J. Agric. Sci. Mansoura Univ., 30 (6): 3025 - 3035,2005

EFFECT OF DIFFERENT LEVELS OF SUPPLEMENTED ORGANIC ZINC SOURCE ON PERFORMANCE OF FRIESIAN DAIRY COWS.

Shakweer, I. M. E.; A. A. M. EL-Mekass and H. M. EL-Nahas
Animal Production Research Institute, Agricultural Research Center, Ministry of Agric. ,Giza.Egypt.

ABSTRACT

This study was conducted to investigate the effect of different levels (40mg , 80mg and 120mg /kg DMI) of zinc methionine supplementation on the digestion coefficients, nutritive value , ruminal and some blood parameters and birth weight of their offspring , milk yield and milk composition of the experimental Friesian dairy cows were also investigate . Animals were fed according to the NRC feed allowances for dairy cattle (1988). Twenty pregnant Friesian dairy cows at the last three months of pregnancy were divided into four similar groups (five animal each) fed in the following rations 1- The control group was fed concentrate feed mixture (CFM) + berseem hay + rice straw) without zinc methionine supplementation. 2- The 1st tested group fed control ration + 40mg zinc methionine /kg dry matter intake (DMI) .3- The 2nd tested group fed control ration + 80mg zinc methionine /kgDMI 4- The 3rd tested group fed control ration + 120mg zinc methionine /kgDMI . All groups were fed from about three months before the expected calving date and continued up to the first 210 days of their lactation season. Results indicated that the addition of different levels of zinc methionine had improved the digestibilities of DM,OM,CP,CF, feeding values as TDN and DCP, feed efficiency and thus increased milk yield compared with the control group. Birth weight of calves was increased with 40mg zinc methionine level compared with the other levels and the control group .Moreover, zinc supplementation improved serum total protein and globulin, but it reduced the concentration of both albumin and urea in blood serum

Keywords : Friesian dairy cows – zinc methionine – feed intake –digestibility –ruminal and blood parameters –calves birth weight – cows milk yield and composition –somatic cell counts .

INTRODUCTION

Trace minerals have been traditionally added to ruminant diets in the form of inorganic or organic salts such as elemental zinc methionine which is under investigateion . Zinc is known to be essential for the function and /or structure of several enzymes as dehydrogenases peptidases, phosphatases , a transphosphorylase, transcarbamylase, carboxpeptidase and it was found to be an essential component of both DNA,RNA polymereses Miles and Henry (1999). It is also vital for a variety of hormonal activities including growth hormone , glucagon , insulin, as well as sex hormones . However, in recent years , there has been considerable interest in feeding ruminants organic trace minerals which increase the bioavailability of the mineral above that of the soluble inorganic form Henry (1995) , Rojas *et al.*, (1955) and Luo *et al.*, (1996) . The metal complex or chelate is stable in the digestive tract and is thus protected from forming complexes with other dietary components which could inhibit its absorption Formigoni et al; (1993) , Spears (1996) and

Cao, *et al*; (2000) . In the animal , trace minerals occur and function as organic complexes , or chelates, and not as free inorganic ionsSpears (1996). Many studies have shown improved growth , milk yield , reproductive performance and /or immune respone in ruminants fed diets containing organic trace minerals Spears (1996) , Socha and Johanson (1998) and Gunter *et al.*, (1999).

The objective of this study was to determine the effect of different levels of zinc methionine supplement to rations of Friesian dairy cows on digestion coefficients , nutritive values . Ruminal and some blood parameters were also investigated birth weight of their calves , milk yield and composition of Friesian dairy cows and birth weight of their calves were also studied .

