INFLUENCE OF FEEDING DIFFERENT RATIOS OF FORAGE TO CONCENTRATE AND METHIONINE HYDROXY ANALOG SUPPLEMENTATION ON GROWTH PERFORMANCE OF HOLSTEIN HEIFERS.

M.A. El-Samahy[1], M.M. Khorshed[2], M.A. El-Ashry[2], S.A. Ibrahim[1], and M.A. Tag El-Din[1]

[1]Animal Production Research Institute, Agriculture Research Center, Dokki, Giza, Egypt
[2]Animal Production Departments, Faculty of Agriculture, Ain Shams University, Cairo, Egypt

(Received 5/1/2010, Accepted 21/3/2010)

SUMMARY

The objective of this experiment was to evaluate the effects of altered forage: concentrate ratio and DL-methionine analogue supplementation on growth performance of growing heifers until breeding weight (330 kg BW). Twenty-four Holstein heifers with an average of age 5.6 ± 0.36 mo and weight 116 ± 6 kg, were fed restricted intakes formulated to allow for 800 g/d. Experimental diets were formulated to contain either 50: 50 (low forage) of 75: 25 (high forage) forage: concentrate ratio diets dry mater (DM) basis. Forage comprised of corn silage (CS) and constant amounts of berseem hay (1.5 and 2 kg/ h/ d for low and high forage, respectively). Treatments were fed with or without Methionine Hydroxy Analog supplementation (MHA, 2.1 g / day/ 100 kg BW). Live body weight (LBW) was taken biweekly, while some body measurements and blood samples were taken monthly. Blood plasma were taken twice weekly during three consecutive week from 280 kg LBW to determine the peak of plasma progesterone (P4). Digestibility trial was performed after three months of the trail (at 170 kg LBW), during the digestibility trial heifers were fed individually in tie-stall. Actual intakes of nutrients were lower than expected intakes due to lower corn silage DM ratio. OM, CP, NFE and EE digestibility were significantly ($P < 0.05$) improved by reducing the forage portion of the diet, hoverer CF digestibility had a significant ($P < 0.05$) opposite direction. While, supplementation of MHA resulted in trends toward increased CF and EE digestibility. Insignificant differences were observed for plasma total protein triglyceride, creatinine, urea, and peak of P4, in addition to negligible difference for albumin, globulin, A/G ratio, and transferases (AST and ALT), while significant ($P<0.05$) decreasing in plasma cholesterol was recorded for low forage without MHA treatment. Throughout the feeding period, ADG was not affected across all treatment rations (0.675 LF, 0.679 HF, 0.715 LFM, 0.666 HFM, SE ± 0.032 kg/d). Gain of heifers body weight and measurements and age at 330 kg BW, were not different among treatments, however age at 330 kg BW was recorded an average of 15.98 mo (15.85 LF, 16.26 HF, 15.41 LFM, 16.38 HFM, SE ± 0.52 mo). Whereas, low forage groups had significantly ($P < 0.05$) better feed-conversion for DM TDN and DCP. Daily cost for high forage groups was significantly ($P < 0.05$) better than low forage groups, even though there is a deep gap within treatments in total feed cost, especially in high forage groups, thus it's was insignificantly influence between treatment in economic efficiency. Thus, we can feed growing heifers in this tested forage strategy under quality recommended for feedstuffs, and method of feeding. Notwithstanding, MHA addition did not have effect on growth of heifers, nevertheless MHA addition may have influences on CF digest and body metabolism, and may be the amount used was not enough to improve growth performance.

Keywords: *Holstein heifers, forage: concentrate ratio, DL-Methionine, digestibility, growth performance.*

INTRODUCTION

Raising dairy heifers from birth to first parturition is an expensive proposition for the dairy farm because of the long duration of this period, the generating expenses (feed, housing, and labor) with the absence of income until the onset of lactation, Radcliff *et al.* (1997), and Zanton and Heinrichs (2009b). One possible way to decrease this cost is to calve heifers at a younger age, to decrease age at first calving, heifers can be fed for accelerated growth rates prior to puberty and bred at an earlier age, Moallem *et al.* (2004), and Brown *et al.* (2005). It is widely accepted within the industry that weight gain of Holstein-Friesian heifers should be approximately 0.7 kg/day before puberty, and about 0.8 kg/day post-puberty to achieve the recommended age and BW at first calving, and to maximize their subsequent performance, Brickell *et al.* (2009).

