# Influence of low or high Groundnut hulls inclusion rate in a Molasses-based diet on energy utilization by Baggara cattle

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## Summary

Twenty four Baggara bulls, divided in two groups, were used in a feeding trial, to study the influence on the energy utilization of molasses-based whole mixture, containing a low (7%), or high (25%) Groundnut hulls (GNH), fed *ad libitum*. Metabolizable energy (ME), and metabolizabilies (gm) were 10.8; 9.9 MJ/Kg DM, and 66%; 61%, respectively. The results showed no effect of GNH nor on growth performance neither on carcasses yield and characteristics. About 30%, and 33% of ME intake were used in maintenance demands, whereas 22% and 21% were used in bodyweight gain, respectively. Efficiency of ME utilization for net weight gain was 12% and 10%, for low and high GNH inclusions respectively. A decreasing trend in feeding level, combined with decrease in efficiency value of gain were noticed, as. GNH concentration increased in the diet. The nature of end products of rumen fermentation, and relative proportions of VFA absorbed in the gut, were suggested as major contributing candidates, in the lowering of the efficiency of ME utilization in the Molasses-based feed.

## Introduction

The Sudan Baggara cattle is the major beef producing livestock in the country. It is raised in the rangelands of western regions in Darfur and Kordofan. It is usually trek driven to central urban, for further fattening and slaughter as home beef or export. Feedlots are traditionally based on harvest crop residues and agro-industrial by-products formulated mixtures, fed for 45-70 days finishing periods. Practically, the efficiency of these operations is evaluated in terms of feed conversion ratio (FCR). Apparently, such evaluation (FCR) does cater for the feed energy utilized by the fattening animal, as it is affected by the feed ingredients and their proportion in the

mix. Therefore this research aimed at the study of energy utilization of a molasses-based feedlot whole mixture containing, a low 7% or high 25% groundnut hulls (GNH), as a main roughage component in the ration, which is reasonably cheap and easily available, for use in cattle feeds.

## Materials and Methods

Twenty four Baggara bull calves, divided into two equal groups, were each fed either of the diets shown in **Table 1**, containing 7% or 25% (W/W) groundnut hulls. The bulls were group-fed the diets *ad libitum*, for a period of 70 days, after which they were slaughtered. The feed proximate composition was determined by A.O.A.C. (1990) methods, whiles the maintenance energy requirement (NE) of bulls, and energy value of gain (MJ/Kg), was calculated according to ARC (1980), and AFRC (1990). The statistical analysis of data was done by Student t-test, according to Snedecor and Cochran (1980).

**Table 1.** Ingredients proportions and chemical composition of the experimental diets

| Component | low groundnut hulls | high groundnut hulls |
|---|---|---|
| Ingredient proportion% | - | - |
| Molasses | 52 | 50 |
| Wheat bran | 29 | 15 |
| Ground nut cake | 10 | 7 |
| Ground nut hulls | 7 | 25 |
| Urea | 1 | 2 |
| Common salt | 1 | 1 |
| Moisture | 6.7 | 6 |
| Total | 100 | 100 |
| Chemical composition(%DM) | - | - |
| Dry matter | 93.3 | 93.0 |
| Ash | 9.67 | 12.58 |
| Organic matter | 90.33 | 86.8 |
| Crude fiber | 9.6 | 13.2 |
| Ether extract | 2 | 1.2 |
| Crude protein | 17.79 | 17.36 |
| Nitrogen free extract | 54.24 | 49.66 |
| Calculated metabolizable energy (MJ/kg DM) * | 10.93 | 9.93 |

** ME (MJ/kg DM) concentration was calculated according to the equation given in bulletin III (ARRC, 1999).*
*(0.012CP+0.031EE+0.014NFE+0.005CF).*
*Groundnut hulls(ME)=7.45MJ/Kg DM.*

## Results and Discussion

Ingredients mix and chemical composition of experimental feeds are shown in **Table 1**. It shows that feeds metabolizable energy contents were: 10.83 and 9.93 MJ/Kg DM, and that the feeds were having, nearly equal metabolizablities: 66% and 61% respectively, though it tends to be higher on the low GNH dietary treatment.

