Egyptian J. Anim. Prod., 33, Suppl. Issue, Nov. (1996): 113-122

ECONOMICAL FATTENING OF BUFFALO CALVES USING DIFFERENT SOURCES OF NON-PROTEIN NITROGEN

M.A. Hanafy[1], A.M. Abd El-Gawad[1] and K.M.M. Mussa[2]

1- Faculty of Agriculture, University of Cairo, Giza, Egypt, 2- Ministry of Agriculture, Giza, Egypt.

SUMMARY

Twenty buffalo calves were divided into four equal groups (average body weight 360 kg) to compare the effect of feeding three NPN sources (urea, ammonia and poultry excreta) on the performance of fattening buffalo calves and the economical efficiency of production. These groups were fed on rations containing: I) Rice straw (RS) + traditional feed mixture (TFM); II) Ureated RS + TFM; III) Ammoniated RS + TFM and IV) RS + Untraditional feed mixture (UFM) containing 20% dried poultry excreta. Animals in all groups were fed the roughages *ad.lib.*, while the feed mixtures were given at the rate of 2.0; 1.5; 1.5 and 2.0% of body weight for groups I, II, III and IV, respectively. At the end of feeding trials which lasted for 95 days, digestibility trials were carried out and some blood parameters were determined.

Urea and ammonia treatments increased CP content and improved most nutrients digestibi-lity of RS. Poultry excreta supplementation also increased CP content of UFM, but had no positive effects on most digestibilities except NFE digestibility. The nutritive value as TDN, SE and DCP were 50.22, 26.63 and 1.46% for untreated RS; 53.40, 31.32 and 4.01% for URS and 56.62, 32.67 and 4.00% for ARS, respectively. While, UFM showed higher($P<0.05$) DCP and insignificant lower SE and TDN comparing with TFM. The animals daily gain was 731, 716, 815 and 766 gm for groups I, II, III and IV, respectively. Blood metabolic profiles of animals fed NPN revealed slight changes in most of the parameters but in general they were within the normal ranges.

Results indicated that feed cost per 1 kg body weight gain was decreased by 18% with ureated straw group; 22% with ammoniated straw group and 21% with poultry excreta group less than the control group. It was concluded that it is more efficient (nutritionaly and econo-mically) to use the different NPN sources in fattening buffalo calves rations.

Keywords: Buffalo calves, dietary NPN, grwoth, nutrient utilization

INTRODUCTION

Although roughages have relatively low nutritive value and low palatability, they are still one of the important components in ruminant rations. Greater roughage intake and more efficient utilization of the roughage have been resulted by increasing dietary nitrogen through supplementation with either natural proteins or non-protein nitrogen (Ammerman *et al.*, 1972 and Horton, 1979). With more shortage of natural protein sources, the economic advantage of including NPN components in ruminant rations will be increased. Enriching roughages with NPN sources such as urea or ammonia might help in obtaining higher nitrogen content, more digestible and utilizable feed and cheaper feeding costs (Abd El-Gawad, 1995). Attention was drown to the possibility of using animal wastes as NPN source in ruminants feeding. A considerable research has shown that dried poultry waste can be used as a valuable ingredient (Smith and Wheeler, 1979 and Hamblin, 1980).

In Egypt, buffalo is a good source for meat production so much so that the Ministry of Agriculture encourage the farm animals producers for fattening buffalo calves. Therefore, the main objective of this study was to evaluate the three NPN sources (urea, anhydrous ammonia and poultry excreta) as N supplements in buffalo ration and their effects on the nutritive value, voluntary feed intake, efficiency of feed utilization and live weight gain of buffalo calves.

MATERIALS AND METHODS

Twenty male buffalo calves weighing about 360 kg on average were alloted to equal four groups according to the live body weight. All the animals were allowed to receive small portion of urea for 3 weeks as adaptation period before starting the experiment which was extended for 95 days.

Four experimental rations were studied as follow:

I) Rice straw, RS + traditional feed mixture, TFM.
II) Ureated rice straw, URS + TFM.
III) Ammoniated rice straw, ARS + TFM.
IV) Rice straw, RS + Untraditional feed mixture, UFM.

Rice straw was stacked in one batch to prepare different treatments. The ARS was prepared as described by Sundstol *et al.* (1978) applying the rate of 30 g anhydrous ammonia per one kg air dried straw. The treated straw was left covered for 3 weeks before uncovering and starting feeding. The URS was prepared using urea (42%N), at the rate of 2% of air dried straw, dissolved in a proper volume of water, then sprayed on chopped straw of 2-3 cm lengths before feeding. Both URS and ARS were sprayed with sugar cane molasses, at the rate of 10% of air dried straw, before offering to the animals.