MATERIAL AND METHODS

This study was conducted during years 2003-2004 in Karada Animal Production Research Station belonging to the Animal Production Research Institute, Agricultural Research Centre , Giza Egypt .Twenty pregnant Friesian cows at the last three months of pregnancy were divided into four similar groups (five animals each) balanced for LBW , milk yield and age . The cows fed on the following tested ration : 1- The control group was fed concentrate feed mixture (CFM) + berseem hay + rice straw) without zinc methionine supplementation. 2- The 1st tested group fed control ration + 40mg zinc methionine /kg dry matter intake (DMI) .3- The 2nd tested group fed control ration + 80mg zinc methionine /kgDMI 4- The 3rd tested group fed control ration + 120mg zinc methionine /kgDMI according to the feed allowances of NRC (1988). Feed additives (zinc mrthionine which content 80.5% methionine hydroxy analogue , 15.10% zinc sulfate)and were mixed manually with some grinded amounts of CFM .Feeding experiments was started three month before the expected calving date and continued up to 210 days of lactation season. Each group was given (during prepartum) a maintenance ration plus productive requirements which can cover and equivalent to produce 2kg milk production with 4% fat. After parturition cows were fed according to NRC feed allowances for dairy cattle (1988). Rations were offered twice daily at 8 a.m. and 4 p.m. Water was offered freely . Cows were weighted after calving and their new born calves were also weight and recorded immediately after calving. Milk yield was done twice daily at 7.0 a.m. and 4.0 p.m. using milking machine. Daily milk yield was recorded individually from parturition and up to 210 days postpartum period. Composite and representative samples of milk (morning and evening samples) were mixed by ratio of 1% weight of milk and analyzed biweekly for fat, lactose , protein , total solids , solids not fat and somatic cells counts using Milkoscan apparatus. Energy of milk was calculated by using the formula of Overmann and Sanmann (1926) where energy of milk (Kcal) = 115.3 (2.51+fat%). Actual milk yield was converted into 4% fat corrected milk (FCM) using the formula given by Gaines (1923) as 4% FCM = 0.4milk yield +15.0 fat yield. Four digestibility trials were carried out at the middle of the feeding trials using three cows from each group to determine the nutrients digestibility and nutritive value of the experimental rations using Acid insoluble ash (AIA) technique as was used as internal marker according to Van keulen and Young (1977). Fecal samples were collected from the rectum daily for four successive days from each animal .Chemical composition of the different ingredients and feces samples were analyzed according to A.O.A.C. (1995) procedures. Rumen liquor samples were collected by stomach tube at three times (just before morning feeding, 3.00 and 6.00 hrs after feeding). Samples were strained in four folds of cheese cloth. pH was determined immediately using a digital pH meter. Ammonia-N was determined according to the modified semi-micro kijeldehl digestion method A.O.A,C. (1995). Total volatile fatty acids (TVFA's) was determined according to Eadie,*et al.*,(1967). Total protozoal counts were determined according to the methods described by EL-Saifi (1969). Blood plasma were taken from each animal at the end of the collection period of each trial before feeding. Blood samples were taken from jugular vein and allowed to flow into acid washed heparinzied tubes. To get blood plasma samples and were centrifuged immediately at 4000 rpm for 20 minuets, blood plasma was used for determination of total protein , albumin, urea, and zinc content . Total protein was determined according to the Weichselbaum (1946). Albumin was determined colorimetrically according to the Drupt (1974). Urea was determined according to Fawcett and Scitt (1960). Zinc was determined according to Makino *et al.*, (1982). The obtained data were statistically analyzed by general linear, model using ANOVA procedures of SAS (1985). The significant differences among treatments were tested using Duncan multiple range test Duncan (1955).

RESULTS AND DISCUSSIONS

Chemical composition of feedstuffs.

Data of table (1). Showed that the chemical composition of fed feedstuffs was within the normal values published by **A.P.R.I. (1997).**

Table (1): Chemical analysis of the feed stuffs and calculated chemical composition of tested ration (DM basis%)

Item	DM	OM	CP	EE	CF	Ash	NFE
*CFM	90.73	89.78	17.42	3.25	14.25	10.22	54.86
Berseem hay (3^{ed} cut)	89.88	87.28	12.65	2.57	31.09	12.72	40.97
Rice straw	90.48	81.51	3.76	1.37	35.55	18.5	40.82
Calculated expremental ration							
Ration 1 (control)	90.52	86.5	11.9	2.49	24.17	13.50	47.93
Ration 2	90.55	87.21	13.10	2.65	22.24	12.78	49.21
Ration 3	90.56	87.44	13.30	3.68	21.86	12.66	19.49
Ration 4	90.56	87.44	13.3	3.68	21.86	12.66	19.49

*Concentrate feed mixture contained : 42% undecorticated cotton seed meal, 10% wheat bran,30%yellow corn, 10% rice bran ,6% molasses, 2% limestone and 1%common salt.

