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SOME BLOOD METABOLIC PARAMRTERS AND BODY WEIGHT OF REPLACEMENT FRIESIAN HEIFERS TREATED WITH SOME ENERGY SOURCES

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SUMMARY

This study was conducted to evaluate the effect of daily oral administration of Friesian dairy heifers with propylene glycol (PG); calcium propionate (CP) or their combination (PG+CP) from about 15 months of age till the occurrence of conception on blood biochemistry and body weight. Heifers in the 1st group were fed on the control ration (T1), while those in G2, G3 and G4 were fed the control ration with 300 PG, 335 CP, and a combination of 150 PG+165 CP ml/head/twice a week, respectively from the initial of experimental work to conception. Results show that, the total proteins, albumin, globulin and glucose were significantly increased (P<0.05) in T4. At puberty and conception periods T4 showed significant (P<0.05) increase in TP, AL, GL, and Glu as compared to T1. Blood total lipids and triglycerides showed significant decrease (P<0.05) in T4 at puberty and conception periods. The total cholesterol concentration was significantly decreased (P<0.05) in T2-T4 as compared to T1. Urea nitrogen concentration in T4 was the lowest value followed by T3 and T2 as compared with T1 at puberty and conception periods. Heifers in T4 and T3 showed decrease (P<0.05) in creatinine concentration at puberty and conception than those in T1 and T2. Liver enzymes (AST and ALT) were lower (P<0.05) in T4 at puberty and conception than the control group. Blood AST and ALT were moderated in T2 and T3 at puberty and conception periods. At puberty, heifers in T4 showed the heavy LBW (P<0.05) followed by T3 then T2 and T1. At conception the higher LBW (P<0.05) was recorded in T2-T4 as compared with T1. Heifers in T4 had the early time (P<0.05) to shown puberty followed by T3 and T2 compared to T1. Also, heifers in T4 were concept at early time (P<0.05) than T1. In conclusion, feeding Friesian female calves on diet supplemented with 150ml propylene glycol plus 165 ml calcium propionate /head/twice a week can improve blood biochemical at puberty and conception periods with increase heifers live body weight and it achieved early time to puberty and conception.

Keywords: *Heifers, propylene-glycol, calcium-propionate, blood and body weight.*

INTRODUCTION

The body weight of dairy heifers is a major factor in assigned the time of puberty occur, which is usually attain when they achieve about 55-60% of their mature body weight (Moriel *et al.*, 2017), while, the puberty age can be delayed than 24 months.

In heifers, age at puberty onset is a major indicator for their reproductive efficiency (Perry, 2016). Heifers that have reached early puberty (≤10 months) can breed at less cost than those with later puberty (Wehrman *et al.*, 1996). The delayed of puberty age is a problem not related only to the genetic potential of the breed, but also it affected by the environmental conditions, particularly feeding level (Menéndez, 1984). Also, the precocious puberty enhanced the lifetime of production (Lesmeister *et al.*, 1973) by allows the heifer to have more estrous cycles and increase the conception rate from first-service (Buskirk *et al.*, 1995), and subsequently reduce the interval to pregnancy (Bagley, 1993).

The basic information about Friesian cattle as exotic breeds in Egypt indicated that to reach the optimum reproductive performance it needs good nutrition plan and management which led to improve the reproductive measures like; age at first calving, number of services per conception and breeding efficiency (Hammoud *et al.*, 2010). The previous studies indicated that, under the subtropical-semiarid condition, the Friesian heifers achieved first service at 547 d of age while, it being pregnant at 573 d of age (Shanty, 1998).

The level of energy in ration of replacement heifers had significant effect on the time of puberty which can identified in Friesian cattle when heifers achieve about 65% of their mature body weight at breeding season (Holmes *et al.*, 2002). In this respect, the period longtime from weaning to puberty depend on the average of daily gain, thus it is possible to fed replacement heifers on high nutrition level to increase their body weight to attain puberty at early age (Costigan *et al.*, 2022).

