การศึกษาเปรียบเทียบองค์ประกอบของร่างกาย องค์ประกอบของซาก และคุณภาพในการทำผลิตภัณฑ์ระหว่างเนื้อกระบือและเนื้อโค

Comparative Study on Body Composition, Carcass Composition and Processing Quality of Meat from Buffalo and Cattle

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บทคัดย่อ

เนื้อกระบือเป็นผลพลอยได้จากกระบือที่มีอายุมากหรือกระบือที่ปลดจากการใช้งานแล้ว พ่อค้าผู้จำหน่ายเนื้อมักจะจำหน่ายเนื้อกระบือผสมร่วมไปกับเนื้อโค แต่ผู้บริโภคโดยทั่วไปมักจะเข้าใจกันว่าเนื้อกระบือนั้นมีคุณภาพด้อยกว่าเนื้อโค เนื่องจากมีไขมันแทรกน้อยกว่าและเหนียวกว่าเนื้อโค โดยเฉพาะอย่างยิ่งเนื้อจากกระบือที่มีอายุมาก อย่างไรก็ตามยังไม่มีการศึกษาเปรียบเทียบองค์ประกอบและคุณสมบัติของเนื้อกระบือกับเนื้อโค และของเนื้อจากกระบือที่มีระดับอายุต่างกัน การศึกษาในครั้งนี้จึงใช้กระบือจำนวน 9 ตัว (อายุ 2, 4 และ 6 ปี) และโคจำนวน 3 ตัว (อายุ 3-4 ปี) เพื่อเปรียบเทียบองค์ประกอบของร่างกาย อวัยวะภายใน องค์ประกอบของซาก และองค์ประกอบของเนื้อ ผลการศึกษาไม่พบความแตกต่างอย่างเด่นชัดในองค์ประกอบหลักของลักษณะต่าง ๆ ที่กล่าวไปแล้ว นอกจากนี้ยังได้ทำการสุ่มตัวอย่างของเนื้อจากสัตว์ทดลองเพื่อนำมาทำผลิตภัณฑ์เนื้อแดดเดียวและไส้กรอกเปรี้ยว ทำการตรวจชิมเพื่อเปรียบเทียบการยอมรับจากผู้ชิม ผลการทดลองพบว่าผลิตภัณฑ์จากเนื้อโคได้รับการยอมรับสูงกว่า อย่างไรก็ตามผลิตภัณฑ์จากเนื้อกระบือทุกกลุ่มอายุก็ยังได้รับการยอมรับในระดับคะแนนสูงจากผู้ชิม (คะแนนมากกว่า 5 จาก 8 คะแนน) จึงสรุปได้ว่าเนื้อจากกระบือที่มีอายุ 2-6 ปีสามารถนำมาใช้บริโภคหรือนำมาทำผลิตภัณฑ์โดยไม่แตกต่างจากเนื้อโคที่มีอายุ อายุ 3-4 ปี

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Abstract

Buffalo meat is the by-product from draft or older buffaloes. It is classified as the low quality meat because of the low marbling and less tender properties. Most butchers or retailers mix buffalo meat with the cattle meat and used as fresh meat or as meat products. The experiment was conducted using 9 buffaloes and 3 cattle to determine body composition, intestinal composition, carcass composition and meat composition of buffaloes and cattle. The data showed no major difference on those characteristics between animals or among different age groups of buffalo. Meat samples from each animals were also used for preparation of meat products (meat jerky and fermented sausage). The products were determined for sensory panel scores and compared among treatments. The data revealed that products from each treatment slightly differed on panel scores. However, all products had high overall acceptability from the panelists (more than 5 out of 8 scores). The data concluded that buffalo meat (2-6 years old) can be used as fresh meat or for meat products without any major difference from cattle meat.

INTRODUCTION

Buffalo population in Asia was constantly at 95-96% of the world total population. In Southeast Asia, Thailand held of the largest population. In 1992, approximately 6.898 millions buffaloes were raised in Thailand. These animals had multiple meaning to farmers life such as draft power, money saving and for foodsupply (Sasaki, 1994; Chantalakhana, 1994)

According to Chantalakhana (1994) buffalo meat comprised up to 50% of beef supply in Thailand. It was byproduct from draft or older animals. Meat was low in fat, less tender and was generally less acceptable to the consumers. Forest; et. al. (1975) reported that meat quality are related to meat composition. Connective tissue and adipose tissue were among the most important factors which related to meat quality. Changing in connective tissue and adipose tissue fractions may related to protein and water composition. These changes may also related to processing properties especially odor, flavor and acceptability of meat product.

