EFFECT OF USING SOME NATURAL FEED ADDITIVES ON PERFORMANCE OF LACTATING GOATS

Ali, M.F.
Dept. of Anim. Prod., Fac. of Agric., Kafrelsheikh University.

SUMMARY

Twenty-eight Damascus goats at 3-5 years old and weighing 52.96 ± 1.27 kg live body weight (LBW) at the last month of gestation were divided into four similar groups (7 goats each). The trial period was divided to suckling period (60 days) and lactation period (150 days). The first group (control) fed a basal diet (T1) that consisted of 50% concentrate mixture (CM) and 50% roughages (35% fresh berseem + 15% wheat straw during suckling period or 50% berseem hay during lactation period) without additives, whereas the second, third and fourth groups (T2, T3 and T4) fed the basal diet supplemented with seeds of fennel (*Foeniculum vulgare L.*), caraway (*Carvum carvi L.*) and fenugreek (*Trigonella foenum-graecum L.*) to concentrate mixture at the rate of 100, 100 and 200 mg seeds/kg LBW/day, respectively. At the end of the lactation period, four digestibility trails were carried out to evaluate the experimental rations, using twelve goats averaged 57.05 ± 2.45 kg LBW (3 goats from each group). After weaning, 23 kids were used in a feeding trial and divided into four groups which fed the previous four treatments (6, 5, 5 and 7 kids in T1, T2, T3 and T4, respectively).

The results showed that the digestibility of all nutrients and nutritive values (as TDN, DCP and ME) for T2 and T3 were increased ($P<0.05$) comparing with T1 (control). The digestibility of EE and NFE for T4 were increased ($P<0.05$), while CF digestibility was decreased ($P<0.05$) comparing with T1 (control). Also, adding FK to T4 led to increase ($P<0.05$) the nutritive value as TDN and ME comparing with T1 (control). All feed additives caused a significant ($P<0.05$) increase of albumin, while cholesterol concentration in blood serum was decreased.

The results of feeding trials indicated that weaning weight, final weight and average daily gain of kids increased ($P<0.01$) by adding FL, CY and FK seeds. Also, feed conversion and

economical efficiency improved, while feed cost decreased by using the three natural additives. Milk yield, 4% fat corrected milk yied and feed efficiency improved by using different additives in goat's rations. The chemical composition of milk was unaffected significantly by using these additives, except percentage of protein for FK treatment was higher ($P<0.05$) than that for control, while fat, protein and total solid yields were significantly ($P<0.05$) increased by the tested additives.

Key words: Fennel, caraway fenugreek, lactating goats, digestibility trial, kids performance, milk production and milk composition.

INTRODUCTION

Using chemical products especially hormones and antibiotics as feed additives in animal and poultry rations to improve their productive performance may cause unfavorable side effects. Moreover, these products could be considered as pollutants for human and threaten their health on the long-run. Attempts to use the natural materials such as medicinal plants could be widely accepted as feed additives to improve the efficiency of feed utilization and animal productive performance (Aboul-Fotouh et al., 1999).

Trease and Evans (1983) reported that fennel seeds contains about 1-4% of volatile oil which consists of phenolic ether, anethole and the ketone; and fenchone, while caraway seeds contains 3-7% of volatile oil and 8-10% of fixed oil, the volatile oil consists of the ketone carvone and the terpene limonene with small quantities of dihydrocarvone, carveol and dihydrocarveol, also they found that fenugreek contains volatile oil, anethole, fenchone, camphene phellandrene and an amino acid called 4-hydroxyisoleucine, which appears to increase the body's production of insulin when blood sugar levels are high. Simon et al., (1984) observed that fennel is a good herb for the entire digestive system as a laxative, appetite stimulant, antispasmodic and carminative, relieves abdominal pain, and is useful for gastrointestinal and colon disorders. It acts as a mild expectorant; useful for coughs or bronchitis and to resolve phlegm, promotes liver and kidney function and health. Caraway stimulates the functions of the

