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## **The nutritive value of Gurum seed cakes (*Citrullus lanatus* var. *colocynthoid*) as feed for ruminants.**

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### **SUMMARY**

Two types of Gurum seed cakes (*Citrullus lanatus* var. *colocynthoid*) chemical and mechanical oil extracted, were analysed to determine their chemical composition.

Three fistulated Nubian goats were used to determine the degradability of DM and CP by incubating the samples in nylon bags for 3, 6, 12, 18, 24, 36 and 48 hr. in the rumen. The rumen fluid from these fistulated goats was used to estimate the Metabolizable Energy content (ME) according to gas production technique. The results showed that the nutritive value, (chemical composition, degradability and energy content) was high in both types. The high CP content 192.5 and 185.3 g/kg of chemical and mechanical extracted cakes respectively, suggests that Gurum cake can be used as a source of protein supplement to ruminant animals.

### **INTRODUCTION**

Oilseed represent an important commodity as a source of oil for human needs and also provide valuable industrial by-products as animal feeds. Sudan is one of the major oilseeds producing countries. Cotton, groundnut, sesame and sunflower are grown in irrigated as well as rainfed agriculture. A number of other oilseed sources such as water melon (*Citrullus vulgaris*), Sinat (*Cucumis melo* var. *agrestis*), Snake cucumber (*Cucumis melo* var. *flexosus*),

Tibish (*Cucumis spp.*), Musk melon, Sharnam (*Cucumis mOo var. aegyptiacus*), Pumpkin, Garaa (*Cucurbita maxima*) Handal (*Citrullus colocynthis L. Schard*) have also been reported (El Hussein *et al.*, 1994). Seeds of such sources contain 20-30% oil, 30-40% crude protein and are rich in vitamins (Oyulo, 1979) Gurum (*Citrullus lanatus var. colocynthoid*) has been recently reported as a source of oil (Ziyada, 1998).

Gurum, a type of water melon, is semi-cultivated in the northern part of the country beside the river Nile. The seedcake obtained from oil extraction is suggested to be a promising animal feed (Ziyada, 1998).

The objective of the study reported herein was to evaluate the mechanically and chemically oil extracted Gurum seed through chemical analysis, degradability and metabolisable energy content of the cakes produced.

## MATERIALS AND METHODS

Two types of Gurum seedcakes (chemical and mechanical oil-extracted) were ground through a 2 mm screen of a Willy laboratory mill and three replicate samples were analysed according to the A. O.A. C. (1975) to determine their chemical composition. The metabolisable energy (ME) of the samples was estimated according to the *in vitro* gas production technique as described by Menke *et al.*, (1979).

Three rumen-fistulated Nubian goats were used to determine the rumen degradation of the cakes. The animals were kept in shaded pens and were offered one kg of molasses-block feed (50% molasses, 30% groundnut cake, 13% wheat bran, 5% urea, 1% limestone and 1% common salt) *ad libitum*. Five grammes of each of the cakes were put in polyester bags and incubated in the rumen of each goat as described by Mehrez and Orskov (1977). The bags were withdrawn at intervals of 3, 6, 12, 18, 24, 36 and 48 hrs after incubation and the dry matter (DM) and crude protein (CP) of degraded material was determined according to the A.O.A.C. (1975). The effective degradability (Pe) was calculated by applying mathematical model proposed by Orskov and McDonald (1979) and McDonald (1981) as follows:

$$Pe = a + bc / (c+k)$$

Where:

a = the very rapidly degradable component.

B = the slowly degradable components.

C = the rate of degradation.

K = the outflow rate from the rumen (assumed to be 0.05).

## RESULTS AND DISCUSSION

Table (1) shows the chemical composition and metabolisable energy value of the two types of Gurum seed cake. As observed the two types differ in their EE, CF, CP and NFE contents. **The** metabolisable energy of both types was similar. These findings were similar to those of Vernon (1969), Husby and Korening (1971) and Ishag (1986) who stated that the nutritive value of cakes may differ according to the method of extraction. The results showed that Gurum cake was similar in chemical composition to that of cotton seed cake particularly in protein content (Sulieman and Mabrouk, 1999), **and** water melon seedcake, (Y.R. Sulieman, Personal communication). As compared to cotton seed cake, the high level of ME in the Gurum seed cake may be due to high level of EE in the latter.

