NUTRITIONAL, PHYSIOLOGICAL AND MICROBIOLOGICAL STUDIES ON USING BIOGEN - ZINC ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF RUMINANTS.
2-PRODUCTIVE PERFORMANCE, DIGESTION AND SOME BLOOD COMPONENTS OF DAMASCUS GOATS.

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ABSTRACT

This experiment designed to study the effect of two levels of Biogen–Zinc (BZ) as a probiotic or a Direct Fed Microbes (DFM) containing Bacillus subtilis and Zinc methionine that work as a feed additive for dairy Damascus goats. The study aimed to recognize the effect of BZ on nutrients digestibility, some rumen parameters, some blood parameters, milk yield and composition, daily gain of kids and economic efficiency. Thirty-six Damascus does (1-2parities), with 48.2 kg average BW and 1.5- 2 years old (within the last 45 days of pregnancy and 90 days post kidding) chosen and divided into three similar groups (12 does each) according to their body weight and fed according to **NRC (1981).** The control group was fed basal ration composed of 60% concentrate feed mixture (CFM), 20% berseem hay (BH) and 20% rice straw (RS), without additives. The tested groups ($BZ_1$and BZ_2) fed the control ration supplemented with Biogen–Zinc (BZ_1) at levels 0.5 g BZ/h/d (25 mg Zn) and 1.0 g BZ/h/d (50 mg Zn), respectively.

The obtained results could summarized as follows

1- Supplementing dairy Damascus goats' rations with the two levels of BZ improved the digestibility of all nutrients within late pregnancy and lactation periods.
2- Biogen–Zinc treatments led to a significant increase in both birth and weaning weights of kids. The best weights occurred with BZ_2.
3- Milk yield and composition increased by addition of BZ to diets.
4- Biogen–Zinc improved the biochemical parameters of blood total protein, globulin, glucose, total cholesterol, triglycerides, total lipids and concentrations of zinc, iron, calcium and phosphorus in blood plasma within late pregnancy and lactation period.
5- Feed and economic efficiencies were better for animals fed supplemented BZ_2 than other groups.

Accordingly, it could concluded that Biogen–Zinc, as a probiotic, supplementation for ration of dairy Damascus goats could improve nutrients digestibility, nutritive value, increase kids born and weaning weights, milk yield and composition, beside better-feed conversion efficiency and economic efficiency.

***Keywords**: dairy Damascus goats, Biogen–Zinc, digestibility, rumen fermentation, blood components, milk yield, economic.*

INTRODUCTION

Damascus goat that known also as Aleppo, Halep, Baladi, Shami, or Chami is a breed of goat raised in Syria and Lebanon. It generally used for milk production. These compounds have two functions; the first, being essential for the optimal biological functioning of the animal such as vitamins and trace elements. The second category is not essential for biological function, but demonstrates a positive effect upon the animal and includes growth promoters, metabolic modifiers, probiotics and prophylactics (**Namur *et al*., 1988**). One of the best-feed additives for all ruminant animals is the probiotics or Direct Fed Microbes (DFM).

For a long time, yeast products have been successfully included in feed of animals and poultry as natural growth promoters. Many types of yeasts fed to animals either in the form of fermented mash, that produced in farm, yeast by-products of breweries, distilleries or commercial yeast products. **Fuller (1989)** and **Krehbiel *et al.* (2003**) reported that the terminology DFM had been defined as a live microbial feed supplement, which beneficially affect the animal by improving its intestinal microbial balance, increased feed conversion efficiency and daily gain in feedlot cattle and improve health and performance of young calves. Moreover, probiotics (bacterial or yeast) had a positive effect, such as reducing antibiotic substances, inhibiting harmful bacteria metabolism and reduce rumen pH (**Salem *et al.*, 2004**). **El-Ashry *et al*., (200l)** found that YC addition to the diet of dairy cows and buffaloes was beneficial in improving production of milk, milk fat and composition. **Faten Abou Ammou, *et al.* (2013)** indicated that addition of yeast culture at levels 2.5g/h/d to Damascus goats ration succeeded to improve their productive traits. **Kassabra, *et al*. (2013)** found that supplementation of live dried yeast to diets of sheep at levels 4 or 8 g/head/day led a beneficial effect on digestion and nutritive values of rations as well as blood constituents, which consequently improved milk yield and composition and daily weight gain of lambs. **Mostafa, *et al*. (2014)** showed that dietary supplementation of probiotics as yeast culture, *S. cerevisiae* (20 g BGY 35/h/d) or as a product of lactic acid bacteria and enzymes (3 g AVI-BAC®/h/d), during 2 months pre-partum and 4 months post-partum, improved productive and reproductive performances of lactating cows. **Sallam *et al*. (2014)** indicated that the two DFM products had positive impacts on cell wall digestibility, which in turn improves metabolic energy supply and nutrients utilization in ruminants as well. **Nde, *et al*. (2014)** suggested that, Celmanax® (yeast culture product) supplemented to diets improved DMI and sheep performance. Therefore, the application of Celmanax® as a feed additive can stimulate rumen fermentation and control nematode population in lambs. **Morsy *et al*. (2014)** found that supplementation of propionibacteria P169 (bacterial DFM containing *P. freudenreichii* strain P169**)** at low dose level in rations of lactating buffalo during early lactation affected negatively DMI and nutrients intake while improved body weight, milk yield, milk components and FCM.

Zinc (Zn) is an essential element required by ruminants for a number of biochemical functions. Zinc plays important roles in growth and health as it needed for energy and protein metabolism, skin integrity and cell repair and in development of the immune response, neurological function and reproduction. The major decrease in milk yield in goats suffered Zn deficiency or Zn excess was a result of depression in appetite of animals and consequently feed dry matter intake, digestibility and nutritive feed values that reflected on the decrease of the available nutrients to mammary gland of does. Zinc recognized for several decades as indispensable for normal growth and health in animals **(NRC, 2001). Rubio *et al.* (2007)** reported that the need for Zn by most animals based on its influence on activities of enzymes and proteins. These enzymes and proteins affect vitamin A synthesis, carbon dioxide (CO2) transport, collagen fiber degradation, free radical destruction, stability of red blood cells' membrane, metabolism of essential fatty acids, carbohydrate metabolism, protein synthesis and metabolism of nucleic acids. **Garg *et al.* (2008)** observed marked improvement in average daily gain and feed efficiency in lambs given ZnMet compared to ZnSO4. **Habeeb *et al*. (2013)** stated that diets of goats contain 30 or 80 ppm Zn showed significant improve in digestibility percentage of CP, CF, EE and NFE and TDN and DCP and daily milk yield during lactation period. Zinc concentration in plasma of goats directly related to Zn levels in the diet. They found also that; LBW of does, litter size at birth, number of kids per doe and litter weight at birth were better in groups fed diets contained 30 or 80 ppm Zn than those fed diets had deficiency or excess of Zn. **Zeedan *et al.* (2008 and 2009b)** indicated that using Biogen–Zinc is beneficial to rumen activities, digestion and growth performance of buffalo calves. The combination of Biogen with zinc methionine as feed supplement bring satisfaction with rations feed to buffalo calves. **Zeedan, *et al.*, (2009a)** concluded that BZ supplementation at different levels (2.5 – 3.5 g) to dairy buffaloes' rations improved the nutrients digestibility, nutritive values, rumen fermentation, milk production and composition.

