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NUTRITIONAL STUDIES ON AUSTRALIAN CALVES IN NOUBARIA AREA – EGYPT

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ABSTRACT

This experiment was carried out to study the effect of feeding cottonseed meal or linseed meal with three level of concentrate feed mixture (CFM): 2, 2.5, and 3% of live body weight on animal performance and carcass quality. Sixty growing Australian calves were randomly divided into 6 equal groups. All groups were fed on rice straw ad lib as the sole source of roughage. Digestibility trials were conducted with three calves chosen randomly from each group. Five calves of each group were slaughtered at the end of the experiment for carcass evaluation.

Results indicated that the digestibility coefficients of all nutrients, feeding value of rations, average daily gain and dressing percentage of fasting body weight values increased with increasing level of CFM in rations. In additions, apparent utilization of rations was insignificantly different between the two types of CFM.

It is concluded that the Australian calves can play a significant role in meat production in Egypt. Linseed meal can substitute cotton seed meal in traditional concentrate feed mixtures so that the cost of nutrition might be reduced. The recommended level of the CFM containing linseed meal would be 2% of BW.

Keywords : Concentrate mixture, Australian calves, growth rate, carcass.

INTRODUCTION

The problem of the shortage of animal protein that should be available for human consumption in Egypt is always a renewable one. The ever-increasing population at high rate imposes certain obligations upon the government. On one hand, the private sector is not able to cope up with the increasing demands over animal protein especially the red meat. On the other hand, there is always an obligation towards the government to confront this increasing demand. Import of livestock was one of the alternatives. Australia is considered one of the main exporters of Australian Braford castrated male calves. Animals were brought to stay a period for finishing. Animal average weight ranges from (300 – 350 Kg.). They are finished at around 550 Kg. Large numbers of animals are brought every year.

Because the import of animals imposes high cost, it is necessary to economically finish these animals. Knowingly, the cost of nutrition composes around 70 – 75% of the total cost. Cotton seed meal (CSM) is one of the most expensive feed ingredients. It is usually the most common supplement used in animal feeding in Egypt (Bechai, 2001). Alternatively, linseed meal (LSM) is comparable one to CSM, yet lower in price (Hussin, 1998).

This study was conducted to compare between CSM and LSM at three levels of intake. The comparison included digestibility coefficients, animal performance, and carcass traits.

MATERIALS AND METHODS

Sixty castrated Australian calves averaging 322.5 ± 0.19 Kg. were used in feeding trials for 150 days during winter season at the Agro- industrial compound, Horticulture Services Unit, Agriculture Research Center. Animals were divided into six similar groups (10 animals each) and randomly assigned to get 2.0, 2.5 or 3% of live body weight from CSM based CFM (CFM1) or LSM based CFM (CFM2). Rice straw was fed ad – lib to animals in all experimental groups. Live body weight and feed intake were recorded on biweekly basis throughout the experimental period. At the middle of the feeding trial, six digestibility trials were conducted simultaneously on the animals (three animals / group) to determine the feeding values of the experimental rations. Acid Insoluble Ash (AIA) method was used as described by Van Keulen and Young (1977). At the end of the fattening experiment, thirty animals (five / group) were slaughtered after they were deprived from feed and water for 16 hrs, according to Ragheb (1985) to study carcass traits.

Samples of feed and feces were analyzed (Table 1) according to A.O.A.C. (1990). The data were analyzed statistically as factorial design using GLM procedures of SAS (1992).

RESULTS

Digestibility Trials

The chemical composition of feed ingredients and the calculated composition of experimental rations are presented in Table (1). Some differences were observed between CFM1 and CFM2 concerning CF, EE, and NFE contents. These differences were reflected in the whole diets. The differences in the proximate analysis of total mixed rations might be due to type and level of ingredients used in formulating CFM and rations. Undecorticated cottonseed meal had higher CF and EE contents compared to linseed meal. (23.08 and 6.03 versus 30.11 and 3.05 for CSM and LSM, respectively). Wheat bran content was higher in CFM2 than in CFM1, (26 versus 10 % respectively). On the other hand, the chemical composition of the tested ration (Table 1) cleared that the OM, CP, EE, and NFE contents increased linearly with increasing CFM level in all tested rations, while CF and ash contents decreased.

Nutrient digestibility coefficients and nutritive values as affected by type and level of CFM are shown in Table (2). The digestibility coefficients of all nutrients were nearly similar in CFM1 and CFM2 based diets. The CF digestibility of CFM1 was significantly higher ($p < 0.05$) than that of CFM2 ration. The value of nutritive value expressed as TDN or DCP were not influenced by type of CFM.

On the other hand, results from the present study show that the digestibility coefficients and nutritive values improved with increasing CFM percentage in rations.

