EFFECT OF DIETARY ENERGY LEVEL ON NUTRIENT UTILIZATION, PRODUCTIVE AND REPRODUCTIVE PERFORMANCES OF GROWING BUFFALO HEIFERS.

G. F. Shahin

Animal Production Research Institute, Ministry of Agriculture, Egypt.

(Received 15/6/2004, accepted 15/9/2004)

SUMMARY

Twenty four growing buffalo heifers were divided into three similar groups fed different dietary energy levels. The experimental rations were iso-nitrogenous with three levels of dietary energy. (80, 100 and 120 % TDN of the allowances) according to Kearl (1982). Heifers in the 1st group were fed 100% TDN (G1), while those in the 2nd (G2) and 3rd (G3) groups were fed 80 and 120% TDN, respectively. Feeding experiment started from puberty age till the first 3 months of gestation. Ages and live body weights at the beginning of experiment were 529, 581, 516 days and 365, 356 and 371 kg for G1, G2 and G3, respectively).

Heifers of G3 showed higher ($P<0.05$) total DM intake than the corresponding values of G1 and G2. Heifers in G3 showed the highest ($P<0.05$) digestibility coefficients of DM, OM, CP, EE and NFE and the lowest ($P<0.01$) digestibility coefficient of CF, however, the nutritive values were highly significant ($P< 0.01$) for TDN and DCP values. Heifers in G3 recorded the highest ($P<0.05$) average body weight, total gain and daily gain at conception and first 3 months of gestation, however, G2 showed the lowest ($P<0.05$) mean values. Feed conversion (kg DM/kg gain), was poorer in G2 and G3 than in G1 at conception and first 3 months of gestation. The differences were significant only between G1 and G2. Feed conversion as TDN kg/kg gain was better ($P<0.01$) in G2 than in G1 and G3 at conception and first 3 months of gestation. Feed conversion as kg DCP/kg gain was better ($P<0.05$) in G3 than in G2, but did not differ significantly from that in G1. Heifers in G3 recorded the earliest ($P<0.05$) ages at puberty, in turn earliest ages at first service and conception. However, those in G2 showed the latest ($P<0.05$) ages. Interval from puberty to the first service or to conception was shorter ($P<0.05$) for heifers in G3 than in G2.

Key words: Energy level, buffalo heifers, digestibility, productive and reproductive performance.

INTRODUCTION

Increasing the human population all over the world requires continues supply of food from either plant or animal sources. In Egypt there is gab between the human requirements of animal proteins and the national resources. Buffaloes are one of animal protein sources used to cover this gab. Feed is the most important cost item for livestock production representing about 70 % of production costs (Borhami and Yacout , 2001 and Abdel – Salam , 2003).

Buffaloes are considered the principal dairy animal in Egypt. They produced about 60 and 40% of the total milk and meat production in Egypt, respectively (A. E. R. I., 1997).

Nutrition is the major factor affecting the physiological and metabolic status of buffaloes. Nutritional components

especially energy level is the most important factor affecting body weight, age of the first fertilized service, age at first calving and growth rate at different ages. El-Ashry *et al.* (2003) concluded that buffalo group fed ration containing 120% energy level and 87.5 % protein level showing highest milk production and best feed efficiency without any adverse effects on performance of buffalo. Dimov *et al.*, (1984) and Shahin (2000) reported that the intake of feed and digestible protein / kg gain was lower with the low energy level. Sharma and Sharma (1983) reported that digestibilities of most major nutrients were unaffected but digestibility of NFE increased with increasing dietary energy.

Heifers fed the greater amount of energy exhibited larger dominant ovarian follicles at a younger age in comparison with heifers fed the lower amount of energy. Age and weight differ (at puberty) among heifers receiving diets with higher energy content compared with those receiving diets with lower energy content (Bergfeld *et al.*, 1994). Shahin (2000) mentioned that optimal energy allowances during rearing of sheep depend on the breed, age, feed cost and effects on health, longevity and performance, the high energy level can be applied in the stages such as late gestation and early lactation to maximize the performance for milk production and pre-weaning of the lambs. Marston *et al* .,(1992) mentioned that benefits of additional levels of energy supplements in cow weight and condition must be achieved before calving . Zedan (1995) reported that energy intake and poor body condition after calving delay the return of normal function of the ovaries; conception rate tends to decrease when energy intake is inadequate.

It seems that scarce information exists on the utilization of diets with different energy levels on reproductive and productive performance of buffaloes in Egypt.

