Effects of sugar beet root based concentrates level on carcass characteristics and body components in *Tagger* male kids

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ABSTRACT

Twelve *Tagger* male kids at 6 month old were used to study the effects of dried sugar beet root (DSBR) based concentrates level on the performance and carcass characteristics in the Gezira State, Sudan. They were weighed, divided into 3 groups according to body weight (BW) and allocated at random to the 3 experimental diets. They were housed in individual pens and weighed weekly before the morning meal for 8 weeks with a two weeks preliminary period. They were fed groundnut haulm (GNH) *ad lib*. in two equal meals at 8 am and 4 pm and different levels of DSBR based concentrates (0 (control), 150g and 300g) in two equal parts before GNH meals. The animals were slaughtered and body components and carcass characteristics were studied. Slaughter weight, hot carcass weight (9.62- 12.69 kg), EBW (7.39-10.1kg), dressing percentages (37.26-41.67), muscle (65.75-68.0%), fat (7.75-12.25%), muscle: bone (2.49:1- 3.58:1) and muscle: fat (8.79:1-10.6:1) increased and bone (26.50 -19.75%) decreased with concentrates level. Body components weight and percentages on live BW varied among and within concentrate levels and were mostly the heaviest in animals fed 300g concentrates. Body components weights and percentages were not significantly ($P>0.05$) affected by concentrates level, except kidneys and renal fat, mesentery and omentum. The highest percentages were higher in the control and least in animals fed 150g concentrates. It is recommended to use DSBR based concentrates in fattening *Tagger* kids.

INTRODUCTION

The substantial increase in meat demand and prices in the last decades in the Sudan (Ahmed, 2014) highlighted the needs to produce cheap high quality meat and exploiting less utilized meat resources. Goat are an attractive choice due to high population, wide distribution and production of high quantities of high quality milk, meat and skin (MARF, 2011). However, goat meat is the least preferred in the country and is mainly used as kids meat. Goat meat is reputed for high nutritive value and muscles and low fat (Devendra and Mc Leroy, 1992). The demand for low fat meat, as goat meat, has increased due to the disputed relation between cardiovascular diseases and cholesterol and saturated fatty acids. However, goat meat production is still mainly traditional and the animals depend on natural pastures which have deteriorated due to many reasons. In addition, the animals are generally neglected with low inputs and outputs (Devendra and Mc Leroy, 1992). According to FAOSTAT (2008), the country ranked 6th in world goat population and goat meat production**.** But, Sudan is not among world main goat meat exporters. Goat meat production can be improved to be competitive in international markets and thus increases the national income. This could be achieved by improving meat quality and yields by improved nutrition, husbandry, health, genetic constitution and marketing. There are many goat breeds in the country including *Tagger* which is a promising meat breed due to its high meat quality (Mudawi, 2002).

Nutrition is among the main constraints for goat meat production in the Gezira State due to natural pastures deterioration (Abusuwar and Darrag, 2002) and seasonal variations in feeds quantity and quality leading to high shortages and negative consequences on animals health and performance, especially in the dry season (Elhag, 1992). Crop residues are used with generally low nutritive value, dry matter intake and animals performance (Hamed, 2007). Sugar beet (*Beta vulgaris* L.) has been introduced into the Gezira State and its by-products are excellent feeds (Harland *et al*., 2006). Mean BW and weight gain generally increased with dried sugar beet root based concentrates level in *Tagger* males. However, there is no available information on sugar beet root and its by-products on goat carcass characteristics and body components in the Sudan. Consequently, this study was conducted to study the effects of different levels of dried sugar beet root based concentrates on *Tagger* kids performance and carcass characteristics.

MATERIALS AND METHODS

Animals

Twelve *Tagger* males at 6 month old were used to study the effects of DSBR based concentrates level on carcass characteristics and body components in the University of Gezira farm in Wad Medani, Gezira State, Sudan. They were vaccinated against prevalent diseases and injected with Intermectin (Interchemie Werken, Harjumaa, Estonia) against internal and external parasites. They were weighed, divided according to BW into three groups, each with four animals and the groups were allocated at random to the experimental feeds using a completely randomized design. They were weighed weekly before the morning meal using a 100 kg hydrologic weighing machine.

