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PERFORMANCE OF GOATS FED RATIONS CONTAINING WHOLE SUNFLOWER SEEDS

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ABESTRACT

This study consisted of two major trials, to evaluate milk productin and the other for digestability estimate. Thirty Zaraibi goats of 4-5 years old and 41.04±1.19 kg average body weight were used for milk production trial while 9 Zaraibi bucks were used for digestability trial. Animals were randomly distributed into three groups and fed ration formulated of 50% concentrate feed mixture and 50% berseem hay. Goats in group 1 acted as a control group (G1) ; goats in group 2 were fed the control group ration but 5% of concentrate mixture was replaced with sunflower seeds (*Halianthus annuus*) (G2) and goats in group 3 were fed the control ration but 10% of concentrate mixture was replaced with sunflower seeds (G3). The digestion coefficients of DM, CP and NFE are slightly increased by adding sunflower but the differences were not significant among treatment groups. There were no significant differences between groups in ruminal pH, NH_3-N and TVFA's values as a result of experimental treatment during the same collected time. Milk yield was higher ($p<0.05$) in G2 and G3 than in G1 group. Addition of sunflower seeds in the goats rations increased ($p<0.05$) milk fat, protein and total solids while decreased lactose percent. Addition of 10% sunflower seed showed higher serum total lipid, triglyceride than those of 5% sunflower seed or control with significant differences ($P<0.05$) during suckling and lactation periods while, The concentration of serum chlesterol was significantly lower in treated groups than control group espesialy with 10 % sunflower. The goats in control group had nearly the same mean serum glucose level compared to the other two groups, while the serum glucose concentration was slightly higher in suckling periob than lactation period in all groups.

KEYWORDS: Goats, Sunflower, Digestbility, Milk

INTRODUCTION

Goats are an important source of meat and milk (**French, 1970 and Devendra & Burns, 1983**). These animals are characterized by their ability to use wastes, fibrous plant material not eaten by other species of animals. There are presently more than 460 million goats worldwide producing more than 4.5 million tons of milk and 1.2 million tons of meat (**Haenlein, 1992**).

Although nutrient requirements are relatively well-defined for sheep and cattle, there is still a lack of reliable information in the literature about the nutritional needs of lactating goats. **(Aguilera *et al*., 1990)**.

Sunflower consider the third oil crop in the world where it has high nutritive value, high percentage of protein and essential fatty acids which contain non-saturated fatty acids. Meanwhile, its content of vitamin E, zinc, magnesium, iron, phosphorus, copper, and selenium are more in there availability when cultivated in new saline land by three times. Total cultivated area is around 40,000 feddan, in Egypt (Agricultural Research Centre **, ARC, 2005).**

It is worthy noting that, linseed oil or sunflower oil supplementation (at rate 5-6% of the ration) reduces the “goaty” taste in milk or fresh cheese, linked to the lower secretion of lipase and reduced post-milking lipolysis (**Chilliard *et al.*, 2003**).

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The objective of the present work was conducted to maeasure impact of feedingrations containing sunflower seeds on goats performance and milk yield and composition.

MATERIALS AND METHODS

This study consisted of two trials, one for milk productin while the second for digestability evaluation.

Milk production trial

Thirty Zaraibi goats aged 4-5 years and averaged 41.04±1.19 kg body weight were used. At the last month of pregnancy animals were randomly distributed into three feeding groups. The first, control group, G-1, fed basal ration formulated of 50% concentrate feed mixture + 50% berseem hay (on DM basis) according to NRC (1981) allowances for production of 1-2 kg milk/head/day. Goats in group 2 were fed the control ration with replace 5% of concentrate mixture with sunflower seeds (*Halianthus annuus*) (G2) and goats in group 3 were fed the control ration with replace 10% of concentrate mixture with sunflower seeds (G3).

