

Effects of dried sugar beet root based concentrates level on wholesale cuts and eye muscle characteristics in *Tagger* male kids

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ABSTRACT

Twelve *Tagger* males at 6 month old were used to study the effects of dried sugar beet root (DSBR) based concentrates level on animals performance, carcass and wholesale cuts characteristics. They were weighed and divided into 3 groups, each with 4 animals. They were housed in individual pens with feed and water troughs and allocated at random to the diets. They were weighed weekly 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 concentrates contained 68% DSBR, 15% GNH cakes, 15% sunflower cake, 1% salt and 1% oyster shell. The animals were slaughtered, skinned and carcass characteristics were studied. The left side was divided into wholesale cuts and were weighed and dissected into muscle, fat and bone. The rib section (10th – 12th) was removed and the characteristics and meat composition were determined. Percentages of best end of neck, breast and leg and chump, neck and loin generally increased with concentrates level. Concentrates level had no significant ($P>0.05$) effect on wholesale cuts percentages. Meat DM, CP, EE and ash were 32.82%, 17.3%, 2.15% and 3.0% at 0 concentrates, 37.5%, 17.9%, 2.35% and 2.65, respectively at 150g concentrates and 35.5%, 18.2%, 2.4% and 2.95%, respectively at 300g concentrates. Overall meat composition was 35.28%, 17.8%, 2.3% and 2.87%, respectively. Meat DM and CP varied significantly ($P<0.05$) with concentrates level. Animals fed no concentrates had the least DM, CP and EE and the highest ash. Animals fed 300g had the highest CP and EE. Supplementing GNH with DSBR based concentrates generally improved *Tagger* kids wholesale cuts percentages and meat composition. It is recommended to use DSBR based concentrates in fattening *Tagger* kids.

INTRODUCTION

The increased meat demand and prices in the Sudan revealed the need to produce cheap and high quality meat and better exploitation of neglected animal species. Goats are an attractive alternative due to high population, wide distribution and production of high quantities of high quality meat, milk and skin (Devendra and Mc Leroy, 1992). Goat meat has a high nutritive value, muscle content and low fat. The low fat meat increased the demand for goat meat due to the correlation between cardiovascular diseases, cholesterol and saturated fatty acids. However, goat meat is the least preferred in the Sudan, is mainly used in rural areas and is preferred as kids meat. Goat meat production in the country is mainly traditional and animals are generally neglected with low inputs and outputs. Improving goat meat production makes it competitive locally and abroad and boosts its demand, consumption and export. It could be improved *via* improved yields and quality by improving genetic constitution, nutrition, health, management and marketing. There are many goat breeds in the Sudan which are generally classified as meat breeds, except the Nubian which is considered the main dairy breed (Devendra and Mc Leroy, 1992). *Tagger* is an excellent meat breed and is found mainly in Nuba Mountains in South Kordofan State (Mudawi, 2002). It has been introduced into the Gezira State about 10 years ago.

Nutrition is one of the main obstacles for goat production in the Gezira State due to rangeland deterioration (Abusuwar and Darrag, 2002) and seasonal variations in feeds quantity and quality leading to serious shortages and effects on animal performance in the dry season (Elhag, 1992). It is important to exploit unconventional feeds to improve goat nutrition. Sugar beet has been introduced into the Gezira State and is a valuable feed. There is no available information on sugar beet root and by products in goat nutrition in the country. Therefore, the objective of this work was to study the effects of DSBR based concentrates on wholesale cuts, eye muscle characteristics and meat composition.

MATERIALS AND METHODS

Animals

Twelve *Tagger* males at 6 month old were used to study the effects of dried sugar beet root based concentrates level on males performance, carcass characteristics, wholesale cuts and meat composition. They were well fed and managed. They were mainly grazed *Kittir* (*A. mellifera*) and *Rabaa* (*Trianthema pentandra* L.) and fed *Gerawia*, *Abu 70* and *Lubia* in pens. They were injected against internal and external parasites with Ivermectin (InterchemieWerken, Harjumaa, Estonia). The animals were housed in individual wire pens (1.5x2 m) in an open corral shaded with corrugated iron sheets. Each pen had roughages, concentrates and drinking water buckets. They were weighed, ranked according to body weight and divided into three groups, each with four animals. The groups were allocated at random to three treatments using a completely randomized design. The animals were then weighed weekly for 8 weeks including a two weeks preliminary period.

