PROFITABILITY OF BALADI CALF FEEDLOTS UNDER DIFFERENT FATTENING SYSTEMS

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SUMMARY

Forty Baladi male calves with body weight of 225 - 275 kg were used to study the growth traits and profitability of two fattening systems through two experiments. The aim of the 1st was to study the effect of initial body weight (BW) on feedlot profitability, while the aim of the 2nd was to study the effect of final BW on the same traits of the 1st experiment. Calves were divided into two groups (G) based on their initial BW. G1 (n=18) had BW of 240.7 ± 1.7 kg, which was lighter (P<0.0001) than G2 (G2, n=22; 260.5 ± 1.5 kg) In both groups calves were fed to a final weight of 400 kg and those did not reach this weight were allowed to grow for a maximum fattening period of 6 months in G1 and 5 months for G2. Growth traits were measured in terms of average daily gain (ADG) and fattening period, while benefit/cost ratio and net return (%) were calculated as economic ones. After the end of experiment 1, 18 calves were chosen randomly to grow up to 415 – 425 kg (C2) to be compared with the profitability of feedlot that marketing their calves at 400 kg (C1). Calves were fed based on their body weight on concentrate feed mixture, rice straw and green maize fodder, while kept tied under shed on a semi-open yard. Animals were weighed once monthly during the experimental period to monitor the changes in BW throughout the fattening period.

In the first experiment of studying the effect of initial BW the overall means of final BW and ADG were 391.6 ± 2.7 and 0.90 ± 0.02 kg, respectively with no difference between G1 and G2. This however, fattening period was shorter (P<0.0001) in G2 by about 17 days. Overall means of gross margin, benefit / cost ratio and net return/head/cycle were L.E 525.3 ± 26.1, 1.11 ± 0.008 and, 10.7 ± 0.008 % respectively with no significant difference between G1 and G2.

Results of the second experiment indicated that increase of marketing BW over 400 kg had negative effect on growth traits and feedlot profitability. ADG of C2 was less (P<0.0001) than C1 by 16 % with an average of 0.780 ± 0.03 and 0.929 ± 0.03 kg, respectively. Benefit / cost ratio, net return (%) per fattening cycle and annual net profit (%) were 1.11± 0.01 vs.1.05 ± 0.01 (P<0.005), 10.7 ± 1.3 vs. 4.95 % (P< 0.004) and 26.5 ± 2.8 vs. 9.6 ± 3.1 %, respectively.

In conclusion, initial body weight (between 225 and 275 kg) had no effect neither on growth traits nor feedlot profitability. Increasing marketing body over 400 kg decreases growth traits and feedlot profitability as well.

Keywords: Baladi cattle, growth, gain, body weight, fattening

INTRODUCTION

Beef industry depends mainly on availability of specialized genotypes in addition to natural rangelands which is not the case in Egypt. Beef production system in Egypt

depends mainly on fattening bovine Baladi, exotic breeds and buffalo male calves on concentrate feed mixture (feedlot) in two batches annually. This system is based on purchasing male calves with initial body weight of 200 - 250 kg to be fattened for six months aiming at reaching marketing weight of 400-450 Kg. Under these circumstances about 40% of the national demand of beef meat is produced (Ministry of Agriculture and Land Reclamation, 2006).

Growth pattern is influenced by genotype (Morsy *et al.,* 1984), age (Sadek *et al.*, 1993), sex (Lawrence and Fowler, 1998), season of the year (Omar *et al.,* 1993) and type and level of feeding (El-Bedawy *et al.*, 2004). On the other hand, feedlot profitability is the output of average daily gain (Omar *et al.,* 1993), economic return (Alsheikh *et al.,* 2004) and feed conversion (Nigm *et al*., 1984). Limited investigations were conducted to evaluate the economic efficiency of feedlot system in Egypt, which is characterized by highly invested capitals and gain net return of 12% per fattening cycle (Alsheikh *et al.,* 2004).