digestive organs relaxes spasms of smooth muscles and acts as anti-spasmodic, tonic and activates the digestive system (Edinger, 1982). However, Sahelian (2004) reported that fenugreek benefits the digestive system as a laxative, intestinal lubricant, carminative, vomiting, colitis, swell, vermifuge, digestive and tonic, helps dissolve fat and cholesterol deposits, prevents fat accumulation and water retention, and helps lower blood sugar levels. It is used to treat abscesses, inflammation, wounds, coughs, arthritis and bronchitis as well as to reduce mucus production and good for asthma and lung disorders.

Abo El-Nor (1999) and Khattab et al. (2001) observed that adding fenugreek or caraway seeds to buffaloes diets increased the milk production. Moreover, Allam et al (1999) and Saleh (2004), indicated that milk yield and fat corrected milk yield (4%) were increased by addition of fenugreek seeds in goats and ewes rations, respectively.

Therefore, the experiment was conducted to study the effect of addition of fennel (*Foeniculum vulgare L.*), caraway (*Carvum carvi L.*) and fenugreek (*Trigonella foenum-graecum L.*) seeds into the rations of Damascus goats on nutrients digestibility, rumen fermentation, some blood parameters, milk yield, milk composition and kids performance.

MATERIALS AND METHODS

The present study was carried out at the Sakha Research Station, Animal production Research Institute, Ministry of Agriculture and the Department of Animal Production, Faculty of Agriculture, Kafrelsheikh University, Egypt.

Twenty-eight Damascus goats at 3-5 years old and weighing 52.96 ± 1.27 kg live body weight (LBW) at the last month of gestation were divided into four similar groups (7 goats each). The trial period was divided to suckling period (60 days) and lactation period (150 days). The first group (control) fed a basal diet (T1) that consisted of 50% concentrate mixture (CM) and 50% roughages (35% fresh berseem + 15% wheat straw during suckling period or 50% berseem hay during lactation period) without additives, whereas the second, third and fourth groups (T2, T3 and

T4) fed on the basal diet supplemented with seeds of fennel (*Foeniculum vulgare L.*), caraway (*Carvum carvi L.*) and fenugreek (*Trigonella foenum-graecum L.*) to concentrate mixture at the rates of 100, 100 and 200 mg seeds/kg LBW/day, respectively. Animals were fed according to NRC requirements (1996) for production of 1-2 kg milk/head/day and the water was available all time. The chemical composition of the feed ingredients and the basal diet is shown in Table (1).

Table (1): Chemical composition of the feed ingredients and basal diet.

Item	DM %	DM composition, %					
		OM	Ash	CP	CF	EE	NFE
Ingredients							
Concentrate mixture	90.98	89.99	10.01	13.89	14.73	3.85	57.52
Fresh berseem (FB)	16.87	88.95	11.05	13.92	27.52	2.04	45.47
Wheat straw (WS)	91.57	87.02	12.98	3.01	37.04	1.56	45.41
Berseem hay (BH)	90.38	88.16	11.84	12.96	26.35	1.68	47.17
Basal diet, calculated							
In suckling period [1]	65.13	89.18	10.82	12.27	22.55	2.87	51.49
In lactation period [2]	90.68	89.08	10.92	13.43	20.54	2.77	52.34

1- Consisted of 50% CM + 35% FB + 15 WS.
2- Consisted of 50% CM + 50% BH.

After lambing, kids were weighted every 15 days during the experimental period (210 days). After weaning, 23 kids were used in a feeding trial and divided into four groups, which fed on the previous four treatments (6, 5, 5 and 7 lambs in T1, T2, T3 and T4, respectively). During the suckling period, does of all groups were milked by hand every 15 days. Hand milking was carried out twice at the day of milking (6 a.m. and 5 p.m.), milk yield was individually measured, recorded and samples were taken for chemical analysis. The total milk yield for a doe at the day of milking was considered to represent her average daily milk yield during the previous 15 days. During the day of milking, kids were removed from their dams and allowed to suckle other goats. At the end of suckling period, machine milking was applied for all of the experimental does twice daily up to the end of lactation period.