Co-op feed mixture was used as a tradition-al feed mixture (TFM). The untraditional feed mixture (UFM) was formulated using the TFM, dried poultry excreta and molasses in the ratio of 75:20:5. Incorporated poultry excreta was taken from caged hens, sun dried for 21 days, ground and seived through in a hammer mill with a 2mm diameter screen.

Animals in groups I, II and III were given TFM at a rate of 2, 1.5 and 1.5% of body weight, respectively. While animals in group IV were given UFM at a rate of 2% of body weight. Daily allowances of both TFM and UFM were divided into two equal portions. Straw was offered *ad.lib.* for all groups. Orts were recorded dialy. Initial weight of animals was recorded followed by biweekly weighing before the morning meal. Vitamins-minerals blocks were always made available to animals throughout the experimental period.

Digestibility trials were carried out at the end of feeding trial using total collection technique of faeces for 7 successive days. Nutrients digestibility were determined directly for feed mixtures (TFM and UFM) and indirectly for staws (RS,URS and ARS) with TFM as a basal diet. Chemical analysis of representative samples using the AOAC (1980) procedures were done in duplicate and results were found to be consistent.

Blood samples were taken after three months of feeding trial from all animals for 2 successive days at 4 hrs. post feeding and serum was separated. Blood parameters included haemoglobin (Van Kampen and Tijlstra, 1961); haematocrite (Wintrobe *et al.*, 1976); total protein (Gornall *et al.*, 1949), albumin (Drupt, 1974) , serum urea (Coulombe and Favreau, 1963) and both glutamic pyruvic transaminase, GPT and glutamic oxaloacetic transaminase, GOT (Reitman and Frankel, 1957) were determined.

Data were statistically analyzed by the analysis of variance and Duncan's new multiple range test as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1- Proximate analysis of feed ingredients

The proximate analysis of untreated rice straw and effects of urea supplementation or ammonia treatment on its composition (Table 1) indicated that CP content was remarkably increased with URS & ARS to form 229% and 225% of that of the untreated RS, respectively. The CF content was noticeably decreased from 39.93% with untreated RS down to 35.12% with URS and to 34.93 with ARS. The same trend was also observed with both ash and EE. While, URS and ARS showed higher content of NFE as a result of molasses addition.

Partially replacement of TFM by dried poultry excreta resulted in higher CP, EE and ash, and lower CF and NFE contents in the UFM comparing with the TFM. This result might be due to the higher content of CP, EE and ash and lower CF and NFE in poultry excreta than those in the TFM.

Table1. Proximate analysis of feed ingredients and effects of dietary treatments on their composition (on DM basis).

Ingredient	DM	CP	CF	EE	NFE	Ash
Rice straw						
Untreated	89.08	3.93	39.93	1.53	40.23	14.28
Ureated*	82.97	9.01	35.12	1.50	41.36	13.01
Ammoniated*	84.11	8.85	34.93	1.42	41.80	13.00
Feed mixture						
Traditional**	89.10	14.93	17.02	4.48	54.93	8.64
Untraditional***	90.04	17.68	15.95	4.75	49.34	12.28
Molasses	75.23	3.55	--	--	85.59	12.86
Poultry excreta	90.00	22.63	14.90	5.01	33.28	24.18

* Ureated and ammoniated rice straw contained 10% molasses.

** Traditional feed mixture consists of 26% yellow corn, 30% undecorticated cotton seed meal, 38% wheat bran, 2% lime stone, 3% molasses and 1% salt.

***Untraditional feed mixture formulated from 75% traditional feed mixture + 20% dried poultry excreta + 5% molasses.

2- Digestibilities and nutritive value

Comparing the digestibilities of treated and untreated RS (Table 2) indicated that urea treatment had no significant effect on the digestibilities of DM, OM, CF and EE, while it increased (P<0.05) the digestibilities of both CP and NFE. On the other hand, ammoniation of rice straw increased (P<0.05) the DM, OM, CP, CF and NFE digestibilities and decreased (P<0.05) the EE digestion.