Forages remain a vital part of the diet for dairy cattle to maintain rumen health, and in many cases, for reducing costs associated with feeding, Eastridge (2006). Feed cost contributed to over 60% of the total cost to raise a replacement heifer. This information should encourage industry to continue to acquire more economical methods and feed sources to supplement heifers, Gabler *et al.* (2000). Dairy replacement heifers require adequate amounts of dietary protein to support growth. As growth rates increase, CP requirements increase at a faster rate than energy requirements, Hoffman *et al.* (2001). However, it is preferable to feed CS in combination with a legume crop to increase the concentration of these nutrients, Waldo *et al.* (1998). Notwithstanding, alfalfa and other forage legumes are high in protein but deficient in S-amino acids cysteine and methionine, Bagga *et al.* (2004).

Methionine and lysine are generally the first limiting AA for growing cattle and lactating dairy cows, Kung and Rode (1996), and Schwab *et al.* (2003), especially in corn silage-based diets, Williams *et al.* (1999). Supplementation of free methionine in an unprotected form to ruminants is, however, generally not economically feasible due to the cost of the free amino acid. Methionine hydroxy analog in either the liquid form or the dry Ca salt of MHA is more resistant to microbial degradation than free methionine, However, MHA is not an amino acid and it differs from methionine by having a hydroxyl group in place of the amine group. Therefore, ruminal degradation of MHA does not involve the deaminative enzymes that are responsible for the degradation of amino acids, Koenig *et al.* (2002).

Concentrations of P4 in 120 to 300 day old heifers were significantly correlated with subsequent milk yield in first lactation, Allaire *et al.* (1981). Likewise, increased concentrations of plasma P4 have been associated with improved conception rates of lactating ruminants, Chagas e Silva *et al.* (2008).

The period before puberty is considered to be critical because of the effects of nutrition on lifetime production of the heifer, Pirlo *et al.* (1997). Therefore, the objective of this experiment was to evaluate performance of growing heifers fed low or high forage diets at equal TDN and CP intakes and supplemented by MHA.

MATERIALS AND METHODS

This study was carried out at *El-Karada* Experimental Station, *Kafr El-Sheikh*, Animal Production Research Institute, Agriculture Research Center, belonging to Ministry of Agriculture.

Animals and feeding system:

Twenty four Holstein heifers (5.6 ± 0.36 mo and 116 ± 6 kg initial age and BW, respectively) were randomly assigned to two forage levels (DM basis): low forage (50% forage) and high forage (75% forage), and to supplementation of MHA (0 or 2.1 g / day/ 100 kg LBW) sequence within forage level administered according to 2 × 2 factorial design, until 330 kg BW. Heifers were fed their nutritional requirements (TDN, CP) at a level formulated to allow for 800 g/d according to NRC (1989) recommendations. The treatments were as follows:

LF	50% CFM + 1.5 Kg BH (as fed) + integrant ratio of CS
HF	25% CFM + 2 Kg BH (as fed) + integrant ratio of CS
LFM	Feed design as LF + supplementation of MHA
HFM	Feed design as HF + supplementation of MHA

Experimental procedures:

Feed allowances of treatments were adjusted biweekly according to changes in heifers LBW. Heifers were housed in a free-stall barn and group-fed for low or high forage, and fed once daily at 8.00 am, MHA supplements were mixed with CFM prior to feeding. Water and trace mineralized salt bricks were available to heifers at all times. LBW was recorded biweekly in the morning before feeding, while body measure and blood sample were taken once monthly approximately 3 h after feeding. Also, at 280 kg BW, blood plasma were taken twice weekly during three consecutive week for determination of the peak plasma level of progesterone, at which in heifers of large dairy breeds, onset of puberty usually occurs at an average LBW of 250 to 280 kg, Sejrsen and Puru (1997).

Heifers were fed individually in tie-stall according to BW, during digestibility trial at 170 kg average LBW, by a grab sample method [acid insoluble ash (AIA, Silica) as internal marker] was applied for determination the nutrients digestibility, Thonney *et al.*, (1980). Feces samples were collected twice daily at 08.00 am and 02.00 pm for three consecutive days. All samples were analyzed according to AOAC (2000). The chemical composition of feedstuffs is shown in Table (1).

Table (1). Chemical composition of treatment rations.