Many studies were executed to describe growth aspects of Baladi calves throughout the fattening period either at experimental (Morsy *et al.,* 1984 and Sadek *et al.*, 1993); or commercial (Ashour *et al.*, 2000, Omar *et al.,* 1993 and Alsheikh *et al.,* 2004) farm levels. The results of the previous studies showed a wide variation in average daily gain (600 - 1228 g/day) as reported by Askar and Ragab (1958); Kamar *et al.* (1961)*;* Galal *et al* .(1973); Omar *et al.* (1993); El-Bedawy *et al.* (1996), Sadek *et al.* (1993), Alsheikh *et al.* (2004) and El-Bedawy *et al.* (2004).

The great increase in the international price of yellow corn represents a real challenge for beef producers in Egypt. Thus, beef producers have to reform their producing systems towards increasing feedlot profitability.

Testing different systems of fattening Baladi calves on feedlot profitability through reforming fattening period or marketing body weight was the aim of this study.

MATERIALS AND METHODS

The present study includes two experiments and carried out in the Experimental Farm Station, Faculty of Agriculture, Cairo University, Giza during year 2006.

Experiment I

Animals and management

The aim of this experiment was to shorten fattening period by testing two different initial body weights (IBW) on the net return of feedlot. A total number of 40 Baladi male calves between 225 and 275 kg were purchased from the local market based on their phenotype, health feature and body confirmation to study the growth performance and feedlot profitability under two IBWs simulating the systems applied in commercial feedlots. Animals were purchased during June and upon receiving, they were treated against the internal and external parasites in addition to vaccination against endemic diseases. Calves were fed to a final weight of 400 kg according to NRC (1996) requirements on concentrate feed mixture, green maize fodder (15 kg/ head/ day) and rice straw. Calves were kept tied under shed on semi-open yards during the experimental period. Calves were fed individually and watered thrice daily between 08:00 and 17:00 hr.

According to the initial BW, calves were divided into two groups; the 1st group (G1= 18) had BW between 225 and 249 with an average of 240.7 ± 1.7 kg, while the 2nd group (G2=22) was heavier (P<0.0001) having BW between 250 and 275 and an average of 260.5 ± 1.5 kg. Animals were fed to reach 400 kg as final body weight, and those that did not reach the target BW were allowed to grow for 6 months in G1 and 5 months of G2. Calves were weighed monthly after 18 hrs fasting period. Growth (growth curve, ADG and fattening period) and economical traits (gross margin and benefit / cost ratio) per calf were calculated.

Experiment II:

After the end of the experiment I, the same calves (n=40) were used in the 2nd experiment. Eighteen calves (C2) were chosen randomly to grow up to 415 - 425 kg to study the impact of marketing body weight on growth and economic traits compared with those with 400 kg body weight of (C1, n=22).

Economic measurements

Fixed costs (administration, building and depreciation) were not considered assuming they are equal between the two systems of study. The economic analysis is based either on the invested capitals or running cost.

Technical coefficients

The prices in this study were based on the average prices of 2006 - 2007

1. Concentrate feed mixture = L.E 1450 / ton
2. Green maize fodder = L.E 60 / ton
3. Rice straw = L.E 109 / ton
4. Veterinary care cost = L.E 50 / head / year
5. Labor = L.E 20 / 50 heads / day
6. Purchasing price for 1 kg live weight = L.E 14.5
7. Selling price for 1 kg live weight = L.E 13.75
8. Produced manure / calf / year = 10 m^3
9. Price of manure = L.E 15 / m^3
10. Running cost = Feeding + veterinary care + labor
11. Total variable cost (LE) = Running cost + purchasing price

Experimental measurements

The following measurements were estimated as:

1. Average daily gain (ADG) = Difference between two successive weight divided by 30.5
2. Gross margin (L.E) = Total income – total variable cost
3. Benefit / cost ratio = Total income divided by total costs
4. Net return (%) = Gross margin divided by total costs multiplied by 100

Statistical analysis

Data were analyzed using the General Linear Model (GLM) procedure (SAS, 2001). Differences between means were assessed by *t* test. Data in percentages were transformed to the arcsine square–root to normalize errors before analysis. Model used was as follows:

