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STUDIES ON USING BIOGEN - ZINC ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF RUMINANTS.
1- PHYSIOLOGICAL RESPONSES OF DAMASCUS GOATS TO DIET SUPPLEMENTATION WITH BIOGEN-ZINC.

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ABSTRACT

A total of 36 of Damascus does aged 1.5-2 years and weighed 45.7±1.64 kg were used to define the influence of Biogen –Zinc (BZ) supplementation on oestrus characteristics , ovarian activity, progesterone concentration, reproductive performance and some blood metabolites of Damascus does. Does were randomly divided into three equal groups (12 each). The first group (G1) fed basal ration composed of 60% concentrate, feed mixture (CFM) plus 20% clover hay and 20% rice straw and served as control. The other two groups fed the same basal ration supplemented daily with Biogen–Zinc (BZ) at levels 0.5 g/h/d (25 mg Zn) and 1.0 gm/h/d (50 mg Zn) g/h/d, respectively.

Results indicated that does treated with BZ at level 0.5gm (G2) had significantly (P≤ 0.05) more oestrus (91.67 %), while those treated with 1.0 gm (G3) had insignificant increase in oestrus (83.33%) compared to the control group (75 %). The duration of oestrus showed the longest (P≤ 0.05) time (28 h) on does treated with BZ at level of 0.5 gm (G2), followed by does treated with BZ at level of 1.0 gm (G3) (25.8 hr) compared to untreated does (G1) (19.2 hr). The interval from treatment to onset of oestrus (time to oestrus) was significantly (P≤ 0.05) shorter with does in G 3 and G2 than those in control group (G1). Day of oestrus was significantly (P≤ 0.05) shorter in the does treated with BZ (G3 and G2) than control (G1). The non-return to oestrus was significantly (P≤ 0.05) higher in G3 than G1.The does treated with BZ at level 1.0 gm (G3) increased (P≤ 0.05) total number of ovulatory cycle and number of oestrus ovulatory cycles compared to the control does. The number of anoestrus ovulatory cycles / doe were significantly (P≤ 0.05) decrease in G2 and G3 compared to the control group (G1). Anoestrus ovulatory cycle (%) showed insignificant lowering in the does in G3 than G1 and G2.

At pre-oestrus period, progesterone (P_4) concentration in blood plasma was significantly (P≤ 0.05) increased in the treated does of G3 while insignificantly increased in G2 compared to G1. At 4, 8 and 30 days post mating, P_4 concentration was higher (P≤ 0.05) in G2 and G3 than that of G1.

Supplementation of BZ significantly (P<0.05) improved conception rate, fertility, fecundity, kidding rate, reproductive ability, does kidded /does conceived, kids born per does joined and kidded and kg of kids born or weaned per does joined.

Biogen-Zinc supplementation significantly (P<0.05) increased blood total protein, albumin, urea, creatine, creatinine, total lipids, AST, T_3, zinc, iron, calcium and phosphorus concentrations during different physiological stages as compared to the control does. Meanwhile, it was significantly (P<0.05) increased globulin, glucose, cholesterol, ALT, triglyceride, T_4 concentrations and A/G ratio, during pregnancy and lactation periods while the increase during mating period was not significant.

Keywords: *Goats, biogen, zinc methionine, ovarian activity, progesterone, reproductive performance, Blood metabolites*

INTRODUCTION

Small ruminant production represents the principal economic output, contributing a large share of the income of farmers **(Ben Salem and Smith, 2008).** Therefore, goats play a significant role in livelihoods of the rural populace and urban dwellers (**Oluwatomi, 2010)** in most developing countries. They are multi – functional animals and play a significant role in the economy and nutrition. Apart from serving as a vital protein source, it also provides income for meeting urgent household needs (**Peacock *et al.*, 2005**).

Several studies have demonstrated interaction between nutrition and reproduction in goats. For example, flushing or minerals improves has been shown to improve production and reproduction parameters (**Fernández *et al*., 2004; Almeida *et al*., 2007and Griffiths *et al*., 2007**). Many studies have also confirmed the lack of a clear nutrition-reproduction interaction (i.e. lack of effect of supplementary feeding or flushing on ovulation rate, oestrus manifestation, fertility or prolificacy) (**Ahola *et al*., 2004; Zarazaga *et al*., 2005 and Rosales *et al*., 2006)**.

Zinc is an essential element required by ruminants for a number of biochemical functions.

Zn deficiency can affect growth, reproduction, immune system and gene expression in ruminants by influencing the enzyme activity or by its effect on mitogenic hormones, signal transduction, gene transcription and RNA synthesis (**MacDonald, 2000** and **Underwood and Suttle, 1999**). The need for Zn by most animals based on its influence on enzymes and proteins and their activities. These enzymes and proteins affect vitamin A synthesis, carbon dioxide (CO_2) transport, collagen fiber degradation, free radical destruction, membrane stability of red blood cells, metabolism of essential fatty acids, carbohydrate metabolism, protein synthesis and metabolism of nucleic acids among others (**Powell 2000; McCall *et al.*, 2000; Stefanidou *et al*., 2006 and Rubio *et al.*, 2007**). The presence of Zn at the cellular level is essential in the gonads, where cell growth and division occurs continuously (**MacDonald, 2000**). Consequently, a Zn deficiency could seriously affect reproductive events in most species. For instance, in females, it could affect them in any phase of reproductive processes such as estrus, gestation or lactation (**Smith and Akinbamijo, 2000**). Zinc also plays a key role in maintaining the integrity of the epithelia of the reproductive organs, which is necessary for embryonic implantation (**Robinson *et al.*, 2006 and Hostetler *et al.*, 2003**). Adequate concentration of Zn in the serum and in the diet, are vital for uterine involution, tissue repair, after parturition, and particularly, the return to oestrus (**Apgar 1985**). Also**, El-Nour *et al.*, (2010)** studied the effect of organic form of zinc on the reproductive performance of goats, and found that organic zinc can improve the reproductive performance by increasing conception rate of goats. In buffalo, **Zeedan *et al*., (2009)** reported that Biogen-zinc supplementation improve reproductive performance and some blood constituents.

Little known about the effect of Biogen zinc on reproductive performance and ovarian activity of goat. The objective of the present study was to determine and assess the effect of Biogen-zinc supplementation on oestrus characteristics, ovarian activity, progesterone concentration, reproductive performance and some blood metabolites of Damascus does during physiological status as a reliable biological indicators of animals' health and performance.

MATERIALS AND METHODS

The present study conducted at El-Gemmaiza Experimental Farm, Animal Production Research Institute, Agriculture Research Center, Egypt. The present work aimed to define the effects of Biogen-zinc supplementation on oestrus characteristics, ovarian activity, progesterone concentration, reproductive performance and some blood metabolites of Damascus does during different physiological status.