Housing

The animals were housed in individual wire pens (1.5x2 m) shaded with corrugated iron sheets. Each pen had roughages, concentrates and drinking water buckets.

Feeds and feeding

The animals were fed the experimental diets for 8 weeks with a two weeks preliminary period. They were fed groundnut haulm (GNH) *ad lib*. in two equal meals at 8 am and 4 pm and dried sugar beet root based concentrates (DSBR) at 0 (control), 150g and 300g in two equal meals before GNH meals.

Slaughter

At the end of the feeding period the animals were fasted overnight and weighed before slaughter according to Islamic rituals (Elimam and Ombabi, 2007). Blood was collected in a pre- weighed plastic container and weighed to determine blood weight. The legs were removed, animals were skinned and carcasses were opened, eviscerated and body components were removed. The small and large intestines and associated fats were separated and weighed separately for each animal. The carcasses were weighed with kidneys and renal (hot carcass weight, HCW). The alimentary tract was weighed full and empty to calculate the gut fill and empty body weight (EBW). Dressing percentages were calculated for each animal. Muscle: bone and muscle: fat ratioes were calculated for each animal.

Calculations and statistical analysis

Body components weights were expressed as percentage of LBW. Dressing percentages were calculated on LBW and EBW for each animal. Means and standard deviations were calculated for different parameters in each treatment. Data were statistically analyzed using the ANOVA procedure.

RESULTS

Table 1 shows the effects of DSBR based concentrates level on *Tagger* males slaughter weight and carcass characteristics. Slaughter weight, EBW, hot carcass weight and dressing percentages on LBW and EBW increased with concentrates level. Dressing percentages were higher on EBW compared to LBW. Carcass muscle, fat, muscle: bone and muscle: fat ratioes increased and bone decreased with concentrates level and the increase in fat was more pronounced than muscles.

Table 1. Effects of dried sugar beet root based concentrates level on slaughter weight and carcass characteristics in *Tagger* males.

Parameters	Concentrates level (g/ day)		
	0	150	300
	Body component weight (kg)		
Slaughter weight (kg)	09.62 ±2.46	11.06 ± 4.75	12.69 ± 2.68
Empty body weight (kg)	07.39 ± 1.94	08.96 ± 4.10	10.10 ± 1.86
Hot carcass weight (kg)	03.21± 0.47	04.61± 2.43	05.31± 1.25
Gut contents (kg)	02.24 ± 0.52	02.11 ± 0.79	02.59± 0.85
Dressing %: LBW	37.26 ± 1.47	40.37 ± 4.30	41.67± 3.10
EBW	42.87 ± 5.59	51.57 ± 6.85	52.15± 4.85
Carcass muscle (%)	65.75 ±0.96	66.75 ± 9.00	68.00 ± 7.44
Carcass bone (%)	26.50 ± 1.73	22.75 ± 5.68	19.75 ± 5.44
Carcass fat (%)	07.75 ± 1.71	10.25 ± 5.44	12.25 ± 11.47
Muscle: bone	02.49 ± 0.18	03.11 ± 1.00	03.58 ±0.69
Muscle: fat	08.79 ±1.87	08.10 ±4.22	10.60 ±9.05

LBW= Live body weight, EBW= Empty body weight.

Table 2 shows the effects of different levels of sugar beet root based concentrates on body components weight in *Tagger* males. Body components weight varied among and within concentrate levels. Spleen and pancreas weights were similar in all concentrate levels and heart weight was similar in animals fed 0 and 300g concentrates. Animals fed 150g concentrates had the heaviest heart, mesentery and kidneys and renal fat. Animals fed 300g concentrates had the heaviest blood, head, forelegs, hind legs, skin, stomach, intestines, lungs, liver, testicles and tail. No body component was the heaviest in animals fed no concentrates and most body components were heaviest in animals fed 300g concentrates. All body components weights were not significantly ($P>0.05$) affected by concentrates level, except kidneys and renal fat, mesentery and omentum. The mesentery and kidneys and renal fat were heaviest in animals fed 150g concentrates and the omentum was significantly ($P<0.05$) heavier in animals fed 300g concentrates. All body components weights were least in animals fed no concentrates, except hind feet and mesentery. The hind feet and omentum were least in animals fed150g concentrates and the mesentery was least in animals fed 300 concentrates.

