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Study the use of urea molasses multinutrient block on pica symptom of cattle

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ABSTRACT

This study discuses the effect use of feeding urea molasses multinutrient block (UMMB) as an alternative supplements on the pica symptom of Limousin cattle. Sixty indigenous pica cattle were chosen from Ningnan mountainous district Guyuan City on the basis of similar bodyweight. The Ningnan mountainous district cattle produce was limited by harsh environments and nutritional factors. Especially the forage quality and availability are affecting nutrient intake. Forage was reduced during winter and early spring of the year. A background of these blocks manufacturing process and their effects on pica symptom of cattle are reported. Sixty cattle were randomly divided equally into control and UMMB treatment supplemental groups. Both groups have the same forage except the treatment group was free access to supplement with UMMB. The experiment lasted for 30 days. The content of mineral elements (Se, Zn, Cu, Co, I, Ca, P) in blood in the experiment group were significantly increased contrast with control group (P<0.05) after feeding the UMMB. The activity of ceruloplasmin (CP), superoxide dismutase (SOD) and lactate dehydrogenate (LDH) in the serum of experimental group were significantly increased contrast with the control group (P<0.05). The content of mineral elements （Se, Zn, Cu, Co） on feather in the experiment group were significantly increased contrast with control group (P<0.05). According to field observation and stockowner reflects, the pica symptom was disappeared in the treatment group after feeding UMMB three days, and the intake and drinking have significantly increased. Cattle have the symptom of pica and the hair was coarseness and lacklustre before experiment in the experiment group. The symptom of pica was gradually disappeared and the appearances of cattle were dramatically changed with feeding the UMMB. Furthermore, the colour of hair was brightness and bushy, and the cattle was in

good condition in the treatment group after feeding UMMB. However, the hair of the cattle in the control group was sparseness and dirty. The symptom of pica was all disappeared, which means the UMMB was an effectively in treated cattle pica. Therefore, the UMMB can be as an effective way mineral supplement and treatment in cattle pica.

INTRODUCTION

Nutrient deficiency is a commonly problem in the world, especially the mineral deficiencies and imbalances for cattle (Garg *et al*., 2013). In arid and semi-arid regions, feed shortage is the main constraint to their productivity. During the hot and dry seasons, the available feed resources are not enough in energy and digestion proteins, which are insufficient to maintenance requirements and reducing productivity throughout the year. In drought conditions, ruminants need enough nutritious to improve animal performance. Earlier studies have assessed the nutritional quality in Ningnan mountainous district forage. The nutrition consent in this mountain was deficiencies and required to supplement the desired level of production. In the past decades, UMMB was chosen as a supplementation to deficient diets in cattle (Garg *et al*., 1992; Schiere *et al*., 1989; Toppo *et al*., 1997), sheep (Emyr *et al*., 2012; Mirza *et al*., 1988; Sudana *et al* 1989;), and baffaloes (Hosamani *et al*., 1995; Mehra *et al*., 1991; Mehra *et al*., 1993; Tiwari *et al*., 1990;). However, there are many kinds of UMMB in the market. Since these UMMB are too soft or hygroscopic due to humidity resulted in gobbled rapidly by the animals, which lead to extensive supplement to animals. In order to study the UMMB for local cattle in Guyuan, the present study was carried out on UMMB formulas, raw material, technical parameter and feeding effect.

METHODOLOGY

Ingredient composition of UMMB: The UMMB prepared in this study using the process as described by Haili et al. (Haili *et al* 2008). Different ingredient of UMMB were chosen from local place with the objective of supplying minerals nutrition. The UMMB consisted of mineral mixture, common salt, urea, sodium bentonite, molasses, wheat bran, calyx and calcium hydrogen phosphate at the level of 8.5%, 20%, 10%, 20%, 20%, 4%, 5% and 12.5% respectively.

Animals feeding and management: The study was done at the Ningnan mountainous district, Guyan City, Ningxia province, China. Sixty indigenous cattle with symptom of pica were chosen from Ningnan mountainous district Guyuan City based on similar bodyweight, divided randomly into two groups of thirty animals in each group. Two groups have the same formula except the treatment group supplemented with UMMB to meet their mineral requirement. The ingredient composition of UMMB was mineral mixture, common salt, urea, sodium bentonite, molasses, wheat bran, calx and calcium hydrogen phosphate at the level of 8.5%, 20%, 10%, 20%, 20%, 4%, 5% and 12.5% respectively.