Table (1): Chemical composition of CFM and R.S. and calculated compositions of the experimental rations

Items	DM, %	On DM %					
		OM	CP	CF	EE	NFE	Ash
CFM1[a]	86.19	92.92	14.16	10.74	3.29	64.73	7.08
CFM2[b]	86.10	92.93	14.19	7.11	2.99	68.64	7.07
Rice Straw	88.62	84.33	4.28	35.02	1.28	43.75	15.67
CSM[c]	89.13	94.02	23.08	23.14	6.03	41.77	5.98
LSM[d]	89.38	94.04	30.11	10.02	3.05	50.86	5.96
Rations (calculated)							
Ration 1	87.12	89.62	10.37	20.05	2.52	56.68	10.38
2	86.89	90.47	11.34	17.67	2.72	58.74	9.53
3	86.71	91.07	12.03	15.98	2.86	60.20	8.93
4	87.07	89.63	10.39	17.82	2.33	59.09	10.37
5	86.82	90.49	11.38	15.05	2.50	61.56	9.51
6	86.65	91.07	12.05	13.14	2.62	63.26	8.93

a, CFM 1 composed of 45%yellow corn, 37% undecorticated cotton seed meal, 10% wheat bran,5% molasses, 2% limestone and 1% salt (TDN = 67.99%)
b, CFM 2, composed of 45%yellow corn, 21% linseed meal, 26% wheat bran,5% molasses, 2% limestone and 1% salt (TDN = 68.36%)
c, CSM = undecorticated cotton seed meal
d, LSM = linseed meal

Table (2): Digestibility and feeding values (%) of the experimental rations fed to growing calves

Items	Nutrient digestibility %						Feeding value %	
	DM	OM	CP	CF	EE	NFE	TDN	DCP
Type of CFM								
CFM 1	65.32	66.82	65.05	53.15 a	71.84	71.05	62.84	7.34
CFM 2	64.90	66.52	65.06	51.79 b	71.31	70.22	62.41	7.41
Level of CFM								
2.0 %	62.55c	63.56c	60.13 c	51.82	69.71 c	67.77 c	59.09 c	6.24 c
2.5 %	65.43b	66.92b	65.34 b	52.56	71.44 b	70.93 b	62.96b	7.50 b
3.0 %	67.37 a	69.53a	69.69 a	53.02	73.58 a	73.21 a	65.83 a	8.39 a
Interaction								
	P<0.05	P<0.05	P<0.05	NS	P<0.05	P<0.05	P<0.05	P<0.05

a,b and c ; Means within column for each category bearing different letters differ (p< 0.05).

Feeding Trials

Data of the applied feeding trials are given in Table (3). The total body weight gains and average daily gains were comparable between the two types of CFM (229.67 Kg and 1531.11 g/h/d and 224.13 Kg versus1494.20 g/h/d for CFM1 ration and CFM2 ration, respectively). On the other hand, average DM intake (CFM or rice straw), average TDN and DCP intakes, feed conversion expressed in terms of DM, TDN, or DCP (Kg/Kg gain) did not show significant differences between calves fed CFM1 or CFM2 based rations. Costs per Kg gain (LE) was lower and economical efficiency was higher for CFM2 based ration containing linseed meal than CFM1 based ration containing CSM.

On the other hand, final weight, total gain, average daily gain, daily DM, TDN, and DCP intake and cost per Kg gain significantly (P< 0.05) increased with increasing CFM level in rations. On the contrary feed conversion as Kg DM, TDN, or DCP intake/ Kg gain and economical efficiency significantly decreased as the level of CFM increased in rations. The results in Table (3) indicated that calves fed on 2% CFM level in ration was better than other levels.

Table (3) : Growth performance of calves fattened for 150 day on tested ration

Items	Type of CFM		Level of CFM		Inter-action	
	CFM 1	CFM 2	2.0 %	2.5 %	3.0 %	
No. of animals	30	30	20	20	20	
Ave. initial BW, Kg	323.20	321.90	322.30	322.60	322.10	
Ave. final BW, Kg	552.87	546.03	527.30	551.75	569.35	NS
Ave. Body w. change, Kg	229.67	224.13	205.00	229.15	246.60	NS
Ave. relative growth rate, %)	71.06	69.63	63.61	71.03	76.56	NS
Ave daily gain, gm	531.11	1464.20	1366.67 c	1527.67 b	1644.00 a	P<0.05
Daily feed intake, Kg/h/d						
CFM	9.213	9.124	7.127 c	9.164 b	11.216 a	P<0.05
Rice Straw	3.537	3.523	3.600	3.518	3.474	NS
Total DMI.	12.750	12.647	10.727 b	12.682 ab	14.690 b	NS
Total TDNI.	8.056	7.938	6.338 b	7.984 ab	9.670 a	NS
Total DCPI.	0.951	0.951	0.669 c	0.951 b	1.233 a	P<0.05
Feed efficiency						
Kg DM/Kg gain	8.29	8.43	7.85 b	8.30 ab	8.94 a	NS
Kg TDN/Kg gain	5.23	5.28	4.64 b	5.23 ab	5.89 a	NS
Kg DCP/Kg gain	0.61	0.63	0.49 c	0.63 b	0.75 a	
P<0.05Cost/Kg gain, L E	6.18	5.78	5.25	5.96	6.73	
Economical efficiency **	1.79	1.87	2.10	1.80	1.60	

