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PERFORMANCE AND SOME BLOOD SERUM CONSTITUENTS OF GROWING BUFFALO CALVES FED RATIONS CONTAINING CORN SILAGE

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ABSTRACT

Twenty growing male buffalo calves with averagebodyweight of 120kgs and 6-9 month of age were used in this investigation and divided into two equal groups each of ten animals. The first group was fed corn silage alone for three months, while the second control group received a control ration.The first group showed clinical manifestions of Cu, Zn, Se and vitamin A deficiencies with prevalence particular signs of unthriftness,weight loss, rough hair coat, alopecia in some parts of the body and hypopigmentation, also diarrhoea, bilateral ocular discharge and coughing be noticed in some animals may. Chemical analysis of the diet revealed that, corn silage alone is not a balanced diet for growing calves. Blood serum biochemical analysis of the diseased calves reflected these dietary deficiencies, as it revealed a significant reduction of the previous trace elements together with significant depletion in serum calcium,vitamin A and total proteins in comparison with the control animals.Haematological picture of the diseased calves revealed hypochromic microcytic anaemia, which is indicative for copper deficiency.Diseased calves responded successfully to supplem-entation of concentrate feed mixture and parentral injection of copper methionate and vitamin A together with dietary mineral supplementation as clinical signs disappeared and all examined blood parameters showed significant improvement towards the normal levels.

INTRODUCTION

Corn silage alone is not a balanced diet,therefore,consideration must be given to adding essential nutrients(***Tilden and Michael,1995***).Feeding

silage alone does not support optimum growth rates of growing calves. Therefore, varying levels of grains may be fed with silage to provide appropriate energy for desired rates of gain and production. Minerals, such as calcium, phosphorus, salt, cobalt and possibly zinc should be provided in a supplement as a portion of the diet, or by feeding in a box on a free–choice basis. Recent research indicates that urea and mineral additions to corn silage at ensiling improve the energy value of the silage as feed for beef cattle from 5-10%, in addition to increase in the rate of gain and feed efficiency **(*Pond, et al. 1995*)**. In earlier, research, (***Perry et al. 1976*)** found that, calves fed a diet of corn silage showed low blood selenium and one calf had died of possible white muscle disease. Also, **(*McDonaled et al.,1966*)** concluded that, corn silage may have lost practically all of its carotene after it was harvested and stored under anaerobic conditions for several months where oxygen and heat was available. Likewise, (***Tilden and Michael, 1995*)** stated that, the carotenes are destroyed by exposure to oxygen or heat during ensiled crops. ***Smith (2002)*** **and** ***Gunter et al. (2003)*** reported that, slowed growth and less-than normal weight gains usually occur at the same time, however, they occasionally occur separately accompanied trace elements and vitamins deficiencies.So, this work aimed to study the effect of feeding corn silage with or without concentrate feed mixture on general health condition,performance and some blood serum constituents of growing buffalo calves.

MATERIALS AND METHODS

Animals:

The current work was carried out at private farm of animal production, Belqas,Dakahlia province.Twenty growing male buffalo calves with average body weight of 120 kgs and 6-9 months of age were included in the present investigation. They were divided into two equal groups, diseased group (G1) has prevalence of particular signs of unthriftness,slow growth rate and alopecia,in addition to diarrhea,bilateral lacrimation and coughing

in some animals.Another apparently clinically healthy group was used,as a control group (G2).

Diets:

Growing buffalo calves of the first group (G1) were fed corn silage alone adlibtium for three months (pre-treatment). During post treatment, calves fed ration composed of 50% corn silage and 50% concentrate mixture(CFM)for ten weeks,while the second group received 50%CFM,25% rice straw and 25%berseem hay(control ration) to cover the requirements of growing calves according to (***NRC, 1996*****)** as shown in Table 1. CFM consists of yellow corn grain, soyabean meal, wheat bran, urea, at 63, 16, 20, 1, %, respectively.