Thus, as a result of the foresaid improvement in the digestibilities of the majority of nutrients, the nutritive value as TDN, SE and DCP of both ureated and ammoniated straws were improved being higher (P<0.05) than the correspondings of untreated straw (Table 2). The TDN value of the ammoniated straw was higher(P<0.05) than that of the ureated straw, while there were no signficant differences in both SE and DCP. These results are in harmony with those found by Ammerman *et al.* (1972), Huber *et al.* (1980) and Herrera-Saldona *et al.*(1982).

On the other hand, the incorporation of the poultry excreta in the mixed feed insignificantly decreased the digestibilities of DM and EE while it increased the CP digestibi-lity (Table 3).

Table2. Digestibilities and nutritive values of rice straws (untreated- ureated-ammoniated).

Item	Rice straw		
	Untreated (RS)	Ureated (URS)	Ammoniated (ARS)
Digestion coefficient*, %			
DM	54.88^{b}	56.97^{b}	61.43^{a}
OM	59.51^{b}	60.98^{b}	63.48^{a}
CP	37.05^{b}	44.56^{a}	45.15^{a}
CF	48.62^{b}	47.11^{b}	50.80^{a}
EE	64.51^{a}	62.18^{ab}	61.84^{b}
NFE	67.40^{b}	70.36^{a}	71.50^{a}
Nutritive value, %			
TDN	50.22^{c}	53.40^{b}	56.62^{a}
SE	26.63^{b}	31.32^{a}	32.67^{a}
DCP	1.46^{b}	4.01^{a}	4.00^{a}

Determined by difference in indirect digestion trials

^{a,b,c} Values in same row with different superscripts are significantly different (P<0.05).

The UFM showed significantly less digestibility values for OM and CF. However NFE digestion coefficient was markedly improved with UFM. The lower digestibilities observed with the UFM in comparison with the TFM might be due to the ease of the true protein to be more utilized by the microorganisms and the host than the NPN provided by the poultry excreta and/or to the higher available energy and nutrients in the TFM. Although the majority of the digestibilities of the UFM were lower than those of the TFM, the nutritive value of both was very close (Table 3) having insignificant difference. This result might be due to the higher digestibilities of CP and NFE observed with the UFM than those of the other. This approach was more clear with DCP than the TDN and SE values.

Table 3. Digestibilities and nutritive values of feed mixtures (traditional- untraditional)

Item	Feed mixture	
	Traditional (TFM)	Untraditional (UFM)
Digestion coefficient, %		
DM	64.36[a]	62.75[a]
OM	68.95[a]	65.27[b]
CP	68.57[a]	69.67[a]
CF	52.65[a]	45.95[b]
EE	66.49[b]	61.93[b]
NFE	67.38[b]	71.24[a]
Nutritive value, %		
TDN	62.92[a]	61.42[a]
SE	57.67[a]	56.36[a]
DCP	10.24[b]	12.32[a]

*Determined in direct digestion trial
a,b Values in same row with different superscripts are significantly different (P<0.05).

3- Blood characteristics

Haemoglobin was decreased (P<0.05) for animals fed URS and ARS, while it was insignificantly higher when UFM was offered (Table 4). The same decreasing trend was also found with the haematocrite values being significantly (P<0.05) lower with different NPN sources in comparison with the untreated RS group. Total protein, blood albumin and blood glubulin were lower (P<0.05) with ammonia treatment and higher (P<0.05) with UFM group. These changes were reflected on the A/G ratio, being significantly higher with urea and poultry excreta groups and insignificantly lower with ammonia group.

Table 4. Blood characteristics of buffalo calves fed the different NPN sources.

Item	Dietary treatments			
	Control (I)	Urea (II)	Amm. (III)	Excreta(IV)
Total protein, g/100 ml	8.60[b]	8.50[b]	7.74[c]	9.12[a]
Albumin, " "	4.27[b]	4.43[a]	3.66[c]	4.88[a]
Globulin, " "	4.33[a]	4.07[c]	4.08[c]	4.24[b]
A/G ratio	0.99[b]	1.09[a]	0.90[b]	1.15[a]
Urea, mg/100 ml	30.48[b]	35.00[a]	35.29[a]	34.81[a]
Haemoglobin (Hb), %	14.65[a]	12.62[b]	12.89[b]	14.40[ab]
Haematocrit (PCV),%	37.23[a]	34.12[b]	34.74[b]	35.00[b]
(GOT)IU/ml	27.46[b]	34.12[a]	34.50[a]	35.02[a]
(GPT)IU/ml	11.52[a]	10.23[b]	12.29[a]	10.89[b]

GOT Glutamic oxaloacetate transaminase , GPT Glutamic pyruvic transaminase
a,b,c Values in same row with different superscripts are significantly different (P<0.05).