Table 2. Effects of dried sugar beet root based concentrates level on body components weight (kg) in *Tagger* males.

Body components	Concentrates level (g)		
	0	150	300
	(kg) Body component		
Blood	0.33 ± 0.12	0.50 ±0.22	0.53 ± 0.23
Head	0.84 ± 0.22	0.92 ±0.35	1.03 ± 0.15
Fore feet	0.16 ± 0.04	0.18 ± 0.07	0.20 ± 0.02
Hind feet	0.13 ± 0.04	0.12 ± 0.02	0. 15 ± 0.02
Skin	0.59 ± 0.15	0.63 ± 0.29	0.72 ± 0.09
Stomach	0.36 ± 0.12	0.39 ± 0.13	0.47 ± 0.11
Intestines	0.40 ±0.04	0.42 ± 0.05	0.46 ± 0.15
Gut fil	2.16 ± 0.40	2.06 ± 0.77	2.61 ± 0.84
Heart	0.06 ±0.01	0.07 ± 0.04	0.06 ±0.12
Lungs	0.12 ± 0.03	0.12 ± 0.05	0.16 ± 0.04
Spleen	0.02 ± 0.01	0. 02 ± 0.01	0.02 ± 0.01
Pancreas	0.02 ± 0.01	0.02 ± 0.01	0.02 ± 0.01
Mesentery	0.02 ± 0.01	0.05 ± 0.04	0.01 ± 0.04
Kidneys and renal fat	0.05 ± 0.01	0.07 ± 0.05	0.01 ±0.04
Liver	0.14 ± 0.04	0.16 ± 0.05	0.20 ± 0.03
Testicles	0.06 ±0.07	0.12 ±0.01	0.16 ± 0.05
Tail	0.02 ± 0.01	0.03 ± 0.01	0.04 ± 0.06
Omentum	0.12 ± 0.01	0.03 ± 0.02	0.05 ±0.01

Table 3 shows the effects of dried sugar beet root based concentrates level on body components percentages in *Tagger* males. Body components percentages varied among and within concentrate levels. The percentages of head, forefeet, hind feet, skin, stomach, intestines, heart, lungs and spleen were highest in animals fed no concentrates (control). The percentages of blood and pancreas were highest in animals fed 150g concentrates and the percentages of mesentery, kidneys and renal fat, liver, testicles, tail and omentum were highest in animals fed 300g concentrates. The control had more body components with the highest percentages among concentrate levels. The percentages of blood, mesenteric, kidneys, testicles and omentum were least in animals fed no concentrates. The percentages of hind feet, skin, stomach, lungs, spleen, liver and tail were least in animals fed 150g

concentrates. The percentages of head, forefeet, intestines and pancreas were least in animals fed 300g concentrates. Animals fed 150g concentrates had more body components with the least percentages among treatments. All body components percentages were not significantly affected with concentrates level, except kidneys and renal fat, mesentery and omentum. The mesentery, omentum and kidneys and renal fat percentages were significantly ($P<0.05$) highest in animals fed 300g concentrates.

Table 3. Effects of dried sugar beet root based concentrates level on body components percentages in *Tagger* males.

Body components	Concentrates (g/day)		
	0	150	300
	(kg) Body component weight		
Blood	4. 42 ± 0.80	5.79±2.23	5.07 ±1.32
Head	11.36 ± 1.00	10.38± 0.16	10.29 ±0.50
Forefeet	2.10 ± 0.18	2.00 ± 0.16	1.99 ± 0.25
Hind feet	1.60 ±0.22	1.37±0.30	1.43 ± 0.56
Skin	7.95± 0.64	6. 87 ± 0.59	7.21 ±0.59
Stomach	4.84 ±0.71	4.48 ± 0.47	4.64 ±0.56
Intestines	5.58 ±1.18	5.17 ± 1.52	4.44 ± 1.00
Gut fil	29.54± 3.46	23.32 ±4.46	25.44 ± 3.99
Heart	0.80 ±0.14	0.76± 0.30	0.63 ± 0.12
Lumgs	1.58 ± 0.22	1.35 ±0.22	1.55 ± 0.20
Spleen	0.25 ± 0.11	0.19 ± 0.03	0.22 ±0.09
Pancreas	0.20 ± 0.06	0.21 ± 0.07	0.20 ± 0.17
Mesentery	0.30 ± 0.16	0.51 ± 0.28	0.78 ± 0.48
Kidneys and renal fat	0.65± 0.11	0.72 ± 0.40	0.91 ±0.26
Liver	01.84 ±0.34	01.82 ± 0.27	01.94 ±0.10
Testicles	00.61 ±0.66	01.09 ±0.64	01.53 ± 0.34
Tail	00.31 ± 0.05	00.26 ± 0.12	00.36 ±0.01
Omentum	0.05±0.20	0.25±0.13	0.49±0.01