Concentrate feed mixture was given twice daily at 8.00 a.m and 5.00 p.m, while corn silage was given at 9.00 a.m and 6.00 p.m. Fresh water was available for calves all the day round.

Clinical examination:

History and complete physical examination of all calves were carried out according to ***Kelly (1990)***.

Blood samples:

Two blood samples were collected from each investigated calf before and ten weeks after treatment.The first heparinized blood sample was analyzed for haematological picture using electronic cell counter(Msg,France), while the second blood sample was used to obtain clear, non haemolysed serum for colorimetric determination of inorganic phosphorus **(*Kilching* and *Freiburg, 1951)***, vitamin A ***(Nobert, 1986)*** , total proteins ***(Weichsclbaum, 1946)***, on the other hand atomic absorption spectrophotometer procedure (Perkin Elmer, 2380) was used for determination of Ca,Cu,Zn, Mn , Se and Fe.

Diet analysis:

Samples of diet offered to each group were chemically analyzed for minerals and trace elements according to ***AOAC(1990)*** using atomic absorption spectrophotometer procedure (Perkin Elmer 2380).

Parasitological examination:

Skin scraping as well as fecal samples was collected from diseased calves for parasitological examination according to ***Kelly(1990)***to ensure that calves are free from any parasitic skin disease or internal parasites as specific antiparastic drugs were used in this farm.

Treatment of diseased calves:

Diseased calves were injected intramuscular with 1 million I.U of vitamin A /calf **(*Radostits et al.,2000*)** together with intramuscular injection of copper in the form of copper methionate***(Coppa Comp.,Bimedia. Broomhill Rd, Tallaght, Dublin 24)*** (20mg Cu/ml)at dose rate of 3 ml/ head/week for three successive weeks **(*Randhawa et al.,1994*)**,in addition to continuous supplementation of mineral salts.

Statistical analysis:

The obtained data were statistically analyzed using general linear model procedure adapted by **SPSS (1995)**.

RESULTS AND DISCUSSION

In agreement with a previous report **(*NRC,2002*)**,corn silage feed is deficient in calcium,crude protein,sodium,copper,zinc and selenium.,Also ***Pond et al.(1995)***previously concluded that,corn silage as a feed for cattle is deficient in protein,calcium and phosphorus(dry matter basis)8.1, 0.27 and0.20 % ;respectively,while the requirements for growing calves (1.651 bs daily gain) are 11.1, 0.31 and 0.25 %; respectively. So urea, dicalcium phosphate and mineral mixture are often added to corn silage at silo filling time to correct protein and mineral deficiencies. Moreover, ***Adam (1988)*** mentioned that, cattle consuming ration rich in corn silage or oat silage

have been found to be deplete normal store of vitamin A in the liver even thought these feeds contained medium to high levels of ß-carotene.He also added that the requirement of heifers or steers wintered in corn silage is 15,000 i.u of vitamin A per head daily.

Copper, zinc, selenium and vitamin A deficiencies are among the major problems in calves and are intimately concerned with optimal health and performance***Pond et al.,(1995);Machen et al.,(1996)and Smith, (2002)***. Diseased calves fed corn silage alone revealed unthriftness, poor weight gain,rough easily sheding hair coat from various parts of the body (Fig .1), anaemia, anorexia, frequent diarrhoea, lacrimation,scaly skin,and achromotrichia,additionally some calves were suffering from coughing.It is clearly seen that,these findings coincided with that of copper,zinc,sele-nium and vitamin A deficiencies and this came in agreement with those previously recorded by ***Nasser et al., (2000);Cerone et al.,(2000);Smith, (2002); Mullis et al., (2003) and Gunter et al., (2003). Enjalbert et al., (1997)*** indicated that,mortality and morbidity rates in cattle herd were not significantly increased by feeding corn silage, but weight loss and decre-ased gain accompanied such diet may be attributed to nitrogen deficiency and lack of mineral complementation increased the risk of diarrhoea.