Serum urea as well as GOT were higher (P<0.05) in NPN groups than the control one. Increasing the GOT values might be attributed to the altered liver activity due to the higher NPN content in the offered rations (Amin *et al.* 1980 and Silanikove and Tiomkin, 1992). Moreover, the GPT values which increased during severe hepotoxicosis cases showed slight differences among the dietary treatments. Blood metabolic profiles of buffalo calves are within the normal ranges as reported by Kaneko (1989).

4- Animal performance

a- Feed consumption

As shown in Table (5), the feed consumption was altered by different treatments. Voluntary intake was the lowest with ureated straw ($P<0.05$) and the highest with control group. No significant differences were detected in total feed intake among the control, ammonia and poultry excreta groups. It was noticed that animals fed ureated straw consumed 33% more straw on DM basis than the control group, while those fed ammoniated straw consumed 54% more straw than the control. Improving the consumption of ureated and ammoniated straws might be related to: a) The restricted feeding of concentrate, and/or b). The positive effect of treatments on the digestibilities. Moreover,increasing the consumption of ammoniated straw compared with ureated straw might be due to the higher digestibilities and rate of passage of the diet through the digestive tract (Sundstol *et al.*, 1978 and Herrera-Soldona *et al.*, 1982).

The dialy feed intake expressed as DM and SE per kg $W^{0.75}$ showed no significant differences among the experimental groups. Animals fed untraditional feed mixture showed higher DCP intake than the others which might be due to the higher CP content of the untraditional feed mixture. The lowest intake of DCP/Kg $W^{0.75}$ was noticed with animals fed ureated straw plus traditional feed mixture (group II)

b- Daily gain

The daily live body weight gain ranged from 0.716 kg for group II to 0.815 kg for group III. No significant differences were found in daily gain between the control group (I) and either groups II or IV. Differences among groups II, III and IV were significant ($P<0.05$). Animals fed ammoniated straw (group III) showed the highest ($P<0.05$) value of daily gain. Results indicated that incorporation of dried poultry excreta at the rate of 20% in the feed mixture resulted higher daily gain than the control and urea groups. Moreover, reducing the concentrate mixture offered to animals with ammoniated straw offered *ad.lib.* showed satisfactory results.

c- Feed conversion

Values in Table (5) illustrated that the highest efficiency of energy utilization was found with ammonia group (III) followed by urea group (II), then by untraditional feed mixture group (IV) being superior to the control group (I). Efficiency of CP utilization was the highest in group III followed by group II, then group I.

5- Economical evaluation of NPN rations

Results in Table (6) elucidated that the cost of producing one kg live weight gain was the highest in the control group.

It is obvious that offering NPN rations was accompanied by a remarkable reduction in the cost of feeds required to produce 1 kg live body gain. The feed cost decreased by 18% with urea group (II), 22% with ammonia group (III) and 21% with poultry excreta group (IV) comparing with the control group (I).

Therefore, it could be concluded that ammonia, urea or dried poultry excreta as alternative NPN sources might be successfully used in fattening buffalo calves to improve the utilization of poor quality roughges, ameliorate the shortage in protein concentrtes, alleviate the environmental pullution sources and finally to minimize feed costs.

Table 5.Performance of buffalo calves fed rations containing different NPN sources

Item		Dietary treatments			
		Control(I)	Urea (II)	Amm.(III)	Excreta(IV)
a) Body weight gain:					
Initial weight,kg		362.2	357.8	357.0	360.4
Final weight, kg		431.6	425.8	434.4	433.2
Total gain, kg		69.4	68.0	77.4	72.8
Daily gain, g		731^{bc}	716^{c}	815^{a}	766^{b}
b) Daily feed intake, kg					
Feed mixture					
Traditional	As fed	8.909	6.596	6.662	–
	DM	7.938	5.877	5.936	–
Untraditional	As fed	–	–	–	8.814
	DM	–	–	–	7.936
Rice straw			–	–	
Untreated	As fed	3.884	–	–	3.688
	DM	3.460	5.525	–	3.285
Ureated	As fed	–	4.584		–
	DM	–	–		–
Ammoniated	As fed	–	–	7.057	–
	DM	–	–	5.336	–
Total DM intake		11.398^{a}	10.461^{b}	11.272^{a}	11.221a
c)Daily nutrient intake/kg $W^{0.75}$		0.120^{a}	0.112^{a}	0.118^{a}	0.118^{a}
DM, kg		0.058^{b}	0.052^{a}	0.054^{a}	0.056^{a}
SE, kg		9.11^{b}	8.38^{bc}	8.63^{b}	10.80^{a}
DCP, g					
d) Feed conversion,		15.59^{a}	14.61^{b}	13.83^{c}	14.65^{b}
kg DM/kg gain		7.52^{a}	6.74^{bc}	6.34^{c}	6.98^{ab}
kg SE/kg gain		1.18^{b}	1.10^{b}	1.0^{c}	1.34^{a}
kg DCP/kg gain					

