

RESPONSE OF CAMEL CALVES FOR FATTENING UNDER INTENSIVE FEEDING REGIMES.

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ABSTRACT

This study was carried out on two experiments. The first experiment was conducted as a pilot experiment lasted 30 day on fifteen Sudanese camel calves (*Camelus dromedaries*) aged 2-3 years and weighted 268.6 ± 42.49 Kg to determine selectively dry matter intake (free consumption) from concentrate feed mixture (CFM) and clover hay. The second one was fattening experiment prolonged 120 day using the same animals, which reached on average of 288.5 ± 41.14 kg to evaluate replacement clover hay (control) with untreated rice straw (URS) or urea treated rice straw (TRS) to decrease feeding costs. The animals were divided into three equal groups in weight and fed CFM at 1.55 % of body weight, which represents 75% of dry matter intake as determined in the first experiment.

The fattening experiment showed no significant differences in DMI among the three groups. There was no significant ($P < 0.05$) difference between control and TRS groups in the digestibilities of DM, OM, CP, CF, NFE and the nutritive value as TDN or DCP. While, the previous parameters were significantly ($P < 0.05$) lower for URS compared with control or TRS groups. The total water intake as well as the insensible water loss was significantly ($P < 0.05$) higher when animals fed TRS ration comparing with the other groups. The nitrogen balance of control and TRS groups was similar and significantly ($P < 0.05$) higher than URS group.

The daily body weight gain of URS group was significantly ($P < 0.05$) lower than control and TRS groups being 525, 593 and 600 g respectively. The TRS and control groups were more feed conversion efficiently ($P < 0.05$) than URS group, being 10.24, 10.36 and 11.76 (DMI/gain), respectively. As a result of reducing feeding costs (LE/head/day) significantly ($P < 0.05$) for the TRS and URS groups vs. the control group, being 3.24, 3.20 and 4.10, respectively, feeding camel calves on TRS ration gave the highest profit followed by URS then control group, being 115.2, 57.6 and 7.20 LE/period.

It could be concluded that clover hay could be entirely replaced with rice straw either treated or not treated with urea molasses mixture to reduce feeding costs as well as achieving more profit.

Keywords: *Camels, fattening, intensive feeding and rice straw.*

INTRODUCTION

Camel is the most predominant animal in arid zones and dry lands where other domestic animals can hardly survive. There are about 18.5 million camels in the world, of which 12.6 million are in Arab countries (FAO, 1989). Knoess, 1976, stated that, camel offers considerable scope for meat production in areas that would be too difficult for other species of domestic animals. Several studies concluded that, the maintenance requirements of camels from energy and protein are less than other ruminants under drought conditions which Egypt could be involved and its ability to decrease feed intake and metabolic rate (Wardah and Farid, 1990, Gihad and El-Bedawy,

1992, Guerouali and Filali, 1992, and Farid, 1995). Yacout and El-Badawi, 2001 reported that camels preferred to eat concentrates as the first choice whenever it was available. Further more, Rutagwanda *et al.*, 1990 reported that camels are superior than the other species in selecting a better quality of plants and feeds. However, Holler *et al.*, 1986 and Lechner and Von Engelhardt., 1989 noted that camels are able to consume and utilize poor quality forages if they are forced to be fed exclusively on it. Average daily gain of camels ranges from 185 to 565 g when fed DM at 1.6 - 3.8% of body weight (Kamoun *et al.*, 1989, Wilson, 1992 and Fay and El-Komi., 1999). Treatment of straw with urea which subsequently hydrolyzed to ammonia has been investigated by many researches (Haque *et al.*, 1983, Doyle, 1984 and Farghaly *et al.*, 2003) and it has been found that urea serves as a good preservative for treatment of straw besides improving its nutritive value.

The present study aims to determine the actual dry matter intake of (free consumption concentrate and roughage as well as investigate the response of fattening camel calves for entirely replacing of clover hay with rice straw either untreated or treated under intensive feeding regimes.

MATERIALS AND METHODS

The present study was carried out at the Experimental Station of Animal Production Department, Faculty of Agriculture, Cairo University.