Feed additives can improves gut health of the animals, increases the digestion rate and improve animal growth performance (Frizzo *et al.*, 2010; Kawakami *et al.*, 2010; Frizzo *et al.*, 2011). The replacement heifers breeding season can start when it achieve a rate of 60 to 65% of mature body weight (Endecott *et al.*, 2013). Heifers in the first breeding season modify their metabolism by increasing feed intake to confront pregnancy and lactation physiological stresses (Rollin *et al.*, 2010). The nutrition plan had perceptible effect on shorten the interval to puberty of dairy cattle (Macdonald *et al.*, 2005). Generally, the energy balance (EB) is important beside nutrient feed intake because it is the principal nutritional factor that regulates the development of reproductive system (I'Anson *et al.*, 1991; Wade *et al.*, 1996).

The fertility in dairy cattle was affected by the numbers of estrus cycles that occur between calving and fertile insemination (Thatcher and Wilcox, 1973). So, it is important to start the normal ovulatory cycle early as possible, which is related to the occurrence of energy balance (EB). Beam and Butler (1997) reported that only 24% of matured follicles during the EB nadir had ability to ovulate, while, 75% of ovulated follicles were maturated after the EB nadir.

The pre-partum period had obviously effect on dairy cattle health and the subsequent production and reproduction performance because animals expose to rapid metabolic and physiological changes (Tanaka *et al.*, 2011), which motivate animals to response via different physiological acts. The main act is acute phase response as nonspecific immune system element then a wide range of proteins will produce in the liver, including serum amyloid A (SAA) and Hp (Jonsson *et al.*, 2013 and Tothova *et al.*, 2014).

The propionate compounds is one of the most valuable extra energy sources of supplementation, it is the major glucose precursor in ruminants and it act as anti-ketogenic (Drackley 1999). Propionate is important for the synthesis of glucose in the liver, it act as metabolic mediator of ruminants nutritional status, and it reduces during the transition period due to the reduction in dry matter intake (DeFrain *et al.*, 2005). It is clear to note that, the animal performance improves when ruminal propionate production increase by feeding high-concentrate diets or feed additives contain propionate (e.g. Propylene glycol and Calcium propionate). In dairy cows, propylene glycol (PG) used to prevent negative energy balance at per-partum period (Rukkwamsuk *et al.*, 2005).

Recently, PG is commonly use in dairy heifers to induce an optimization in metabolic parameters (Juchem et al, 2004), also, it had a beneficial effect on glucose and fat homeostasis with differ effects for breed, physiological state or feeding conditions (Nielsen and Ingvartsen 2004) in dairy cattle.

Therefore, the objectives of the present experiment was assessing the impact of supplementing PG, CP or their combination as a source of energy to Friesian heifers during puberty on reproductive performance and some metabolic parameters.

MATERIALS AND METHODS

The experimental work of this study conducted at the Animal Production Research Institute (APRI), Egypt, in cooperation with Department of Animal Production, Faculty of Agriculture, Tanta University.

Animals and experimental design:

A total of 24 healthy Friesian female calves with 13.53±0.30 months of age and 209.04±9.23 kg LBW were divided randomly into four experimental groups according to age and body weight (6 in each). The first group as control, animals received a basal diet and drenched 3 liters of saline solution (NaCl 0.9%) without any treatment (T1). Animals in T2, T3, and T4 were received the basal diet with daily oral-dose of 300ml propylene glycol (PG) , 335g calcium propionate (CP), or 150ml PG +165g CP dissolved in 3 liters of (NaCl 0.9%) head/ twice a week, respectively as descripted by Gavana and Motorga (2009). All experimental Friesian heifers were kept under the same housing system (individually in semi-open sheds), environment and management conditions.

Feeding system:

The experimental animals in all groups were received their diet individually, which containing concentrate feed mixture (CFM), berseem hay (BH) and rice straw (RS) according to APRI for Friesian heifers requirements. Feeds were offered at 7 a.m. and 4 p.m., while drinking water was offered all day time. The ingredients and chemical analysis of different feedstuffs are presented in Table (1).

Table (1): Chemical analysis of CFM, BH an RS in the basal ration of the experimental animals.