Milk yield was individually measured at each milking time using Tru-Test milk meter fixed on the milk line. Milk samples, 100 ml each, were taken monthly for chemical analysis. Milk samples were analyzed for fat, total protein, total solid (TS) and ash according to methods of Ling (1963).

At the end of the lactation period, four digestibility trails were carried out to evaluate the experimental rations by using twelve goats averaged 57.05 ± 2.45 kg LBW (3 goats from each group). Collection period lasted 7 days, feces samples were collected twice daily during the collection period. Actual feed intake and excreted feces for each goat were recorded. Nutrient digestibilities were determined using acid insoluble ash (AIA) technique as described by Van Keulen and Young (1977). Composite samples of feeds and feces were analyzed according to AOAC (1990). Each animal was given daily diets individually. Rumen liquor samples were obtained using a rubber tube from all animals at 4 hrs. after the morning feeding, samples were strained through two folds of cheesecloth. The pH values were immediately measured by Beckman pH meter. The ruminal ammonia-nitrogen (NH_3-N) was determined according to AOAC (1990). While, the total volatile fatty acids (TVFA's) concentration was determined according to Warner (1964). At the same time of rumen liquor collection, blood samples were taken from the jugular vein. Blood serum was separated within one hour and analyzed for glucose according to Trinder (1969). Total proteins were determined according to Henry et al. (1974), while, albumin was assayed according to the method of Doumas et al. (1971). Estimation of globulin was done by subtracting albumin values from total proteins values. Activity of aspirate (AST) and Alanin aminotransferase (ALT); and cholesterol concentration were estimated according to the methods described by Varley (1976). Estimation of all blood constituents were done calorimetrically using commercial kits.

Statistical analysis for the obtained data was performed according to SPSS computer program (SPSS, 1999).

RESULTS AND DISCUSSION

Data in Table (2) cleared that the nutrients digestibility were significantly ($P<0.05$) increased for T2 and T3 comparing with T1 (control). However, the nutrients digestibility of T4 were insignificantly increased, except EE and NFE digestibility increased significantly ($P<0.05$), while CF digestibility decreased ($P<0.05$) comparing with T1 (control), which may be due to that FK may contain some component which may affect the viability or activity of cellulolytic bacteria or decrease the number of cellulolytic bacteria or may increase Turnover rate of the digest and consequently decrease the fiber digestion (Saleh, 2004). In addition, the data showed that adding FL, CY and FK significantly ($P<0.05$) increased the TDN and ME values by 6.5, 12.7 and 5.2% for T2, T3 and T4, respectively comparing with T1 (control). Higher DCP values for T2, T3 and T4 were recorded, it increased by 5.8, 17.5 and 1.7%, respectively than T1 (control). The positive effect of these coefficients as affected by adding these natural additives was parallel to the enhancements in milk yield of goats (Table, 4) and ADG of kids (Table, 6), this enhancement may be due to incorporation these additives in some essential nutrients (Soliman et al., 1995), which may improve the absorption of nutrients through the small intestine as well as the digestibility coefficients. These results were in agreement with the results of Allam, et al. (1999), who found that the digestibility of EE increased with adding fenugreek seeds, also the TDN and DCP increased from 54.3 and 10.1 to 57.4 and 10.5%, respectively. Moreover, Khattab et al. (2001) observed that the addition of 200 g fenugreek seeds, 50 g caraway, 50 g black seeds and 100 g *Lepidium sativum* to the basal diet of lactating buffaloes led to increase ($P<0.05$) the nutrients digestibility in the treated rations compared with the control ration.

