*Egyptian J. Nutrition and Feeds (2006) 9 (2):19-35*

# STUDIES ON FEEDING ALLOWANCES DURING DIFFERENT GROWTH PERIODS FOR CROSSBRED FRIESIAN HEIFERS

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**(Received 27/7/2006, accepted 18/2/2007)**

## SUMMARY

Twenty four growing heifers (about 8 months of age and 177 Kg mean body weight) were allocated randomly to four treatments on the basis of age, body measurements and weight. Animals (6 per treatment) were received their experimental rations with rate of 2; 2.5 and 3 % feed dry matter on basis of live body weight as R1; R2 and R3, respectively, and the fourth ration (R4) whish was represented as control ration, the heifers were fed from it according to NRC, (1996) allowances. Roughage and concentrate in the ration was based on corn silage and a concentrate mixture in the ratio of 70:30. Body weight of each heifer was recorded biweekly until the study was completed. The main results showed that the DM, OM, NFE digestibility and nutritive values (TDN and DCP) were significantly ($P<0.05$) increased with increasing feeding level. In contrast, the digestibilities of CP, CF and EE decreased ($P<0.05$) with increasing feeding level. Daily gain, age at the onset of the first heat and first service of heifers fed high feeding level (R3) was significantly ($P<0.05$) better than those fed low feeding level (R1). The feed conversion (kg DM, TDN or DCP/ kg gain) for heifers fed high feeding level (R3) was poorer at puberty and first service compared to those fed on the other three diets. Among the experimental groups, the results showed that the highest values ($P<0.01$) for total and daily gain as well as all tested body measurements were recorded on animals fed R3 while heifers fed R1 showed the lowest values. In addition, heifers fed high feeding level (R3) showed the highest body condition score (BCS) compared to those fed low feeding (R1). The heifers fed high feeding level (R3) obtained the highest value of relative daily gain efficiency, attained earlier onset of puberty and earlier first service compared to those fed low feeding (R1) and thus the highest relative economic efficiency. In addition, the heifers fed on (R4) (control) ration had the most expensive value compared to those fed (R1) having the lowest fed cost.

It was concluded that the heifers fed rations (R2) and (R4) were almost similar on all studied traits. While, heifers fed rations R3 appeared to improve in daily gain, body measurements, age at puberty and at the 1$^{st}$ service compared with those fed the control ration (R4). But also had lowest feed efficiency till puberty and first service than other treatments. The ration containing corn silage with concentrate feed mixture resulted in better parameters for heifers.

*Keywords: feeding level, corn silage, cow heifers, digestibility, puberty and performance*

## INTRODUCTION

The improvement which can be obtained using potentially available forage to maximize the animal production is an important objective in livestock sector. The green forage production during winter season covers the animal requirements and the abundant from it make to silage as conservation technique (Ahmed *et al.*, 2003). Corn silage is a very palatable product with moderate to high content of digestible energy, but usually low to moderate in digestible protein, particularly for the amount of energy contained. The ratio between roughage to concentrate (R:C) represents one of the major dietary factors involved to influence feed intake, which is reflected on rumen digestion kinetics and consequently rumen environment which is the resultant picture to feed utilization by ruminant farm animals ( Mehrez *et al.*, 2001). There are many economic advantages in the production and use of corn silage in feeding of cattle.

Ead, (1999) demonstrated clearly that varying R: C ratio had significantly influenced fermentation pattern in the rumen and the feeding values of the rations. Corn silage is the high value of digestible energy and moderate for digestible protein, so, it is very palatable for animals. It suggests using it in ration with a moderate level such as 70% form energy and portion. On the other, dairy cattle consumed more corn silage owing to high energy and quality (Mohamed *et al.*, 1999). In addition Etman *et al.*, (1994) concluded that using corn silage was very successful with growing lambs. Also, using corn silage for calves improved their performance, reduced cost of feeding and minimized the amount of expensive concentrate in daily ration (El-Sayes *et al.*, 1997 and Khinizy *et al.*, 1997).

Hammes *et al.*, (1964) and Mahmoud *et al.*, (1992), with different ratios of concentrate to corn silage in fattening and growing rations, demonstrated that higher levels of corn silage can be justified and tended to improve productive and reproductive performance of growing animals as well as saving considerable amounts of the expensive concentrate.

Available evidence concerning the relationship between growth rate, mammary growth and milk yield in heifers: 1) Increased growth rate due to high feeding level before puberty onset can lead to reduced pubertal mammary growth and reduced milk yield potential. 2) Increased growth rate due to high feeding level after puberty and during pregnancy have no effect on mammary growth and milk yield. 3) Higher body weight gain due to higher genetic potential for growth is positively related to milk yield (Sejrsen *et al.*, 2000).This implies a positive relationship between growth rate of heifers in the rearing period and their subsequent milk yield potential. The relationship, however, is not straightforward, because high prepubertal growth rate caused by increased feeding level often lead to reduced milk yield (Sejrsen and Purup, 1997).