Item	DM	Chemical analysis (%, on DM basis)					
		OM	CP	EE	CF	NFE	Ash
Concentrate feed mixture	91.50	88.74	15.85	4.70	13.66	54.53	11.26
Rice straw	92.30	79.63	3.47	1.41	35.10	39.65	20.37
Berseem hay	89.00	85.96	15.96	2.92	28.2	38.88	14.04

DM= Dry matter, OM= Organic matter, CP= Crude protein, CF= Crude fiber, EE= Ether extract, NFE= Nitrogen free extract.

Concentration of blood biochemical:

Monthly blood samples were collected (throughout the experimental period of 8 months) from all Friesian female calves by jugular vein puncture in heparinized test tubes and centrifuged at 4000 rpm/ 15 minutes for plasma separation, then it was stored at -20 ºC until performing of biochemical analysis. Using spectrophotometer and commercial kits the plasma samples were analyzed photometrically to determine the concentration of total protein, TP (Tietz, 1990), and its fractions (albumin; Al according to Tietz, 1994, while globulin; GL was computed by subtracting concentration of albumin from total protein). The glucose (Glu) was determined as descripted by Trinder (1969). Total cholesterol (TC), triglycerides (TG) and total lipids (TL) were assessments according to Richmond, 1973, Mc Gowan *et al.*, 1983, and Zöllner and Kirsch (1962). The concentrations of urea nitrogen (UN) and creatinine, (Cr) were determined according to Tietz, (1990) and Bartles *et al.* (1972). The liver function was evaluated by measures both ALT and AST enzymes according to Reitman and Frankel (1957).

Live body weight and age at different stages of heifer life:

Animals were weighed monthly throughout the experimental period (13-23 months of age). Thereafter, calves live body weight and age were recorded at the beginning of experimental period (pre-puberty), at puberty, and at conception.

Statistical analysis:

At all experimental intervals, data were statistically analyzed using SPSS analysis program (**SPSS, 2010**) by one way ANOVA design. Duncan Multiple Range Test (Duncan, 1955) was used for detecting the significant differences at $P<0.05$.

RESULTS AND DISCUSSION

Blood biochemical parameters:

The concentrations of total proteins and its fraction in Friesian female calves blood at pre-puberty, at puberty and at conception periods were presented in Table (2). Total proteins (TP), albumin (AL), globulin

(GL) and glucose (Glu) were significantly increased (P<0.05) by the combination treatment of PG and CP than the remained groups (Table 2).

Data in Table (2) showed significant (P<0.05) increase in TP at puberty and conception periods in T4 as compared by T1, while T2 and T3 showed the moderated values at both periods. The concentration of AL in T4 showed the highest levels at the conception period only.

Plasma GL in T4 showed the same trend of TP in Friesian heifers, being the highest significantly (P<0.05) level at puberty and conception periods as compared to control (T1) while, T2 and T3 showed the moderate level (Table, 2).

Results in Table (2) showed that the concentration of blood plasma Glu was not affected by different treatments at pre-puberty, while it being high significantly (P<0.05) in T4 at the other periods (puberty and conception). The concentration of Glu did not affected significantly by T1, T2 and T3 treatments.

Table (2): Concentrations (M±SE) of total proteins, albumin, globulin and glucose in blood plasma of Friesian heifers at different treatment periods.

Item	Treatment group			
	T1	T2	T3	T4
Total protein:				
Pre-Puberty	5.50±0.20	5.57±0.26	5.58±0.18	5.68±0.18
At puberty	6.06±0.26^{b}	7.12±0.49^{ab}	7.04±0.36^{ab}	8.02±0.46^{a}
At conception	6.22±0.19^{c}	7.42±0.35^{b}	7.18±0.27^{b}	8.58±0.24^{a}
Albumin:				
Pre-Puberty	2.86±0.13	2.91±0.04	2.89±0.19	2.93±0.08
At puberty	3.08±0.23	3.16±0.33	3.17±0.38	3.59±0.22
At conception	2.80±0.14^{b}	3.22±0.09^{b}	3.23±0.15^{b}	3.88±0.25^{a}
Globulin:				
Pre-Puberty	2.64±0.19	2.66±0.24	2.68±0.21	2.75±0.21
At puberty	2.97±0.46^{b}	3.95±0.44^{ab}	3.86±0.36^{ab}	4.43±0.29^{a}
At conception	3.41±0.30^{b}	4.20±0.37^{ab}	3.95±0.36^{ab}	4.70±0.21^{a}
Glucose:				
Pre-Puberty	54.69±1.47	54.92±1.13	54.98±1.97	54.94±1.98
At puberty	55.44±1.74^{b}	60.94±2.04^{b}	59.65±2.16^{b}	66.54±2.66^{a}
At conception	59.35±1.93^{b}	65.54±1.58^{b}	64.59±1.94^{b}	75.70±2.35^{a}