In a preliminary pilot experiment (Exp.1), fifteen Sudanese male camel calves, aged 2-3 years old and weighted 268.6 ± 42.49 Kg, were feed *ad. Lib.* on concentrate feed mixture (CFM) and clover hay (*Trifolium alexandrinum*) separately for 30 day. At the end of the pilot experiment, the same animals, which reached on average of 288.5 ± 41.14 Kg body weight were divided into three similar groups (five of each) in the fattening trial (Exp. 2) All animals were fed individually through the fattening trial, which lasted 120 day. The concentrate feed mixture was offered at 1.55% of body weight (75% of total feed intake) was presented as a part of a total 2.1 % as fed, which it was offered twice a day. The rest of total feed intake (0.55% of body weight) was offered from clover hay for control group, chopped untreated rice straw (URS) for the second group and treated chopped rice straw (TRS) for the third one. Urea and molasses solution, 5% urea and 10% molasses w/w at 50% moisture, was sprayed on a batch of 100 Kg rice straw and incubated for 4 weeks. At the last week, feces and urine were quantitatively collected daily according to El-Badawi *et al.*, 2003. Preservative samples of feeds, feces and urine were taken and prepared for chemical analysis to determine nutrients digestibility, feeding value as well as nitrogen and water balances. Camels were individually weighed monthly to record the body weight gain and the feed intake was adjusted accordingly. Chemical analyses of feeds, feces and urine samples were carried out according to A.O.A.C., 1990. Data were statistically analyzed using the one-way analysis of variance, by MSTAT-C computer programme, 1989. Differences among means were statistically tested using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Results of the preliminary pilot experiment indicated that camels can consume 2.1% as fed (1.9% as DM) of their live body weight (1.55 % and 0.55% for concentrate and roughage, respectively). This intake appropriately covered the protein and energy requirements as mentioned before by Wardeh and Farid, 1990. The concentrate to roughage ratio was 74:26 % and the average daily weight gain was 0.663 Kg.

The chemical composition of the feedstuffs and experimental rations are presented in Table 1.

Table 1. Chemical composition of the feedstuffs and experimental rations.

Item	DM%	Chemical composition (DM basis)					
		OM	CP	CF	EE	NFE	Ash
Feedstuffs:							
CFM	90.04	84.00	14.72	09.64	03.20	56.44	16.00
Clover hay	89.92	84.90	15.81	22.30	02.91	43.88	15.10
URS	88.88	79.98	04.50	36.82	01.78	36.88	20.02
TRS	45.00	79.89	11.50	34.85	01.75	31.79	20.11
Experimental rations							
Control ration	90.01	84.22	14.99	12.81	03.13	53.29	15.78
URS ration	89.75	83.00	12.17	16.44	02.85	51.54	17.00
TRS ration	90.03	82.97	13.92	15.94	02.84	50.27	17.03

CFM: Concentrate feed mixture; 20% un-decoricated cottonseed meal, 15% wheat bran, 10% rice bran, 50% yellow corn, 3% limestone, 1% salt and 1% minerals and vitamins mixture.

Control: CFM + clover hay URS: CFM+ rice straw TRS: CFM + urea treated rice straw

The experimental rations are almost comparable in the organic matter and nitrogen free extract contents, however, crude protein and crude fiber slightly but differed. Data in Table 2, indicated that there was no significant ($P < 0.05$) difference in the digestibilities of DM, OM, CP, CF, NFE and nutritive values as TDN and DCP between control ration (68.97, 72.95, 74.36, 54.90, 78.31, 64.31 and 11.15%) and TRS ration (67.13, 71.84, 76.06, 58.26, 73.89, 62.24 and 10.59%), respectively. While, URS significantly ($P < 0.05$) decreased the same previous parameter by 15.0, 15.5, 5.6, 10.8, 19.1, 16.4 and 23.4%, in the same order. There was no significant ($P < 0.05$) difference among control, URS and TRS rations in the digestibility of EE being 73.54, 72.56 and 74.12%, respectively. Urea treatment of straw improved the digestibilities of DM, OM, CP, CF, NFE and nutritive values as TDN and DCP by 14.4, 16.5, 8.4, 19.0, 16.7, 15.73 and 24.0%, respectively. This improvement in the nutrients digestibility and nutritive values may be due to that the alkali reduces the strength of intermolecular hydrogen bonds that binds cellulose fiber within cell wall matrix which may be physically restrained from swelling. Similar results were obtained by Whistler and Teng, 1970, Letham *et al.*, 1979, Rai and Mudgal, 1987, Oliverose *et al.*, 1993, Sirohi and Rai, 1994 and 1995, Hanafy *et al.*, 1996, Abdul-Aziz *et al.*, 2001, Farghaly *et al.*, 2003 and Granzin and Dryden, 2003.

Table 2. Nutrients digestibility and feeding values of the experimental rations.

