008)

SUMMARY

The objective of this study was to determine the effects of unconventional diets on feed intake, weight gain, feed conversion and body composition characteristics of Holstein calves. Twenty male Holstein calves (average weight 147kg) were allotted to one of the four diets containing: 1) 25% wheat straw (straw-based diet); 2) 25% cardboard (CB-based diet); 3) 25% date palm leaves (DPL-based diet); and 4) 25% protein-enriched fermented fodder (PEFF-based diet). Average daily gain (ADG) was the highest (0.87 kg) on the CB-based diet and the lowest (0.53 kg) on the straw-based diet. Average daily feed intake (ADFI) was the highest (4.9 kg) on the CB-based diet and the lowest (4.5 kg) on the PEFF-based diet, and FC (ADFI/ADG) was the lowest (5.9 kg) on the CB-based diet and the highest (8.7 kg) was on the straw-based diet. The effect of diets on carcass weight, dressing percentage and skin weight was significant ($P < 0.05$). The results revealed good approach of feeding dairy calves on CB-based diets.

Keywords: unconventional diets, Holstein calves, feed conversion, carcass, characteristics

INTRODUCTION

Beef and veal production in Kuwait provides an alternative use for male dairy calves, which are often unwanted by the dairy industry. In the past, various unconventional ingredients, including ground corrugated cardboard (CB), protein-enriched fermented fodder (PEFF) and date palm leaves (DPL), were included in the diets of sheep; however, research studies on the use of unconventional items in the diets of weaned dairy calves are limited (KISR, 1995). Corrugated CB and DPL are available in Kuwait, and PEFF production technology has been developed at KISR for testing these items in the complete diets of growing calves.

The aim of the present study was to determine the effects of diets containing 25% straw, untreated CB, DPL or CB-based PEFF fed to dairy calves on feed intake, growth, feed conversion, body measurements and carcass characteristics.

MATERIALS AND METHODS

Twenty male Holstein calves with an average age of 139 days and an average weight of 147 kg were randomly divided into four groups of five animals each to receive the diets presented in Table 1.

The animals were preconditioned to their respective diets for one week before the start of the experiment. The trial was carried out over a period of eight weeks.

Calculations and statistical analysis were carried out using GLM procedure of SAS (1996) to calculate average daily feed intake (ADFI), average daily weight gain (ADG) and feed conversion (FC)RFI. Student Numan Kuel procedure were used to separate the means.

Table (1): Composition of diets based on wheat straw, cardboard, date palm leaves and protein-enriched fermented fodder, fed to dairy calves over an eight-week experimental period.

Item	Experimental diet contents, %			
	Straw-based	CB-based	DPL-based	PEFF-based
Barley	26.0	26.0	26.0	26.0
Corn	9.1	7.2	11.1	12.4
Soybean meal	15.0	16.9	14.3	12.4
Wheat bran	13.7	13.7	12.4	13.0
Dicalcium phosphate	0.6	0.6	0.6	0.6
Vitamin and	0.3	0.3	0.3	0.3
Mineral premix Salt	0.3	0.3	0.3	0.3
Wheat straw	25.0	--	--	--
CB	--	25.0	--	--
DPL	--	--	25.0	--
PEFF	--	--	--	25.0
Alfalfa hay	10.0	10.0	10.0	10.0
Total	100.0	100.0	100.0	100.0
Crude protein	21.8	22.3	20.5	19.4

CB = Cardboard; DPL = Date palm leaves; PEFF = Protein-enriched fermented fodder

RESULTS AND DISCUSSION

The weekly feed intake was calculated as the difference between the feed offered (3% of body weight) and the feed left over. After three weeks, the animals were consuming all the feed offered to them. Average daily feed intake (ADFI), average weight gain (ADG) and feed conversion (FC) were calculated using weekly measurements of feed intake and body weight. Because FC is negatively correlated with growth, applying selection pressure against FC in growing cattle will most likely lead to larger mature cows (Herd and Bishop, 2000). At the end of the eight-weeks feeding trial, calves were slaughtered according to the standard procedures at the Central Abattoir in Shuwaikh. Carcass measurements included dressed hot carcass weight, dressing percentage (dressed weight expressed as a portion of

the live weight) and eye muscle area. The eye muscle are of the twelfth rib was determined as a product of the greatest width and the greatest heights of the eye muscle.