Means in the same column for each factor with different superscripts differ significantly (P<0.05). T1= control group, T2= propylene glycol, T3= calcium propionate, T4= Combination (PG+CP).

Lipid profile:

Data in Table (3) indicated that treatments had no significant effect on total lipids (TL) and triglycerides (TG) concentrations at pre-puberty, while it showed the significant decrease (P<0.05) in T4 at puberty and conception periods followed by T3 and T2 as compared to T1 (Table, 3).

Total cholesterol concentration in blood plasma of heifers was significantly decreased (P<0.05) as affected by different treatments (T2-T4) as compared to control (T1, Table 3).

Table (3): Concentration (M±SE) of total lipids, total cholesterol and triglycerides in Friesian heifers blood as affected by treatments.

Item	Treatment group			
	T1	T2	T3	T4
Total Lipids:				
Pre-Puberty	505.00±4.97	502.33±5.81	502.83±7.33	501.16±5.04
At puberty	605.63±6.43[a]	567.72±6.42[b]	563.45±5.68[b]	510.66±6.63[c]
At conception	600.47±9.29[a]	561.54±10.80[b]	560.21±9.48[b]	508.21±9.36[c]
Triglycerides:				
Pre-Puberty	19.33±0.89	19.32±0.77	19.33±0.72	19.33±0.78
At puberty	29.11±1.48[a]	24.98±1.25[b]	23.76±1.59[b]	18.51±1.07[c]
At conception	30.22±1.02[a]	25.08±1.19[b]	24.12±1.13[b]	19.66±0.92[c]
Total Cholesterol:				
Pre-Puberty	193.15±5.32	193.23±5.95	191.40±5.06	191.79±5.64
At puberty	240.03±7.95[a]	227.03±8.57[b]	225.04±7.73[b]	200.36±7.31[c]
At conception	246.77±9.02[a]	230.34±8.50[b]	227.47±7.16[b]	199.36±9.08[c]

Means in the same column for each factor with different superscripts differ significantly (P<0.05). T1=Control group, T2= propylene glycol, T3= calcium propionate, T4= Combination (PG+CP).

The presented results concerning the concentration of total protein (TP) as affected by propylene glycol (PG) were in agreement with Ghaffar *et al.* (2018) who indicated significant increase in serum TP concentration of buffalo heifers treated with 300 g of PG. Also, Ayoub *et al.* (2015) found same effect for 200 ml of PG treatment in dairy cows at postpartum period. The marked improve in blood plasma TP of heifers in the present study as affected by calcium propionate (CP) treatment, was in harmony with Abdel-Latif *et al.* (2016) and Abdelhamid *et al.* (2017) results who indicated similar trend in buffalo heifers treated with CP.

Blood plasma albumin (AL) concentration as early marker of dietary protein level (Agenas *et al.*, 2006) in our study did not affected by PG treatment as compared with non-treated heifers, and this trend was in line with Ayoub *et al.* (2015) finds in dairy cows.

The significant increase in the concentrations of blood plasma protein and its fractions which occurred in Friesian heifers fed diet supplemented with the combination of PG and CP (T4) may be attributed with the beneficial effects for both components in improving the forage fermentation in rumen in association with increasing the stability of aerobic proteolysis microbe (Wen *et al.*, 2017). In general, the utilization of protein in rumen as affected by dietary protein could increase blood TP concentration (Adamski *et al.*, 2011).