A total number of 36 healthy Damascus does aged 1.5-2 years and 45.7±1.64 kg body weight were used. The does assigned to three groups (12 each). The first group fed basal ration composed of 60% concentrate feed mixture (CFM) plus 20% berseem hay, and 20% rice straw and served as control. The other two groups fed the same basal ration supplemented daily with Biogen–Zinc (BZ) at levels 0.5 gm/h/d (25 mg Zn) and 1.0 gm/h/d (50 mg Zn).

Animals housed in semi open sheds under natural daylight condition and fed allowances according to **NRC (1981)** recommendations for dairy goats. The does allowed drinking clean fresh water *ad lib*. Vitamin and minerals block mixture was available all the time to does.

Kilogram of Biogen–Zinc (BZ) contain 500g Biogen {*Bacillus subtilis nato* over than 10^{11}CFU +500g of Zinc methionine}, while zinc methionine contains methionine hydroxy analogue and 10% Zinc which produced by IBEX International Co. BZ was well mixed with some of the grounded feed mixture pellets before feeding. Chemical composition of the basal rations and BZ shown in Table (1).

Natural mating applied during breeding season where buck to does ratio was 1:12. Mating season extended for 35 days. After two weeks of BZ supplementation, detection of oestrous started immediately after treatments and carried out by exposing does to teaser buck three times daily (30 minutes each). Does were considered in heat when they full stand to be mounted by the male. Does were naturally mated and observed for oestrus after 17-25 days of mating. The indicators applied for monitoring estrous characteristics were; duration of oestrus (the time between first and last accepted mount); onset of oestrus (onset of post treatment); the mean interval from treatment to the onset of oestrus; day of oestrus (determined as the first day of symptoms seen including buck harness or doe stand when mounted by the buck). Ovarian activity monitored by progesterone determination in the blood samples at particular time throughout the estrous cycle.

Reproductive traits of does recorded including; conception rate (CR) as percentage of does conceived/does joined; fertility as percentage of does kidded/does joined; fecundity as percentage of kids born/does joined; prolificacy as percentage of kids born/does kidded (kidding rate); reproductive ability as percentage of kids weaned of does joined; percentage of kids weaned/does kidded; kilograms of kids born/does joined; kilograms of kids born/does kidded; kilograms of kids weaned/does joined; kilograms of kids weaned /does kidded; mortality rate and finally percentage of dead kids from birth to weaning.

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

Items	Chemical composition, DM basis (%)							
	DM	**OM**	**CP**	**CF**	**EE**	**Ash**	**NFE**	**Zn(mg/kg)**
	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:							
G1	89.42	88.30	12.42	20.98	2.29	11.70	52.61	72.76
G2	89.49	88.61	12.93	20.12	2.36	11.39	53.20	95.53
G3	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.
G1 = control, G2= 0.5 mg Biogen–Zinc (BZ)/h/d (25 mg Zn) and G3=1.0 g Biogen–Zinc (BZ)//h/d (50 mg Zn).

Blood samples (5 ml) were randomly collected at morning, from 6 does of each group, from jugular vein puncture using heparinized vacutainer tubes. Blood collected before feeding and drinking. They collected before treatments, during the estrus and at 4, 8 and 30 days after mating and every two days weekly up to the end of the experimental period. Blood samples centrifuged at 4000 rpm for 15 minutes. Blood plasma were carefully separated and stored at -20^{0}C until analysis for aspartate amino transferase (AST), alanine amino transferase (ALT), enzyme activities according to **Reitman and Frankel (1957)**, glucose, cholesterol and urea according to **Henry (1965),** creatinine and creatine according to **Bartels (1971) and** total protein and albumin according to **Doumas and Biggs (1972a & b**) using commercial colorimetric kits. Globulin calculated by subtraction concentration of albumin from that of total protein then albumin/globulin ratio (A/G ratio) estimated also. Commercial kits used for calorimetric determination of plasma triglycerides, total lipid. Concentration of Zinc, iron, calcium and phosphorus in plasma determined by the absorption spectrophotometer.

Quantitative determination of progesterone (P4), thyroid hormones ((Triiodothyronine (T3) and thyroxin (T4)) in the plasma samples was carried out using radioimmunoassay kits.

Data were statistically analyzed using analysis of variance procedure described by **SPSS (1999)** and significant differences among treatments were tested by Duncan's Multiple Range Test **(Duncan, 1955).**

RESULTS AND DISCUSSION

Oestrus characteristics:

The incidence of oestrus (Table, 2) was significantly ($P \leq 0.05$) higher in does treated with BZ at level 0.5 gm/h/d (G2) (91.67 %) followed by G3 (83.33%) then control (75 %). This result is in agreement with **Abdel Monem and EL-Shahat (2011)** who reported an increased oestrus in response to zinc supplement **to** Baladi ewes. The increased oestrus response may be due to that Zinc supplement through BZ has a critical role in the repair of damaged uterine tissue and maintenance of uterine lining following parturition, speeding return to the normal reproductive function and oestrus (**Green *et al.*, 1998**). **Zeedan *et al*. (2009)** reported higher intensity of oestrus symptoms in BZ supplemented buffaloes, which reflect differences in ovarian activity and release of ovarian hormones responsible of manifestation of oestrus symptoms.

Table 2: Oestrus characteristics of Damascus does as affected by Biogen–Zinc supplementation.

Items	Biogen –Zinc Level			
	G1 (Control)	G2, (**0.5 gm/h/d/BZ) (25 mg Zn)**	G3 (**1.0 gm/h/d/BZ) (50 mg Zn)**	Sig
Number of does	12	12	12	
Oestrus response number (%)	9 (75%) ^{b}	11 (91.67 %) ^{a}	10 (83.33%) $^{a b}$	*
Duration of oestrus (h)	19.20 ^{b} ± 1.45	28.00 ^{a} ± 1.47	25.84 ^{a} ± 2.54	*
Onset of oestrus (d)	19.65 ^{a} ± 0.78	14.46 ^{b} ± 1.03	12.64 ^{b} ± 0.78	*
Day of oestrus (d)	8.81 ^{a} ± 0.66	4.91 ^{b} ± 0.45	3.29 ^{c} ± 0.19	*
Non-return to oestrus (does)(%)	7 (77.78) ^{b}	9 (81.82%) $^{a b}$	10 (100) ^{a}	*

$^{a,\ b\ and\ c,}$ values in the same row with different superscripts are significantly different (P<0.05).

Concerning oestrus duration, the does treated with BZ at level of 0.5 gm (G2) had significantly ($P \leq 0.05$) longer duration (28 hr), followed by G3 (25.84 hr) then G1 which was the shortest (19.20

hr). The increased duration might be due to development of more ovarian follicles than that with untreated does. In addition, the increased number of developed follicles that led to high level of plasma estrogen, perhaps caused the longer duration. The enhancement in oestrus duration due to increased plasma estrogen level may be because of BZ supplementation.