Digestibility coefficients and feeding values :.

Data presented in table (2) indicated that the addition of different levels of zinc methionine increased ($p<0.05$) the digestibilities of DM, OM, CP and CF compared with those of the control group. However these were no significant differences in case of EE and NFE digestibilities among all levels of zinc methionine and the control group. The highest digestibility values were obtained with ration supplemeted with 120mg and 80mg zinc mrthionine /kgDMI , followed by the ration which contained 40mg zinc methionine . The improvement in apparent digestibility coefficient with zinc methionine supplementation may be due to either improved of their digestibility and of absorption in the abomasum. These results are in line with those obtained by Aly *et al.*, (2005) who found that the apparent digestibility of DM,OM,CP,CF,EE and NFE were significantly ($P<0.05$) improved with added protected methionine in the ration of goats .Dinn *et al.*, (1998) reported that the apparent digestibility of CF was increased significantly with addition of protected amino acids than those of unprotected one. Mousa and EL-Sheikh, (2004) found that the apparent digestibility of DM,OM,CP,CF;EE and NFE were slightly increased by different levels of zinc sulfate supplementation to the ration of lactating buffaloes. Rations nutritive values as TDN and DCP were significantly ($P<0.05$) increased by different levels of zinc methionine supplementation compared to that of the control group (Table 2). On the other hand, 80mg and 120mg zinc methionine levels slightly increased TDN and DCP compared with only added 40mg level zinc methionine . Improved of TDN and DCP might be due to the higher digestibility values of all nutrients by addition with different levels of zinc methionine supplementation . These results are in accordance with Mousa and EL-Sheikh (2004) who found that TDN and DCP were significantly ($P<0.05$) increased by the addition of the highest level of zinc sulfate.

Table (2): Digestion coefficients and nutritive values of rations fed to lactaing cows and supplemented with different levels of zinc methionine.

Item	Control Ration (1)	Experimental rations		
		Ration(1)+ 40mg/kgDMI	Ration(1)+ 80mg/kgDMI	Ration(1)+ 120mg/kgDMI
Digestibility (%)				
DM	67.25^{b}	69.07^{ab}	70.21^{a}	70.81^{a}
OM	68.47^{b}	71.24^{a}	72.07^{a}	72.38^{a}
CP	64.11^{d}	71.47^{c}	73.35^{b}	75.14^{a}
CF	58.28^{d}	62.19^{c}	64.90^{b}	66.67^{a}
EE	68.36^{a}	69.94^{a}	70.63^{a}	69.60^{a}
NFE	77.19^{a}	78.02^{a}	77.64^{a}	76.49^{a}
Nutritive values (%)				
TDN	62.93^{b}	65.75^{ab}	66.58^{a}	66.60^{a}
DCP	7.58^{d}	9.32^{c}	9.71^{b}	9.95^{a}

a,b,c : means in the same raw followed by different superscripts are siglnificantly ($P<0.05$) different.

Rumen parameters

From the data presented in table (3). The sampling time (0.00, 3 and 6 hrs) showed that the pH value was decreased after the 0.00 time feeding meanwhile , ammonia –N and TVFA's were increased at 3hrs post feeding and then began to decreased again at 6hrs post feeding . It was found that the average pH values were not affected by the different levels of zinc methionine supplementation . Rumen pH was decreased only when 80mg zinc methionine level was added at 6.00hr time of sampling compared with other zinc levels and the control group. These results are in accordance with those of Aly *et al.*, (2005) , Dinn *et al.*, (1998) and Robison *et al.*, (2002) . However, Bharadwaj *et al.*, (1999) and Demeterova *et al.*, (2002) reported that there was slight decrease in rumen pH value when protected amino acid supplemented to the basal diet of lactating buffaloes . Overall mean of ammonia-N in ruminal fluid was decreased with different levels of zinc methionine compared with the control group. These results are in line with those obtained by Arelovich *et al.*, (2000) who found that added zinc or zinc plus Mn inhibited NH_3 accummulation from urea, which may be due to decreased ureolysis or increased ammonia utilization by ruminal microbes.. On the other hand, the TVFA's was increased with all different levels of zinc methionine supplementation compared with that of the control group, . This increase in TVFA's may be due to the increase of apparent digestibility of organic matter .