The combination of PG and CP addition to heifers diet in this study, induced significant increase in the level of blood plasma glucose which may regard to the important role for calcium propionate as a precursor for the synthesis of glucose and it can metabolize and absorbed by animals (Zhang *et al.*, 2020), beside CP that produced from the starch fermentation in the rumen (Lemosquet *et al.*, 2009). In addition, the significant increase in blood plasma glucose in T4 may be due to the glycogenic ability of PG and CP Abdel-Latif *et al.* (2016). Also, Hussein *et al.* (2015) cleared another reason for the increase in blood glucose by decrease glucose demand of peripheral tissue.

On the other hand, Zhang *et al.* (2022) indicated that serum glucose did not affected by the calcium propionate addition.

Kidney and liver function:

Results in Table (4) showed that the concentration of urea nitrogen in blood plasma of heifers in T4 was the lowest value (P<0.05) compared with the other treatments at puberty and conception.

The concentration of creatinine in blood plasma of treated heifers in T4 and T3 was decreased significantly (P<0.05) at puberty and conception than those in T1 and T2 (Table, 4).

As present in Table (4) both liver enzymes AST and ALT did not differ significantly at pre-puberty period, while at puberty and conception T4 showed the lowest (P<0.05) values for both enzymes than the remain treatment groups. In this respect, data of Table (4) indicated that blood AST and ALT recorded the moderate levels in T2 and T3 at puberty and conception periods.

The significant reduction in blood plasma TL, cholesterol and TG that associated with using PG or CP or there combination as dietary additive in comparing with non-treated group reflect their important role in balanced the energy status (Hussein *et al.*, 2015 and Santos *et al.*, 2017). The obtained results were in good agreement with Cruz *et al.* (2014) results in sheep fed diet with propylene glycol inclusion.

The marked decrease in blood plasma urea nitrogen levels in heifers treated with PG or CP or their combination was in line with Mecitoğlu *et al.* (2017) in dairy cows and Abdel-Latif *et al.* (2016) in buffalo treated with PG or CP, they indicated that the reduction in body tissue catabolism may be led to reduce the concentration of serum blood urea nitrogen.

Creatinine concentration in heifer blood plasma in the present study either treated by PG or CP or their combination may be affected by animal muscle mass because it correlated with the metabolism of protein (Yadav *et al.*, 2018). Also, Behery *et al.* (2020) recorded insignificant decreased in blood creatinine as affected by PG treatment. The present data of creatinine concentration in treated heifers was in line with Ayoub *et al.* (2015) results in dairy cows. In this respect, Marzocco *et al.* (2018) recorded insignificant decreased in human blood serum creatinine in association with sodium propionate treatment.

Blood plasma AST and ALT could using as a specific marker for the occurrence of damage in liver cells (Praveen *et al.*, 2015). The treatment of Friesian heifers with PG or CP in this study induced significant reduction in blood AST and ALT as compared to control. These results were in agreement with the finds of Chiofalo *et al.* (2009) in dairy goats treated with PG and Zhang *et al.* (2022) in Holstein dairy cows fed diet with 350 g/d calcium propionate. The significant decrease in blood plasma AST and ALT levels in heifers treated by PG+CP in G4 was in agreement with Behery *et al.* (2020) results in Zaraibi goats.

The significant increase in heifers average body weight in dietary treatment groups included PG, CP and their combination during the conception period was in agreement with the find of Lien *et al.* (2010) who reported that, PG is a substance which used for ruminants as glucoplastic. In addition, Zhang *et al.* (2020) reported that CP is a source for energy which can be hydrolyzed in rumen into Ca_2+ and propionic acid which use in ketosis prevention of dairy cows.

At the puberty stage, the significant improve in body weight of Friesian heifer which was associated with PG treatment may be attributed to its role in the regulation of animal muscles mass versus the mobilization of adipose tissue then it decreases the liver NEFA (Nielsen and Ingvartsen, 2004 and Bjerre-Harpøth *et al.*, 2015). In this respect, Sun *et al.* (2020) indicated that feeding dairy cows suffered from energy lack on PG is a nutritional strategy that should be implemented at the critical period of animal life. The significant increase in heifer blood glucose in the present study indicated that PG treatment may be increase a greater energy availability that resulted in increase animals body weight (Abeni *et al.*, 2000).