After parturition kids were allowed to suckle their dams up to weaning at minimum body weight of 11 kg with minimum age ranged from 8 to 10 weeks. During the suckling period, milk production was measured every two weeks by hand milking twice daily (6 am and 5 pm). Milk yield was individually recorded for animals in all groups and samples were taken for chemical analysis. The total milk yield for a doe at the day of milking represent her average daily milk yield during the previous two weeks. During the day of milking, kids were removed from their dams and allowed to suckle other does. After the end of suckling, machine milking was applied for all of the experimental does twice daily up to the end of lactation where milk yield was individually measured at each milking time using Tru-Test milk meter fixed on the milk line. Milk samples were collected every two weeks through milk meter for chemical analysis. Milk composition was analyzed by milk scan apperatus.

Blood samples were taken from all animals to determine the concentration of AST, ALT, triglyceride, cholesterol, total protein and glucose.

Digestibility trial

Nine Zaraibi bucks (3 of each treatment group) were used to determine nutrients digestion coefficient and nutritive values of the experimental rations**.** The animals were kept in separate metabolic cages. Each trial consisted of 14 days as a preliminary period followed by 7 days collection period and fed with the same regime of the previous trial. Representative samples of feedstuffs and feces were analyzed to determine CP, CF, EE and ash according to **A.O.A.C. (1990)**. Chemical composition of tested feedstuffs is presented in Table (1). Rumen liquor samples were obtained via rubber stomach tube before feeding and at 3 and 6 hours after feeding to determine rumen pH, Ammonia-N concentration and Total Volatile Fatty Acids (TVFA's). Chemical composition of tested feedstuffs are presented in Table (1).

Statistical analysis for the obtained data was performed according to SAS General Liner Models Procedure (**SAS, 1985**).

RESULTS AND DISCUSSION

Digestibility trial

Table (2) show that DM, OM, CF, NFE and ash content were nearly similar among the experimental treatment diets. However, CP and EE showed relatively higher values in G-3 compared to G-1 and G-2.)

The digestion coefficients of DM, CP and NFE (Table 3) are slightly increased by adding sunflower but the differences were not significant among treatment groups, while the digestion coefficient of EE was increased ($P<0.05$) in 10% sunflower supplemented groups than control. These results are in agreement with the results obtained by **Petit *et al.* (2004).** In contrast, digestion coefficient of OM and CF decreased by adding sunflower but difference was significant ($P<0.05$) only for CF in G-3 compared to control one. These results are in agreement with **Anderson *et al.* (1984)** who reported that digestion coefficient of CF tended to be lower with sunflower seed supplemented diet and **Jenkins (1993)** who recorded that vegetable oil often depress animal fiber digestion because fiber digestibility is adversely affected by dietary fat.

Table (3) show that TDN was decreased with inceasing sunflower in tested rations, while DCP was increased, but insignificantly..

The effect of sunflower supplement on ruminal parametrs is presented in Table (4). There were no significant differences among groups in pH, NH_3-N and TVFA's values within the same collection time.However, among sampling times 0, 3 and 6 after feeding, pH values in all goats were significantly lower at 3 hrs post-feeding than at 0 and 6 hrs. On the other hand, NH_3-N and TVFA's concentrations were significantly higher at 3 hrs post-feeding than at 0 and 6 hrs. These results are in agreement with the those obtained by **France and Siddons (1993) and Kucuk *et al.* (2004)**.

Milk production trial

Milk yield:

Changes in the average daily milk yield of the different studied groups are presented in Table (5) and Fig. (1).

Lactation curveshad the same general trend among all groups, being the highst at 1st month of lactation (1.83, 2.10 and 2.07 kg/day for control; 5% sunflower and 10% sunflower, respectively), then decreased gradually up to the end of the 7th month.