$Y_{ij} = \mu + G_i + e_{ij}$, where,

Y_{ij}= observation

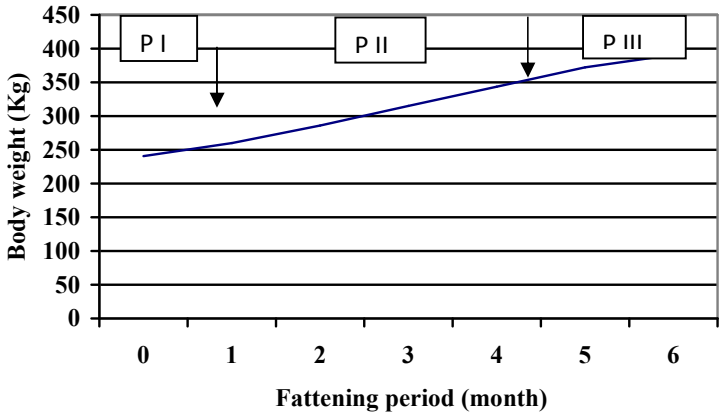
μ = mean
G_i = the effect of initial body weight, i= 1,2
G1= group with initial body weight of 225-250 kg;
G2 =group with initial body weight of 250- 275 kg.
e_{ij} = the experimental error
The same model was used to analyze the second experiment replacing C instead of G:
C_i = the effect of marketing body weight, i= 1,2
C1= group had marketing body weight of 390 - 400 kg;
C2 = group had marketing body weight of 415 - 425 kg.

RESULTS

Experiment I

1. Growth performance

Growth curve of Baladi calves under the present experimental conditions could be divided into three phases. The 1st extended for one month during which the growth curve had a semi concave shape. This shape had transformed to be linear during the 2nd phase and continued up to the 5th month, before having a semi convex shape during the 3rd phase (Figure 1).



ADG (kg)	0.59 ±0.06	0.85 ±0.05	0.96 ±0.04	0.93 ±0.04	0.94 ±0.03	0.84 ±0.06

Figure 1. Growth curve and ADG (kg) of Baladi calves throughout the growth phases of the experimental period

ADG was 0.59 ± 0.06 kg during the 1st months of fattening period reached its peak (0.96 ± 0.04 kg) by the 3rd month. ADG sustained around that value up to the 5th months before decreasing to 0.84 ± 0.06 kg during the 3rd phase (Figure 1). The overall mean of ADG was 0.90 ± 0.02 kg (Table 1).

By the end of the experiment calves reached 391.6 ± 2.7 kg through fattening period of 156.7 ± 2.4 day. The gained weight (about 140 kg) during the experimental period represents 57.6 % of the initial BW.

Table 1. Growth characteristics (LSM ± S.E) of Baladi calves as affected by initial body weight (Experiment I)

Trait	G1	G2	Overall mean	P value
Number	18	22	40	
Initial body weight (kg)	240.7 ± 1.7	260.5 ± 1.5	251.7 ± 1.1	0.0001
Final body weight (kg)	392.3 ± 3.0	390.9 ± 2.7	391.6 ± 2.0	0.727
Fattening period (day)	171.3 ± 3.9	144.9 ± 3.3	156.7 ± 2.4	0.0001
Average daily gain (kg)	0.89 ± 0.03	0.90 ± 0.03	0.90 ± 0.02	0.814
Body weight gain (kg)	151.6 ± 3.5	130.4 ± 3.2	139.9 ± 2.1	0.0001

G1 had initial B.W between 225 and 249 kg, G2 had initial B.W between 250 and 275 kg

2. Effect of initial body weight on growth and economical traits

Results in table (1) indicate that, however G2 reached the final body weight in shorter (P<0.0001) period (18 % less) compared to G1, there was no difference between the two groups concerning ADG and feed efficiency. The increase (P<0.0001) of BW gain in G1 relative to G2 (+16.3 %) is attributed to its longer fattening period.

However, fattening period was less (P< 0.0001) in G2 than in G1 by about 27 days (Table 1), in addition lower feeding (P<0.0001), and labor (P<0.0001) costs, there was no significant difference between the two groups in the total cost, total income and all economical traits (Table 2). It is worth to note that purchasing price of G2 (+ L.E 292) compensates the increase of feeding cost of G1.

Under the experimental circumstances, feeding costs represented about 93 % of the running cost, while labor and veterinary care were 4.9 and 2.1%, respectively.

Experiment II

C2 had longer (P<0.0001) fattening period (45%) and heavier (P<0.0001) marketing body weight (6.3 %) compared to C1. On the contrary, ADG was less (P<0.0007) in C2 relative to C1 by 16 % (Table 3 and figure 2). Increasing marketing BW from 392 in C1 to 417 kg in C2 had extremely negative impact on economic traits of C2.

