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EFFECT OF FEEDING DIFFERENT CONCENTRATE: CORN SILAGE RATIO ON BODY WEIGHT AND AGE AT CONCEPTION OF BUFFALO HEIFERS.

M.A.El-Ashry[1]; G. F. Shahin[2]; T.I. El-Monayer[2] and S.B. Mehany[2]

[1] *Animal Production. Department, Faculty of Agriculture, Ain Shams University Shoupra El-Khaima, Egypt.*
[2] *Animal Production Research Institute, Ministry of Agriculture, Dokki, Giza, Egypt.*

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SUMMARY

This study was conducted to investigate the effect of feeding whole corn silage (WCS) ration with different levels of concentrate feed mixture (CFM) on productive and reproductive performance of Egyptian buffalo heifers after weaning to conception period. Thirty two growing buffalo heifers (about 9 months old and 178 Kg body weight) were assigned randomly into 4 similar groups of 8 each. Each animal group was randomly fed one of the following experimental treatments. The 1st treatment ration R1: heifers were fed according to Animal Production Research Institute allowances (1997), the amounts of roughage were maintained to keep a constant R:C ratio of about {61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) } (Farm control rations); while, the experimental ration, R2: 25% CFM + 75% WCS; R3: 50% CFM + 50% WCS, R4: 75% CFM + 25% WCS, these three treatment rations were formulated to cover maintenance and production allowances according to El-Ashry allowances (1980).

The main results showed that the animals fed R2 recorded lowest ($P<0.05$) digestibility values of DM, OM and CP and highest ($P<0.05$) digestibility of CF and EE compared with other treatments. The highest ($P<0.05$) serum albumin, globulin, total protein, total lipids, NH3-N, creatinine, GOT and GPT were recorded for R4 compared with other treatments. Among the experimental groups, it is obvious that the highest values ($P<0.01$) of total and daily gain in all tested body measurements were noticed with animals fed (R4). While, calves fed on (R2) ration had the lowest values, except for rumen girth. Also, the highest value of average daily body gain was recorded for (R4). While, the lowest one was recorded for (R2). The feed conversion expressed as the amount intake of DM or TDN required per kg gain was significantly ($P<0.05$) poorest in heifers fed (R2) than those others treatments, with the exception of feed conversion expressed as the amount intake of DCP required per kg gain was significantly ($P<0.05$) better in heifers fed (R2) than those others treatments. The animals fed ration (R4) recorded significantly ($P<0.05$) the earliest ages at puberty, 1st service and conception. While, animals fed ration (R2) significantly showed the oldest ages. Interval from puberty to the first service or first service to conception was significantly ($P<0.05$) shorter for heifers fed (R2) than those other treatments. On the other hand, oestrous activity, number of oestrous cycles from puberty to 1st service or to conception was significantly

(P<0.01) higher in heifers fed (R4) ration than those other treatments. The feed cost and efficiency indicated that the animals fed (R2) had the superior economical efficiency. But, heifers fed ration (R3) showing some improvement in productive and reproductive performance i.e. live body weight, rapid rate of growth, some nutrients digestibility and its no embryonic mortality.

Generally, feeding growing buffalo heifers on (R2) which consisted of 75% corn silage: 25% CFM, had the superior economical efficiency, but production, some reproduction performance and production costs increased with increasing feeding CFM.

Keywords: *corn silage, buffalo heifers, digestibility, production and reproduction performance*

INTRODUCTION

In Egypt, buffaloes are considered the main source of milk and meat production, they contributed about 60 and 40% of total milk and red meat production, respectively, the total planted area of corn crop was about 2 million feddans (Agriculture Economy Research Institute, 1997). Recently use of maize silage has increased rapidly as forage for buffaloes and cattle in Egypt. Corn plants are one of the main crops in Egypt. This increase can be related to the relatively high energy yield of corn crop and ease of mechanization with which the whole plant can be ensiled to provide highly palatable source of energy and high quality forage (Mohamed *et al.* 1999). There are many economic advantages in the production and use of corn silage in feeding of cattle.

Reproduction is a vital factor in determining the efficiency of heifer's production. Animals' production efficiency is largely dependent on reproductive performance, the relationship between nutrition (concentrate to roughage ratio) and reproduction in ruminants is complex and often quite variable. Nutrition is the major factor affecting the physiological and metabolic status of the animals, thus optimal feeding buffalo in good body condition insures maximum production and high reproduction efficiency (El-Ashry *et al.* 2003). Silage has many advantages compared to hay. It is succulent feed, palatable and balanced diet of constant composition over the whole year, thus avoiding a seasonal disturbance in production (Etman *et al.* 1994). Vandehaar *et al.* (1999) found that increasing the energy and protein density up to 1.6 Mcal of NE/ kg and 16% CP in dairy cow diets during the last month before calving improved nutrient balance of cows prepartum. While, El-Ahsry *et al.* (2003) concluded that buffalo group fed ration containing 120% energy level with 87.5% protein level according to El-Ashry allowance, (1980) improved feed efficiency; productive and reproductive without any adverse effect on performance of buffalo.