Feeds and feeding

The animals were fed groundnut haulm (GNH) *ad lib.* in two equal meals at 8 am and 4 pm and dried sugar beet root (DSBR) based concentrates at 0 (control), 150g and 300g in two equal parts before GNH meals. The concentrates had 68% DSBR, 15% groundnut cakes, 15% sunflower cake, 1% salt and 1% oyster shell. Sugar beet root were chopped, air dried, crushed in a mill and then mixed with the concentrates ingredients.

Slaughter

At the end of the experiment, the animals were fasted overnight, weighed and slaughtered according to Islamic rituals (Elimam and Ombabi, 2007). The legs were removed and the animals were skinned, eviscerated and hot carcasses were divided into left and right sides along the vertebral column using a saw. The left side was divided into six wholesale cuts including neck, single short forequarter, best end of neck, breast, loin and leg and chump as described by MLC (1977). Each cut was weighed and dissected into muscles, fat and bones and were weighed separately for each animal.

Rib section characteristics

The rib section (10th – 12th) was removed from each carcass and weighed. The surface area of the eye muscle (*Longissimus dorsi*) at the 12th rib was measured using a tracing paper. Rib sections were dissected into muscles, fat and bones and were weighed separately for each animal.

Carcass chemical analysis

Fresh samples containing muscle, bone and fat were minced, mixed thoroughly and used for laboratory analysis as described by AOAC (1990).

Calculations and Statistical analysis

Each wholesale cut weight was expressed as percentages of EBW. Means and standard deviations were calculated for different parameters. Data was statistically analyzed using ANOVA procedure.

RESULTS

Table 1 shows effects of DSBR based concentrates level on wholesale cuts weight. All cuts weight generally increased with concentrates level, but differences were not significantly ($P>0.05$). Single short forequarter was the heaviest and the neck was least in weight in all concentrate levels.

Table 1. Effects of sugar beet based concentrates level on wholesale cuts weight (kg) in *Tagger* males fed groundnut haulm *ad lib.* in the Gezira State, Sudan.

Wholesale cuts	Concentrates level (g)		
	0	150	300
Neck	0.26 ± 0.01	0.39 ± 0.18	0.41 ± 0.09
Single short fore quarter	1.21 ± 0.15	1.71 ± 0.88	2.02 ± 0.50
Best end of neck breast	0.48 ± 0.08	0.66 ± 0.38	0.77 ± 0.18
Loin	0.31 ± 0.14	0.47 ± 0.24	0.47 ± 0.16
Leg and chump	0.96 ± 0.14	1.44 ± 0.84	1.65 ± 0.45

Table 2 shows the effects of DSBR based concentrates level on wholesale cuts percentages of empty body weight (EBW). Concentrates level had no significant ($P>0.05$) effect on wholesale cuts percentages. The percentages of best end of neck, breast and leg and chump increased with concentrates level. Single short forequarter had the highest percentage followed by leg and chump while the neck had the least percentage in all concentrates levels. The percentage of single short forequarter was highest in animals fed no concentrates and least in animals fed 150g concentrates.

Table 2. Effects of sugar beet based concentrates level on wholesale cuts as percentages of empty body weight in *Taggers* males fed groundnut haulm *ad lib.* in the Gezira State, Sudan.

Wholesale cuts	Concentrates level (g)		
	0	150	300
	Percentages of EBW		
Neck	08.27±1.18	08.68±1.25	07.86±1.63
Single short fore quarter	38.39±1.89	36.88±1.38	37.94±0.80
Best end of neck breast	13.65±1.97	13.78±2.10	14.80±2.60
Loin	10.12±2.76	10.36±1.42	08.58±1.24
Leg and chump	29.56±1.08	30.30±5.90	30.82±1.68

Table 3 shows the effects of DSBR based concentrates level on eye muscle characteristics. Eye muscle weight increased with concentrates level and was significantly ($P<0.05$) highest in animals fed 300g concentrates. Eye muscle area increased with concentrates level, but differences were not significant ($P>0.05$). Muscle percentages generally increased and bone percentages generally decreased with concentrates level and differences were significant ($p<0.05$) in animals fed no concentrates. Fat percentage increased with concentrates level up to 150g and significantly ($P<0.05$) decreased in animals fed 300g concentrates. Animals fed 300g concentrates had the highest eye muscle area, weight and muscles and the least fat.

Table 3. Effects of sugar beet based concentrates level on eye muscle characteristics in *Tagger* males fed groundnut haulm *ad lib.* in the Gezira State, Sudan.