The objective of the present study was to evaluate the effects of BZ addition to diets on nutrients digestibility, birth weight of offspring, milk (yield and composition), some blood constituents, feeding value of the tested rations and economic efficiency in dairy Damascus goats.

MATERIALS AND METHODS

Experimental procedures:

This study carried out at El-Gemmaiza Experimental Farm, belonging to Animal Production Research Institute, Agricultural Research Centre.

Thirty six Damascus does (1-2parities), with 48.2±1.64 kg average BW and aged 1.5 - 2 years old (in the last 45 days of pregnancy) were chosen and divided into three similar groups (12 does each) according to their body weight and were fed according to **NRC (1981).** The first group was fed a basal ration composed of 60% concentrate feed mixture (CFM), 20% berseem hay (BH) and 20% rice straw (RS) which served as control without additives Biogen–Zinc (BZ_0). The tested groups ($BZ_1$and BZ_2) were fed the control ration supplemented with two levels of Biogen–Zinc at 0.5 g BZ/h/d (25 mg Zn) and 1.0 g BZ/h/d (50 mg Zn), respectively. Studying the effect of BZ on nutrients digestibility, some rumen parameters, some blood parameters, milk yield and composition as well as kids' daily gain from kidding to weaning and economic efficiency were applied. Chemical composition of the basal rations and BZ shown in (Table, 1). Biogen–Zinc contained 500g of Biogen (*Bacillus subtilis nato* over than 10^{11}CFU) and 500g of Zinc methionine/kg BZ, while zinc methionine consisted of methionine hydroxy analogue and 10% zinc. Biogen–Zinc (BZ) mixed well with some of the ground co-op mix before feeding.

Management and feeding:

All animals were free of diseases and parasites and housed in semi-shaded well-ventilated pens. The experiment began 45 days before kidding and lasted for 90 days post kidding (suckling period). Does were fed based on their body weight according to **NRC (1981).** Concentrate feed mixture (CFM) offered to the animals at 8:30 am and berseem hay (BH) and rice straw (RS) at 11:30 am. Fresh drinking water was offered twice daily at 12:00 and 16:00 hr. The experimental rations were chemically analyzed for determination of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fiber (CF), nitrogen free extract (NFE) and ash according to **A.O.A.C. (1995).**

Daily milk yield was recorded (for 7 does of each group) during the first 3 months of lactation (suckling period) until kids weaning. Representative milk samples (about 0.5% of total milk produced) taken at days 7, 15, 30, 60 and 90th post kidding from each doe. Milk was recorded twice daily at 7:00 am and 5:00 pm using milk suckling technique. Kids separated from dams at 5:00 pm the day prior milk assessment and body weight recorded at 7:00 am then left those suckling from dams for 30 minutes and body weight recorded again. The residual milk was hand milked and recorded. Similar procedure repeated at the evening suckling at 5 pm. The differences in the weight of kids before and after suckling added to give daily milk of suckled to kids. Milk intake plus milk removed by hand milking represented daily milk yield. The same procedure reported for milk yield of ewes by **Moawd (2003)**. Milk samples kept at –20° C for late chemical analysis. Total solids, ash, total protein, fat, lactose and solids non-fat were determined using *Milkoscan* apparatus (model/30 series type 10900 FOSS).

Digestibility trials and rumen parameters:

Nine Damascus bucks averaged 2.5-3 years old and 57.6±1.33 kg body weights were used in the digestibility trial. They divided according to body weight into the previous same three comparable groups (3 bucks each) and fed according to **NRC (1981)**. Animals kept and fed individually in metabolic cages allowing separate collection of feces as described by **Maynard *et al*. (1979).** The experimental animals were adapted to the cages for 30 days as a preliminary period followed by 7-days collection period. Every morning, the feed residues, if any, collected, weighed then subtracted from the amount offered to calculate the actual feed intake. Feed and feces samples also quantitatively collected for each animal, weighed, a 10% aliquot taken and the composite samples were dried. DM content was determined, the dry samples were ground allowed to pass through 1 mm screen sieve and kept for analysis. Proximate chemical analysis of feed and feces samples done according to **A.O.A.C. (1995)**. Acid Insoluble Ash (AIA) technique, according to **Van Keulen and Young (1977)**, used as a marker for the determination of the nutrients digestibility. Digestibility of DM as well as all nutrients were determined according to the following equation:

% Nutrient digestibility = 100-(% DM digestibility x % Nutrient in feces) / % Nutrient in feed).

By the end of digestibility trial, rumen samples collected by a stomach tube at 0 and 3 hours post-feeding. Rumen samples strained through four layers of cheesecloth into a plastic containers and pH immediately measured. Ammonia-N estimated as soon as possible using the distillation method as described by **Horn *et al*. (1981).** Total volatile fatty acids were determined according to **Warner (1964).**

Blood sampling:

Blood samples collected at 30 and 15 days of pregnancy (pre kidding) and 15, 30, 60 and 90 days post kidding (suckling period). Blood samples were collected in dried clean tubes by jugular vein puncture from 5 does of each group in the morning just before feeding and drinking which immediately centrifuged at 4000 rpm for 15 minutes. Plasma was decanted and stored frozen at -20°C until the time of analysis. Total protein and albumin concentrations estimated, while globulin was calculated by the difference between total protein and albumin concentrations. Glucose, urea, creatinine and enzymes activities of liver function assessed by measuring the activities of alanine amino transferase (AST) and aspartate amino transferase (ALT). Total cholesterol, triglycerides and total lipids were determined using commercial kits (Produced by Bio-Diagnostics Company, Egypt). Concentration of Zinc, iron, calcium and phosphorus in plasma determined by the absorption spectrophotometer.

Statistical analysis;

Data statistically analyzed according to **SPSS (2012)** computer program using the following fixed model:-

$$Yij = \mu + T_i + e_{ij}$$

Where: Yij = The observation. μ = Overall mean. T_i = Effect of the treatments. e_{ij} = Random error component assumed to be normally distributed.

Ducans' multiple range tests was performed **(Duncan, 1955)** to detect significant differences among means.