Sejrsen and Purup (1997) and Sejrsen *et al.* (2000) studied the relationship between growth rate, mammary growth and milk yield in heifers. Who found that increased growth rate due to high feeding level before puberty onset can lead to reduced pubertal mammary growth and reduced milk yield potential.

Etman *et al.* (2007) reported that the heifers fed high levels of energy and protein based on increasing corn silage tended to have beneficial on improvement in age at puberty; first service and rapid rate of growth and consequently decreased number of days of feeding till service. Shahin (2007) concluded that pregnant heifers fed ration at 3% LBW feeding level showing some improvement in productive and reproductive

performance i.e. live body weight; rapid rate of growth, some nutrients digestibility; oestrous cycle length; some body measurements and body condition score. Otherwise, observed that increase feed conversion and most expensive feed costs in heifers raised on high feeding level. There are many economic advantages in the production and use of corn silage in feeding of beef cattle. Corn silage is 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. On a dry matter basis, corn silage usually has 8 to 9% crude protein and 65 to 75% TDN (Mahmoud *et al.* 2003).

The objective of this study was to determine the effect of feeding level using silage made from whole corn plant in the ration of buffalo heifers on their productive, reproductive performances and economics of buffaloes heifers.

MATERIALS AND METHODS

Thirty two growing buffalo heifers (about 9 months old and 178 Kg body weight) were assigned randomly into 4 similar groups of 8 each using repeated measurments. This study was conducted at El-Gemiza Experimental Station Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt during 2003/2004. Each animal group was randomly fed one of the following experimental treatments. The 1st treatment ration R1: heifers were fed according to Animal Production Research Institute allowances (1997), the amounts of roughage were maintained to keep a constant R:C ratio of about {61.5% (23% rice straw (RS) +38.5% berseem hay (RS) + 38.5% CFM }, R1 (Farm control rations);while the experimental ration, R2: 25% CFM + 75% WCS; R3: 50% CFM + 50% WCS, R4: 75% CFM + 25% WCS, these three treatment rations were formulated to cover maintenance and production allowances according to El-Ashry allowances (1980). All experimental heifers were kept under semi-open sheds, restricted and individual daily feeding was applied. The experimental rations contained CFM, BH, WCS and RS and offered separately. Treatment period lasted 10 months. 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 by 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 (1). Heifers were observed for oestrus twice daily, at 7 a.m. and 4 p.m. The heifers were mating (the first service) at live body weight about 350 kg. Data of observed estrous and number of services per conception was recorded for each animal. Throughout the feeding period, body condition score (BCS) was monthly recorded for each animal (Ebrahim, 2004). The heifers were examined clinically and pattern of embryonic loss from days 28 to 84 of gestation. Blood samples were taken from each heifer biweekly before morning feeding.. Serum total lipids, total proteins, albumin, globulin (by difference), urea-N, creatinine, GOT and GPT were determined in blood colorimetrically using commercial diagnostic kits (Test-combination, Pasteur lap), Mahmoud *et al.* (2003).

Table (1): Chemical analysis of experimental feed stuff and calculated tested rations.

Item		DM	Nutrient % of DM					
			OM	CP	CF	EE	NFE	Ash
Feedstuff								
CFM*		88.73	89.65	16.59	11.85	1.51	59.70	10.35
Corn silage		35.89	86.25	7.33	23.12	2.39	53 41	13 75
Rice Straw		89.25	80.55	2.44	37.21	1.03	39.87	19.45
Berseem hay		88.49	87.80	11.17	28.90	1.35	46.38	12.20
Tested ration	**TDN**							
Rations 1 (control)	50.41	88.76	86.84	11.24	24.26	1.34	50.0	13.16
Rations 2	63.75	49.10	87.10	9.65	20.37	2.17	54.91	12.90
Rations 3	62.5	62.32	87.96	11.97	17.54	1.95	56.50	12.04
Rations 4	61.25	75.52	88.80	14.27	14.69	1.73	58.11	11.20

*R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage *The ingredients of concentrate feed mixture (CFM) were: 39% yellow corn, 29% undecorticated cottonseed meal, 14% rice bran, 9% soybean meal, 5% vinas, 3% limestone and 1% salt.*

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:

Chemical analysis of different tested rations is summarized in Table (1). Results showed that highest percentages of OM and CP in the ration (R4) compared with other treatments (R1, R2 and R3). On the other hand, results showed that highest percentage of CF and Ash were recorded in the ration (R1) followed by R2, R3 ranked the third, while R1 recorded the lowest values. Concerning, the percentage of EE, it was observed that R2 recorded the highest values, followed by R3 and R4. However, R1 recorded the lowest values.