Feedstuffs	DM%	Chemical composition on DM basis, %					
		OM	CP	CF	EE	NFE	ASH
CFM	91.77	91.06	15.96	6.77	2.83	65.50	8.94
Corn Silage	24.59	91.28	7.36	29.67	1.98	52.27	8.72
Berseem hay	90.96	86.83	13.70	28.42	1.49	43.22	13.17

CFM: Concentrate Feed Mixture, consisted of 30% cracked corn, 31% wheat bran, 35% undecorticated cottonseed meal, 1% molasses, 2% limestone, and 1% sodium chloride.

Blood plasma analysis:

Total protein and albumin were measured according to Falkner *et al.* (1982) and Tietz (1987), respectively, plasma globulin was calculated by difference. Triglyceride and cholesterol were determined according to Young (1995), urea, Patton and Crouch (1977) and Creatinine Henry (1974). While, ALT (alanine amino transferase), and AST (aspartate amino transferase), were determined according to, Reitman and Frankel (1957), P4 concentrate was determined according to Nulsen and Peluso (1992).

Statistical analysis:

All data ANOVA and regression analyses were done using the GLM procedure of SAS (1998), variables with a single measurement described by the following model: $?_{ijk} = \mu + ?_i + ?_j + (T \times M)_{ij} + e_{ijk}$, While, variables with repeated measures were analyzed according to the following model: $Y_{ijk} = \mu + T_i + M_j + (T_i \times M_j) + an_k (T_i \times M_j) + time_l + T_i \times time_l + M_j \times time_l + T_i \times M_j \times time_l + e_{ijk}$, Where, $?ijk$ = the observation, μ = overall mean, $?_i$ = the effect of forage ratio, $?_j$ = the effect of MHA, $(?_i \times ?_j)$ = the effect of interaction, an_k $(T_i \times M_j)$ = random effect of heifers, $time_l$ = the effect of sampling time, e_{ijk}= experimental error, means were separated among groups by Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Feed intake:

Feed intakes were not statistically analyzed because they primarily reflected feeding program differences according to forage level (Table 2). Actual intakes of nutrients were lower than the formulated levels due to a lower content of DM ratio in CS (only 24.6%), compared with normal CS DM ratio (32-38%) NRC (2001). Thus, the forage ratio declined for all forage level compared with feeding program, but differences between low and high forage diets were almost maintained.

Table (2). Actual feed intakes component of treatment rations (DM basis).

Feedstuffs, kg/ h/ d	LBW kg / low or high forage									
	150		200		250		300		350	
	LF	HF	LF	HF	LF	HF	LF	HF	LF	HF
CFM	2.52	1.38	2.75	1.61	3.21	1.84	3.44	2.06	4.13	2.11
CS	0.86	1.72	1.23	2.46	1.60	3.20	1.72	3.44	2.21	3.69
BH	1.36	1.82	1.36	1.82	1.36	1.82	1.36	1.82	1.36	1.82
DMI	4.75	4.92	5.35	5.88	6.17	6.85	6.53	7.33	7.71	7.62
Forage, ratio	46.86	72.01	48.51	72.71	47.98	73.21	47.28	71.82	46.42	72.30

Apparent Digestibility coefficients and Nutritive values:

Apparent digestibility coefficients and Nutritive values of dietary components are shown in Table (3). DM, OM, CP, NFE and EE digestibility were improved by reducing the forage component of the diet. When low forage diets are compared with high forage diets at restricted intakes the digestibility of DM, OM, energy, CP and EE Reynolds *et al.* (1991); DM, OM, CP and starch Moorby *et al.* (2006); DM Moody *et al.* (2007), and DM, OM and CP Zanton and Heinrichs (2009a, b) have been increased by decreased forage ratio. CF digestibility was improved as the ratio of forage increased, this result was consistent with the results reported by Moorby *et al.* (2006), Moody *et al.* (2007) and Zanton and Heinrichs (2009 a, b) that which would be expected based on the anticipated reduction in rumen pH associated with the consumption of the low forage diet, Conflicting results reported by Reynolds *et al.* (1991) in which lower forage diets resulted in higher CF digestibility likely because of enhanced retention times and more digestible sources of NDF offsetting the negative consequences of reduced ruminal pH. As well as, Zanton and Heinrichs (2009 a) concluded that the greater OM digestibility for the low forage diet is due to the composition of the diet from highly digestible component. However, the partition of carbohydrate into CF and NFE, besides having low precision, the CF procedure does not recover all the fiber, resulting in large losses of hemicellulose and soluble lignin into the NFE fraction. Some studies indicated an decreased in CP digestibility as the percent concentrate increased in the diet by Molero *et al.* (2004); Moody *et al.* (2007) attributed to lower ruminal pH, which causes changes in protein solubility and reduces fibrolytic activity of rumen microflora. Nutritive values ratios were increased significantly with low forage groups. However Lammers and Heinrichs (2000) suggested that increasing the ratio of dietary CP: ME ratio from NRC (1989) recommendation of 50 to 61.2 g/Mcal with energy sufficient to meet desired rates of gain will optimize growth and performance in heifers from 6 to 12 mo of age.