The mean interval from supplement with BZ to the onset of oestrus (time to oestrus) was significantly (P≤ 0.05) shorter for G3 followed by G2 then control does (12.64, and 14.46vs. 19.65days, respectively). The extent of this interval depends on the phase of follicular development and the time of BZ treatment. Does possess dominant follicles that are still growing, will show oestrus in 48 to 60 hrs, while does with follicles at the plateau stage or regressing phase will take more than 3 days to show oestrus (**Pinheiro, *et al*., 1998)**. **Beal (1996)** suggested that variation in the timing to oestrus may be due to differences among animals in the rate of regression of CL following their treatment. These results are in agreement with those reported by **Abdel Monem and EL-Shahat (2011)** who found that interval from treatment to the onset of the first oestrus was significantly shorter in the ewes treated with zinc than control. In addition, **Zeedan *et al*. (2009)** reported that BZ improved and shorted the appearance of estrous postpartum in buffalos supplemented with BZ. Additionally, **Campbell and Miller (1998)** reported that cow and heifers supplemented with zinc took fewer days to show first oestrus than non–supplemented.

Day of oestrus was significantly (P≤ 0.05) shorter in the does supplemented with BZ (G3 and G2) than control (G1). This result is in agreement with that reported by **Zeedan *et al*. (2009)** on buffaloes. The percentage of dose do not return to oestrus was significantly (P≤ 0.05) higher in G3 (100.00%), followed by G2 (81.82%) then untreated does (77.78%). Since, the sign of non-return to oestrus, due to pregnancy, is not physically different from anestrous at the end of the breeding season **(El-Shamaa *et al*., 2003),** therefore pregnancy diagnosis based on non-return to oestrus is not reliable in sheep and goats due to the seasonality in oestrus behavior (**Sallam, 1999).**

<u>Ovarian activity:</u>

Data presented in Table (3) revealed marked increase (P≤ 0.05) in the average number of oestrus ovulatory cycles in G3 than control (G1). While, does treated with BZ in G2 and G3 had significant (P≤ 0.05) decrease in the number of anoestrus ovulatory cycles/doe compared to the control group (G1). It is worth noting that % of anoestrus ovulatory cycles in G3 was 31.73% *versus* 40.30 and 56.02% in G2 and G1, respectively. This indicated that exogenous zinc induce follicular growth and ovulation in anovulatory cycles. **Abdel Monem and EL-Shahat, (2011)** reported that supplementation with zinc oxide at levels 100 and 150 ppm for ewes had a higher population of large follicles compared to other groups (0 and 50 ppm).

Table 3: Ovarian activity of Damascus goats as affected by Biogen–Zinc supplementation.

Items	**Biogen –Zinc Level**			
	G1 (Control)	**G2 (0.5 gm/h/dBZ) (25 mg Zn) g/h/d**	**G3 (1.0 gm/h/dBZ) (50 mg Zn) g/h/d**	**sig**
Average number of ovulatory cycle/doe	$2.16^{b} \pm 0.41$	$2.01^{c} \pm 0.07$	$2.49^{a} \pm 0.09$	*
Number of oestrus ovulatory cycle / doe	$0.95^{b} \pm 0.05$	$1.2^{ab} \pm 0.08$	$1.7^{a} \pm 0.11$	*
Number of anoestrus ovulatory cycle / doe	$1.21^{a} \pm 0.08$	$0.81^{b} \pm 0.06$	$0.79^{b} \pm 0.05$	*
Anoestrus ovulatory cycle (%)	56.02 %	40.30 %	31.73 %	

$^{a\ and\ b,}$ values in the same row with different superscripts are significantly different (P<0.05).

This was a reflection of the significant (P<0.05) high ovulation rates in treated groups supplemented with 100 and 150 ppm Zn. The highest percentage of ovulated ewes achieved with supplementation of 150 ppm Zn (100%). The present results agree with **Abou-Zeina *et al*. (2009)** who reported that treatment with zinc methionine for short period improved the fertility of anoestrous buffalo-cows and enhanced the ovarian activity about 20%. **Gottsch *et al*. (2000)** suggested that zinc has a role on reorganizing ovarian follicle as a source of progesterone through the involvement of metalloproteinase-2 (MMP-2), the member of zinc endopeptidase family. On the other hand, this improvement might affected by the rate of uterine involution, the rate of development of ovarian follicles, pituitary and peripheral concentrations of gonadotropins and peripheral level of estrogen and progesterone **(Stevenson and Britt, 1980)**. These results confirmed by incidence of kidding rate in the does (Table 5). In addition, **Manspeaker *et al.* (1987)** found that supplementation of dairy heifers with Cu, Zn, Mn, Fe and Mg (chelated form) exhibited higher number of mature follicles 30–80 days post-partum compared to non-supplemented (35 vs. 20%, respectively). **Swenson (1998)** supplemented Cu, Zn, Co and Mn either as inorganic sulfate or as a complex form to the first-calf heifers. He showed that even though the percentage of significant structures (follicles greater than 12 mm and/or corpora lutea as determined by rectal palpation) and cows exhibiting oestrus by day 45 were lower when complex minerals supplemented and the percentage of cows bred by AI improved. In addition, **El-Nour *et al*., (2010**) attributed the improvement of ovarian activity to increase of plasma β-carotene level that correlates directly to the improved conception rates and embryonic development.

***Progesterone concentration**:*

The blood plasma progesterone (P_4) concentrations of the does treated with different levels of BZ shown in Table (4). At pre-oestrus period, P_4 concentration was significantly ($P \leq 0.05$) increased in G3 (3.20 ng/ml)) and insignificantly increased in G2 (2.94 ng/ml) in comparison with that in G1 (2.30 ng/ml). At mating (onset of oestrus), P_4 concentration was less than 0.5 ng/ml in does for all groups without significant differences. Although the highest and lowest values of P_4 were recorded with the does in G3 and G2, respectively. At 4 days after mating, P_4 concentration was significantly ($P \leq 0.05$) higher in G3 than G1. The differences in P_4 concentration in the does at 8 and 30 days after mating were significant (P<0.05).

Table 4: Plasma progesterone concentration (ng/ml) of Damascus does at pre-oestrus period, oestrus period and post mating as affected by Biogen–Zinc supplementation.