Feed groundnut hulls are a produce, resulting from the decorticating and sieving process of the nuts themselves. It is usually a non-homogenous mixture of different parts of the nut components, predominately, the nut pericarp-(shell). Therefore, its' energy value may vary considerably. Thus, ElHag and Mukhtar (1978) data implied an estimated ME value of 8.9 - 9.3 MJ/Kg, while Sulieman and Mabrouk (1999), reported a value of 7.45 MJ/Kg

DM, and that Abu Swar and Darrag (2002) data indicated an ME value of 6.5 MJ ME/Kg. In this respect, Ibrahim *et al.*, (2009) indicated that, high GNH proportions (50-30%) in molasses-based (10-30%) diets reduced dry matter degradation in the rumen coupled with basal changes in rumen fermentation media.

Performance and carcass characteristics are shown in **Table 2**. It indicates that, inclusion of GNH had no effect, neither on growth, nor on carcass yield parameters, despite GNH metabolizable energy contribution was 5% and 19% approximately, of the energy consumption in the low and high inclusions respectively, as can be inferred from **Table 1.**

**Table 2.** Carcass yield and characteristics of Western Baggara bulls fed low (7%) or high (25%) ground nut hulls of proportions a molasses based feed mix

| | Treatments (mean ± SD) | | |
|---|---|---|---|
| Item | Low groundnut hulls | High groundnut hulls | Level of significance |
| No. Animals | 6 | 6 | - |
| Slaughter weight (kg) | 249.17 ± 12.81 | 237.5 ± 16.65 | NS |
| Empty body weight ( kg) | 226.67 ± 10.41 | 213 ± 17.5 | NS |
| Hot carcass weight (kg) | 129.16 ± 7.38 | 122.73± 12.11 | NS |
| Cold carcass weight (kg) | 125.53 ± 7.06 | 119.17 ± 11.75 | NS |
| Cold carcass side weight (kg) | 62.94 ± 4.38 | 59.09 ± 6.32 | NS |
| Chiller shrinkage (%) | 2.80 ± 0.36 | 2.89 ± 0.64 | NS |
| Dressing % of carcass (live weight base) | 51.85 ± 1.95 | 51.61 ± 2.23 | NS |
| Dressing% of hot carcass (empty body weight base) | 56.97 ± 1.43 | 57.56 ± 1.85 | NS |
| Dressing % cold carcass (live weight base) | 50.4 ± 1.98 | 50.11 ± 2.19 | NS |

| | | | |
|---|---|---|---|
| Dressing % of Cold carcass (empty body weight base) | 55.31 ±1.46 | 55.49 ± 2.10 | NS |
| L.dorsi area (cm $^2$) | 51.33 ± 6.25 | 47.33 ± 7.89 | NS |
| Subcutaneous fat thickness (cm) | 0.40 ±0 .12 | 0.44 ± 0.15 | NS |

Partition of dietary ME intake, as can be seen in **Table 3**, indicates that in both treatments, about 30 and 33% of ME intake were utilized for maintenance demands, and only, 22% and 21% of ME intake, were used for body weight gain, on low and high GNH, respectively. It follows, that the efficiency of ME, been utilized in tissue synthesis for body weight gain were 12% and 10%, which are apparently low. This may be attributed to a relatively high fibre content, 11% and 15% in feed organic matter, though less than 16% , that can effect a fall in metabolizability, occurring with increasing feed intake, as suggested by Kay (1977) ; Citing and Blaxter (1974). But, in this study, a decreasing feeding level, from 1.74 to 1.63 was obtained, associated with, the decrease in efficiency of body weight gain values. These values seem to be low compared to others, that can be calculated from some previous feedlot studies, on Baggara cattle, fed different mixtures of agricultural and agro-industrial by-products, to an average feeding level of: 2.16+0.2021, and when average metabolizability (qm) value was: 0.57+0.059; (n=12). ElShafie and McIleroy (1964), Mustafa *et al.*, (1990), ElTayeb *et al.*, (1990), and ElKhidir *et al*., (1995). In those studies, average body weight gain efficiency was: 20% +4.274. It can be concluded from this study, that high inclusion rate (25%) of GNH, may have had caused a reduction in feed intake, to the effect of lowering the efficiency of gain, from the molasses-based mix, fed; in which the nature of the end products from rumen fermentation (VFA) absorbed, and their relative proportions, would have been a major influencing factor, contributing to low body weight gain efficiencies obtained. It is therefore advised that, in such molasses-based diets, to include also another source of readily available carbohydrate, in order to change the relative proportions of VFA production in the rumen fermentation mixture, to a pattern favouring higher propionic acid proportion.