The objective of this work was to use corn silage rations and concentrate

with ratio of 70:30 at different levels to growing heifers and studies its effect on their productive and reproductive performance and economic efficiency.

## MATERIALS AND METHODS

This study was conducted at El-Gemiza Experimental Station Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, and Egypt during 2004/2005.

Twenty four growing crossbred Friesian heifers (about 8 month old and 177 Kg body weight) were assigned randomly into 4 similar groups of 6 each. All experimental heifers were kept under semi-open sheds, and individual daily feeding was applied. Feed allowances for three experimental groups as TDN and DCP were shown in Table (1). Experimental allowances were as follow: Heifers in the 1st group were fed 2% of live body weight on DM (R1), while those in the 2nd and 3rd groups (R2 and R3) were fed 2.5 and 3% of live body weight on DM, respectively, but, the fourth (R4) heifer group was fed according to NRC, recommendation (1975). Roughage to concentrate ratio was 70:30. The experimental rations contained concentrate feed mixture (CFM), berseem hay (BH), whole corn silage (MS) and rice straw (RS). Mineral blocks and fresh water were available freely through the experimental period. The CFM was individually weighed for each animal and offered twice daily at 7 a.m. and 4 p.m. while roughage was offered at 8 a.m. and 5 p.m. Daily feed intake was individually recorded, while body weight of each heifer was biweekly recorded before morning feeding.

Heifers were adapted to a number of body measurements according to Fahmy, (1964) with some modifications, after Saddick and Ahmed (1991). The above mentioned measurements were made on all heifers at the same weighing times. Measurements as well as weighing took place in the morning after overnights holding of feed and water. Feed allowance was adjusted biweekly accorded to the change in body weight. Chemical analysis of different feed stuffs and calculated chemical composition of the experimental rations are presented in Table (2). Heifers were observed for oestrus twice daily, at 7 a.m. and 4 p.m. At the end of the experiment, individual feeds and fecal grab samples were collected for a 3 days period and composted for each animal to determine total tract apparent nutrients digestibility using silica (McDonald *et al.*, 1995) as an internal marker. Feed and fecal samples were chemically analyzed according to the methods of A. O. A. C. (1995).

Data were statistically analyzed according to SAS (1995). Differences among means were determined by using Duncan's test (1955).

## RESULTS AND DISCUSSION

Chemical analysis of ingredients feedstuffs and calculated composition of experimental rations (Table, 2) indicated that the 1st, 2nd and 3rd rations which introduced to animal with rate of 2, 2.5 and 3% of LBW

**Table (1): Experimental feed allowances as TDN and CP for tested animal groups as 2, 2.5 and 3% from live body weight (on DM basis) and roughage: concentrate ratio of 70:30.**

| R | % | B.W | DMI | 30% | 30% CFM | | 70% | 70% silage | | Total CPI | Total TDN |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | kg | kg | DM | CP | TDN | DM | CP | TDN | kg | kg |
| | | 150 | 3.00 | 0.9 | 0.14 | 0.59 | 2.10 | 0.16 | 1.34 | 0.31 | 1.92 |
| | | 200 | 4.00 | 1.20 | 0.19 | 0.78 | 2.80 | 0.22 | 1.78 | 0.41 | 2.56 |
| 1 | | 250 | 5.00 | 1.50 | 024 | 0.98 | 3.50 | 0.27 | 2.23 | 0.51 | 3.20 |
| | 2 | 300 | 6.00 | 1.80 | 0.29 | 1.17 | 4.20 | 0.33 | 2.68 | 0.61 | 3.85 |
| | | 350 | 7.00 | 2.10 | 0.34 | 1.37 | 4.90 | 0.38 | 3.12 | 0.72 | 4.49 |
| | | 400 | 8.00 | 2.40 | 0.38 | 1.56 | 5.60 | 0.43 | 3.57 | 0.82 | 5.13 |
| | | 150 | 3.75 | 1.125 | 0.18 | 0.73 | 2.63 | 0.20 | 1.67 | 0.38 | 2.40 |
| | | 200 | 5.00 | 1.50 | 0.24 | 0.98 | 3.50 | 0.27 | 2.23 | 0.51 | 3.20 |
| 2 | | 250 | 6.25 | 1.88 | 0.30 | 1.22 | 4.38 | 0.34 | 2.79 | 0.64 | 4.01 |
| | 2.5 | 300 | 7.50 | 2.25 | 0.36 | 1.46 | 5.25 | 0.41 | 3.34 | 0.77 | 4.81 |
| | | 350 | 8.75 | 2.63 | 0.42 | 1.71 | 6.13 | 0.47 | 3.90 | 0.89 | 5.61 |
| | | 400 | 10.00 | 3.00 | 0.48 | 1.95 | 7.00 | 0.54 | 4.46 | 1.02 | 6.41 |
| | | 150 | 4.50 | 1.35 | 0.22 | 0.88 | 3.15 | 0.24 | 2.01 | 0.46 | 2.88 |
| | | 200 | 6.00 | 1.80 | 0.29 | 1.17 | 4.20 | 0.33 | 2.68 | 0.61 | 3.85 |
| 3 | | 250 | 7.50 | 2.25 | 0.36 | 1.46 | 5.25 | 0.41 | 3.34 | 0.77 | 4.81 |
| | 3 | 300 | 9.00 | 2.70 | 0.43 | 1.76 | 6.30 | 0.49 | 4.01 | 0.92 | 5.77 |
| | | 350 | 10.50 | 3.15 | 0.50 | 2.05 | 7.35 | 0.57 | 4.68 | 1.07 | 6.73 |
| | | 400 | 12.00 | 3.60 | 0.58 | 2.34 | 8.40 | 0.65 | 5.35 | 1.23 | 7.69 |
| | 2.67 | 150 | 4.00 | - | - | - | - | - | - | 0.50 | 2.76 |
| | 2.60 | 200 | 5.20 | - | - | - | - | - | - | 0.62 | 3.45 |
| 4 | 2.52 | 250 | 6.30 | - | - | - | - | - | - | 0.70 | 4.05 |
| | 2.40 | 300 | 7.20 | - | - | - | - | - | - | 0.77 | 4.56 |
| | 2.29 | 350 | 8.00 | - | - | - | - | - | - | 0.83 | 5.05 |
| | 2.15 | 400 | 8.60 | - | - | - | - | - | - | 0.86 | 4.45 |

