EFFECT OF SLAUGHTER WEIGHT ON CARCASS CHARACTERISTICS OF EGYPTIAN BALADI BULLOCKS

Amal K. El-Asheeri

Department of Animal Production, Faculty of Agriculture, Cairo University, Giza, Egypt

Based on their slaughter weight (SW) a total of 20 Baladi bullocks were divided into two groups (n=10 each) to study the effect of SW (400 vs. 450 kg) on carcass characteristics. Average SW of the 1st group (G1) was 404.3 ± 2.1, while of the 2nd one (G2) was 445.3 ± 2.1 kg. Experimental animals were kept tied and fed according to body weight (BW) on concentrate feed mixture, Egyptian clover (Trifolium alexandrinum) hay and rice straw. After slaughtering, hide removing and eviscerating, weights of edible and non-edible offal in addition to internal fat were recorded. Carcass was weighed and afterward was sectioned down into two halves. Each half was dissected between the 8th and 9th rib into fore and hind-quarters before weighing. Forequarter was separated into brisket, shoulder, fore ribs, flat ribs, neck and shin, while hindquarter was separated into fillet, thick flank, thin flank, hind shank, round and sirloin cuts. Bones were removed from the left half for recording boneless meat percentage. Dressing percentage, boneless meat percentage, internal fat, edible and non-edible offal weight were recorded.

Carcass weight of G2 was higher (P<0.0003) than of G1 by about 25 kg, however no significant difference between the two groups was observed concerning dressing and boneless meat percentages. Except liver (P<0.03) and testis weight (P<0.02) which were higher in G2 than in G1, difference in weights of the other edible offal were non-significant. G2 was higher in kidney (P<0.05) and mesenteric (P<0.008) fat weight than G1. G2 was higher in brisket (P<0.004) and neck (P<0.009) cuts, while G1 was higher in fillet (P<0.003) and thick flank cuts (P<0.003).

Under the present experimental circumstances, it could be preliminary concluded that increasing SW to more than 400 kg is not recommended, due to increasing forequarter weight relative to hind ones, increasing percentages of internal fat and non-edible offal by about 0.6 and 62.5 % of the total increase in SW.

Keywords: Egyptian Baladi bullocks, slaughter weight, carcass traits, cuts

INTRODUCTION

Beef industry chain is ended by meat marketing. Boneless meat percentage and proportion of high price cuts as well as carcass fat are the most critical factors influencing meat marketing revenue. Body weight at slaughter determines to a considerable extent the carcass composition.

Egyptian feedlot system depends mainly on marketing Baladi (native) bullocks between 400 and 450 kg, which is close to weight at sexual maturity. Average daily gain decreases with sexual maturity-hood (Lawrence and Fowler, 1998), hence cost of producing 1 kg live body weight increases due to the change in metabolism path

towards fat deposition. This of course is reflected on the proportion of muscles in carcass relative to bone and fat tissues. This will reduce benefit/cost ratio of feedlot when Baladi bullocks are allowed to grow over 400 kg (El-Asheeri, 2008).

Carcass traits of growing Baladi calves were studied by Mostageer *et al.* (1982); Sadek *et al.* (1993); El-Bedawy *et al.* (1996 & 2004); and El- Asheeri *et al.* (2008). Previous studies emphasized mainly the calculation of the percentages of dressing (56 – 58 %) and boneless meat (46 – 48 %). Increasing slaughter body weight improves boneless meat percentage and affects the proportion of carcass cuts. Thus, many studies gave special attention to this issue in bovine (Abdallah *et al.*, 1981, 1982 a & b, Keane and Mooer O'ferrall, 1988, Keane and Drennan, 1990, El-Asheeri, 1992; El-Koly *et al.*, 1997 and Sawyer *et al.*, 2004), however the relation between slaughter weight and carcass cuts of Baladi calves is not comprehensively studied.

The objective of the present study was to characterize carcass traits of Baladi bullocks in relation to slaughter weight.

MATERIALS AND METHODS

Animals and management:

The present study was carried out at the Fattening Research Unit, Agriculture Experimental Station, Faculty of Agriculture, Cairo University, Giza, Egypt on 20 Baladi male calves, which were purchased from the local market and reared under the common practice of fattening in the experimental station. Initial body weight of the experimental calves ranging between 225 and 250 kg with approximately 14-15 month of age. Ten Baladi bullocks, between 395 and 405 kg, were chosen randomly to be slaughtered as group 1 (G1), while the other 10 were allowed to grow up to 440 and 450 kg (G2) to study the effect of slaughter weight (SW) on carcass characteristics. During the experimental period average daily gain of the bullocks was 0.9 ± 0.02 kg and the fattening period of G1 and G2 was 150.2 ± 5.4 and 211.2 ± 6.0 days, respectively. Average slaughter weight (SW) of G1 was 404.3 ± 2.1, while of G2 was 445.3 ± 2.1 kg. Pre-fattening process, calves were treated against internal and external parasites, kept tied in semi open yards and watered twice daily. Feed allowances were offered based on NRC (1996) requirements on concentrate feed mixture, Egyptian clover hay (*Trifolium alexandrinum*) and rice straw.

