

Effect of Some Nutritional Studies on the Performance of Brown Swiss Heifers

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**F**ORTY-eight Brown Swiss heifers of about 8 months age were used to study the effect of plane of nutrition on their performance during the growing and pregnant periods. Animals were randomly distributed into four groups of twelve animals each. Four experimental rations were used. They included two levels of nutrition (medium and high) with two ratios of concentrate (C) : roughage (R) (75 : 25 and 67 : 33%). So, the four experimental groups represented ; medium level with 75 : 25% C : R ratio (I), Medium level with 67 : 33% C : R ratio (II), high level with 75 : 25% C : ratio (III) and high level with 67 : 33% C : R ratio (IV). The experiment lasted until the first calving time.

The results showed that the high level of nutrition significantly affected average daily gain, starch equivalent (SE) and digestible protein (DP) efficiency. The values were 444.8, 467.5, 531.5 and 592.8 g/day; 7.5, 6.96, 5.55 and 6.87 S.E. Kg/kg gain ; 1.468, 1.335, 1.116 and 1.104 DP kg/kg gain, for treatments I, II, III and IV, respectively. However, no significant effect of the C : R ratio on average daily gain and feed efficiency was detected. The corresponding values during the pregnancy period were ; 0.558, 0.548, 0.657 and 0.618 g/day; 7.727, 8.323, 6.613 and 7.365 SE kg/kg gain; 1.455, 1.536, 1.336 and 1.451 Dp kg/kg gain. Statistical analysis showed a significant effect of the level of nutrition but insignificant effect regarding C : R ratio.

Results of the reproductive performance indicated non-significant effect of the level of nutrition neither C : r ratio on age and weight at puberty or on age at first service. However, level of nutrition affected significantly both weight at first service and weight at conception. Animals received the high level of nutrition had significantly higher weight at calving than those received the low level.

Brown Swiss is a newly imported breed to Egypt. Almost no information concerning its capabilities under the local environmental conditions are available.

The growth and development of dairy heifers from birth to the time of first calving was found to be highly related to the amount of nutrients consumed (Steacey and Filipson, 1957, Sorensen *et al.*, 1959 and Bansal, *et al.*, 1981). Moreover, roughage to concentrate ratio also affects growth and reproductive performance of dairy heifers. Hibbs, *et al.*, (1956) reported that weight gain, total digestible nutrient intake and percentage of digestible protein increased as the amount of grain in relation to hay increased in the ration of growing Jersey and Holstein calves. Devendra and Kockchoo, (1977) used different levels of r:c (100:0, 75:25, 50:50, 25:75 ; 0:100) in the rations of growing dairy cattle heifers. The authors showed significant treatment differences in daily live weight gain. On the other hand, Satter, *et al.*, (1973) and Brown, *et al.*, (1975) reported non significant differences in body weight changes when animals were fed different levels of roughage.

In the present study an attempt of evaluating the Brown Swiss heifers under different levels of nutrition and different c:r ratios was made.

### Material and Methods

Forty-eight Brown Swiss heifers were randomly distributed into four experimental groups of twelve animals each. Animals were assigned to treatments on the basis of age and live body weight. The average ages and weights were, 258, 241, 232 and 241 days; 180, 178, 178 and 178 kg, respectively four groups I, II, III and IV. The four experimental groups contained two main groups represented two levels of nutrients requirements, Medium (I), (II) and high (III), (IV). The Medium level allows an average daily gain of about 500 g/day and the high level allows 650 g/day. Each level of allowances contained two sub groups represented two ratios of concentrate (C) : roughage (R) ; 75:25% (I), (III) and 67:33% (II), (IV). So ; the four animal experi-

mental groups represented, Medium level with 75:25% C:R ratio (I), Medium level with 67:35% c:r ratio (II), high level with 75:25 C:R ratio (III) and high level with 67:33% C:R ratio (IV). The experimental treatments lasted until first calving. The four experimental rations were tested regarding their effects on average daily gain, feed efficiency during the growing and pregnant periods, age and weight at puberty, age and weight at conception and age and weight at first calving. Animals were housed in a kind of tail to tail pens, fed individually. Water was available at all times.