Buffalo meat in Thailand has been used as both fresh meat and for meat products. The common meat products from buffalo meat are meat jerky and fermented sausage. Buffalo meat may be similar or even superior to cattle meat in quality, quantity or processing quality. However, no comparison had been done to determine carcass composition, meat composition, and quality of their meat products between buffalo and cattle meat.

The objectives of this research were to compare body, carcass, and meat composition of buffaloes at different ages as well as processing properties of their meat to those of 4 year old cattle.

MATERIALS AND METHODS

Nine water buffaloes were selected and allotted into three age groups (2, 4 and 6 years) and compared to three Brahman x Native cattle (4 years). All animals were slaughtered in a private slaughter house near Khon Kaen University. Body composition (head, shank and skin) and emptied internal organs (rumen, reticulum, omasum, abomasum, small intestine, large intestine, lung and heart, spleen, kidney and liver) were separated and weighed. Warm cascasses were also weighed and dressing percentage was determined. Carcass composition in terms of warm weights of lean meat, loin, fat, belly, bone and waste were determined and compared among treatments. Meat samples from leg cut were collected from each carcass (20 kg per cascass). The samples were used to determine for proximal composition (water, protein, fat and ash) using AOAC procedures (AOAC, 1984). Meat samples were also used for processing into typical Northeastern meat products (meat jerky and fermented sausage). Sensory panel score of

meat products were determined by 15 trained panelists and compared among treatments. Means of all characteristics were statistically analyzed for treatments differences by using analysis of variance and Tukey New Multiple Range Test (SAS, 1988)

RESULTS AND DISCUSSION

Body composition, carcass composition and proximal composition of meat

Live weight, carcass weight, dressing percentage and body composition of cattle and buffalo showed in Table1. The average weight of cattle and buffalo were ranged from 334 to 404 kg. Four-year-old buffalo was heavier ($P<.05$) than 2-year-old buffalo but similar ($P>.05$) to 6-year-old buffalo and 4-year-old cattle. The dressing percentage of buffalo was 48.8% compared to 55% of cattle. The carcass weight and dressing percentage of cattle and buffalo were similar ($P>.05$) among treatments. Dressing percentage of buffaloes in this experiment were similar to those reported by Chantalakhana (1984, 42-49%) but were lower than those reported by Buranamanus (1977, 54%).

Buffalo had heavier ($P<.05$) head and shank compared to cattle. Two-year-old buffalo had heavier ($P<.05$) skin compared to cattle but similar to ($P>.05$) 4- and 6- year old buffaloes. Chantalakhana (1984) reported that buffalo had heavier skin and head compared to cattle. Prucsasri; et. al. (1996) also showed that buffalo had heavier head (4.1% vs 3.6%) and skin (12.5% vs 10%) but lower dressing percentage (48% vs 55%) compared to cattle

Intestinal organs of cattle and buffalo were reported in Table 2. Six-year-old buffalo had heavier ($P<.05$) rumen, omasum and large intestine compared to 2- to 4-year-old buffalo. They also had heavier ($P<.05$) rumen but had similar ($P>.05$) weight of large intestine compared to cattle. Two-year-old buffalo had heavier ($P<.05$) small intestine compared to 4-year-old buffalo. The weights of other organs were not significantly different ($P>.05$) among treatments.

Carcass compositions of cattle and buffalo were reported in Table 3. Six-year-old buffalo had more ($P<.05$) belly and waste compared to cattle. Buffalo also had more ($P<.05$) waste compared to cattle. Lean meat, loin, tender loin, fat and bone were not significantly different ($P>.05$) among treatments averaging 45.5, 16.3, 2.8, 6.5 and 18.1% of carcass weight, respectively. Chantalakhana (1984) reported that total meat of buffalo were 73-76% and bone were 20-23% of the carcass weight. The different cutting technique may resulted in this difference.