The clear increase in body weight of heifers treated with CP in the present study conform its ability to prevent the energy loss and the poor palatability of animal feeds, so it use in dairy cow diet which containing silage or TMR. This trend was in agreement with Bintvihok and Kositcharoenkul (2006) who reported that feeding broilers on diet supplemented with CP led to increase body weight, feed consumption, and conversion. In this respect, Abdel-Latif *et al.* (2016) fed Egyptian buffalo heifers on diet supplemented with CP and they found a significant increase in live body weight. Also, Zhang *et al.* (2017) recorded significant improve in daily gain of Holstein male calves as affected by CP treatment. In addition, Zhang *et al.* (2018) indicated significant increase in body weight of calves treated with 5% CP in milk replacer, they also recorded that propionate can be convert to glucose in animal liver which mean increase the energy availability that will use in increasing the growth rate and subsequently animal total body weight. Cao *et al.* (2020) also indicated significant improve in calve body weight gain when treated with CP at pre- and post-weaning periods.

The significant increase in body weight of heifers treated with the combination of PG and CP than non-treated or either PG or CP was in agreement with Gabr *et al.* (2017) who fed Egyptian buffalo heifers on diet supplemented with PG and CP as energy source, and they found clear increase in the average of animals live body weight.

Table (4): Concentration (M±SE) of urea nitrogen, creatinine, AST and ALT in Friesian heifers blood as affected by treatments.

Item	Treatment group			
	T1	T2	T3	T4
Urea nitrogen:				
Pre-Puberty	18.34±0.65	18.15±0.89	18.09±0.92	18.30±0.76
At puberty	17.34±0.61^{a}	11.11±0.52^{b}	9.38±0.45^{b}	7.28±0.48^{c}
At conception	16.94±0.68^{a}	8.10±0.56^{b}	7.26±0.48^{b}	5.33±0.41^{c}
Creatinine:				
Pre-Puberty	1.35±0.06	1.26±0.07	1.27±0.08	1.25±0.07
At puberty	1.29±0.12^{a}	1.14±0.13^{a}	1.00±0.12^{b}	0.74±0.11^{b}
At conception	1.26±0.14^{a}	1.04±0.12^{a}	0.80±0.10^{b}	0.55±0.09^{b}
AST:				
Pre-Puberty	48.71±1.34	50.17±1.28	49.03±1.45	49.82±1.41
At puberty	48.34±1.07^{a}	41.26±1.28^{b}	39.26±1.73^{b}	33.67±1.42^{c}
At conception	47.92±1.89^{a}	38.53±1.86^{b}	36.72±1.55^{b}	29.87±1.76^{c}
ALT:				
Pre-Puberty	21.12±1.15	20.37±0.88	20.44±1.00	20.31±1.04
At puberty	21.03±1.18^{a}	15.18±0.97^{bc}	16.42±1.01^{b}	12.44±0.81^{c}
At conception	20.68±0.96^{a}	14.89±0.95^{b}	16.01±0.93^{b}	10.85±0.76^{c}

Means in the same column for each factor with different superscripts differ significantly (P<0.05). T1= Control group, T2= propylene glycol, T3= calcium propionate, T4= Combination (PG+CP).

***Live body weight and age at different treatment periods*:**

As present in Table (5) the LBW of Friesian heifers did not affected at pre-puberty period by different treatment groups. At puberty, heifers in T4 showed the heavy LBW (P<0.05) followed by T3 then T2 and finally T1 (control). Data cleared that, at conception period the higher LBW (P<0.05) was recorded in different treatment groups as compared with non-treated group (control; T1).

Data in Table (5) showed that Friesian heifers had the same age at pre-puberty period with average of 13 month. The heifers in T4 had the early time (P<0.05) to shown puberty followed by T3 and T2, while those in T1 showed the late time. In this respect, heifers in T4 were concept early (P<0.05) than T1.

Table (5): Live body weight and age of Friesian heifers at pre-puberty, puberty and conception periods as affected by treatments.