*R1: 2% in live body weight on DM ** R2: 2.5% in live body weight on DM
***R3: 3% in live body weight on DM **** R4: heifers were fed according to NRC, (1975)

**Table (2): Chemical analysis of experimental feed stuff and tested rations.**

| Item | DM | Nutrient % of DM | | | | | |
|---|---|---|---|---|---|---|---|
| | | OM | CP | CF | EE | NFE | Ash |
| Concentrate feed mixture (CFM ) | 89.51 | 88.66 | 16.00 | 11.89 | 2.06 | 58.71 | 11.34 |
| Corn silage | 36.25 | 87.11 | 7.73 | 22.43 | 2.57 | 54.38 | 12.89 |
| Rice Straw | 92.23 | 79.89 | 2.83 | 36.04 | 0.47 | 40.55 | 20.11 |
| Berseem hay | 89.83 | 88.65 | 11.45 | 30.89 | 2.51 | 43.80 | 11.35 |
| Rations 1,2 and 3 | 52.23 | 87.58 | 10.21 | 19.27 | 2.42 | 55.68 | 12.42 |
| Rations 4 (control) | 89.97 | 87.78 | 11.95 | 25.70 | 2.18 | 47.95 | 12.22 |

The ingredients of concentrate feed mixture (CFM) were: 39% yellow corn, 29% undecorticated cottonseed meal, 14% rice bran, 9% soybean meal, 5% vines, 3% limestone and 1% salt.

characterized by low DM; CP and CF contents, with high EE and NFE compared with control (R4) ration. Generally all tested rations appeared to have similar OM and Ash contents.

***Digestibility trials and nutritive values:***

Digestibility coefficients and nutritive values of the four experimental rations are shown in (Table, 3). Results obtained revealed that, the digestion coefficients of DM, OM and NFE were significantly increased ($P<0.05$) with increasing feeding level. But, the digestibilities of CP, CF and EE decreased significantly ($P<0.05$) as shown in Table (2). Animals fed R1 recorded the highest digestion coefficient of CP, CF and EE. While, those fed ration R2 and R3 showed to be lower of digestibility CP, EE and CF. The reduced particle size of concentrate in contrast to corn silage and increasing level of feed intake (3% on live body weight) may be resulted in increasing DM intake, faster rate of passage reduced ruminal digestion time and subsequently lowered the digestibilties of CP, CF and EE. The highest digestion coefficient of NFE obtained for the level of energy in the diets and may be resulted in increasing DM intake. These results are in agreement with those obtained by Schrage *et al.*, (1991); Hussein and Berger (1995), Cilliers *et al.*, (1998), Mehany, (1999) and El-Ashry *et al* ., (2003). While, heifers fed (R4) recorded the nearly similar trend with (R2) in digestion coefficient of OM, CP and NFE and also similar trend with (R3) in digestion coefficient of DM. At the same time, heifers fed (R4) recorded the lowest digestion coefficient of CF compared with the other experimental treatments.

Nutritive values expressed as TDN and DCP of the experimental rations are presented in Table (3). The values as TDN were significantly increased ($P<0.05$) with increasing feeding levels. While, increasing of feeding values as TDN was correlated with increasing DM intake from 2% with R2 to 3% of LBW. The high TDN values of rations contained concentrate mixture and corn silage may be attributed to the mutual associative effect of corn silage with concentrate mixture. While, DCP recorded opposite trend as shown in Table (3). On the other hand the R4 tended to higher DCP digestibility. The differences in DCP digestibility were highly significant ($P<0.05$) and may be attributed to increasing in CP intake of animals groups (R4). These results are in accordance with those obtained by El-Sayes *et al.*, (1997); Khinizy *et al.*, (1997) and Taie *et al* ., (1998).