Proximal composition of cattle and buffalo meat were reported in Table 4. All components were similar ($P>.05$) among treatments. Cattle and buffalo meat had water, protein, fat and ash averaging 72-75, 20-23, 2.2-3.2 and 0.66-0.89%, respectively. Four-year-old cattle and 6-year-old buffalo had slightly higher ($P>.05$) fat (averaging 3%) compared to 2- to 4-year-old buffalo (averaging 2.2%). Protein of meat from this experiment were similar to those reported by Liu; et. al. (1986) at 22% and by NRC (1981) at 20%. Ash of meat from this experiment were also similar to those of local water buffalo in China (0.88%) which reported by Liu; et. al. (1986). Liu; et. al. (1986) also found that proximal composition of cattle and buffalo meat was similar.

Meat Processing, Shelf-life and Eating Quality

1. Meat Jerky

Meat jerky from cattle and buffalo meat were determined for sensory panel scores and were reported in Table 5. Color scores of meat jerky from cattle meat (averaging 7.2) were higher ($P<.05$) compared to buffalo meat (averaging 6.0). These may be dued to the brighter red color of products of the cattle meat after cooked. There were no significant difference ($P>.05$) among color scores of products from the different age group of

products from buffalo meat. Odor scores of products from cattle meat were also higher (P<.05) compared to those of buffalo meat. Products from 6-year-old buffalo had lower (P<.05) odor scores compared to those of 4-year-old but similar to (P>.05) those of 2-year-old buffalo.

Texture scores of products from cattle and 2-year-old buffalo were higher (P<.05) compared to those of 6-year-old buffalo but were similar to those of (P>.05) 4-year-old buffalo. The coarse texture of older buffalo may resulted in the lower texture scores of the products from 6-year-old buffalo (Burana-manus, 1989). Overall acceptability of meat jerky from 6-year-old buffalo meat had lower (P<.05) scores compared to those of cattle and 2-year-old buffalo but were similar to (P>.05) those of 4-year-old buffalo. This was dued to the brighter color, fine texture and better odor of meat jerky from cattle or younger buffalo compared to older buffalo.

2. Fermented Sausage

Fermented sausage from cattle and buffalo meat were determined for sensory panel scores. The results were reported in Table 6. Color scores of fermented sausage from cattle meat were higher (P<.05) compared to buffalo meat. This was dued to darker color of buffalo meat compare to cattle meat. There were no differences (P>.05) in color scores of products from different age group of buffalo. Odor scores of fermented sausage were similar (P>.05) among treatments.

Texture and overall acceptability scores of products from cattle meat were higher (P<.05) compared to 4-year-old buffalo but were similar to (P>.05) 2- and 6-year-old buffaloes. There were no differences (P>.05) in texture and overall acceptability scores of products from different age groups of buffalo. This may concluded that buffalo meat from 2- to 6-year-old can be used for fermented sausage product without any differences on sensory panel scores compared to cattle meat.

CONCLUSIONS

Carcass weight and dressing percentage of animals were similar among treatments. Buffalo had heavier head and shank and tended to have lower dressing percentage (49 vs 55%) compared to cattle. Most intestinal organ weights were similar among treatments except rumen and omasum which were bigger in older buffalo. Most carcass compositions and proximal compositions of meat were similar between cattle and buffalo except waste (fat and connective tissue) was higher in buffalo carcasses.

Meat samples were used for meat products (meat jerky and fermented sausage). Sensory panel scores were determined and compared among treatments. Meat jerky from cattle meat had better color, odor, texture and overall acceptability scores compared to those from buffalo meat. However, there were no major different in panel scores among products from different age groups. Fermented sausage from cattle meat had higher color, texture and overall acceptability scores compared to those from buffalo meat.

Meat from 2- to 6-year-old buffalo were similar to cattle and can be used for either fresh meat or meat products. Meat products from either cattle or buffalo meat had no major difference in sensory penal scores.

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Table 1 :Live weight, carcass weight, dressing percentage and body composition of cattle and buffalo

Items	T1[1]	T2[1]	T3[1]	T4[1]	SD
Live weight ,kg.	351.0[ab]	334.33[a]	404.67[b]	382.0[ab]	33.521
Carcass weight, kg.	191.73	168.67	188.67	186.40	13.215
Dressing Percentage, % live weight	54.8	50.97	46.663	48.83	4.393
Head, % live weight	3.60[a]	4.94[b]	4.35[b]	4.89[b]	.391
Shank, % live weight	9.72[a]	12.12[b]	10.49[ab]	10.90[ab]	.141
Skin, % live weight	1.49[a]	2.14[b]	1.90[b]	1.92[b]	.856

1. *T1 = 4 years cattle, T2 = 2 years buffalo, T3 = 4 years buffalo and T4 = 6 years buffalo. a and b means within the same row with different superscript were differ at P<.05.*

Table 2 : Internal organs of cattle and buffalo,% of live weight.

