The Libyan Journal of Agriculture
Volume (21), No. (1-2), 2016: 86-91

Original Article

The effect of age on fat deposition in longissimus doris muscle (between 12th -13th ribs) in camel compared to goat

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Abstract

This study was under taken to assess the effect of age and species on fat deposition in longissimus doris muscles, and meat quality. Samples of longissimus doris muscle were randomly collected from 15 male goats, and 15 male camels. Consisting of 3 age groups: A (0.5-1.5 years), B (1.5-2 years) and C (over 3 years).Each group contains 5 animals from each species. Samples were chilled (1- 0 C°) for one month. Moisture, crude protein, fat and ash were determined on freeze dried ground muscle. Parts of used muscle from each experimental animal were used for histological study. The results indicated that the species had a significant effect ($P<0.05$) on fat deposition, protein and expressible moisture, but not on ash. However, the age had a significant influence ($P<0.05$) on percent deposition of protein and moisture in both species, but did not have an effect on fat deposition except in camel over 3- years. Histological study, showed that an increase in density and diameter of muscle myofibrils in aged animals, this indicated that there was a reduction in the deposition of fat between muscle fibers in old ages (over 3 years) in goat and camel if it is compared with those in ages (1-2 years). In conclusion camel meat is similar in taste and texture to goat (1-2 year). This study confirmed that camel and goat meat is healthy and nutritious as it contains low fat as well as being good source of minerals. Also, has been proven that age is an important factor in determining meat quality and composition.

Key words: Camel, Goat, Fat deposition, Age, Quality.

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Received: 25/11/2015 Accepted: 15/ 06/2016

Introduction

Camel and goat meat is used for human consumption in several Arab countries, but it is not popular over the world. Camel and goat can be raised economically for meat production in the desert ecosystem. The dressing percentage of camel and goat ranges from 55 - 70 % and 50 - 60 % respectively. Camel and goat carcasses consist of 54 – % 77 and 51 – % 62 (Shareha, 1990 and Biala *et al.,* 1990). The optimum and economical age for slaughtering camel and goat is 1.5 – 2 years (Shareha, 1990). It has been reported that meat of young camel and goat are comparable in taste and texture with that of cattle and sheep slaughtered at young age (Biala *et al.*, 1999). Camel and goat meat was widely believed to be tough; salty and has strong taste. Accordingly several investigators used proteolytic enzymes to improve its tenderness (Kok *et al.*, 1993), however there are several factors that could affect that physical, chemical and palatability attributes.

The purpose of the current study was to determine the effects of age on chemical composition and histological structure of Longissimas dorsi muscle (12^{th} – 13^{th} rib) of the Libyan (one humped) camel meat compared with local goat meat at the same ages.

Materials and Methods

Samples of longisimus dorsi muscle (between 12, 13 ribs) were collected from different some slaughter house in Tripoli, Libya and transported to the laboratory using refrigerated box (4 C°). The study included 15 male goats and 15 male camels. Three different age groups were studied which included group **A** (0.5- 1.5 years), group **B** (2-3years), and group **C** (over than 3 years), each group comprises five animals from each species. Samples were chilled (1-0 C°) for about one month. Moisture, crude protein, fat and ash were determined on freeze - dried ground muscle. Part of the muscle from each experimental animal were taken for histological study. The samples were dehydrated in graded ethanol series, imbedded in paraffin wax, and histological sections (5 µm in thickness) were prepared from three samples of each treated group, stained with hematoxylin and eosin, and examined under a light microscope (General hospital, Tripoli). Fat deposition, protein and moisture content data were analyzed for the effects of age and species using the computer program (SAS -1991). The model for each observation reads:

$$Y_{ijk} = \mu + A_i + B_j + e_{ijk}$$ Where:

μ= means, A_i = effects of species, B_i = effects of ages, and e_{ijk} = the random error.

Results and Discussion

The result indicated that species has a significant effect ($p<0.05$) on fat deposition, protein and expressible moisture but not ash (Table 1). However, the age had a significant effects ($P<0.05$) on percent deposition of protein and moisture in all of the used species but did not have an effect on fat deposition except in animals aged 2 years in goat

Table 1. Shows protein, fat and moisture percent (%) in longissismus dorsi muscle of camel and goat at the same age .