Table (3): The effect of different levels of zinc mthionine supplement on ruminal pH, NH_3, TVFA's values and protozoal count

Parameters	Time	Control Ration (1)	Experimental rations		
			Ration(1)+ 40mg/kgDMI	Ration(1) 80mg/kgDMI (3)+	Ration(1)+ 120mg/kgDMI
pH	0	7.34^{a}	7.29^{a}	7.35^{a}	7.21^{a}
	3	6.53^{a}	6.63^{a}	6.66^{a}	6 76^{a}
	6	6.77^{a}	6 48^{ab}	6.12^{b}	6 89^{a}
Ammonia_N (mg/100ml RL)	0	21.53^{a}	18 06^{b}	18.02^{b}	16.06^{c}
	3	33.63^{a}	29.14^{b}	26.96^{c}	24.33^{d}
	6	28.72^{a}	22.47^{b}	18.51^{c}	16.69^{d}
TVFA's (meq/100ml RL)	0	6.44^{b}	6.98^{b}	7 98^{ab}	8 34^{a}
	3	8.13^{c}	9.42^{b}	10.11^{ab}	10.39^{a}
	6	6.33^{c}	6.37^{c}	7.42^{b}	8.57^{a}
Protozoal count ($x10^{5}$/ml)	0	1.95^{a}	2.003^{a}	2.013^{a}	2.043^{a}
	3	1.85^{ab}	2.117^{a}	2.083^{a}	1 663^{b}
	6	0.960^{a}	1.240^{a}	1.287^{a}	0.960^{a}

a,b,c : means in the same raw followed by different superscripts are siginificantly ($P<0.05$) different.

These results are in accordance with **Arelovich *et al.*, (2000)** who reported that the increased proportion of propionate in ruminal VFA leads to an increased energetic efficiency of ruminal fermentation which might explain the consistent benefits obtained when from addition of chelated zinc supplement. Aly *et al.*, (2005) found an increased also of TVFA's with added protected amino acids ration of goats ration. As shown in table (3). The protozoal counts were increased with the addition of 40 and 80mg zinc methionine levels compared to 120mg zinc methionine level and the non supplemented control group. Mathur *et al.*, (1991) reported also that lambs fed protected protein diet showed significantly higher protozoal counts in their rumen than those of unprotected protein diet .

Blood parameters

The data in table (7) Show improved total protein , globulin and zinc concentration with different zinc methionine supplementation .On the other hand, albumin and urea concentration in blood serum were decreased . Similar findings , were obtained by Mousa and EL-Sheikh (2004) who indicate that addition of 80 and 120mg zinc sulfate improved total protein and globulin , while it decreased albumin and urea concentrations in blood serum of lactating buffaloes . Reid *et al.*, (1987) , Spears and Kegleg (2002) found that there was a significant ($P<0.05$) increase in serum zinc concentration of lambs fed alfalfa supplemented with varying zinc levels . Aly *et al.*, (2005) found increased serum total protein with protected amino acid supplementation in ration of goats.

Table (4):Effect of different levels of zinc methionine supplement on some blood parameters

Items	Control Ration (1)	Experimental rations		
		Ration(1)+ 40mg/kgDMI	Ration(1)+ 80mg/kgDMI	Ration(1)+ 120mg/kgDMI
Total protein g/dl	$7\ 28^{c}$	8.40^{b}	8.86^{ab}	9.13^{a}
Albumin g/dl	4.43^{a}	4.00^{c}	4.19^{b}	4.12^{bc}
Globulin g/dl	2.85^{c}	4.40^{b}	4.64^{ab}	5.01^{a}
Urea mg/dl	$38\ 72^{a}$	33.15^{b}	28.69^{bc}	26.66^{c}
Zinc mg/dl	0.70^{c}	0.79^{b}	0.81^{b}	0.89^{a}

a,b,c : means in the same raw followed by different superscripts are siginificantly ($P<0.05$) different

Milk yield and composition

The data of table (5) It could be noticed that the different levels, of zinc methionine supplementation increased the actual milk yield and 4% fat corrected milk of dairy Friesian cows compared to the control group. On the other hand, added zinc methionine at 80mg and 120mg levels increased of actual milk yield compared with added 40 mg zinc methionine level. There were unsignificant differences in milk composition was observed between all the different levels of zinc methionine and also the control group (Table 5).