RESULTS AND DISCUSSION

1 - Chemical composition of feedstuffs:

Chemical composition of CFM, BH, RS and BZ (Table 1) are within the normal ranges that reported in Egypt by several workers (**Zeedan, *et al*., 2009a, Kassabra, *et al*. 2013, Faten Abou Ammou, *et al.* 2013 and Morsy, *et al*. 2014**).

2 - Nutrients digestibility and nutritive values:

Digestion coefficients and nutritive values (TDN and DCP), presented in Table (2), tended to be significantly ($P<0.05$) more for nutrients of BZ_1 and BZ_2 compared to BZ_0**.** This result is in agreement with **Zeedan *et al*. (2008 and 2009a, b).** They found that addition of different levels of BZ to rations of buffalo calves and lactating buffaloes cows significantly ($P<0.05$) increased the digestibility of DM, OM, CP, CF, EE, NFE, TND and DCP compared to control ration. **Habeeb *et al*. (2013)** stated that diets of goats contains 30 or 80 ppm Zn were significantly improved the digestibility of CP, CF, EE, NFE, TDN and DCP. **Faten Abou Ammou *et al.* (2013)** indicated that adding yeast culture (YC)**,** at levels 2.5g/h/d or 5g/h/d, to Damascus goats ration improved digestion coefficient and nutritive values (TDN and DCP). **Kassabra *et al*. (2013)** found that

Table (1): The chemical composition of feed ingredients and calculated composition of the experimental rations.

Items	Chemical composition on DM basis (%)							
	DM	**OM**	**CP**	**CF**	**EE**	**Ash**	**NFE**	**ZN (mg)**
				Chemical composition of the ingredients :				
CFM*	89.61	91.85	15.41	12.85	3.22	8.15	60.37	50.12
BH	90.22	84.67	14.25	26.61	1.11	15.33	42.70	21.80
RS	88.11	82.11	2.35	37.82	0.91	17.89	41.03	22.27
BZ	94.95	94.69	24.10	3.26	5.50	5.31	61.83	-
				Calculated chemical composition of tested rations:				
BZ_0	89.42	88.30	12.42	20.98	2.29	11.70	52.61	72.76
BZ_1	89.49	88.61	12.93	20.12	2.36	11.39	53.20	95.53
BZ_2	89.57	89.03	13.58	19.01	2.46	10.97	53.98	118.31

*CFM; concentrate feed mix contained in percentage ; 37% yellow corn , 30% undecortecated cotton seed , 20% wheat bran, 6.5% rice bran, 3% molasses , 2.5% limestone, 1% common salt.

BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

Table (2): Effect of Biogen–Zinc supplementation on nutrients digestibility and feeding value of the experimental rations fed to Damascus bucks.

Items	BZ_0	BZ_1	BZ_2	**SEM**
		Digestion coefficients (%):		
DM	65.72[c]	68.45[b]	70.62 [a]	1.01
OM	67.52[c]	70.35[b]	73.20[a]	0.23
CP	69.33[c]	72.52[b]	74.59[a]	0.20
CF	70.63[b]	72.59[b]	74.62[a]	1.10
EE	61.44[c]	64.52[b]	67.68[a]	0.25
NFE	71.65[c]	74.56[b]	77.33 [a]	0.21
		Feeding value (%):		
TDN	64.29 [c]	67.05 [b]	69.80 [a]	1.00
DCP	8.61	9.38[b]	10.13[a]	0.05

Means bearing different superscripts in the same row are significantly different (P < 0.05).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

digestibility of DM, OM, CP, CF, EE and NFE as well as the nutritive values TND and DCP were higher (P > 0.05) in live DY supplemented groups than control group. **Sallam *et al*. (2014)** indicated that supplementation of DFM improved the apparent total tract digestibility of DM, OM, CP and the nutritive values TDN and DCP, but the improvement was not significant compared to the control. **Mousa, *et al*. (2012)** indicated that the digestibility of DM, CP, CF, TND and DCP was higher with 5 and 7.5g/h/d dried yeast supplemented groups than control. The increase of nutrients digestibility may be due to yeast effect on rumen bacteria especially cellulolytic bacteria. Yeast culture can enhance the digestive process associated with microorganism in the gastrointestinal tract. In addition, improvement of all nutrient digestibilities resulted in increasing the nutritive values of rations containing Biogen. Probiotic or bacteria species such as *B. subtilis* has shown to produce digestive enzymes as amylase, protease and lipase, which may enrich concentration of intestinal digestive enzymes **(Lee and Lee, 1990).** Also, the improvement in digestibility coefficients could be illustrated on the basis that zinc methionine can play indirect role to stimulate anaerobic fermentation of organic matter hence improving the utilization of nutrients efficiency that has a direct role on improving digestion in abomasum. Zinc addition may attributed to increase the activity of some enzymes related to carbohydrates, fats and protein digestion (amylase, lipase, trypsinogen, chemotrypsinogen and some peptidases), since these enzymes are known to be Zn-dependent (**Banerjee, 1988**).

Supplementation of BZ improved significantly (P<0.05) the nutritive values as TDN and DCP in both BZ_1 and BZ_2 than BZ_0. Improvement percentages were 4.29% and 8.57 % for TDN and 8.94% and 17.65% for DCP, for BZ_1 and BZ_2 compared with BZ_0 (Table 2). Improvement of TDN and DCP might be due to the higher digestibility values of all nutrients achieved by BZ supplementation. This finding is in agreement with the results of **Mousa and Sheikh (2004), Shams (2008), El–Hosseiny *et al*. (2008) and Zeedan *et al*. (2008 and 2009a, b)**. On the other hand, **Morsy *et al*. (2014)** found that supplementation with propionibacteria P169 did not cause significant differences among treatments in digestion coefficients and nutritive value (TDN and DCP).

3 - Rumen fermentation:

Ruminal pH value is one of the most important factors affecting microbial fermentation in the rumen and influence their functions. However, data presented in Table (3) illustrate that pH values were not significantly differed among the experimental groups and the averages were nearly similar in all groups of the experiment. However, pH value decreased after zero and three hrs. of feeding in all groups. Similar results were reported by **Shams (2008) and Zeedan *et al*. (2008 and 2009a, b)**. **Mousa *et al*., (2012)** and **Sallam *et al*. (2014)** indicated that ruminal pH values were deceased steadily at 3 hrs.-post feeding and the differences between DY and DFM levels on pH value were not significant.