The concentrate part of the experimental rations was a local feed mixture (co-op-feed mix.) consisted of 42% undecorticated cotton seed meal, 25% wheat bran, 22% maize, 5% rice bran, 3% molasses, 2% limestone and 1% salt. Berseem or its hay and rice straw were used as roughage sources. The levels of nutrients requirements during growing and pregnant stages were calculated according to allowances of El-Ashry (1980) and Tommi (1963), respectively. Animal allowances were adjusted biweekly according to body weight changes and the stage of pregnancy.

The chemical composition of the feed stuffs used is presented in Table 1.

Heifers were served only when attained not less than 350 kg of live weight and over 18 months of age in all groups. Rectal examination were carried after 45 days from service for individual heifers. Body weight changes were recorded monthly.

Table (1): Chemical composition of ingredients used in rations for Brown Swiss heifers.

Ingredients	Moisture	Ash	Crude protein	Ether extract	Crude fibre	N-Free extract
Co-op-feed mix.	11.60	2.00	21.00	2.30	20.20	42.30
Rice Straw	9.10	10.50	2.30	1.20	36.70	40.20
Hay	12.00	2.10	9.47	1.30	32.00	43.05
Berseem	63.25	2.61	2.64	0.21	4.94	6.35

The data obtained were analyzed statistically according to Snedecor's book (1961).

## Results and Discussion

### 1. *Effect of plane of nutrition on growth and feed efficiency* a) *Growing period (8-19 months)*

The average body and daily gain of heifers subjected to the different feeding treatments are shown in Table 2. The results indicated that heifers offered the high level of nutrition had a significant ( $P < 0.01$ ) higher body weight and daily gain than those of the medium level throughout the four three monthly periods. These results are in agreement with the findings of the early work of Herman and Ragsdale, (1946), Reid, (1953) on Holstein heifers, Hansson, (1956), Short and Bellows (1971), Bansal, *et al.*, (1981) on cross breed Holstein x Hargana heifers and Haryu, *et al.*, (1982) on Japan Black heifers. On the other hand, results showed insignificant effect of C:R ratios on neither body weight changes nor daily gain which contradicted those of Hibbs, *et al.*, (1956), Satter, *et al.*, (1970), Soliman, (1976) and Devendra and Kokehoc, (1977). Such contradiction can be attributed to differences in roughage percentage used.

Considering mean daily gain for different three monthly periods, it is clear that highest gains were recorded during the first period ranging from 8 to 10 months of age, then it decreased gradually over the following periods by 11, 16 and 24% for periods 2, 3 and 4, respectively, *i.e.*, body weight gain was decreased gradually as heifers became closer to sexual maturity.

Inspection of figures of gross feed efficiency presented in Table 2, indicate that Brown Swiss heifer groups received the high level of nutrition were significantly ( $P < 0.01$ ) more efficient than those on medium level. These results are in accordance with those obtained by Conniffe and Harte (1967), Lister, *et al.*, (1968), El-Ashry, *et al.*, (1972) and El-Gafrawy, (1979). However, there was nonsignificant effect of C : R ratios on neither SE nor Dp efficiency.

### b) *Pregnant period (20-28 months)*

The average body and daily gain of pregnant heifers subjected to the four different feeding treatments are shown in Table 3. Statistical analysis of the data indicated that plane of

nutrition for pregnant heifers had significant ( $P < 0.05$ ) effects on their average body weight and daily gain during the different three periods of pregnancy. On the contrary, C:R ratios had no significant effects.

Table (2): Averages of body gain, daily gain and feed efficiency of growing brown Swiss heifers\* in different treatments.

Item	Experimental groups			
	I	II	III	IV
<b>Averages of body gain (Kg)</b>				
Period 1	46.9	49.2	58.4	59.5
Period 2	41.4	43.3	51.8	57.9
Period 3	38.7	41.8	45.0	52.7
Period 4	35.6	46.7	41.9	46.6
Means	40.7a	42.8a	49.3b	54.2b
<b>Averages of daily gain (gm)</b>				
Period 1	509	534	634	646
Period 2	450	471	532	629
Period 3	424	463	500	585
Period 4	396	402	460	511
Means	444.8a	467.5a	531.5b	592.8b
<b>Averages of feed efficiency</b>				
<b>Kg SE/Kg gain</b>				
Period 1	5.19	5.16	4.10	4.33
Period 2	6.79	6.35	4.63	4.57
Period 3	7.96	7.32	6.24	6.13
Period 4	10.07	9.02	7.21	6.87
Means	7.50a	6.96a	5.55b	5.48b
<b>Kg Dp/Kg gain</b>				
period 1	0.988	0.929	0.776	0.882
Period 2	1.189	1.216	0.869	0.902
Period 3	1.609	1.467	1.303	1.229
Period 4	1.846	1.729	1.519	1.403
Means	1.408a	1.335a	1.116b	1.104b