MATERIALS AND METHODS

This work was carried out at El-Gemmizah Experimental Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt.

Twenty four growing buffalo heifers were divided into three groups. Mean ages and live body weights at the beginning of experiment were 529, 581, 516 days and 365, 356 and 371 kg in G1, G2 and G3, respectively. The experimental rations were iso-nitrogenous with three levels of dietary energy. (100, 80 and 120 % TDN) according to Kearl (1982). Heifers in the 1st group were fed 100% TDN (G1), while those in the 2nd and 3rd groups (G2 and G3) were fed 80 and 120% TDN, respectively. Feeding experiment started from puberty age till the first 3 months of gestation.

The experimental rations contained concentrate feed mixture (CFM), berseem hay (BH), yellow corn (C) and rice straw (RS). Mineral blocks and fresh water were available freely through the experimental period. The (CFM) and (C) were offered twice daily at 7.0 a.m and 4.0 p.m. while roughage was available during all day time. Daily feed intake was individually recorded, while body weight of each heifers was biweekly recorded before morning feeding. Feed allowance was adjusted biweekly according 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. At the end of the experiment, individual feeds and fecal grab samples were collected for a 3- d 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 evaluated using Duncan 's test (1955) .

RESULTS AND DISCUSSION

Feed intake:

Data in table 2 revealed that heifers fed 120% TDN ration (G3) showed significantly ($P<0.05$) higher total DM intake by about 8 and 27% than those fed 100% (G1) and 80% (G2), respectively. Moreover, heifers fed 80% TDN (G2) showed significantly ($P<0.05$) lower total DM intake by about 15% than those fed 100% TDN (G1).

These results are in agreement with the findings of Almeida *et al.* (1999); Dawa (2003) and El-Ashry *et al.* (2003), who found that increasing energy levels in the diet or energy supplementation resulted in increasing feed intake.

Nutrient digestibility:

Data of table 2 clearly indicated that heifers fed 120% energy level (G3) significantly showed the highest ($P<0.05$) digestibility coefficients of DM, OM, CP, EE and NFE and the lowest ($P<0.01$) digestibility coefficient of CF, but did not differ significantly than those fed 100% (G2). On the other hand, heifers fed 80% energy level showed the opposite trend.

These results are in agreement with those reported by Kumar *et al.* (1981) and Etman (1985), who reported that the increase of dietary energy density improved the digestibility of all nutrients except CF digestion in male buffalo calves. Also, Shahin (2000) and Hussain *et al.* (2001) found marked improvement in most nutrients digestibility coefficients by increasing the dietary energy content. Tiwari *et al.* (1990) reported that the higher levels of dietary energy may increase rumen microbial growth.

Nutritive values:

Heifers of G3 fed ration containing 120% TDN recorded highest nutritive values expressed as TDN and DCP (being 62.37% TDN and 7.24 % DCP), followed by G1 (100% TDN) (58.67% TDN and 7.22 % DCP). Heifers in G2 ranked the third (80 % TDN) and recorded the lowest values (being 53.86% TDN and 6.66% DCP). The group differences were highly significant ($P< 0.01$) for TDN and DCP values (Table 2).

The present values are nearly similar to that obtained by El-Ashry *et al.* (2003), who reported a linear increase in TDN with increasing energy level in the diet. Also, Shahin (2000) found that the rise in level of dietary energy resulted in increased nutritive values in terms of TDN and DCP.

Growth performance:

Data presented in table 3 show that heifers fed 120% TDN (G3) recorded significantly the highest mean body weight, total gain and daily gain at first service, conception and first 3 months of gestation. However, heifers fed 80% TDN (G2) significantly showed the lowest mean values. The differences were almost significant between G3 and G2, but were almost not significant between G3 and G1.

Improving growth performance of animals by increasing dietary energy density is supported by the results reported by Shahin (2000) and Al-Deeb *et al.* (2003).

Concerning the feed conversion (kg DMI / kg gain), it was observed that heifers fed 80 (G2) or 120% (G3) TDN rations had poorer feed conversion at

Table(1): Chemical analysis of feed stuffs and calculated chemical composition of tested rations.

