BIOLOGICAL PERFORMANCE AND ECONOMIC INDICATORS OF FATTENED BALADI BULLOCKS UNDER TWO FATTENING SYSTEMS

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SUMMARY

This study aimed at comparing between two fattening systems considering feeding type as a fixed effect. Ten Baladi bullocks were divided into two similar groups (G) with an average body weight (BW) of 243 and 247 kg for G1and G2, respectively. Bullocks of G1 were fed on 100% concentrate feed mixture (CFM), while in G2 75 % of CFM was replaced by maize silage. Animals were kept tied, fed individually and offered water thrice daily. Growth, carcass and economic traits of the two groups were studied. Animals were weighed bi-weekly to characterize growth features up to reaching the target weight of 430 kg. By the end of the experiment bullocks were slaughtered to estimate carcass traits. Total variable costs, total income, gross margin, benefit/ cost ratio and cost of 1kg gain were calculated.

Growth curve of G1 and G2 was consistent up to the 10th wk of fattening period, thereafter, BW tended to be higher in G1. Fattening period (252.0 ± 6.7 day) of G2 increased (P< 0.001) by 25.1 % more than G1 (201.4 ± 6.7 day), while ADG of G1 was higher (0.96 ± 0.03 kg, P< 0.001) than of G2 (0.72 ± 0.03 kg). Feed conversion was better (P<0.01) in G1 (8.2 ± 0.4 kg/1 kg gain) than in G2 (9.9 ± 0.4 kg/1kg gain). No difference was observed concerning carcass traits of the two studied groups.

Total variable cost of G1 was higher (P<0.02) than of G2 by 7.1 %, meanwhile no difference was found in total income. Benefit / cost ratio was higher (P<0.04) in G2 (1.16 ± 0.4) than in G1 (1.1 ± 0.4). Also, lower (P<0.02) cost of producing 1 kg gained weight in G2 (L.E 9.3 ± 0.4) was recorded compared to G1 (L.E. 11.0 ± 0.4).

In conclusion replacing concentrate feed mixture up to 75 % with maize silage had a positive impact on benefit/cost ratio of Baladi bullocks under Egyptian condition.

Keywords: Baladi bullocks, feeding, growth, carcass, and economic indicators

INTRODUCTION

In Egypt, feedlot system represents the main source of fattened Baladi or buffalo calves. This system relies on feeding calves on concentrate mixture, which represents the major variable of running costs (86 to 93 %) (Alsheikh *et al.,* 2004 and El-Asheeri, 2008). Minimizing the cost of input under this system is a way to keep feedlots profitable, under the global increase in cereal price.

Average daily gain (ADG) is an indicator of genetic makeup and calf's capacity of feed conversion. Many trials conducted to estimate ADG of Baladi calves reported a wide range of 600 – 1228 g (Askar and Ragab, 1958; Kamer *et al.,* 1961*;* Galal *et al.,* 1973; Omar *et al.,* 1993; Sadek *et al.,* 1993, El-Bedawy *et al.,*1996, Alsheikh *et al.,* 2004, El-Bedawy *et al.,*2004 and El-Asheeri, 2008). ADG is reported to be a determinant factor of farm profitability (Amal El-Asheeri, 2008), which comes in consensus with the finding of Nigm *et al.* (1984) reporting that feed conversion is the main factor influencing farm profitability.

Limited studies aimed at manipulating feeding types to replace concentrate feed ixture. Many trials (Mader *et al.,* 1991; Sami *et al.,* 2004; Kirkland *et al.,* 2005; and Cozzi *et al.,* 2005) fed beef breeds on corn silage only and reported ADG between 0.92 and 1.4 kg. Young *et al.* (1978); Karadjoli *et al.* (1983) and Rossi and Loerch (2001) replaced part of concentrate feed mixture with maize silage (25 – 85 %). They reported close ADG between studied groups, however calves fed on maize silage spent longer fattening period to reach the target weight. El-Bedawy *et al.* (1996 & 2004) on their study on Baladi calves added protected fat to fattening rations to increase energy intake. The authors reported no difference in ADG between the control and treated groups (1024-1097 g). Feeding on maize silage is recently adopted by animal producers to minimize feeding costs. Studies of Wand & McEwen (2003) and Sewell & Wheaton (1993) reported good nutritive value of maize silage however. No studies are available to determine the economic return of feeding on maize silage on growth performance and benefit / cost ratio under Egyptian conditions.

The present study was designed to compare between two feeding types for fattening Baladi bullocks.

MATERIALS AND METHODS

Animals and management

The present study was carried out during the period from April to December 2007 in the Fattening Research Unit, Agriculture Experimental Station, Faculty of Agriculture, Cairo University, Giza, Egypt. A total of 10 Baladi (local) bullocks (*Bos indicus*) were purchased from the local market. Animals were diagnosed as free from diseases and treated upon purchasing against internal and external parasites. Animals were housed in a semi open yard and kept tied throughout the experimental period. Animals were watered thrice daily, while feed allowances based on NRC (1996) requirement were offered twice daily.

