

RELATIONSHIP BETWEEN BODY CONDITION SCORES AND SOME ECONOMIC TRAITS IN JENUBI COWS.

T.Y. Petrus

Department of Animal Resources, College of Agriculture, University of Baghdad, Iraq.

(Received 20-1-2008, Accepted 27-8-2008)

SUMMARY

Thirty two Jenubi cows were used to study the relationship between body condition scores at drying – off and at calving with 8 – weeks of milk yield , 16 weeks of milk yield and peak milk yield at Salman pack area. Cows were fed a concentrate diet at a daily rate through drying off and lactation period, and cows were given an access to pasture in addition to wheat-straw as well. Milk yield was recorded twice a day for each cow.

The SAS program was used to study the effect of body condition score on milk yield and peak milk yield. Duncan test was used to compare the significant different between means.

Condition score at drying off and at calving showed significant relationship with 8 weeks of milk yield and 16 weeks of milk yield ($P < 0.01$). Similar significant relationship between body condition score and peak milk yield was found. Cows at average body condition score of 3 – 3.25 had the most effect on milk yield and peak milk yield. These results suggest that body condition score could be used to monitor and manage the productive status of Jenubi herds.

Keywords: body condition score, Jennubi cows, economic traits.

INTRODUCTION

Energy balance in dairy cattle can be defined as the differences between energy intake and energy requirements for milk yield and maintenance. The energy is mostly negative in early lactation (Berglund and Danell, 1987), which can result in a considerable mobilization of body adipose (Tamminga *et al.*, 1997). Energy reserves in the dairy cow are stored as lipid in adipose tissue (such as body condition) and support, during the first month of lactation, about 33 % of milk production (Bauman and Currie, 1980). This led to the requires of a simple and reliable measure of the level of body reserves of live animal.

Until the 1970^s, there has been no standard system of assessing and describing body reserves or body condition in cattle for use in the practical farm situation (Stockdale, 2001). In the UK, the east of Scotland College of Agriculture (ESCA) has developed an Australian technique which enables the body condition of individual cows to be assessed on 1 to 5 scale. Cows body condition score (BCS) of 1 are extremely thin and cows at BCS of 5 are excessively fat (ESCA ,1976). Then many systems has established around the world to assist the body condition .

Much of the information relating BCS to milk yield is based on studies conducted in the UK. Those studies utilized small numbers of cows, and breeds and management strategies were different from those in the United States. In a review of research from the UK a suggestion was made that the relationship between BCS and milk yield was variable and that cows with higher BCS generally lost more body condition during lactation (Gransworthy, 1988). Waltner *et al.* (1993) suggested that BCS was related to milk production of 3.5 % FCM at 90 days of lactation. Petrus (1981) found a significant relationship between milk yield and BCS and a significant relationship as well between milk yield and BCSD .

Berry *et al.* (2007) studied relationship among BCS and milk yield production in Irish Holstein-Friesian spring calving dairy cows. Significant associations were observed among BCS and milk yield production. Moreover Land and Leaver (1980) found that cows calving at BCS of 3 produced 9 % more milk during the first 16 weeks of lactation compared to those calving in BCS of 2.

On the other hand, these results didn't agree with the findings of other researchers. An observational study of 429 Holstein cows in 13 herds (mean 305-d FCM yield of 7225 kg) was conducted to determine the relationship between BCS and its changes with milk yield, (Ruegg and Milton 1995). They found that condition score at calving had no effect on either peak or 305-d milk yields.

The primary goal of this study was to investigate the relationship between BCS and milk yield in Jenubi cows. A secondary goal was to define typical patterns of BCS in Jenubi cows.

MATERIALS AND METHODS

The study included 32 of Jenubi cows bred in Salman pack area. All cows were condition scored, at two months before calving (dry-off) and at calving (48 hours after calving). The East of Scotland College of Agriculture (ESCA) system of condition scoring was used (ESCA, 1976). Scores ranged from 2.25 to 3.25 with quarter scores which gave a 5 point scale. All BCS were assigned by one individual . Cows were in second and third parity.

Cows were fed a concentrate diet at a daily rate of 2.5–3 kg/cow/day through drying off and 3.5 kg/cow/day through lactation period. The concentrate diet contained 17% crude protein. Cows were given an access to pasture and wheat straw also offered at the rate of 3–3.5 kg/day/cow.

Milk yield for individual cows were recorded every day on mornings and afternoons, beginning 3 days after calving.