Parameters	Concentrates level (g)		
	0	150	300
Weight (g)	0.09 ±0.0	0.11±0.04	0.17± 0.05
Area (cm)	7.00±1.7	8.69±3.06	10.75±0.90
Composition(%):Muscle	73.92±9.02	73.80±14.10	82.31±7.4
Bone	17.35±6.21	14.05 ± 3.44	14.99±6.54
Fat	11.58±2.38	16.20± 4.38	12.75± 1.34

Table 4 shows that DSBR based concentrates level affected meat composition. Animals fed no concentrates had the least DM, CP and EE and the highest ash. Animals fed 300g had the highest CP and EE and animals fed 150g concentrates had the highest DM. The differences in meat composition were not significant ($P \geq 0.05$) for ash and EE and were significant ($P < 0.05$) for DM and CP. Dry matter content was significantly ($P < 0.05$) highest in animals fed 150g and least in animals fed no concentrates. Crude protein content was significantly ($P < 0.05$) least in animals fed no concentrates.

Table 4. Effects of dried sugar beet based concentrates level on meat chemical composition (%) in *Tagger* males fed groundnut haulm *ad lib.* in the Gezira State, Sudan.

Concentrate level (g)	DM	CP	EE	Ash
0 (control)	32.82±0.15	17.30±0.00	2.15±0.05	3.00±0.00
150	37.50±0.50	17.90±0.10	2.35±0.05	2.65±0.15
300	35.50±0.50	18.20±0.10	2.40±0.10	2.95±0.05
Overall mean	35.28±0.87	17.80±0.17	2.30±0.05	2.87±0.80

DISCUSSION

The generally increased wholesale cuts weight with concentrates level was mainly due to increased BW, slaughter weight and dressing percentages in these animals.

The variations in wholesale cuts percentages among concentrates levels were mainly due to variations in slaughter, carcass and wholesale cuts weights and proportional growth. The generally increased percentages of neck and loin at 150g were mainly due to improved nutrient supply and performance. Wholesale cuts percentages of EBW were lower for neck and higher for single short forequarter, best end of neck and breast and loin than *Tagger* males fattened at 6 and 12 month old (Elimam *et al.*, 2010). Leg and chump percentage was lower than in *Tagger* at 6 month old and higher than at 12 month old. Percentages of leg and chump, single short forequarter and loin were higher than on Ingessana goats at < 1 year old and lower than at >1 year old (Abdalla, 2004). Best end of neck and breast and neck were higher in *Tagger* than Ingessana goats at <1 and 1 year old. All wholesale cuts percentages, except single short forequarter were higher than in Desert males at 7.5 month old (Babiker *et al.*, 1985). Leg and chump, single short forequarter, best end of neck and breast were higher and within the range for loin and neck in Desert goats and their temperate crosses (Bello and Babiker, 1988). It had lower leg and chump, loin and Single short forequarter and within the range for neck, best end of neck and breast in Desert goats (Hassaballa, 1996).

The increased eye muscle weight, area and muscles with concentrates level were due to improved nutrients supply, weight gain (Elimam *et al.*, 2017), slaughter weight and dressing percentages. The generally decreased bone percentage with concentrates level and least values in animals fed 300g concentrates is advantageous and indicated better meat characteristics. The increased fat percentage with concentrates level up to 150g was due to improved nutrients supply, especially energy, encouraging fat deposition. The least fat percentage in animals fed 300g concentrates was mainly due to energy partition favouring muscle growth. The highest eye muscle area, weight and muscles and the least fat in animals fed 300g concentrates is advantageous.

The effects of concentrates level on meat composition were mainly due to variations in weight gain and differential growth. The least DM, CP and EE and highest ash in the control were due to the lower weight gain. The highest CP and EE in animals fed 300 g were mainly due to high energy and protein supply and weight gain. The highest DM in animals fed 150 g concentrates was mainly due to highest weight gain. The generally increased DM, CP and EE with concentrates level were due to increased nutrients supply and improved animals performance and meat composition. These effects were advantageous due to the significant effects on DM and CP. *Tagger* meat DM was higher than *Tagger* at 6 month old and within the range at 12 month old (Elimam *et al.*, 2010). Crude protein was higher than *Tagger* in the Gezira. Ether extract was lower than in animals fattened at 12 month old and within the range at 6 month old. Ash was lower than in *Tagger* fattened at 6 and 12 month old.