Supplementation of MHA had a slight influence in nutritive values and digestibility, plus trends toward increases in digestibly of CF and EE. Digestibility of CF, EE and energy Holter *et al.* (1972) have been increased by MHA supplementation in lactating cows, Patterson and Kung (1988) also reported improvements in fiber digestion only after 24 hour of incubation and when sulfur was limiting in the in vitro cultures. Others have shown no effects of MHA supplementation on digestibility of DM Kenna and Schwab (1981) and OM, CP and NDF Noftsger *et al.* (2005) in lactating cows; and OM, hemicellulose, and NDF Noftsger *et al.* (2003) and DM, OM, NDF, ADF, and CP Vázquez-Añón et al. (2001) by in vitro studies.

Table (3). Digestibility coefficients and nutrient values of experimental diets fed by growing heifers.

Items	Treatment				SE±	Contrast (*P*-value)		
	LF	HF	LFM	HFM		Forage	MHA	*int.*
Digestibility coefficients % (DM basis)								
DM	63.03	61.69	63.42	62.03	0.72	0.08	NS	NS
OM	61.90	59.87	62.93	60.38	0.93	0.03	NS	NS
CP	55.63^{ab}	52.40^{bc}	58.97^{a}	51.06^{c}	1.13	0.0003	NS	0.06
CF	47.73^{c}	52.34^{ab}	49.78^{bc}	56.09^{a}	1.34	0.002	0.05	NS
NFE	67.35	64.61	67.50	64.07	1.34	0.04	NS	NS
EE	72.69^{a}	65.64^{b}	73.98^{a}	69.07^{ab}	1.63	0.003	0.17	NS
Nutritive values % (DM basis)								
TDN	57.74^{ab}	55.25^{b}	58.70^{a}	55.79^{b}	0.85	0.0077	NS	NS
ME*	2.09^{ab}	2.00^{b}	2.12^{a}	2.02^{b}	0.03	0.0077	NS	NS
DCP	7.56^{b}	6.48^{c}	8.01^{a}	6.31^{c}	0.15	< 0.0001	NS	0.06
CP:ME, g/ Mcal	65.11^{a}	61.99^{b}	64.09^{ab}	61.30^{b}	0.96	0.0094	NS	NS

SE± = Interaction standard error of the differences, NS = not significant and *int.* = interaction between factors.

Means with different superscripts (a, b and c) in the same row are significant ($P<0.05$).

*Estimated: ME (Mcal/kg of DM) = TDN × 0.04409 × 0.82.

No interactions between forage level and MHA were observed, except for the LFM group was exhibited highest on apparent digestion of CP and DCP ratio, furthermore, the HFM group was showed lowest on apparent digestion of CP and DCP ratio.

Plasma constituents:

Effect of forage levels and MHA supplementation on some blood plasma constituents is shown in Table (4). Insignificant differences were observed in plasma total protein, albumin, triglyceride, urea, Creatinine, and ALT, however, small differences between treatments were recorded for globulin, albumin / globulin ratio, and AST. Nevertheless, all these parameters were within the standard ranges, and these negligible differences probably did not have a biological value, suggesting a good metabolic status of heifers of all groups. These observers may be due to used the same feed ingredients with almost isonitrogenous and isoenergetic intakes. Whereas, blood proteins related to dietary CP Hoffman et al. (2001) and energy intake Keady *et al.* (2001). Conversely, supplementation by MHA had no effect on blood protein Sklan and Tinsky (1996). In agreement with our data, forage level and MHA had no effect on plasma triglyceride Ramanzin *et al* (1997), and Bertics and Grummer (1999), respectively. Plasma cholesterol trend to be increased in high forage and MHA supplementation groups, however most (90 to 95%) cholesterol in bovine blood is found in the high density lipoproteins Grummer and Carroll (1988). Furthermore, plasma cholesterol decreased significantly with LF heifers, this drew attention to presumably that high forage and MHA have a similar effect on rumen total volatile fatty acids by increase of ratio of ruminal acetate to propionate, of animals fed high forage Zanton and Heinrichs (2009b), and with MHA supplementation Lundquist *et al.* (1983).