Similar results were reported by Miller *et al.*, (1989) , Kellogg and lane (1996) and Campbell *et al.*, (1999) they found that Holestein cows milk components were not affected by zinc supplementation. The addition of different levels of zinc methionine decreased somatic cell counts compared with that of the control group (Table 5). This results is in accordance with that Uchida *et al.*, (2001) who found decreased somatic cell counts with added zinc amino acid to ration of dairy cows. Milk energy was increased with control group , 40mg and 80mg zinc methionine levels compared to 120mg zinc methionine level.

Table (5) :Average actual daily milk yield , 4%fat correct milk yield and milk composition of lactating Friesian cows fed on ration supplemented with different levels of zinc methionine .

Items	Control Ration (1)	Experimental rations		
		Ration(1)+ 40mg/kgDMI	Ration(1)+ 80mg/kgDMI	Ration(1)+ 120mg/kgDMI
Actual milk yield, kg/day	10.63^{c}	13.33^{b}	14.17^{a}	14.33^{a}
4% fat correct milk yield, kg/da	10.11^{c}	12.80^{b}	13.40^{a}	13.11^{ab}
Milk composition (%)				
Fat	3.70^{a}	3.74^{a}	3.63^{a}	3.42^{a}
Protein	2.70^{a}	2.63^{a}	2.63^{a}	2.44^{a}
Lactose	4.30^{a}	4.40^{a}	4.40^{a}	4.43^{a}
Solids non fat	7.64^{ab}	7.70^{a}	7.72^{a}	7.23^{a}
Total solids	10.80^{a}	11.47^{a}	11.33^{a}	10.98^{a}
Milk energy (Kcal/kg milk)	716.01^{a}	720.24^{a}	708.32^{ab}	684.11^{b}
Somatic cells counts /ml	484^{a}	350^{b}	347^{b}	336^{b}

a,b,c : means in the same raw followed by different superscripts are siginificantly (P<0.05) different.

Birth weight of born calves

Data in table (6) Show that addition of different levels of zinc methionine significantly (<0.05) increased birth weight of calves at birth compared with data of the control group .On the other hand , addition of 40mg zinc increased significantly calf birth weight compared with those for the other levels . These results are in line with those obtained by Mousa and EL-Sheikh (2004) who reported that increased calf birth weight with added 40mg zinc sulfate /kg DMI to lactating buffaloes.

Table (6) :The effect of different levels of zinc methionine supplement on weight of calf birth and their dams at calving.

Item	Control Ration (1)	Experimental rations		
		Ration(1)+ 40mg/kgDMI	Ration(1)+ 80mg/kgDMI	Ration(1)+ 120mg/kgDMI
No. of dam	5	5	5	5
No. of calves	5	5	5	5
Weight of dam at calving , kg	528.5	528	592	504
Weight of calf at birth, kg	28.3^{c}	40.33^{a}	33.33^{b}	31.67^{bc}

a,b,c : means in the same raw followed by different superscripts are siginificantly (P<0.05) different

Feed intake and feed efficiency

Data of table (7) Show that the feed intake as(DM,TDN and DCP) was increased with all different zinc methionine supplementation compared to that of the un- spplemented control group. Daily nutrients intake was improved with addition of 80 and 120mg zinc methionine compared to either control or control+ 40mg zinc methionine as shown in table (7) .

Table (7): Feed intake and feed efficiency of lactating cows fed on ration supplemented with different levels of zinc methionine .