Animal age	Camel			Goat		
	P	F	M	P	F	M
0.5 - 1.5	24.06 ± 0.07 [a]	3.66 ± 0.10 [c]	70.55 ± .06 [a]	19.60 ± 0.070 [b]	2.60 ± 0.08 [b]	75.84± 2.9 [a]
1.5 - 2	22.5 ±0.06 [a]	4.64± 0.12 [b]	69.80± 0.06 [b]	19.20 ± 0.065 [c]	2.80 ± 0.07 [b]	75.90 ± 2.6 [a]
2-4more	23.7±0.069 [b]	5.05 ± 0.15 [a]	69.33± .07 [c]	19.86 ± 0.068 [a]	3.44± 0.07 [a]	75.30 ± 2.7 [a]

P= Protein F= Fat M=Moisture

*This Table showed the comparative figures between and within the species at different ages.

a ,b ,c , means with the see letters is not significantly different (p < o . o5).

and over 3 years camels. In other word, the percentage of protein decreased and that of fat increased with increase in goat and camel age (Table, 1), which agreed with those of Kamone (2oo4) and Biala *et al.*, (1999). However, there was no difference in percent of ash (1.14, 1.1) between the used species which was in agreement with those found by Yossife and Babiker, (1989) and Shareha *et al.*, (2013). There was a decline in protein percentage in goat and camel meat aged (1-2) years as compared with those over three years old (Table, 1). The little decrease in meat protein of the young animals may be due to the increase of moisture. In conclusion this study indicated that protein percentage was higher in camel than beef; sheep and goat (Shareha *et al.*, 2o13).

Fat percentage of camel and goat aged 0.5 – 2 years was significantly lower (P≤0.05) than those over three years of age. This was in agreement with Biala *et al.*, (1990) and Shareha, (1990). Anyway the best slaughter age of goat and camel is not more that 1.5 – 2 years due to meat will be less in moisture and more fat and protein. In term of histological study the results showed that age of animals under investigation had a significant influence ($p \leq 0.05$) on mass and diameter of longissimus dorsi muscles between (12^{th} -13^{th} rib) specially in goat 1 - 2 years, (fig. 2 and 4) and camel (fig. 1 and 3). However , it seems that the deposition of fat between muscle fibers in goat meat was higher than that in camel muscle at the same age specially at 2 years old (Fig. 3 and 4). The increase in density and diameter of muscle myofibrils of camel meat reduces the percentage of fat deposition between the muscle fiber specially in camels over ≤ 3 years, compared to goat (Fig. 5 ,6) of the same age. Shareha (1990), Biala *et al.,* (1990) and Shareha *et al.* (2013) found that the optimum and economical age for slaughtering camel was 1.5 -2 years old. In general, camel and goat meat is similar in taste and texture to beef and sheep (1-2) years (Shareha *et al.*, 2013). The amino acids and minerals contents of camel and goat meat often higher than beef and sheep (Kadim et al. 2007) this is properly due to lower intramuscular fat. Figure 1,2 ,showed that the diameter of myofibrils and

muscle bundles and fat deposition in longissimus dorsi muscle in the two species at age between (0.5-1.5) years old.

However, we observe that a space between the muscle bundles and between the fibers of the same muscle bundles. This may give the chance for fat deposition in those ages. The carcasses of the two species at the age (2-3) years old show very little change in the diameter of fibers and muscle bundles (Fig, 5 ,6) compared with sheep and beef (Mortho1984, and Shareha *et al.* 2013).

However a different change was occurred in the camel meat aged over than 3 years, as compared to those of goat at the same age. Figure 5 ,6 shows the large increase in myofibrils and muscle fibers diameter and this influence reduces the percentage of fat deposition between the muscle fiber in camel meat over 3 years old, compared to those in goat at the same age.

This study confirmed that camel and goat meat is healthy and nutritious as it contains low fat and as a good source of minerals. Animal age is important factor in determining meat quality and composition. Future research need to focus on exploiting the potential of camel and goat as source of meat through multi-research into the efficient production system and improving meat technology and marketing.