Hypopigmentation may be attributed to copper containing enzyme, tyrosinase (polyphenyloxidase) which is needed to convert L- tyrosine to melanin and with copper deficiency this conversion is slow and hair is lighter in color than normal***(Machen et al,(1996)and Smith,(2002)***.Diarrhoea and coughing of deficient buffalo calves may be attributed to reduced immunity. ***Jones and Suttle, (1981),Xin et al.(1991) and Cerone et al. (2000)*** indicated that,copper and zinc deficiencies alter the activity of several enzymes (copper and zinc superoxide dismutase and cytochrome C oxidase) in peripheral blood lymphocytes, neutrophils and monocytes-derived macrophages which mediate antioxidant defense and ATP formation and these effects may impair the cell immune functionality,affecting

the bactericidal capacity and making the animal more susceptible to infection. ***Additionally, Stable et al. (1989) and Bailey et al. (2001)*** found that, selenium deficiency decreased the immunity of calves through decreasing IgM formation following stress. On the other hand, ***Arrayet et al. (2002)*** contributed immunosuppression, poor growth and death in Holstein calves to zinc deficiency.

Deficiency of single trace element rarely occur in the field,as deficiency is complicated by close inter-relation of many trace elements and various metabolic processes as the imbalance in the intake or metabolism of one element may change the requirement of the others ***Hidiroglou, (1979)***.The present study revealed that,blood serum biochemical analysis of investigated unthrifty buffalo calves showed significant reduction in calcium, total proteins and trace elements especially copper, zinc, and selenium in comparison with healthy ones (Table 4) and this agreed with previous reports of ***Nasr, (1993) and Nasser et al. (2000).*** Also,unthrifty calves proved significant decrease in serum vitamin A (Table 4). ***Tilden and Michael, (1995)*** contributed vitamin A deficiency to its destruction by heat,humidity,prolonged bad storage and other adverse environmental conditions. On the other hand, ***Yavuz et al. (1991)*** attributed vitamin A deficiency in beef cattle feeding silage to the reduction of ß-carotene retention in the rumen as a result of high nitrite in the silage leading to inefficient conversion of carotene to vitamin A.

The obtained haematological values as recorded in table (5) are indicative for the presence of copper deficiency in growing buffalo calves feeding corn silage alone in comparison with healthy control ones. Diseased calves revealed significant ($P<0.01$) decrease in both haemoglobin and erythrocytic count indicating hypochromic microcytic anaemia.These results agreed with previous study of ***Nasser, et al.(2000) and Radostits et al. (2000). Xin et al. (1991) and Smith, (2002)*** reported that, copper plays an important role in the transport of iron from the gut to marrow

and incorporation of iron into the haeme moiety,so the anaemia produced by copper deficiency is closely resembles iron deficiency in that,it is usually a microcytic hypochromic anaemia. On the other hand, insignificant changes were observed in total leukocytic count in deficient claves, but differential leukocytic count showed significant variations in comparison with control group (Table 5). These results coincided with ***Cerone et al. (1998) and Cerone et al. (2000)*** who proved that, in copper deficient animals,total leukocytic numbers were not affected, but differential count showed a marked increase in monocytes subpopulation and significant decrease in lymphocytes and neutrophils. They also concluded that, these changes reduce the animal's immune competence may contributed to greater incidence of infectious diseases in copper deficient cattle.

All recorded clinical signs disappeared after supplementation of CFM to the diet of calves together with intramuscular injection of copper methionate and vitamin A and dietary mineral mixture supplementation. In addition to all blood values showed significant improvement towards the normal levels (Tables 4 & 5). These results were similar with those reported by ***Nasr, (1993), Pechin et al. (1999) Gierus et al. (2002) and Gunter et al. (2003).***

Finally,it could be concluded that,corn silage alone is not a balanced diet and feeding it alone does not support optimum growth rates of growing buffalo calves, therefore, consideration must be given to fed concentrate feed mixture with silage to provide appropriate energy for desired rate of gain and production. Additionally mineral mixture and vitamin A supplements should be included in corn silage based diet.