Item	control Ration (1)	Ration(1)+ 40mg/kgDMI	Ration(1)+ 80mg/kgDMI	Ration(1)+ 120mg/kgDMI
Daily feed Intake (as fed),kg				
CFM	7.1	8.85	9.59	9.59
Berseem hay (3rd cut)	2	2	2	2
Rice straw	5	4	4	4
Daily feed intake (as DM),kg				
CFM	6.44	8.03	8.7	8.7
Berseem hay	1.8	1.8	1.8	1.8
Rice straw	4.52	3 62	3.62	3.62
Total daily nutrients intake, (kg,head)				
DM	12.76	13.45	14.12	14.12
TDN	8.03	8.48	9.4	9.4
DCP	0.97	1.26	1.37	1.4
Daily 4% FCM yield , kg	10.11^{c}	12.80^{b}	13.40^{a}	13.11^{ab}
Feed efficiency :				
4% FCM /kg DM	0.80^{b}	0.95^{a}	0.95^{a}	0.93^{ab}
4% FCM /kg TDN	1 26^{d}	1.45^{a}	1.43^{b}	1.39^{c}
4% FCM /kg DCP	11.21^{a}	10.19^{b}	9.78^{bc}	9.34^{c}

a,b,c : means in the same raw followed by different superscripts are siginificantly (P<0.05) different.

It was found that feed efficiency was higher increased also with added of 40 and 80mg zinc methionine levels compared to either 120mg zinc methionine level and or the control group. This might be attributed mainly to their higher milk production , feed intake , its nutrient digestibility and fedding values as shown by Arelovich,*et al.*, (2000) . Similar findings were also obtained by Mousa and EL-Sheikh(2004) who indicated that slightly improved feed efficiency when 40mg zinc sulfate was added to lactating buffaloes ration.

CONLUSION

From all the shown results, It could be concluded that different levels of zinc methionine supplementation improved nutrient digestibility and thus ration feeding values , milk yield and decreased somatic cell counts .Addition of 40mg zinc methionine /kgDMI of ration fed to Friesian cows from three months before the expected calving date led to increasing birth weight of their calves.

REFERENCES

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

A.P.R.I. (1997) Animal Production Research Institute ,Animal Nutrition (Scientific and Production) ,Agriculture Research Center ,Ministry of Agricu.ture , Cairo,Egypt.

Aly,T.A. ; M.A.AL-Ashry; A.M. Kholif; H.M.EL-Sayed ; H.A.EL-Alamy and M.M.Khorshed (2005) .Effect of rumen –protected methionine and/or lysine supplementation to the ration on nutrients digestibility and on some rumen parameters of male Balady goats.Egyptian J.Nutrition and Feeds .8(1):41-51.

Arelovich,H.M.;F.N.Owens,G.W.Horn and J.A.Vizcarra (2000) Effect of supplemental zinc and manganese on ruminal fementation , forage intake and digestion by cattle fed prairie hay and urea .J.Anim.Sci.78.2972-2979.

Bharadwaj,A.;B.P.Sengupta and T.R.Chauhan(1999) Effect of dietary unprotected and protected protein on some blood and rumen metabolities in lactating buffaloes. Buffalo J.,2:153-163.

Cao,J.;P.R.Henry;R.A.Holwerda ;J.P.Toth; R.C.Littell;R.D.Miles and C.B.Ammerman (2002) Chemical characteristics and relative bioavailability of supplemental organic zinc source for poultry and ruminants.J.Anim.Sci.78: 2039-2054.

Compbell,M.H;J.K.Miller and F.N.Schrick(1999) Effect of additional cobalt, copper, manganese and zinc on reproduction and milk yield of lactating dairy cows receiving bovine somatotropin. J.Dairy Sci., 82:1019-1025.

Demeterova, M.;V.Vaida;P.Pastierik and A.Koteles (2002) .The effect of protected fat and protein supplements on rumen metabolism on some parameters of intermediary metabolism and on the quality and production of milk in dairy cows . Folia veterinaria, 46:20-26.

Dinn.N.E;J.A.Shelford and L.J. Fisher (1998) .Use of the cor mell net carbohydrate and protein system and rumen –protected lysine and methionine to reduce nitrogen excretion from lactating dairy cows. J.Dairy Sci. ,81:229-237.

Drupt,E.(1974). Colorimetric determination of albumin .Biol. J.9.777.

Duncan,D.B.(1955) Multiple range and multiple F tests . Biomerics, 11:1.

Eadie,J.M.;P.N.Hobson and S.O.Mann(1967) A note on some comparison between the rumen content of barley fed steers and that young calves also fed on high concentrate rations.J.Anim.Prod., 9:247.