The SAS program (SAS, 2001) was used to study the effect of BCS on milk yield. Duncan test (Duncan, 1955) was used to compare the significant differences between means in different periods (8 weeks of milk yield and 16 weeks of milk yield) to find the regression coefficients of milk yield in different periods on BCS at the same program.

RESULTS AND DISCUSSION

BCSD showed significant effect ($P < 0.01$) on 8 weeks of milk yield and 16 weeks of milk yield (Table 1). These results agree with the finding of Petrus and Mohammed (1987), Markusfeld *et al.* (2005) and Saleh (2007). Table (1) shows clearly that BCSD

3.25 had significantly the highest means 367.40 ± 19.09 at the 8 weeks of milk yield, and the BCSD 3.25 had significantly highest means of 788.40 ± 44.99 at the 16 weeks of milk yield of those below the BCSD 2.75. These results agree with the finding of Saleh (2007) in his experiment on Karadi cows.

The peak milk yield showed significant difference ($P < 0.01$) and the highest means 63.20 ± 3.25 was at the BCSD of 3.25. These results supported by the finding of Saleh (2007) on Karadi cows, and Froot and Croxton (1978).

The regression equations in Table (2) show the estimated relationship between BCSD and 8 weeks of milk yield, 16 weeks and peak milk yield. The response of 8 weeks and 16 weeks of milk yield was significant with fairly high r^2 . The coefficient of this equation implies that milk yield increases by 149.13 kg in the first 8 weeks (about 2.7 kg/d) for each unit increase in BCSD, and milk yield increases by 295.07 kg in the first 16 weeks (about 2.6 kg/d) for each unit increase in BCSD. The regression of BCSD on peak milk yield was found to be significant with fairly high r^2 . The equation implies that peak milk yield increase by 23.23 kg/week for each unit increase in BCSD.

BCSC showed significant effect ($P < 0.01$) on 8 weeks and 16 weeks of milk yield (Table 3), which agree with those of Saleh (2007), Domecq *et al.* (1997), Buckley *et al.* (2003), Land and Leaver (1981) and Berry *et al.* (2007). BCSC 3.0 and 3.25 had significant highest mean of 334.14 ± 12.05 kg and 372.60 ± 2.83 kg respectively at 8 weeks of milk yield, and the BCSC at 3.25 had significant highest mean of 830.60 ± 33.33 kg at 16 weeks of milk yield.

The peak milk yield showed significant difference of ($P < 0.01$) and the highest mean 64.80 ± 2.91 was at the BCSC 3.25, (Saleh, 2007).

The regression equations (Table 4) show the estimated relationship between BCSC and 8 weeks, 16 weeks of milk yield and peak milk yield. The response of 8 weeks and 16 weeks of milk yield was significant ($P < 0.01$). Although both of these variables, 8 weeks and 16 weeks of milk yield showed significant relationship with BCSC, the values of r^2 for each them indicate that BCSC is more closely related to 8 weeks of milk yield with r^2 (0.71) than its to 16 weeks of lactation with r^2 (0.44).

The coefficient of this equation implies that milk yield increase by 166.73 kg the first 8 weeks (about 3 kg/d) for each unit increase in BCSC and milk yield increase by 326.89 kg in the first 16 weeks (about 2.9 kg/d) for each unit increase in BCSC. Bourchier *et al.* (1987) found that the response in milk yield over early lactation was (5 kg/d) for an increase in BCSC from 1.25 to 2.25, but only (2 kg/d) from increase in BCSC from 2.25 to 3.75.

Table (1): The effect of body condition score at drying off (BCSD) on milk yield (kg) and peak milk yield (kg/week).

BCSD	Mean \pm S.E.		
	8 Weeks of milk yield	16 weeks of milk yield	Peak milk yield
2.25	221.17 \pm 12.55 c	503.50 \pm 15.16 c	40.17 \pm 0.94 d
2.5	240.00 \pm 11.03 c	559.44 \pm 31.07 c	45.67 \pm 2.72 cd
2.75	309.00 \pm 13.59 b	663.40 \pm 24.24 b	51.60 \pm 1.86 bc
3	317.43 \pm 20.79 b	719.71 \pm 42.15 ab	57.57 \pm 2.84 ab
3.25	367.40 \pm 19.09 a	788.40 \pm 44.99 a	63.20 \pm 3.25 a
Significance level	**	**	**

Means having different letters at the same row are significantly different.

** Significant at $P < 0.01$. n = 32 cows.

Table (2): Regression coefficient of 8 weeks of milk yield, 16 weeks of milk yield and peak milk yield on body condition at drying off (BCSD).