Slaughtering

Bullocks were slaughtered according to Halal rules after feed prevention of 16 hrs. After hide removing and eviscerating, weights of offal that called "fifth quarter, Jarrige and Bé1992) were recorded. Offal were classified into edible (liver, heart, kidneys, spleen, lungs and testis), non-edible (head, hide, four feet, tail and digestive tract), carcass and internal fat. Each carcass was split into left and right sides by longitudinal sawing along the middle of the vertebral column and then the left side was divided between 8th and 9th thoracic vertebra into forequarter and hindquarter. Carcass was weighed to estimate dressing percentage (hot carcass weight divided by SW multiplied by 100) and after removing bones, boneless meat was weighed to calculate boneless meat percentage (meat weight divided by SW multiplied by 100).

Percentages of dressing, boneless meat, internal fat, hind- and fore- quarters and high price cuts were considered as economic indicators.

The German Federal procedure of cutting beef carcass (Lothar Schön, 1961 and Wenigor *et al.*, 1963) was applied in this study. Left forequarter was separated into brisket, shoulder, fore-ribs, flat ribs, neck and shin, while hindquarter was separated into fillet, thick and thin flank, hind shank, round and sirloin including best ribs cuts. Weight of each cut was recorded before and after bone removing and their proportions were estimated relative to the left side weight. Sirloin, shoulder, fillet and round were considered as high priced cuts according to the study of El- Koly *et al.* (1997).

Statistical analysis

Data were statistically analyzed as one way analysis of variance according to SAS (2001). Data in percentages were transformed to the arcsine square–root in an attempt to normalize errors before analysis. The model used was as follows:

$Y_{ij} = \mu + G_i + e_{ij}$, where,

Y_{ij}= observation

μ = mean

G_i = Slaughter weight groups, i= 1,2 (G1= slaughtered at weight of 400 kg; G2 = slaughtered at weight of 450 kg).

e_{ij} = the experimental error

RESULTS AND DISCUSSION

Carcass traits

Carcass weight of G2 was higher (P<0.0003) than of G1 by about 25 kg, however no significant difference was observed between the two groups concerning dressing and boneless meat percentages. It is worth to note that increasing SW of G2 was accompanied by increasing the proportion (+ 1.6 %) of forequarters relative to hindquarters, while a reverse trend was observed in G1 (Table 1 and Figure 1).

Table 1: Carcass characteristics (LSM & S.E) of Baladi bullocks (n=10 each) as affected by slaughter weight

Traits	G1	G2	S.E	P value
Slaughter weight (kg)	404.3	445.3	2.1	0.0001
Carcass weight (kg)	231.6	256.9	4.01	0.0003
Forequarters weight (kg)	113.8	130.2	1.07	0.0001
Hindquarters weight (kg)	117.8	126.8	1.13	0.011
Dressing percentage	57.3	57. 7	0.86	0.74
Boneless meat percentage	47.7	48.1	0.85	0.74
Hind: Fore quarters ratio	1:1.04	0.97:1		

G1: slaughtered at 400 kg , G2: slaughtered at 450 kg

The obtained dressing percentages of both groups are close to that reported by Mostageer *et al.* (1982), El-Bedawy *et al.* (1996 & 2004) and El-Asheeri *et al.* (2008) on Baladi bullocks (56–58.8%). Also, the obtained percentages of boneless meat of

G1 and G2 (about 48 %) are similar to the findings of Mostageer *et al.* (1982), El-Bedawy *et al.* (2004) and El-Asheeri *et al.* (2008) (46.6 – 48.8 %).

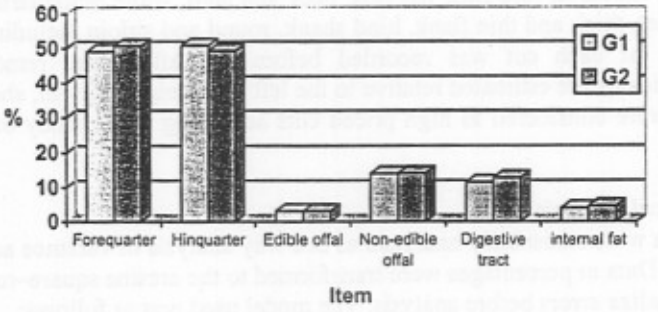

Figure 1. Percentages of fore and hind-quarters (relative to carcass weight), edible and non-edible offal, digestive tract and internal fat (relative to SW) of Baladi bullocks slaughtered at 400 kg (G1) and 450 kg (G2)