Item	DM%	Chemical analysis (%)					
		OM	CP	CF	EE	NFE	Ash
Feed stuffs:							
CFM	88.13	93.19	16.39	10.45	1.37	64.98	6.81
Corn	88.41	97.24	8.35	2.83	2.46	83.60	2.76
Rice Straw	92.36	80.70	2.86	36.31	1.61	39.92	19.30
Berseem hay	89.74	87.27	11.28	28.67	1.28	46.04	12.73
Tested rations:							
Rations 1 (G1)	89.75	88.66	10.52	21.08	1.54	55.54	11.34
Rations 2 (G2)	89.98	87.57	10.15	24.20	1.46	51.75	12.43
Rations 3 (G3)	89.50	90.20	10.24	17.75	2.69	60.53	9.81

R1: 100% TDN R2: 80%TDN R3: 120% TDN CFM: concentrate feed mixture

Table (2): Mean values of daily DM intake, digestibility coefficients and nutritive values as DM, TDN and DCP of experimental ration offered to buffalo heifers.

Item	Experimental group		
	G 1	G 2	G 3
Average LBW, kg	430.67±5.3	410.33±13.2	454.00±0.58
MBW, $kg^{0.75}$	94.54±0.88	91.15±2.21	98.35±0.09
Average daily DM intake (kg/h/d):			
CFM	4.44	2.82	4.21
Corn	1.11	0.47	3.00
Rice straw	3.33	2.82	3.00
Berseem hay	2.22	3.29	1.80
Total	11.10 ± 0.25^{b}	9.40 ± 0.14^{c}	12.01 ± 0.17^{a}
Nutrients digestibility (%):			
DM	71.11 ± 0.86^{a}	67.34 ± 0.75^{b}	72.22 ± 0.30^{a}
OM	75.19 ± 0.24^{a}	70.79 ± 0.99^{b}	75.58 ± 0.51^{a}
CP	73.14 ± 1.30^{a}	69.66 ± 0.36^{b}	74.72 ± 1.52^{a}
CF	51.62 ± 1.20^{ab}	56.19 ± 2.66^{a}	50.87 ± 0.41^{b}
EE	72.57 ± 0.72^{a}	69.57 ± 0.57^{b}	73.05 ± 0.42^{a}
NFE	68.76 ± 0.80^{ab}	61.06 ± 0.23^{b}	70.01 ± 0.84^{a}
Feeding value (%):			
TDN	58.67 ± 1.47^{ab}	53.86 ± 0.85^{b}	62.37 ± 1.03^{a}
DCP	7.22 ± 0.18^{a}	6.66 ± 0.22^{ab}	7.24 ± 0.18^{a}

a and b: Group means with different letters within the same row are significantly different at $P< 0.05$. MBW= Metabolic body weight.

conception and first 3 months of gestation than those fed 100% TDN (G1)ration. However, the differences were significant only between G1 and G2. Feed conversion as TDNI kg / kg gain was significantly (P<0.01) better in heifers fed 80% TDN (G2) than in G1 and G3 at conception and first 3 months of gestation. However, the differences were significant only between G2 and G3. Regarding the feed conversion as kg DCPI / kg gain, it was significantly (P<0.05) better in G3 than in G2, but did not differ significantly from that in G1 (Table 3).

It was reported that feed efficiency was improved as the energy density increased in animal diets (Jordanovski, 1993 and Shahin, 2000). However, feeding low energy density diets resulted in a better feed conversion as the amount of TDN required to produce one kg gain compared with feeding high energy level (Soliman *et al.*, 1975 and Shahin, 2000).

Age at puberty, first service and conception:

Age (day) of heifers at puberty, first service and conception are presented in table 4. Results show that heifers fed 120% TDN (G3) recorded significantly (P<0.05) the earliest ages at puberty, at first service and at conception. On the other hand , heifers fed 80% TDN (G2) significantly showed the oldest ages. The differences were significant between G3 and G2, but were not significant between G1 and each of G2 and G3.

Occurrence of earlier puberty in heifers fed 120% TDN, significantly (P<0.05) than in those fed 80% TDN and insignificantly than those fed 100% TDN ration was associated with increasing their live body weight as affected by dietary energy level (Table 3). On the other hand, age at puberty, first service and conception of heifers fed 80% TDN ration did not differ significantly from those fed 100% TDN ration as a control group. This finding indicated pronounced effect of reducing rather than increasing dietary energy level on age at puberty and then at first service and conception. These findings agree well with those obtain by Whitaker *et al.*,(1993) ; Hall *et al.*, (1994) and Prasad *et al.*, (1995) who concluded that the heifer and different female animals fed on the low energy were significantly older at 1 st oestrus than those on the high energy diets .

Interval from puberty to the first service or to conception was significantly (P<0.05) shorter for heifers fed 120% TDN (G3) than those fed 80% TDN (G2), which showed the longest interval. However, the differences were not significant between both groups (G2 and G3) and the control one (G1).