The cattle animals were kept in sheds during the experimental conduction. Clean and fresh drinking water provided in the morning and afternoon. During the 30 days of experiment haematology index, serum enzymology index, the mineral concentration of the blood, the mineral content of the hair, the consumption of UMMB and the pica animal clinical manifestation and disease

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development were tested at the beginning and at the end of the experiment.

Sample preparing: Take blood sample 30 ml in the neck venous before the experiment and at the end of the experiment with 1% heparin anticoagulation and stored at -25 ℃. 10 ml used for the test mineral element, 10 ml used for the determination haematology index and 10 ml used for the biochemical index test. Take 1 g clothing hair before and at the end of the experiment for mineral test.

Routine haematological examination: Routine haematological was examined by automatic animal blood analyzer. The routine haematological test indexes including : Red blood cell (RBC), white blood cell (WBC), hematocrit (HCT), hemoglobin (HGB), neutrophils (GR), lymphocyte (LY), median cells (MO), platelet (PLT), lymphocyte ratio (LY%), mid-value cell ratio (MO %), neutrophils ratio (GR %), mean corpuscular volume (MCV), mean content of hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean platelet volume (MPV), platelet cubic thrombocytocrit (PCT).

Blood biochemical index examination: Blood biochemical index was examined by chemical colorimetric method (Test Kit). The evaluation indexes including ceruloplasmin (CP), glutathione peroxidase (GSHPX), superoxide dismutase (SOD), lactate dehydrogenase (LDH), alkaline phosphatase (AKP).

Blood element analysis: The blood element analysis: (1) selenium determination. Instruments: AFS-930 double ways for atomic fluorescence photometric (Beijing auspicious day Instrument Company.). Methods: blood 2.0 g, add 15 ml nitric acid and 1 ml strong high chlorine acid, in cook stove digestion 15 to 16 h (130 ℃ temperature), cooling the sample and then added to 10 ml. Hydride generation atomic fluorescence spectrometric determination (HGAFC), 200~290 nm wavelength, standard curve equation Ⅰ(fluorescence intensity value)=40.4049×C(density)-3.9259. (2) The calcium, phosphorus, copper, zinc, cobalt, selenium, iodine element determination. Instruments: plasma atomic emission spectrometer (American varian company VISTA-AES). Methods: the former dealing similar with selenium determination, determination conditions temperature was -35 ℃, Water temperature 22 ℃, Power 1.2 kW; Gas flow for argon was 2.25 L/min, nitrogen 1.5 L/min. Determine wavelength was: 396.847, 213.618, 327.395, 213.857, 238.892, 257.610, 238.204 nm respectively. (3) Element fluorine, chlorine determination. Instruments: ion chromatography (Dianne Company). Methods: the former dealing similar with selenium determination, according to GB/T14924.12 2001, the eluent and leacheate were 12% of chromatographic pure NaOH; Temperature 30 ℃, and the sample volume 20 μl, the volume was leacheate 250 μl/time, each sample elution time was 20 min.

Data statistics and processing: The SPSS 13.00 software on One-Way ANOVA analysis of variance and Duncan's multiple comparisons, the result in average ± standard deviation.

RESULTS

Routine blood index: Routine blood test results were showed in table 1. The results showed that the number of red blood cells (RBC), hematocrit (HCT), hemoglobin (HGB) and the number of white blood cells (WBC) of pica cattle were below normal index. The number of RBC, WBC, HCT, HGB, neutrophils (NP), mean corpuscular volume (MCV), medial plaque volume (MPV) in the experiment group were increased by 49% (P>0.05), 4.19% (P>0.05), 12.88% (P<0.05), 3.64% (P>0.05), 6% (P>0.05), 7.67% (P<0.05), 2.54% (P<0.05), 11.68% (P>0.05) compared with control group. Lymphocytes (LY), median cells (MC), platelets (PLT), lymphocyte rate (LY%), median cells rate (MC%), mean content of hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), platelet cubic thrombocytocrit (PCT) in the experiment group were reduced by 9.2% (P>0.05), 23.38% (P>0.05), 16.18% (P<0.05), 2.04% (P>0.05), 18.97% (P>0.05), 9.16% (P>0.05), 11.65% (P<0.05), 5.26% (P<0.05) compared with control group.