EL-Saifi , A.A. (1969) The diagnostic value of the ruminal juice examination in cases of in digestion in buffaloes .M.Sc. Vet. Thesis , Fac. Vet. Medicine, Cairo,Univ.

Fawcett, J.K.,and J.E.Scott(1960) Colorimetric determination of urea .An. J. Clin.Path. B,156.

Formigoni,A.Parisini,P.,Corradi,F.(1993) The use of amino acid chelates in high production milk cows . In: A shmead ,H.D.(Ed).The roles of amino acid chelates in Animal Nutrition. Noyes Publication, Park Ridge, NJ,PP.170-186.

Gaines,W.L.(1923) Relation between percentage of fat content and yield of milk .1- Correction of milk yield for fat content .Agric..Exo. Sta. Bull. 245.

Gunter,S.A.,Kegley,E.B.,Duff,G.C.,Vermeire,D.(1999) The performance by steers fed different zinc source before and during receiving at a New mexico feedlot.J.Anim.Sci. 77 (suppl.1).19 (Abstract).

Henry,P.R, (1995) Manganese bioavailability . In : Ammerman , C.B.,Baker, D.H.,Lewis, A.J.(Eds.). Bioavailability of Nutrients for Animals .Amino acids , minerals , and vitamins . Academic Press, San Diego, CA, PP.239-256.

Kellogg, W. and A.Lane (1996) Effect of supplementing zinc complex to lactating Holstein cows .Technical Bull.Zinpro Cerop. Eden. Prairie , MN.

Luo,X.G.,Henry,P.R.,Ammerman,C.B.,Madison,J.B.(1996).Relative bioavailability of copper in a copper lysine complex or copper sulfate for ruminants as affected by feeding regimen .Anim.Feed Sci.and Technol.57,281-289.

Makino,T.; M.Saito; D.Horiguchi and K.Kina (1982) Colorimetric determination of zinc Clinica .Chimica. Acta, 120,127-135.

Matur,O.P.;C.S.Mathur,G.R.Purohit and T.Sharma(1991)Effect of dietary protection with urea supplementation on rumen microflora. Ind .J.Anim.Nutri.8(4) 297.

Miles,R.D.,Henry,P.R.(1999) Relative trace mineral bioavailability. In: Proceeding of the califorina Animal Nutrition Conference held on may 6,1999, Piccadilli Inn Hotels ,Fresno, CA,PP.1-24.

Miller,W.J.;H.E.Amos,R.P.Gentry;D.M.Blackmon,R.M.Durrance ,CT.Crowe,A.S.Fielding and M.W.Neathery.(1989) Long term feeding of high zinc sulfate diets to lactating and gestating dairy cows J.Dairy Sci.,72:1499-1508.

Mousa ,Kh.M.M.and S.M.EL-Sheikh(2004) Effect of different leveles of zinc supplementation on utilization of non-protein nitrogen for lactating buffloes.J.Agric.Sci.Mansoura Univ.,29(6) :3063-3073.

NRC,(1988)Nutrient Requirements of Dairy cattle .6th ed. Acad.Sci.,Washington,Dc.

Overman,O.R. and F.P.Sanmann.(1926) The energy of milk as related to composition . 3rd Agric . Exp. Sta.Bull.,282.

Reid,R.L.,G.A.Jung,W.L.Stout and T.S.Ranney (1987) Effect of varying zinc concentrations on quality of alfalfa for lambs. J.Anim.Sci. ,64:1735-1742.

Robinson.P.H.;W.Chalupa; C.J.Sniffen;W.E.Juliens; H.Sato;T.Fujieda;T.Uedo and H.Suzuki(2002) Influence of abomasal infusion of high levels of lysine ,methionine. or both on ruminal fermentation eating behavior and performance of lactating dairy cows. J. Anim.Sci.,78: 1067-1077.

Rojas, L.X., McDwell, L,R., Cousins, R.J.,Martin, F.G.,Wilkinson, N.S.,Johanson,A.B. and Velasquez,J.B.(1995). Relative bioavailability of two organic and two inorganic zinc sources fed to sheep . J.Anim.Sci.73,1202-1207.

SAS ,(1985) SAS user's guide : statistics .SAS. Inst.,Inc.,Cary, NC.