Animals were divided into two similar groups (n=5) and initial body weight (BW) (Table 2). Feeding requirements of the 1st group (G1) were covered by concentrate mixture and rice straw, while in the 2nd one (G2) 75% of the concentrate mixture requirement was replaced by maize silage. Feed stuffs were chemically analyzed according to A.O.A.C. (2000) (Table 1). Feed intake was estimated daily and BW was recorded bi-weekly throughout the experimental period that ended up when animals reached BW of 430 kg.

At the end of the experiment calves were weighed (FBW) and slaughtered, according the Halal rules, after fasting period of 16 hrs. After bleeding, calves were skinned, eviscerated and sectioned down through the vertebral column into two halves. Rib cut (9, 10 and 11th ribs) was separated from the left side and area (cm^2) of

the fresh section of *Longissimus dorsi (L dorsi)* (9th rib) was estimated by a planimeter. Rib cut was weighed and after chilling at 4°C for 24 h it was dissected into bone, lean and fat. After deboning the carcass, boneless meat were weighed.

Table 1. Chemical composition of feed stuffs

Items	Concentrate mixture	Maize silage	Rice straw
Dry matter (%)	92	34	90
Crude protein (%)	15	8.0	3.5
Ether extract (%)	4.4	6.1	1.0
Crude fiber (%)	9.2	16.0	40
NFE (%)	62.1	60.9	50
Ash (%)	9.3	9	6.0

Table 2. Growth performance (LSM ± S.E) of Baladi bullocks fattened on 100% concentrate feed mixture (G1) and on 25% concentrates feed mixture plus 75% maize silage (G2)

Item	G1	G2	± S.E	*P value*
Number of animals	5	5		
Initial body weight (kg)	243	247	4.2	0.5
Final body weight (kg)	437.4	428.8	3.9	0.2
Average daily gain (kg)	0.96	0.72	0.03	0.001
Fattening period (day)	201.4	252	6.7	0.001
Dry matter intake (kg/day)	7.9	7.1	0.1	0.0004
Feed conversion (kg DMI/ kg gain)	8.2	9.9	0.4	0.01

Measurements
1. Biological and carcass traits
    In addition to the biological parameters (growth curve; ADG and feed conversion); physical components of the rib cut (bone%, fat% and lean%), dressing% and boneless meat% were calculated as carcass measurements.

2. Economic indicators
 • Running cost (L.E)   = Costs of feeding, labor and veterinary care
 • Total variable cost (L.E)   = Running cost + Purchasing price of calves
 • Total outputs   (L.E)   = Selling price + manure price
 • Benefit /cost ratio (L.E)   = Total income / Total variable cost
 • Gross margin (L.E)   = Total outputs – Total variable cost
 • Cost of producing 1 kg gain (L.E) = Total running cost / total gain (Omar *et al.,* 1993)
 • Dressing %   = carcass weight / FBW multiplied by 100
 • Boneless meat %   = Meat weight / FBW multiplied by 100

Technical Coefficients
  Prices of year 2007 were used as follows:
   • Concentrate feed mixture   = L.E 1475 /ton
   • Maize silage   = L.E 200 /ton
   • Rice straw   = L.E 110 /ton

- Purchase price   = L.E 14.5 / kg live body weight
- Selling price   = L.E 13.75 / kg live body weight
- Manure price   = L.E 15.0 / m3
- Veterinary care cost   = L.E 30 / animal
- Casual labor cost   = LE 20 /50 head/ day

Statistical analysis

Data were statistically analyzed according to SAS (2001). Data in percentages were transformed to the arcsine square–root in an effort to normalize the error analysis, using the following models:

$$Y_{ij} = \mu + T_i + e_{ij}$$

where

Y_{ij} =the measured trait

μ = the overall mean

T_i = effect of feeding types (T= 1,2; 1= fed on 100 % concentrate feed mixture and 2= fed on 25% concentrate feed mixture plus 75 % maize silage)