Ammonia-N concentration was significantly (P< 0.05) decreased for Damascus goats supplemented with Biogen- Zinc (BZ_1 and BZ_2) compared to the control group (BZ_0) at 0 time after feeding in all groups, while ammonia-N was increased (P<0.05) at 3 hrs post feeding as shown in Table (3). These results are in agreement with those reported by **Shakweer *et al*. (2005), Shakweer *et al*. (2010)**, **Shams (2008) and Zeedan *et al*. (2008 and 2009a, b)**. In addition, the results in the present study are in harmony with those reported by **Mousa *et al*. (2012)** who revealed that ruminal ammonia-N concentration at 3-hr post feeding was lower in groups supplemented with 5 and 7.5 g/h DY than control group. On the other hand, some studies found higher values of ruminal ammonia-N due to yeast culture supplementation **(Abdel-Latif, 2005,** with sheep and **Shahin *et al*., 2005** with buffalo calves). **Sallam *et al*. (2014)** indicated that Bactozyme and Ru-max (DFM) supplementation showed apparent increase (P> 0.05) in the NH3-N at 3 hrs post feeding. The decrease of ruminal ammonia-N concentration may attributed to the decrease of ureolysis or increase in ammonia-N conversion to microbial protein due to adding zinc methionine (**Putnam and Schwab, 1994 and Arelovich *et al*., 2000**). The lowest values of both ammonia-N concentration and pH in BZ_2 group may attributed to the high BZ level (1.0 g Biogen–Zinc /h/d) which seemed more efficient in encouraging rumen lactic acid producing bacteria and other species that can convert ammonia-N into synthesized microbial protein. **Newbold *et al*. (1990)** noticed that reduction in rumen NH3-N by yeast cultural addition was not due to a reduction in the proteolytic, peptidolytic or deamination activity of rumen microorganisms, but due to the increase of bacterial growth. **Williams and Newbold (1990)** reported that reduction in rumen ammonia appears to be a result of increased incorporation of ammonia into microbial protein and it may be the direct result of stimulated microbial activity. Also **Salem *et al.* (2004)** indicated that probiotics (bacteria or yeast) has positive effect on lactic acid production by intestinal bacteria activities which inhibit harmful bacteria such as *Escherichia coli*-10 in the intestine of sheep.

Table (3) shows that the TVFA's in BZ_1 and BZ_2 were significantly (P< 0.05) greater than that in BZ_0 at all sampling times (0 and 3 hrs. post feeding). Similar result was obtained by **Shakweer *et al*. (2005), Shakweer *et al*. (2010)**, **Shams (2008) and Zeedan *et al*. (2008 and 2009a, b)**. **Baker (1995)** reported that ruminal TVFA's concentration is dependent on several factors as OM digestibility, rate of absorption, rumen pH, rate of digesta passage from rumen to other parts of the digestive tract and the microbial population in the rumen and their activities. In the present study, greater VFA's concentration with both BZ groups may be due to the increase in OM, CP and CF digestibilities than the control group (Table, 2). **Wali (1994)** explained that yeast culture stimulate ruminal bacteria which led to rapid utilization of the fermentable carbohydrates. In addition, **Arelovich *et al*., (2000)** indicated that increased proportion of propionate in ruminal VFA leads to an increase of energetic efficiency of ruminal fermentation that might explain the consistent benefits obtained by adding chelated Zinc. On the other hand, **Sallam *et al*. (2014)** indicated that Bactozyme and Ru-max (DFM) supplementation had no effects on VFA concentration at 3.0 h after feeding.

Improvement resulted from DFM supplementation to ruminants diets could anticipated due to its positive effects on various digestive processes, especially cellulolysis, synthesis of microbial protein, stabilizers of ruminal pH and lactate, increased absorption of some nutrients or displayed a growth-promoting effect. Adding DFM to a diet may increase the hydrolytic capacity of the rumen mainly due to increased bacterial attachment, stimulation of rumen microbial populations or synergistic effects with hydrolysis of ruminal microorganisms.

4 - Birth weight and growth performance of born kids:

Data in Table (4) show higher values ($P<0.05$) of birth and weaning weights, total and daily gain of kids born from does supplemented with Biogen–Zinc (BZ) compared with control group. This result may be due to the higher milk yield and contents of total solid, total protein and milk fat, which is in consistency with the results of **Shakweer *et al*. (2005)** and **Zeedan *et al*. (2008 and 2009a, b).** This result is also in line with those obtained by **Mousa and EL-Sheikh (2004)** who noticed increase in calf birth weight with adding 40 mg zinc sulfate/kg DMI to lactating buffaloes. In addition**, Abdel-Rahman *et al*., (2012) and Mousa *et al*., (2012)** reported that supplementation of yeast to ewes diets increased litter weight at birth and weight gain of their offspring. In this regard**, Shakweer *et al*. (2010)** supplement 40 mg Zn to the diet, preferably in the form of Zn methionine rather than Zn sulphate, during the last three months of pregnancy and during both suckling and growing periods where it improved growth performance and feed utilization. **Faten Abou Ammou *et al.* (2013)** indicated that addition of yeast culture (YC) at levels 2.5g/h/d or 5g/h/d to Damascus goats ration increased birth and weaning weights and total and daily gain of kids born. **Kassabra *et al*. (2013)** found the highest birth weight, weaning weight and daily gain with 8 g/h DY supplemented group followed by 4 g/h DY supplemented group then the lowest values was in control group ($P<0.05$). **Nde *et al*. (2014)** reported that weekly live weight gains tended to increase ($P< 0.05$) in lambs fed with Celmanax® (yeast culture product) for both diets. **Dawson (1994)** showed that, yeast or yeast culture are rich source of vitamins, enzymes and other important nutrients and act as cofactor which make them attractive as digestive enhancers of basic source of nutrients.

Result could attributed to the significant ($P < 0.05$) increase of daily milk yield and total solid contents (Table, 5) and this reflected on the growth rate of kids. **Habeeb *et al*. (2013)** stated that diets of goats containing 30 or 80 ppm Zn caused significant increase in LBW of kids at birth and consequently at weaning. The best LBW of kids at birth and weaning were in goats fed 80 ppm Zn in diets. This improve in growth performance, due to zinc supplementation, was not only due to its component since it activate more than 200 metalloenzymes and hormones (**Riordan and Vallee, 1976**) and activate digestive enzymes **(Izhboldina, 1994**). On the other hand, **Mostafa *et al*. (2014)** showed that supplementing commercial yeast culture (S. cerevisiae) namely BGY at rate 35 g/d or a product of lactic acid bacteria and enzymes namely AVI-BAC® (two probiotics) to the diet of lactating cows led to a significant increase in birth weight of produced calves.