Item	Experimental rations			±SE
	Control	URS	TRS	
Dry matter intake, Kg/h/d	3.600	3.590	3.601	0.020
Nutrients digestibilities, %				
DM	68.97 ^a	58.66 ^b	67.13 ^a	3.157
OM	72.95 ^a	61.68 ^b	71.84 ^a	3.254
CP	74.36 ^a	70.17 ^b	76.06 ^a	2.957
CF	54.90 ^a	48.98 ^b	58.26 ^a	3.550
EE	73.54	72.56	74.12	0.455
NFE	78.31 ^a	83.34 ^b	73.89 ^a	4.491
Nutritive values, %				
TDN	64.31 ^a	53.78 ^b	62.24 ^a	3.240
DCP	11.15 ^a	8.54 ^b	10.59 ^a	0.373

a,b,c means with different superscript in the same row are significantly different at (P<0.05)

Control: CFM + clover hay URS: CFM + rice straw TRS: CFM + urea treated rice straw

Data in Table, 3, showed that the daily intake of concentrate feed mixture and roughage as well as the total DM intake (% of body weight or g/Kg metabolic body size) were insignificantly differ among all the experimental rations. In contrary, the intake of total digestible nutrients and digestible crude protein were similar in both control and TRS rations, being (51.80 and 8.98) and (50.06 and 8.51). Dry matter intake as Kg/h/d and g/Kg $w^{0.75}$ agreed with the findings of Yacout and El- Badawi, 2001 and Abd El- Rahman *et al.*, 2003. While, it was disagreed with the findings of El- Badawi and Yacout, 1999. These differences might be due to the variation in total DMI (as % of body weight) and the percent of concentrate in the ration, being (1.9 and 75%) in the present study and (1.75 and 90%) in the study of El - Badawi and Yacout, 1999.

There was insignificant difference in growth performance between control and the TRS groups (Table 4). Average daily gain of the URS group was significantly lower than the control and TRS groups, being 0.525, 0.593 and 0.600 Kg/h/d, respectively. Kamoun *et al.*, 1989 reported that the daily gain ranged from 326 to 565 g in camel calves fed on ration consisted of 80% concentrate and 20% oat straw. However, Yacout and El- Badawi, 2001 recorded a higher average daily gain (810 and 812 g/d) with camel calves fed on a concentrate mixture (14% CP) at 1.6% of BW (80% of total dry matter). Feed conversion (Kg DMI/Kg weight gain) was significantly better in control and TRS groups comparing to the URS group, being 10.36, 10.24 and 11.67, respectively (Table 4). These findings is comparable to that reported by El-Badawi and Yacout, 1999 (10.01 Kg TDMI/Kg gain) when camel calves fed concentrate mixture (14% CP) at 1.8% of body weight. The feeding costs (LE/h/d) were significantly (P<0.05) higher in the control group comparing to the TRS or URS groups. The gain prices (LE/h/d) were insignificantly differed between control and TRS groups, which by turn were significantly higher than URS group (Table 4). In the control group, the highest gain, gain price and profit over feeding costs LE/h/d or (LE/h/period), were significantly among all groups (Table 4).

Table 3. Feed and nutrients Intake of the experimental rations.

Item	Experimental rations			±SE
	Control	URS	TRS	
DM Intake, Kg/h/d				
Feed mixture	4.610	4.610	4.610	0.000
Roughage	1.535	1.517	1.536	0.006
Total	6.145	6.127	6.146	0.006
DM Intake, % Body weight				
Feed mixture	1.42	1.44	1.42	0.007
Roughage	0.47	0.47	0.47	0.000
Total	1.89	1.91	1.89	0.007
DM Intake, g/ Kg W^{0.75}				
Feed mixture	60.40	60.90	60.30	0.190
Roughage	20.10	20.00	20.10	0.030
Total	80.50	80.90	80.40	0.150
TDN Intake, Kg/ Kg W^{0.75}				
	51.80 ^a	43.40 ^b	50.06 ^a	1.950
DCP Intake, G/Kg W^{0.75}				
	8.98 ^a	6.91 ^b	8.51 ^a	0.617

a,b,c means with different superscript in the same row are significantly different at (P<0.05)

Control: CFM+ clover hay URS: CFM + rice straw TRS:CFM + urea treated rice straw

Table 4: Growth performance feed conversion and economical evaluation of the experimental rations.