***Productive and reproductive performance***

The results of heifer's performance are shown in Table (4). Weight and total body gain at puberty and first service were similar for heifers fed different experimental rations, showing no significant differences. Regarding age at onset of puberty and first service the values were 429, 390.5, 377.17 and 399.33 days and 488, 442.5, 421.17 and 444.33 days, respectively. Heifers fed ration R3 attained onset of earlier puberty and first service compared with other experimental treatments, recording highest ($P<0.05$) average daily gain till puberty and first service. This might be attributed to animals fed R3 received high DMI compared with those fed R1, R2 or R4. The average daily gain in this study seemed to agree

**Table (3): Intake of DM, Nutrients digestibilities and feeding value of experimental rations offered to grow heifer groups.**

| Item | Experimental | | | | Sig |
|---|---|---|---|---|---|
| | R 1 | R 2 | R 3 | R4 | |
| Body weight , kg | 229.83±11.11 | 237.50±17.41 | 245.55±12.78 | 232.50±13.79 | |
| $W^{0.75}$ | 58.96 ± 2.14 | 60.36±3.27 | 61.94±2.44 | 59.44±2.64 | |
| DM intake Kg /h/d | | | | | |
| CFM | 1.34 | 1.64 | 2.04 | 1.64 | |
| Corn silage | 3.12 | 3.82 | 4.75 | - | |
| Berseem hay | - | - | - | 3.26 | |
| Rice straw | - | - | - | 0.54 | |
| Total DM intake (kg /h/d | 4.46±0.12 | 5.46±0.11 | 6.79±0.11 | 5.44±0.12 | |
| Total DMI Kg $w^{0.75}$ | 0.076±0.003 | 0.091±0.004 | 0.11±0.004 | 0.093±0.005 | |
| Total CP intake kg/h/d | 0.455 | 0.557 | 0.693 | 0.650 | |
| Nutrients digestibility % | | | | | |
| DM | $61.57^{b}$ ± 2.27 | $63.40^{a}$ ± 3.46 | $65.57^{a}$ ± 2.64 | $65.96^{a}$±1.48 | * |
| OM | $67.66^{b}$ ± 0.98 | $68.9^{a}$ ± 0.73 | $70.97^{a}$ ± 1.09 | $69.04^{a}$±0.72 | * |
| CP | $69.17^{a}$± 1.73 | $65.16^{b}$ ± 1.92 | $63.93^{b}$ ± 1.93 | $64.33^{b}$±1.28 | * |
| CF | $59.55^{a}$ ± 0.79 | $55.93^{ab}$ ±1.15 | $54.04^{ab}$ ± 2.06 | $50.16^{b}$±0.57 | ** |
| EE | $70.78^{a}$± 0.81 | $64.08^{b}$ ± 0.83 | $63.02^{b}$ ± 2.14 | $66.87^{ab}$±0.93 | ** |
| NFE | $64.23^{b}$ ± 2.25 | $68.53^{ab}$±1.32 | $72.70^{a}$ ± 0.32 | 68.60ab±0.79 | ** |
| Feeding value % | | | | | |
| TDN | $61.61^{b}$ ± 0.38 | $65.12^{ab}$± 0.93 | $68.84^{a}$ ± 0.74 | $64.88^{ab}$±0.77 | ** |
| DCP | $6.06^{b}$ ± 0.15 | $6.65^{ab}$ ± 0.81 | $6.52^{ab}$ ± 0.32 | $7.69^{a}$±0.73 | ** |

a, b means of different letter in the same row are significant different .