Traits regressed on body condition score	Regression coefficient	Significancy level	Linear equation	r ²
8 weeks of milk yield	149.13 Kg / unit	**	Y [^] = -121.36 + 149.13 (x)	0.64
16 weeks of milk yield	295.07 Kg / unit	**	Y [^] = -166.18 + 295.07(x)	0.61
Peak of milk yield	23.23 Kg / wk/unit	**	Y [^] = -12.26 + 23.23(x)	0.62

** Significant at P<0.01. n = 32 cows.

Table(3) : The effect of body condition score at calving (BCSC) on milk yield (kg) and peak milk yield (kg /week).

BCSC	Mean ± S.E.		
	8 Weeks of milk yield	16 weeks of milk yield	Peak milk yield
2.25	218.80 ± 8.19 c	476.80 ± 14.58 c	33.60 ± 1.20 d
2.5	230.83 ± 17.44 bc	517.17 ± 24.68 bc	41.83 ± 1.37 d
2.75	267.78 ± 9.70 b	622.44 ± 14.10 bc	50.57 ± 1.13 c
3	334.14 ± 12.05 a	644.43 ± 91.79 b	58.7 ± 1.61 b
3.25	372.60 ± 2.83 a	830.60 ± 33.33 a	64.80 ± 2.91 a
Significancy level	**	**	**

Means having different letters at the same row are significantly different .

** Significant at P<0.01. n = 32 cows.

The regression of BCSC on peak milk yield found to be significant (P<0.01) with high r² (0.85). The equation implies that peak milk yield increase by 28.77 kg/week for each unit increase in BCSC .

In this group of small herds in Iraq , the effect of BCSC and BCSD was significant for 8 weeks and 16 weeks of milk yield and peak milk yield .Cows at average BCS of 3 – 3.25 had the most effect on these variables .The rate of increase in milk yield in early lactation is important and may more accurately reflect the dynamic biological changes experienced by the cow, and the rate of increase in milk yield may associated with BCS. These results suggest that BCS could be used to monitor and manage the productive status of Jenubi herds.

Further studies are needed in which broader range of BCS can be used to confirm the results of this study, and additional investigation of the role of BCS in Iraqi breeds is needed.

Table (4): Regression coefficient of 8 weeks of milk yield, 16 weeks of milk yield and peak milk yield on body condition at calving (BCSC).

Traits regressed on body condition score	Regression coefficient	Significancy level	Linear equation	r ²
8 weeks of milk yield	166.73 Kg / unit	**	Y [^] = -17.5 + 166.73(x)	0.71
16 weeks of milk yield	326.89 Kg / unit	**	Y [^] = -284 + 326.89 (x)	0.44
Peak of milk yield	28.77 Kg / wk/unit	**	Y [^] = -28.46 + 28.77 (x)	0.85

** Significant at P<0.01. n = 32 cows.

ACKNOWLEDGMENT

The author wish to thank Dr. Nasr Noori Al-Anbari for his advice and help with the statistical analysis.

REFERENCES

- Bauman, D.E. and W.B. Currie (1980).** Partitioning of nutrients during pregnancy and lactation. *J. Dairy Sci.*, 63:1514.
- Berglund, B. and B. Danell (1987).** Live weight changes ,feed consumption ,milk yield and energy – balance in dairy – cattle during the 1st period of lactation . *Acta Agric. Scand., Sect. A* 37:495 – 509.
- Berry, D.P.; F. Buckley and P. Dillon (2007).** Body condition score and live –weight effects on milk production in Irish Holstein – Friesian dairy cows. Teagasc, Moore Park Dairy Production Research Center, Fermoy Co. Cork. Ireland.
- Bourchier, C.P.; P.C. Gransworthy; J.M. Hutchinson and T.A. Benton (1987).** The relationship between milk yield, body condition and reproductive performance in high yielding dairy cows. *Anim. Prod.*, 44:460.
- Buckley, F.; K. O'Sullivan; J.F. Mee; K.D. Evans and P. Dillon (2003).** Relationship among milk yield, body condition, cow weight, and reproduction in spring – calved Holstein – Friesian. *J. Dairy Sci.*, 86:2308 – 2319 .
- Domecq, J.J.; A.L. Skidmore; J.W. Lloyd and J.B. Kaneene (1997).** Relationship between body condition scores and milk yield in a large herd of high yielding Holstein cows. *J. Dairy Sci.*, 80 :101 – 112 .
- Duncan, D.B. (1955).** Multiple Range and Multiple F- Test *Biometrics* , 11:1–42.
- East of Scotland College of Agriculture (ESCA) (1976).** Condition scoring dairy cows. Advisory leaflet; 100.
- Frood, M.J. and D. Croxton (1978).** The use of condition scoring in dairy cows and its relationship with milk yield and live weight. *Anim. Prod.*, 27: 285 – 291.
- Gransworthy, P.C. (1988).** The effect on energy reserves at calving on performance of dairy cows: 157- 170 in "Nutrition and Lactation in the Dairy Cow". 1st edition, Butterworth's, London. England.
- Land, C. and J.D. Leaver (1980).** The effect of body condition at calving on the milk production and feed intake of dairy cows. British Society of Animal Production . Winter Meeting 1980 .
- Land, C. and J.D. Leaver (1981).** The effect of body condition at calving on the production of Friesian cows and heifers. British Society of Animal Production, Winter Meeting 1981.
- Markusfeld, O., E. Carsten and K. Ofer (2005).** Herd health. Kuppin Institute for Higher Education, 2nd edition (Hebrew and English).
- Petrus, T.Y. (1981).** Condition scoring and body weight in dairy cows and their relationship with milk yield. M.Sc. Thesis, University of Aberdeen, Scotland.
- Petrus, T.Y. and S.A. Mohammed (1987).** The relationship between milk yield, body condition scoring and weight in dairy cows under local condition in Iraq. *J. Agric. Water Reso. Res.*, 6(1):27 – 36 .