Nutrient digestibility and feeding values:

Data of Table (2) clearly indicate that animals fed R2 recorded lowest ($P<0.05$) digestibility values of DM, OM and CP compared with other treatments. This result may be attributed to low feeding level of concentrate feed mixture (25% CFM) in the diets and may be due to decreasing the percentage of CP in the diets (Table1). However, digestibility of CF and EE were significantly ($P<0.05$) improved for low proportion of CFM (R2) and increase for feeding level of Corn silage than other treatments. This may be attributed to the increase of rumen microbial activity and differences in rate of digestion. Moreover, animals fed (R4) showed the highest ($P<0.05$) digestibility coefficients of NFE. followed by R3 and R2, while, R1 recorded the lowest values. These results are in agreement with those obtained by Hussein and Berger (1995); Cilliers *et al.* (1998); El-

Ashry *et al.* (2003) and Etman *et al.* (2007) who reported that the increase of dietary CFM levels improved the digestibility of all nutrients expect CF digestibility. On the other hand, results obtained in Table (2) indicate that nutritive values as TDN was significantly increased (P<0.05) with heifers fed highest level from CFM with corn silage. While, animals fed (R1) control groups recorded the lowest values. The high TDN values of rations contained high CFM (75%) and low corn (25%) silage may be attributed to the mutual associative effect of corn silage with CFM. Moreover, animals fed R4 recorded the highest of feeding values as DCP, followed by those fed ration R1 and R3, while R2 recorded the lowest DCP value. These results are coincided with those CP digestibilities. The differences in DCP were highly significant (P<0.01) and may be due to increasing in percentage of CP in the diets (Table 1). These results are in accordance with those obtained by (Khinizy et al., 1997; Taie et al., 1998 and Etman *et al.* 2007).

Table (2): Mean nutrients digestibility and feeding value of buffalo heifers fed the different experimental rations.

Item	Treatment			
	R 1	R 2	R 3	R4
Nutrients digestibility %				
DM	$66.68^{a} \pm 0.43$	$64.43^{ab} \pm 0.24$	$65.78^{a} \pm 0.41$	$68.06^{a} \pm 0.28$
OM	$67.55^{a} \pm 0.84$	$65.25^{ab} \pm 0.53$	$68.84^{a} \pm 0.25$	$69.80^{a} \pm 0.36$
CP	$66.47^{a} \pm 0.36$	$64.51^{ab} \pm 0.32$	$66.27^{a} \pm 0.10$	$68.14^{a} \pm 0.29$
CF	$51.02^{ab} \pm 0.42$	$55.98^{a} \pm 0.33$	$52.58^{ab} \pm 0.25$	$50.93^{b} \pm 0.11$
EE	$75.56^{ab} \pm 0.32$	$78.75^{a} \pm 0.40$	$74.43^{ab} \pm 0.63$	$71.84^{b} \pm 0.33$
NFE	$70.19^{b} \pm 0.70$	$71.90^{ab} \pm 0.23$	$73.32^{ab} \pm 0.34$	$77.54^{a} \pm 0.24$
Feeding value%				
TDN	$59.02^{b} \pm 0.47$	$62.65^{ab} \pm 0.08$	$62.50^{ab} \pm 0.19$	$65.33^{a} \pm 0.17$
DCP	$7.47^{AB} \pm 0.04$	$6.22^{B} \pm 0.03$	$7.93^{AB} \pm 0.01$	$9.72^{A} \pm 0.04$

R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

a,b Means of different letter in the same row are significant different (P<0.05) and (P<0.01)

Blood parameters:

The results of blood constituents of buffalo heifers are shown in Table (3). The highest (P<0.05) total protein, albumin, creatinine and NH_3-N were recorded for R4 and R1 followed by R3, while R2 recorded the lowest values. However, the highest concentration of blood GOT and GPT activity were recorded by R4 followed by R1 and R3 ranked the third, while R2 recorded the lowest values. Concerning, globulin, albumin: globulin ratio and total lipids were lower (P<0.05) for heifers fed R2 than those other treatments. These results may be due to lower dietary crude protein as shown in Table (1). Also, Khinizy *et al.* (1997), Mohesen *et al.* (2001) and El-Ashry *et al.* (2007) found that higher level of protein in the diets resulted in higher NH_3-N and creatinine concentrates. In general, the animals fed R2 showed lowest values of all parameters studied compared with other treatments. Also, the values obtained in the present study are within the normal range as determined by many other reports (Hawkins *et al.* 1995 and Basiony, 1998).

Table (3): Blood serum constituents of buffalo heifers fed the different experimental rations.