5 - Milk yield and composition:

Milk yield expressed as daily milk yield and composition shown in Table (5). Daily milk yield of dairy Damascus goats was significantly (P< 0.05) greater in groups BZ_1 and BZ_2 than BZ_0. Similar result obtained by **Shakweer *et al*. (2005), Kholif and Khorshed (2006), Shams (2008) and Zeedan *et al.* (2009a**). Improvement of 10.56 % and 16.90%, in milk yield for BZ_1 and BZ_2, noticed compared with BZ_0. **Faten Abou Ammou *et al.* (2013)** indicated that addition of yeast culture improved milk yield. **Kassabra *et al*. (2013)** found that daily milk yield was higher (P<0.05) in DY supplemented groups than control group. **Mousa *et al*. (2012)** reported that supplement with yeast culture increased daily milk yield of lactating ewes. **Morsy *et al*. (2014)** found that milk yield was insignificantly (P<0.05) increased in lactating buffaloes in response to dietary P169 supplementation **(**bacterial DFM containing *P. freudenreichii* strain**)** compared with control ration. **Habeeb *et al*. (2013)** stated that diets of goats containing 30 or 80 ppm Zn improved significantly daily milk yield over two weeks and one month of suckling period and during the completely suckling period. The increase in milk yield with BZ supplementation may be due to one or more of the following reasons; 1- Higher nutrients digestibility (Table 2) and TVFA's concentration and lower ammonia nitrogen concentration in the rumen (Table 3). 2- An increase in efficiency of nitrogen utilization, increase in feed conversion and availability of nutrients for milk synthesis (**Iwanska *et al*., 1999**). 3 - Methionine appears to be the most limiting amino acid for milk synthesis as it efficiently utilized by the mammary gland (**Schwab *et al*., 1992**). The higher content of glucose and albumin in blood of animals fed BZ, as shown in Table (7), might anticipated in increasing milk lactose synthesis and consequently increasing milk production. On the other hand, **Mostafa *et al*. (2014)** showed insignificant effect for dietary supplementation with probiotics on milk yield and milk composition of cows, although cows in both treatment groups had increase in average daily milk yield by about 17 and 15 % for AVI-BAC and BGY groups compared to the control cows, respectively.

Total solids, milk fat, solids not fat (%) and average daily yield of fat, protein and lactose (g/h) were significantly higher (P <0.05) in groups BZ_1 and BZ_2 compared with BZ_0 as shown in (Table 5). The increase in milk protein content by, probiotic addition may be due to increased ruminal cellulose digestion and stimulation of rumen microbes that cause alteration of the microbial protein synthesis and increased milk protein yield (**Dawson, 1994**). He reported also that yeast or yeast culture are rich source of vitamins, enzymes and other important nutrients and cofactors which make them attractive digestive enhancers for basic source of nutrients. This result could attributed to the significant (P< 0.05) increase of daily milk yield and total solid contents (Table, 5). **Faten Abou Ammou *et al.* (2013)** indicated that addition of yeast culture increased total solids, milk fat, solids not fat (%) and daily yield of fat, protein and lactose. **Habeeb *et al*. (2013)** stated that diets of goats contained 30 or 80 ppm Zn had more milk fat, protein, lactose and consequently total solids, at days 1, 30 and 60 postpartum and better quantity and quality. This result is in accordance with **Mousa *et al*. (2012)**, **Zeedan *et al.* (2009a)** and **Kassabra *et al*. (2013)**. **Seymour *et al.* (1990)** found that increased milk fat with Zinc methionine supplementation might be due to the role of methionine on facilitating the transfer of blood lipids to milk by furnishing methyl group for synthesis of choline and phosphatidylcholine, which represent an important link between methionine and lipid metabolism in ruminants. **Ali (2005)** found that protected methionine increased milk SNF and TS concentrations. On the other hand, **Mostafa *et al*. (2014)** showed that dietary supplementation with both probiotics insignificantly increased milk components (%) including fat, protein and lactose. **Morsy *et al*. (2014)** found no significant differences in milk composition and

Table (3): Effect of Biogen–Zinc supplementation on some rumen liquor parameters of Damascus bucks.

Item	Time	Treatments			
		BZ_0	BZ_1	BZ_2	SEM
pH	0	6.58	6.51	6.45	0.03
	3	6.21	6.16	6.11	0.05
Ammonia-N (mg/dl)	0	13.05 ^{a}	11.65 ^{b}	8.89 ^{c}	0.65
	3	16.52 ^{a}	14.01 ^{b}	11.70 ^{c}	0.76
Total VFA (meq/dl)	0	7.66^{c}	9.53 ^{b}	11.76 ^{a}	0.56
	3	12.22 ^{c}	14.54 ^{b}	15.35^{a}	0.52

Means bearing different superscripts in the same row are significantly different (P < 0.05).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

Table (4): Effect of Biogen–Zinc supplementation on productive performance of kids during suckling period.

Item	Treatments			SEM
	BZ_0	BZ_1	BZ_1	
Birth weight (kg)	3.35^{c}	3.64^{b}	3.95^{a}	0.01
Weaning weight (kg)	14.80^{b}	15.75^{ab}	16.51^{a}	0.03
Total gain (kg)	11.45^{b}	12.11^{b}	12.87^{a}	0.02
Daily gain (g)	127.22^{b}	134.56^{b}	139.56^{a}	3.38

Means bearing different superscripts in the same row are significantly different (P < 0.05).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

Table (5): Effect of Biogen–Zinc supplementation on milk yield and composition for Damascus goats does during suckling period.

Item	Treatments			SEM
	BZ_0	BZ_1	BZ_2	
Daily milk yield, kg	1.42^{b}	1.57^{a}	1.66^{a}	0.01
Improvement,%	-	10.56	16.90	-
Total solids,%	11.83^{C}	12.56^{b}	13.46^{a}	0.02
Fat,%	3.60^{c}	3.95^{b}	4.31^{a}	0.04
Solids not fat,%	8.23^{b}	8.61^{b}	9.20^{a}	0.05
Protein,%	3.21	3.52	3.86	0.31
Lactose,%	4.23	4.32	4.53	0.13
Ash,%	0.79	0.77	0.76	0.01
Av. fat yield, g/d	51.12^{c}	62.02^{b}	71.55^{a}	0.87
Av. Protein yield, g/d	45.58^{c}	55.26^{b}	64.10^{a}	0.82
Av. Lactose yield, g/d	60.07^{c}	67.82^{b}	75.20^{a}	0.66

Means bearing different superscripts in the same row are significantly different (P < 0.05).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

yields. **Habeeb *et al*. (2013)** stated that goats fed diets containing 30 or 80 ppm Zn did not show changes in ash content of milk due to Zn level in diet or days postpartum.

6 - Feed intake and feed efficiency:

Data in Table (6) indicate that BZ_1 and BZ_2 groups had lower DMI compared to BZ_0 group, but differences were not significant. In accordance with the present results, **Zeedan *et al*. (2008 and 2009a, b)** indicated that DMI tended to decrease when diets of buffalo calves and lactating buffaloes were supplemented with Biogen–Zinc (BZ)**.** On contrast, **Sallam *et al*. (2014) and Morsy *et al*. (2014)** indicated that

Bactozyme, Ru-max (DFM) and P169 supplementation had no positive impact on DMI. In addition, **Mostafa *et al*. (2014)** reported no changes in DMI for cows fed diet supplemented with probiotics (AVI- BAC and BGY) during pre-partum period**.** Moreover **Elamin *et al. (*2013)** also reported that Zinc supplementation (33mg zinc/kg) to diet did not significantly affect daily feed intake.