CONCLUSION

Dried sugar beet root based concentrates level had beneficial effects on wholesale cuts and meat composition. It generally increased the cuts weight and muscle percentage and increased eye muscle weight and area.

RECOMMENDATION

It is recommended to use DSBR based concentrates in fattening *Tagger* male kids due to improved wholesale cuts and eye muscle characteristics. More research is required to use non protein nitrogen as a source of N.

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أثر المستويات المختلفة من عليقة مركزة تركز على جذور بنجر السكر الجافة على القطع الإجمالية والعضلة العينية وتركيب اللحم في جديان التقر

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الخلاصة

حفز ارتفاع الطلب وأسعار اللحوم في السودان على تحسين لحوم الماعز لارتفاع أعدادها وارتفاع العضلات والقيمة الغذائية وانخفاض الكولسترول والأحماض الدهنية المشبعة . تعتبر التقر سلالة واعدة لإنتاج اللحوم لجودة القوام ونوعية اللحم . إنتاج اللحوم عامة تقليدي مع انخفاض الاستثمار والعائدات . التغذية من أهم المعوقات لتدهور المراعي والتباين الموسمي في كمية ونوعية العلف وغلاء العلائق المركزة . أدخل بنجر السكر لولاية الجزيرة وهو علف واعد خاصة الجذر لارتفاع الطاقة . لا تتوفر معلومات عن استخدام جذر البنجر الجاف لجديان التقر . ولذلك أجريت هذه الدراسة لاختبار اثر مستويات عليقة مركزة تركز على جذر البنجر الجاف على الأداء وصفات الذبيحة وتركيب اللحم في جديان التقر . وضعت 12 من ذكور جديان التقر بعمر 6 أشهر في حظائر فردية بها أوعية للعلف والماء وأعطيت عشوائيا الأعلاف المختيرة . وزنت الحيوانات أسبوعيا لمدة 8 أسابيع منها أسبوعين فترة إعدادية . أعلفت الحيوانات تبن الفول السوداني حسب الرغبة في وجبتين متساويتين عند الثامنة صباحا والرابعة مساء ووزن العلف المتبقي . أعلفت الحيوانات مستويات مختلفة من عليقة مركزة تركز على جذور البنجر الجاف (صفر (الشاهد) 150 و300 جم) في جزئين قبل وجبات تبن الفول السوداني . احتوت العليقة المركزة على 68% جذور البنجر الجاف و 15% امبارز فول سوداني و 15% أمبارز زهرة الشمس و 1% ملح و 1% صدف . حفظت عينات من تبن الفول السوداني و جذور البنجر الجاف والتبن المتبقي والعليقة المركزة للتحليل المعمل . ذبحت الحيوانات وسلخت وفصلت مكونات الجسم الثانوية ووزنت لوحدها . وزنت الذبيحة وحسبت صفات الذبيحة . قسم الجزء الأيسر من الذبيحة إلى قطع إجمالية ووزنت ثم شرحت كل منها . فصلت العضلة العينية (الضلع 10-12) وعينت الصفات والتركيب .. قُسمت الذبائح لخمس قطع تجارية ولم تُلاحظ فروق معنوية بين مستويات العلائق المركزة . عند التحليل الكيميائي للحوم كانت النسب المئوية للمادة الجافة و البروتين الخام والدهون الخام والرماد 32.82% و 17.3% و 2.15% و 3.0% للمجموعة القياسية و 37.5% و 17.9% و 2.35% و 2.65% عند 150 جم عليقة مركزة و 35.5% و 18.2% و 2.4% و 2.95% عند 300 جم عليقة مركزة ، علي التوالي . وكان المتوسط العام لتركيب اللحم 35.28% و 17.8% و 2.3% و 2.87% ، علي التوالي وكانت الفروق بين مستويات العليقة المركزة معنوية للمادة الجافة والبروتين الخام ($P<0.05$) . كان للمجموعة القياسية أقل مادة جافة وبروتين خام ودهون وأعلي نسبة رماد . بينما نالت المجموعة المغذاة علي 300 جم عليقة مركزة أعلى بروتين خام ودهون . عامة ساهمت إضافة تبن الفول السوداني والعلائق المركزة المعتمدة علي جذور بنجر السكر في تحسين نسب القطع التجارية وتركيب اللحم . نوصي استخدام علائق بنجر السكر لتسمين جديان التقر