Feed intake, growth performance and carcass quality of growing Brahman cattle fed varying level energy and protein

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Abstract: A 3 x 3 factorial arrangement in completely randomized design was utilized to evaluate the effects of three level of metabolizable energy (ME) and three level of crude protein (CP) on feed intake, growth performance and carcass quality. Yearling male Brahman cattles were randomly assigned to a diet combination containing 7.60, 8.90 or 10.20 MJ ME /kgDM and diet containing 11, 13 or 15 %CP respectively. It was found that there were no interaction between dietary CP and ME intake ($P>0.05$). Increasing ME intake increased ($P<0.01$) weight gain, average daily gain (ADG), dressing percentage and carcass quality. Protein level had no improved ADG and no affected on carcass quality. The results indicated that feeding diets containing higher energy resulted in higher growth performance and carcass characteristics in Thai Brahman cattle.

Keywords: Intake, Energy, Protein, Carcass, growing Brahman cattle

Introduction

Tropical livestock are normally fed in a system based on natural pasture and crop residues that is often low quality and quantity of both protein and energy (Sommart, 1998). Thai Brahman cattle typically is classified as *Bos indicus*, which is adapted to hot climates, heat tolerant disease and parasite resistant and the ability to utilized low quality feed than in *Bos taurus* thus, may resulted in lower energy requirement for maintenance. Recently, energy and protein requirement for maintenance of beef cattle have been intensively study (Tangjitwatanachi et al., 2008; Chaokaur et al., 2008; WTSR, 2008; or Nitipot et al., 2008). It has been suiggested that increased energy and protein intake can improve feed efficiency and growth performance. However, feed intake, growth performance and carcass quality of Thai Brahman are limited. Therefore, the aim of this experiment was to evaluate the effects of varying dietary ME and CP concentrations on feed intake, growth performances and carcass quality of growing Brahman cattle under feeding Thailand condition.

Materials and methods

Twenty-seven yearling male Brahman cattles (body weight 217.30 ± 49.9 kg) were housed in an individual pen with free access to fresh water and mineral block. The dietary treatments composed of three leves of metabolizable energy (ME) (7.60, 8.90 or 10.20 MJ/kgDM) and crude protein (CP) (11, 13 or 15 %) were assumed low (L), medium (M) and high (H) plane of nutrition respectively. During preliminary period for 30 day, all animals were fed *ad libitum* of Pangola grass hay (*Digitaria decumbens*), and 1.5 %BW of concentrate (ME 8.90 MJ/kgDM and CP 13 %). Dietary treatments were fed at intake rate 2.6 %BW according to a 3 x 3 factorial arrangements in a completely randomizeddesign with 3 replications. The animals were assigned randomly in to one of nine dietary treatments **(Table 1)** for 91 day in experimental period. The feed offered and refused were recorded and sampling weekly for proximate analysis according to AOAC (1990), neutral detergent fiber and acid detergent fiber analysis according to (Goering and Van Soest,1970).

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Animals were slaughtered at Mahasarakham slaughterhouse. All data were analyzed by general linear model (GLM) procedure and treatment means were compared by Duncan's new multiple range test (SAS, 1996)

Results and discussions

Feed intake, growth performance and carcass quality are presented in **Table 2**. The ME x CP interaction was no significant (*P>0.05*) for feed intake (kg/d, %BW and g/kgBW$^{0.75}$/d), final weight, weight gain and average daily gain (g/d and g/kgBW$^{0.75}$/d). The results are similar to the report by Broderick (2003), who found that interaction between dietary CP and NDF not significant. Dietary crude protein (11, 13 or 15 % ration) from this study was no affected on animal productivities. However, the results show that increased intake of ME increased (*P<0.01*) in average daily gain, slaughter weight, hot carcass weight, dresing percentage, rib fat thickness, psoas major yield, longissimus dorsi yield and semimembranosus yield.

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Table 1 Feed ingredient and chemical composition of dietary treatments[1/]

Item	Dietary treatments								
	LL	LM	LH	ML	MM	MH	HL	HM	HH
Ingredients, %									
Pangola grass hay	78.50	72.19	65.55	58.47	51.62	48.16	37.06	34.67	31.83
Cassava chip	1.00	1.00	1.00	21.52	20.59	16.02	42.61	39.97	37.28
Soybean meal	9.50	11.00	13.00	10.56	11.00	13.00	12.00	15.00	18.00
Coconut meal	1.00	1.00	1.00	1.00	1.00	5.37	1.00	1.00	1.00
Kapok seed meal	4.55	9.36	14.00	3.00	10.35	12.00	1.88	3.92	6.44
Molasses	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Urea	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Sulfer	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Dolomitie	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mixed minerals	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
Chemical composition, %									
DM	93.04	93.47	89.61	93.30	93.40	93.30	93.61	93.17	93.03
Ash	10.63	11.20	11.54	9.78	10.43	10.64	10.21	9.90	17.27
OM	89.37	88.80	88.46	90.22	89.57	89.36	89.79	90.10	82.73
CP	13.80	14.74	15.61	12.52	12.52	15.18	12.68	16.15	16.95
EE	1.39	1.73	1.97	1.16	1.72	2.15	1.20	1.42	1.45
CF	28.26	28.42	28.52	21.48	21.48	21.60	14.84	15.46	15.45
NFE	45.93	43.91	42.25	55.07	53.85	50.43	61.07	57.08	48.89
NDF	61.86	60.33	58.19	57.03	52.00	51.50	46.55	45.40	44.34
ADF	37.12	36.62	36.03	28.73	28.68	29.58	20.75	22.19	21.29
ADL	5.31	6.04	6.59	4.03	4.90	5.63	3.01	3.40	3.54
TDN*	62.11	62.03	62.06	64.03	63.51	63.35	66.03	66.21	66.34
Energy content, MJ/kgDM*									
GE	15.40	15.61	15.83	15.49	15.78	15.98	15.60	15.75	15.85
DE	9.39	9.58	9.80	10.57	10.68	10.75	11.81	11.92	12.03
ME	7.51	7.61	7.73	8.77	8.77	8.77	10.08	10.08	10.07