On the other hand, **Mostafa *et al*. (2014)** showed that cows fed diet supplemented with probiotics (AVI- BAC and BGY) post-partum significantly (P<0.05) had increased total DM intake**. Nde *et al*. (2014)** suggested that Celmanax® (yeast culture product) addition increased both roughage and total DMI (P < 0.05). **Habeeb *et al*. (2013)** stated that goats fed diets contain 30 and 80 ppm Zn showed significant more DMI from both BH and CFM. **Shakweer *et al*. (2010**) indicated that the highest feed intake recorded with Zinc methionine supplementation followed by Zinc sulfate supplementation and then control group for suckling and growing Friesian calves. Data in Table (6) showed that feed intake, as TDN and DCP, per head had no significant differences between groups. It was found that feed efficiency was significantly (P< 0.05) improved by adding BZ. This might attributed mainly to enhance of milk production, nutrient digestibility and feeding values as shown by **Arelovich *et al*., (2000).** Similar finding obtained by **Mousa and EL-Sheikh (2004)** and **Zeedan *et al*. (2009a)** who indicated slight improve in feed efficiency with supplement of 40 mg zinc sulfate or Biogen–Zinc (BZ) at levels 2.5g/h/d or 3.5 g/h/d to ration of lactating buffaloes. In addition, **Kholif and Khorshed (2006)** found that milk yield/DMI was significantly (P< 0.05) improved with animals fed yeast supplement.

7 - Biochemical parameters of Blood:-

7.1- Metabolic profile:

Blood constituents presented in Table (7). Plasma total protein, albumin, globulin and glucose were significantly increased (P<0.05) with supplementing BZ within the two stages (late pregnancy and Lactation). This result is in agreement with those of **Zeedan *et al*. (2008 and 2009a, b)**, **Kassabra *et al*. (2013)**, **Mousa *et al*. (2012)**, **Faten Abou Ammou *et al.* (2013)**, **Elamin *et al. (*2013)**, **Mostafa *et al*. (2014) and Morsy *et al*. (2014)**. **Shakweer *et al*. (2005)**, **El–Hosseiny *et al*. (2008)** and **Shams (2008)** found that addition of zinc increase total protein and globulin. Also, **EL-Ashry *et al.* (2001)** reported that yeast culture supplemented to ruminant diets led to increase concentration of total protein. This result is also in accordance with those reported by **Abd EI-Gawad *et al.* (2002)** that yeast culture supplement induced an increase in serum globulin level in ruminants. In addition, **Mousa and El-Sheikh (2004)** indicated that addition of 80 and 120 mg zinc sulfate increased total protein and globulin. **Shakweer *et al*. (2010**) indicated that plasma albumin concentration increased with zinc sulfate addition, while plasma globulin concentrations increased with zinc methionine addition. **Kholif and Khorshed (2006)** found that yeast culture supplemented to diets of lactating buffaloes led to increase blood glucose. The mechanism by which yeast culture increased serum glucose could be attributed to increasing cellulolytic bacteria that act on cellulose fibers degradation and produce more glucose; increase the glucogenic precursor propionate in rumen, decrease plasma insulin and insulin-glucose ratio, indicating an increase in gluconeogenesis.

Increasing blood plasma protein with Zinc methionine addition may refer to an increase in protein synthesis resulted from increased anabolic hormone secretion that is responsible of utilization of amino acids (**El-Masry and Habeeb, 1989**). In addition, **Putnam and Schwab (1994)** showed that increasing blood plasma protein might due to that yeast culture stimulates rumen microbes and altered microbial protein synthesis yet increased protein passage as well as protein yield. The present results could related to the beneficial effect of YC supplementation on increasing protein digestibility through the enzymatic effect of protease and alteration of amino acid profile of digesta that due to increasing microbial protein synthesis (**Williams, 1989**

Table (6): Effect of Biogen–Zinc supplementation on feed intake and feed efficiency for Damascus goats does.

Items	Treatments			SEM
	BZ_0	BZ_1	BZ_2	
Daily feed DM intake (kg /h/d) :				
CFM	1.10	1.10	1.10	-
BH	0.40	0.40	0.40	-
R.S.	0.40	0.30	0.20	-
Total DMI	1.90	1.80	1.70	0.21
Total TDNI	1.22	1. 21	1.19	0.03
Total DCPI	0.16	0.17	0.17	0.01
Daily milk yield, kg	1.42^b	1.57^a	1.66^a	0.01
Feed efficiency :				
Milk yield / DMI	0.75^c	0.87^b	0.98^a	0.02
Milk yield / TDNI	1.16^c	1.30^b	1.39^a	0.01
Improvement (%)	-	12.10	19.83	-

Means bearing different superscripts in the same row are significantly different ($P < 0.05$).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

Table (7): Effect of Biogen–Zinc supplementation on some blood plasma parameters for Damascus goats does during late pregnancy and suckling periods.

Blood component	Pregnancy period			SEM	Suckling period			SEM
	BZ_0	BZ_1	BZ_2		BZ_0	BZ_1	BZ_2	
Plasma blood constituents								
Total protein (mg/dl)	5.91^c	6.55^b	7.22^a	0.21	6.85^c	7.69^b	8.49^a	0.19
Albumin (mg/dl)	2.89^b	2.90^b	3.22^a	0.03	2.95^c	3.39^b	3.79^a	0.02
Globulin (mg/dl)	3.02^b	3.65^a	4.00^a	0.02	3.90^b	4.30^a	4.70^a	0.01
Glucose (mg/dl)	51.33^b	58.60^a	60.75^a	1.50	56.45^c	59.56^b	65.62^a	1.80
kidney function								
Urea (mg/dl)	42.31^a	41.23^a	38.63^b	0.20	45.22^a	44.42^a	40.60^b	0.18
Creatinine (mg/dl)	71.55^a	70.65^b	68.95^c	0.21	73.47^a	71.61^b	66.88^c	0.23
Plasma lipid function								
Total lipid (g/l)	1.86^c	2.13^b	2.30^a	0.01	1.98^c	2.16^b	2.32^a	0.01
Triglyceride (mg/dl)	73.12^b	78.65^a	80.90^a	0.58	77.12^c	81.75^b	85.68^a	0.65
Cholesterol (mg/dl)	66.12^b	69.88^a	71.68^a	0.35	68.17^c	71.95^b	74.34^a	0.26
Enzyme function								
AST (IU/L)	54.27	55.32	55.78	0.85	55.92	56.64	56.32	0.75
ALT (IU/L	29.88	30.98	29.73	0.50	32.81	33.67	33.88	0.47
Mineral metabolism								
Zinc (mg/dl)	0.64^c	0.78^b	0.84^a	0.01	0.65^b	0.80^a	0.88^a	0.01
Iron (mg/dl)	76.14^c	79.88^b	82.59^a	0.50	76.39^b	78.95^b	83.10^a	0.87
Calcium (mg/dl)	7.09^c	7.39^b	7.86^a	0.10	6.89^c	7.38^b	7.77^a	0.13
Phosphorus (mg/dl)	7.18^c	7.54^b	7.99^a	0.18	6.59^c	7.53^b	7.91^a	0.14

