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INFELUNCE OF SAFFLOWER OR SUNFLOWER SEEDS SUPPLEMENTATION ON GROWTH PERFORMANCE AND IMMUNE RESPONSE IN SUCKLING FRIESIAN CALVES

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ABSTRACT

The present study aimed to investigate the effect of safflower and sunflower seeds supplementation on growth performance of suckling Friesian calves, through blood biochemical parameters and immune response from birth to weaning. Twenty newly born Friesian calves were randomly divided into five groups (4 each). The first group (G_1) was used as control of which the calves were suckled pure milk from cows fed ration not added with safflower or sunflower seeds. The second and third groups (G_2 and G_3) included calves suckled pure milk from cows fed rations contained 3% of whole safflower or sunflower seeds replaced from concentrate for 105 days of age and fed starter not included safflower or sunflower seeds, respectively. The fourth and fifth groups (G_4 and G_5) included calves suckled pure milk from cows fed the control ration, but 3 % of its starter replaced by whole safflower and sunflower seeds, respectively. The results showed that, serum total protein (TP), albumin (Alb) and globulin (Glob) levels increased significantly ($P<0.05$) and reached earlier to the normal range in calves suckled milk from cows fed safflower seeds (G_2) than other groups. At 45^{th} day after birth till the end of experiment the glucose level increased significantly ($P<0.05$) for calves of G_2 compared to G_1. There were no significant differences among the experimental groups of mean values of AST and ALT concentrations. Serum concentrations of triglycerides and LDL were similar among experimental groups. Overall mean of total cholesterol concentrations were the highest after calves supplemented with sunflower seeds for 105 days of age (G_3) compared to other groups. HDL-cholesterol increased significantly ($P < 0.05$) in blood serum of calves that suckled milk from cows fed safflower or sunflower seeds (G_2 and G_3) compared to un-supplemented one (G_1). Supplementation of safflower and sunflower seeds did not alter the cellular immunity, either in lymphocytes or neutrophils. The elevation of growth rate of G_2 and G_3 was affected

by safflower and sunflower seeds compared to control (G_1). It could be concluded that, the use of safflower and sunflower seeds supplementation in ration's cows was effective in blood components, immune response and growth performance of their suckled Friesian calves.

Keywords:

Friesian calves; safflower; sunflower; immunoglobulin; growth.

INTRODUCTION

Lipids supplementation in dietary, such as oilseeds may be a method to more adequately meet nutritional demands associated with growth and immune responses of newborn calves. Safflower is an annual, thistle-like plant with many branches and little known use except for its oil. Fortunately, this oil is extremely valuable and is extracted from the seeds. It has been an important plant for cultures dating back to Greeks and Egyptians (**Zohary and Hopf, 2000**). Safflower has been used as a laxative and as a dietary supplement to modify lipid profiles and treat fevers. It is characterized by the presence of a high proportion of n-6 polyunsaturated fatty acids that include linoleic (approximately 75%), oleic (13%), palmitic (6%), stearic (3%), and other minor straight-chained fatty acids. Some of the health benefits of safflower oil include its ability to lower cholesterol levels, manage blood sugar, aid in weight loss, improve hair health, boost skin health, control muscle contractions and improve the immune system **(Jaudszus *et al.,* 2016**). **Encinias *et al.* (2004)** reported that lambs fed a late gestation diet that included 4.6% safflower seeds had increased survivability and lowered pneumonia rates than lambs fed a 1.9% fat, is caloric pre-partum diet. Supplementation of the dam with dietary fat can increase the survivability of the calf. It has been shown that calves from dams supplemented with safflower seeds have increased glucose concentrations, cholesterol levels, cortisol levels and higher rectal temperatures during prolonged cold exposure compared to calves from dams without fat in the diet **(Lammoglia *et. al.,* 1999)**. Whole high-oil sunflower seeds have several characteristics of a desirable supplement for range beef cows; including high level of lipid concentration and moderate concentration of protein. For these reasons, high-oil of sunflower seeds could be used to replace traditional protein addition, which concomitantly provide supplemental lipid. Supplementation of beef cattle with sunflower seeds or diets containing sunflower seeds has variable effects on body weight **(Funston *et al.,* 2002)**. Sunflower seed would be a good choice from a consumer's point of view, as it is rich in polyunsaturated fatty acids and a source of linoleic acid (66 % of total fatty acids) which is omega 6 fatty acids **(Petit, 2003)**. To an even lesser extent, sunflower oil or other fats have been used to increase energy supplementation in ruminant diets. This is especially true for dairy diets, but the much lower milk production and dry matter intake of a beef cow might indicate that, the results of dairy research might not be applicable to beef cattle **(Parks *et al.,* 1981)**. Sunflower and safflower oils can be used as sources of oil for broiler diets without having any effect on performance, immune responses or the activity of anti-oxidizing enzymes. Higher concentrations of dietary α-tocopherol (50 or 100mg/kg) reduced lipid peroxidation activity and enhanced activities of anti-oxidative enzymes; they also improved the cell-mediated immune responses in commercial broilers **(Rama Rao *et al.,* 2011)**. Unfortunately, few investigations are available regarding the effect of safflower or sunflower seeds on growth performance and immune response. Therefore, the present study aimed to define the effect of safflower or sunflower seeds supplementation to the diet of cows or starter of calves on growth performance and immune response in suckling Friesian calves.

MATERIAL AND METHODS

The current work was carried out at Karada Experimental Station, belonging to the Animal Production Research Institute (APRI) in cooperation with Department of Immunity, Animal Reproduction Research Institute, and Agriculture Research Center, Egypt.

Experimental animals and Treatment:

Twenty suckling Friesian calves with an average body weight of 31.25±1.25 kg at birth day were divided into five similar groups (4 each). The calves were left with their dams to receive colostrum freely, and fed individually on milk at rate 10% of their body weight given in two meals. After three weeks of birth all calves were fed on starter gradually increased in expense of milk on two meals. Consequently, the milk allowances were reduced gradually until weaning at 105th day of age. The first group (G_1) was used as control which suckled pure milk from cows fed ration without safflower or sunflower seeds. The second and third groups (G_2 and G_3), the calves were suckled pure milk from cows fed rations added with 3% of whole safflower or sunflower seeds replaced from concentrate for 105 days. At the same time, calves fed starter not added with safflower or sunflower seeds, respectively. The fourth and fifth groups (G_4 and G_5), the calves were suckled pure milk from cows fed on the control ration, but 3 % of its starter replaced by whole safflower and sunflower seeds, respectively. Calves were allowed to starter and hay from the beginning of the third week of age. Body weight was measured at birth, then biweekly intervals until 105th day of age. Dry matter (DM) was determined by drying a subsample at 105°C for 24 hrs. All samples of the milk, starter, safflower and sunflower seeds were analyzed according to **AOAC (1990)**. Chemical composition of milk, safflower, sunflower seeds and experimental starters were shown in (Tables 1 and 2).