Organs	T1[1]	T2[1]	T3[1]	T4[1]	SD
Lung and heart	1.87	2.12	2.07	2.8	.219
Liver	1.23	1.21	1.11	1.33	.135
Kidney	0.25	0.22	0.18	0.23	.042
Spleen	0.29	0.25	0.28	0.23	.049
Rumen	1.87[a]	1.84[a]	1.90[a]	2.27[b]	.157
Reticulum	0.34	0.32	0.33	0.45	.066
Omasum	0.75[ab]	0.60[a]	0.64[a]	0.88[b]	.092
Abomasum	0.46	0.34	0.31	0.42	.077
Small intestine	2.39[ab]	2.68[a]	1.97[b]	2.50[ab]	.308
Large intestine	0.89[b]	0.69[a]	0.64[a]	0.90[b]	.105

1. *T1 = 4 years cattle, T2 = 2 years buffalo, T3 = 4 years buffalo and T4 = 6 years buffalo.*
   a and b means within the same row with different superscript were differ at P=.05.

Table 3 : *Carcass composition of cattle and Buffalo, % of carcass weight.*

Compositions	T1[1]	T2[1]	T3[1]	T4[1]	SD
Lean meat	47.11	45.03	45.94	44.07	1.864
Loin	14.02	18.96	16.54	15.68	2.538
Tender loin	2.68	2.67	2.82	2.84	.183
Belly	4.25[a]	4.43[ab]	4.79[ab]	5.34[b]	.537
Fat	7.78	4.87	5.23	8.12	2.590
Waste[2]	4.99[a]	5.75[b]	6.17[b]	6.41[b]	.392
Bone	17.95	18.30	18.52	17.54	1.47

1. *T1 = 4 years cattle, T2 = 2 years buffalo, T3 = 4 years buffalo and T4 = 6 years buffalo.*
2. *From small pieces of fat, Connective tissue and bone. a and b means within the same row with different superscript were differ at P<.05.*

Table 4 Proximal composition of cattle and buffalo meat, as is basis.

Compositions	T1[1]	T2[1]	T3[1]	T4[1]	SD
Water	74.7	74.83	72.25	75.0	2.924
Protein	20.26	20.32	23.28	19.90	5.278
Fat	3.21	2.21	2.39	2.88	5.141
Ash	.66	.89	.88	.85	.610

1. *T1 = 4 years cattle, T2 = 2 years buffalo, T3 = 4 years buffalo and T4 =6 years buffalo.*

Table 5 Sensory panel scores of meat jerky of cattle and buffalo meat

Meat type	Mean±SD[1]			
	color	odor	texture	overall acceptability
Beef	7.20±1.31[a]	6.80±1.45[a]	6.13±0.98[a]	6.40±1.25[a]
2 years buffalo	6.33±1.95[b]	6.00±1.42[bc]	6.33±1.38[a]	5.93±0.78[ab]
4 years buffalo	6.00±1.57[b]	6.13±1.12[b]	5.86±1.83[ab]	5.73±0.78[bc]
6 years buffalo	5.80±1.88[b]	5.47±1.83[c]	5.33±1.80[b]	5.33±0.80[c]

1. *Subjectively evaluated by a panel of 15 members. Scores were ranged from 1 to 8 and the higher number means the better score.*
   a, b and c means within the same column with different superscript were differ at P<.05.

Table 6 Sensory panel scores of fermented sausage of cattle and buffalo meat.

Meat type	Mean±SD[1]			
	color	odor	texture	overall acceptability
Beef	6.20±0.60[a]	7.00±0.85	5.93±1.49[a]	5.80±1.02[a]
2 years buffalo	5.33±0.67[b]	6.60±1.25	5.53±1.12[ab]	5.40±1.25[ab]
4 years buffalo	5.33±1.09[b]	6.53±0.98	5.00±1.28[c]	5.20±0.74[c]
6 years buffalo	5.53±0.98[b]	6.87±1.55	5.53±1.26[ac]	5.67±1.23[ac]

1. *Subjectively evaluated by a panel of 15 members. Scores were ranged from 1 to 8 and the higher number means the better score.*
   a, b and c means within the same column with different superscript were differ at P<.05.