Item	Treatment			
	R 1	R 2	R 3	R4
Total protein (g/dl)	$8.60^{a} \pm 0.11$	$7.35^{b} \pm 0.21$	$8.07^{ab} \pm 0.27$	$8.71^{a} \pm 0.20$
Albumin (g/dl)	$4.83^{a} \pm 0.07$	$3.75^{b} \pm 0.04$	$4.11^{ab} \pm 0.01$	$4.63^{a} \pm 0.04$
Globulin (g/dl)	$3.74^{a} \pm 0.04$	$3.54^{b} \pm 0.03$	$3.74^{a} \pm 0.02$	$3.87^{a} \pm 0.03$
A/G ratio	$1.29^{a} \pm 0.07$	$1.06^{b} \pm 0.06$	$1.10^{b} \pm 0.03$	$1.20^{ab} \pm 0.06$
Total lipids (mg/dl)	$213.45^{c} \pm 19.20$	$244.50^{b} \pm 32.15$	$276.73^{ab} \pm 33.17$	$298.11^{a} \pm 22.1$
NH_3-N(mg/dl)	$25.59^{a} \pm 1.21$	$19.73^{b} \pm 0.29$	$22.59^{c} \pm 0.29$	$25.51^{a} \pm 0.31$
Creatinine (mg/dl)	$1.35^{a} \pm 0.01$	$1.21^{b} \pm 0.02$	$1.32^{ab} \pm 0.01$	$1.41^{a} \pm 0.01$
GOT (IU/L)	$41.28^{ab} \pm 0.73$	$32.76^{c} \pm 0.64$	$38.25^{b} \pm 0.59$	$44.41^{a} \pm 0.73$
GPT (IU/L)	$22.12^{ab} \pm 0.64$	$19.54^{c} \pm 0.81$	$20.98^{b} \pm 0.34$	$23.65^{a} \pm 0.43$

R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

a,b and c Means of different letter in the same row are significant different (P<0.05).

Some body measurements:

Some body measurements and BCS of buffalo heifers fed different experimental treatment are presented in Table (4). The results showed generally that the animals fed (R4) were highest values of final body, total and daily gain in all tested body measurements. This may be due to the higher level of (CFM) intake in the ration and this lead to some improvement in productive performance i.e. live daily body gain, some nutrients digestibility and feeding values expressed as TDN and DCP. On the other hand, heifers fed on (R2) ration recorded significantly (P<0.01) higher of rumen girth compared with other treatments. This finding may be due to the increase percentage of roughage (corn silage) to concentrate ratio, which lead to higher in development of rumen capacity. Similar results were reported by other investigators D'Hour *et al.* (1996); Bilik *et al.* (2001) and El-Ashry *et al.* (2007) who reported that growing animals fed ad-libitum (high feeding level), grew faster and were larger in all body measurements studied than those under feed restricted regime. Regarding, body condition score (BCS) heifers fed (R4) showed the highest value (P<0.05), followed by R3 or R1. While the lowest score was that for R2. These results may be due to higher dietary CFM intake, lead to some improvement in productive performance.

Productive performance:

The results of heifer's performance are shown in Table (5). The weight at puberty, 1st service and conception were almost similar for heifers fed different experimental treatments, showing no significant differences. This was associated with large different age of heifers at puberty, 1st service and conception. These results are in agreement with those of Shahin (2004) and Etman *et al.* (2007). While, Total body weight gain (from initial to puberty), heifers fed ration (R2 or R3) recorded higher (P<0.05), followed by rations (R1 or R4) groups. These results may be due to the improved of six hormones activity for heifers fed (R1 or R4). On the other hand, the highest of total body weight gain at puberty to 1st service was recorded by R4 followed by R1 and R3 ranked the third, while, R2 recorded the lowest values. Concerning the total body weight gain at 1st service to conception, it was indicated that animals fed on (R4 or R3) had the highest values

followed by those on (R1), however, animals fed on ration (R2) recorded the lowest vales. On the other hand, the total body weight gain at initial to conception was insignificantly higher in experimental ration (R4) than those other treatments. .Also, data in table (5) indicate generally that the highest value of average daily body gain were recorded for (R4) while, the lowest one was recorded for (R2). This might be due to the increase of CFM some nutrients digestibility and improved in feeding values expressed as TDN and DCP which would be more efficient utilized for growth. These results are in agreement with those of Mohamed *et al.* (1999), El-Ashry *et al.* (2003) and Etman *et al.* (2007). On the other hand, Almquist and Amann (1976) reported that weight and age at different reproductive performance stage to be a genetic character.

Table (4): Total, daily gain in some body measurements and body condition score of buffalo heifers groups fed the different experimental rations.