Items	Biogen –Zinc Level				
	G1 (Control)	**G2 (0.5 gm/h/dBZ) (25 mg Zn) g/h/d**	**G3 (1.0 gm/h/dBZ) (50 mg Zn) g/h/d**	**Sig**	**Average**
Pre-oestrus period	$2.30^{b} \pm 0.27$	$2.94^{ab} \pm 0.16$	$3.20^{a} \pm 0.21$	*	$2.81^{C} \pm 0.21$
Onset of oestrus (at mating)	$0.37^{a} \pm 0.04$	$0.45^{a} \pm 0.01$	$0.48^{a} \pm 0.02$	N.S	$0.43^{E} \pm 0.02$
4 days after mating	$1.89^{b} \pm 0.23$	$2.07^{ab} \pm 0.11$	$2.44^{a} \pm 0.12$	*	$2.13^{D} \pm 0.15$
8 days after mating	$3.27^{c} \pm 0.15$	$4.30^{b} \pm 0.15$	$5.04^{a} \pm 0.09$	*	$4.20^{B} \pm 0.13$
30 days after mating	$3.60^{c} \pm 0.15$	$4.82^{b} \pm 0.09$	$6.10^{a} \pm 0.14$	*	$4.84^{A} \pm 0.13$
Sig					**

[a, b and] values in the same row with different superscripts are significantly different (P<0.05).
[A,B,C and D] values in the same column with different superscripts are significantly different (P<0.01)

Kandreze *et al*. (1997) reported negative correlation between plasma progesterone and zinc during dry period in goats. The concentration of P_4 was almost associated with the number of corpora lutea counted on the ovaries of does after mating as affected by treatment **(El-Gohary, 2004)**. This result may be due to that BZ induces the release of both LH and FSH, which causes maturation of ovarian follicles and ovulation. The pronounced increase in P_4 concentration post treatment by BZ inducted ovulation incidence thus activate corpus luteum development. This result is similar to that reported by **Allbrahim *et al*. (2010)** and **Abdel Monem and EL-Shahat (2011)**.

Reproductive performance:

Data in Table (5) clearly indicate that dietary supplementation of Biogen-zinc significantly ($P \leq 0.05$) improved conception rate, fertility, fecundity, kidding rate, reproductive ability, does kidded /does conceived, kids born per does joined and kidded and kg of kids born or weaned per does joined. While, Biogen-zinc insignificantly affected does aborted/does conceived, twining frequency, kids weaned/kids kidded and kg of kids born or weaned per does kidded as compared to control does. Survival rate of kids from birth to weaning was the highest with 5.0 gm BZ supplemented group (77.78%) than the 1.0 gm BZ supplemented (70.59%) and control groups (66.67%).

Table5: Reproductive performance of Damascus does as affected by Biogen–Zinc supplementation.

Items	Biogen –Zinc Level			
	G1 (Control)	G2(0.5 gm/h/dBZ) (25 mg Zn)	G3 (1.0 gm/h/dBZ) (50 mg Zn)	Sig
Number of does joined with buck	12	12	12	
Conception rate (%)	9 (75%)^{b}	11 (91.67 %)^{a}	10 (83.33%)^{ab}	*
Fertility, does kidded / does joined	8 (66.67 %)^{b}	11(91.67%)^{a}	10 (83.33 %)^{a}	*
Does kidded/ does conceived, (%)	8 (88.89 %)^{a}	11 (100%)^{a}	10 (100%)^{a}	N.S
Does aborted / does conceived, (%)	11.11%	00	00	
Fecundity, kids born/does joined, (%)	12 (100)^{a}	18 (150)^{b}	17 (141.67)^{b}	*
Kids born per doe joined, (%)	1.00^{a} ± 0.15	1.5^{b} ± 0.15	1.42^{b} ± 0.15	*
Kidding rate, kids born/does kidded,(%)	(150 %)^{b}	(163.64 %)^{a}	(170 %)^{a}	*
Kids born per doe kidded	1.50^{b} ± 0.19	1.64^{a} ± 0.15	1.7^{a} ± 0.15	*
Twining frequency, (%)	(50 %)	(63.64%)	(70%)	
Number of viable kids at weaning	8	14	12	
Reproductive ability (kids weaned/does joined), %	66.67^{b} ± 0.14	116.67^{a} ±0.11	100.00^{a} ± 0. 15	*
Kids weaned/does kidded , (%)	100.00^{a} ± 0.14	127.27^{a} ±0.12	120.00^{a} ± 0.12	N.S
Kg. of kids born per doe joined	3.35^{b} ± 0.13	5.31^{a} ± 0.44	5.08^{a} ± 0.48	*
Kg. of kids born per doe kidded	5.03^{a} ± 0.63	5.79^{a} ± 0.55	6.10^{a} ± 0.67	N.S
Kg. of kids weaned per doe joined	11.25^{b} ± 2.55	20.00^{a} ± 1.55	17.25^{a} ± 0.73	*
Kg. of kids weaned per doe kidded	16.88^{a} ± 1.32	21.82^{a} ± 1.97	20.70^{a} ± 2.79	N.S
Survival rate of kids from birth to weaning %	66.67	77.78	70.59	

[a and b] values in the same row with different superscripts are significantly different ($P<0.05$).

These findings may partially due to trace elements contents of BZ, especially zinc. The present results agree with those of **Kundu *et al.*, (2014**) who reported that supplementation of different levels of inorganic zinc oxide significantly increased pregnancy rate (12%) and kidding rate (5%) compared to control. Whereas, does received 100 ppm Zn showed significantly (P<0.05) higher pregnancy rate (100%) followed by 50 ppm group (66.66%) then control group (50.00%). Significant higher kidding rates recorded in supplemented groups than control group. The number of kids born and their weights at birth were significantly (P<0.05) higher in does supplemented with 50 ppm and 100 ppm Zn than control group. Generally, ewes receiving zinc supplementation had a higher fertility rate and more prolific. Thus, goats fed diets of low Zn had low conception rates and prolificacy **(Ali *et al.*, 1998**).

In addition, **El-Nour *et al*. (2010)** reported that zinc methionine supplement improved conception rate in treated does compared to control group. **Abou-Zeina *et al.* (2009)** reported that treatment with zinc methionine alone for short period-improved fertility of anestrous buffalo-cows. In addition, **Abdel Monem and EL-Shahat (2011)** reported that supplementation of zinc to ewes diet increased pregnancy rate, lambing rate and fecundity compared to control group. This may be due to increasing level of plasma β-carotene by zinc supplementation. β-carotene is directly correlated to the improved conception rate and embryonic development (**El-Nour *et al*., 2010).** The present results illustrate that kilograms of kids born or weaned per does joined or does kidded were the highest in groups supplemented with Biogen-zinc than the control group. These results are in agreement with obtained results by **Zeedan *et al.* (2008).** Improvement of growth performance with BZ may be due to the positive effect of Biogen as natural growth promoter on rumen microbial activity and all nutrients digestibility. **El-Nour *et al*. (2010)** reported that weaning weight of kids born from dams treated with zinc methionine was significantly higher compare to those from control. **Abdel Monem and EL-Shahat (2011)** found that body weight of lambs was significantly improved in-group supplemented with zinc compared to control group. This increase in body weight of kids born from Biogen –zinc treated does may be attributed to the increase of milk yield in the treated does a matter previously reported by **Zeedan *et al.* (2009)** in buffalo-cows and **Salama *et al.* (2003)** in goats**.** In addition**, McDowell *et al*., (1997**) revealed that consumption of low Zn diets in goats, led to low conception rates and prolificacy. In other study, Zn supplementation increased prolificacy by 14% **(Minson, 1990).**