Table (1): Formulation of the rations fed to growing buffalo calves before and after treatment.

Ingredients	First group (G1)		Second group (G2)
	Pre-treatment	Post-treatment	

Corn silage %	100	50	0.00
CFM % *	0.00	50	50
Rice straw %	0.00	00	25
Berseem hay %	0.00	00	25

Table (2): Chemical composition (on dry matter basis) of feed ingredients fed to growing buffalo calves.

Ingredients	DM%	Composition of DM %					
		OM	CP	EE	CF	NFE	Ash
Corn silage	38.56	92.44	6.46	2.30	29.77	53.91	7.56
Wheat bran	89.10	93.50	15.50	4.40	11.00	62.60	6.50
Yellow corn	88.00	98.50	9.50	4.10	2.50	82.40	1.50
Soyabean meal	88.85	92.80	48.52	1.80	6.23	36.25	7.20
Urea	100		280				
Rice straw	92.34	82.40	3.40	1.75	30.81	46.44	17.60
Berseem hay	90.68	87.50	14.20	2.50	24.85	45.95	12.50
Experimental rations (Calculated)							
After treat. (G1)	100	94.52	13.05	3.03	17.27	61.17	5.48
Control ration (G2)	100	90.77	14.22	2.94	16.30	57.31	9.23

Table (3): Minerals concentration (on DM basis) of ingredients fed to growing buffalo calves.

Ingredients	Macro elements %						Micro elements, ppm				
	Ca	P	Mg	K	Na	S	Cu	Fe	Mn	Se	Zn
Corn silage	0.15	0.13	0.13	1.25	0.02	0.09	3	120	20	0.02	15
Wheat bran	0.15	1.10	0.45	1.85	0.03	0.25	12	170	110	0.38	75
Yellow corn	0.02	0.22	0.13	0.65	0.01	0.13	2	45	8	0.04	20
Soyabean meal	0.55	0.75	0.38	2.65	0.05	0.56	18	210	27	0.13	60
Rice straw	0.60	0.11	0.22	2.03	0.28	0.13	6	120	40	0.01	25
Berseem hay	1.40	0.30	0.30	2.90	0.10	0.25	10	375	50	0.20	45
Experimental rations (Calculated)											

After treat.	0.14	0.30	0.18	1.23	0.02	0.16	5	108	26	0.07	26
Control ration	0.55	0.31	0.23	1.73	0.10	0.19	7	163	37	0.11	34

*Experimental ration after treatment was supplemented with $CaCO_3$ and NaCl to provide 0.4% Ca and 0.1% Na while salt premix was $CuSO_4.5H_2O$, $MnSO_4.4H_2O$, Na_2SeSO_3, and $ZnSO_4.7H_2O$ to provide 5 Cu, 14 Mn, 0.23 Se, and 14 Zn mg/kg DM, respectively.

Table (4): Blood serum biochemical parameters in healthy and diseased calves before and after treatment.

Parameter	Unit	First group (G1) n = 10		Second group (G2) n = 10
		Before Treatment n = 10	After Treatment n = 10	
Ca	mg/dl	9.03±.26 [a]	9.86±.28 [b]	10.18±.25 [b]
Inorganic P	mg/dI	6.54±.21	6.78±.24	7.14±.22
Cu	µg/dI	70.00±3.85 [a]	90.25±3.91 [b]	93.38±2.99 [b]
Mn	µg/dI	2.09±.02 [a]	2.61±.07 [b]	2.60±.08 [b]
Se	µg/dI	.013±.0008 [a]	.030±.001 [b]	.035±.001 [c]
Zn	µg/dI	75.25±3.35 [a]	90.25±2.07 [b]	92.63±2.05 [b]
Fe	µg/dI	136.88±2.51	151.13±5.46	148.75±6.08
Total Proteins	g/dI	5.35±.25 [a]	6.81±.32 [b]	7.03±.33 [b]
Vitamin A	µg/dI	18.50±1.35 [a]	29.5±.87 [b]	34±.93 [c]

Overall means within rows with different superscripts (P<0.05)

Table (5): Haematological values in healthy and diseased calves before and after treatment.