On the other hand, interval from the first service to conception (service period) did not differ significantly among groups and ranged between 39.6 and 46.4 days (Table 4). The present findings are nearly similar to these obtained by Whitaker *et al.*,(1993) ; Hall *et al.*, (1994) and Hegazy *et al.*, (1994) . In this respect , Niekerk *et al* ., (1990) and Freetly and Cundiff (1998) reported that the level of feeding of heifers up to mating at 2 years has little effect on their reproductive performance .

Oestrous activity:

Number of oestrous cycles from puberty to first service or to conception was significantly (P<0.05) higher in heifers fed 80% (G2) than those fed 100% (G1) TDN. However those heifers fed 120% (G3) did not differ significantly from either G1 or G2. This was attributed with the interval from puberty to the first service or to conception in each group (Table 4).

Also, average oestrous cycle length was affected significantly with the

Table (3): Growth performance of buffalo heifers fed different experimental rations.

Item	Experimental group		
	G 1	G 2	G 3
Live body weight (kg) at:			
First service	365.15±4.8^{a}	356.26±10.7^{a}	371.14±4.4^{a}
At conception	390.50±8.1^{ab}	379.77±12.3^{b}	404.34±6.3^{a}
3 months of gestation	450.88±9.6^{ab}	428.43±11.8^{b}	467.25±6.8^{a}
Total body gain (kg)from:			
1st service to conception	25.35±5.4^{ab}	23.51±4.2^{b}	33.21±3.5^{a}
Conception to 3 mo. gest.	60.38±1.99^{a}	48.65±1.54^{ab}	62.91±1.71^{a}
Average daily gain (kg):			
1st service to conception	0.64±0.042^{ab}	0.54±0.01^{b}	0.71±0.016^{a}
Conception to 3 mo. gest.	0.67±0.022^{ab}	0.54 ±0.017^{b}	0.70±0.019^{a}
Feed conversion {DM (kg)/gain (kg)}:			
1st service to conception	14.58±1.00^{b}	16.66±0.59^{a}	15.21±0.45^{ab}
Conception to 3 mo. gest.	15.69 ±0.68^{b}	17.28± 0.85^{a}	16.32±0.61^{ab}
Feed conversion {TDN (kg)/gain (kg)}:			
1st service to conception	9.31±0.50^{ab}	8.74±0.33^{b}	9.94±0.41^{a}
Conception to 3 mo. gest.	9.80±0.43^{ab}	9.38±0.39^{b}	10.92±0.62^{a}
Feed conversion {DCP(kg)/gain (kg)}:			
1st service to conception	1.27±0.06^{ab}	1.35±0.04^{a}	1.25±0.03^{b}
Conception to 3 mo. gest.	1.31±0.04^{ab}	1.39±0.05^{a}	1.27±0.03^{b}

a , b: Group means with different letters within the same row are significantly different at P< 0.

Table (4): Reproductive performance of buffalo heifers fed different experimental rations

Item	Experimental group		
	G 1	G 2	G 3
Age (day) of Heifers at:			
Puberty	433.25±9.4^{ab}	458.00±11.8^{a}	424.88±3.8^{b}
First service	529.13±4.8^{ab}	581.25±10.8^{a}	516.38±4.8^{b}
Conception	568.75±9.5^{ab}	625.13±9.1^{a}	563.13±5.6^{b}
Interval (day) from:			
Puberty to first service	95.88±7.8^{ab}	123.25±6.1^{a}	91.50± 3.5^{b}
Puberty to conception	135.50±3.8^{b}	167.25±3.8^{a}	137.88±4.6^{ab}
1st service to conception*	39.62±6.8	44.00 ± 4.7	46.38 ± 4.6
Number of oestrous cycles from puberty to:			
First service	2.3±0.40^{b}	4.5±0.31^{a}	3.2±0.18^{ab}
Conception	4.8±0.19^{b}	6.5±0.18^{a}	5.1±0.26^{ab}
Oestrous cycle length (day):	20.1±0.59^{ab}	22.0±0.32^{a}	19.50±0.19^{b}

a and b: Group means with different letters within the same row are significantly different at P< 0.05 . * service period

Table (5): Oestrous and mating performance of buffalo Heifers fed different the experimental ration.