Blood sampling and analysis:

Blood samples were collected from jugular vein of calves at birth and then biweekly intervals until 105th day of age.

Immediately after blood collection, the blood samples were divided into two portions. The first portion was drawn into tube containing EDTA (Ethylene diamine tetra acetic acid) as anticoagulant material. The total white blood cells count (WBCS) was estimated by Exigo analysis, and the differential leukocytic count was performed according to **Bernard *et al.* (2000)**. The second portion of the blood was centrifuged at 600 *g* for 15 minutes and the obtained clear serum was stored at -20ºC until assay of blood components. Total serum protein was estimated according to Biuret-taratrate method described by **Henery (1974)**, while albumin estimation was performed according to **Doumas *et al.* (1971)**. Serum globulin level was obtained by subtracting albumin from total protein. Concentration of glucose was determined according to **Trinder (1969).** Triglyceride was determined according to **Scheletter and Nussel (1975)**. Cholesterol was determined according to **Rolschlau (1974)**. High density lipoprotein (HDL- cholesterol) was determined as described by **Niedmann *et al*. (1983)**. Concentration of low density lipoprotein (LDL- cholesterol) was calculated by using the formula:LDLc=total cholesterol-HDLc-(Triglyceride/5)according to **Fridewald *et al.* (1972)**. Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) were determined according to **Reitman and Frankel (1957)**.

Table (1): Chemical composition (%) of the suckled milk of calves of the experimental groups

Experimental groups	Fat	protein	Lactose	TS	SNF	Ash
G_1, G_4 and G_5	**3.10**	**3.23**	**4.63**	**11.65**	**8.55**	**0.69**
G_2	**3.93**	**3.53**	**4.79**	**12.97**	**9.04**	**0.72**
G_3	**3.62**	**3.39**	**4.69**	**12.36**	**8.74**	**0.65**

TS: Total solids and SNF: Solids not fat.

Table (2): Chemical composition of feed stuffs of the experimental groups.

Item	DM	Chemical composition, % (on DM basis)					
		OM	CP	CF	EE	NFE	Ash
Safflower seeds	**94.20**	**91.50**	**19.20**	**30.34**	**29.35**	**12.61**	**8.50**
Sunflower seeds	**95.00**	**91.50**	**17.40**	**28.32**	**29.85**	**15.93**	**8.50**
Starter of G_1, G_2 and G_3	**93.54**	**91.00**	**17.00**	**6.00**	**2.14**	**65.86**	**9.00**
Starter of G_4*	**93.56**	**91.02**	**17.07**	**6.73**	**2.96**	**64.26**	**8.98**
Starter of G_5*	**93.58**	**91.02**	**17.01**	**6.34**	**2.97**	**64.70**	**8.98**
Berseem hay	**90.02**	**86.90**	**11.33**	**34.91**	**0.86**	**39.80**	**13.10**

***calculated. DM: Dry matter, OM: Organic matter, CP: Crude protein, CF: Crude fiber and NFE: Nitrogen free extract.**

Immune response:

The lymphocyte proliferative response in peripheral blood was estimated using MTT (3[4, 5-dimethylthiazol-2-y1]-2, 5-diphenyltetrazolium bromide) reduction assay according to **Rai-Elbalhaa *et al.* (1985)**. Lysozyme concentration was estimated according to **Schultz (1987)**. The measurement of nitric oxide (NO) was assessed according to the method described by **Rajarman *et al.* (1998)** using spectrophotometrically by ELISA reader at 570 nm. Nitro blue tetrazolium (NBT) slide test was adapted from the technique described by **Campbell and Douglas (1997)**, aiming to evaluate the microbicidal mechanism of phagocytes by their ability to generate toxic oxygen radicals capable of reducing the compound NBT to an insoluble form, named formazan, which is identified under optical microscopy by a blue color in the cytoplasm of the cell. The amount of NBT reduced is directly proportional to the amount of oxygen radicals produced by phagocytes.

Statistical analysis:

Data were statistically analyzed using the general linear model procedure (**SAS, 2002**). Significance among the means was checked using Duncan's Multiple Range Test **Duncan (1955)**. Model: $Yij = \mu + Ti + Eij$ Where Yij expressed every observation in different treatments, μ expressed the overall mean, Ti expressed the treatment effect and Eij expressed the experimental error. Significance among the means of period (at birth, 15^{th} day, 30^{th} day, 45^{th} day, 60^{th} day, 75^{th} day, 90^{th} day and 105^{th} day) was checked using **Duncan (1955)** and was non-significant. Unless stated otherwise, significance was declared when $P<0.05$.

RESULTS AND DISCUSSION

1. Blood serum components:

1.1. Total protein, albumin and globulin concentration (g/dl):

Blood represents an important index of physiological, pathological and nutritional status of the organism. Changes in the constituent compounds of blood, when compared to the normal values, could be used to interpret the metabolic status of the animal and perhaps nutrient adequacy of feed consumed **(Nworgu *et al.,* 2007**). Data presented in Table (3) showed that at birth, the level of total protein (TP) was between 4.47 - 4.54 g/dl below the lower limit of the normal range of cattle (6.0 - 7.9 g/dl) and (5.9 - 7.8 g/dl) according to **Kaneko (1989) and Jawasreh *et al.* (2010)**, respectively. It increased quickly after that probably as a result of the colostrum intake but continued below the normal range until the 15th day of age in all of the experimental groups. At 30th day of age, the level of TP increased significantly ($P<0.05$) and reached earlier to the normal range in calves suckled milk from cows fed safflower seeds (G_2) than other groups. Superior of G_2 in TP level continued till the end of experiment compared to other groups. Overall mean of TP level recorded the highest value (6.39 g/dl) in G_2 followed by calves suckled milk from cows fed sunflower seeds with G_3 (6.02 g/dl). Whereas the lowest value (5.53 g/dl) was found in the control group (G_1). The differences showed significantly ($P<0.05$) between groups G_1 and G_2. On the other hand, the differences were insignificant between G_2 and G_3 or among G_1, G_3, G_4 and G_5. It is worth noting that Alb and Glob (Table 3) levels followed the same trend with TP and continued superior of G_2 compared to other experimental groups. Higher concentration of TP, Alb and Glob in G_2 may be related to high content of protein in safflower seeds and suckled milk of G_2 as shown in Tbles (1 and 2). Also, these results may be attributed to improve nitrogen absorption **(Kornegay *et al.,* 1997**).