Item	Treatment			
	R 1	R 2	R 3	R4
Body measurements, Cm.				
Heart girth				
Initial	122.12 ± 2.58	121.73±2.99	122.41±3.61	122.07±2.43
Final	169.69^{ab}±3.24	162.52^{b}±3.54	170.62^{ab}±4.94	178.41^{a}±3.32
Total gain	47.57^{ab}±3.11	40.79^{b}±3.71	48.21^{ab}±2.43	56.34^{a}±2.08
Daily gain	0.148^{b}	0.121^{c}	0.170^{ab}	0.194^{a}
Rumen girth				
Initial	162.63±4.24	162.14±4.32	161.79±4.51	163.01±3.94
Final	235.16^{AB}±5.73	260.9^{A}±6.78	245.07^{AB}±4.61	224.81^{B}±5.83
Total gain	72.53^{B}±2.72	98.77^{A}±5.22	83.28^{AB}±5.35	61.80^{C}±4.61
Daily gain	0.225^{AB}	0.292^{A}	0.294^{A}	0.213^{B}
Width at withers				
Initial	17.75±1.11	17.45±1.41	17.61±1.39	17.67±1.07
Final	29.58^{ab}±0.91	26.72^{b}±0.67	30.03^{ab}±0.52	32.36^{a}±0.91
Total gain	11.83^{b}±0.56	9.27^{c}±0.42	12.42^{ab}±0.11	14.69^{a}±0.69
Daily gain	0.037^{b}	0.027^{c}	0.044^{ab}	0.051^{a}
Width at hips				
Initial	25.75±1.39	25.29±1.09	25.50±1.04	24.89±0.98
Final	42.18^{ab}±1.02	38.91^{b}±1.12	44.61^{a}±2.09	46.51^{a}±1.24
Total gain	16.43^{b}±0.92	13.62^{c}±0.67	19.11^{ab}±0.84	21.62^{a}±1.07
Daily gain	0.051^{b}	0.040^{c}	0.067^{ab}	0.075^{a}
Body condition score				
Initial	1.44±0.20	1.41±0.27	1.38±0.21	1.40±0.22
Final	2.85^{ab}±0.31	2.47^{b}±0.33	2.95^{ab}±0.40	3.22^{a}±0.30
Total gain	1.41^{b}	1.06^{c}	1.57^{ab}	1.82^{a}

R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

a ,b and c Means of different letter in the same row are significant different (P<0.05) and (P<001).

Table (5): Effect of experimental treatments on productive performance of buffalo heifers.

Item	Treatment			
	R 1	R 2	R 3	R4
No .of animal	8	8	8	8
Weigh changes, kg				
Initial weight	178.25± 22.71	178.38±8.46	178.75±9.30	178.50±11.58
at puberty	306.71 ± 3.56	321.50±4.17	312.50±12.58	301.06±5.10
at first service	344.33 ± 3.11	345.46±4.12	348.16± 5.71	350.88±2.15
at conception	367.31 ± 5.56	365.49 ± 4.44	373.65 ± 7.43	377.41± 4.26
Total body gain, kg				
Initial to puberty	124.88^{ab}± 22.60	139.75^{a}±10.02	133.75^{a}±9.84	122.56^{ab}±10.27
Puberty to first service	41.21^{ab} ± 4.24	23.96^{c}±1.96	35.66^{b}±4.16	49.81^{a}±5.31
first service to conception	22.97^{ab} ± 3.23	20.03^{b} ± 3.62	25.49^{a} ± 2.92	26.53^{a} ± 3.51
Initial to conception	189.06 ± 24.27	190.35 ± 9.53	194.90 ± 7.85	198.91 ± 11.29
Average daily gain, kg				
Initial to puberty	0.536^{ab}±0.03	0.537^{ab}±0.02	0.701^{a}±0.03	0.715^{a}±0.06
Puberty to first service	0.639^{b}± 0.04	0.637^{b}±0.04	0.683^{ab}± 0.05	0.742^{a}±0.06
first service to conception	0.662^{ab}±0.02	0.611^{b}±0.03	0.657^{ab}±0.04	$0.7.03^{a}$±0.01
Initial to conception	0.572^{ab}±0.02	0.570^{ab}±0.02	0.691^{a}±0.02	0.701^{a}±0.04
Feed conversion kg DM/kg gain				
Initial to puberty	12.07^{AB}	12.63^{A}	11.43^{B}	11.43^{B}
Puberty to first service	12.50^{AB}	13.34^{A}	12.08^{AB}	11.32^{B}
first service to conception	13.14^{AB}	14.32^{A}	12.94^{AB}	12.32^{B}
Initial to conception	12.59^{A}	12.98^{A}	11.90^{AB}	11.69^{AB}
Feed conversion kg TDN/kg gain				
Initial to puberty	7.14^{b}	8.04^{a}	7.14^{b}	7.47^{ab}
Puberty to first service	7.38^{ab}	8.49^{a}	7.55^{ab}	7.40^{ab}
First service to conception	7.76^{b}	9.12^{a}	8.09^{ab}	8.05^{ab}
Initial to conception	7.45^{b}	8.62^{a}	7.44^{ab}	7.64^{ab}
Feed conversion kg DCP/kg gain				
Initial to puberty	0.951^{ab}	0.786^{c}	0.906^{b}	1.111^{a}
Puberty to first service	0.978^{ab}	0.830^{b}	0.958^{ab}	1.10^{a}
first service to conception	1.053^{ab}	0.891^{b}	1.026^{ab}	1.198^{a}
Initial to conception	0.983^{ab}	0.807^{b}	0.944^{ab}	1.136^{a}

R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

a ,b and c Means of different letter in the same row are significant different(P<0.05) and (P<001).