DISCUSSION

The increased slaughter weight, EBW and hot carcass weight with concentrates level were mainly due to improved nutrients supply, weight gain and BW. Slaughter weight, hot carcass weight and EBW were also increased significantly with slaughter age in Ingessana (Abdalla, 2004) and Desert (Elimam and Ombabi, 2007) goats and were due to increased BW and proportional growth. The increased dressing percentages with slaughter weight were also reported in Sudanese goat breeds (Bello and Babiker, 1988; Yassin, 1994; Hassaballa, 1996; Elimam *et al.*, 2010).

Tagger males slaughter weight, EBW and hot carcass weights were lower than for the breed fattened at 6 and 12 month old (Elimam *et al.*, 2010) and were mainly due to lower initial BW in this study. It was lower in animals fed 150g concentrates than males and close to females in Eldaleng area (Mudawi *et al.*, 2012).*Tagger* males EBW in Eldaleng area was higher and in females was higher than in animals fed 0 and 150g concentrates and lower than animals fed 300g concentrates. *Tagger* hot carcass weight was lower than Nubian males slaughtered at 20 and 30 kg (Gaili, 1976).

The higher dressing percentages on EBW than LBW were because the former was the lower. Similar results were reported in *Tagger* goats (Elbukhary, 1998; Mudawi *et al.*, 2012; Elimam *et al.*, 2010) and were higher than in Desert (Ombabi, 2006) and Ingessana (Abdalla, 2004) goats. Dressing percentages on LBW and EBW were lower in this study than *Tagger* males fattened at 6 and 12 month old (Elimam *et al.*, 2010) and higher in fattened than unfattened Desert goats (Gaili, 1976). *Tagger* dressing percentages in males fed different levels of DSB based concentrates were lower than in Rashad area (Elbukhary, 1998). They were generally lower on LBW and EBW in animals fed DSB based concentrates than in Eldaleng area (Mudawi, 2002).They were lower than Nubian goat on LBW and EBW (Yassin, 1994; Gaili, 1976) and fattened Desert goat and within the range for the unfattened (El Gaili *et al.*, 1972). It was lower than in Desert goats at 20 and 30 kg BW (El Gaili, 1977), Desert goat (Hassaballa, 1996) and Desert goats and their temperate crosses (Bello and Babiker, 1988).

The increased muscle and fat with concentrates level were due to increased nutrients supply, weight gain and carcass weight. The higher increase in fat than muscle in this study suggested that energy was not limiting and N was limiting in concentrates. The decreased bone with concentrates level is advantageous as carcasses with low bone, high muscle and reasonable fat are preferred. Percentages of muscle were lower and bone and fat percentages were higher than *Tagger* males (Elimam *et al.*, 2010) and percentages of muscles were higher and fat and bone were lower than Nubian kids (Yassin, 1994). They had generally higher muscle, fat and bone than Desert males and lower muscles, bone and fat in females (Hassaballa, 1996)

The increased muscle: bone and muscle: fat with concentrates level is preferred and indicted higher muscles in carcasses. They had higher muscle: bone and lower muscle: fat than *Tagger* males (Elimam *et al.*, 2010) and higher muscle: bone than Nubian males (Yassin, 1994). They had higher muscle: bone than Desert kids (Elfadil, 1996) and males and females (Hassaballa, 1996).