1.2. Glucose (mg/dl):

Data presented in Table (4) showed insignificant increased of blood serum glucose level from birth till 30th day of age in the groups treated with safflower and sunflower seeds compared to un-supplemented one (G_1). At 45th day after birth till the end of experiment there was increased significantly ($P<0.05$) in serum glucose level for calves of G_2 compared to G_1. At the same time, there was insignificant increased in calves that supplemented with safflower and sunflower seeds (G_3), G_4 and G_5 compared to G_1. Mean values of serum glucose increased significantly ($P<0.05$) in calves that suckled milk from cows fed safflower seeds (G_2)

compared to other groups except of G_3, the difference was not significant. Highest concentration of glucose was recorded in supplemented safflower seeds group (G_2) that may be attributed to high content of this group from fatty acids. The fatty acids are mostly metabolized in the rumen. Fats are hydrolyzed to their polyunsaturated fatty acid constituents and glycerol. A high proportion of the fatty acids are then partially or completely hydrogenated and much of the glycerol is fermented to propionic acid, one of the major volatile fatty acids, that is a precursor for glucose **(Funston and Filley, 2002)**. The present results are in agreement with those of **Lammoglia *et al.* (1999)** who concluded that feeding heifers supplemented fat of safflower seeds during the late gestation increased ($P<0.05$) glucose concentrations in the newborn calf.

Table (3): Means ± SE of total protein, albumin and globulin of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age.

Period (days)	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
Total Protein (g/dl)					
At birth	4.53 ±0.12	4.54 ±0.09	4.52 ±0.17	4.47 ±0.03	4.49 ±0.10
15th	5.01^{c} ±0.12	5.45^{a} ±0.01	5.35^{ab} ±0.02	5.28^{ab} ±0.01	5.25^{b} ±0.03
30th	5.18^{c} ±0.02	5.94^{a} ±0.15	5.56^{b} ±0.09	5.39^{bc} ±0.05	5.27^{c} ±0.03
45th	5.36^{c} ±0.03	6.26^{a} ±0.14	5.96^{ab} ±0.22	5.68^{bc} ±0.12	5.39^{c} ±0.04
60th	5.61^{d} ±0.16	6.56^{a} ±0.12	6.29^{ab} ±0.07	6.15^{bc} ±0.05	5.91^{cd} ±0.09
75th	5.82^{d} ±0.21	7.17^{a} ±0.05	6.61^{b} ±0.15	6.27^{bc} ±0.04	6.14^{cd} ±0.04
90th	6.23^{d} ±0.06	7.46^{a} ±0.06	6.82^{b} ±0.10	6.59^{bc} ±0.09	6.44^{cd} ±0.07
105th	6.53^{c} ±0.14	7.71^{a} ±0.09	7.05^{b} ±0.14	6.83^{bc} ±0.03	6.74^{bc} ±0.07
Overall mean	5.53^{b} ±0.13	6.39^{a} ±0.21	6.02^{ab} ±0.17	5.83^{b} ±0.15	5.70^{b} ±0.14
Albumin (g/dl)					
At birth	2.36 ±0.10	2.37 ±0.10	2.43 ±0.14	2.28 ±0.03	2.34 ±0.05
15th	2.26 ±0.07	2.46 ±0.08	2.38 ±0.08	2.35 ±0.07	2.32 ±0.03
30th	2.50^{bc} ±0.08	2.68^{a} ±0.02	2.58^{ab} ±0.04	2.49^{bc} ±0.04	2.38^{c} ±0.04
45th	2.67^{b} ±0.08	2.92^{a} ±0.03	2.78^{ab} ±0.09	2.72^{ab} ±0.09	2.66^{b} ±0.06
60th	2.77^{b} ±0.10	3.25^{a} ±0.09	3.01^{ab} ±0.07	2.91^{b} ±0.08	2.82^{b} ±0.07
75th	2.88^{b} ±0.09	3.42^{a} ±0.05	3.16^{ab} ±0.11	2.98^{b} ±0.10	2.95^{b} ±0.08
90th	3.22^{d} ±0.06	3.73^{a} ±0.04	3.54^{b} ±0.04	3.41^{bc} ±0.07	3.34^{cd} ±0.06
105th	3.39^{c} ±0.02	3.86^{a} ±0.04	3.65^{b} ±0.06	3.55^{bc} ±0.07	3.45^{c} ±0.03
Overall mean	2.76^{b} ±0.08	3.09^{a} ±0.11	2.94^{ab} ±0.10	2.84^{ab} ±0.09	2.78^{b} ±0.09
Globulin (g/dl)					
At birth	2.17 ±0.04	2.17 ±0.03	2.10 ±0.09	2.19 ±0.00	2.15 ±0.04
15th	2.75 ±0.17	2.99 ±0.09	2.97 ±0.09	2.92 ±0.07	2.93 ±0.05
30th	2.68^{c} ±0.06	3.26^{a} ±0.17	2.98^{b} ±0.05	2.90^{bc} ±0.01	2.90^{bc} ±0.01
45th	2.69^{c} ±0.07	3.34^{b} ±0.13	3.18^{ab} ±0.15	2.96^{bc} ±0.06	2.73^{c} ±0.03
60th	2.85^{c} ±0.06	3.32^{a} ±0.06	3.28^{a} ±0.02	3.24^{ab} ±0.03	3.09^{b} ±0.07
75th	2.93^{c} ±0.13	3.75^{a} ±0.09	3.45^{b} ±0.06	3.29^{b} ±0.06	3.18^{bc} ±0.06
90th	3.01^{b} ±0.10	3.73^{a} ±0.09	3.28^{b} ±0.07	3.18^{b} ±0.06	3.10^{b} ±0.12
105th	3.14^{b} ±0.14	3.86^{a} ±0.08	3.39^{b} ±0.08	3.28^{b} ±0.09	3.29^{b} ±0.09
Overall mean	2.78^{c} ±0.06	3.30^{a} ±0.11	3.08^{ab} ±0.09	3.00^{bc} ±0.07	2.92^{bc} ±0.07

a, b, c and d: Means with different superscripts in the same row are significantly ($P < 0.05$) different.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

In addition, **Mohsen *et al.* (2011)** reported that blood serum of glucose increased significantly ($P<0.05$) by feeding sunflower seeds compared to the control. However, **Bellows *et al.* (2001)** found that no differences in concentrations of glucose after feeding primiparous beef heifers with sunflower seeds for 68 d before calving compared to a control diet without added fat.

1.3. Transaminase enzyme activities (U/L):

Results of Aspartate aminotransferase (AST) and Alanine aminotransferase (ALT) enzyme activity of the different experimental groups are presented in Table (4)**.** The overall mean of AST enzyme activity indicated that there were no differences among the experimental groups. This means that safflower and sunflower supplementation either, in suckled milk of calves or in its starter did not affect AST enzyme activity. The same trend was obtained by ALT enzyme concentration except in both of G_4 and G_5 which supplemented with safflower and sunflower seeds in starter's calf, respectively. **Gaynor (2016)** fed rats on of safflower oil (10% fat) as the source of γ-linolenic acid, associated with increase blood levels of AST and ALT. On the other hand, **Mohsen *et al.* (2011)** reported that, the activity of AST and ALT decreased with increasing level of sunflower seeds supplementation for winter ($P>0.05$) and summer rations ($P<0.05$). The present values of serum AST and ALT enzyme activities in the different experimental groups are within the normal range for ruminants, reflecting the lowest of AST and ALT enzyme activities of the liver function in the calves fed safflower and sunflower seeds.