**Table (4): Productive and reproductive performance of Friesian heifer groups during the experimental period .**

| Item | Experimental | | | | Sig |
|---|---|---|---|---|---|
| | R 1 | R 2 | R 3 | R4 | |
| No .of animal | 6 | 6 | 6 | 6 | |
| Initial age , day | 246 | 234.50 | 250.17 | 244.33 | |
| Weigh changes : | | | | | |
| Initial weight , kg | 178.17± 10.54 | 177.17±13.86 | 177.50±7.45 | 178.00±12.45 | NS |
| at puberty , kg | 277.33 ± 8.22 | 275.17±17.30 | 270.50±13.62 | 275.67±14.15 | NS |
| at first service, kg | 308.00 ± 6.38 | 307.40±18.14 | 302.08± 14.03 | 304.83±12.51 | NS |
| Total body gain, kg | | | | | |
| Initial to puberty | 99.16$^{a}$± 2.69 | 98.00$^{a}$±4.44 | 93.00$^{b}$±6.37 | 97.67$^{a}$±8.98 | * |
| Puberty to first service | 30.67$^{a}$ ± 2.26 | 32.23$^{a}$±2.09 | 31.58$^{a}$±0.78 | 29.16$^{b}$±2.87 | * |
| Average daily gain, kg | | | | | |
| Initial to puberty | 0.542$^{b}$±0.02 | 0.628$^{ab}$±0.03 | 0.732$^{a}$±0.05 | 0.630$^{ab}$±0.03 | ** |
| Puberty to first service | 0.520$^{b}$± 0.04 | 0.614$^{ab}$±0.04 | 0.718$^{a}$± 0.02 | 0.648$^{ab}$±0.06 | ** |
| Feed conversion kg DM/kg gain | | | | | |
| Initial to puberty | 7.76$^{b}$±0.51 | 8.51$^{ab}$±0.71 | 8.85$^{a}$±0.76 | 8.17$^{ab}$±0.44 | ** |
| Puberty to first service | 11.19± 0.92 | 11.55±0.96 | 11.53±0.33 | 11.03±0.97 | |
| Feed conversion kgTDN/kg gain | | | | | |
| Initial to puberty | 4.78$^{b}$±0.32 | 5.37$^{ab}$±0.45 | 5.65$^{a}$±0.49 | 5.15$^{ab}$±0.27 | ** |
| Puberty to first service | 6.89$^{ab}$±0.57 | 7.29$^{a}$±0.60 | 7.36$^{a}$±0.21 | 6.93$^{ab}$±0.61 | * |
| Feed conversion kgDCP/kg gain | | | | | |
| Initial to puberty | 0.656$^{c}$± 0.04 | 0.788$^{ab}$ ±0.07 | 0.864$^{a}$±0.07 | 0.716$^{b}$±0.04 | ** |
| Puberty to first service | 0.947$^{b}$± 0.08 | 1.07$^{ab}$ ±0.09 | 1.125$^{a}$ ±0.03 | 0.966$^{b}$±0.08 | ** |

a ,b and c means of different letter in the same row are significant different .

with the general pattern observed by El-Sayes *et al.*, (1997); Khinizy *et al.*, (1997).

On the other hand, available evidence concerning the relationship between growth rate, mammary growth and milk yield in heifers was reflected on heifers fed ration R3 which recorded the reduced of the mammary growth. Sejrsen *et al.*, (1982); Mantysaari *et al.*, (1995) and Sejrsen *et al.*, (1998) observed that mammary development was incomplete in cows raised on high feeding level before puberty onset. Our investigations suggest that blood growth hormone (GH) is important for mammary development, and that the negative effect of high feeding level on mammary development may be due to reduced blood GH Sejrsen *et al.*, (2000).

Concerning the feed conversion (kg DM, TDN or DCP/ kg gain) it was observed that heifers fed highest DM intake (R3) had lowest feed conversion till puberty and first service than other treatments. Difference in feed conversion was highly significant. But heifers fed R1 showed the best efficiency ($P<0.01$). It might be due to the maintenance of requirements were reduced as these animals reach puberty and first service at an earlier stage than the other groups and subsequently lowered the feed conversion of animals fed ration (R3). These results are in harmony with those obtained by Danner *et al.*, (1980); Perry and Cecava (1995); Khinizy *et al.*, (1997) and Mohamed *et al.*, (1999).

***Body measurements:***

The results of average body length, heart and rumen girth, width at withers and hips, height at withers and hips and body condition score of cattle heifers in the different experimental groups are presented in Table (5). Among the experimental groups, it is obvious that the highest values of daily gain in the all tested body measurements were those for group of animals fed (R3), followed by (R2) and (R4) (control). Heifers in (R1) ranked the third and recorded the lowest values. The group differences were highly significant ($P<0.01$).

On the other hand, total gain in heart girth and height at hips were similar for animals fed different experimental rations, showing no significant differences, while, the highest values of total gain in rumen girth, width at withers and body condition score were observed for groups of heifers fed R3 ($P<0.05$). This might be attributed to animals fed R3 received higher DMI compared with those fed R1, R2 and R4. Also, total gain in body length, width at hips and height at withers in the heifers fed (R4) (control) ration were higher compared with those fed R1, R2 and R3, the differences were significantly.

However, the different experimental treatments had no significant effect on the all final body measurements, except for width at withers and body condition score increased ($P<0.05$) with increasing feeding level (R2 and R3) and (R4) control compared to animal in (R1).