Milk yield was higher ($p<0.05$) in groups G2 and G3 than G1. The apparent differences in daily milk yield throughout lactation period might be due to the better digestibility and high amount of available energy in the rations contaning sunflower seeds in G2 and G3. The changes in milk yield were very limited between 2nd and 4th month of lactaion then the yield declined sharply to the end of lactation. The resultant lactation curve for Zaraibi goats agrees **with El-Gallad *et al.*, (1988) estimates** on the same breed.

Chemical composition of milk

Chemical compositions of milk of different groups in the suckling and lactation periods are presented in table (6). It could be observed that fat, protein and total solids percentages were higher during suckling period than lactation period while lactose percent was increased in lactaion period than suckling period. These results dis agrees with results of **Mashaly *et al.*, 1984** on Egyptian Baladi goats, **Eissa, 1996** on Barki goats and **Hadjipanayitou and Koumas, 1991 on** Damascus goats who found thatmilk fat during suckling period was less than lactation period. **Hassan *et al.*, 1986 and El-Gallad *et al.*, 1988** reported that milk protein in Zaraibi ranged from 2.30 to 3.84 %. Milk total solids values ranged from 10.7% in Alpine (**Lu, 1993**) to 14.9% in Beetal goats (**Verma and Chawla, 1984**).

Addition of sunflower seeds to the goat's ration increased ($p<0.05$) milk fat, protein and total solids while decreased lactose percent. This result agree with the result of **Schmidely and Sauvant, 2001** that addition of non protected fat increased milk fat content. Meanwhile, the increase in milk fat content with the addition of calcium salts of fatty acids was more marked for ewes than goats.

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Blood parameters:

Table (7) presents that goats fed 10% sunflower seed showed higher total lipid and triglyceride than those fed 5% sunflower seed or control with significant differences ($P<0.05$) during suckling and lactation periods, while the concentration of triglyceride was relatevily higher in suckling period than lactation period. This result is not in agreement with **Zicarelli, 1988** who reported that serum triglycerides concentrations increase during lactation and show a positive correlation with milk fat levels. The values of serum triglycerides are usually considered as indicators of nutrition level, where they increase with high-fat diets (**Bertoni, 1989**).

The concentration of chlesterol was significantly lower in treated groups than control group, espesialy with 10 % sunflower. (Table 7). **Binkoski *et al.*, (2005)** reported that sunflower oil diet decreased both total and low-density lipoprotein cholesterol levels. Total cholesterol decreased by 4.7% and low-density lipoprotein cholesterol decreased by 5.8% with no effect of the experimental diets on triglyceride levels.

The control goats had nearly the same mean serum glucose level compared to the other two groups, while the serum glucose concentration was slightly higher in suckling period than lactation period. **Hyvärinen *et al.* 1976** reported that because the changes in blood glucose level may be very rapid and are affected by numerous external and internal factors, it is difficult to differentiate between the effects of nutrition and season and the potential effects of animal handling.

It would be noted also that though sunflower seed feedsupplement have positive effect of increasing the energy density of the diet, it may also suppress rumen function if given in large amounts (**Bartley 1989 and McDonald *et al.*, 1995**).

CONCLUSION

Replacment of 5% or 10% of concentrate by sunflower seeds of the goat's rations improved nutrient digestablities, ruminal parameters, milk yeild, milk fat percetage and decrease serum cholesterol.

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أداء الماعز المغذاه على علائق تحتوي على بذور عباد الشمس الكاملة

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أشتملت هذه الدراسة على تجربتين أساسيتين وهما تجربة هضم و تجربة إنتاج لبن حيث أستخدم فى تجربة الهضم عدد 9 تيوس ماعز زرايبي و فى تجربة إنتاج اللبن عدد 30 عنزة زرايبي. قسمت الحيوانات فى التجربتين إلى ثلاث مجموعات و غذيت جميع المجموعات على علائق مكونة من 50% علف مركز و 50% دريس برسيم بحيث تغطي إحتياجات حفظ الحياة و إنتاج 1-2 كجم لبن/يوم تبعا لمقررات NRC (1981) . المجموعة الأولى تمثل الكنترول و فى المجموعة الثانية إستبدل 5 % و فى الثالثة إستبدل 10 % من العلف المركز ببذور عباد شمس شمس كاملة.

