CARCASS QUALITY OF CULLED DAIRY COWS AND FATTENING DAIRY STEERS RAISED BY MEMBERS OF BEEF CLUSTER COOPERATIVE IN THAILAND

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Abstract – This study was aimed to investigate the effect of slaughter weight and raising system on carcass quality and marbling score of culled dairy cows and fattening dairy steers. Five hundred and twenty records were obtained from 412 culled cows and 108 steers which were at least 75% Holstein Friesian crossbred and fattened by members of Beef Cluster Cooperative Limited (Maxbeef) for 4-5 and 10-12 months, respectively. Results showed that there was no effect of slaughter weight on percentages of hot and cold carcasses. Weights of hot and cold carcass and skin including marbling score increased and percentage of skin weight decreased as slaughter weight increased (P<0.05). Higher percentages of hot and cold carcass and skin were found in dairy steer group but higher marbling score was found in culled cow group (P<0.05). It was found that higher proportions of marbling score scale 3 and 4 were found in culled cow group compared to those of steer group (22.33 and 10.19%, respectively). It was found that culled dairy cows, fattened for shorter period, had higher marbling score than dairy steers.

Keyword- Carcass Quality, Marbling Score, Culled Dairy Cows, Fattening Dairy Steers

I. INTRODUCTION

Currently, demand for beef consumption has been increased every year in Thailand. However, the number of fattening steers has tended to decrease due to lack of beef cattle for feedlot production. Quality beef that market required is focused on marbling score (Sethakul, 2016). Consumers desire tenderness and flavor attribute which are mainly influenced by *Bos Taurus* breed and feeding management for increase in intramuscular fat. Several researches had been widely studied on carcass and meat quality of dairy beef. Study on beef market share in France, there were 75% from fattening dairy cows and heifers and 25% from fattening dairy steers (Jurie *et al.*, 2007). In Japan, there were 40% of beef market share from fattening dairy steers, heifers and culled cows (Suzuki, 2015). Dairy farming in Thailand has been developed. Therefore, dairy population was 565,310 heads which consisted of 301,000 milking cows. These numbers of cows could produce 225,750 calves based on a conception rate and mortality of 75% (Koonawootrittiron, 2014). Dairy steers fattened from male calves as well as culled dairy cows could be utilized as dairy beef for market demand of beef consumers. Therefore, the aim of this study is to investigate the carcass quality and marbling score of fattening culled dairy cows and dairy steers that had different slaughter weight and raising system.

II. MATERIALS AND METHODS

Five hundred and twelve records were collected for carcass quality. Four hundred and twelve culled dairy cows aged more than 4 years old and had averaged slaughter weight of 580.85±3.76 kg which was culled due to old age, problem related to the udder health and reproductive problem. They were fattened with concentrate and roughage for 4-5 months. One hundred and eight fattening dairy steers aged more than 2 years old and had averaged slaughter weight of 584.45±7.33 kg which were fattened for 10-12 months. All cows and steers were at least 75% Holstein Friesian crossbred and were fattened by members of Beef Cluster Cooperative Limited (Maxbeef) during 2014-2016. Immediately after slaughter, carcasses were weighed and chilled at 0-4 ºC in a cold room for 7 days. Data were recorded as slaughter weight (SW), hot carcass weight (HCW), cold carcass weight (CCW), skin

weight (SW), and marbling score (MBS). Marbling score were assessed according to ACFS (2004). Percentages of hot carcass weight (%HCW), cold carcass weight (%CCW) and skin weight (%SKW) were calculated.

For the statistical analysis, Data were analyzed by an analysis of variance (ANOVA) using the General Linear Model (GLM) procedure of the SPSS package (SPSS, version 22.0, USA) and the least squares mean (LSM) were compared. All statistical of LSM were performed for a significance level P<0.05. The model used was:

$Y_{ijk} = \mu + W_i + S_j + W_i * S_j + E_{ijk}$

Y_{ijk} is the observation of dependent variables (SW, HCW, CCW, SKW, %HCW, %CCW, %SKW, MBS)

μ is the overall mean,

W_i is the effect of slaughter weight treatment, i= 1 2 3 (1=450-549 kg 2=550-649 kg 3=> 650 kg)

S_j is the effect of raising system, j= 1 2 (1=fattening culled cows 2=fattening dairy steers)

$W_i * S_j$ is the interaction of slaughter weight and raising system effects

E_{ijk} is the residual random error associated with the observation.

III. RESULTS AND DISCUSSION

The results showed that the different of slaughter weight did not effect on percentages of hot and cold carcasses but slaughter weight had influenced on hot carcass weight, cold carcass weight, skin weight, skin weight percentage and marbling score (P<0.05) as shown in Table 1. There was no effect of slaughter weight on percentages of hot and cold carcasses (P>0.05). Weights of hot and cold carcass and skin including marbling score increased and percentage of skin weight decreased as slaughter weight increased (P<0.05). These were agreed with Vestergaard *et al*. (2007); Sukjai *et al.* (2012) and Noidad *et al.* (2014a, b) who had been studied on influence of slaughter weight on carcass quality of culled dairy cows and steers. They also found that increasing slaughter weight had significant effect on increases in hot carcass weight, cold carcass weight and skin weight (P<0.05). The effects of slaughter weight on carcass quality in fattening dairy cattle were similar to those in fattening beef cattle reported by Huffman *et al*. (1990) and Sinpitakkul (2011). Moreover, marbling scores were significant enhanced as the slaughter weight increased (P<0.05) due to more accumulation of fat deposit, which was agreed with Opatpatanakit *et al.* (2004) and Sinpitakkul (2011) who revealed that increases in slaughter weight resulted in greater hot carcass weight and marbling score of fattened beef steers.