\* The growing stage was divided into 4 equal successive periods: period 1 (8-10 months), period 2 (11-13 months), period 3 (14-16 months) and period 4 (17-19 months of age).

a, b Values in the same row with different superscripts are significantly different ( $P < 0.01$ ).

Considering mean daily gain for the different three monthly periods of the experimental animals, it is clear that highest gains were recorded in the last three months of pregnancy (26-28) for the different animals groups, where it increased gradually during the gestation period being; 436, 533 and 819 g/day for the first, second and last third, respectively. These values mean that during the second and last third of gestation, average daily gains were increased by 20 and 85%, respectively of that obtained during the first third.

Table (3): Averages of body gain, daily gain and feed efficiency of pregnant Brown Swiss heifers <sup>a</sup> in different treatments.

Item	Experimental groups			
	I	II	III	IV
Averages of body gain (Kg)				
Period 1	36.33	35.00	46.25	43.42
Period 2	46.25	45.50	54.25	50.50
Period 3	70.09	69.42	79.42	75.17
Means	50.89 <sup>a</sup>	49.97 <sup>a</sup>	59.97 <sup>b</sup>	56.36 <sup>b</sup>
Averages of daily gain (gm)				
Period 1	0.394	0.380	0.502	0.471
Period 2	0.502	0.494	0.589	0.548
Period 3	0.778	0.771	0.882	0.835
Means	0.558 <sup>a</sup>	0.548 <sup>a</sup>	0.657 <sup>b</sup>	0.618 <sup>b</sup>
Averages of feed efficiency				
Kg SE/Kg gain				
Period 1	9.344	10.982	8.022	7.727
Period 2	8.017	8.753	7.036	8.323
Period 3	5.821	6.125	4.782	6.613
Means	7.727	8.323	5.299	7.365
Kg Dp/Kg gain				
Period 1	1.773	1.861	1.675	1.455
Period 2	1.684	1.577	1.397	1.536
Period 3	0.910	1.172	0.936	1.336
Means	1.455	1.536	1.103	1.451

<sup>a</sup> The pregnant stage was divided into 3 successive periods; period 1 (20-22 months), period 2 (23-25 months) and period 3 (26-28 months of age).

<sup>a, b</sup> Values in the same row with different superscripts are significantly different ( $P < 0.05$ ).

Concerning the efficiency of feed utilization for energy and protein during pregnancy (Table 3), results indicate that animal groups received the high level of nutrition were more efficient than those on medium level, but differences were not statistically significant. Concentrate: roughage ratio did not affect significantly feed utilization.

## 2. Effect of plane of nutrition on some reproductive performance

Results of Table 4, indicate that heifers on the high level of nutrition reached puberty at younger ages than those fed on the medium level, the difference was 1.34 months. These findings are in agreement with those of Short and Bellows, (1971) and El-Gaf-

frawy (1979). Also, animals of the high plane were first served at earlier ages than those of the medium plane which is in accordance with that reported by Baishya, *et al.* (1982), Ducker *et al.* (1982) and Yarovaya and Kulik (1983). Moreover, the present results indicate that neither plane of feeding nor C : R ratio had affected age at conception. However, plane of feeding seemed to affect weight at conception which is in agreement with that of Pendlum, *et al.* (1977) on Herford heifers.

Table (4): Averages of some reproductive parameters of Brown Swiss heifers in different treatments.