Improving the all body measurements of heifers by increasing dietary feeding level density is supported by the results reported by Aboul- Naga, (1966), Abd- El- Hafiz and El -Hommosi (1975) ; Sharma and Sharma (1983); Idris, (1990) and

**Table (5): Total, daily gain in body measurements and body condition score of Friesian heifer groups during the experimental period.**

| Item | Experimental | | | | Sig |
|---|---|---|---|---|---|
| | R 1 | R 2 | R 3 | R4 | |
| No .of animal | 6 | 6 | 6 | 6 | |
| **Body measurements, Cm.** | | | | | |
| **Body length** | | | | | |
| Initial | 103.33±1.63 | 103.83±1.82 | 103.92±1.98 | 103.17±1.58 | NS |
| Final | 138.83±2.27 | 141.17±1.87 | 140.55±2.29 | 141.50±1.80 | NS |
| Total gain | $35.5^{b}$ ± 1.67 | $37.33^{a}$±2.75 | $36.63^{a}$± 2.06 | $38.33^{a}$±3.12 | * |
| Daily gain | $0.147^{c}$ | $0.179^{b}$ | $0.214^{a}$ | $0.192^{ab}$ | ** |
| **Heart girth** | | | | | |
| Initial | 112.17±3.65 | 112.67±2.93 | 112.33±2.09 | 112.83±2.15 | NS |
| Final | 152.17±3.42 | 155.33±3.69 | 153.67±3.26 | 155.00±2.92 | NS |
| Total gain | 40.0±3.08 | 42.67±4.67 | 41.33±2.90 | 42.17±3.74 | NS |
| Daily gain | $0.165^{b}$ | $0.205^{ab}$ | $0.242^{a}$ | $0.216^{ab}$ | ** |
| **Rumen girth** | | | | | |
| Initial | 153.00±4.57 | 154.23±5.58 | 151.62± 4.43 | 151.50±3.73 | NS |
| Final | 208.17±4.76 | 212.20±4.24 | 213.80±4.06 | 205.64±4.91 | NS |
| Total gain | $55.17^{b}$±5.53 | $57.97^{ab}$±4.95 | $62.18^{a}$±3.85 | $54.14^{b}$±3.33 | ** |
| Daily gain | $0.228^{b}$ | $0.279^{ab}$ | $0.364^{a}$ | $0.271^{ab}$ | ** |
| **Width at withers** | | | | | |
| Initial | 13.67±0.88 | 12.50±0.56 | 12.97±0.61 | 13.58±0.88 | NS |
| Final | $22.02^{ab}$±0.82 | $24.37^{a}$±0.83 | $24.93^{a}$±0.85 | $25.13^{a}$±0.36 | * |
| Total gain | $8.35^{b}$±0.27 | $11.87^{a}$±0.60 | $11.96^{a}$±0.58 | $11.55^{a}$±1.05 | ** |
| Daily gain | $0.035^{c}$ | $0.057^{ab}$±0.07 | $0.070^{a}$ | $0.058^{a}$ | ** |
| **Width at hips** | | | | | |
| Initial | 18.72±0.82 | 18.13±1.10 | 17.67±0.89 | 17.97±0.65 | NS |
| Final | 33.47±0.62 | 34.17±0.70 | 33.37±1.09 | 33.92±0.44 | NS |
| Total gain | $14.75^{b}$±0.42 | $16.04^{a}$±0.61 | $15.70^{a}$±0.42 | $15.95^{a}$±0.34 | * |
| Daily gain | $0.061^{b}$ | $0.077^{ab}$ | $0.092^{a}$ | $0.08^{ab}$ | ** |
| **Height at withers** | | | | | |
| Initial | 106.33±1.84 | 107.0±1.29 | 106.50±1.69 | 106.97±1.73 | NS |
| Final | 130.24±2.04 | 131.83±1.35 | 131.33±1.59 | 132.50±1.34 | NS |
| Total gain | $23.91^{ab}$±3.15 | $24.83^{ab}$±1.35 | $24.83^{ab}$±1.95 | $25.53^{a}$±2.76 | * |
| Daily gain | $0.099^{c}$ | $0.119^{b}$ | $0.145^{a}$ | $0.128^{ab}$ | ** |
| **Height at hips** | | | | | |
| Initial | 115.50±1.38 | 114.53±1.61 | 115.62±1.68 | 114.92±1.68 | NS |
| Final | 141.30±1.43 | 140.14±3.01 | 141.17±2.55 | 141.08±1.44 | NS |
| Total gain | 25.80±1.32 | 25.61±2.33 | 25.55±3.06 | 26.16±1.31 | NS |
| Daily gain | $0.107^{c}$ | $0.123^{b}$ | $0.149^{a}$ | $0.131^{ab}$ | ** |
| **Body condition score** | | | | | |
| Initial | 1.5±0.22 | 1.54±0.16 | 1.51±0.13 | 1.51±0.13 | NS |
| Final | $2.25^{b}$±0.21 | $2.50^{ab}$±0.18 | $2.63^{a}$±0.15 | $2.42^{ab}$±0.08 | ** |
| Total gain | $0.75^{c}$±0.11 | $0.96^{ab}$±0.10 | $1.12^{a}$±0.23 | $0.91^{b}$±0.13 | ** |
| Daily gain | $0.004^{b}$ | $0.005^{ab}$ | $0.007^{a}$ | $0.005^{ab}$ | ** |

a ,b and c means of different letter in the same row are significant different .