Table 1: Results of blood routine in sickness cattle

Blood routine item	At the beginning of the experiment		At the end of the experiment		Unit
	Experiment group	Control group	Experiment group	Control group	
RBC	4.64±0.99	4.56±0.92	9.18±0.99*	4.74±0.94*	10^{12}/L
WBC	7.88±2.39	7.93±2.32	8.46±2.33*	7.55±2.03*	10^{9}/L
HCT	22.72±5.54	21.46±5.23	26.08±6.14*	23.21±5.52*	%
HGB	109.4±12.86	108.64±12.41	113.53±11.58	112.13±12.45	g/L
NP	2.98±0.8	2.76±0.73	3.17±0.92	3.15±0.86	10^{9}/L
LY	4.13±1.76	3.94±1.48	3.75±1.38*	4.44±1.72*	10^{9}/L
MC	0.77±0.41	0.71±0.34	0.59±0.17*	0.78±0.36*	10^{9}/L
PLT	413.5±216.37	415.57±217.3	346.6±146.09*	417.8±193.17*	10^{9}/L
LY%	51.05±8.4	50.83±7.48	50.01±8.34*	52.34±8.86*	%
MC%	9.49±2.94	9.13±2.51	7.69±1.09*	8.99±2.61*	%
NP%	39.46±8.08	40.12±8.53	42.74±8.03*	38.67±8.32*	%
MCV	48.67±2.52	47.86±2.17	49.94±3.18	48.73±2.61	fL
MCH	24.66±7.32	25.67±7.85	22.4±2.51*	24.54±6.16*	Pg
MCHC	515.9±185.81	513.1±183.65	455.8±102.56*	511.8±158.01*	g/L
MPV	9±1.78	9.56±1.92	10.19±1.86	9.33±1.67	fL
PCT	0.38±0.26	0.35±0.17	0.36±0.21	0.4±0.24	%

Note：Experiment group compared with control group. *Notice P＜0.05, Significant difference.

Serum enzyme activity test results: Result of enzymatic activity in blood serum was showed in table 2. From table 2, the results showed that the enzyme activity are not significant difference (P>0.05) in the experiment group and control group at the beginning of the experiment. However, at the end of the experiment, the CP, GSHPX, SOD, AKP and LDH activities were higher (significant difference, P<0.05) than the control group.

Table 2: Result of enzymatic activity in blood serum

Item	At the beginning of the experiment		At the end of the experiment		Unit
	Experiment group	Control group	Experiment group	Control group	
CP	1.38±0.99	1.29±0.91	8.45±2.56*	1.41±0.77*	10^{12}/L
GSHPX	208.71±8.98	205.97±8.53	246.15±75.63*	211.16±15.09*	10^{9}/L
SOD	105.98±6.02	104.56±5.87	130.81±2.55*	106.89±6.32*	%
LDH	2653.29±171.67	2651.11±169.88	4544.51±347.7*	2643.99±137.37*	g/L
AKP	20.69±8.08	21.51±8.11	28.08±11.68*	19.13±6.82*	10^{9}/L

Note：Experiment group compared with control group. *Notice P＜0.05, Significant difference.

The mineral element content in blood: It can be seen from the table 3, the concentration of calcium was significant difference (P<0.05), the other index were not significant (P>0.05) at the beginning of the experiment. At the end of the trial, experiment group and control group were all significant difference (P<0.05), and the concentration of the index were close or higher than the normal index.

Table 3: The mineral content in blood (mg/L)

Item	At the beginning of the experiment		At the end of the experiment		Reference
	Experiment group	Control group	Experiment group	Control group	
Se	0.011±0.005	0.012±0.005	0.084±0.015*	0.026±0.011*	0.13
Zn	1.47±0.41	1.35±0.4	8.2±0.28*	3.15±0.26*	9
Cu	1.66±0.16	1.67±0.148	5.09±0.25*	2.41±0.16*	5
Co	0.025±0.004	0.027±0.004	0.08±0.002*	0.03±0.003*	0.1
I	0.01±0.003	0.013±0.004	0.03±0.002*	0.011±0.002*	--
Ca	81.99±1.16*	83.44±0.72*	97.91±3.46*	84.33±0.38*	102
P	150.13±0.48	150.16±0.53	250.8±7.52*	153.36±1.3*	260.15

Note：Experiment group compared with control group. *Notice P＜0.05, Significant difference.