At slaughter, the skin, head, feet (shanks and hooves), pluck (lungs, trachea, and heart) and rumen were weighed. The weight of the rumen was obtained after removing its contents.

Table (2): Least-squares means and standard errors for average daily feed intake, average daily weight gain and feed conversion of Holstein calves offered diets based on wheat straw, cardboard, date palm leaves and protein-enriched fermented fodder.

Diet	Number	ADFI (g±SE)	ADG (g±SE)	FC±SE
Straw-based	5	4.6±0.01 ^a	0.54±0.06 ^a	8.7±0.64 ^a
CB-based	5	4.9±0.01 ^b	0.87±0.06 ^b	5.9±0.64 ^b
DPL-based	5	4.5±0.01 ^c	0.67±0.06 ^a	7.0±0.62 ^{ab}
PEFF-based	5	4.5±0.01 ^d	0.59±0.06 ^a	7.8±0.63 ^a

ADFI = Average daily feed intake.

ADG = Average daily gain.

FC = Feed conversion calculated as ADFI/ADG.

CB = Cardboard.

DPL = Date palm leaves.

PEFF = Protein-enriched fermented fodder.

Note : Means in a column with different superscripts differ significantly (P<0.05).

Data were adjusted for initial calf weight.

There were significant differences between the diets for ADFI, ADG and FC. The ADFI was 4.6, 4.9, 4.7 and 4.5 kg/d for calves on the straw-based, CB-based, DPL-based and PEFF-based diets, respectively (P<0.05).

Gaylean and Hubbert (1993) suggested that the initial weight was related linearly to average daily dry matter intake (dry matter intake = 4.6346 + .01422 x initial weight) in beef cattle. Using this equation, the dry matter intake of the calves in the present study should have been about 6.6 kg/d, which is higher than the daily feed intakes actually recorded on the restricted diets. Thus, the feedlot managers and nutritionists need to use their own database to derive equations to predict dry matter intake and/or total feed intake from initial weight.

Calves on the CB-based diet gained 0.87 kg/d, which was significantly more (P<0.05) than the calves offered any of the other diets. Mean FC rates ranged from 5.9 to 8.7 kg; calves on the CB-based diet were the most efficient (5.9 kg), followed by those on the DPL-based diet (7.0 kg). Calves receiving the straw-based diet were the least efficient (8.7 kg).

Table (3): Least-squares means and standard errors for body length, height, girth and carcass characteristics of Holstein calves offered diets based on straw, cardboard, data palm leaves and protein-enriched fermented fodder.

Trait	Diet				Significance
	Straw-based	CB-based	DPL-based	PEFF-based	
Body length (cm)	128.0±2.0	133.0±3.0	128.0±3.0	129.0±3.0	NS
Height (cm)	112.0±1.0	109.0±1.0	112.0±1.0	112.0±1.0	NS
Girth (cm)	136.0±1.0	135.0±2.0	138.0±1.0	140.0±1.0	NS
Carcass weight (kg)	100.9±2.2	95.4±2.6	106.7±2.0	100.0±2.2	*
Dressing (%)	51.2±1.1	49.2±1.3	54.1±1.1	50.7±1.1	*
Eye muscle area (cm ²)	74.9±5.1	73.5±6.0	74.0±4.8	73.8±5.1	NS
Head (kg)	10.4±0.3	9.9±0.4	10.6±0.3	10.7±0.3	NS
Hooves and shanks (kg)	5.5±0.2	4.9±0.2	5.2±0.2	5.6±0.2	NS
Skin (kg)	10.9±0.4	12.8±0.4	12.6±0.3	12.3±0.4	*
Pluck (kg)	2.7±0.2	2.7±0.2	2.5±0.2	2.7±0.2	NS
Rumen (kg)	6.1±0.5	5.1±0.6	5.1±0.4	5.2±0.5	NS

Note : Data were adjusted for slaughter weight.