<u>Blood plasma metabolites and thyroid hormones concentration in Damascus does as affected by Biogen-zinc supplementation</u>:

Protein fractions:

Data in Table (6) indicate that, Biogen-zinc supplementation significantly (P<0.05) increased blood concentration of total protein, albumin, urea, creatine and creatinine during different physiological status. Meanwhile, it significantly (P<0.05) increased globulin concentration and A/G ratio within the two stages of pregnancy and lactation, while increase was not significant during mating period. The significant increase in blood total protein with zinc methionine addition may refer to increased protein synthesis resulted from increased anabolic hormone secretion that is responsible for utilization of amino acids (**El--Masry and Habeeb, 1989**). The present result agree also with **Levengood *et al.*(2000) and Mohamed (2001)** who found that goats supplementated with zinc show high level of blood total protein. In addition, **Mousa and El-Sheikh (2004)** indicated that addition of 80 or 120 mg zinc sulfate increased total protein. **Shams, (2008) and Zeedan *et al.*, (2008 and 2009)** found that addition of zinc methionine increased blood total protein. The present result agree with the conclusion of **Zeedan *et al.*, (2008 and 2009**). Additionally, **El-Masry and Marai (1991)** related the variations in serum proteins to alteration in thyroid hormone level and to albumin or globulin concentrations.

The significant increase in blood albumin during different physiological stages suggested a normal status of liver function, since liver is the main organ for albumin synthesis. The obtained results are in accordance with those reported by **El-Shaer (2003)** and **Mahrous and Abou-Ammou (2005)** for sheep and **Kholif (2001)** and **Abu-El-Ella and Kommonna (2013)** for goats. The increase of albumin in response to Biogen-zinc supplementation may be associated with improved nitrogen absorption. This result agrees with the conclusion of **Talha *et al*., (2009**). Serum albumin has shown as a good indicator of nitrogen status, especially in small ruminants (**Ingraham and Kapple, 1988; Gaskins *et al*., 1991 and Laborde *et al*., 1995**). In addition, albumin acts as a significant mobile protein store for amino acids **(White et al., 1959)**. In addition, **Hassan, *et al*. (2011)** indicated that addition of 15 mg zinc methionine increased blood albumin concentration than adding 25 mg zinc methionine or 25 mg zinc sulfate in sheep.

Data in Table (6) indicate that supplementation with BZ increased (P<0.05) globulin level during both pregnancy and lactation periods compared to control. The present result is in accordance with those obtained by **Shams, (2008) and Zeedan *et al.*, (2008 and 2009)** who found that addition of zinc methionine or BZ increased blood globulin. **Mousa and El-Sheikh (2004)** indicated that addition of 80 or 120 mg zinc sulfate increased globulin. The high level of globulin in treated groups may indicate good develop of immunity status **(Kitchernnham *et al*., 1975). Maxine (1984)** reported that albumin tends to predominate over globulin in sheep and goats. The globulin concentrations in treated groups were within the normal values indicating good immunity status of animals. It is important to note that the values of A/G ratio were higher than 1.0 that indicates that animals did not suffer any health problem that might affect the performance of experimental animals as reported by **EL-Sayed *et al*. (2002).**

Plasma urea concentrations were determined as a significant indicator of dietary protein supply in both sheep and goats **(Nazifi *et al.*, 2003**). Supplementation with BZ increased (P<0.05) urea-N concentration during different physiological stages as compared to the control does (Table, 6). **Abdel-Rahman *et al*. (2012) and Mousa *et al* (2012)** found that feeding diets treated with yeast culture resulted in increase of urea concentration in sheep. This controversial with the present result may be due to the differences in levels of Biogen-zinc used.

Creatine and creatinine concentrations in blood plasma were significantly (P<0.05) lower in G1 and G2 than G3 during pregnancy and lactation periods. In mating period, creartine concentration in blood plasma was significantly (P<0.05) higher in G2 than G1 and G3, while, creatinine concentration was significantly (P<0.05) lower in G1 than G3 and G2 (Table, 6). The quantity of creatinine formed daily depends on the total body content of creatine, which in turn depends on dietary intake, rate of synthesis of creatine and muscle mass (**Gluseppe *et al*., 2009**). Generally, serum creatinine level is a useful indicator of glomerular filtration in the kidney.

Energetic metabolism:

Data in Table (6) indicate that supplementation with BZ increased (P<0.05) total lipids during different physiological stages and increased (P<0.05) glucose and cholesterol during pregnancy and lactation periods, while in mating period the increase was not significant. In general, total lipids concentrations in blood of G3 and G2 groups were significantly (P< 0.05) higher than that of G1 during different physiological stages. While, glucose and cholesterol concentrations in blood of G3 and G2 groups were significantly (P< 0.05) higher than G1within the two stages (pregnancy and lactation). This result is in agreement with **Zeedan *et al.*,(2008 and 2009)** who found that BZ supplementation increase total lipids, glucose and cholesterol during different physiological stages. **Piccione *et al.* (2009)** found that total lipids was increased in the middle and end of pregnancy compared to early pregnancy, probably due to the reduced insulin that mediated inhibition of lipolysis observed in late pregnancy **(Schlumbohm *et al*, 1997).** Lipogenesis, stimulated by insulin, is also responsible of the increased values of total lipids observed in ewes during early lactation. Additionally, **Juma *et al.* (2009)** found that total cholesterol concentration in blood serum increased significantly during pregnancy period. This may be due to enhanced progesterone synthesis in the placenta **(Lin *et al.*, 1977),** and it decline after parturition due to estrogen decrease in plasma LDL (**Ganog, 1995)**.

The increase of glucose levels in blood might related to the rapid rate of hydrolysis and absorption of the dietary carbohydrates in alimentary tract (**Abdel-Rahman *et al,* 2012).** This finding may be related to the effect of Biogen-zinc on activity of amylase that led to increasing carbohydrates metabolism because of higher thyroid hormones secretion**.** Additionally, the increase in blood glucose could be a response to thyroid hormones, which followed by increase in carbohydrates metabolism (**Harper *et al*., 1980**). Thyroid hormones known to increase gluconeogensis and/or plasma glucose concentration in blood (**Cole *et al.*, 1994**). Otherwise, this could attributed to increasing the activity of cellulolytic bacteria that act on cellulose fibers degradation and thus produced more glucose and increased the glucogenic precursor propionate in rumen or decreased plasma insulin and insulin-glucose ratio leading to an increase in gluconeogenesis. However, **Puchala *et al.* (1999)** and **Shined *et al*. (2013)** reported that there was no effect for dietary zinc methionine supplementation on plasma glucose concentration.