Table (4): Means ± SE of glucose, ALT and AST of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age.

Period (days)	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
Glucose (mg/dl)					
At birth	52.18 ±2.66	51.74 ±3.07	52.03 ±2.60	51.83 ±1.52	51.93 ±2.40
15th	53.77 ±2.35	61.75 ±3.90	59.10 ±3.15	57.37 ±2.63	56.30 ±3.01
30th	55.20 ±2.40	63.57 ±4.10	60.45 ±3.41	59.50 ±2.95	58.83 ±2.17
45th	57.73^{b}±1.80	65.70^{a} ±3.06	62.28^{ab}±2.31	61.23^{ab} ±2.42	60.55^{ab} ±1.58
60th	59.12^{b}±2.08	67.57^{a} ±1.75	64.16^{ab}±2.79	62.15^{ab} ±2.12	61.49^{ab} ±1.66
75th	60.83^{b}±1.69	68.63^{a} ±1.80	65.37^{ab}±2.94	63.40^{ab} ±2.51	62.57^{ab} ±1.70
90th	61.99^{b}±1.76	69.94^{a} ±1.66	66.57^{ab}±2.36	64.37^{ab} ±1.78	63.66^{ab} ±1.70
105th	63.81^{b}±2.00	70.90^{a} ±1.85	67.77^{ab}±2.78	65.67^{ab} ±1.70	64.85^{ab} ±1.45
Overall mean	58.08^{c}±1.02	64.97^{a} ±1.46	62.22^{ab}±1.29	60.69^{bc} ±1.09	60.02^{bc} ±1.02
AST (U/L)					
At birth	20.32 ±1.48	19.98 ±1.13	19.83 ±1.43	20.40 ±1.13	19.87 ±1.42
15th	27.24 ±0.81	28.48 ±0.55	28.76 ±0.42	29.40 ±0.43	29.28 ±1.10
30th	30.46^{b}±1.35	30.02^{b} ±0.35	31.24^{ab}±0.59	32.91^{a} ±0.23	33.08^{a} ±0.25
45th	33.48^{b}±0.71	34.39^{ab}±0.68	34.80^{ab}±0.68	36.02^{a} ±0.84	36.47^{a} ±0.71
60th	35.39^{c}±0.49	36.31^{bc} ±0.25	36.83^{b} ±0.36	38.49^{a} ±0.55	38.70^{a} ±0.45
75th	36.58^{c}±0.52	37.04^{c} ±0.46	37.82^{bc} ±0.42	39.04^{ab} ±0.27	39.30^{a} ±0.26
90th	37.40^{b}±0.65	38.33^{ab}±0.46	38.75^{a} ±0.40	39.58^{a} ±0.10	39.63^{a} ±0.08
105th	37.85^{b}±0.80	39.13^{ab}±0.20	38.95^{ab}±0.25	39.73^{b} ±0.04	39.71^{b} ±0.11
Overall mean	32.34 ±1.22	32.96 ±1.28	33.37 ±1.30	34.45 ±1.33	34.50 ±1.38
ALT (U/L)					
At birth	8.95 ±0.56	9.03 ±0.55	9.32 ±0.50	8.92 ±0.51	9.04 ±0.42
15th	12.41^{c}±0.65	14.30^{b} ±0.43	14.26^{b} ±0.53	15.56^{ab} ±0.49	16.25^{a} ±0.53
30th	14.77^{c}±0.60	16.67^{b} ±0.18	16.62^{b} ±0.44	19.53^{a} ±0.62	19.68^{a} ±0.68
45th	15.50^{c}±0.50	17.89^{b} ±0.29	17.55^{b} ±0.58	20.47^{a} ±0.55	21.15^{a} ±0.52
60th	16.56^{c}±0.58	18.64^{b} ±0.41	18.44^{b} ±0.47	21.26^{a} ±0.50	22.27^{a} ±0.56
75th	17.95^{c}±0.44	19.85^{b} ±0.25	19.46^{bc} ±0.39	23.70^{a} ±0.87	23.80^{a} ±0.28
90th	18.65^{c}±0.30	21.18^{b} ±0.95	21.31^{b} ±0.95	24.77^{a} ±0.61	25.83^{a} ±0.13
105th	19.53^{c}±0.06	22.32^{b} ±0.62	22.50^{b} ±1.09	25.10^{a} ±0.46	26.83^{a} ±0.37
Overall mean	15.54^{c}±0.70	17.48^{bc} ±0.84	17.43^{bc} ±0.84	19.91^{ab} ±1.07	20.61^{a} ±1.13

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

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5= Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

1.4. Triglyceride and cholesterol and high density lipoprotein (HDL) and low density lipoprotein (LDL):

Serum concentrations of triglycerides were similar among experimental groups (Table 5). During the experimental period, safflower and sunflower supplementation to the diet, demonstrated that insignificant increased in blood serum triglycerides especially in G_3 from 15^{th} day of age till the end of experiment compared to non-supplemented one (G_1). These results agreed with those obtained by **Alizadeha *et al.* (2010)** who reported that blood concentrations of triglycerides were not influenced as safflower seed was added to the diet of lactating cows. However, **Mirzaei *et al.* (2009)** concluded that plasma concentrations of triglycerides were higher in ewes that consumed diets contained safflower oil than the control. The present data showed that calves suckled milk from cows fed diet supplemented with sunflower seeds (G_3) were higher significantly ($P<0.05$) in overall mean of serum cholesterol concentrations than the control (Table 5). From birth till 90^{th} day of age, cholesterol concentration was no significant differences among the experimental groups. At 105^{th} day of age, cholesterol level increased significantly ($P<0.05$) in the G_3 compared to the control. Total cholesterol concentrations were the highest ($P<0.05$) after calves supplemented with sunflower seeds by suckling for 105 days of age (G_3) compared to the control group (92.95 mg/dl vs. 78.21 mg/dl, respectively) and other groups. No significantly differences were found among different groups G_2, G_3, G_4 and G_5 in serum concentrations of cholesterol. Supplementation of safflower seeds, either in suckled milk of calves or in its starter had insignificant increased serum concentrations of total cholesterol compared to the control. The same trend was obtained by **Seiquer *et al.* (1995)** who reported that, serum cholesterol of swine after 12 weeks was insignificantly differences, while increased significantly ($P<0.05$) after 50 weeks in serum cholesterol levels in group added with sunflower diet. The increase of the serum concentration of cholesterol can be related to the higher digestibility of unsaturated fats than saturated fats **(Nik-Khah *et al.*, 2003)**. These findings could also be related to increase to the synthesis of cholesterol in the epithelium of the small intestine and liver cells, and the increase of the absorption of these fats from the small intestine after dietary supplementation **(Demeyer and Doreau, 1999 and Chichlowski *et al.*, 2005)**.