a, b and c ; Means within row for each category bearing different leters differ (p< 0.05).

***Based on the assumption that the price of one ton of CFM1, CFM 2 and rice straw (600), (550) and (65) L. E.**
respectively, the price of 1 Kg. Body weight gain 7.5 L. E.

****Economical efficiency (as a ratio between price of the weight gain and cost of feed consumed).**

Carcass Characteristics

Data presented in Table (4) indicated that the difference between CFM1 and CFM2 based rations was not significant in carcass traits except for spleen weight which had a lower value (P<0.05) for calves fed CFM1 based rations. Cost (LE) per Kg carcass weight with edible offal relative to fasting weight was reduced with CFM2 ration containing linseed meal. On the other hand, results in Table (4) showed that animals at 3% CFM level had higher fasting weight, carcass weight, total offal organs weight, dressing percentages, but the cost (LE) per Kg carcass weight with edible offal relative to fasting weight increased as the level of CFM increased; being the highest for 3% level and the lowest was recorded for 2% level.

Table (4): Carcass characteristics of calves slaughtered at the end of feeding period.

Items	Type of CFM		Level of CFM		Inter-action	
	CFM 1	CFM 2	2.0 %	2.5 %	3.0 %	
Fasting wt, Kg	534.20	527.60	509.10b	533.10ab	550.50a	NS
Carcass wt, Kg	329.93	324.03	302.30b	332.75ab	345.90a	NS
Liver wt, gm.	6.320	6.393	5.845b	6.526a	6.699a	NS
Heart wt, gm	2.035	2.189	2.016	2.133	2.187	
Kidney wt, gm	1.063	1.092	1.013	1.054	1.166	
Spleen wt, gm	0.806	0.889	0.811c	0.857b	0.875a	P<0.05
Total offal organs, Kg	10.224	10.563	9.685b	10.570a	10.927a	NS
* Dressing (1), %	61.76	61.42	59.38b	62.42a	62.83a	NS
* Dressing (2), %	63.78	63.42	61.28b	64.40a	64.82a	NS
Cost/Kg Carcass 2, L E	9.69	9.10	8.57	9.25	10.38	

(1) Carcass weight without edible offal relative to fasting weight.
(2) Carcass weight with edible offal relative to fasting weight
a, b and c ; Means within row for each category bearing different letters differ (p< 0.05).

DISCUSSION

Digestion coefficients of different nutrients are shown in Table (2). The differences among the two forms of CFM were not significant except for CF .

The CFM1 ration containing cotton seed meal , was higher in CF digestibility (53.15%) than CFM2 ration containing linseed meal (51.79%). This could be a reflection of the increase of CF content in CFM1 ration . Van Soest, (1982)and Taie *et al* (1996), reported that the higher CF digestibility with high fiber content in ration might result from slower passage rate of fiber particles from the rumen.

It was worth noting that, digestion coefficients and feeding values increased with increasing CFM level in all tested rations. These results are in agreement with those obtained by (Baraghit *et al*, 1999 and Mehrez *et al* 2001). It might be due to the change in cell wall composition, which makes the structural carbohydrates susceptible to ruminal microbial degradation (Kibria *et al*, 1994). On the other hand, the increase in TDN values with increasing CFM level in rations may be due to increased digestibilities of CF, EE and NFE (Table 2) and decreasing ruminal turnover rate (Ellis *et al*, 1983). Improving DCP values may be due to high protein intake (Table 1), and increased CP digestibility (Table 2). Gabr *et al* (1999) reported that the high DCP values of diets could be associated with better CP digestibility .

Feed intake, body weight gain and feed conversion during the feeding period (150 day) are presented in Table(3). All calves remained in good health and completed the experimental period without health discrepancies. Calves consumed all CFM offered. The CFM1 based rations containing CSM had non significant higher average daily gain (1531.11 g/h/d) than those of CFM2 based rations containing LSM (1494.20 g/h/d). This may be due to that CSM is a good supply for amino acids. Bolton and Blair, (1977) mentioned that arginine, lysine and cystine in cotton seed meal tended to be complementary to cereal protein. On the other hand, Gell (1975), reported

that linseed meal dose not supply vitamin B carotene or vitamin D. Crooker *et al.* (1986) found that heated linseed meal had a lower concentration of glutamic acid, and this was associated with lower arginine, aspartic,methaionine and glycine.