The feed conversion expressed as the amount intake of DM, TDN and DCP required per kg gain (Table5) showed that the heifers fed (R4 or R3) had better (P<0.01) feed conversation expressed as kg intake of DM followed by (R1), while, heifers fed (R2) showed the poorest feed conversion values. It might be due attributed to the mutual associative effect of increase of average daily body gain. Feed conversion expressed as the amount intake of TDN required per kg gain was significantly (P<0.05) poorest in heifers fed (R2) than those others treatments, with the exception of Feed conversion expressed as the amount intake of DCP required per kg gain was significantly (P<0.05) better in heifers fed (R2) than those others treatments, while, ration (R4) recorded the poorest values. It

might be due to the increase in percentage of CP in the (R4) ration (Table1), which would be increase CFM levels of this ration. These results are in harmony with those obtained by Perry and Cecava, (1995); Khinizy *et al.* (1997); El-Ashry *et al.* (2003) and Etman *et al.* (2007).

Age at puberty, 1st service and conception

Age at puberty, 1st service and conception are shown in Table (6). Data show that animals fed ration (R4) recorded significantly (P<0.05) the earliest ages at puberty, 1st service and conception. While, animals fed ration (R2) significantly showed the oldest ages. This might be due to the increase fed intake of CFM level and improved in some nutrients digestibility, feeding values expressed as TDN and DCP and higher metabolizable energy and protein in this ration (R4), which would be more efficient utilized for growth. These finding agree well with those obtain by Hall *et al.* (1994); Prasad *et al.* (1995); Shahin (2004) and Etman *et al.* (2007) who concluded that the animals fed on low feeding level were significantly oldest at 1st oestrus than those on the high feeding levels.

Table (6) : Some reproductive performance of buffalo heifers fed different experimental rations.

Item	Treatment			
	R 1	R 2	R 3	R4
Age (day) of heifers:				
Initial age	285.94±14.80	283.5±16.7	286.50±15.60	277.5±13.50
Puberty	509.1^{ab}±10.82	552.3^{a}±13.50	478.50^{b}±13.20	458.7^{c}±12.80
First service	573.3^{a}±9.60	590.1^{a}±14.40	529.8^{ab}±12.90	529.8^{ab}±13.50
Conception	608.4^{a}±13.80	621.6^{a}±18.90	570.0^{ab}±12.0	567.9^{ab}±13.20
Interval (day) from:				
Initial to puberty	223.2^{ab}±21.1	268.5^{a}±20.70	192.0^{b}±14.90	181.20^{c}±23.40
Puberty to first service	64.2^{ab}±5.10	38.1^{c}±7.32	51.30^{b}±9.30	71.19^{a}±11.40
first service to conception	35.1^{b}± 5.10	32.4^{c}±5.70	40.20^{a}±5.70	33.10^{ad}±5.10
Initial to conception	322.5^{ab} ± 23.9	338.1^{a}±21.30	283.5^{b}±13.20	290.5^{b}±24.90
Number of oestrous cycles from puberty to:				
first service	3.23^{AB}±0.34	1.95^{C}±0.21	2.6^{B}±0.22	3.64^{A}±0.27
Conception	1.75^{B}±0.30	1.75^{B}±0.30	2.13^{A}±0.30	2.02^{AB}±0.27
Oestrous cycles length (day)	20.0^{a}± 0.56	18.53^{ab}±0.34	19.0^{ab}± 0.56	18.88^{ab}±0.43

R1 = 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

a ,b,c and d Means of different letter in the same row are significant different at (P<0.01) and (P<0.05)

Interval from puberty to the first service or first service to conception was significantly (P<0.05) shorter for heifers fed (R2) than those other treatments. This might be due to the heifers fed ration (R2) attained onset of earlier 1st service and conception, which would be high efficient utilized for six hormones and the number of ostrous cycles from puberty to 1st service and 1st service to conception was lower (Table 6). On the other hand, the animals fed (R2) ration appeared to show longest (P<0.01) interval from initial to puberty or to conception than those other treatments, which may be due to the low level of CFM in the rations and decrease of live body weight daily gain. The present findings are similar to those obtained by Hegazy *et al.* (1994); Hall *et al.* (1994); Prasad *et al.* (1995); Shahin

(2004) and Etman *et al* (2007). In the except, Freetly and Cundiff (1998) reported that the level of feeding of heifers up to mating at 2 years has little effect on their reproduction performance.

On the other hand. oestrous activity, number of oestrous cycles from puberty to 1st service or to conception was significantly ($P<0.01$) higher in heifers fed (R4) ration than those other treatments. However, the animals fed (R2) was recorded the lowest of oestrous cycle's values. This was attributed with the interval from puberty to 1st service or to conception in each group (Table 6). Also, results show that heifers fed (R1) recorded significantly ($P<0.05$) longer than those other treatments (R2, R3 or R4). This might be attributed to the mutual associative effect of corn silage with concentrate mixture or seems to be a genetic character.

Table (7): Oestrous and mating performance of buffalo heifers fed different experimental rations.