Daily supplementation of plant oils, either safflower or sunflower seeds increased significantly ($P<0.05$) high density lipoprotein (HDL-cholesterol) in blood serum of calves that suckled milk from cows fed safflower or sunflower seeds (G_2 and G_3) compared to un-supplemented one (G_1), especially starting from the 60^{th} day after birth till the end of experiment (Table 6). No significantly differences were found between groups G_2 and G_3 in serum HDL concentrations. Supplementation of safflower and sunflower seeds in starter's calf had no significantly effect on serum concentrations of HDL. The present results are in agreement with those of **Seiquer *et al.* (1995)** who reported that, at 12 weeks of age there were no significant differences in serum HDL-cholesterol of swine. However, at 50 weeks of age serum HDL-cholesterol levels increased significantly ($P<0.05$) in the sunflower diet and reached values significantly higher compared to monounsaturated (olive) diet. Also, **Mirzaei *et al.* (2009)** indicated that plasma concentrations of HDL were higher in ewes that consumed diets contained safflower oil than the diets without oil. In addition, **Dai *et al.* (2011)** informed that daily supplementation of sunflower seed oils increased ($P<0.05$) serum HDL-cholesterol in dairy cows compared with feeding the control diet. The results of the present study showed that, there were no significantly differences among experimental groups in serum LDL cholesterol concentrations (Table 6). The same trend was obtained by **Petit *et al.* (2004)** who indicated that, there were no effects among treatments in serum LDL concentrations when fed dairy cows on diets contained on palm oil, whole flaxseed, whole sunflower seed and no supplemented fat (control).

Table (5): Means ± SE of triglyceride and cholesterol of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age.

Period (days)	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
Triglyceride (mg/dl)					
At birth	53.67±9.21	53.67 ±8.95	53.00 ±7.57	52.67 ±5.81	53.33 ±7.05
15th	54.33 ±9.13	55.00 ±8.66	56.33 ±6.36	54.33 ±5.21	56.00 ±6.08
30th	56.33 ±8.76	59.33 ±6.74	60.00 ±6.43	56.00 ±5.51	58.00 ±6.43
45th	58.17 ±8.28	59.67 ±5.78	63.33 ±7.26	57.33 ±5.93	59.67 ±6.57
60th	58.58 ±9.63	63.67 ±4.91	68.33 ±7.26	62.76 ±6.57	61.67 ±7.13
75th	64.00 ±0.58	65.67 ±4.33	71.33 ±8.41	66.00 ±5.86	63.33 ±6.67
90th	67.00 ±1.15	70.33 ±2.40	78.33 ±8.82	68.67 ±4.67	72.67 ±3.93
105th	69.33 ±1.76	73.00 ±2.65	80.00 ±8.72	70.33 ±4.63	74.67 ±3.84
Overall mean	60.18 ±2.41	62.54 ±2.23	66.33 ±2.97	61.00 ±2.11	62.42 ±2.33
Cholesterol (mg/dl)					
At birth	62.67 ±1.17	61.50 ±1.22	61.50 ±1.16	61.83 ±4.38	61.67 ±5.55
15th	68.67 ±6.96	64.00 ±1.35	66.00 ±1.42	63.50 ±4.44	62.50 ±6.64
30th	69.67 ±6.74	79.50 ±7.52	77.67 ±9.84	72.00 ±4.62	77.67 ±6.01
45th	72.33 ±6.49	83.17 ±8.66	86.50 ±7.69	76.67 ±6.39	80.00 ±5.29
60th	80.47 ±5.92	93.42 ±12.38	101.50 ±5.20	86.25 ±9.96	95.17 ±9.11
75th	84.87 ±5.79	102.00±10.83	108.00 ±6.29	90.67 ±10.59	102.00±9.54
90th	91.67 ±8.79	108.25 ±5.63	116.25 ±4.19	102.75 ±13.42	109.75±3.32
105th	95.33^{b}±9.84	111.00^{ab}±6.66	126.17^{a}±3.35	108.67^{ab}±12.72	109.00^{ab}±4.93
Overall mean	78.21^{b}±3.29	87.85^{ab} ±4.75	92.95^{a} ±5.27	82.79^{ab} ±4.31	87.22^{ab} ±4.28

a and b: Means with different superscripts in the same row are significantly (P < 0.05) different.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

Table (6): Means ± SE of high density lipoprotein (HDL) and low density lipoprotein (LDL) of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age.

Period (days)	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
HDL (mg/dl)					
At birth	**30.00 ±6.35**	**30.50 ±3.17**	**29.67 ±4.84**	**29.67 ±1.76**	**30.33 ±3.71**
15th	**34.00 ±2.31**	**34.00 ±1.15**	**36.50 ±2.02**	**36.00 ±2.31**	**34.50 ±1.18**
30th	**31.5. ±2.02**	**37.00 ±1.73**	**31.50 ±3.17**	**34.50 ±0.87**	**42.00 ±5.77**
45th	**34.50 ±1.44**	**44.50 ±4.33**	**45.50 ±2.59**	**42.00 ±0.58**	**35.00 ±6.93**
60th	**37.50^{b}±0.87**	**48.50^{a} ±1.15**	**48.50^{a} ±1.15**	**40.75^{ab} ±2.74**	**37.25^{b} ±5.05**
75th	**39.75^{c}±1.01**	**55.25^{a}±1.30**	**51.50^{ab}±0.29**	**35.50^{c} ±6.06**	**44.50^{bc} ±0.00**
90th	**37.00^{b}±0.58**	**48.00^{ab}±4.62**	**49.75^{a} ±0.43**	**40.50^{ab} ±4.62**	**39.50^{ab} ±3.18**
105th	**42.00^{b}±1.15**	**54.50^{a} ±2,02**	**48.00^{ab}±0.58**	**42.40^{b} ±3.18**	**49.5^{ab} ±3.18**
Overall mean	**35.78^{c}±1.11**	**44.03^{a} ±1.99**	**42.61^{ab}±1.84**	**37.66^{bc} ±1.30**	**39.07^{abc}±2.12**
LDL (mg/dl)					
At birth	**21.93 ±3.94**	**20.26 ±8.97**	**21.23 ±8.49**	**21.63 ±2.29**	**20.67 ±3.41**
15th	**23.80 ±4.33**	**16.00 ±1.15**	**23.23 ±1.08**	**18.13 ±4.98**	**9.30 ±1.01**
30th	**21.40 ±5.38**	**19.63 ±2.54**	**15.92 ±8.58**	**20.30 ±1.10**	**26.57 ±8.17**
45th	**29.20 ±3.74**	**37.23 ±7.79**	**37.33 ±9.01**	**29.20 ±3.24**	**33.57 ±7.56**
60th	**34.25 ±3.75**	**36.18 ±7.47**	**42.33 ±7.03**	**31.72 ±9.66**	**47.83 ±2.00**
75th	**34.57 ±5.53**	**40.37 ±9.05**	**45.23 ±6.05**	**36.72 ±6.99**	**52.08 ±3.32**
90th	**38.52 ±8.48**	**38.94 ±4.47**	**49.08 ±3.71**	**53.52 ±6.82**	**50.72 ±2.79**
105th	**39.47 ±9.59**	**41.90 ±9.05**	**62.17 ±5.17**	**52.20 ±9.01**	**44.57 ±1.10**
Overall mean	**30.39 ±2.27**	**31.32 ±3.17**	**37.07 ±3.83**	**32.93 ±3.26**	**35.66 ±3.34**