Dietary GNH inclusion rate may then, preferably be reduced to a reasonable minimum below the 25% rate.

**Table 3.** Partition of dietary metabolizable energy in Baggara bulls fed low (7%) or high (25%) ground nut hulls of proportions a molasses based feed mix

| Item | Treatments (mean ± SD) Low groundnut hulls | High groundnut hulls | Level of significance |
|---|---|---|---|
| No. animals | 12 | 12 | - |
| Feeding period (day) | 70 | 70 | - |
| Dry matter intake (kg/D) | 7.63 | 7.65 | - |
| Metabolizable energy (ME) intake (MJ/D) | 92.87 | 85.22 | - |
| M/D | 12.1 | 11.14 | NS[1] |
| $q_m$[2] | 0.66 | 0.61 | - |
| $K_m$[3] | 0.734 | 0.717 | - |
| $K_g$[4] | 0.521 | 0.482 | - |
| Live weight gain (kg/day) ± SD | 0.73 ± 0.23 | 0.85 ±0. 24 | NS |
| Average Body weight (Kg) | 221.45 | 215.00 | - |
| Calculated Net energy (NE) required for maintenance (MJ/D)[5] | 20.33 | 19.93 | - |
| Metabolizable energy (ME required for maintenance MJ/D) | 27.70 | 27.80 | - |
| Energy value of gain (MJNE/Kg)[6] | 12.59 | 12.13 | - |
| Net energy of gain (MJ) | 10.70 | 8.49 | - |
| Metabolizable energy of gain (MJ) | 20.54 | 17.61 | - |
| % MEI | 22 | 21.6 | - |
| Total Heat production (MJ/D)[7] | 72.33 | 67.61 | - |
| % MEI | 78 | 79 | - |
| Efficiency of gain ($NE_{gain}/ME_{intake}$ %) | 12 | 10 | - |
| Level of feeding | 1.74 | 1.63 | - |
| Feed conversion efficiency (kg DM intake/weight gain kg) | 9 | 10.9 | - |

**Notes:**

[1] not significant

[2] metabolizability = (M/D) ÷ 30.4

[3] efficiency for maintenance = 0.35 $q_{m + 0.503}$

[4] efficiency for gain = 0.78 $g_{m + 0.06}$

[5] NE maintenance (NEm) = 0.53 $(W/1.08)^{0.67}$ + 0.0071W

[6] Energy value of gain = ME gain ÷ ΔW
[7] Total Heat production = ME intake – ME (gain)

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**أثر نسب إضافة قشرة الفول السودانى المنخفضة أو العالية فى عليقة المولاس**

## على استخدام الطاقة فى أبقار البقارة

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**الملخص**

أجريت دراسة على ثأثيرخلط قشرة الفول السودانى بنسبة منخفضة 7% أو مرتفعة 25% فى عليقية المولاس على استخدام الطاقة الغذائية فى أبقار البقارة. أستخدم فى التجربة عشرون عجلاً من بقر البقارة مقسمة بالتساوى على مجموعتى العليقة. قدرت الطاقة التمثيلية ومعدل تمثيلها ب10.0 و 9.9 ميجا جول/كجم مادة جافة ؛ 66% و 61% على التوالى فى مجموعتى العليقة المختبرتين . أستخدمت نسبة 30% و 33% من طاقة تمثيل العليقة لتوفير المتطلبات الحافظة بينما استخدمت نسب 22% و 21% من الطاقة التمثيلية فى كسب الوزن (النمو) فى المجموعتين على التوالى. وقد آظهرت النتائج ان نمو العجول والذبيحة ومميزاتها تلك بانها لم تتأثر بنسبة إضافة قشرة الفول. وبلغت كفاءة استخدام الطاقة الصافية للكسب نسبة 12% و 10% للمستويين الأدنى والأعلى لقشرة الفول فى الوجبة. تلاحظ بان هناك منحى لأرتباط مستوى انخفاض تناول العليقة وتدنى كفاءة النمو، مجتمعة بتزايد نسبة القشرة فى العليقة.

ارجعت طبيعة تخمير الغذاء فى الكرش ومكون التركيز النسبى للأحماض الدهنية الطيارة الناتجة منه ، والتى يتم أمتصاصها فى القناة الهضمية كعامل محتمل،يعزى اليه التأثير على الأستفادة من طاقة التمثيل الغذاءي فى العليقة التى تعتمد على المولاس كمكون أساسى بها.