أدت المعاملات إلى تحسين معامل هضم المادة الجافة و البروتين الخام و المستخلص الخالي من الأزوت. لم تكن هناك إختلافات معنوية فى مواصفات سائل الكرش بين المجموعات لكل وقت من أوقات جمع العينات. زاد معدل إنتاج اللبن اليومي و تركيز دهن اللبن و كذلك الجوامد الكلية للبن فى مجموعتى المعاملتين عن مجموعة الكنترول. أدت الإضافة الى زيادة محتوى مصل الدم من الدهون الكلية و الجلسريدات الثلاثية فى حين إنخفض محتوى الدم من الكوليستيرول فى مجموعتى المعاملتين عن مجموعة الكنترول كما كان معدل التغير فى جلكوز الدم محدود فى حين كان أكثر فى مرحلة الرضاعة عن مرحلة الحليب فى كل المجاميع.

Table (1): Chemical composition of tested feedstuffs.

Item	Chemical composition (on DM basis)						
	DM	OM	CP	CF	EE	NFE	Ash
CFM	89.91	87.73	14.42	12.11	3.51	57.69	12.27
Sunflower seeds	90.53	92.98	16.67	18.31	21.74	36.26	7.02
Fresh Berseem	17.53	84.99	14.22	26.25	1.19	43.13	15.01
Berseem hay	90.43	89.16	12.84	27.92	3.07	45.33	10.84

Table (2): The calculated chemical composition on DM basis (%) for tested rations.

Item	DM	OM	CP	CF	EE	NFE	Ash
G-1, Control	90.21	88.34	13.72	19.72	3.25	51.74	11.66
G-2, 5% sunflower	90.15	88.52	13.75	19.34	3.76	51.67	11.48
G-3, 10% sunflower	89.81	87.93	14.51	19.23	4.25	49.94	12.07

Table (3): Average digestion coefficients and nutritive values of the experimental rations.

Item	Experimental rations		
	G-1, Control	G-2, 5% sunflower	G-3, 10% sunflower
Mean, LBW (kg)	44.6±0.72	45.3±0.98	45.4±1.18
Nutrients digestibility coefficient:			
DM	65.68±0.33^{a}	67.89±0.79^{a}	68.61±0.89^{a}
OM	71.92±0.69^{a}	70.72±0.63^{a}	69.57±0.70^{a}
CP	67.32±1.56^{a}	68.95±0.31^{a}	69.42±0.86^{a}
CF	65.71±2.26^{a}	63.41±0.19^{ab}	60.36±2.07^{b}
EE	68.69±1.33^{b}	71.55±1.32^{ab}	73.36±1.17^{a}
NFE	75.71±0.71^{a}	76.88±1.08^{a}	77.25±2.36^{a}
Nutritive values			
TDN	67.44±1.28^{a}	66.22±0.98^{a}	66.01±0.95^{a}
DCP	10.11±0.18^{a}	10.46±0.17^{a}	10.61±0.09^{a}

Means within a raw with different superscripts are significantly different at (P<0.05).

Table (4): Effect of experimental rations on ruminal pH, NH_3-N and TVFA's concentrations