a,b,c Values in same row with different superscripts are significantly different ($P<0.05$).

Table 6. Economical evaluation of tested rations containing different NPN sources.

Item	Dietary treatments			
	Control (I)	Urea (II)	Amm. (III)	Excreta(IV)
Price of feed intake*, L.E.				
Feed mixture:				
Traditional	4.28	3.17	3.20	--
Untraditional	--	--	--	3.53
Rice straw:				
Untreated	0.20	--	--	0.19
Ureated	--	0.44	--	--
Ammoniated	--	--	0.78	--
Feed cost/daily gain, L.E.	4.48	3.61	3.90	3.72
Feed cost/kg gain, L.E.	6.13	5.04	4.79	4.86

Feed prices (L.E./ton) at 1993 were: 480 traditional feed mixture, 50 rice straw, 500 urea, 250 molasses, 150 dried poultry excreta and 40 for ammonia treatment of one ton straw.

REFERENCES

Abd El-Gawad, A.M., 1995. Applied feeding of different nitrogen sources for beef production under small farmer conditions. J. Agric. Sci., Mansoura Univ., 20:2131.

Amin, M.M.; M.T. El-Sherif and A.A. El-Saifi, 1980. Studies on some enzymatic activities and metabolic changes in urea soybean fed lambs.Pakistan J.of Biochem., Vol. XIII, 2.

Ammerman, C.B.; J.Verde Gladys,J.E. Moore; W.C. Burnes and C.F. Chicco, 1972. Biuret, urea and natural proteins as nitrogen supplements for low quality roughages for sheep. J. of Amin. Sci., 35:121.

A.O.A.C., 1980. Official Methods of Analysis, (13th Ed.) Association of Official Agricultural Chemists, Washington, D.C. USA.

Conlombe, J.J. and L.Favreau, 1963. A new semi-micromethod for colorimetric determination of urea. J. Clin. Chem., 9:102.

Drupt, F., 1974. Determination of serum albumin. Pharm. Biol., 9:777.

Gornall, A.G.; C.J.Bardawill and M. David, 1949. Determination of serum protein by mean the biuret reaction. J. Biol. Chem., 177:751.

Hamblin, D.C. 1980. Commercially processing and selling poultry waste as a feed ingredient. J. of Anim. Sci., 50:342.

Herrera-Saldana, R.; D.C. Church and R.O. Kellems, 1982. The effect of ammoniation treatment on intake and nutritive value of wheat straw. J. of Anim. Sci., 54:603.

Horton, G.M.J., 1979. Feeding value of rations containing non-protein nitrogen or natural protein and of ammoniated straw for beef cattle. J. Animal Sci., 48:38.

Huber, J.T., H.F. Bucholtz and R.L.Boman, 1980. Ammonia versus urea treated silages with varying urea in concentrate, J. Dairy Sci., 63:76.

Kaneko, Jiro J., 1989. Clinical biochemistry of domestic animals. 4th Ed. Academic Press, Inc. San Diego, California, USA.

Reitman, S. and S. Frankel, 1957. A colorimetric method for determination of serum glutamic oxaloacetic and glutamic pyruvic transaminases. Amer. J. Clin. Path., 28:56.

Silanikove N. and D. Tiomkin, 1992. Toxicity induced by poultry litter consumption : effect on measurements reflecting liver function in beef cows. Anim. Prod. 54:203.

Snedecor, G.W. and W.G. Cochran, 1980. Statistical Methods. 7th Ed. Iowa State Univ. Press, Ames.

Smith, L.W. and W.E. Wheeler, 1979. Nutritional and economic value of animal excreta. J. Anim. Sci., 48:144.

Sundstol, F.; E. Coxworth and D.W. Mowat, 1978. Improving the nutritive value of straw and other low quality roughages by treatment with ammonia. World Anim. Rev., 26:13.