Item	Experimental group		
	G 1	G 2	G 3
No. of Heifers	8	8	8
No. of conceived Heifers after:			
1st service	4	2	3
2nd service	3	4	4
3rd service	1	2	1
Total	8	8	8
NS/C after the 2nd service	1.5	1.75	1.63
NS/C after the 3rd service	1.62	2.00	1.75
Cumulative conception rate (%) after:			
1st service	50	25	37.5
2nd service	87.5	75.0	87.5
3rd service	100	100	100
No. of heifers to 3 months of gest.	8	7	7
Pregnancy rate (%)*	100	100	100
Pregnancy rate (%)**	100	100	100
No. of heifers embryonic loss	0	1	1
Embryonic loss (%)***	0	12.50	12.50

* On the basis of conceived animals, ** On the basis of total animals
*** On the basis of conceived animals (No of Heifers conceived , not aborted and not calved).

($P<0.05$) level of dietary energy, being longer in G2 (22.0 d) than G3 (19.5 d), however, showed insignificant differences with G1 (20.1 d). On the other hand, average oestrous cycle length of G3 did not differ significantly than that of G1 (Table 4). The present findings are in accordance with those obtained by Whitaker *et al.*,(1993) ; and Hegazy *et al.*, (1994) . Moreover , Sprott (1981) reported that heifers receiving the low energy diet had a significantly longer postpartum interval to oestrous than heifers given the high energy diets .

In this respect , Ducker *et al* .,(1985) and Grimard *et al* .,(1994) reported that feed energy level had no significant effect on ovulation rate .

Conception and pregnancy rates:

Conception rate (CR %), number of service per conception (NS/C) and pregnancy rate (PR) of buffalo heifers as affected by dietary energy level are shown in table 5. Results indicate that CR of the 1st and 2nd service was almost higher for control group (G1) than those in G2 and G3. However, all buffalo heifers (100%) were conceived in G1 , G2 and G3 after the 3rd service. This was reflected in similarity in NS/C after the 2nd service in G1 and G3, being higher than that of G2. It is of interest to note that heifers in G1 , G2 and G3 required 1-3 sevices / conception . NS/C of the 2nd and 3rd service were higher in G2 than G1or G3 (1.5 and 1.63 vs. 1.75 S/C) and (1.62 and 1.75 vs. 2.0 S/C), respectively . These results are in good agreement with the findings of Whitaker *et al.*,(1993) and Marston *et al* ., (1995) reported that the conception rates were significantly improved by feeding levels of supplemental energy .

Pregnancy rate on the basis of number of conceived or total animals in each group were similar in all treatments. One heifer in G2 and G3 was conceived without calving resulting in embryonic mortality of 12.5% in each of both groups (Table 5).The heifers were examined clinically and pattern of embryonic loss from days 28 to 84 of gestation.The present findings are in accordance with those obtained by Diskin *et al* ., (2000) and Silke *et al* ., (2002) .

CONCLUSION

From this study , it could be concluded that buffalo heifer groups fed ration containing 100 or 120 % energy levels showing some improvement in reproductive performance i.e., live body weight and age of heifers at conception and at 3 months of gestation ; number of oestrous cycles from puberty to first service and conception and oestrous cycles length .

On the other hand , increasing the energy level in the diet of the buffalo heifers resulted in improved rate of growth, some nutrients digestibility , feeding values and feed conversion, Thus, it is not recommended to apply the high energy diets for feeding the growing buffalos heifers in all stages of reproduction and productive performance. In addition, extending the feeding period on high energy level can increase the production costs.

REFERENCES

Abdel-Salam , O. (2003). Response of Ossimi lambs fed high-energy concentrate feed mixture . AL-Azhar J . of Agric . Research, Vol. 37 , (June 2003).

Agricultural Economy Research Institute (1997) . Annual Report for Agriculture Production , Ministry of Agriculture , Egypt (In Arabic) .

AL-Deeb ; S. L. Nissen ; D. G. Morrical and J. A. Rathmacher (2003) . The

effect of dietary energy and protein levels on performance and nitrogen balance in heavy and normal muscle lambs . Egyptian J . Nutrition and Feeds 6 (Special Issue) : 943 .

Almeida, M .A. ; F. S. Silva ; AEO. L. Ferr ; J . M. R. Ribero and A. F. Munres (1999). Effect of forage and energy level of diet on intake and composition of cow milk . Colectanea-da- EZN (Portugal) . Apr 1999. No. 4. P. 314.

A. O. A. C.(1995). Official Methods of Analysis . 15th ed. Association of Official Analytical Chemists Washington , Virginiall U.S.A.