e_{ij}= random error

RESULTS AND DISCUSSION

1. Growth performance and related aspects

The obtained results indicated that up to the 10th week of fattening period, there was no difference between G1 and G2 in their growth curves. With the beginning of the 12th week body weight of G1 tended to be higher and the difference between the two groups increased with time. Low ADG of G2 increased the fattening period required to reach the target BW relative to G1. ADG reached its peak between week 8 and 12 in G1, while the corresponding peak of G2 was between week 16 and 24 (Figure 1).
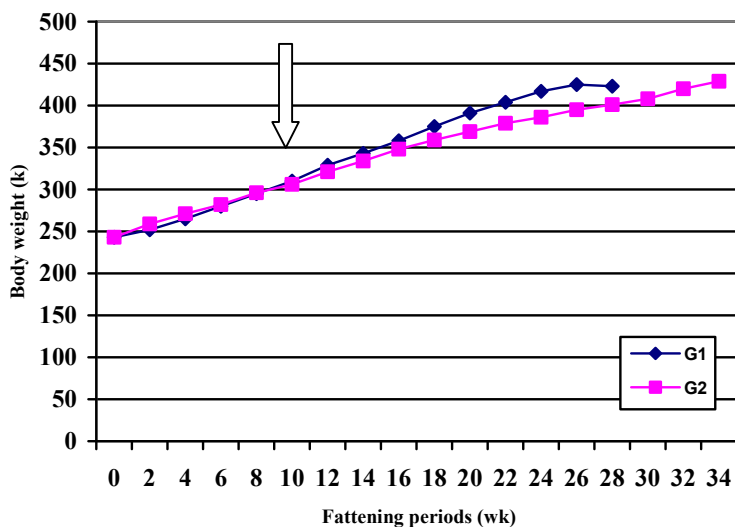
Overall mean ADG of G1 increased by 33% (P< 0.001) than that of G2 (0.96 *vs.* 0.72 kg). This is because of feed conversion of G1 was less (P<0.01) than that of G2 by 1.7 kg DMI. This consequently shortened (P< 0.001) fattening period of G1 by 23.4% than of G2 (Table 2).

2. Carcass traits

Carcass traits (dressing %, boneless meat %, rib components, *L. dorsi* area and expletive fat weight) of slaughtered Baladi bullocks showed non significant difference between G1 and G2 (Table 3). This most probably attributed to non significant difference in FBW of the two studied groups (Table 2).

3. Economic indicators

Total variable cost of G2 was less (P<0.02) than that of G1 by L.E 374. However, no significant difference was observed in total outputs between the two studied groups. Benefit / cost ratio of G1 was higher (P<0.05) than that of G2 by 15 %. This is due to the low cost of producing 1 kg gained weight (P< 0.02) in G2 than in G1 by 15.5%. Feeding cost represented 94.8 (P<0.001) in G1 *vs.* 92.3 % for G2, respectively out of the running cost (Table 4).

ADG (Kg)	Group	0 – 8	8-16	16-24	24-34
	G1	0.873	1.040	1.000	-
	G2	0.817	0.858	1.000	0.723

Figure 1. Growth curve of Baladi bullocks fattened on 100% concentrate feed mixture (G1) and on 25% concentrate feed mixture plus 75% maize silage (G2)

Table 3. Carcass traits (LSM ± S.E) of Baladi bullocks fattened on 100% concentrate feed mixture (G1) and on 25% concentrates mixture plus 75% maize silage (G2)

Item	G1	G2	± S.E	*P value*
Number of animals	5	5		
Hot carcass weight (kg)	247.9	240.0	3.9	0.2
Dressing percentage	56.7	56.0	0.7	0.6
Boneless meat (%)	47.5	46.6	0.6	0.5
Eye muscle area (cm^2)	71.1	70.0	4.5	0.9
Rib component (*9, 10, 11th*)				
Bone %	18.3	18.2	1.4	0.97
Fat %	20.1	17.1	2.3	0.4
Lean %	61.5	64.6	1.5	0.2
Expletive fat weight (kg)	26.2	23.3	3.4	0.5

Table 4. Economic traits of fattening cycle (LSM ± S.E) of Baladi bullocks fattened on 100% concentrate mixture (G1) and on 25% concentrate feed mixture plus 75% maize silage (G2)

Item	G1	G2	± S.E	*P value*
Number of animals	5	5		
Variable cost (L.E)				
Purchasing price/ animal	3520.6	3581.5	60.5	0.5
Feeding cost	2016.9	1561.9	60.04	0.001
Veterinary care cost	30	30	0.0	0.0
Labor cost	80.7	100.8	2.7	0.001
Total variable cost (L.E)	5648.1	5274.2	86.14	0.02
Outputs (L.E)				
Selling price/animal	6014.3	5896	54.05	0.2
Manure price	167.8	210.0	86.1	0.001
Total Outputs (L.E)	6182.1	6106	56	0.4
Economic traits				
Growth Margin (L.E)	534	831.8	88.7	0.04
Benefit /cost ratio	1.1	1.16	0.4	0.05
Cost of producing 1 kg gain (L.E)	11	9.3	0.4	0.02

GENERAL DISCUSSION

The obtained ADG of G1 (0.96 kg, Table 1) is so close to that recorded by El-Bedawy *et al.* (1996 & 2004), Alsheikh *et al.* (2004) and Amal El-Asheeri (2008) (0.9 – 1.02 kg), while less than that reported by Sadek *et al.* (1993, 1.04 kg). Results of Asker and Ragab (1958), Kamar *et al.* (1961) and Omar *et al.* (1993) on Baladi calves reported extremely lower ADG representing two-third (0.6 – 0.72 kg) of that obtained in the present study. This is may be due to the authors characterized ADG starting with younger ages and for longer periods than that applied in the present study. The higher ADG of G1 compared to G2 (Figure 1) is due to the lower feed intake and feed conversion of the later group (Table 2), which reflected negatively on fattening period required to reach the target final body weight. The no difference in carcass traits of G1 and G2 (Table 3) is most probably attributed to the insignificant difference between FBW of two groups.