Hepatic functionality:

Data in Table (6) illustrated that activity of AST increased ($P<0.05$) response to both levels of BZ supplemented during different physiological stages and increased ($P<0.05$) ALT and triglyceride during pregnancy and lactation periods, while increase was not significant in mating period. **Smith and Walsh (1975**) and **Eissa *et al*. (1992)** reported that serum AST and ALT concentrations increased with pregnancy progress for ewes and cows. The present results are also in agreement with those reported by **Zeedan *et al.*, (2008 and 2009)** that values of serum AST and ALT were not significantly affected by using Biogen–zinc treatments. In the present study, the values of plasma AST are comparatively higher, while those of ALT are lower than the normal range obtained in previous studies on does. This conflict may be due to several factors such as feeding practices, genetics control, response to stress, age, liver function and body weight (**Talha, *et al*, 2009**). Values of AST and ALT were within the normal range, indicating that animals were generally in a good nutritional status. Also, this result is in accordance with that reported by **Zeedan *et al.*,(2009)** that BZ supplemented to diets of lactating buffaloes led to increase blood triglyceride during late pregnancy and postpartum periods. **Antunovic *et al*. (2011) and Deghnouche *et al*. (2013)** reported that the higher concentration of triglyceride in the blood of ewes during pregnancy of ewes could be explained as a consequence of heavy transport of the lipoproteins or to energy deficiency in the meal.

Table6: Some blood metabolites of Damascus does as affected by Biogen–Zinc supplementation.

Items	Physiological status											
	Mating period				Pregnancy period				Lactation period			
	G1	G2	G3	Sig	G1	G2	G3	Sig	G1	G2	G3	Sig
Protein metabolism												
Total protein (mg/dl)	$5.93^{b}\pm0.06$	$6.10^{a}\pm0.08$	$6.17^{a}\pm0.08$	*	$6.61^{c}\pm$ 0..03	$6.74^{b}\pm0.04$	$7.06^{a}\pm0.05$	*	$7.07^{c}\pm0.11$	$8.30^{b}\pm0.12$	$8.57^{a}\pm0.14$	*
Albumin (mg/dl)	$3.24^{b}\pm0.06$	$3.42^{a}\pm0.06$	$3.46^{a}\pm0.05$	*	$3.68^{b}\pm0.02$	$3.70^{b}\pm0.03$	$3.98^{a}\pm0.06$	*	$3.75^{c}\pm0.06$	$4.32^{b}\pm0.06$	$4.74^{a}\pm0.06$	*
Globulin (mg/dl)	$2.71^{a}\pm0.06$	$2.68^{a}\pm0.06$	$2.71^{a}\pm0.06$	N.S	$2.93^{b}\pm0.04$	$3.04^{a}\pm0.04$	$3.08^{a}\pm0.4$	*	$3.32^{b}\pm0.08$	$3.98^{a}\pm0.13$	$3.83^{a}\pm0.12$	*
AG ratio	$1.20^{a}\pm0.04$	$1.28^{a}\pm0.04$	$1.28^{a}\pm0.03$	N.S	$1.25^{ab}\pm0.02$	$1.22^{b}\pm0.02$	$1.29^{a}\pm0.03$	*	$1.13^{b}\pm0.03$	$1.08^{b}\pm0.04$	$1.24^{a}\pm0.04$	*
Urea (mg/dl)	$30.23^{b}\pm0.27$	$31.31^{a}\pm0.32$	$31.97^{a}\pm0.31$	*	$42.31^{b}\pm0.49$	$43.23^{b}\pm0.50$	$45.63^{a}\pm0.55$	*	$45.22^{b}\pm0.58$	$48.42^{a}\pm0.59$	$49.60^{a}\pm0.81$	*
Creatine (mg/dl)	$0.49^{b}\pm0.02$	$0.56^{a}\pm0.02$	$0.53^{ab}\pm0.02$	*	$0.68^{b}\pm0.01$	$0.77^{a}\pm0.01$	$0.79^{a}\pm0.01$	*	$0.71^{c}\pm0.01$	$0.74^{b}\pm0.01$	$0.83^{a}\pm0.02$	*
Creatinine (mg/dl)	$65.67^{b}\pm0.60$	$69.10^{a}\pm0.55$	$70.28^{a}\pm0.49$	*	$71.55^{C}\pm0.72$	$82.65^{b}\pm1.06$	$84.95^{a}\pm0.95$	*	$73.47^{c}\pm0.83$	$83.61^{b}\pm0.94$	$85.88^{a}\pm1.33$	*
Energetic metabolism												
Total lipid (g/l)	$1.81^{b}\pm0.03$	$1.82^{b}\pm0.05$	$1.96^{a}\pm0.04$	*	$1.93^{c}\pm0.03$	$2.14^{b}\pm0.04$	$2.25^{a}\pm0.05$	*	$2.01^{c}\pm0.04$	$2.13^{b}\pm0.03$	$2.28^{a}\pm0.03$	*
Glucose (mg/dl)	$52.27^{a}\pm0.40$	$52.53^{a}\pm0.23$	$53.13^{a}\pm0.28$	N.S	$53.48^{b}\pm0.45$	$60.24^{a}\pm0.57$	$61.13^{a}\pm0.66$	*	$57.25^{c}\pm0.49$	$61.80^{b}\pm0.67$	$66.49^{a}\pm0.57$	*
Cholesterol (mg/dl)	$71.56^{a}\pm0.30$	$71.30^{a}\pm0.37$	$71.16^{a}\pm0.35$	N.S	$65.74^{b}\pm0.57$	$68.69^{a}\pm0.61$	$69.31^{a}\pm0.78$	*	$69.89^{c}\pm0.54$	$71.78^{b}\pm0.64$	$74.17^{a}\pm0.88$	*
Hepatic functionality												
AST (IU/L)	$50.16^{b}\pm0.38$	$51.04^{a}\pm0.24$	$51.78^{a}\pm0.26$	*	$54.27^{c}\pm0.55$	$57.32^{b}\pm0.76$	$60.78^{a}\pm0.84$	*	$53.52^{c}\pm0.59$	$59.64^{b}\pm1.12$	$64.32^{a}\pm1.28$	*
ALT (IU/L	$26.41^{a}\pm0.15$	$26.22^{a}\pm0.23$	$26.25^{a}\pm0.21$	N.S	$27.88^{b}\pm0.33$	$30.98^{a}\pm0.35$	$31.73^{a}\pm0.35$	*	$32.01^{b}\pm0.51$	$33.67^{a}\pm0.56$	$33.88^{a}\pm0.54$	*
Triglyceride (mg/dl)	$67.91^{a}\pm0.49$	$68.39^{a}\pm0.67$	$68.50^{a}\pm0.46$	N.S	$77.03^{b}\pm0.67$	$81.57^{a}\pm0.72$	$82.86^{a}\pm0.73$	*	$75.30^{c}\pm0.96$	$80.71^{b}\pm1.36$	$84.76^{a}\pm1.80$	*
Hormonal metabolism												
T3 (Ug/dl)	$1.61^{b}\pm0.02$	$1.73^{a}\pm0.02$	$1.80^{a}\pm0.04$	*	$1.86^{c}\pm0.02$	$2.00^{b}\pm0.04$	$2.10^{a}\pm0.01$	*	$1.88^{c}\pm0.02$	$2.00^{b}\pm0.03$	$2.21^{a}\pm0.01$	*
T4 (Ug/dl)	$33.42^{a}\pm0.27$	$34.02^{a}\pm0.27$	$34.14^{a}\pm0.32$	N.S	$47.57^{c}\pm0.66$	$49.40^{b}\pm0.79$	$53.05^{a}\pm0.79$	*	$49.39^{b}\pm0.90$	$51.1^{b}\pm0.84$	$55.53^{a}\pm0.96$	*
Mineral metabolism												
Zinc (mg/dl)	$0.46^{c}\pm0.01$	$0.49^{b}\pm0.01$	$0.56^{a}\pm0.01$	*	$0.66^{c}\pm0.01$	$0.74^{b}\pm0.01$	$0.82^{a}\pm0.01$	*	$0.63^{b}\pm0.02$	$0.78^{a}\pm0.01$	$0.82^{a}\pm0.02$	*
Iron (mg/dl)	$75.34^{b}\pm0.84$	$78.13^{a}\pm0.65$	$76.89^{ab}\pm0.77$	*	$75.57^{b}\pm0.85$	$80.84^{ab}\pm2.78$	$83.87^{a}\pm3.86$	*	$75.76^{b}\pm1.04$	$77.16^{b}\pm1.24$	$81.55^{a}\pm1.43$	*
Calcium (mg/dl)	$7.04^{c}\pm0.09$	$7.35^{b}\pm0.10$	$8.34^{a}\pm0.13$	*	$7.49^{b}\pm0.06$	$7.59^{b}\pm0.08$	$7.77^{a}\pm0.10$	*	$7.04^{b}\pm0.31$	$7.46^{ab}\pm0.09$	$7.73^{a}\pm0.10$	*
Phosphorus (mg/dl)	$4.96^{c}\pm0.07$	$6.07^{b}\pm0.08$	$6.63^{a}\pm0.10$	*	$6.37^{c}\pm0.07$	$7.87^{b}\pm0.12$	$8.31^{a}\pm0.13$	*	$7.09^{c}\pm0.09$	$7.51^{b}\pm0.10$	$7.84^{a}\pm0.13$	*