Bergfeld , E. G. M. ; F. N. Kojima ; A.S. Cupp ; M. E. Wehrman ; K. E. Peters ; M. Garcia-Winder and J. E. Kinder (1994) . Ovarian follicular development of prepubertal heifers is influenced by level of dietary energy intake . Biology of Reproduction . 51 : 1051.

Borhami , B.E.A. and M. H. M. Yacout (2001) . Is the animal protein essential for better utilization of plant protein in ruminants ? Egyptian J . Nutr . And Feeds (Special Issue) .

Dawa , M. (2003). Effect of energy and protein levels in the diet on intake of lactating Awassi ewes . Egyptian J . Nutrition and Feeds 6 (Special Issue) : 1347.

.Dimov , K . ; M . Tsankova and A . Tosev (1984) . Comparative intensive fattening of buffalo calves and calves different amount of dietary energy . Zhivotnor dni – Nauki , 21 : 4 , 57 .

Diskin , M. ; V. Silke ; J.F. Mee and J.M. Sreenan (2000) . Embryo loss in dairy cows : implications for breeding management. Irish-Grasslan and Animal Production Assocition Journal . 34: 34.

Doumalin , L . (1996) . The protein content . Agood indicator . Production Laitiere Moderne . No. 254 , 64.

Ducker , M.J. ; R.A. Haggett ; W.J. Fisher ; S.V. Morant and G. A. Bloomfield (1985) . Nutrition and reproductive performances of dairy cattle . 1. The effect of level of feeding in late pregnancy and around the time of insemination on reproductive performances of first lactation dairy heifers. Animal production 41:1 , 1.

Duncan , D . B . (1955) . Multiple rang and mutiple – Test . Biometric , 11 : 1 .

El-Ashry , M. A.; H. M. Khattab; K. E. I. Etman and S. K. Sayed (2003) .Effect of two different energy and protein levels on productive and reproductive performances of lactating buffaloes . Egyptian J . Nutrition and Feeds 6 (Special Issue) : 491.

Etman , K.I. (1985) . The effect of limit of concentrate feeding and roughage on meat production . Ph. D. Thesis , Fac. of Agric. Moshtoher, Zagazig Univ.

Freetly , H.C. and L.V.Cundiff (1998) . reproductive performance, calf growth , and milk production of first calf heifers sired by seven breed and raised on different levels of nutrition . J . of Animal Sci., 76 : 6 , 1513.

Grimard , B. ; P. Humblot ; J. P. Mialot ; A .A. Ponter ; D. Sauvant ; and M . Thibier (1994). Factors affecting duration of postpartum oestrus and fertility at induced oestrus in suckler cows, with special reference to energy supplements . Premieres renconters autour des recherches sur les ruminants , Paris , France , 1-2 December ., 249 .

Hall , J. B. ; K. K. Schillo ; B. P. Fitzgerald and N. W. Bradley (1994). Effects of recombinant somatotropin and dietary energy intake on growth , secretion of luteinizing hormone , follicular development , and onset of puberty in beef heifers. J . of Animal Sci., 72 : 3 , 709.

Hegazy , M.A. ; A.A. El-Wishy ; A. H. Youssef and H. M. Telb (1994) . Interrelationship between pre-and /or postpartum feeding levels, blood constituents and reproductive performance of buffaloes . Proceedings , 4th World Buffalo Congress, Sao Paulo , Brazil , 27 – 30 June, Volume 3 , 634.

Hussain , A . ; J . I . Sultan and Zia . UI . Hasan (2001) . Supplementation effect of protein and energy on nutrient digestion and N metabolism of buffalo calves fed wheat straw based diets.Pakistan Journal of Agricultural Sciences ,vol . 38 (3-4) P . 22 .

Jordanovski . N (1993). Effect of dietary energy level on growth performance of early weaned lambs fattened to 84 days old. Krmiva . 35 : 4 , 173 – 178 .

Kearl, L . C . (1982) . Nutrient allowance of ruminants in developing countries . International Feedstuffs Institute Utah Agricultural Experiment Station Utah State University , Logan Utah December .

Knmar , N. ; U. B. Singh and D. N. Verma (1981). Effect of different levels of dietary protein and energy on growth of male buffalo calves . Indian J. Anim.Sci., 51(5) : 513.

Marston , T.T. ; K. S. Lusby and R. P. Wettemann (1992) . Pre-and post-calving protein or energy supplementation of spring-calving beef cows. Animal-Sci. Research Report , Agricultural Experiment Station Oklahoma State University . NO. MP-136, 179.