The mineral elements content in hairs: It can be seen from the table 4, the concentration of copper were significant difference (P<0.05), the other index were not significant (P>0.05) at the beginning of the experiment. At the end of the trial, experiment group and control group were all significant difference (P<0.05), and the concentration of the index were close or higher than the normal index.

Table 4: The mineral elements content in hairs (mg/kg)

Item	At the beginning of the experiment		At the end of the experiment		Reference
	Experiment group	Control group	Experiment group	Control group	
Cu	6.19±0.17*	6.33±0.14*	9.35±0.13*	6.42±0.09*	10
Zn	92.44±0.99	92.51±1.32	208.15±0.78*	105.75±0.88*	—
Co	0.21±0.026	0.21±0.03	0.42±0.036*	0.24±0.02*	—
Se	0.173±0.02	0.161±0.014	1.3±0.15*	0.18±0.01*	1～5

Note：Experiment group compared with control group. *Notice P＜0.05, Significant difference.

The block consumption: The table 5 showed the consumption of the block. 1-5 d was about 126.41 g/d, 6-15 d was 76.20 g/d and 16-30 d was 76.00 g/d.

Table 5: The consumption of the block (g/d)

Day	1－5 d	6－15 d	16－30 d
Consumption	126.41±8.43	76.2±5.14	76±6.73

Note：Experiment group compared with control group. *Notice P＜0.05, Significant difference.

The consumption of the block: The pica cattle were very like lick block and the block palatability is better, especially in the first stage, some cattle not only suck block but also bite it. It means that the mineral deficiencies of cattle are serious in the countryside. In the first days of the test, the time of lick was control in order to prevent the excessive suck. After four or five days, the average intake was normal (76.2 g/d). According to the lick intake each day, each block can available for every cattle suck 20 ~30 days or so. In this study, cattle feed intake block are differences among the individual, but did not appear urea poisoning.

The effect of the block on the hairs and treatment the symptom of pica: Every cattle has the symptom of pica before experiment. The pica cattle gradually reduced symptoms since entering the experiment period in the experiment group. According to observe and reflect from the client, the cattle with pica symptoms cattle in the experiment group were gradually disappeared after licking the block 3 days, the feed and water intake were increased. The pica symptom was disappeared after 15 days, but the control group still have pica symptom. The hair was harsh and lustreless etc. before the experiment, the hair was improved greatly and hair removal in advance, hair removal time neatly and with shining fur after the experiment. The results showed that UMMB has a good curative effect on cattle pica. It can improve hair nutrition; promote the hair take off and growth as early as possible.

The appetite, spirit and different body status: All the cattle feed and excrement was normal during the experiment. The feed and water intake were increased according to the field observation and reflect from the client. The feed intake still could not measure although a lot of effort on feed intake, because this experiment was conduct in production conditions. The body status and fur condition in experiment group were better than the control group. The above statement showed that UMMB can improve the cattle nutrition and health conditions, and can improve the dry matter of feed intake, especially straw feed intake.

DISCUSSION

Routine blood index is a comprehensive index, which reflects the cattle nutrition condition, metabolism condition, the environmental balance in the body, body health, growth speed and production performance (Azizi-Shotorkhoft *et al* 2013). The present study results showed that the index of RBC, WBC, HGB were below normal index in pica cattle. The blood routine index was normal after feeding UMMB. It means that the physiological and biochemical indexes had relatively comprehensive improvement after feeding UMMB. The most important function of mineral elements is the composition of enzyme and maintain of the enzyme activity. The corresponding enzyme in the blood and tissue of the active can make corresponding reaction when certain mineral elements lacking, which can be used to diagnose certain mineral elements. The study results showed that the enzyme activity was significantly higher in the experiment group than the control group. AKP is a kind of metal enzymes containing zinc, the AKP activity dropped significantly when animals lacked zinc or vice versa, the activity of AKP increasing significantly since supplementary zinc (Roth *et al*., 1979). A lack of mineral element selenium will resulted in the GSHPX activity change. The relationship between blood GSHPX activity and food selenium levels was confirmed in mouse, chicken, lamb, calves and pig. The activity of GSHPX can be used as an index in the early diagnosis of selenium deficiency (Chavez *et al*., 1979). Siddons reported that GSHPX changes provide an objective evidences for the ruminant animals and clinical diagnosis of selenium deficiency index of this diseases (Siddons *et al*., 1981). The RBC GSHPX can well reflect the ox of selenium condition (Rombo *et al*., 1982). The advantages of evaluation minerals nutrition through enzyme activity not only can early monitoring minerals nutrition, but also can avoid sample pollution of the elements, but this approach also has some shortcomings that the activity of GSHPX may reduced, especially the activity of GSHPX (Levander 1985).