Item	Experimental groups			
	I	II	III	IV
Age at puberty (months)	13.33	12.81	11.63	11.83
Weight at puberty (Kg)	251.40	258.30	254.80	258.80
Age at first service (months)	19.22	18.35	18.19	18.57
Weight at first service (Kg)	329.80a	333.90a	364.80b	378.90b
Age at conception (months)	19.43	19.05	18.64	19.16
Weight at conception (Kg)	348.30a	346.30	374.60b	397.50b
Number of service per conception	1.66	1.58	1.41	1.50
Age at first calving (months)	29.35	28.38	28.09	28.77
Weight at first calving (Kg)	525.40a	517.30a	576.70b	554.00b
Weight of calves (Kg)	29.25	28.70	30.70	31.01

a,b Values in the same row with different superscripts are significantly different ( $P < 0.01$ ).

It seems from the results of Table 4, that animals of medium plane groups required more number of services per conception compared to high plane groups. These findings are in agreement with those of Joubert, (1954) and Pendlum, *et al.*, (1977). Animals which received the high level of nutrition had a significant ( $P < 0.01$ ) higher weight at calving than those of the medium level. Weight of calves at birth was insignificant higher for dams offered the high level of nutrition than those received the medium level.

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## تأثير بعض المعاملات الغذائية على الاداء الانتاجي في البسرون

سويس

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استخدم في هذه الدراسة ٤٨ عجلة برون سويس في عمر حوالي ٨ شهور مقسمة على اربعة مجاميع متساوية بهدف دراسة تأثير ٤ معاملات غذائية على معدلات النمو وكفاءة التحويل الغذائي خلال مرحلتى النمو والحمل وكذلك على بعض الصفات التناسلية واستمرت التجربة حتى ميعاد الوضع الاول .

استخدم ٤ معاملات غذائية تمثل مستويين غذائيين ، مستوى متوسط يسمح بعدل نمو يومية مقداره ٥٠٠ جم ومستوى مرتفع يسمح بمعدل نمو يومية مقداره ٦٥٠ جم وكل مستوى من هذه المستويات استخدم معه نسبتين مختلفتين من المواد المركزة : المواد الخشنة النسبة الاولى ٢٥:٧٥ والثانية ٦٧ : ٣٣٪ وأوضحت النتائج ما يلى :

١ - المستوى الغذائي المرتفع كان له تأثير معنوى خلال مرحلة النمو ( ٨ - ١٩ شهرا من العمر ) على معدل النمو اليومي وكفاءة التحويل الغذائي للنشأ والبروتين وكانت القيم كما يلى : ٤٤٤٨ ، ٤٧٦٥ ، ٥٢١٥ ، ٥٦٢٨ جم/يوم لمعدل النمو اليومي ، ٧٥ ، ٦٩٦٦ ، ٥٥٥٥ ، ٥٨٧٥ كجم معادل نشأ/كجم نمو ، ١٤٦٨ ، ١٣٣٥ ، ١١١٦ ، ١٠٤١ كجم بروتين مهضوم/كجم نمو . للمعاملات الاربعة على الترتيب ( سنوى غذائى متوسط مع كل من ٦٧،٧٥٪ مواد مركزة ٢٤١ ومستوى غذائى مرتفع مع كل من ٦٧،٧٥٪ مواد مركزة ٤٤٢ ) ولم يكن لاختلاف نسب المواد المركزة : المواد الخشنة تأثير معنوى على هذه الصفات المدروسة .

٢ - خلال مرحلة الحمل ( ٢٠ - ٢٨ شهرا ) كان للمستوى الغذائي المرتفع تأثير معنوى على معدل النمو اليومي وتأثير غير معنوى على كفاءة التحويل الغذائي . ولم يكن لاختلاف نسب المواد المركزة : المواد الخشنة تأثير معنوى على هذه الصفات .

٣ - أوضحت النتائج أن كل من المستوى الغذائي ونسبة المواد المركزة المواد الخشنة لم يكن لها تأثير على العمر والوزن عند البلوغ الجنسي أو العمر عند أول تليفحه . بينما كان للمستوى الغذائي تأثير معنوى على كل من الوزن عند أول تلقيحة والوزن عند الحمل . وقد أظهرت النتائج أن الحيوانات المغذاة على المستوى الغذائي العالى كانت أكثر وزنا عند الوضع من الحيوانات المغذاة على المستوى الغذائي المتوسط . ولم يكن لاختلاف نسبة المواد المركزة : المواد الخشنة أى تأثيرات معنوية على هذه الصفات التناسلية .