Van Kampen, E.J. and W.G. Zijlstra, 1961. Standardization of haemoglobinmetry II. The haemoglobin cyanide method. Clin. Chem. Act., 6:538.

Wintrobe, M.M.; L.C.Rich; D.R.Boggs, T.C. Bithell; J.W. Athemus and J. foerster, 1976. Clinical haematology. 7th Ed. Lea and Reibger Philadephia, USA.

التسمين الاقتصادى لعجول الجاموس بإستخدام مصادر مختلفة من الازوت غير البروتينى

محمد أحمد حنفى [١] ، عبدالرحمن محمود عبدالجواد [١] ،خالد محمود موسى [٢]

١- قسم الانتاج الحيوانى - كلية الزراعة - جامعة القاهرة، ٢- وزارة الزراعة - جمهورية مصر العربية

أجريت تجربة تغذية تطبيقية (٩٥ يوما) بإستخدام عشرون عجل جاموس(متوسط أوزانها ٣٦٠ كجم) مقسمة الى أربع مجموعات لمقارنة تأثير التغذية بإستخدام مصادر أزوتية غير بروتينية مختلفة (اليوريا - غاز الامونيا-زرق الدواجن) على استجابة التسمين والكفاءة الاقتصادية للانتاج . وقد غذيت الحيوانات على:

١-قش ارز غير معامل للشبع + علف مخلوط تقليدى (لايحتوى علـى زرق دواجـن) بمعدل ٢٪ من وزن الحيوان.

٢- قش أرز معامل باليوريا للشبع + علف مخلوط تقليدى بمعدل ٥ر١٪ من وزن الحيوان.

٣-قش أرز معامل بالامونيا للشبع + علف مخلوط تقليدى بمعدل ٥ر١٪ من وزن الحيوان.

٤-قش أرز غير معامل للشبع + علف مخلوط غير تقليدى (يحتوى على زرق دواجـن) بمعدل ٢٪ من وزن الحيوان.

وفى نهاية التجربة التطبيقية أجريت خمس تجارب هضم وقدرت بعض القياسات للدم .أدت معاملة قـش الارز باليوريا والامونيا الى زيادة محتواه من البروتين الخام كما تحسنت معاملات الهضم لمعظم مركباته الغذائية . وكان لاستخدام زرق الدواجن فى العلف غير التقليـدى أثره فـى زيـادة محتـواه مـن البـروتين الخام ولكنه لم يحدث تأثيرا ايجابيا على معظم معاملات الهضم فيمـا عـدا هضـم المستخلص الحـالى مـن الازوت . كانت القيمة الغذائية كمجموع مركبات.غذائية مهضـومة ومعادل نشا وبروتين خام مهضوم لقش الارز غير المعامل والمعامل باليوريـا أو الامونيـا هـى ٢٢ر٥٠، ٦٣ر٢٦، ٤٦ر١٪ و ٤ر٥٣، ٣٢ر١٣١، ١٠ر٤٪ و ٦٢ر٥٦، ٦٧ر٣٢، ٠ر٤٪ بـالترتيب . بينمـا أظهـر العلـف المخلـوط غـير التقليـدى ارتفاعـا معنويا فى البروتين الخام المهضوم وانخفاضا غيرمعنويا فى معادل النشـا ومجمـوع المركبـات الغذائيـة المهضومة بالمقارنة بالعلف التقليدى . وقد سجلت الحيوانات متوسط زيادة يوميـة فـى وزن الجسـم الحـى مقدراها ٧٣١، ٧١٦، ٨١٥، ٧٦٦ جم للمجاميع ١، ٢، ٣ و ٤ بالترتيب . وكانت جميـع قياسـات الـدم فـى حدود ها الطبيعية على الرغم من وجود بعض التغيرات فى بعض القياسات نتيجة للتغذية على ازوت غـير بروتينى. وقد أوضحت النتائج أن تكلفة الغذاء لانتاج ١ كجم زيادة فى وزن الجسم الحى قد انخفضت بنسـبة ١٨٪ ، ٢٢٪، ٢١٪ للمجاميع الثانية والثالثة والرابعة على الترتيب بالمقارنة بالمجموعة الاولى (مجموعـة المقارنـة) وبالتالى فانه من الافضل إقتصاديا وغذائيا إستخدام مصادر الازوت غير الـبروتينى المختلفـة فى علائق تسمين عجول الجاموس .