[1/] LL, low ME and low CP; LM, low ME and medium CP; LH, low ME and high CP; ML, medium ME and low CP; MM, medium ME and medium CP; MH, medium ME and medium CP; HL, high ME and high CP; HM, high ME and high CP; HH, high ME and high CP; DM, dry matter; OM, organic matter ;CP, crude protein; EE, ether extracts; CF, crude fiber; NFE, nitrogen free extracts; NDF, neutral detergent fiber; ADF, acid detergent fiber; TDN, total digestible nutrients; GE, gross energy ; DE, Digestible energy; ME, Metabolizable energy. * Calculated value.

Table 2 Feed intake, growth performance and carcass characteristics of growing Brahman cattle fed various dietary metabolizable energy and crude protein intake [1/]

Item	ME intake			CP intake			SE	*P*-value[2/]		
	Low	Medium	High	Low	Medium	High		ME	CP	MExCP
Number animal, head	n = 9	n =9	n =9	n = 9	n = 9	n = 9	-	-	-	-
Feed intake										
kgDM/d	5.66^{Z}	6.43^{Y}	6.94^{X}	7.35^{X}	5.74^{Y}	5.94^{Y}	0.087	<0.01	<0.05	0.58
% BW	2.52	2.59	2.64	2.68^{X}	2.57^{XY}	2.50^{Y}	0.023	0.14	<0.05	0.84
g/ kgBW$^{0.75}$/d	97.41	102.42	105.73	108.59^{X}	99.29^{Y}	97.68^{Y}	1.019	0.63	<0.05	0.79
Growth performance										
Initial weight, kg	207.00	221.44	223.44	240.33	213.83	197.72	10.26	0.77	0.25	0.84
Final weight, kg	247.88^{Z}	290.11^{Y}	310.77^{X}	314.55	272.44	261.77	2.991	<0.01	0.14	0.36
Average weight, kg	227.44^{Z}	255.77^{Y}	267.11^{X}	277.44	243.13	229.75	1.495	<0.01	0.14	0.36
Weight gain, kg	40.88^{Z}	68.66^{Y}	87.33^{X}	74.22	64.05	58.61	2.906	<0.01	0.11	0.31
ADG, g/d	484.11^{Z}	820.22^{Y}	1091.00^{X}	948.22^{X}	759.00^{Y}	688.11^{Y}	0.025	<0.01	<0.05	0.57
Carcass characteristics										
Slaughter weight, kg	239.77^{Z}	275.12^{Y}	302.44^{X}	299.37	255.33	266.22	2.69	<0.01	0.06	0.15
Hot carcass weight, kg	118.88^{Z}	137.93^{Y}	165.83^{X}	159.06	128.38	137.55	1.966	<0.01	0.13	0.14
Dressing percentage, %	47.73^{Y}	49.31^{Y}	52.68^{X}	51.06^{X}	48.94^{Y}	49.91^{XY}	0.354	<0.01	0.73	<0.05
Rib fat thickness, mm	2.38^{Y}	3.12^{Y}	5.22^{X}	3.93	3.22	3.66	0.025	<0.01	0.98	0.67
Rib eye area, cm^{2}	53.02	64.69	65.19	60.81	60.33	61.33	2.054	0.10	0.66	0.67
Kidney pelvic heart, %	2.30^{Y}	3.04^{Y}	6.32^{X}	4.57	3.7	3.55	0.475	0.05	0.42	0.70
Tiger cry, % of carcass	3.13^{Z}	4.53^{Y}	6.86^{X}	6.47	3.61	4.65	0.25	<0.01	0.42	0.18
Psoas major, % of carcass	3.56^{Z}	4.83^{Y}	6.39^{X}	6.23	3.87	4.84	0.199	<0.01	0.38	0.27
Longissimus dorsi, % of carcass	7.54^{Z}	10.64^{Y}	15.11^{X}	14.22^{X}	8.46^{Z}	11.00^{Y}	0.395	<0.01	0.25	<0.05
Semimembranosus, % of carcass	11.76^{Z}	15.44^{Y}	22.58^{X}	21.07	13.25	16.08	0.66	<0.01	0.31	0.18

[1/] SE, standard errors; DM, dry matter; BW, body weight; BW$^{0.75}$, metabolic weight; ME, Metabolizable energy; CP, crude protein; ADG, average daily gain.

[2/] Probability of a significant effect of metabolizable energy intake (ME) or crude protein intake (CP) or metabolizable energy intake and crude protein interaction (ME xCP)

[X, Y, Z] Least square means with different superscripts among treatments significantly differ ($P<0.05$) or highly significant differ ($P < 0.01$).

These finding are similar to report by Brown et al.(2005) and Chaokaur et al.(2007), that increased energy intake can increse the rate of body growth of dairy heifer and potentially reduce rearing costs.

Conclusion

The results of the present feeding trials indicated that increasing dietary ME intake had a significantly improved growth performance and carcass characteristics. Average daily gained was decreased when fed dietary protein was higher than 13 % in the rations in Thai Brahman cattle. The results indicated that feeding diets containing higher energy resulted in higher growth performance and carcass characteristics in Thai Brahman cattle

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