The obtained proportion of hind and fore-quarters in both groups are close to that reported by El-Bedawy *et al.* (2004) (50.1 and 49.9 %) when Baladi bullocks were slaughtered at 419 kg. The non-significant difference between the two studied groups in dressing percentage comes in agreement with the findings of Mostageer *et al.* (1982) and El-Bedawy *et al.* (2004) reporting close dressing percentages, however the slaughter weight was 380 and 419 kg, respectively. The obtained ratio of hind: fore quarters of G1 agrees with that reported by Abdallah *et al.* (1981, 1:1.1) on Friesian crossbred cattle.

Edible and non-edible offal (fifth quarter)

Results in table (2) indicate an increase in weights of edible ($P<0.02$) and non-edible offal ($P<0.0005$), digestive tract ($P<0.002$) and internal fat ($P<0.04$) of G2 than G1. The difference in total weight of previous parts between G1 and G2 is about 24 kg, representing 58.5 % of the difference in BW between the two groups.

Except digestive tract and internal fat percentages (Figure 1) there was no difference between edible and non-edible offal relative to slaughter weight. Within the edible offal, weights of liver ($P< 0.03$) and testis ($P<0.02$) were higher in G2 than in G1. In non-edible organs hide ($P<0.004$) and tail ($P<0.004$) were higher in G2 than in G1, while no-significant difference was observed in the other components (Table 2).

Higher internal fat percentage in G2 (0.6 %) is due to the increase in weight of kidney ($P<0.05$) and mesenteric ($P<0.008$) fat, while heart and caul fat weights were insignificantly higher in G2 than in G1 (Table 2).

The percentage of total internal fat recorded in this study relative to SW in both groups (4.0– 4.6 %) is less than that reported by Mostageer *et al.* (1982) and El-Bedawy *et al.* (2004) (5.4 – 6.2 %) on the same breed. Sawyer *et al.* (2004) reported that kidney, pelvic and heart fat percentages increase with age advancement which

agrees with the present findings. The difference between the fat percentages in the previous studies is most probably attributed to feeding level, genotype and age or weight at slaughter.

Table 2. Non-carcass components (LSM & S.E) of Baladi bullocks as affected by slaughter weight

Traits	G1	G2	S.E	P Value
Edible offal weight (kg)	**12.4**	**13.6**	**0.35**	**0.02**
Heart	1.81	1.86	0.084	0.67
Liver	4.84	5.44	0.18	0.03
Lungs	3.38	3.64	0.20	0.39
Spleen	0.96	1.11	0.07	0.17
Kidneys	0.84	0.91	0.05	0.33
Testis	0.53	0.64	0.03	0.02
Non-edible offal weight (kg)	**56.8**	**62.91**	**1.03**	**0.0005**
Head	19.7	20.5	0.47	0.26
Hide	27.5	31.0	0.94	0.004
Four feet	8.4	9.01	0.28	0.13
Tail	1.2	1.5	0.07	0.004
Full digestive tract weight (kg)	**46.64**	**57.16**	**3.11**	**0.002**
Rumen	35.53	38.92	2.54	0.36
Intestine	11.11	18.24	0.96	0.0001
Internal fat weight (kg)	**16.1**	**20.5**	**1.77**	**0.04**
Heart fat	1.05	1.10	0.12	0.77
Kidney fat	5.89	8.05	0.74	0.05
Caul fat	5.28	7.02	0.77	0.13
Mesenteric	3.8	4.3	0.35	0.008

G1: slaughtered at 400 kg , G2: slaughtered at 450 kg

Carcass cuts:

No significant differences were observed in absolute weight of fillet, fore-ribs, shin and thin flank in G1 and G2, while the weights of the other cuts were differed significantly as presented in Table (3). The proportion of carcass cuts indicated that G2 was higher in brisket ($P<0.004$) and neck ($P<0.009$) cuts, while G1 was higher ($P<0.003$) in fillet and thick flank cuts (Table 3).

Economic indicators:

Increasing forequarters weight (less class cuts) to 65 % compared to 35% in hind ones (high class cuts) and increasing mesenteric fat (0.6%) in G2 than G1, in addition to decreasing fillet (0.45%), and increasing brisket (1.2%) and neck (1.6%) may have negative impact on the expected revenue of marketing carcass comes from Baladi bullocks slaughtered at 450 kg.

CONCLUSION

Under the present experimental circumstances, fattening Baladi bullocks to 450 kg may have negative impact on the expected revenue of marketing carcass. This is due to increase forequarter weight compared to hind one relative to those slaughtered

at 400 kg. Further studies to calculate the gross margin and benefit / cost ratio for marketing meat cuts of Baladi bullocks slaughtered at 400 and 450 kg is required.