Item	Experimental ration		
	G-1, Control	G-2, 5% Sunflower	G-3, 10% sunflower
Ruminal pH			
0 hr	7.25±0.06^{a}	6.95±0.12^{a}	6.91±0.20^{a}
3 hr	5.40±0.15^{b}	5.41±0.13^{b}	5.52±0.13^{b}
6 hr	7.43±0.18^{a}	6.75±0.07^{a}	6.61±0.22^{a}
Ruminal NH_3-N concentration (mg/100 ml RL).			
0 hr	19.37±1.38^{b}	19.68±1.30^{b}	20.93±1.72^{b}
3 hr	22.26±0.93^{a}	23.25±0.96^{a}	24.31±1.07^{a}
6 hr	19.15±0.60^{b}	19.57±0.59^{b}	21.27±0.67^{b}
Ruminal TVFA's concentration (meq/100 ml RL).			
0 hr	13.62±2.77^{b}	9.57±0.40^{b}	9.50±0.86^{b}
3 hr	18.43±3.51^{a}	14.27±0.43^{a}	13.19±0.35^{a}
6 hr	14.72±2.91^{b}	10.91±0.23^{b}	9.95±0.82^{b}

a,b :Means within row with different superscripts are significantly different at (P<0.05).

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Table (5): LSq Means of daily milk yield (kg/h/d) of does in different treatment groups during the lactation period.

Lactation months	Treatment		
	Control (G1)	5% sunflower (G2)	10% sunflower (G3)
1	1.83±0.29^{b}	2.10±0.11^{a}	2.07±0.11^{a}
2	1.37±0.10^{b}	1.76±0.03^{ab}	1.91±0.06^{a}
3	1.40±0.04^{b}	1.69±0.06^{ab}	1.89±0.05^{a}
4	1.43±0.05^{b}	1.54±0.05^{b}	1.87±0.05^{a}
5	0.97±0.06^{b}	0.99±0.05^{b}	1.32±0.07^{a}
6	0.71±0.04^{b}	0.67±0.03^{b}	0.90±0.03^{a}
7	0.57±0.03^{b}	0.58±0.08^{b}	0.90±0.07^{a}

a, b Means within the same column with different superscripts are significantly different at P<0.05

Table (6) Chemical composition of milk for treated groups during suckling and lactation periods.

Period	Treatment	Fat	Protein	Lactose	Ash	T.S.
Suckling	Control	3.81±0.19^{b}	4.70±0.17^{b}	2.81±0.23^{a}	0.77±0.01	12.08±0.59^{b}
	5 %	4.28±0.10^{ab}	4.74±0.13^{b}	2.80±0.34^{a}	0.83±0.01	12.65±0.39^{ab}
	10 %	4.98±0.18^{a}	5.14±0.27^{a}	2.19±0.13^{b}	0.83±0.02	13.13±0.34^{a}
Lactation	Control	2.77±0.07^{b}	3.47±0.21^{a}	3.46±0.21^{a}	0.70±0.01	10.40±0.12^{a}
	5 %	3.21±0.12^{ab}	3.26±0.25^{b}	3.10±0.07^{b}	0.74±0.02	10.30±0.27^{b}
	10 %	3.37±0.13^{a}	3.25±0.31^{b}	3.02±0.17^{b}	0.73±0.01	10.36±0.32^{a}

a, b Means within the same column with different superscripts are significantly different at P<0.05

Table (7) Average of some blood parameters during suckling and lactation periodes for different treatments.

Period	Treatment	Total lipids	Triglyceride	Cholesterol	Glucose
Suckling	Control	156.8±31.8^{b}	69.6±10.64^{c}	86.7±7.7^{a}	58.1±5.66
	5 %	317.4±12.1^{a}	86.6±12.62^{b}	66.9±3.59^{b}	58.6±5.33
	10 %	357.7±21.0^{a}	1002.±9.89^{a}	59.4±3.71^{c}	56.7±4.46
Lactation	Control	224.3±22.4^{b}	46.50±1.22^{a}	86.7±6.30^{a}	45.9±3.06^{b}
	5 %	469.9±85.9^{a}	71.1±15.28^{ab}	83.2±8.73^{a}	53.5±4.54^{a}
	10 %	502.1±88.8^{a}	87.6±16.87^{a}	77.95±7.59^{b}	49.6±2.48^{b}

a, b and c Means within the same column with different superscripts are significantly different at P<0.05