Item	Treatment			
	R 1	R 2	R 3	R4
No. of conceived heifers after				
1st service	3	3	2	2
2nd service	4	3	3	4
3rd service	1	2	3	2
Total service to conception	8	8	8	8
NS/C after the 2nd service	1.86	2.17	2.80	2..30
NS/C after the 3rd service	1.75	1.88	2.13	2.00
Cumulative conception rate (%) after:				
<1st service	37.50	37.50	25.00	25.00
2nd service	87.50	75.00	62.5	75.00
3rd service	100	100	100	100
No. of heifers of gestation	8	8	8	8
Pregnancy rate (%)*	100	100	100	100
Pregnancy rate (%) **	100	100	100	100
No. of heifers embryonic loss	0	0	0	1
Embryonic loss (%)	0	0	0	12.50

R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage

** On the basis of conceived animals, ** On the basis of total animals*

Conception and pregnancy rate:

Reproductive performances are presented in Table (7). Data indicated that conception rate (CR %) of the 1st and 2nd service was the highest for control ration (R1), followed by R2 and R4, while, R3 recorded the lowest values. Concerning, the number of service per conception (NS/C) after the 2nd or 3rd service were almost the same trend of conception rate (CR %). On the other hand, all buffalo heifers conceived in the all treatments after the 3rd service (required 1-3 service / conception). These results are in agreement with those of Almquist and Amann, (1976). One heifer in R4 was conceived without calving resulting in embryonic mortality of 12.5 percentages (Table 7). The heifers were examined clinically and pattern of embryonic loss from days 28 to 84 of gestation. This may be due to the continuous increase in level of CFM in the diets, and at the same time is affected by development of sex organs with advancing of age and weight at different reproductive performance stages. Similar results were reported by Silke *et al.* (2002) and Shahin. (2004).

Economic efficiency

Economic efficiency are presented in Table (8). The data indicated generally that the relative economic efficiency of average daily gain was significantly (P<0.01) increased with increasing CFM levels in (R4 or R3) content of CFM compared with (R1) control ration followed finally by (R2). Concerning, feed intake and feed cost, it was indicated that the animals fed (R3 or R4) had the higher (P<0.01) feed intake than those of R2 or R1.

However, the feed cost and efficiency indicated that the animals fed (R2) had the superior economical efficiency, followed by heifers fed on (R1), R3 ranked the third, while R4 recorded the lowest values. Also, the total feed cost and efficiency, it was observed that the heifers fed (R2) had the superior economical efficiency followed by R3, R1 ranked the third and the animals fed (R4) ranked the lowest values. Regarding, return and relative economic efficiency at daily gain or total gain, it was indicated that the heifers fed ration (R2) had superior economical efficiency at daily and total gain, followed by heifers fed ration (R3), R1 ranked the third and the R4 ranked the lowest values. This might be due to the lowest feed cost of ration (R2) than those other treatments (Table 8). These results seem to agree with those of Mohamed *et al.* (1999) and Etman *et al.* (2007). Also, the heifers fed ration (R3) 100% conceived and its not embryonic mortality (0 %), (Table 7).

Table (8): The economic of different feeding level during different period of growing buffalo heifers.

Item	Treatment			
	R 1	R 2	R 3	R4
Average daily gain, kg	0.572	0.570	0.691	0.701
Relative daily gain efficiency	100	99.65	120.8	122.6
Period between initial and conception ,days	322.5	338	283.5	290.5
Relative in all period efficiency	100	95.16	112.1	109.93
DM intake, kg / h /d				
CFM	2.77	1.85	4.11	6.15
Berseem hay	2.77	-	-	-
Rice straw	1.66	-	-	-
Corn silge	-	5.55	4.11	2.05
DMI	7.20[ab]	7.40[ab]	8.22[a]	8.20[a]
Feed cost, LE/h/d	7.4	5.23	8.18	10.53
Relative feed cost efficiency	100	129.32	89.46	56.53
TDMI	2322	2502	2330	2382
Total Feed cost, LE/h/d	2386.5	1768	2319	3059
Relative total feed cost efficiency	100	125.92	102.83	71.82
Price of daily gain, LE	8.01	7.98	9.67	9.81
Return, LE *	+0.61	+2.75	+1.50	-0.716
Relative economic cost efficiency *	100	+350.82	+145.90	-217.38
Price of total daily gain, LE	2646.84	2664.9	2728.60	2784.74
Return, LE **	260.34	896.90	409.6	-274.26
Relative economic efficiency **	100	+244.51	+57.33	-205.35

*The price of feed stuffs as DM basis and products: Feed mixture / ton = 1573 (LE); corn silage / ton= 417.941(LE); berseem hay / ton = 1017 (LE) and rice straw / ton = 134.5 (LE) and live body weight / kg= 14 LE. * Return= price of daily gain- daily feed cost ** Return= price of total daily gain- total daily feed cost. R1= 61.5% (23% rice straw +38.5% berseem hay) + 38.5% (CFM) R2=25% concentrate feed mixture (CFM) + 75% corn silage R3=50% concentrate (CFM) + 50% corn silage R4= 75% concentrate (CFM) + 25% corn silage*

Conclusion

It could be concluded that feeding growing buffalo heifers on (R2) which consisted of 75% corn silage: 25% CFM, had the superior economical efficiency, but production, some reproduction performance and production costs increased with increasing feeding CFM. In addition, it is recommended to apply the high feeding level (75% corn silage) diets for feeding growing buffalo heifers in all stage of production performance. These conclusion might then differ from what is written in the manuscript because the economic evaluation might change depending on variations in the price of concentrates (as it is currently the case).