Socha, M.T.,Johanson,A.B.(1998) Summary of trials conducted evaluating the effect of a combination of complexed zinc methionine ,manganese methionine ,copper lysine and cobalt glucoheptonate on lactation and reproductive performance of dairy cattle .J.Dairy Sci.81(suppl.1),251(Abstract).

Spears,J.W.,(1996) Organic trace minerals in ruminant nutrition .Anim.Feed Sci.and Technol.58,151-163.

Spears,J.W.and E.B.Kegley (2003) Effect of zinc source (zinc oxide vs. zinc proteinate) and level on performance , carcass characteristics, and immune respone of growing and finshing steers .J.Animal Sci. 80:2747-2752.

Uchida,k;p.Mandebvu;C.S.Ballard;C.J.Sniffen;and M.P.Carter (2001) Effect of feeding a combination of zinc ,manganese and copper amino acid complexes, and cobalt glucoheptonate on performance of early lactation high producing dairy cows .Animal Feed Science and Technology 93: 139-203.

Van Keulen,J. and B.A.Young (1977).Evalution of acid insoluble ash as a natural marker in ruminant digestibility studies . J.Anim.Sci.,44;282.

Weichselboum, F. (1946) Colorimetric determination of total protein .An. J. Clin.Path. 16.40.

تاثير اضافة مستويات مختلفة للزنك من مصدر عضوى على اداء الابقار الفريزيان الحلابة

ابراهيم محمد السيد محمد شقوير - احمد عبد العزيز مرسى المقص - حسن محمود النحاس

معهد بحوث الانتاج الحيوانى - قسم بحوث تغذية الحيوان- مركز البحوث الزراعية -جمهورية مصر العربية

أجريت هذة الدراسة بهدف دراسة تاثير اضافة مستويات مختلفة من زنك المثيولين على معاملات الهضم والقيمة الغذائية ومحصول اللبن وبعض مقاييس الكرش والدم ووزن الميلاد للعجول المولودة . حيث استخدم ٢٠ بقرة عشار عند الشهر الثالث قبل الولادة وتمت التغذية على المستويات المختلفة من الزنك حتى ٢١٠ يوم من موسم الحليب وقسمت الحيوانات الى اربعة مجاميع على النحو التالى ١- مجموعة الكنترول غذيت على علف مركز +دريس برسيم + قش ارز ٢- مجموعة مختبرة غذيت على عليقة الكنترول + ٤٠ملجم زنك مثيونين /كجم مادة جافة ماكولة ٣- مجموعة مختبرة غذيت على عليقة الكنترول + ٨٠ملجم زنك مثيونين /كجم مادة جافة ماكولة ٤- مجموعة مختبرة غذيت على عليقة الكنترول + ١٢٠ملجم زنك مثيونين /كجم مادة جافة ماكولة. وكانت النتائج كالاتى :-

اضافة زنك المثيونين بمستوياتة المختلفة ادى الى تحسن فى معاملات الهضم والقيمة الغذائية للعليقة الماكولة وكذلك محصول اللبن ووزن الميلاد للعجول المولودة مقارنة بمجموعة الكنترول . اما بالنسبة لمقاييس الكرش فقد ادت اضافة زنك المثيونين الى انخفاض تركيز امونيا الكرش مع كل مستويات الزنك المضافة ولكنها ادت الى ارتفاع تركيز بروتين الدم والجلوبيولين بينما انخفض تركيز الالبيومين ويوريا الدم بينما ادت اضافة زنك المثيونين الى انخفاض اعداد الخلايا الجسدية فى لبن الابقار الفريزيان مقارنة بمجموعة الكنترول.

<u>وتوصى الدراسة</u> : بان اضافة زنك المثيونين بمستويات ٤٠ ، ٨٠ ،١٢٠ ملجم /كجم مادة جافة ماكولة /اليوم ادى الى تحسن فى المركبات المهضومة وقيمتها الغذائية وكذلك ناتج اللبن اليومى كما ان اضافة ٤٠ ملجم زنك مثيونين /كجم مادة جافة ماكولة فى علائق الابقار الفريزيان خلال ال٣ شهور الاخيرة من الحمل ادى الى زيادة وزن العجول عند الميلاد.