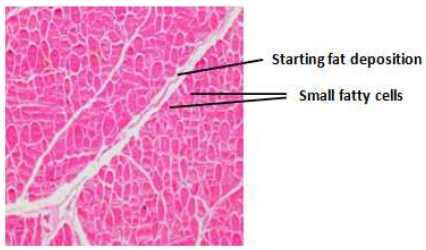

figure 1. camel one year old

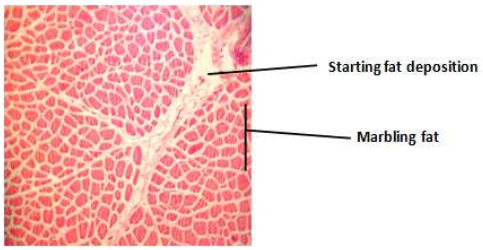

figure 2. goat one year old

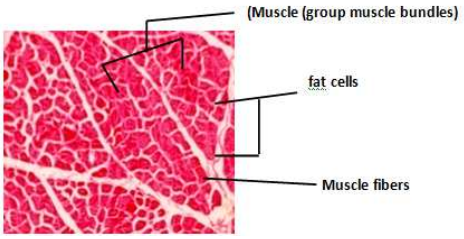

figure 3. Camel 2 year old

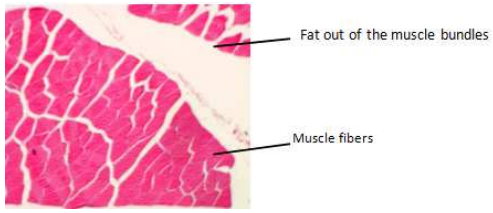

figure 4. Goat 2 year old

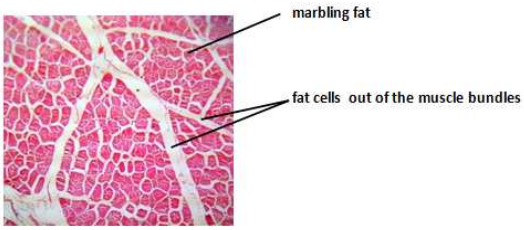

figure 5. camel 3 year old

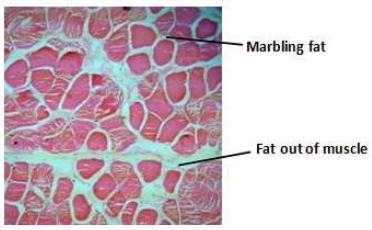

figure 6. goat 3 year old

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المجلة الليبية للعلوم الزراعية
المجلد (21): العدد (1-2): 2016: 86-91

ورقة أصيلة

تأثير العمر على ترسيب الدهن في العضلة العينية (Rib 12-13) في الإبل مقارنة بالماعز

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المستخلص

في هذه الدراسة تم تحديد تأثير العمر والنوع على ترسيب الدهون داخل العضلة العينية وكمية اللحم في حيوان الإبل مقارنة بالماعز عند نفس العمر. أخذت عينات من العضلة العينية عشوائيا عددها 15 من ذكور الإبل و 15 من ذكور الماعز ، حيث قسمت إلى ثلاثة مجموعات عمرية مختلفة كما يلي: أ- (0.5-1.5 سنة) ب- (1.5 – 2 سنة) ج- (أكثر من ثلاثة سنوات)، وكل مجموعة تحتوي على عدد خمسة حيوانات من كل من الإبل والماعز. العينات تم حفظها في درجة التجميد (صفر - 1 °م) لمدة شهر تقريبا. خضعت العينات إلى التحليل الكيميائي لمعرفة نسبة الرطوبة والبروتين الخام والدهون والرماد في جزء من لحم العينة المجمدة الجافة و المطحونة جيداً، أما الجزء الثاني من العينة فقد استخدم لغرض الفحص النسيجي. أظهرت نتيجة التحليل الكيميائي أن لنوع الحيوان التأثير المعنوي عند مستوى ($P < 0.05$) على نسبة الدهون والبروتين و الرطوبة، ولكن ليس على نسبة الرماد، كما كان للعمر التأثير المعنوي ($P \geq 0.05$) على نسبة ترسيب البروتين و الرطوبة في كلا السلالتين ولكن ليس لها تأثير على ترسيب الدهن ما عدى في حيوانات الإبل التي أعمارها أكثر من ثلاثة سنوات.

أظهرت الدراسة الهستولجية الزيادة في الكثافة و الحجم للألياف العضلية في الأعمار المتقدمة وهذا يعنى وجود انخفاض في ترسيب الدهن بين الألياف العضلية في الأعمار الكبيرة (3 سنوات فأكثر) في كل من الإبل والماعز إذا ما قورنت بالأعمار الصغيرة (سنة و سنتين).

نستخلص من هذه الدراسة إن لحوم الإبل الصغيرة تشابه في الطعم و الطراوة لحوم الماعز عند نفس العمر (1-2 سنة)، كما أنها تؤكد إن لحوم الإبل و الماعز جيدة الاستعمال صحيا ومغذية، بالإضافة إلى أنها منخفضة في نسبة الدهن ومصدر جيد للعناصر المعدنية ، كما ثبت أيضا إن لعمر الحيوان تأثير مهم في اختيار نوعية اللحم ومكوناته الغذائية.

الكلمات الدالة: الإبل، الماعز، ترسيب الدهن، العمر، الجودة.

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استلمت بتاريخ: 2015/11/25 **أجيزت بتاريخ: 2016/06/15**