a, b and c: Means with different superscripts in the same row are significantly ($P < 0.05$) different.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

2. Immune response:

Table (7) showed that a significant stimulation of total leukocytic count in groups supplemented with safflower and sunflower seeds (G_2, G_3, G_4 and G_5) in comparison to the control group (G_1). The difference was significantly ($P<0.05$) between G_4 and G_1, while insignificantly among G_2, G_3, G_5 and G_1 or among G_2, G_3, G_5 and G_4. This stimulation in total leukocytic count may be attributed to the effect of safflower and sunflower seeds on the lipid content of bone marrow for producing more leukocytes. These results are in agreement with those of **Amaral *et al.* (2005)** who found that concentration of live total leukocytic count in the uterine flush appeared higher in cows supplemented with safflower oil or fish oil than those obtained with not supplemented one. There were no significant differences in differential leukocytic counts among the experimental groups.

Table (7): Means ± SE of total and differential leukocytic count of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age

Item	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
Total leukocyte ($\times 10^3$ /UL)	$6.32^b \pm 0.69$	$6.68^{ab} \pm 0.65$	$7.67^{ab} \pm 0.48$	$8.28^a \pm 0.47$	$7.79^{ab} \pm 0.18$
Neutrophil ($\times 10^3$ /UL)	2.37±0.52	2.34±0.36	3.60±0.75	3.07±0.59	2.66±0.21
Lymphocyte ($\times 10^3$ /UL)	3.57±0.47	3.91±0.37	4.30±0.68	4.14±0.56	4.53±0.18
Monocyte ($\times 10^3$ /UL)	0.236±0.04	0.354±0.08	0.384±0.05	0.383±0.07	0.308±0.05
Basophile ($\times 10^3$ /UL)	0.127±0.02	0.221±0.16	0.210±0.06	0.151±0.01	0.167±0.03

a and b: Means with different superscripts in the same row are significantly ($P < 0.05$) different.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

Table (8) shows significantly ($P<0.05$) stimulation of lymphocyte transformation for calves G_2 by suckling milk of cows fed safflower seeds compared to other groups. This stimulation may be attributed to the change of the fat content in the environment around the lymphocyte and increasing of inflammatory condition. These results are in agreement with those of

Helms *et al.* (1983) and Urata *et al.* (1992) who found significantly ($P<0.05$) increased in the percentage rosette formation, total circulating T-cells, and mutagenesis to phytohemagglutinin and pokeweed mitogen were demonstrated after only 1 week of safflower oil. Lysozyme concentration was significantly ($P<0.05$) stimulated in calves of G_3 by suckling milk of cows fed sunflower seeds compared to other groups. Percentage of phagocytic activity (Table 8), which expressed as the percentage of neutrophil which contain formazan deposits to that which doesn't contain it (Figure 1), showed significant stimulation in G_2 supplemented with safflower seeds by suckling milk of cows fed safflower seeds compared to other groups. The same trend was obtained in nitric oxide concentration. This stimulation may be attributed to the direct effect of safflower and sunflower seeds supplementation on macrophage and neutrophil function and its stimulant effect on superoxide anion causing reduction of nitro blue tetrazolium (NBT). Maternal prepartum nutritional management and postpartum lipid supplementation of the dam would influence immune response in suckling calves. Calf intake of dietary fatty acids might have been sufficient to change lymphocyte fatty acids profile to reflecting of the calf's diet **(Lake *et al.*, 2006)**. In addition, **Garcia *et al.* (2014)** reported that supplemented long-chain fatty acids prepartum in the saturated and unsaturated forms may influence the fatty acids profile of enterocytes that could affect the transfer of immunoglobulin to plasma of calves. The present results are agreement with those obtained of **Trushina *et al.* (2003)** who studied the influence of dietary polyunsaturated fatty acids on the superoxide anion production by peritoneal macrophages and phagocytosis by blood neutrophils in rats fed isocaloric purified diets contained 24% fat representing combinations of lard, sunflower oil and fish oil (eiconol) providing the ratios of w6/w3 fatty acids equal 49.0; 6.1; 1.1. The increase of superoxide formed by peritoneal macrophages and phagocytic activity of neutrophils in the group received diet with the minimal ratios of w6/w3 fatty acids compared to that in rats fed diet with ratio 49.0 was noted. The increased activity of mononuclear-phagocytic system was confirmed by morphological investigation of peripheral lymphoid organs. **Lacetera *et al.* (2004)** stated also that, concentration of tumor necrosis factor was greater in culture from neutrophils collected from cows fed safflower oil compared to those fed palm oil. In addition, **Amaral *et al.* (2005)** found that primiparous cows that fed high oleic acid of sunflower and safflower oils tended to be higher neutrophils in a uterine flush compared to those fed linolenic acid of linseed oil. While, **Pizato *et al.* (2006)** and **Kowalska *et al.* (2012)** found that dietary omega-6 and omega-3 poly unsaturated fatty acid oil or sunflower oil alter immune function in rats and reduced the immunological response of the phagocytes and lymphocytes in the fish.