Running costs were higher in C2 than C1 (Table 3), which resulted in an increase in total variable costs by 12.9 % relative to C1 (Figure 2). Outputs of C2 was higher (P<0.0001) than C1 by 17.5%, however gross margin (P<0.007), benefit/cost ratio (P< 0.005) and net benefit/ fattening cycle were less in C2 than C1 by 51, 5.4 and 53.3 %, respectively (Figure 2).

Fattening period of C2 reduces the expected number of fattening cycles / year compared to C1 (Table 3). This consequently reduces the annual net return per total variable cost by about 17% (26.5 vs. 9.6 % for C1 and C2, respectively).

DISCUSSION

Slow growth pattern during the 1st phase of growth curve is most probably attributed to the physiological reaction of the calves to new managerial practice (micro-environment and management system) compared to that applied at small farm level. Changing growth curve during the 2nd phase is referred to the compensation of growth of calves after adaptation to the new managerial practices. Decreasing ADG

during the 3rd phase agrees with the finding of Omar *et al.* (1993), and could be explained by reaching calves to sexual maturity stage (Payne and Wilson, 1999).

Table 2. Economic traits (per head) (LSM ± S.E) of Baladi calves as affected by initial body weight (kg), (Experiment I)

Traits	G1	G2	Overall mean	*P value*
Number	18	22	40	
Input (L.E)				
Calf	3488.3±21.5	3780.7±19.5	3649.2±14.4	0.0001
Feeding	1305.0±34.3	1089.8±31.0	1186.7±23.0	0.0001
Labor	68.6±1.44	57.8±1.30	62.7±0.97	0.0001
Veterinary	25	25	25	0.0
Total variable cost	4886.7±39.2	4953.2±35.4	4923.3±26.3	0.126
Outputs (L.E.)				
Manure	70.5±1.5	59.4±1.4	64.4±0.99	0.0001
Calf's selling price	5392.4±38.6	5377.6±34.9	5384.3±25.9	0.811
Total outputs	5462.9±40.8	5436.9±36.9	5448.7±27.5	0.22
Economic traits				
Gross margin (L.E)	576.1±38.9	483.7±35.2	525.3±26.1	0.200
Benefit/ cost ratio	1.12±0.009	1.10±0.008	1.11±0.008	0.161
Expected annual return*				
Fattening cycles/yr **	2.1	2.5	2.3	
Return / cycle (%)	11.8±0.009	9.8±0.008	10.7±0.008	0.179
Return / year (%)***	24.8	24.5	24.8	

* Calculated as number of animals / batch = 50 heads
** Calculated as 365 day divided by fattening period.
*** Calculated as the number of expected fattening cycle / year multiplied by net return / cycle

ADG (900 g, Table 1) obtained in the present study is less than that reported by Sadek *et al.* (1993), El-Bedawy *et al.* (1996 & 2004) and Alsheikh *et al.* (2004) (1024 – 1228 g), and higher than that reported by Askar and Ragab (1958); Kamar *et al.* (1961) and Omar *et al.* (1993) (600 -747 g). Meanwhile, the present result is in accordance with that reported by Galal *et al.* (1973) (881.0 g). Differences in age, management practices and season of growth may be the main reasons of variation in recorded ADG among the previous studies.

The non-significant difference in growth traits of G1 and G2 is most probably attributed to the narrow difference in the initial body weight (about 20 kg, Table 1) and equal marketing body weight. The non-significant difference between G1 and G2 concerning the studied economic traits, is due to the no difference between intput and outputs.

Benefit / cost ratio and annual net return of G1 and G2 (Table 2) indicated that initial body weight of 225 - 275 kg with fattening period of 5 - 6 months had no effect on the profitability of feedlot.

Decreasing ADG with age progress (in experiment II) is due to reaching calves of C2 the sexual maturity after which animals need more energy to gain 1 kg live body weight (Lawrence and Fowler, 1998). This biological phenomenon is previously recorded as a result of turning physiological activity towards fat deposition (Lawrence, and Fowler, 1998).