**Table (6): The economic of feeding different energy and protein allowance during differentperiod of crossed Friesian heifers.**

| Item | Experimental | | | |
|---|---|---|---|---|
| | R 1 | R 2 | R 3 | R4 |
| No .of animal | 6 | 6 | 6 | 6 |
| **Weigh changes :** | | | | |
| Initial weight , kg | 178.17±10.5 | 177.17±13.9 | 177.50±7.45 | 178.0±12.5 |
| at first service, kg | 308.00 ± 6.4 | 307.40±18.1 | 302.08± 14.0 | 304.8±12.5 |
| Total body gain, kg | 129.83 | 130.23 | 124.58 | 126.83 |
| Average daily gain, kg | 0.536 | 0.626 | 0.729 | 0.634 |
| **Relative daily gain efficiency** | 100 | +116.79 | +136.01 | +118.28 |
| **Age changes:** | | | | |
| Initial age , day | 246 | 234.50 | 250.17 | 244.33 |
| Period between initial and age at first service , days | 242 | 208 | 171 | 200 |
| **Relative in all period efficiency** | 100 | +116.35 | +141.52 | +121 |
| **DM intake kg / h /d** | | | | |
| CFM | 1.36 | 1.75 | 2.04 | 1.65 |
| Corn silage | 3.17 | 4.08 | 4.76 | - |
| Berseem hay | - | - | - | 3.29 |
| Rice straw | - | - | - | 0.55 |
| DMI , kg / h /d | 4.53 | 5.83 | 6.80 | 5.49 |
| Total feed cost, LE/ h / d | 3.10 | 4.13 | 4.61 | 4.84 |
| **Relative economic efficiency (feed cost), h/d** | 100 | -133.22 | -148.71 | -156.13 |
| Total DMI, kg/h | 1096 | 1212 | 1162 | 1098 |
| Total feed cost, LE/ h | 750 | 859 | 788 | 968 |
| **Relative economic efficiency (feed cost), h (head)** | 100 | -114.53 | -105.07 | -129.07 |

The price of feed stuffs and products: Feed mixture / ton = 1100 (LE); corn silage / ton= 180 (LE); berseem hay / ton = 800 (LE) and rice straw / ton = 120 (LE).

D'- Hour *et al.*, (1996). Concerning the results of body condition score are nearly similar to these obtained by Walters *et al.*, (1984); Brooks *et al.*, (1985); Patterson *et al.*,(1991); DeRouen *et al* ., (1994); Olsson *et al.*, (1997) and Shahin, (2000).

***Economic efficiency:***

Data of economic point of view (Table 6) include the relative economic efficiency (daily gain, age of first service and fed cost).

Means of final weight (weight at first service) and total gain of cow heifers over the whole experimental period for different experimental groups were almost similar. It was found that heifers fed ration R3 resulted an increase in average daily gain by 36% compared to those fed R1. Concerning, the age at puberty and first service, it could be noticed that the heifers fed ration R3 was attained onset of earlier puberty and first service than those fed R2 and R4 rations, being 41.52, 16.35 and 21%, respectively, compared with (R1). Such differences proved to be statistically highly significant.

Regarding the feed cost, (head/day) or (head) it was indicated that animals fed R4 (control) ration had the most expensive value followed by those fed on (R3 and R2), while, the lowest feed cost recorded with those fed ration R1. It is quite obvious that the daily feed cost will increase from R1 to R3 where the animals are fed with the same diet in increasing amounts. R3 will however a high daily gain is favorable as the time to reach puberty at an earlier stage than R1 and the fewer days to reach this stage may result in a lower total cost. These results are in harmony with those obtained by Mohamed *et al.*, (1997) who found that the feed cost / kg FCM was decreased by feeding corn silage. Also, using corn silage for dairy cattle or fattening calves improved their performance and reduced feeding cost and minimize the amount of expensive concentrate in daily ration (Mahmoud *et al.*, 1992; El-Sayes *et al* ., 1997 and Khinizy *et al.*, 1997).

## CONCLUSION

It could be concluded that in increasing feeding level to growing cow heifers in particular during the period of significant response part from the period of early after weaning, age at puberty and first service, might be promote a rapid rate of growth and consequently decrease the number of days on feeding till first service would take place on body weight basis. Using ration containing higher corn silage tended to higher digestibility coefficients, low feed cost and improves daily gain. In addition, it is not recommended to apply the high feeding level (corn silage) diets for feeding the growing cow heifers in all stages of reproductive and productive performance, because the relationship is not straightforward.