The variations in body components weight among concentrates levels were mainly due to variations in slaughter weight and weight gain and proportional growth. The generally heaviest

body components in animals fed 300g concentrates were due to higher slaughter weight and weight gain and proportional growth. The heaviest mesentery in animals fed 150g concentrates could be due to high fat and the highest weight gain. The least mesentery in animals fed 300g concentrates, although it had the highest slaughter weight, carcass weight and fat, suggested that it was not the main site for fat deposition. The generally least body components weight in animals fed no concentrates was associated with the least nutrients supply, slaughter weight, weight gain and proportional growth. *Tagger* body components weight was lower than in *Tagger* males fattened at 6 and 12 month old on GNH and concentrates (Elimam *et al.*, 2010). This was mainly due to higher slaughter weight in the latter.

The variations in body components percentages among concentrate levels were mainly due to variations in nutrient supply, slaughter weight, weight gain, carcass weight, body components weight among treatments and proportional growth. The control had higher number of the highest body components percentages due to low slaughter and carcass weight. The least number of the highest body components percentages in animals fed 150g concentrates was associated with the highest weight gain. Blood and skin percentages were within the range for *Tagger* fattened on GNH and concentrates (Elimam *et al.*, 2010). Head percentages were higher and legs percentages were lower than *Tagger* fed on GNH and concentrates.

CONCLUSION

Sugar beet root based concentrates level improved all carcass characteristics, except bone percentage.

RECOMMENDATION

It is recommended to feed goat kids DSBR based concentrates to improve carcass characteristics and reduce feeds cost.

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أثر مستويات عليقة مركزة تحتوي على جذور بنجر السكر الجافة على صفات الذبيحة ومكونات الجسم الثانوية في ذكور جديان التقر

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الخلاصة

على جذور بنجر السكر تحتوي مركزة عليقة مستويات أشهر لدراسة أثر 6 بعمر التقر جديان من ذكر 12 استخدم تم وزن الحيوانات وتقسيمها الى 3 الثانوية في ولاية الجزيرة بالسودان. الجسم مكونات الذبيحة و الجافة على صفات مجموعات على أساس الوزن ووزعت عشوائيا على اعلاف الدراسة الثلاث. وضعت الحيوانات في حظائر فردية ووزنت الرغبة السوداني حسب الفول تبن الحيوانات أعلفت إعدادية. فترة أسبوعين منها أسابيع 8 لمدة أسبوعياً قبل وجبة الصباح جذور بنجر السكر على ترتكز مركزة عليقة من مختلفة مستويات و مساء والرابعة صباحا الثامنة عند متساويتين وجبتين في مكونات وقيست الحيوانات ذبحت السوداني. الفول تبن وجبات قبل جزئين في) جم300و و150 (الشاهد) الجافة (صفر الجسم الذبح والذبيحة الحارة(9.62- 12.69 كجم) ووزن وزن الثانوية وصفات الذبيحة. أظهرت الدراسة ازدياد الجسم أساس علي 42.875-52.15% و الحي الوزن أساس علي 67 .41%) %– 37.26التصافي (الفارغ (7.39-10.1 كجم) ونسبة 3.58% -2.49% للعظام (العضلات %) والدهون (7.75%-12.25%) ونسبة68.00 %- 65.75العضلات (ونسب الفارغ الوزن فروق بدون المركزة العليقة مستوي زيادة مع) العظام (19.75%-26.50% نسب تقل و %) للدهون 8.79%-10.6%) والعضلات وكانت المركزة العليقة مستويات وداخل بين الجسم الثانوية ونسبها على أساس وزن الجسم مكونات أوزان تباينت .معنوية الفروقات في أوزان ونسب مكونات تكن الشاهد . لم مجموعة وأقلها في مركزة عليقة جم 300 علي المغذاة الحيوانات في أعلي الأحشاء. كان عدد النسب المئوية الأعلى أكبر في مجموعة الشاهد ودهن والمساريقا ودهنها الكلي عدا الجسم الثانوية معنوية جديان السكر الجافة لتسمين بنجر جذور علائق تحتوي على باستخدام واقل في التي أعلفت 150 جم عليقة مركزة. يوصي .ماعز التقر