Increasing feeding cost of C2 (due to the lower ADG) is the main factor that reduces the benefit / cost ratio, and gross margin. The obtained net return / fattening cycle in G1 (11.8 %, Table 2) or in C1 (10.7 %, table 3) is close to that reported by Alsheikh *et al.* (2004, 12 %) under commercial farm condition. The drastic decrease in number of expected fattening cycles and annual net return / year of C2 (Table 3) draw the attention to that increasing marketing body over 400 kg minimizes feedlot profitability. This trend is close to that reported by El-Asheeri *et al*. (2008).

In conclusion initial body weight (between 225 and 275 kg) and marketing body weight around 400 kg are the better to maximize feedlot return under Egyptian conditions.

Table 3. Growth performance and economic traits (LSM ± S.E) of Baladi calves as affected by marketing body weight (Experiment 2)

Traits	C1	C2	P Value
Number of calves	22	18	
Growth characteristics			
Fattening period (day)	151.1 ± 5.4	219.2 ± 6.0	0.0001
Marketing body weight (kg)	392.6 ± 2.2	417.4 ± 2.5	0.0001
Average daily gain (kg)	0.93 ± 0.03	0.78 ± 0.03	0.0007
Economical characteristics			
Iutput (L.E)			
Calves	3674.7 ± 38.2	3617.8 ± 42.3	0.32
Feeding	1178.0 ± 50.9	1841.7 ± 56.3	0.0001
Labor	60.5 ± 2.2	87.7 ± 2.4	0.0001
Veterinary care	25.0 ± 0.6	32.6 ± 0.6	0.0001
Total variable cost (L.E)	4937.9 ± 58.8	5577.0 ± 65.1	0.0001
Outputs (L.E)			
Manure	62.1 ± 2.2	90.1 ± 2.5	0.0001
Calf's selling price	5397.6 ± 31.4	5740.0 ± 34.7	0.0001
Total Outputs (LE)	5459.7 ± 31.4	5830.0 ± 34.7	0.0001
Economic traits			
Gross margin (L.E)	521.8 ± 63.1	252.9 ± 69.7	0.007
Benefit / cost ratio	1.11 ± 0.01	1.05 ± 0.01	0.005
Expected annual return*			
Number of fattening cycles/ year**	2.4	1.7	
Net return / cycle (%)*	10.7 ± 1.3	4.95 ± 1.4	0.004
Net return / year (%) ***	26.5 ± 2.8	9.6 ± 3.1	0.0003

C1: Claves that allowed to grow up to 400 kg
C2: Claves that allowed to grow between 415and 425 kg
* Calculated based on the total variable cost
** Calculated as 365 day divided by fattening period.
*** Calculated as the number of expected fattening cycle / year multiplied by net return / cycle

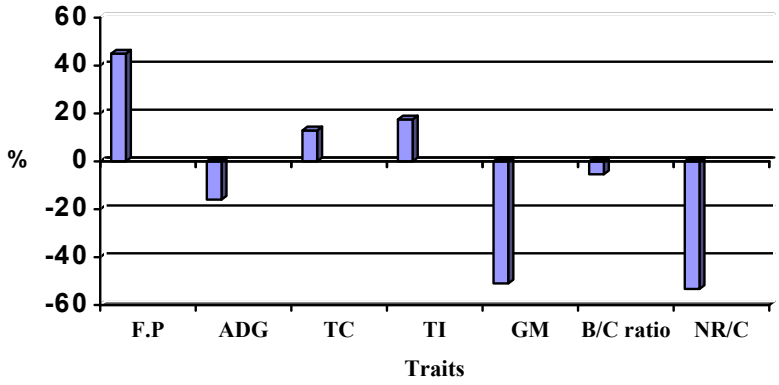


Figure 2. Change (%) in growth (fattening period, FP and ADG) and economic (TC= total cost; TI, total income, GM= gross margin, B/C ratio= benefit / cost ratio and net return / cycle) of C2 relative to C1

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أربحية تسمين العجول البلدية تحت نظم تسمين مختلفة