On the other hand, calves fed high CFM level gained significantly more ($P<0.05$) body weight than other groups. This may be due to increased microbial efficiency (Olson *et al*, 1992), increased digestion, retention of nutrients or as a result of the improvement in balance of the intestinal microflora. (Kopecny *et al*, 1989). On the other hand, greater live weight gain was associated with high concentrate diets in this study can be explained by the more efficient propionic acid utilization than acetic acid for maintenance and fattening of ruminants (Armstrong *et al*, 1958, Lawrence and Thomas, 1973 and Gibson, 1981). Lyle *et al* (1981) and Hassan and Bryant (1986), reported that increasing the proportion of concentrates in the diet, increased propionic acid in the rumen proportionately.

In the present study the daily gain ranged from 1345.33 g/h/d to 1674.67 g/h/d and the overall average daily gain was 1512.78 g/h/d. These values of average daily gain for Australian calves under local condition were higher than those reported by some investigators in Egypt, when calves fed CFM and rice straw. Fahmy, (1990), El- Badawy and Yacout, (1999) and El-Shinnawy *et al* (1999) reported 683, 770 and 700 g/h/d respectively, for Baladi cow calves). El-Gendy *et al*, (1999) reported 721 g/h/d for crossbred Friesian calves. Abdel-Baki *et al*, (2001), Mostafa *et al* (2001) and Yousef and Zaki (2001) reported 733, 850 and 953 g/h/d, respectively for Friesian calves). In fact, good nutrition and management are more effective in promoting gain when applied early in life.

Most carcass components were significantly affected by the level of CFM in rations. Results in Table (4) showed that fasting carcass, liver, heart, kidney and spleen weight, and carcass weight without edible offal relative to fasting weight or carcass weight with edible offal relative to fasting weight increased with increasing level of CFM. Data presented in Table (4), clear that carcass weights increased with increasing fasting weights. Nalda'del (1968) found that the dressing percentage is highly correlated with the slaughter live weight. On the other hand, Houria *et al*, (1995) reported that carcass weights increased with body size.

The mean values of dressing percentages of carcass weight without edible offal relative to fasting weight or carcass weight with edible offal relative to fasting weight in this study with this breed (61.54 and 63.5 % respectively) were higher than those obtained by other breeds in Egypt. Estimates of dressing percentage of carcass weight without edible offal relative to fasting weight or carcass weight with edible offal relative to fasting weight were higher than those obtained by Farrag *et al*, (1991) and Nowar *et al*, (1997) using CFM and rice straw fed to Friesian calves (55.7 and 53 %, respectively), and than those reported by El- Badawi and Yacout, (1999) using CFM and rice straw fed to Baladi cow calves (58.6 %)

CONCLUSION

It is fair, to state that, Australian calves can play an important role as red meat provider particularly, in the newly reclaimed lands as Noubaria area. On the other hand, and under the circumstances of this study, feeding linseed meal as the source of protein in CFM was proven as an economical approach in decreasing the feeding cost of growth calves. The recommended level of the CFM containing linseed meal would be 2% of BW. In case if the time is a factor, 3% BW of traditional CFM can be used.

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دراسات غذائية على العجول الاسترالى فى منطقة النوبارية – مصر

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تم اختيار ستون عجل استرالى قسمت الى سته مجاميع متساويه وفقا لوزن الجسم لدراسة استخدام نوعين من الاكساب (كسب قطن غير مقشور أو كسب كتان) لانتاج مخلوطين من العلف المركز قدمت للعجول بثلاث نسب مختلفه من وزن الجسم (٢ – ٢,٥ – ٣ %) مع تقديم قش الارز كماده مالئه وأثر ذلك على الاداء الانتاجى وخصائص الذبيحه لتلك العجول . وقد تم اجراء تجارب تقييم غذائى وفى نهاية التجربه (١٥٠ يوم) تم ذبح خمسة عجول من كل مجموعه . أوضحت النتائج بصفة عامه ان معاملات الهضم ومعدل النمو اليومى ونسبة التصافى تزداد بزيادة نسبة العلف من العلائق . مع عدم وجود اختلافات تذكر بين نوعى العلف المركز.

يمكننا القول بان العجول الاسترالى المستوردة يمكنها ان تلعب دورا جيدا فى انتاج اللحوم فى مصر. كما يمكن خفض تكاليف انتاج كيلو النمو و كيلو اللحم باستخدام علائق تحوى ٢% من وزن الجسم علف مركز به كسب كتان بدلا من كسب القطن