Saleh (2004) reported that the digestibility of EE was significantly ($P<0.05$) increased by 17.8 and 10.9%, while the CF digestibility was decreased by 10.7 and 15.4% when the basal diet of lactating ewes was supplemented with ground fenugreek seeds (GFS) by 20 and 40 g/h/day, respectively, but the differences between the control diet and the treated diets were not significant.

Abdel-Azeem (2006) reported that adding of both FK and FL (0.5 and 1.0%) increased the digestibility of DM and CP except DM digestibility of 1.0% FK diet, which gave the lowest value when compared to the control group. The highest (P<0.01) CF digestibility was recorded with birds received 0.5% FL diet.

Table (2): Feed intake, nutrients digestibility and nutritive value of the experimental rations used in goats feeding.

Items	Treatments				SE M
	T1(control)	T2 (FL)	T3 (CY)	T4 (FK)	
DM intake (kg)	1.580	1.580	1.580	1.580	--
Digestibility, %					
DM	68.15^{c}	72.84^{b}	75.48^{a}	69.89^{c}	1.84
OM	71.12^{c}	75.01^{b}	77.97^{a}	72.67^{c}	2.01
CP	63.85^{c}	67.59^{b}	75.05^{a}	65.01^{c}	1.51
CF	58.99^{b}	63.45^{a}	65.84^{a}	55.54^{c}	1.91
EE	61.24^{c}	71.05^{b}	73.14^{a}	74.45^{a}	2.41
NFE	73.13^{c}	77.06^{b}	81.37^{a}	78.92^{b}	1.76
Nutritive value, %					
TDN	62.79^{c}	66.88^{b}	70.76^{a}	66.09^{b}	3.1
DCP	8.58^{c}	9.08^{b}	10.08^{a}	8.73b^{c}	1.2
ME (Mcal/kg DM)	2.261^{c}	2.408^{b}	2.547^{a}	2.379^{b}	0.14

^{a,b,c} means in the same row with different superscripts differ significantly at (P<0.05).
T1: 50% CM +50% BH without additive. T2, T3 and T4: T1+100, 100 and 200 mg FL, CY and FK seeds / kg LBW/d, respectively.
ME, Mcal/kg DM=(TDN×3.6)/100 (Church and Pond, 1982).

Results in Table (3) showed that the Fl, CY and FK supplementation to goat's diets did not significantly affect rumen pH values and total VFA's concentrations, while the concentration of NH_3-N significantly (P<0.05) decreased with using the feed additives comparing with the control ration. These results agreed with Allam et al. (1999) and Mohamed et al. (2003), who reported that the ruminal pH value insignificantly affected by medicinal plants (fenugreek seeds, chamomile, *Nigella sativa*) supplementation. Also, their results indicated that the addition of medicinal plants to the tested diets decreased (P<0.05) NH_3-N concentration comparing with the control diet.

Data in Table (3) indicated that serum total proteins and globulin were significantly (P<0.05) increased by adding FL and CY into the ration comparing with FK and the control rations. No

significant differences were observed between FK and the control ration. On the other hand, all feed additives significantly (P<0.05) increased albumin and decreased cholesterol concentration. These results are in agreement with those reported by Saleh (2004), who found that serum TP and GL concentrations unaffected, while serum albumin concentration increased (P<0.05) and cholesterol concentration decreased (P<0.05) by adding GFS to the rations of lactating ewes. Also, Abo El-Nor (1999) found that plasma cholesterol concentration decreased by adding fenugreek seeds to buffaloes rations.

Table (3): Effect of supplementing fennel, caraway and fenugreek seeds on the rumen liquor and some blood parameters of goats.