**Table 1.** The chemical composition (Mean  $\pm$  S.E.) and metabolizable energy (ME) of Gurum seed cakes.

Type	DM	Ash	CP	CF	EE	NFE	ME
				g/kgDM			MJ/kg DM
<b>Gurum cake (chemically oil extracted)</b>	949.1 $\pm 0.61$	46.1 $\pm 0.88$	192.5 $\pm 0.50$	100.0 $\pm 1.10$	30.0 $\pm 0.40$	631.0" $\pm 0.66$	10.8
<b>Gurum cake (Mechanically oil extracted)</b>	951.7 $\pm 0.50$	46.7 $\pm 0.29$	185.3 $\pm 0.98$	96.6 $\pm 0.12$	63.3 $\pm 0.64$	608.0 $\pm 1.09$	10.5

The DM and CP disappearance (g/100g incubated) of both types of cakes from the rumen of Nubian goats at different incubation periods is shown in Table (2) . It was clear that as the incubation period increases, the loss of DM and CP increases but the rate of disappearance differs between the two types. The chemically oil-extracted cake was more rapidly disappearing than the

mechanically oil extracted cake. Table (3) presents the degradation characteristics of the two types of cakes. Both types had a relatively high effective degradability of DM and CP. However the chemically oil extracted cake tends to have the highest values.

**Table 2.** The dry matter (DM) and crude protein (CP) disappearance (g/100g) of Gurum seed cakes from the rumen of fistulated goats at different incubation periods.

Incubation Period (hrs)	DM disappearance (g/100g)		CP disappearance (g/100g)	
	Chemically oil extracted	Mechanically oil extracted	Chemically oil extracted	Mechanically oil extracted
0	29.0	48.2	42.8	30.5
3	37.8	55.0	46.0	41.0
6	46.0	64.3	52.1	53.0
12	34.5	73.6	67.9	60.3
18	66.1	85.1	73.4	69.5
24	75.0	90.3	84.3	76.3
36	82.0	93.2	89.8	81.4
48	87.8	89.9	85.9	89.5

**Table 3.** The effective degradability (Pe) and the degradation characteristics of the DM and CP of Gurum seed cake.

Type of Gurum Seed cake	Pe	DM			CP					
		a	a+b	c	b	a + b	c			
Chemically oil Extracted	75.9	48.2	45.0	93.2	0.06	62.7	30.5	59.0	89.5	0.06
Mechanically oil extracted.	68.4	42.8	47.0	89.8	0.06	61.01	29.0	58.8	87.8	0.06

The results of this study show that the Gurum cakes had a high DM potential degradability (93.2 and 89.8 g/100g). Similar results were reported by Ganey *et al.*, (1979) and Ahmed (2000). The CP potential degradability of Gurum cake (89.5 and 87.8 g/100g) was lower than that of groundnut cake (93.6 g/100g) as reported by Ahmed (1998). This could be explained by the high oil content of the latter. These findings were in agreement with those of Orskov *et al.*, (1978) who stated that high fat content reduces degradability. On the other hand Gurum cake degradability was higher than the 69.4% reported by Ahmed (2000) for cotton seed cake and that may be attributed to the higher CF content in cotton seed cake. Similar findings were reported by Brooks *et al.*, (1954) and Kowalczyk *et al.*, (1977). The CP degradability of Gurum cakes (87.8 and 89.5 g/100g) were similar to the 89.5 g/100g reported for cotton seed cake by Ahmed. (2000).

It is evident from these results that both chemical and mechanical oil extracted Gurum cakes have a high nutritive value and are thus suggested to be relatively good sources of protein for ruminant.

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## القيمة الغذائية لكسب الجرم ( *Ctrue / us / danients* ) كغذاء للمجترات

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والمعمل المركزي لتغذية الحيوان ، مركز بحوث الإنتاج الحيواني كوكو ، الخرطوم بحري  
- السودان .

### ملخص البحث

جري تطيل عينتين من كسب الجرم مستخلصة الزيت ميكانيكيا او كيميائيا وذلك  
التعبين مكوناتها الكيميائية , استخدمت ثلاثة رعوس من الماعز النوبي مجهزة جراحيا  
بناسور في الكرش وذلك لتعبين معامل تكسر المادة الجافة والبروتين الخام للعينات عند  
تحضيرها في كيس من النايلون داخل الكرش لفترات 3 ، 6 ، 12 ، 18 ، 24 ، 36 ثم  
48 ساعة . وقد استخدم سائن الكرش من هذه الماعز أيضا لتقدير طاقة الإيض للعينات  
حسب تقنية بتاج الغاز ( التخمير )  
أوضحت النتائج بان تقيمة الغذائية لكلا عينتي الكسب عالية أن المحتوي العالي من  
البروتين الخام 1923 و 185.3 جم كجم في الكسب المستخلص كيميائية المستخلص  
ميكانيكيا على التوالي تشير إلى إمكانية الاستفادة من كسب الجرم در تدعيم بروتيني  
للمجترات.