Parameter	Unit	First group (G1)		Second group (G2) n = 10
		Before Treatment n = 10	After Treatment n = 10	
RBCs	10^6/µL	8.19 ± 0.30[b]	8.68 ± 0.45[b]	12.1± 0.35[a]
Hb	g/dL	8.4 ± 0.27[b]	11.1 ± 0.13[a]	12.5± 0.10 [a]
Platlets	10^3/µL	125.0 ± 10.1[c]	197.2 ± 9.5[b]	280 ± 20.3 [a]
WBCs	10^3/µL	7.32 ± 0.13	7.04 ± 0.23	7.5 ± 0.7
Lymphocytes	%	46.2 ± 3.2[b]	56.1 ± 2.2[a]	55.8 ± 3.2[a]
Monocytes	%	18.2 ± 3.2[a]	12.3 ± 2.1[c]	14.1 ± 3.1[b]
Granulocytes	%	33.1 ± 7.2[a]	31.1 ± 0.3[b]	32.2 ± 6.1[a]

Overall means within rows with different superscripts ($p<0.05$).

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Fig. (1): Buffalo-calves showed unthriftness, weight loss, alopecia and hypopigmentation.

Fig. (2): Buffalo-calf 10 weeks after treatement.

Fig. (3): Buffalo-calf of the same age (control group).

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أداء وبعض مكونات الدم لعجول الجاموس النامية والتي تتغذى على علائق تحتوي على سيلاج الذرة

مدحت ناصف محمد

قسم طب الحيوان – كلية الطب البيطري بكفر الشيخ – جامعة طنطا

أجريت هذه الدراسة على عدد عشرون عجل جاموسي في عمر النمو(6–9 شهور) والتي تزن 120 كجم في مزرعة للإنتاج الحيواني ببلقاس – محافظة الدقهلية . وقد تم تقسيم هذه الحيوانات إلى مجموعتين كل مجموعة بها عشرة عجول حيث تغذت المجموعة الأولى (المجموعة المصابة) على سيلاج الذرة فقط لمدة ثلاثة شهور، أما المجموعة الثانية (مجموعة المقارنة السليمة) تغذت على علف مركز وقش أرز بالإضافة إلى دريس برسيم. وقد لوحظ ظهور أعراض إكلينيكية على المجموعة الأولى في صورة ضعف عام وهزال وبطء في معدل النمو وفقدان لوزن الجسم وتساقط للشعر في بعض أجزاء

الجسم وكذا نقص في صبغة الشعر بالإضافة لإسهال وإفرازات دمعية من العينين وكحة في بعض العجول . وقد أتضح من تحليل العليقة أن سيلاج الذرة غير متزن غذائيا بالنسبة لعجول الجاموس النامية حيث به نقص كبير في كل من البروتين الخام والكالسيوم وبعض العناصر النادرة وخاصة النحاس ،المنجنيز ،السيلنيوم ،الزنك وقد أظهر فحص صورة الدم وجود أنيميا (hypochromic microcytic) الناجمة عن نقص عنصر النحاس وهذا ما أكده التحليل البيوكيميائى لسيرم دم المجموعة الأولى حيث أتضح أن هناك نقص معنوي في العناصر المعدنية السابق ذكرها وكذلك نقص في كل من فيتامين (أ) والبروتين الكلى في الدم هذا بالمقارنة بالمجموعة الثانية (لعجول السليمة). ولقد استجابت حيوانات المجموعة الأولى لإضافة الأملاح المعدنية مع العليقة المركزة بالإضافة إلى حقن عنصر النحاس وفيتامين (أ). حيث اختفت الأعراض الإكلينيكية مع حدوث تحسن في الشكل الظاهري للعجول مع زيادة في الوزن وتحسن ملموس في قياسات الدم نحو المستويات الطبيعية.