Table (4). Effect of forage level and MHA on some blood plasma parameters.

Items	Treatment				SE±	*P*-value		
	LF	HF	LFM	HFM		Forage	MHA	*int.*
Total Protein , g/dl	6.49	6.43	6.31	6.40	0.08	NS	NS	NS
Albumin, g/dl	3.25	3.53	3.43	3.40	0.08	0.18	NS	0.09
Globulin , g/dl	3.21^{a}	2.90^{b}	2.88^{b}	3.01^{ab}	0.09	NS	NS	0.04
Albumin / Globulin, ratio	0.76^{b}	0.93^{a}	0.95^{a}	0.84^{ab}	0.04	NS	NS	0.01
Triglyceride , mg/dl	17.36	16.29	16.70	14.19	1.36	NS	NS	NS
Cholesterol , mg/dl	68.54^{b}	85.15^{a}	85.34^{a}	82.86^{a}	3.45	0.0749	0.07	0.02
Urea, mg/dl	28.12	25.23	27.07	27.59	0.88	NS	NS	0.09
Creatinine , mg/dl	0.97	1.04	0.97	1.07	0.05	NS	NS	NS
AST, u/L	34.93^{a}	38.04^{a}	36.84^{a}	29.03^{b}	1.77	NS	0.09	0.02
ALT, u/L	18.47	16.29	16.11	16.00	1.18	NS	0.07	NS
Peak of P4 (at 280 kg BW), ng/ml	6.12	7.60	6.84	6.06	0.75	NS	NS	0.17

SE± Interaction standard error of the differences, NS = not significant and *int.* = interaction between factors.

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

Blood urea tended to be lower for HF heifers, whereas, plasma urea was significantly higher for low forage despite the intake of N and also increased significantly as N intake increased Zanton and Heinrichs (2009a), as well as, Plasma urea concentration was higher in cows fed MHA Sklan and Tinsky (1996), furthermore Plasma urea concentration in all tested heifers was elevated may be due to either a higher CP intake or following catabolism of body protein reserves when energy intake is restricted Brickell et al. (2009). Plasma creatinine and activity transferases demonstrated the consistency of treatments with good kidney and liver functionality.

Peak of plasma P4 at 280 kg LBW was unaffected by the plane of nutrition, this results agree with, Spitzer et al. (1978), Reed and Whisnant (2001), and Meyer et al. (2006), either supplemental MHA didn't effect on P4 level across treatments, in correspond to the results obtained by Tripp et al. (1998) using protected Methionine.

Growth performance and Feed conversion:

Growth performance (body weight and measurements) until 330 kg LBW and feed conversion are shown in Table (5).

Table (5). Effect of forage level and MHA on growth performance and feed conversion.

Items	Treatment				SE±	*P*-value		
	LF	HF	LFM	HFM		Forage	MHA	*int.*
Initial LBW, kg	116.50	116.50	115.83	116.17	6.60	NS	NS	NS
ADG kg/day	0.690	0.679	0.715	0.666	0.03	NS	NS	NS
Age at 330kg, mo	15.85	16.26	15.41	16.38	0.53	NS	NS	NS
Feed conversion kg /one kg gain								
DM	8.68[ab]	9.88[a]	8.45[b]	10.03[a]	0.45	0.006	NS	NS
TDN	5.01	5.51	4.96	5.54	0.25	0.04	NS	NS
ME	18.13	19.94	17.93	20.03	0.91	0.04	NS	NS
CP	1.143	1.127	1.112	1.144	0.05	NS	NS	NS
DCP	0.566[b]	0.636[ab]	0.584[ab]	0.656[a]	0.03	0.02	NS	NS
Heart girth, cm								
Initial	117.67	116.00	115.92	115.33	2.36	NS	NS	NS
At 330kg,cm	164.69	164.01	162.28	162.14	1.15	NS	0.08	NS
ADG cm/day	0.152	0.152	0.155	0.145	0.007	NS	NS	NS
Width at hip, cm								
Initial	27.00	26.08	26.83	26.83	0.63	NS	NS	NS
At 330kg,cm	44.15	44.19	44.23	44.19	0.40	NS	NS	NS
ADG cm/day	0.056	0.058	0.058	0.054	0.003	NS	NS	NS
Withers height, cm								
Initial	98.00	96.00	95.17	94.17	1.20	NS	0.07	NS
At 330kg,cm	123.03[ab]	123.85[a]	120.55[c]	121.01[bc]	0.69	NS	0.001	NS
ADG cm/day	0.081	0.087	0.085	0.082	0.003	NS	NS	0.19
Hip height, cm								
Initial	102.17	98.17	100.58	100.50	1.85	NS	NS	NS
At 330kg,cm	127.79	127.93	127.55	127.37	0.79	NS	NS	NS
ADG cm/day	0.083	0.093	0.089	0.082	0.004	NS	NS	0.03