Items	Treatments				SEM
	T1 (control)	T2 (FL)	T3 (CY)	T4 (FK)	
Rumen liquor parameter:					
pH	6.01	5.80	5.73	5.95	0.12
Ammonia- N, mg/100ml	29.54^{c}	24.01^{a}	23.58^{a}	26.01^{b}	1.75
Total VFA's, meq/100ml	8.73	9.15	10.45	8.98	1.41
Some blood parameters:					
Glucose, mg/100ml	61.85	62.85	63.01	62.01	1.18
Total protein, g/100ml	6.15^{b}	7.24^{a}	7.62^{a}	6.29^{b}	0.75
Albumen (AL), g/100ml	3.13^{c}	3.85^{a}	4.02^{a}	3.27^{b}	0.12
Globulin(GL), g/100ml	3.02^{b}	3.39^{a}	3.60^{a}	3.02^{b}	0.61
AST, units/ml	38.15	37.29	36.98	37.54	1.54
ALT, units/ml	18.84	16.57	16.28	17.31	1.24
Cholesterol, mg/100ml	125.75^{a}	108.57^{c}	103.98^{c}	115.54^{b}	6.71

^{a,b,c} means in the same row with different superscripts differ significantly at (P<0.05). T1: 50% CM +50% BH without additive. T2, T3 and T4: T1+100, 100 and 200 mg FL, CY and FK seeds / kg LBW/d, respectively.

In addition, data in Table (3) showed that the activites of AST and ALT were decreased, while glucose concentration increased by adding FL, CY and FK to the rations compared to the control ration. However, the differences were not significant. The results are also in agreement with those reported by Saleh (2004), who found that values of AST, ALT, total lipids; triglycerides and urea concentration were not-significantly decreased by GFS supplements. Moreover, Khattab et al. (2001) observed that the addition of 200 g fenugreek seeds to the basal diet of lactating

buffaloes increased (P<0.05) blood glucose compared with the control group.

Data in Table (4) showed that during suckling period the ADG of goats fed T2, T3 and T4 supplemented with FL, CY and FK was significantly (P<0.05) higher than that of those fed T1.

Table (4): Effect of supplementing fennel, caraway and fenugreek seeds on the performance of lactating goats.

Items	Treatments				SEM
	T1	T2	T3	T4	
Suckling period (1- 60 days)					
Initial weight of goats, kg.	48.14	46.71	48.29	48.43	1.15
Final weight of goats, kg.	52.57	52.43	53.71	53.71	--
Total gain, kg	4.43	5.72	5.42	5.28	--
Av. Daily gain, g.	74^{b}	95^{a}	90^{a}	88^{a}	0.10
DM intake, g/h/d					
Concentrate mixture	1000	1000	1000	1000	--
Fresh berseem	700	700	700	700	--
Wheat straw	300	300	300	300	--
Total	2000	2000	2000	2000	--
Total milk yield, kg/h	52.4^{c}	62.2^{b}	74.1^{a}	59.1^{b}	0.01
Daily milk yield, g/h/d	873^{c}	1037^{b}	1235^{a}	985^{b}	23.93
Feed efficiency, g DM/g MY	2.29	1.93	1.62	2.03	
Lactating period (61- 210 days)					
Initial weight of goats, kg.	52.57	52.43	53.71	53.71	--
Total DM intake, g/h/d	2250	2250	2250	2250	--
Concentrate mixture	1125	1125	1125	1125	--
Berseem hay	1125	1125	1125	1125	--
Total milk yield, kg/h	105.5^{c}	119.4^{b}	128.4^{a}	120.6^{b}	1.95
Daily milk yield, g/h/d	703^{c}	796^{b}	856^{a}	804^{b}	11.83
Feed efficiency, g DM/g MY	3.20	2.83	2.63	2.80	--
Suckling and lactating period (1- 210)					
Total milk yield, kg/h	157.9^{c}	181.6^{b}	202.5^{a}	179.7^{b}	1.96
Daily milk yield, g/h/d	752^{c}	865^{b}	964^{a}	856^{b}	15.88
DM intake, g/h/d	2179	2179	2179	2179	--
Fat corrected milk (4%), g/h/d	591^{c}	702^{b}	751^{a}	706^{b}	13.54
Feed efficiency, g DM/g MY	2.90	2.52	2.26	2.54	--
Feed efficiency, g DM/g FCM	3.69	3.10	2.90	2.09	--