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# دراسات عن المقررات الغذائية في مراحل النمو المختلفة لعجلات الفريزيان الخليط النامي

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استهدفت الدراسة معرفة تأثير استخدام أربع معاملات غذائية مختلفة من الطاقة والبروتين التي تحتاجها عجلات الفريزيان الخليط النامية على معاملات الهضم والنمو ومعدل الأداء والعمر عند البلوغ الجنسي والعمر عند أول تلقيحه. استخدم في هذه الدراسة عدد ٢٤ من عجلات الفريزيان الخليط النامية متوسط عمرها ٨ شهر عند أبتدأ التجربة ومتوسط وزنها ١٧٧ كجم قسمت بالتساوي تبعا للعمر والوزن الي أربع مجموعات متشابه كل مجموعة تتكون من ٦ حيوانات لاختبار أربع معاملات غذائية كالاتى :- المجاميع المغذاة على ثلاث المعاملات الأولى هي علائق تحتوى على (٢ ، ٢,٥ ، ٣% من وزن هذه العجلات على اساس المادة الجافة) أما المعاملة الرابعة تم فيها تغذية العجلات على مقررات NRC لسنة ١٩٧٥م(مجموعة ضابطة) وكانت نسبة العلائق المركزة إلى الخشنة في الأربع معاملات الغذائية السابقة ٣٠ : ٧٠ وكانت العلائق الخشنة في المجاميع الأولى حتى الثالثة هي سيلاج الذرة الكامل والمجموعة الرابعة كان عبارة عن دريس برسيم وقش أرز. وقد استمرت التجربة حوالي ٨ شهر تم خلالها دراسة أداء العجلات حيث يتم وزن الحيوانات كل ١٥ يوم وتم اخذ عينات من الغذاء المأكول ومن روث كل حيوان لمدة ثلاثة أيام متتالية حيث استخدم لتقدير معاملات هضم المركبات الغذائية المختلفة باستخدام طريقة الرماد غير الذائب كمرقم داخلي.

وقد أشارت النتائج إلى ما يلى:

- تحسنت معاملات هضم المادة الجافة والعضوية والمستخلص الخالى من الازوت وكذلك القيمة الغذائية معنويا في المجموعة التي كانت تتغذى على مستوى عالي(٣% من وزن هذه العجلات) بينما معاملات هضم البروتين والألياف الخام والمستخلص الاثيرى أعطى افضل قيمة ومعنويا للعجلات المغذاة على مستوى(٢% من وزن هذه العجلات على أساس المادة الجافة ) وذلك بالمقارنة بالمجاميع الأخرى .
- زاد الوزن النهائي للعجلات عند البلوغ الجنسي زيادة غير معنوية و ذلك نتيجة التغذية على مستويات الغذاء المختلفة وذلك بالمقارنة بالمجموعة الضابطة.
- ذاد معدل النمو اليومي زيادة معنوية عند مستوى معنوي ١% للعجلات عند البلوغ الجنسي و عند أول تلقيحه وذلك بالنسبة للحيوانات التي تتغذى على مستوى(٣% من وزن هذه العجلات) بالمقارنة بمستوى (٢ % من وزن هذه العجلات). وفى نفس الوقت أظهرت النتائج أن المجموعة المغذاة على (٣% من وزن هذه العجلات) تحسن أدائها تحسنا معنوي عن المجموعة المغذاة على (٢,٥% من وزن هذه العجلات) والمجموعة الضابطة.
- كما أظهرت النتائج أيضا أن بعض مقاييس الجسم المختلفة و (BCS) تحسنت معنويا للعجلات التي كانت تتغذى على مستوى(٣% من وزن هذه العجلات) وذلك بالمقارنة بالحيوانات التي كانت تتغذى على بمستوى (٢% من وزن هذه العجلات).
- لوحظ زيادة في طول الفترة حتى البلوغ الجنسي و حتى أول تلقيحه في المجموعة التي تتغذى على عليقه تحتوى على مستوى منخفض (٢% من وزن هذه العجلات) وذلك بالمقارنة بالمجاميع المغذاة على (٣ أو ٢,٥% من وزن هذه العجلات) وكذلك مجموعة المقارنة وكانت الاختلافات معنوية جدا .
- أظهرت النتائج أن مجموعة الحيوانات التي غذيت على عليقة الضابطة ( مقررات NRC لسنة ١٩٧٥م) ذادت التكلفة الاقتصادية بالمقارنة بمجاميع الحيوانات التي كانت تتغذى على مستوى ٣ أو ٢,٥ أو ٢ % من وزن هذه العجلات.
- ومن هذه الدراسة أتضح أن استخدام مستوى(٣% من وزن هذه العجلات على أساس المادة الجافة) أعطى أفضل نتائج من حيث الهضم والقيمة الغذائية وهذا انعكس على معدل النمو للمجموعة الثالثة ومعدل الأداء الإنتاجي والعمر عند البلوغ وأول تلقيحه لعجلات الفريزيان الخليط.
- توصى الدراسة بأن تكون عليقة عجلات الأبقار الخليطة تحت ظروف الأجواء المصرية تعتمد على سيلاج الذرة الكامل وبمستوى (٣% من وزن هذه العجلات) وأن تكون نسبة العليقة المركزة إلى الخشنة ٣٠ : ٧٠ حيث أن هذه المقررات أعطت أفضل النتائج.