Item	Experimental rations			±SE
	Control	URS	TRS	
Growth performance				
Initial BW, Kg	288	289	288.6	0.291
Final BW, Kg	359.2	352	360.6	2.664
Av. BW, Kg	323.6	320.5	324.6	1.234
BW gain, Kg/h/d	0.593 ^a	0.525 ^b	0.600 ^a	0.024
Feed conversion				
Kg DM/ Kg gain	10.36	11.67	10.24	0.458
Kg TDNI/ Kg gain	6.66	6.28	6.38	0.113
Gram DCPI/ g gain	1.16	1.00	1.09	0.061
Economical evaluation				
Feeding cost (FC), LE/h/d	4.10 ^a	3.20 ^b	3.24 ^b	0.294
Gain price, LE/h/d	4.15 ^a	3.68 ^b	4.20 ^a	0.166
Profit : FC, LE/h/d	0.06 ^c	0.48 ^b	0.96 ^a	0.260
Profit : FC, LE/h/period.	7.20 ^c	57.60 ^b	115.2 ^a	31.20

The real prices of the feedstuffs and experimental rations are as follows: 600LE for 1 ton of CFM and clover hay; 70 LE for 1 ton of rice straw; 100 LE for 1 ton of treated rice straw.

Drinking water was insignificantly differed among the experimental groups, it was tended to be higher in animals fed TRS ration (Table 5). Moreover, dietary water was significantly higher in the TRS group, as a result of the high moisture content of the treated straw. Urinary water in the TRS was significantly lower than that of the control as well as the URS group. Payne, 1965 detected that, urea recycling is always complained with urinary water re-absorption.

Table 5: Water and nitrogen balances of the experimental rations.

Item	Experimental rations			±SE
	Control	URS	TRS	
Water balance				
Drinking water intake, L/h/d	5.260	4.830	5.850	0.296
Dietary water intake, L/h/d	0.400 ^b	0.410 ^b	1.399 ^a	0.331
Total water intake, L/h/d	5.660 ^b	5.240 ^b	7.249 ^a	0.612
Urinary water secretion, L/h/d	3.130	2.980	2.880	0.073
Fecal water secretion, L/h/d	1.700	1.880	2.060	0.104
Total water loss, L/h/d	4.830	4.860	4.940	0.033
Insensible water loss, L/h/d	0.830 ^b	0.380 ^c	2.309 ^a	0.289
Urinary water, % water intake	55.30 ^a	56.87 ^a	49.23 ^b	2.330
Nitrogen balance				
Dietary nitrogen intake, g/h/d	86.34 ^a	69.90 ^c	80.20 ^b	5.290
Urinary nitrogen loss, g/h/d	32.64 ^b	24.63 ^b	30.73 ^a	2.415
Fecal nitrogen loss, g/h/d	23.51 ^a	23.23 ^a	19.19 ^b	1.992
Nitrogen balance, g/h/d	30.19 ^a	22.04 ^b	30.28 ^a	3.447
Nitrogen balance, % intake	34.97 ^a	31.53 ^b	37.76 ^a	2.930
Urinary N concentration, g/d L	0.96 ^a	0.74 ^b	1.05 ^a	0.102

a,b,c means with different superscript in the same row are significantly different at (P<0.05)

Control: CFM+ clover hay URS: CFM + rice straw TRS: CFM + urea treated rice straw

Dietary nitrogen intake as shown in Table 5 was significantly differed between the experimental groups, being (86.34, 69.90 and 80.20 g/h/d) in control, URS and TRS, groups, respectively. This difference may be due to the difference of protein content. The urinary nitrogen loss of the URS group was significantly lower than control or TRS groups, however, fecal nitrogen was significantly lower in TRS group compared with the control or URS groups. The high ability of camel for urea recycling could gave it the advantage to utilize the marginal and poor quality feeds more efficient than the good quality feeds. In this connection, Emmanuel *et al*, 1976 showed that camels feed on a low protein ration trapped more urea in their rumens. Nitrogen balance (g/h/d) was significantly higher in the control and TRS groups, being 30.19 and 30.28 vs.22.04 in URS group. Results indicated that there was a positive correlation among dietary protein content and urinary nitrogen concentration (g/d) as that reported by Yacout and El-Badawi, 2001. Increasing the water consumption in TRS group compared to the control and URS groups was in agreement with the findings by Yagil, 1985 and Yacout and El-Badawi, 2001 who reported that, the decline in urine volume is directly correlated with urea and accompanying water re-absorption.

From the present study, it could be concluded that camel calves under intensive fattening regimes could properly utilize the low quality roughage such as rice straw either treated with urea and molasses (mixture) or not. Further investigations should be carried out to study camel response for reducing the concentrate ratio instead of roughages to enhance profitability.