According to raising system, fattened dairy steers had higher percentages of hot carcass, cold carcass and skin weights than fattened culled cows (P<0.05). This result was consistent with Aungkuro and Aviruttapait (2003) had reported that steers had greater growth performance and carcass dressing percentage than cows due to higher proportions of reproductive organs and digestive tracts as well as lower potential in muscle development

Table 1 Carcass quality of fattening dairy cows and steers with different slaughter weight and raising system

Trait	Slaughter Weight (W)			SEM	Raising system (S)		SEM	P-value		
	450-549 (n=145)	550-649 (n=206)	>650 (n=61)		Cow (n=412)	Steer (n=108)		W	S	W * S
SW	510.72^{a}	595.39^{b}	710.01^{c}	3.34	580.85^{x}	584.45^{y}	6.54	<0.0001	<0.0001	<0.0001
HCW	276.87^{a}	322.84^{b}	389.40^{c}	1.95	313.26^{x}	326.56^{y}	3.80	<0.0001	<0.0001	<0.0001
CCW	269.84^{a}	317.99^{b}	392.87^{c}	1.94	304.96^{x}	318.93^{y}	3.76	<0.0001	<0.0001	<0.0001
SKW	33.03^{a}	37.12^{b}	43.83^{c}	0.30	35.12^{x}	42.42^{y}	0.53	<0.0001	<0.0001	<0.0001
%HCW	54.22	54.22	54.82	0.09	53.92^{x}	55.84^{y}	0.16	0.140	<0.0001	0.982
%CCW	52.81	52.78	53.55	0.11	52.48^{x}	54.53^{y}	0.16	0.077	<0.0001	0.902
%SKW	6.47^{a}	6.24^{ab}	6.15^{b}	0.04	6.06^{x}	7.28^{y}	0.06	<0.019	<0.0001	0.934
MBS[1]	1.68^{a}	1.83^{ab}	2.00^{b}	0.04	1.85^{x}	1.59^{y}	0.38	<0.001	<0.043	0.078

^{abc} Mean with the same row with different superscripts differ significantly (P<0.05)

^{xy} Mean with the same row with different superscripts differ significantly (P<0.05)

[1]Marbling score (MBS: 1-5); Assignment to a marbling degree was based on the carcass side using visual assessments by graders from Beef Cluster Cooperative. Marbling scores were encoded as follows: 1= traces to slight, 3 = modest to moderate, 5=slightly abundant to moderately abundant (ACFS, 2004).

SW=Slaughter weight, HCW=Hot carcass weight, CCW=Cold carcass weight, SKW=Skin weight, %HCW=Hot carcass weight percentage, %CCW=Cold carcass weight percentage, %SKW=Cold carcass weight percentage, MBS=Marbling score

compared steers. However, higher marbling scores were found in culled cow group than those in dairy steer group (P<0.05). This is consistent with Choat *et al*. (2006); Bureš and Bartoň (2012) who reported that steers had higher hot carcass weight than cows, but lower marbling score than cows (P<0.05) due to maturity of culled dairy cow, aged more than 4 years old and decreasing rate muscle, bone and organs development.

Table 2 Proportion of marbling score according to raising system

MBS[1]	Raising system, head (%)		Total, head (%) (n=520)
	Cow (n=412)	Steer (n=108)	
MBS 1	162 (39.32)	58 (53.70)	220(42.31)
MBS 2	158 (38.35)	39 (36.11)	197(37.88)
MBS 3	80 (19.42)	8 (7.41)	88 (16.92)
MBS 4	12 (2.91)	3 (2.78)	15 (2.88)
MBS 5	0(0.00)	0 (0.00)	0 (0.00)

[1]Marbling score (MBS: 1-5); Assignment to a marbling degree was based on the carcass side using visual assessments by graders from Beef Cluster Cooperative. Marbling scores were encoded as follows: 1= traces to slight, 3= modest to moderate, 5= slightly abundant to moderately abundant (ACFS, 2004).

The result showed that cow group tended to have higher proportions of higher marbling score, especially marbling score 3 (19%) compared to steer group (7%) as shown in Table 2. Additionally, it found no marbling 5 in both groups and only 3% in marbling score 4. This finding is consistent with Chaot *et al*. (2006) who reported that cows had significant higher USDA quality grades and marbling score than steers (P < 0.01).

IV. CONCLUSION

It showed that weights of hot and cold carcass and skin including marbling score increased and percentage of skin weight decreased as slaughter weight increased in fattening dairy cattle. Culled dairy cows, fattened for 4-5 months had lower slaughter weight, percentages of hot and cold carcass and skin but had higher marbling score compared to dairy steers, fattened for 10-12 months. It was found that higher proportions of marbling score scale 3 and 4 were found in culled cow group compared to those of steer group (22.33 and 10.19%, respectively), especially marbling score scale 3, however, marbling score scale 5 was not found in both groups. It suggested that feeding for higher marbling score could be done in culled dairy cows due to shorter fattening period compared to dairy steers.

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