, b and c, values in the same row with different superscripts are significantly different (P<0.05).

Hormon metabolism:

Data in Table (6) indicate that supplementation of BZ increased (P<0.05) T_3 concentration during different physiological stages and increased (P<0.05) T_4 concentration during pregnancy and lactation periods compared to the control. In general, T_3 concentration in blood of G3 and G2 was significantly (P< 0.05) higher than G1 during different physiological stages, while, T_4 concentration in blood of G3 was significantly (P< 0.05) higher than that of G2 and G1 within the two stages, pregnancy and lactation. Thyroid hormones (T_3 and T_4) concentrations were higher during lactation period compared to the values obtained during pregnancy and mating periods. This result agree with the conclusion of **Zeedan *et al.,* (2008**). **El-Nour *et al*. (2010)** showed that concentrations of thyroid hormones (T_3 and T_4) significantly increased with zinc methionine supplement compared to the control. **Abou-Zeina *et al.* (2009)** found that zinc supplementation increased total T_3. It has been reported that zinc participate in protein synthesis and essential for thyroid function since involved in T_3 binding to its nuclear receptor (**Liu *et al*., 2001**). There was increase in concentrations of T_3 and T_4 obtained in the blood during lactation period compared to mating and pregnancy periods. Similar results of T_3 and T_4 levels in sheep were determined by **Karapehlivan *et al.* (2007)** and for T_3 in goat by **Lucaroni *et al.* (1991)**. **Todini *et al.* (2007)** reported higher activity of T_4 in blood of lactating goats in relation to late pregnancy.

Mineral metabolism:

Supplementation with BZ increased (P<0.05) plasma concentrations of zinc, iron, calcium and phosphorus during different physiological stages compared to control does (Table, 6). In general, zinc level was higher during pregnancy and lactation periods compared to the values obtained during mating period. This could related to the increase in rate of accumulation of zinc in the foetus **(Elnageeb and Abdelatif, 2010)**. **Williams *et al*. (1972)** showed that developing of feotus accumulates 1 to 2 mg of zinc/day and that pregnant ewes increases the demands for zinc towards the end of pregnancy. In addition, **El-Nour *et al*. (2010)** showed that level of zinc in serum significantly increased with zinc methionine supplemented group compared to control. This results was in agreement with **Zeedan *et al.,* (2008 and 2009)** and **Abou-Zeina *et al.* (2009)** in buffalos; **Grag *et al*. (2008)** in lambs; and **Huerta *et al*. (2002)** in beef steers. This finding indicates a higher bioavailability of zinc from zinc methionine supplementation and effective absorption via intestinal transport mechanism. In present study, serum zinc level was higher during suckling period compared to the values measured during mating period. This indicates the high requirements of lactating does to zinc as previously reported by **Elnageeb and Abdelatif, (2010).** The present results also showed higher serum 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**). The increase on serum zinc level during lactation period also could be associated with the changes in serum albumin level, which reported to be higher during lactation period (**Abdelatif *et al*., 2009).**

Plasma iron (Fe) level was higher during pregnancy compared to lactation and mating periods. This result is in accordance with those reported by **Sema Yaralıoğlu *et al.,* (2009**) who found that serum Fe concentration showed a tendency to increase during gestation. Such pattern is in agreement with that reported by **Chang and Mowat (1992).** It is well known that immunoglobulin production regulated by specific enzymes that have trace elements at their core, the most common being Zn, Fe and Cu **(Fielden and Rotilio, 1984).** The present results disagree with those reported by **Gurdogan *et al,* (2006)** who indicated that serum Fe concentration decreased at 60, 100 and 150 days of pregnancy in sheep. In addition, **Pinar *et al*. (2009)** found that Fe level decreased at late stage of pregnancy in goats. The recorded decline in serum Fe during late pregnancy could be related to the great demand to this element by foetus (**Swenson and**

Reece, 1993 and **Barratt *et al*, 1994**), since Fe concentration in the foetus liver increases continuously with the advance of pregnancy and reaches the highest level in the fifth month in sheep **(Rallis and Papasteriadis, 1987)**.