^{a,b,c} means in the same row with different superscripts differ significantly at (P<0.05).
T1: 50% CM +50% BH without additive. T2, T3 and T4: T1+100, 100 and 200 mg FL, CY and FK seeds / kg LBW/d, respectively

In the same trend, the averages of total milk yield (TMY), daily milk yield (DMY) and 4% fat corrected milk (FCM) during suckling and lactating periods were significantly ($P<0.05$) increased by adding the supplemented feeds to goat's rations (T2, T3 and T4) comparing with those fed T1. Also, feed efficiency improved by 13.1, 22.1 and 12.4% with supplementing FL, CY and FK, respectively. Increasing milk yield may be due to that these additives may contain some active substance stimulating hypothalamus to increase the releasing factor of prolactin hormone or stimulating directly the pituitary gland to increase their release from prolactin hormone leading to increase milk production (Saleh, 2004).

These results are in agreement with the results of Allam et al. (1999), who reported that adding FGS to Zaraiby goat's ration at level of 500 mg/kg LBW increased milk production by 34%. Also, Abo El-Nor (1999) found that adding fenugreek seeds (FGS) to lactating buffaloes diet at level of 100 and 200 g/h/d increased milk yield by 11.1 and 19.7%, respectively and also improved feed efficiency. Khattab et al. (2001) observed that the addition of 200 g fenugreek seeds, 50 g caraway, 50 g black seeds and 100 g *Lepidium sativum* to the basal diet of lactating buffaloes led to increasing ($P<0.05$) milk yield and 4% FCM comparing with the control.

Saleh (2004) observed that mean milk yield was significantly ($P<0.05$) improved by 11.4 and 14.1% with supplementing GFS levels at 20 and 40 g/h/d, respectively and they also improved feed efficiency compared with the control ration.

Results in Table (5) indicated that milk composition was not affected by adding FL, CY and FK seeds except percentage of protein for FK treatment was higher ($P<0.05$) than that for control. On the other hand, the addition of the three natural additives into goat's rations increased fat yield by 22.6, 25.8 and 25.1%; protein yield by 20.2, 29.0 and 33.8%; and TS yield by 17.4, 28.4 and 17.4%, respectively comparing with the control ration. Increasing nutrients yield for goats fed T2, T3 and T4 may be due to increasing their milk yields. These results agree with Allam et al. (1999), who reported that CP% of goat's milk was non-significantly increased with supplements of fenugreek seeds to goats ration.

Moreover, Abo El-Nor (1999) found that adding fenugreek seeds did not significantly affect neither SNF nor TS content of buffalo's milk. Also, they observed increasing milk yield and nutrient yield by adding GFS. Khattab et al. (2001), indicated that milk composition of lactating buffaloes was not affected by FK and CY seeds, except for lactose content which had significantly ($P<0.05$) increased for treated animals than the control. Also, daily fat, protein, SNF and lactose yields were increased ($P<0.05$) for treated groups compared to the control. Saleh (2004) reported that chemical composition of milk was insignificantly affected by adding the GFS, except for fat% which decreased by adding the GFS. In addition, fat, protein and total solid yields were increased by the GFS supplementation.

Table (5): Milk composition and nutrient yield produced by goats as affected by the experimental rations.

Item	Treatments				SEM
	T1 (control)	T2 (FL)	T3 (CY)	T4 (FK)	
Milk composition % :					
Fat	2.58	2.75	2.53	2.83	0.18
Protein	2.88^{b}	3.01^{ab}	2.90^{b}	3.39^{a}	0.18
Casein	2.90	2.40	2.36	2.71	0.17
TS%	10.31	10.53	10.32	10.64	0.34
SNF	7.73	7.78	7.49	7.81	0.27
Ash	0.77	0.77	0.74	0.75	0.01
Nutrient yield, kg:					
Fat	4.07^{b}	4.99^{a}	5.12^{a}	5.09^{a}	0.21
Protein	4.55^{c}	5.47^{b}	5.87^{a}	6.09^{a}	0.19
TS	16.28^{c}	19.12^{b}	20.90^{a}	19.12^{b}	0.31

^{a,b,c} means in the same row with different superscripts differ significantly at ($P<0.05$).
T1: 50% CM +50% BH without additive.
T2, T3 and T4: T1+100, 100 and 200 mg FL, CY and FK seeds / kg LBW/d, respectively.