Item	Treatment group			
	T1	T2	T3	T4
Live body weight (kg):				
Pre-Puberty	209.83±7.62	208.33±6.82	208.83±6.93	209.16±6.25
At puberty	262.16±9.26^{c}	290.17±9.20^{b}	291.33±7.35^{b}	318.00±8.09^{a}
At conception	358.00±10.69^{b}	377.83±10.75^{a}	378.33±9.88^{a}	380.16±9.64^{a}
Age (month):				
Pre-Puberty	13.13±0.58	13.18±0.56	13.16±0.55	13.15±0.56
At puberty	20.51±1.35^{a}	17.07±1.05^{b}	16.99±0.84^{b}	16.08±0.95^{b}
At conception	25.95±1.15^{a}	20.40±1.07^{ab}	20.37±1.02^{ab}	17.28±0.70^{b}

Means in the same column for each factor with different superscripts differ significantly (P<0.05). T1= Control group, T2= propylene glycol, T3= calcium propionate, T4= Combination (PG+CP).

CONCLUSION

Feeding Friesian female calves on diet supplemented with 150ml propylene glycol plus 165 ml calcium propionate /head/twice a week had a greater improve on blood total proteins, albumin, globulin and glucose at puberty and conception periods, while total cholesterol, total lipids, triglycerides, urea nitrogen, creatinine, AST and ALT enzymes were reduced significantly and at puberty (1st service) and conception periods, heifers had the heavy live body weight with early time to shown puberty and conception.

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بعض مقاييس الدم الايضية ووزن الجسم لعجلات الأستبدال الفريزيان المعاملة ببعض مصادر الطاقة

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أجريت هذه الدراسة لتقييم تأثير المعاملة بـالبروبيلين جليكول، بروبيونات الكالسيوم أو خليط بينهما عن طريق الفم لعجلات الفريزيان من عمر 15 شهر حتي حدوث الحمل على مقاييس الدم الكيميائية ووزن الجسم. تم تغذية العجلات في المجموعة الاولي الكنترول علي عليقة المحطة بدون معاملة بينما غذيت المجموعة الثانية، الثالثة والرابعة بنفس عليقة الكنترول وعوملوا بـ 300 ملي من البروبيلين جليكول و 335 ملي من بروبيونات الكالسيوم و بـ 150 ملي من البروبيلين جليكول + 165 ملي من بروبيونات الكالسيوم كخليط رأس/مرتين/اسبوع علي التوالي من بداية التجربة حتي الحمل. أظهرت النتائج أن هناك زيادة معنوية (P <0.05) في تركيز البروتينات الكلية، الألبومين، الجلوبيولين والجلوكوز في المجموعة الرابعة في فترات البلوغ والحمل مقارنة بمجموعة الكنترول والمجموعات الأخرى. بينما انخفض تركيز كل من الدهون الكلية، الدهون الثلاثية، الكوليسترول الكلي، الكرياتينين، يوريا نيتروجين ونشاط الانزيمات (AST و ALT) في المجموعة الرابعة إنخفاضا معنوية (P <0.05) مقارنة بمجموعة الكنترول والمجموعات الأخرى في فترتي البلوغ والحمل. عند البلوغ أظهرت العجلات في المجموعة الرابعة اعلي وزن جسم يليها المجموعة الثالثة، الثانية مقارنة بمجموعة الكنترول، بينما عند الحمل أظهرت العجلات في المجموعة الرابعة والثانية اعلي وزن جسم يليها المجموعة الثالثة مقارنة بمجموعة الكنترول. وصلت العجلات في المجموعة الرابعة الي سن البلوغ وكذلك سن الحمل في وقت مبكرا معنويا (P <0.05) مقارنة بمجموعة الكنترول والمجموعات الأخرى.

يستنتج من هذة الدراسة ان معاملة عجلات الأستبدال الفريزيان عن طريق الفم بـ 150 ملي من البروبيلين جليكول + 165 ملي من بروبيونات الكالسيوم كخليط رأس/مرتين/اسبوع يحسن من مقاييس الدم الكيميائية في فترات البلوغ والحمل مع زيادة في وزن الجسم الحي وتحقق وقت مبكر للبلوغ والحمل، وإنتاج عجلات استبدال في حالة صحية جيدة.