SE± Interaction standard error of the differences, NS = not significant and *int.* = interaction between factors.

Means with different superscripts (a, b and c) in the same row are significant ($P<0.05$).

Average daily gain, as determined through analysis of change in LBW, showed no effects between treatment rations, these result agree with those reported by, Rotger *et al.* (2005), Kononoff *et al.* (2006), and Zanton and Heinrichs (2007), when low forage diets are compared with high forage diets. Moreover, Tripp *et al.* (1998), and Klemesrud *et al.* (2000) found that added Methionine did not improve ADG, conversely Hersom *et al.* (2009) reported that MHA was improving the performance of growing beef calves provided forage-based diets, presumably because the efficiency of methionine use were dependant on energy supplementation and independents of the source of energy Schroeder *et al.* (2006).

Whilst, the groups fed low forage showed significant better feed-conversion as DM, TDN, ME and DCP compared to groups fed high forage ration, while decreased energy conversion for high forage ration may be due to a lower CP:ME ratios compared with low forage groups Gabler and Heinrichs (2003).

As discussed previously, the observed ADG was lower than that expected for ADG 0.8 kg, most probably, actual nutrient requirements intake was not met for this ADG. Overall, the differences in body measurements between treatments were negligible. In agreement with our results, Kononoff *et al.* (2006), and Zanton and Heinrichs (2007), found that, growth of most characteristics of body measurements was unaffected when fed for equal ADG between dietary groups.

Economic efficiency:

Feed cost until 330 kg LBW is shown in Table (6). The mean cost per heifer per day was significant lower in high forage heifers, nevertheless, there were no significant differences in feed cost efficiency and total feed cost among the different experimental groups, depend on the contemporary price of feed constituents. Noteworthy, standard deviations for gain and total cost were larger within high forage treatments, whereat, standard deviations for gain cost were 0.70, 1.53, 0.53, 1.41 L.E, while standard deviations for total feed cost were 191.2, 465.0, 287.3, 311.8 L.E, for LF, HF, LFM, and HFM groups, respectively; this could be attributed to competition for feed between heifers within high forage groups.

Table (6). Effect of forage level and MHA on feed cost until 330 kg LBW.

Items	Treatment				SE±	*P*-value		
	LF	HF	LFM	HFM		Forage	MHA	*int.*
Daily cost/ h/ d, LE.	7.24^{a}	6.49^{b}	7.40^{a}	6.56^{b}	0.06	< .001	0.047	NS
Period until 330 kg, d	257.7	275.0	249.8	276.0	13.2	0.115	NS	NS
Cost/ one kg gain, LE.	10.53	9.74	10.38	10.03	0.46	NS	NS	NS
Total cost/ head, LE.	2248	2094	2228	2143	134	NS	NS	NS

SE± Interaction standard error of the differences, NS = not significant and *int.* = interaction between factors.

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

The price of one kg of CFM, CS, BH, and MHA were 1.50, 0.18, 0.70, and 18 L.E., respectively

CONCLUSION

From the results of this experiment we conclude that, heifers fed diets containing different forage levels for equal ADG and MHA supplementation, didn't affect most growth characteristics. Nevertheless, used high forage ration in rearing growing heifers didn't have any bad effects on heifers performance. On the other hand, decreased forage ratio and supplementation by MHA were had some satisfactorily effects on digestibility and nutritive values. However, caution must be exercised when ascribing the results of this experiment, because, the forage quality may be a major factor affecting in heifers performance and it should be evaluated in further studies. In a situation of competition for feed, used of total mixer ration may be necessary in forage-based diets. Additionally, forage and MHA ratios differences between the experiments may have attenuated the expectation of a response to supplemental MHA, possibly due to insufficiency supplemental ratio of MHA.