As shown in Table (6), there was a significant ($P \leq 0.05$) increase in plasma calcium and phosphorus levels during different physiological stages as affected by BZ supplementation compared to control. In general, plasma calcium/phosphorus levels were higher during pregnancy compared to lactation and mating periods. This result is in accordance with that reported by **Waziri *et al.* (2010)** who found that calcium level increased during pregnancy. The increase in calcium during pregnancy could related to calcium metabolism from the skeleton to meet the higher demand of calcium (**Braithwaite, 1983**). Moreover, oestrogen increased calcium retention and process, yet plasma calcium may be increased (**Swenson, 1998**). Some researchers obtained different results about calcium levels during pregnancy and lactation. **Kandreze *et al*. (1997)** reported that calcium concentrations in plasma increased as gestation progressed and decreased after kidding. In contrast, **Yokus *et al*. (2004)** concluded that the levels of calcium decreased slightly from early pregnancy to late pregnancy and then increased at lactation period in sheep.

Phosphorus known as a component of phospholipids, which are important in lipid transport, skeleton and dent formation (**Krajnicakova *et al*., 2003**). **Ozyurtlu *et al*. (2007)** found that phosphorus level during pregnancy significantly increased in does and ewes**.** In addition**, Yokus *et al*. (2004)** demonstrated in ewes that during lactation there are decreases in the level of phosphorus compared to gestation period. Other researchers informed that phosphorus levels during late gestation and postpartum significantly increased in ewes and goats **(Ozyurtlu *et al*., 2007** and **Tanritanir *et al*., 2009).** In addition**, Sema Yaralıoğlu *et al.*, (2009**) found that serum Ca and P concentrations were higher after parturition. Nevertheless, some researchers reported insignificant differences in phosphorus levels at different stages (**Krajnicakova *et al*., 2003).** In addition, **Yokus and Cakir (2006)** showed that phosphorus levels were unchanged in all gestation and lactation periods in cattle.

In general, data in Table (6), suggests the two levels of BZ supplemented had improved some blood components without any undesirable effects on kidney or liver functions.

CONCLUSION

From the present study, it could recommend that BZ could added to does ration at the levels 0.5 or 1.0 g/head/day during reproduction stages in order to improve reproductive performance by increasing the incidence of oestrus, decreasing the number of days to oestrus, conception rate, fertility, fecundity and kidding rate and improve some blood components without any adverse effects on either liver or renal functions. In general, Zn affects directly the reproductive performance of goats, as manifestation of oestrus and embryo implantation or indirectly by affecting the health of livestock. Usually little Zn is available to the body except those ingested in the diet. Thus, Zn must continually supplemented**.**

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STUDIES ON USING BIOGEN - ZINC ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF RUMINANTS. 1- PHYSIOLOGICAL RESPONSES OF DAMASCUS GOATS TO DIET SUPPLEMENTATION WITH BIOGEN-ZINC.

الملخص العربى

دراسات غذائيه وفسيولوجيه وتصنيعيه وميكروبيلوجيه لكفاءة استخدام البيوجين-زنك على الأداء الانتاجى والتناسلى للمجترات.

1- الاستجابة الفسيولوجية لاضافة البيوجين زنك في علائق الماعز الدمشقى

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استخدمت فى هذة الدراسه 36 عنزه دمشقى عمر 1.5 -2 سنه ومتوسط وزن45.7± 1.64وذلك لدراسة تأثير اضافة البيوحين زنك الى العليقه على النشاط الجنسى والأداء التناسلى وبعض مكونات الدم فى الماعز الدمشقى خلال فترات التلقيح والحمل والرضاعه. وقد قسمت العنزات الى ثلاث مجموعات متماثلة (12 بكل مجموعة) حيث غذيت الأولى على عليقة أساسية مكونه من 60% علف مركز و 20 % دريس برسيم و 20% قش أرز (عليقة كنترول) أما الثانية والثالثة فغذيت على نفس العليقة السابقة مضاف إليها بيوجين زنك بمعدل 0.5 جم/اليوم/رأس (25 ملج/زنك) و 1.0جم/اليوم/ رأس (50 ملج/زنك) على التوالي وتمت المعاملة قبل بداية موسم التلقيح واستمرت حتى انتهاء فترة الرضاعه. أوضحت نتائج الدراسه ما يلى:

- أعلى نسبه للماعز الشائعه كانت فى المجموعه الثانيه (91.67%) بينما كانت أقل نسبه فى المجموعه الأولى (75 %) . كانت أطول فترة شياع فى المجموعه الثانيه وأقصرها فى المجموعه الأولى. كان الوقت من المعامله حتى ظهور الشياع قصيرا معنويا فى المجموعه الثالثه والثانيه مقارنه بالمجموعه الأولى . كان متوسط يوم الشياع قصيرا معنويا فى العنزات المعامله بالبيوجين زنك عن تلك الغير معامله. كانت نسبة العنزات التى لم تظهر علامات الشياع بعد التلقيح عاليه معنويا فى المجموعه الثالثه مقارنه بالمجموعه الأولى.
- اجمالى دورات التبويض الصامت وعدد دورات التبويض الشبقى عاليه معنويا فى المجموعه الثالثه مقارنة بالمجموعه الأولى بينما ظهر انخفاض فى عدد دورات الشياع الصامت فى المجموعه الثانيه.
- زياده فى تركيز هرمون البروجستيرون فى دم الاناث الى عوملت بالبيوجين زنك (المجموعه الثالثه) مقارنه بالغير معامله قبل بداية الشياع بينما حدث زياده فى تركيز هرمون البروجستيرون فى اليوم الرابع والثامن والثلاثين من التلقيح فى عنزات المعامله الثانيه والثالثه مقارنة بالكنترول.
- اضافة البيوجين زنك ادت الى تحسن معنوى فى كل من معدل الخصوبه ، القدره الاخصابيه ، معدل الحمل ، معدل المواليد ، معدل الولادات ، نسبة الجديان المولوده / الأمهات المعدة للتلقيح ، نسبة الجديان المفطومة / للأمهات التى وضعت وعدد كيلو جرامات الجديان المولودة والمفطومه للأمهات المعدة للتلقيح .
- أدت اضافة البيوجين زنك الى ارتفاع معنوى فى تركيزات كل من البروتين الكلى ، الألبيومين , اليوريا ، الكريتين , والكرياتينين ، الليبيدات الكليه , AST, T3 ,وتركيزات الزنك ، الحديد ، الكالسيوم ، الفوسفور خلال فترات التلقيح والحمل والحليب. بينما ادت الى زياده معنويه خلال فترتى الحمل والحليب لكل من الجلوبيولين ، الجلوكوز ، الكولستيرول ، ALT ، الترايجلسريد ، وتركيز T4.

ونستخلص من نتائج هذة الدراسة أن استخدام االبيوجين زنك خاصة عند مستوى 0.5جم أو 1.0 جم / رأس / يوميا للعنزات خلال فترات التلقيح والحمل والحليب أدى تحسين فى النشاط الجنسى والأداء التناسلى و قياسات الدم.