آمال كمال العشيرى

قسم الإنتاج الحيوانى- كلية الزراعة- جامعة القاهرة- الجيزة- مصر

تم استخدام ٤٠ عجل بقرى أوزانها بين ٢٢٥- ٢٧٥ كجم لدراسة خصائص النمو وأربحية نظامين للتسمين من خلال تجربتين. هدفت الاولى لدراسة تأثير وزن العجول عند بداية التجربة على اربحية عملية التسمين ، وفيها تم تقسيم العجول الى مجموعتين اعتماداً على وزن الجسم عند بداية التجربة. الاولى (ج١) تضمنت ١٨ عجل بمتوسط وزن ٢٤٠.٧ ± ١.٧ كجم بينما كان عدد العجول فى المجموعة الثانية (ج٢) =٢٢ عجل بمتوسط وزن ٢٦٠.٥ ± ١.٥ كجم وكان الفرق فى الوزن بين المجموعتين معنوى على مستوى (٠.٠٠٠٠١) تمت تغذية العجول حتى وزن ٤٠٠ كجم ، وتم استكمال مدة التسمين للعجول التي لم تصل للوزن المستهدف لفترة أقصاها ٦ شهور ل ج ١ و ٥ شهور ل ج٢ . تم أعتبار متوسط الزيادة اليومية (ADG) و طول فترة التسمين ك مقاييس للنمو بينما صفات قيمة العائد/ التكاليف، % للعائد الصافى كمقايس اقتصادية. بعد انتهاء التجربة الأولى ثم اختيار ١٨ عجل بصورة عشوائية وتركت تنمو حتى وزن جسم يتراوح بين ٤١٥-٤٢٥ كجم (س2) وذلك لدراسة تأثير الوزن النهائى على أربحية مزارع التسمين مقارنة بالمجموعة السابقة النى تم تسويقها على وزن ٤٠٠ كجم (س١). تم تغذية الحيوانات على مخلوط العلف المركز ١٤ % بروتين إضافة للدراوة وقش الارز على اساس وزن الجسم. أثناء التجربة كانت الحيوانات مربوطة فى عنابر شبة مفتوحة ، وكان يتم وزن الحيوانات شهرياً خلال فترة التجربة لحساب التغير فى وزن الجسم . وكانت أهم النتائج:

١. كانت متوسط الوزن النهائى و معدل الزيادة اليومية فى الوزن حوالى ٣٩١.٦± ٢.٧ كجم ، ٠.٩٠ ± ٠.٠٢ كجم على الترتيب ، ولم يكن هناك فرقا معنويا بين ج١ و ج٢ وإن كانت فترة التسمين أقصر فى ج٢ بحوالى ١٧ يوم.
٢. كان متوسط العائد بالجنية ، نسبة العائد / التكاليف ، العائد الصافى / الرأس / الدورة هو ٥٢٥.٣ ± ٢٦.١ جنية، ١.١١ ± ٠.٠٠٨ ، ١٠.٧ ± ٠.٠٠٨ % على الترتيب ولم يكن الفارق معنوى بين ج١ و ج٢
٣. أشارت نتائج الجزء الثانى من التجربة أن زيادة وزن التسويق عن ٤٠٠ كجم كان له تأثير سلبى على مظاهر النمو وأربحية المزرعة.
٤. كان متوسط الزيادة اليومية فى س٢ أقل من فى س١ بحوالى ١٦ % بمتوسط قدرة ٠.٧٨٠ ± ٠.٠٣ ، ٠.٩٢٩ ± ٠.٠٣ كجم على الترتيب.
٥. كانت نسبة العائد / التكاليف ، % للعائد الصافى لدورة التسمين وكذلك % للعائد السنوى فكانت القيم ١.١١ ± ٠.٠١ مقابل ١.٠٥ ± ٠.٠١ على مستوى (٠.٠٠٥) ، ١٠.٧ ± ١.٣ مقابل ٤.٩٥ ± ١.٤ % على مستوى (٠.٠٠٤) ، ٢٦.٥ ± ٢.٨ مقابل ٩.٦ ± ٣.١ على التوالى.

والخلاصة ان استخدام العجول البقرى على وزن بداية يتراوح بين ٢٢٥-٢٧٥ كجم لم يكن له تأثير معنوى سواء على خصائص النمو أو على أربحية مزارع التسمين ، بينما زيادة وزن التسويق لأعلى من ٤٠٠ كجم يؤثر سلباً على خصائص ومعدلات النمو ويقلل من أربحية مزارع التسمين .