DEDICATION

To atman of Prof. Dr. *Mohamed El-Ashry,* may ALLAH save his soul.

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تأثير التغذية على مستويات مختلفة من المالئ إلى المركز مع إضافة المثيونين هيدروكسى أنالوج على أداء نمو عجلات الإستبدال.

محمد عبد الفتاح السماحى[1]، محمود محمد محمد خورشيد[2]، محمد عبد المنعم العشرى[1]، سمير علي ابراهيم[1]، محمد عبد الحليم تاج الدين[1]

[1]قسم بحوث تربية الأبقار، معهد بحوث الإنتاج الحيواني، مركز البحوث الزراعية، وزارة الزراعة، مصر
[2]قسم الإنتاج الحيواني، كلية الزراعة جامعة عين شمس، مصر

أجريت هذه الدراسة لتقييم أثر نسبة المركز إلى المالئ وكذلك التدعيم بواسطة المثيونين أنالوج على أداء نمو العجلات حتى وزن التلقيح (٣٣٠ كجم). حيث تم تغذية أربعه وعشرون عجلة متوسط أعمارهم ٥,٦ شهر بينما متوسط أوزانهم١١٦,٢٥كجم على كميات محسوبة لإعطاء مستوى نمو موحد. صممت المعاملات لتحتوى على نسبة مالئ منخفضة (٥٠ %) أو مرتفعة (٧٥%) على أساس المادة الجافة، حيث اشتمل المالئ على سيلاج ذرة مع كمية ثابتة من دريس البرسيم طوال التجربة (١,٥ و ٢ كجم/ عجلة/ اليوم ، للمنخفضة والمرتفعة، على التوالي) مع أو بدون التدعيم بالمثيونين هيدروكسي أنالوج (٢,١ جم/ يوم/ ١٠٠كجم وزن حي). طوال التجربة تم وزن العجلات مرة كل أسبوعين، بينما تم اخذ مقاييس الجسم وعينات الدم مرة كل شهر، وعند وزن ٢٢٠ كجم تم اخذ عينات دم مرتان بالأسبوع لحساب اعلي تركيز لهرمون البروجيسترون عند هذا الوزن. تجربة الهضم تمت بعد مرور ثلاثة أشهر من بداية المعاملات، تم خلالها تغذية العجلات تغذية فردية طبقا لوزنها. كمية المادة الجافة الماكولة خلال التجربة كانت اقل من المحسوبة بسبب انخفاض نسبة المادة الجافة بسيلاج الذرة ٢٤,٦% فقط. تحسن معامل هضم المادة العضوية والبروتين الخام والمستخلص الخالي من النيتروجين و مستخلص الأثير معنويا مع خفض نسبة المالئ في العلائق ولكن انخفض معامل هضم الألياف الخام. بينما إضافة المثيونين هيدروكسي أنالوج أظهرت تحسن في هضم الألياف الخام ومستخلص الأثير. لم تظهر فروق معنوية على مقاييس الدم فيما عدا انخفاض معنوي في كوليسترول الدم للعجلات المغذاة على مالئ منخفض بدون مثيونين. لم يتأثر معدل الزيادة الوزنية اليومية وكذلك إجمالي الزيادة الوزنية ولمقاييس الجسم بالمعاملات. كان معدل التحويل الغذائي أفضل للعجلات الأقل في نسبة المالئ. على الرغم من الانخفاض المعنوي في التغذية اليومية للعجلات الأعلى في المالئ، ولكن الفروق داخل المعاملة الواحدة كان كبير جدا وبخاصة في العجلات عالية المالئ، وبالتالي لم يكن هناك تأثير معنوي للمعاملات على الكفاءة الاقتصادية. بالتالي يمكن استخدام نظم التغذية المختبرة في تنشئة العجلات النامية تحت شروط جودة مكونات العلف، وطريقة التغذية. على الرغم من عدم تأثر نمو العجلات بالمثيونين إلا أنه قد يكون ذو تأثير جيد على هضم الألياف والتمثيل بالجسم، وقد تكون الكمية المضافة غير كافية لإحداث تحسن في النمو.