Marston , T.T. ; K. S. Lusby and R. P. Wettemann and H.T. Purvis (1995) .Effects of feeding energy or protein supplements before or after calving on performance of spring-calving cows grazing native range. J. Animal Sci., 73: 3 , 657.

McDonald , P . ; R . A . Edwards and J . D . Greenhalgh (1995). Special methods for measuring digestibility. Animal Nutrition . 5 th Ed . England .

Niekerk , A. van ; R. Kernick ; A.W. Lishman and A. Van-Niekerk (1990). The effect of winter and summer nutritional levels on the reproductive performance of beef heifers bred at 2 years of age . Animal Production , 51: 2 , 255.

Prasad , D. ; M. S. Saini ; A. S. Virk ; B. P. Sangupta and P . C. Gupta (1995). Optimum energy , protein and phosphorus requirements of breedable Murrah buffalo heifers. Buffalo-Bulletin. 14: 2 , 45.

SAS Institute, Inc . (1995) . SASI STAT Guide for personal computers , Vers I

Shahin , G. F. (2000). Effect of dietary energy level and protein source on sheep performance . Ph . D. Thesis , Fac . Agric. Menoufiya Univ .

Sharma , SC . and DD. Sharma (1983) . Effect of levels of energy on growth rate and utilization in buffalo calves . Asian journal of Dairy Research 2 : 2 , 106 .

Silke , V. ; M.G. Diskin ; D. A. Kenny ; M. P. Boland ; P. Dillon ; J.F. Mee and J.M. Sreenan (2002) . Extent , pattern and factors associated with late embryonic loss in dairy cows . Anim. Reprod. Sci., 71 : 1-2 , 1.

Soliman , H . S . ; M . A . EL – Ashry and O . Shehata (1975) . Different energy and protein levels in rations

for fattening lambs . 1 – Effect of different energy and protein levels in rations on body weight gain and feed efficiency of Rahmani lambs . Egypt . J . Anim . Prod . , 15 : 19 .

Sprott , L. R. (1981) . Effects of monensin and nutrition on reproductive performance in beef heifers from weaning through first postpartum period. Dissertation – Abstracts-International , 42 : 7 , 2615.

Tiwari , S . P . ; Sanjeev Kumar and H . P . Narang (1990) . The effect of protein and energy levels during late pregnancy on nutrient utilization and kid birth weight in goats . Actaveterinaria – Beograd , 40 : 5 – 6, 297 .

Whitaker , D. A. ; E. J. Smith ; GO.da. Rosa ; J.M. Kelly and GO. Da.Rosa (1993). Some effects of nutrition and management on the fertility of dairy cattle . Veterinary Record . 133: 3 , 61.

Zedan,K.I. (1995) .Effect of dietary energy on the performance of milking buffaloes. M.Sc. Thesis Dept Anim. Prod. Fac. Agric. Menoufiya Univ. Shebin El Kom, Egypt.

اثر مستوى طاقة الغذاء علىمعاملات الهضم والأداء الإنتاجي والتناسلي لعجلات الجاموس

جمال فاروق شاهين

قسم تغذية الحيوان – معهد بحوث الإنتاج الحيواني - مركز البحوث الزراعية – الدقي الجيزة

تهدف هذه الدراسة معرفة تأثير استخدام ثلاث مستويات من الطاقة في علائق عجلات الجاموس تبعا لمقررات كيرل ١٩٨٢ (٨٠ – ١٠٠ – ١٢٠ % من مجموع المركبات الغذائية المهضومة) على معاملات الهضم والنمو ومعدل الأداء الإنتاجي والتناسلي. استخدم في هذه الدراسة عدد ٢٤ من عجلات الجاموس النامية متوسط العمر والوزن هو ٥٢٩ – ٥٨١ – ٥١٦ يوم و ٣٦٥- ٣٥٦ – ٣٧١ كجم وذلك للمجاميع (١٠٠و ٨٠ و ١٢٠ % من المركبات الغذائية المهضومة).