Table 3. Weight and proportion (LSM & S.E) of carcass cuts of Baladi bullock as affected by slaughter weight (weight and proportions were calculated out of the carcass left side)

Traits		G1	G2	S.E	P value
Fillet	(kg)	3.43	3.23	0.13	0.28
	(%)	2.96	2.51	0.09	0.003
Sirloin*	(kg)	9.7	11.00	0.39	0.03
	(%)	8.40	8.55	0.28	0.70
Round	(kg)	32.36	35.80	0.78	0.006
	(%)	27.94	27.86	0.36	0.88
Hind shank	(kg)	4.09	4.38	0.90	0.04
	(%)	3.54	3.41	0.07	0.19
Fore ribs	(kg)	15.1	15.17	0.73	0.95
	(%)	13.02	11.82	0.57	0.15
Shoulder	(kg)	18.15	19.9	0.42	0.009
	(%)	15.68	15.50	0.25	0.63
Brisket	(kg)	7.18	9.58	0.34	0.0001
	(%)	6.23	7.45	0.26	0.004
Flat ribs	(kg)	3.34	3.93	0.15	0.015
	(%)	2.89	3.07	0.13	0.35
Neck	(kg)	9.06	12.13	0.52	0.0006
	(%)	7.82	9.45	0.39	0.009
Shin	(kg)	4.02	4.34	0.12	0.082
	(%)	3.47	3.38	0.07	0.37
Thick flank	(kg)	3.54	3.00	0.017	0.04
	(%)	3.06	2.34	0.15	0.003
Thin flank	(kg)	5.79	5.98	0.29	0.66
	(%)	4.99	4.67	0.24	0.34

G1: slaughtered at 400 kg G2: slaughtered at 450 kg * Including best ribs

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تأثير وزن الذبح على خصائص الذبيحة في العجول البلدية

آمال كمال العشيري

قسم الإنتاج الحيواني ، كلية الزراعة، جامعة القاهرة، الجيزة، مصر

هدف البحث إلى دراسة تأثير وزن الذبح (400 أو 450 كجم) على صفات الذبيحة وقطعيات اللحوم، لذلك تم اختيار 20 عجل بلدي مسمن تم تقسيمها إلى مجموعتين: الأولى (ج1) كان متوسط وزن العجول عند الذبح 404.3 ± 2.1 كجم ، بينما كان متوسط وزن المجموعة الثانية (ج2) 445.3 ± 2.1 كجم. و كانت الحيوانات خلال فترة التسمين مربوطة في أحواش نصف مفتوحة، وغذيت الحيوانات على مخلوط علف مركز(12% بروتين) بالإضافة إلى البرسيم أو دريس البرسيم وقش الأرز طبقاً لاحتياجات الحيوان الغذائية المبنية على وزن الحيوان الحي. وبعد إجراء عمليات الذبح والسلخ والتجويف ، تم وزن الذبيحة و الأحشاء الداخلية المأكولة وغير المأكولة والدهن الداخلي. وتم شق كل ذبيحة إلى نصفين، كما تم تقسيم كل نصف إلى ربعين أمامي وخلفي (بين الضلعين الثامن والتاسع) . تمت تشفية النصف الأيسر من الذبيحة لحساب نسبة التشافي ووزن ونسب القطعيات. تم تقطيع الربع الأمامي إلى قطعيات: الصدر، والكتف ، السن ، الضلوع ، الرقبة ، الموزة الأمامية ، أما قطعيات الربع الخلفي فكانت الفلتو، والبطن ، الموزة الخلفية ، الفخذ ، وبيت الكلاوي. تم حساب نسب التصافي والتشافي ، والدهن الداخلي ، ووزن ونسب قطعيات الذبيحة.

كان وزن الذبيحة في (ج2) أعلى ($P<0.0003$) منه في (ج1) بحوالي 25 كجم ، لكن لم يكن هناك فروق معنوية في نسبتي التصافي والتشافي بين المجموعتين. وفيماعدا وزن الكبد ($P<0.03$) والخصيتين ($P<0.02$) اللذان كانا أعلى في (ج2) عنه في (ج1) ، لم يكن هناك فروق معنوية بين المجموعتين فيما يخص باقي الأجزاء المأكولة . كانت نسبة الدهن الداخلي أعلى في (ج2) عن (ج1) بنسبة 0.6 % ، كنتيجة لزيادة وزن دهن الكلية ($P<0.05$) والأحشاء ($P<0.008$). أما بالنسبة للقطعيات فكانت (ج2) أعلى في نسب الصدر والرقبة ، بينما (ج1) أعلى في الفلتو ($P<0.003$) والبطن ($P<0.003$).