- Ruegg, P.L. and R.L. Milton (1995).** Body condition scores of Holstein cows on Prince Edward Island, Canada: Relationships with yield, reproductive performance and disease. *J. Dairy Sci.*, 78 : 552 – 564.
- Saleh, B.M. (2007).** The effect of body condition score and body weight on some economic traits of karadi and crossbred cows. M. Sc. Thesis, University of Sulaimani, Iraq.
- SAS (2001).** SAS users guide: Statistics. Version 6th edition, SAS Inc. Inc. Cary, N.C., USA.
- Stockdale, C.R. (2001).** Body condition at calving and the performance of dairy cows in early lactation under Australian condition: A review. *Aust. J. Exp. Agric.*, 41:823 – 829.
- Tamminga, S.; P.A. Luteijn and R.G.M. Meijer (1997).** Changes in composition and energy content of live weight loss in dairy cows with time after parturition. *Livest.prod.Sci.*52:31 – 38.
- Waltner, S.S.; J.P. Mcnamara, and J.K. Hillers (1993).** Relationships of body condition score to production variables in high producing Holstein dairy cattle. *J. Dairy Sci.*, 76:3410 – 3419.

العلاقة بين درجة حالة الجسم وبعض الصفات الاقتصادية في الأبقار الجنوبية

طلال يوسف بطرس

قسم الثروة الحيوانية ، كلية الزراعة ، جامعة بغداد

تم استخدام ٣٢ بقرة من النوع الجنوبي لدراسة العلاقة بين درجة حالة الجسم عند التجفيف وعند الولادة مع إنتاج الحليب عند (٨) أسابيع وإنتاج الحليب عند (١٦) أسبوع وقمة الإنتاج ، في منطقة سلمان باك .

تم تغذية الأبقار على عليقة مركزة بمعدل يومي خلال فترة التجفيف وخلال فترة إنتاج الحليب كما تم رعي الأبقار بالإضافة إلى تقديم تبن القمح كعلف خشن . تم تسجيل الحليب مرتين يوميا ولكل بقرة خلال فترة التجربة . استعمل برنامج SAS للتحليل الإحصائي لدراسة تأثير درجة حالة الجسم على إنتاج الحليب وقمة الإنتاج (أقصى إنتاج) . كما استعمل اختبار دنكن لمقارنة الفروقات المعنوية بين المتوسطات .

أظهرت درجة حالة الجسم عند التجفيف وعند الولادة علاقة معنوية ($P < 0.01$) مع إنتاج الحليب عند (٨) أسابيع وإنتاج الحليب عند (١٦) أسبوع . كما أن علاقة معنوية مشابهة ظهرت بين درجة حالة الجسم عند التجفيف وعند الولادة مع قمة الإنتاج . وأن إنتاج الأبقار عند معدل درجة حالة الجسم (٣ - ٣.٢٥) أظهرت التأثير الأكبر على إنتاج الحليب وعلى قمة الإنتاج . يمكن الاستنتاج حسب ما ظهر من نتائج بأنه يمكن استعمال درجة حالة الجسم لمراقبة وإدارة الحالة الانتاجية في قطعان الأبقار الجنوبية .