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تأثير التغذية على نسب مختلفة من المركزات وسيلاج الذرة على وزن الجسم والعمر عند أول تلقيحه فى عجلات الجاموس

محمد عبد المنعم العشرى[1] ـ جمال فاروق شاهين[2] ـ طارق المنير[2] ـ سمير بشرى مهنى[2]

[1] قسم الإنتاج الحيواني ـ كلية الزراعة ـ جامعة عين شمس ـ مصر.

[2] قسم تغذية الحيوان ـ معهد بحوث الإنتاج الحيواني ـ مركز البحوث الزراعية ـ الدقي ـ الجيزة ـ مصر.

أستخدم ٣٢ عجلة جاموسي بمتوسط وزن ١٧٨ كجم و عمر ٩ شهر لدراسة معدلات النمو و معاملات الهضم والكفاءة التناسلية والاقتصادية للعجلات النامية المغذاة على مستويات مختلفة من سيلاج الذرة مع المركزات. قسمت العجلات عشوائيا و بالتساوي تبعا للعمر والوزن آلي أربع مجاميع متشابه كل مجموعة تتكون من ٨ عجلات لاختبار أربع معاملات غذائية كالآتى:

المعاملة الأولى: هي عليقه المحطة (مجموعة ضابطة) وكانت نسبة العلائق المركزة إلى الخشنة هي ٣٨.٥: ٦١.٥ (٣٨.٥ :٢٣ ٪) وذلك حسب مقررات معهد بحوث الإنتاج الحيواني ١٩٩٧م وكانت العلائق الخشنة عبارة عن دريس برسيم وقش أرز .

المعاملة الثانية: هي علائق تحتوى على ٢٥٪ علف مركز + ٧٥٪ سيلاج الذرة حسب مقررات العشري ١٩٨٠م.

المعاملة الثالثة: هي علائق تحتوى على ٥٠٪ علف مركز + ٥٠٪ سيلاج الذرة وذلك حسب مقررات العشري ١٩٨٠م.

المعاملة الرابعة: هي علائق تحتوى على ٧٥٪ علف مركز + ٢٥٪ سيلاج الذرة وذلك حسب مقررات العشري ١٩٨٠م.

وقد استمرت التجربة حتى وصول العجلات إلى أول تلقيحة مخصبة 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 الرماد غير الذائب كمرقم داخلي.

وكانت أهم النتائج:

- أظهرت المجموعة التي غذيت على المعاملة الثانية زيادة معنوية في معاملات هضم كل من الألياف و المستخلص الأثيري وأقل في معاملات هضم كلا من المادة الجافة والعضوية

والبروتين الخام بالمقارنة بالمعاملات الأخرى بينما المعاملة الرابعة أظهرت زيادة معنوية في معاملات هضم المستخلص الخالي من الآزوت وكذلك القيمة الغذائية لمجموع المركبات الغذائية المهضومة و البروتين المهضوم.

- زاد تركيز كلا من الالبيومين و الجلوبيولين الدم والليبدات الكلية والكرياتين والبروتين الكلى بزيادة مستوى العليقة المركزة بينما انخفض بزيادة مستوى التغذية على سيلاج الذرة فى العليقة.
- كما أظهرت النتائج أيضا أن مقاييس الجسم المختلفة محل الدراسة و (BCS) تحسنت معنويا للعجلات التي كانت تتغذى على عليقة المجموعة االرابعة بينما زاد محيط الكرش بزيادة مستوى سيلاج العليقة (العليقة الثانية).
- الوزن النهائي للعجلات كان تقريبا متساوي عند البلوغ وعند اول تلقيحة والتلقيحة المخصبة والاختلافات كانت غير معنوية بينما المجموعة التي غذيت على المعاملة الرابعة أظهرت زيادة في معدلات النمو اليومي والفروق كانت معنوية.
- تحسنت الكفاءة الاقتصادية و الغذائية لكلا من مجموع المركبات الغذائية المهضومة و البروتين المهضوم وانخفضت الفترة مابين البلوغ وأول تلقيحة و كذلك الفترة من أول تلقيحة حتى التلقيحة المخصبة ومتوسط وكذلك انخفضت عدد مرات الشياع من البلوغ حتى أول تلقيحة و من أول تلقيحة حتى التلقيحة المخصب معنويا لحيوانات التي غذيت على المعاملة الثانية وانخفضت متوسط عدد التلقيحات اللازمة للإخصاب معنويا في المجموعة الضابطة بالمقارنة بالمجاميع الأخرى في حين لم يظهر هناك أي اختلافات معنوية في طول فترة الحمل.

لذلك يمكن التوصية بأن تكون عليقة عجلات الجاموس تعتمد على سيلاج الذرة الكامل) وأن تكون نسبة العليقة المركزة إلى الخشنة ٢٥: ٧٥ حيث أن هذه المقررات أعطت أفضل النتائج الاقتصادية.