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استجابة عجول الجمال للتسمين تحت نظم التغذية المكثفة محمد سيد فرغلي، هشام محمد عبد الجواد البنا، علي محمد علي قسم الإنتاج الحيواني ، كلية الزراعة ، جامعة القاهرة ، جيزة ، مصر

أجريت هذه الدراسة على تجربتين ، الأولى منها تجربة استكشافية لمدة ٣٠ يوم على خمسة عشر من عجول الجمال للسوداني وجيدة للنمات عمر ٢-٣ سنوات ومتوسط 268.1 ± 12.49 كجم ، لتحديد كمية المادة الجافة المأكولة اختياريًا من العلف المركز (١٤% بروتين خام) ودراس البرسيم . والثانية منها تجربة تسمين لمدة ١٢٠ يوم على نفس الحيوانات بمتوسط وزن 288.5 ± 11.14 كجم لتقييم احتلال كس الأرز غير المعامل أو المعامل بمحلول اليوريا (٥%) والمولاس (١٠%) بنسبة رطوبة ٥٠% وللتحضير لمدة ٤ أسابيع ، محل للدراس لخفض تكاليف التفتية. حيث تسمت الحيوانات إلى ثلاثة مجموعات متساوية من حيث الوزن والقى عذبت على العلف المركز بمعدل ١,٥٥% من وزن الجسم والذي يمثل ٧٥% من الماكول الكلي والذي تم تحديده في التجربة الأولى . حيث اعطيت المجموعة الأولى (مجموعة المقارنة) دريس البرسيم والثانية كس الأرز غير المعامل والثالثة كس الأرز المعامل باليوريا والمولاس والذي يمثل الـ ٢٥% لبقية سن الماكول الكلي لكل مجموعة .

أظهرت نتائج التجربة الأولى أن كمية المادة الجافة الكلية المأكولة اختياريًا تمثل ١,٩% من وزن الجسم بنسبة حوالي ٧٥: ٢٥ لكل من العلف المركز والدريس على التوالي .

أظهرت التجربة الثانية للنتائج التالية :

- ١ - عدم وجود فروق معنوية للمجموعات الثلاثة بالنسبة للماكول البرسي من المادة الجافة.
 - ٢ - لم يكن هناك اختلاف معنوي في هضم المادة الجافة والمادة العضوية والبروتين الخام والالياف الخام والكربوهيدرات الذائبة وكذا القيمة الغذائية في صورة مركبات غذائية مهضومة كلية أو بروتين خام مهضوم بين مجموعتي المقارنة و للقس المعامل ، في حين كان هناك انخفاض معنوي في القياسات السابقة ، لمجموعة القس الغير معامل مقارنه بالمجموعتين السابقتين .
 - ٣ - كان استهلاك الماء الكلي اعلى معنويًا عند التغذية على عذبة القس المعامل بالمقارنة بالمجموعتين الأخرتين. ونفس الاتجاه لوحظ مع فقد ماء البخر.
 - ٤ - كان ميزان الأزوت متساوي في مجموعتي المقارنة والقس المعامل ، وكانتا اعلى معنويًا من مجموعته القس الغير معامل .
 - ٥ - كان معدل النمو اليومي لمجموعة القس الغير معامل أقل معنويًا من المجموعتين الأخرتين. حيث كانت التقيم 0.575 ، 0.592 ، 0.600 جم ، على التوالي.
 - ٦ - كانت كفاءة التحويل الغذائي (وحدة مادة جافة مأكولة/ وحدة نمر) لمجموعتي المقارنة والقس المعامل أفضل معنويًا بالمقارنة بمجموعة القس الغير معامل، حيث كانت التقيم 10.36 ، 10.24 ، 11.67 كجم ، على الترتيب.
 - ٧ - كانت تكاليف التفتية (جنيه/رأس/يوم) أقل معنويًا لمجموعتي القس المعامل والغير معامل مقارنة بمجموعة المقارنة، حيث كانت 3.24 ، 3.20 ، 4.10 جنيه، على الترتيب. مما أدى إلى زيادة عند التسمين (جنيه/رأس/الفرد) ، حيث كانت التقيم 115.2 ، 57.10 ، 7.20 على الترتيب.
- ويستخلص من هذه الدراسة إمكانية إحلال كس الأرز لغير معامل أو المعامل بالمولاس واليوريا إحتلالاً كاملاً محل دريس البرسيم في تسمين عجول الجمال السوداني لخفض تكاليف التفتية وزيادة عائد التسمين. ونوصى بإجراء بعض الدراسات بهدف خفض معدل التفتية على العلف المركز .