Means bearing different superscripts in the same row are significantly different ($P < 0.05$).
BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

and Abdel-Khalek *et al.*, 2000). On the other hand, **Elamin *et al. (*2013)** showed that dietary Zinc supplementation (33 mg Zinc/kg) did not significantly ($P>0.05$) affected levels of serum total protein. **Shakweer *et al*. (2010**) showed that addition of zinc sulfate or zinc methionine had no significant effect on plasma total protein concentration.

7.2- Kidney function:-

Data in Table (7) show that BZ caused significant decrease in plasma urea and creatinine**.** This result may dedicate to improvement of kidney function with BZ addition. This result is in agreement with those reported by **Abu-El-Ella and Kommonna (2013) and Faten Abou Ammou *et al.* (2013)** on goats. They found lower concentration of serum urea-N in response to YC supplementation, which suggested as an indicator of better nitrogen metabolism and utilization of protein. This result is in agreement also with **El-Ashry *et al*. (2003)** who showed that sheep fed diets treated with yeast or fungi exhibited lower urea concentration than control. **Abdel-Rahman *et al*. (2012), Mousa, *et al* (2012), Abu-El-Ella and Kommonna (2013) and Kassabra *et al*. (2013)** found that feeding diets treated with yeast culture resulted in an increase of urea and creatinine concentrations with sheep and goats. However, though **Mostafa *et al*. (2014)** reported a decrease in plasma urea during post-partum period in cows there was no significant effect for dietary probiotics supplementation. In this respect, **Khattab *et al*. (2003)** with sheep and **Ragheb *et al*. (2003)** with Friesian calves revealed no significant effect or a decrease in creatinine concentration with the addition of yeast culture. A possible explanation of the observed decrease in plasma urea and creatinine with increasing BZ levels may be an interaction between BZ and the activity of some microbial strains. Accordingly, it can hypothesized that BZ might interfere, to some extent, in decreasing the harmful bacteria and increasing protein synthesis and consequently reducing ammonia production and/or utilization**. Faten Abou Ammou *et al.* (2013)** indicated that addition of yeast culture increased creatinine concentration for Damascus goats.

7. 3- Plasma lipid function:-

The effect of BZ supplement to ration of Damascus goats on lipids profiles shown in Table (7). Groups received BZ had higher total lipids, cholesterol and triglycerides within the two stages; late pregnancy and lactation, compared with those of control group. Similar results were obtained by **Zeedan *et al*., (2008 and 2009a, b)** and **Morsy *et al*. (2014)**. **EL-Ashry *et al.* (2001)** reported also that yeast culture supplement to ruminant diets led to increase concentrations of total lipids and cholesterol. **Salem *et al*. (2002)** reported that blood cholesterol concentration increased until the 2^{nd} month postpartum for lactating buffaloes. **Komonna (2007)** indicated that blood cholesterol concentration increased with yeast culture supplementation during late pregnancy and postpartum in sheep. The noticed increase in total lipids due to YC supplementation may attributed to stimulation of bacterial lipids synthesis **(Williams, 1989).** On the other hand, **Elamin *et al. (*2013)** showed that dietary Zinc supplementation (33 mg zinc/kg) did not significantly (P>0.05) affected levels on serum cholesterol. In addition, **Mousa *et al* (2012)** using sheep and **Abu-El-Ella and Kommonna (2013)** and **Faten Abou Ammou *et al.* (2013)** using goats, found that feeding diets treated with yeast culture resulted in a decrease of cholesterol concentration.

7.4- Liver enzymes function:-

No significant differences observed in AST (aspartate amino transferase) and ALT (alanine amino transferase) among the three groups (Table 7) within the two stages late pregnancy and lactation. Values of AST and ALT were within the normal range indicating that animals were generally in good nutritional status. Plasma AST and ALT (Table 7) were determined as an indicator of enzymatic activity related to the rate of protein metabolism and liver function. Accordingly, it could evidence that, no significant variations found in liver functions due to dietary treatments applied. This result may explain that increasing BZ is safe on liver functions and so it did not have any harmful effects on liver tissues. This result is in agreement with **Zeedan *et al* (2008 and 2009a, b) and Mostafa *et al*. (2014).** This finding agrees also with **Abd EI-Khalek *et al*. (2000)**

who found that ALT and AST activities not affected by yeast supplementation to Friesian calves. Moreover, **EI-Ashry *et al*. (2001) and EI-Shamaa (2002**) found that addition of yeast culture to ruminant diet did not affect significantly ALT and AST activities. This result could explain that BZ supplement had no harmful effect on liver function. On the other hand, **Faten Abou Ammou *et al.* (2013)** indicated that addition of yeast culture at levels 2.5 and 5 g/h/d to Damascus goats ration increased AST and ALT concentrations.

7. 5 - Mineral metabolism:-

Supplementation with BZ increased (P<0.05) plasma zinc, iron, calcium and phosphorus concentrations during the two stages late pregnancy and lactation compared to the control (Table 7). **Garg *et al.* (2008)** found that zinc supplement increased plasma Zinc, Calcium and Phosphorus concentrations for lambs. This could related to the increase in rate of accumulation of zinc in the foetus **(Elnageeb and Abdelatif, 2010)**. In addition, **Hayat *et al*. (2010)** showed that level of serum zinc significantly increased with zinc methionine supplemented group compared to control ration. Moreover, **Zeedan *et al*. (2009a)** indicated that Biogen–Zinc (BZ) supplementation at two levels (2.5 & 3.5 g) to buffaloes rations, within the two stages late pregnancy and postpartum, significantly tended to increase zinc compared to control. In the present study, plasma zinc level was higher during suckling period compared to late pregnancy. This indicates a higher requirement of lactating does for zinc as previously reported by **Elnageeb and Abdelatif (2010)**. The present results also showed higher plasma zinc concentration during lactation period compared to the values measured during pregnancy period, which reflect the low absorption capacity of zinc in pregnant does (**Elnageeb and Adelatif, 2010**). **Abu-El-Ella and Kommonna (2013)** found that yeast culture supplement to diets of goats led to increase blood Iron during pregnancy period.