Table (8): Means ± SE of lymphocyte transformation, lysozyme concentration, nitric oxide concentration and phagocytic activity of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age

Item	Experimental groups				
	G_1	G_2	G_3	G_4	G_5
Lymphocyte transformation (optical density)	**$2.14^{ab}\pm0.27$**	**$2.63^{a}\pm0.02$**	**$2.02^{ab}\pm0.29$**	**$2.14^{ab}\pm0.30$**	**$1.71^{b}\pm0.35$**
Lysozyme concentration (Ug/ml)	**$110.20^{ab}\pm0.20$**	**$99.10^{bc}\pm5.4$**	**$115.3^{a}\pm6.14$**	**$96.90^{c}\pm2.26$**	**$98.50^{bc}\pm2.7$**
Nitric oxid concentration (Ug/ml)	**$19.50^{b}\pm3.31$**	**$25.20^{a}\pm2.74$**	**$20.70^{ab}\pm3.15$**	**$19.10^{b}\pm1.96$**	**$22.90^{ab}\pm3.26$**
Phagocytic activity of neutrophil (%)	**$30.10^{b}\pm0.28$**	**$35.20^{a}\pm1.04$**	**$28.2^{bc}\pm0.14$**	**$25.60^{c}\pm2.60$**	**$29.10^{bc}\pm0.53$**

a, b and c: Means with different superscripts in the same row are significantly ($P < 0.05$) different.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

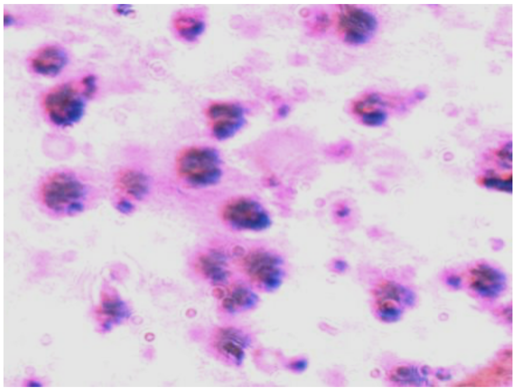
G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

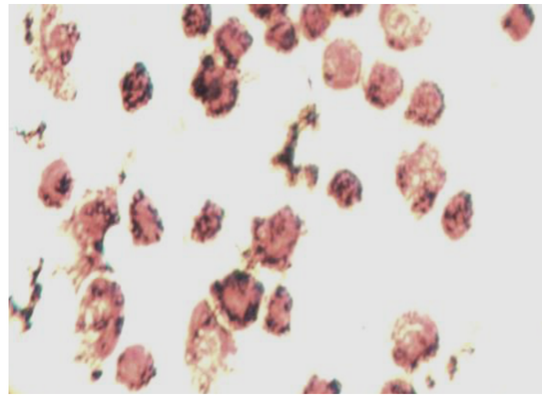
G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

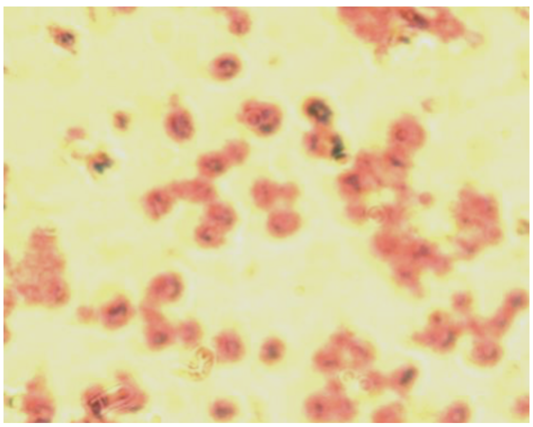
G_1 (30.1%)



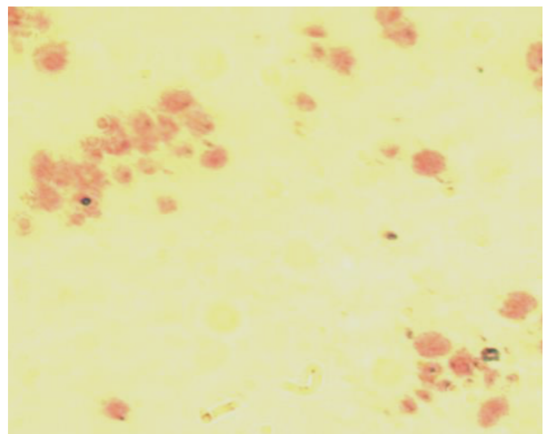
G_2 (35.2%)



G_3 (28.2%)



G_4 (25.6%)



G_5 (29.1%)

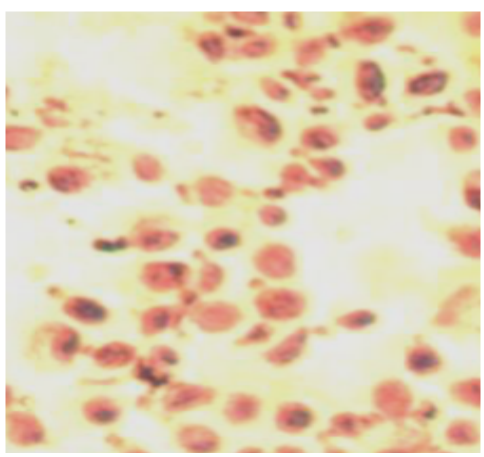


Fig. (1): Neutrophils of the experimental groups showed stained smear using oil immersion objective and total count of 100 or more of neutrophils. Record is positive when neutrophils showing formazan deposits while became negative with monochrome feature.

3. Growth performance:

Table (9) and Fig. (2) illustrated graphically showed at the development of mean body weights, total gain (TG) and average daily gain (ADG) of suckling Friesian calves fed on safflower and sunflower seeds from birth to 105^{th} day of age. Although the initial body weight (at birth) was not differ among five groups, there were marked differences in TG and ADG at the end of experimental period. TG and ADG of G_2 was significantly ($P<0.05$) higher than that of G_1, especially starting from 30^{th} day of age after birth till the end of experiment (105^{th} day of age). Total gain of G_2 group was 19.4 % higher than that in the control animals. The differences among G_2, G_3 and G_4 or among G_1, G_4 and G_5 were not significant. The elevation of growth rate of G_2 and G_3 compared to the control (G_1) was affected by safflower and sunflower seeds supplementation in calves that suckled milk from cows fed diets contained safflower and sunflower seeds which characterized by presence of a high proportion of oils (Table 2). These oils contained n-6 polyunsaturated fatty acids that include linoleic, oleic, palmitic, stearic and other minor straight-chained fatty acids which partially or completely hydrogenated and much of the glycerol is fermented to propionic acid which is a precursor for glucose (**Funston and Filley, 2002**). Consequently, increase serum glucose of calves (Table 4) and total protein (Table 3) in the calves of G_2 and G_3, which suckled milk contained on a high proportion of protein compared to other groups (Table 1).The stimulatory effect of safflower and sunflower seeds, the main source of polyunsaturated fatty acids, led to improve performance indices and feed utilization of animals**.** These results may be due to improving gain and feed utilization with fat which has been related to its energy density, higher value of nutrients digestibility and feeding values **(Ashmawy *et al*., 2013**). Similarly, **Vonghia *et al.* (1992)** reported that dietary supplemented with safflower cake in feedlot lambs improved both the daily gain and feed conversion ratio. Also, **Ashmawy *et al.* (2013**) informed that kids fed rations containing 15 or 20% whole sunflower seeds and fed the same rations of their dams of Zaraibi goats resulted in improved growth performance and viability rate of kids during the suckling and milking periods compared to kids fed on a basal diet (control).