المعاملة الأولى وفيها تناولت الحيوانات غذاء يحتوى على ١٠٠% من احتياجاتها من المركبات الغذائية المهضومة + ١٠٠% من احتياجاتها من البروتين المهضوم والمعاملة الثانية تناولت الحيوانات غذاء يحتوى على ٨٠ % من احتياجاتها من المركبات الغذائية المهضومة + ١٠٠% احتياجاتها من البروتين المهضوم والمعاملة الثالثة حيث تناولت الحيوانات غذاء يحتوى على ١٢٠% من احتياجاتها من المركبات الغذائية المهضومة + ١٠٠% من احتياجاتها من البروتين المهضوم. وقد استمرت التجربة حوالي ١٥٠ يوم 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 :

- زادت كمية الغذاء المأكول اليومي كمادة جافة زيادة معنوية في المجموعة التي تتغذى على مستوى منخفض من الطاقة (١٢٠ %) وذلك بالمقارنة بالحيوانات التي تتغذى على مستوى ١٠٠% أو مستوى ٨٠% من الطاقة.
- تحسنت معاملات هضم كل من المادة الجافة والمادة العضوية والبروتين الخام و المستخلص الخالي من الأزوت والمستخلص الأثيري وكذلك القيمة الغذائية. بينما انخفض معامل هضم الألياف في مجموعة العجلات التي تتغذى على علائق ذات مستوى ١٢٠% طاقة بالمقارنة ١٠٠او ٨٠ % طاقة.
- زاد الوزن النهائي للعجلات عند الثلاث شهور الأولى من الحمل زيادة معنوية و ذلك نتيجة التغذية على مستويات الطاقة ١٠٠% أو ١٢٠% TDN وذلك بالمقارنة بمستويات الطاقة المنخفضة ٨٠ % TDN.

- زاد معدل الزيادة اليومية زيادة معنوية عند مستوى معنوي ٥% للعجلات عند أول تلقيحه مخصبة و عند الثلاث شهور الأولى من الحمل وذلك بالنسبة للحيوانات التي تتغذى على مستوي ١٢٠% TDN وكانت الفروق معنوية بالمقارنة بمستوى ٨٠ % TDN .
- ولقد أظهرت النتائج أيضا تحسن في الكفاءة التحويلية للغذاء على أساس (كجم مأكول من المادة الجافة اللازم لانتاج كجم زيادة في الوزن) وذلك نتيجة لتغذية على مستويات الطاقة ١٠٠% TDN وذلك بالمقارنة بمستويات الطاقة ٨٠ أو١٢٠%TDN و ذلك عند أول تلقيحه مخصبة و عند الثلاث شهور الأولى من الحمل وكانت الاختلافات معنوية. و بالنسبة للكفاءة التحويلية للغذاء على أساس (كجم مأكول من البروتين المهضوم اللازم لانتاج كجم زيادة في الوزن) تحسنت وذلك نتيجة لتغذية على مستويات الطاقة ١٢٠% TDN وذلك بالمقارنة بمستويات الطاقة ٨٠ و١٠٠ % TDN . بينما تحسنت الكفاءة التحويلية للغذاء على أساس (كجم مأكول من مجموع المواد الغذائية المهضومة اللازم لانتاج كجم زيادة في الوزن) وذلك في الحيوانات التي تتغذى على مستوي منخفضة من الطاقة (٨٠ % TDN) بالمقارنة بالمجموعة التي غذيت على المستوى (١٠٠% أو ١٢٠% TDN) طاقة وكانت الاختلافات معنوية .
- كما أظهرت النتائج أيضا أن عجلات المجموعة الثالثة و التي كانت تتغذى على مستوى ١٢٠%TDN وصلت ألي التلقيحة المخصبة مبكرا وذلك بالمقارنة بالمجموعة الثانية وكانت الاختلافات معنوية. بينما الفترة ما بين أول تلقيحة والتلقيحة المخصبة كانت اقصر في المجموعة ألتي كانت تتغذى على مستويات الطاقة ١٠٠% TDN وذلك بالمقارنة بمستويات الطاقة المنخفضة و العالية ٨٠ و١٢٠ % TDNوكانت الاختلافات غير معنوية .
- لوحظ أن عدد دورات الشياع من البلوغ حتى أول تلقيحة او التلقيحة المخصبة كانت اكبر في المجموعة الثانية ٨٠% TDN بالمقارنة بالمجاميع التي كانت تتغذى على مستوى ١٠٠% او١٢٠% TDN وكانت الاختلافات معنوية وكذلك كان طول دورة الشياع أطول في العجلات التي كانت تتغذى على علائق ذات مستوى اقل في الطاقة ٨٠%TDN بالمقارنة بالمجموعة الثالثة ١٢٠%TDN وكانت الاختلافات معنوية.
- كان هناك فقد أجنة في المجموعة الثانية والثالثة في الفترة ما بين ٢٨ إلى ٨٤ يوم من بداية الحمل بنسبة ١٢,٥% لكل من المجموعة الثانية والثالثة .