N = 5, each diet group for a total of 20.

NS = Not significant difference.

*P<0.05.

No significant differences were observed between the diets for body length, height, heart girth, eye muscle area or the weights of head, feet, pluck and rumen (Table 3). The effect of diet on carcass weight, dressing percentage and pelt weight was significant (P<0.05).

Live weight-adjusted dressed carcass weight and dressing percentage were significantly lower in calves on the CB-based diet than in those on the DPL-based diet (P<0.05). The skin weights of the calves fed the straw-based diet were significantly lower than those of the calves fed the other diets (P<0.05).

These results imply that feeding calves CB as a principal roughage source would result in better daily weight gain and FC than feeding wheat straw, DPL or PEFF; however, the results also suggest that, on a constant live weight basis, the feeding of CB is likely to result in a slightly decreased carcass weight and dressing percentage. The CB-based diets offer potential for the utilization of this unconventional feed resource to enhance the feedlot performance of dairy calves. Ground cardboard used in this study was not contaminated with any potential contaminants, such as chemical residues and fungi, and caused no health problems. The unit costs of the CB-based ration were no greater than for a standard ration.

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أداء عجول أبقار الهولستين المغذاة على علائق محتوية على مكونات تقليدية و غير تقليدية

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تهدف هذه الدراسة إلى التعرف على تأثير تغذية الأبقار من سلالة الهولستين بأعلاف غير تقليدية على معدلات أدائها من حيث معدلات استهلاك الغذاء، الوزن المكتسب، كفاءة تحويل العلف وخصائص تركيب أجسامها.

وقد تم تقسيم عشرين من ذكور أبقار الهولستين (بمتوسط وزن ١٤٧ كجم) على أربع مجموعات مختلفة من خلطات العلف تحتوي على التالي : الخلطة الأولى علف القش، وتحتوي على ٢٥٪ من قش القمح، خلطة ورق الكرتون بنسبة ٢٥٪، ثم خلطة سعف النخيل بنسبة ٢٥٪، وأخيراً خلطة العلف الأخضر المتخمّر (PEFF) بنسبة ٢٥٪.

وقد أظهرت النتائج أن متوسط زيادة الوزن اليومية بلغت أقصى حد لها (٠.٨٧ كجم) وذلك عند استخدام خلطة العلف المحتوية على الكرتون، في حين انخفض المتوسط إلى أدنى حد ليبلغ (٠.٥٣ كجم) عند استخدام خلطة العلف المحتوية على قش القمح.

أما متوسط معدل الاستهلاك اليومي فقد بلغ أقصاه عند استخدام خلطة العلف المحتوية على الكرتون ليبلغ ٤.٩ كجم وانخفض ليبلغ أدناه (٤.٥ كجم) عند استخدام خلطة العلف المحتوي على PEFF.

وسجلت النتائج معدلات تحويل العلف بما مقداره (٥.٩ كجم) من العلف المحتوي على الكرتون لكل كجم زيادة في الوزن كأدنى حد. في حين ارتفع معدل التحويل ليبلغ أعلاه (٨.٧ كجم من العلف لكل كجم زيادة في الوزن) عند استخدام العلف المحتوي على قش القمح.

وكان أثر جميع خلطات الأعلاف المستخدمة في الدراسة على وزن الذبائح، نسبة الوزن بعد التجهيز (أي بعد الذبح والإعداد للبيع) ووزن الجلد ملحوظ بشكل عام ($P < 0.05$).

وقد دلت النتائج على إمكانية تسمين الأبقار الحلوب على الأعلاف المحتوية على الكرتون بنسبة ٢٥٪ من وزن العليقة.