Table (9): Means ± SE of total gain (TG) and average daily gain (ADG) of suckling Friesian calves fed whole safflower and sunflower seeds for 105 days of age

Experimental groups	TG	ADG
G_1	63.00^{c} ±2.27	0.600^{c} ±0.02
G_2	79.25^{a} ±3.35	0.760^{a} ±0.03
G_3	75.75^{ab} ±4.01	0.720^{ab} ±0.04
G_4	73.75^{abc} ±3.01	0.700^{abc} ±0.03
G_5	67.50^{bc} ±4.17	0.640^{bc} ±0.04

a, b and c: Means with different superscripts in the same column are significantly (P < 0.05) different.

TG = Total gain and ADG = Average daily gain.

G_1 = Calves that received milk and starter without safflower and sunflower supplementation.

G_2 = Calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = Calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = Calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = Calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

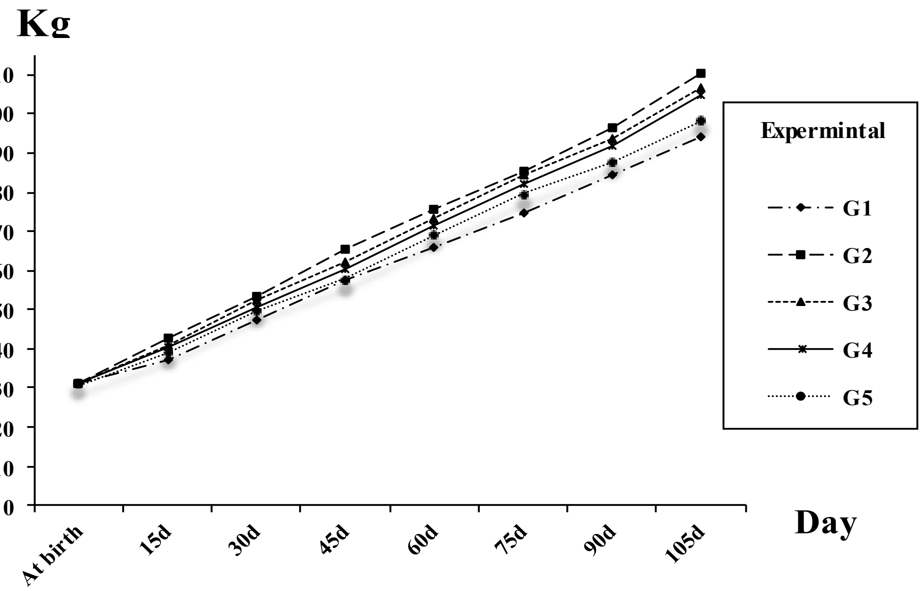


Fig. (2): Growth performance of suckling Friesian calves fed safflower and sunflower seeds for 105 days of age

G_1 = calves that received milk and starter without safflower and sunflower supplementation.

G_2 = calves that suckled milk from cows fed safflower seeds and its starter without supplementation.

G_3 = calves that suckled milk from cows fed sunflower seeds and its starter without supplementation.

G_4 = calves that suckled milk without supplementation and its starter supplemented with safflower seeds.

G_5 = calves that suckled milk without supplementation and its starter supplemented with sunflower seeds.

In conclusion, calves suckled milk from cows supplemented with safflower or sunflower seeds getting better growth performance, blood components and immune response than un-supplemented calves or calves fed starter contained these seeds. So, it can be recommended to use safflower or sunflower seeds as a new alternative to improve growth performance of suckling Friesian calves.

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تأثيراضافة بذور القرطم أو دوار الشمس على أداء النمو والإستجابة المناعية في العجول الفريزيان الرضيعة

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الملخص العربي

تهدف الدراسة إلى معرفة تاثير اضافة بذور القرطم ودوار الشمس الكاملة على اداء النمو والإستجابة المناعية لعجول الفريزيان الرضيعة من خلال دراسة بعض قياسات الدم والاستجابة المناعية لهذه العجول من الولادة وحتى الفطام. و استخدم لهذه الدراسة 20 عجل فريزيان حديث الولادة تم تقسيمها عشوائيا الى 5 مجاميع (كل مجموعة تتكون من 4 عجول). المجموعة الاولى استخدمت كمجموعة ضابطة تم رضاعة عجولها بلبن ابقار تغذت على علائق لا تحتوي على بذور القرطم او دوار الشمس. المجموعة الثانية والثالثة احتوت على عجول تم رضاعتها على لبن ابقار تغذت على علائق احتوت على بذور القرطم او دوار الشمس على التوالي بنسبة 3% كاحلال من اجمالي المادة الجافة المأكولة لمدة 105 يوم وتغذت على بادئ لا يحتوي على بذور القرطم او دوار الشمس.احتوت المجموعة الرابعة والخامسة على عجول تم رضاعتها على لبن ابقار تغذت على العليقة الضابطة مع استبدال 3% من البادئ ببذور القرطم او دوار الشمس الكاملة على التوالي. اظهرت النتائج زيادة مستويات البروتين الكلي والالبيومين والجلوبيولين في سيرم دم العجول معنويا ووصولها مبكرا للحدود الطبيعية في العجول التي رضعت من ابقار تناولت القرطم في علائقها عن باقي العجول في المجاميع الاخرى. كان هناك زيادة معنوية في مستوى الجلوكوز لعجول المجموعة الثانية بالمقارنة بالمجموعة الضابطة وذلك في اليوم الـ 45 بعد الولادة وحتى نهاية التجربة. لم تظهر اي فروق معنوية بين المجاميع التجريبية في متوسط قيم تركيزات إنزيم اسبارات أمينو ترانسفيريز وأنزيم ألانين أمينو ترانسفيريز. تقاربت تركيزات الدهون الثلاثية والبروتين الدهني منخفض الكثافة بين المجاميع التجريبية. ارتفعت متوسطات قيم تركيزات الكوليستيرول الكلي فى العجول التى تغذت على بذور دوار الشمس في البادئ حتى عمر 105 يوم مقارنة بباقي المجموعات الاخرى. ارتفع الكوليستيرول من نوع البروتين الدهني عالي الكثافة معنويا في سيرم دم عجول التي رضعت من ابقار تغذت على بذور القرطم او دوار الشمس (المجموعة الثانية والثالثة) مقارنة بالمجموعة الضابطة (المجموعة الاولى). لم تؤثر اضافة بذور القرطم او دوار الشمس على المناعة الخلوية سواء الليمفاوية او النتروفيل. تاثرت الزيادة في معدل النمو للمجموعتين الثانية والثالثة مقارنة بباقى المجاميع. يمكن التوصية باستخدام بذور القرطم او دوار الشمس كإمداد في علائق الابقار حيث كانت مؤثرة ايجابيا على مكونات الدم واداء نمو العجول الفريزيان الرضيعة.