The lower total cost / head in G2 compared to G1 (Table 4) by L.E 376 is mainly attributed to its lower feeding cost. The share of feeding (92.3 – 94.8 %) in the running cost is close to that reported by El-Asheeri (2008, 93 %), however, less than that reported by Alsheikh *et al.* (2004, 86 %). The increase in feeding cost is most probably attributed to the global increase in feed ingredients price in higher rates compared to the other in-puts components (labor and veterinary care).

In conclusion replacing concentrate feed mixture up to 75 % with maize silage has a positive impact on benefit/cost ratio of Baladi bullocks under Egyptian condition.

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الآداء البيولوجي والاقتصادي لمزارع تسمين العجول البقرى تحت نظامين للتسمين

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هدف البحث إلي مقارنة نظامين لتسمين للعجول البلدية اعتمادا على تغير النظام الغذائى. تم استخدام ١٠ عجول بقرى قسمت إلى مجموعتين (ج) متساويتين فى العدد (٥/ مجموعة) بمتوسط وزن ٢٤٧، ٢٤٣ كجم لكلٍ من ج١ و ج٢ على التوالى. تمت تغذية ج١ على مخلوط علف مركز وقش الارز. أما المجموعة الثانية فغذيت علي ٢٥ % مخلوط علف مركز بالإضافة إلي ٧٥ % سيلاج الذرة. تم حساب معدلات النمو ومكونات الذبيحة واقتصاديات التسمين لكل مجموعة. أجريت عملية وزن الحيوانات مرة كل أسبوعين خلال فترة التسمين للتعرف على خصائص النمو. وبعد وصول الحيوانات لوزن ٤٣٠ كجم تم ذبح الحيوانات لتقدير خصائص الذبيحة. شملت المؤشرات الاقتصادية حساب التكاليف الكلية، الإيرادات الكلية، العائد الصافي، نسبة العائد / التكاليف وتكلفة إنتاج ١ كجم زيادة في الوزن. وأشارت النتائج إلى:

١. كان منحنى النمو في كل من ج١ ، ج٢ متطابقين حتى الأسبوع العاشر من بداية التسمين ، أعقب ذلك زيادة في وزن الجسم في ج١. وكان معدل الزيادة يرتفع مع التقدم نحو نهاية فترة التسمين.

٢. كانت فترة التسمين أطول في ج٢ بنسبة ٢٥.١% مقارنة ج١   بمتوسط قدره ٢٥٢± ٦.٧ & ٦.٧±٢٠١ للمجموعتين ج١ ، ج٢ على التوالى.

٣. كان معدل الزيادة اليومية في ج١ أعلى (٠.٩٦±٠.٠٣ كجم) منه في ج٢ (٠.٧٢±٠.٠٣ كجم)، كان معدل التحويل الغذائي أفضل في ج١ (٨.٢ ± ٠.٤ كجم/ ١ كجم في الوزن)مقارنة ب ج٢ (٩.٩ ± ٠.٤ كجم)

٤. لم تكن هناك اختلافات معنوية في نسبة التصافي (٥٦.٧ مقابل ٥٦%) أو نسبة اللحم الخالي من العظام (٤٧.٥ مقابل ٤٦.٦%) لكل من المجموعتين تحت الدراسة .

٥. كانت التكاليف الكلية أعلى في ج١ عنها في ج٢ بمقدار ٧.١% بينما لم تكن هناك اختلافات في الإيرادات الكلية، نسبة العائد / التكاليف كانت أعلى في ج٢ (١.١٦ ± ٠.٠٤)عنها في ج١ (١.١ ± ٠.٤) ، أما تكلفة إنتاج ١ كجم زيادة في الوزن فكانت أقل في ج٢ (٩.٣ ± ٠.٤ جنيه) مقارنة ب ج١ (١١.٠ ± ٠.٤جنيه).

من الدراسة يتضح أن استبدال مخلوط العلف المركز بسيلاج الذرة في تسمين العجول البقري حتى ٧٥% من احتياجات الحيوان كان له تأثير إيجابي على عائدات مزارع تسمين العجول البقرية تحت الظروف المصرية.