Hair is part of the animals' organization. Many microvascular grow in to hair roots during the hair growth. Hair roots cells, blood, lymphatic and extracellular fluid close contact to get fully nutrition and the mineral elements deposit on the base of the hair in the short term. Therefore, the concentration of element in hair can reflect the body metabolism. Combs reported that animal hair is a tape, which reflects the elements intake and metabolism in different periods. Use hair monitoring animal nutritional status with the advantages of sampling take easily, without any damage to the animal, long-term preservation, analysis convenience etc. The element concentration of hair is changed with the breed of livestock and poultry, age, body parts, body colour, hair period and the different parts of the season and changes.

The table 3 showed that the levels of Se, Zn, Cu, Co, I, Ca and P in the experiment group have reached or exceeded the reference requirements. The mainly biological functions of elements were regulated the body's physiological activities through proteins and enzymes involved in metabolism of the body or form hormones (Wang 1996). The lack of trace element will lead to metabolism disorder, which affects livestock production performance (Gandra *et al*., 2011; Xin *et al*., 2011; Romero-Huelva *et al*., 2012). Mineral nutrition imbalance has become recognized as one of the main factors that restrict livestock production, it seriously affect the growth of livestock, and cause more serious consequences than infectious diseases (Schiere *et al*., 1989). There are more reports about adding trace elements to improve ruminant livestock production performance (weight and lactation). It's mainly concentrated in weight gain effects after add a single element selenium (Se) and iodine (I) and filling zinc nutritional status (Garg *et al*., 1992; Emyr *et al*., 2012; Mirza *et al*., 1988; Sudana *et al*., 1986; Tiwari *et al*., 1990; Toppo *et al*., 1997;). There are also a large number of literature reported on zinc supplementation promotes the growth of cattle and sheep, and increased feed intake of the stress of calf, promote weight on cattle and treatment effect of thin cattle (Mirza *et al*., 1988). For the bulls, zinc deficiency will resulted in seminiferous tubule degeneration, abnormal mesenchymal cells, sperm dysplasia, reduce testosterone production, impact shape of testis and delay the onset of estrus (Mehra *et al*., 1991). Zinc is also associated with Animals taste and appetite, its deficiency may result in corneal cornification and cover or block the taste buds small, lead to taste loss (Mehra *et al*., 1993). Adding Co can increase the haemoglobin and weight gain in the process of production (Hosamani *et al*., 1995). The influence of Co deficiency on cattle immune will lead to lowered immunity (Paterson *et al*., 1990). Cu, Zn, Co, Se, Fe and I are necessary mineral nutrition elements for livestock. Co and Fe are mainly involved in hematopoietic; Co can also boost ruminant rumen digestion. Se involved in antioxidant effect and regulation of thyroid function by forming glutathione peroxidase and iodine enzyme, respectively (Berry *et al*., 1991; Wenzheng *et al*., 1996;). Se deficiency (white myopathy) and anaemia is a worldwide widespread disease.

Urea molasses multinutrient block can treatment and prevention of many diseases. The parasite was significantly reduced by giving male lamb Urea molasses multinutrient block (Anindo *et al*., 1998; Molina-Alcaide *et al*., 2010). The incidence of intestinal parasitic diseases were effectively reduced by adding licking block (drug urea molasses lick block, molasses lick block 7% urea and 21% urea molasses lick block) (Rafiq *et al*., 2000). Urea molasses multinutrient block can also treatment the water buffalo's lack of mood disorder, which is the most common summer buffalo reproductive disorders (Atta *et al*., 2012; Kang *et al*.,2005). Supplementary feeding urea molasses to 5-month east African goat not only improve the body weight gain, but also significantly reduced gastrointestinal nematode parasites (Waruiru *et al*., 2003).

It could be concluded that UMMB could treatment the Ningna Mountains cattle pica. Supply of UMMB in experiment increased the intake and the performance of cattle. The results showed that UMMB supplementation is an effective strategy to increase the production, maintaining animal performance and feed efficiency.

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