In general, plasma calcium and phosphorus levels were higher during pregnancy period compared to the values obtained during lactation periods. The increase in calcium during pregnancy could related to calcium metabolism of the skeleton to meet the higher demand of calcium (**Braithwaite, 1983**). On the other hand, **Elamin *et al.* (2013)** showed that dietary zinc supplementation (33mg zinc/kg) did not significantly (P>0.05) affected levels of calcium, inorganic phosphorus, zinc, and iron.

The increase in blood constituents studied might due to the role of Biogen as probiotic in improving all nutrient digestibility especially CP (Table, 2) and rumen parameters (Table, 3) for Damascus goats fed different levels of BZ. It might probably led to an increase in the absorption rate from the digestive tract, thus the blood constituents of supplemented animals could reflect the corresponding increase of these values.

8 - Economic efficiency:-

Data presented in Table (8) show that Damascus goats fed ration supplemented with BZ gave more milk yield than the control group. Moreover, BZ supplementation tended to achieve more economic efficiency (1.89 and 2.02) and increasing the net revenue. This result is in agreement with those obtained by **Zeedan *et al*. (2009b)** with buffalo's calves and **Shakweer *et al.* (2010**) on Friesian calves. They found that treatment with Biogen, Biogen–Zinc and zinc (zinc sulfate and zinc methionine) showed higher estimates of economic efficiency than the control group.

CONCLUSION

The findings of this study recommend that addition of Biogen–Zinc to diets of Damascus goats at levels 0.5 g and 1.0 g BZ/h/d could have positive and beneficial effects on digestion, nutritive values, rumen fermentation, milk production, biochemical parameters of blood, economic efficiency and consequently does productive performance. The combination of Biogen with zinc methionine as feed supplement bring satisfaction with feeding lactating Damascus goats. More studies are required in this field to confirm the present results.

Table (8): Economical efficiency of lactating Damascus goats does as affected by Biogen–Zinc supplementation.

Items	BZ_0	BZ_1	BZ_2
Daily consumption (kg)			
CFM	1.21	1.21	1.21
BH	0.44	0.44	0.44
R.S	0.45	0.33	0.22
Biogen–Zinc (BZ) (g)	-	0.50	1.00
Total cost LE	4.14	4.12	4.10
Actual milk yield, kg / day	1.42	1.57	1.66
Price of daily milk yield	7.10	7.85	8.30
Profit above feeding cost (LE)	2.96	3.73	4.20
Feed cost / Price of daily milk (LE) %	58.31	52.48	49.40
Improve in net revenue %	-	10.00	15.28
Economic efficiency*	1.71	1.89	2.02

Price of feedstuffs (LE / ton) for 2013: concentrate feed mixture 2800, berseem hay 1350, and rice straw 365 and *Kg* Biogen–Zinc (BZ=*35LE,* wherever kg of milk of Damascus goats was 5 LE.

*****Economic efficiency = Price of milk (LE) / Total feed cost (LE).

BZ_0 = control, BZ_1= 0.5 g Biogen–Zinc (BZ)/h/d (25 mg Zn) and BZ_2=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

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NUTRITIONAL, PHYSIOLOGICAL AND MICROBIOLOGICAL STUDIES ON USING BIOGEN - ZINC ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF RUMINANTS.
2-PRODUCTIVE PERFORMANCE, DIGESTION AND SOME BLOOD COMPONENTS OF DAMASCUS GOATS.

الملخص العربى

دراسات غذائية وفسيولوجية وميكروبيلوجية لكفاءة استخدام البيوجين- زنك على الأداء الانتاجى للمجترات:- ١ - الأداء الإنتاجي، والهضم وبعض مكونات الدم في الماعز الدمشقى .

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أجريت هذه الدراسة في محطة بحوث الإنتاج الحيواني بالجميزة بهدف تقييم إضافة مركب البيوجين – زنك كأحد منشطات النمو الطبيعيه وكمنشط ميكروبي ومصدرللزنك مثيونين على الأداء الانتاجى للماعز الدمشقى الحلاب. تم استخدام ٣٦ أنثى ماعز دمشقي يبلغ عمرها من ١,٥- ٢ سنه ومتوسط اوزانها ٤٨,٢ كجم فى مواسم ١-٢ من إنتاج اللبن و قُسمت عشوائياً إلى ثلاث مجموعات متساوية (١٢ عنزة لكل مجموعة). بدأت التجربة عند ٤٥ يوماً قبل الولادة واستمرت لمدة ٩٠ يوماً بعد الولادة وقسمت على حسب اوزانها وغذيت على اساس مقررات NRC لسنة ١٩٨١ . تكونت العليقة الأساسية من مخلوط علف مركز ومواد خشنة (دريس برسيم+ قش أرز) بنسبة ٦٠:٤٠ بدون اى اضافة بينما اضيف للمجموعة الثانية بجانب عليقة الكنترول نصف جرام من البيوجين زنك فى اليوم للراس اما المجموعة الثالثة اعطيت نفس العليقة الكنترول مضاف اليها واحد جرام بيوجين زنك فى اليوم للراس. وذلك لدراسة تاثيرالبيوجين زنك على معاملات الهضم وتخمرات الكرش ومكونات الدم وانتاج وتركيب البن ومعدل وزن المواليد وفطامها وكذلك الكفائة الاقتصادية. و قد أوضحت النتائج ما يلى :-

١- اضافة البيوجين زنك الى علائق الماعز الدمشقى الحلاب حسنت من معاملات الهضم فى مرحلتى آخر الحمل و الرضاعة .
٢- اضافة البيوجين زنك حسنت وزن المواليد وكذلك وزن الفطام وكانت احسن النتائج مع المجموعة المضاف اليها واحد جرام بيوجين زنك فى اليوم للراس.
٣- تحققت زيادة في انتاج اللبن ومكوناتة باضافة البيوجين زنك.
٤- اضافة البيوجين زنك حسن بعض مكونات الدم مثل البروتين الكلى والجلوبيولين والجلكوز والدهون الكلية والتراى جلسرايد وبعض المعادن مثل الزنك والحديد والكالسيوم والفوسفور فى كلا المرحلتين اثناء نهاية الحمل والرضاعة .
٥- تحسنت الكفائة الاقتصادية للحيوانات التى اضيف لها البيوجين زنك خاصة المجموعة المضاف اليها ١ جرام بيوجين زنك فى اليوم للراس.

عموما، يمكن القول أن اضافة بيوجين والزنك بوصفهما منشطات للنمو الطبيعي وكمنشط ميكروبي ومصدرا للزنك مثيونين فى علائق الماعز الدمشقى الحلاب يؤدى الى تحسين معاملات الهضم والقيمة الغذائية ووزن فطام الجديان وانتاج ومكونات اللبن كما يحقق تحسن فى الكفاءة الاقتصادية .