Results in Table (6) indicated that adding FL, CY and FK seeds in goat's rations during suckling period significantly ($P<0.01$) improved the weaning weight by 13.86, 32.04 and 13.32%; and the ADG by 14.75, 43.44 and 18.85%, respectively, this parameter

reflects indirectly the milk production during suckling period. After weaning period adding these additives to the kids rations were significantly increased (P<0.01) the ADG, improved feed conversion by 18.9, 20.8 and 15.7% and economical efficiency by 21.4, 24.4 and 16.7%, while decreased feed cost by 17.6, 19.6 and 14.1%, respectively comparing with control ration.

Table (6): Performance of kids during suckling their dams and after weaning fed ration with or without some natural feed additives

Items	Treatments				SEM
	T1 (control)	T2 (FL)	T3 (CY)	T4 (FK)	
Suckling period					
No. of lambs	9	8	9	11	--
Birth weight, kg	3.78	4.25	4.17	3.91	0.12
Weaning weight, kg	11.11^{c}	12.65^{b}	14.67^{a}	12.59^{b}	0.46
Total gain, kg	7.34	8.40	10.50^{a}	8.68	0.45
Av. Daily gain, g	122^{c}	140^{b}	175^{a}	145^{b}	7.21
After weaning					
No. of lambs	6	5	5	7	--
Weaning weight, kg	11.11^{c}	12.65^{b}	14.67^{a}	12.59^{b}	0.46
Final weight, kg	24.00^{c}	29.40^{b}	33.20^{a}	28.71^{b}	1.04
Total gain, kg	12.89^{c}	16.75^{b}	18.53^{a}	16.12^{b}	0.76
Av. Daily gain, g	86^{c}	112^{b}	124^{a}	107^{b}	5.00
DM intake, g/h/d					
Basal diet	895	943	1020	935	--
Additives	--	2.5	3.0	4.8	--
Total	895.0	945.5	1023.0	939.8	--
Feed conversion, kg DM/Kg gain	10.41	8.44	8.25	8.78	--
Feed cost, PT/h/d	89.5	96.1	103.8	95.7	--
Feed cost, LE/kg gain	10.41	8.58	8.37	8.94	--
Economical efficiency*	1.68	2.04	2.09	1.96	--

a,b,c means in the same row with different superscripts differ significantly at (P<0.01).
T1: 50% CM +50% BH without additive.
T2, T3 and T4: T1+100, 100 and 200 mg FL, CY and FK seeds / kg LBW/d, respectively
The feed cost was calculated according to the price list of one kg (season 2007) of CM, BH , FL, CY and FK were1.25, 0.75, 6.00, 6.00 and 4.50 LE, respectively.
*Economical efficiency= price of one kg LBW (17.5 LE) / feed cost (LE/kg gain).

The improvement of ADG for kids fed treated rations may be due to antibacterial related to flavonoids in the most of natural additives (Bhatti et al., 1996 and Abou-Raiia et al., 1991) that led to maintaining normal intestine microflora by competitive exclusion and antagonism, altering metabolism and increased liver and muscle glycogen contents (Gomez et al., 1988). Moreover, Oktay et al. (2003) found that fennel is a potential source of natural antioxidant due to increasing digestive enzymes activities and decreased bacterial enzyme activity. These results are in agreement with those reported by Saleh (2004), who found that the ADG of lambs during suckling period was improved by 2.9 and 12.5% for low and high level of GFS (20 and 40 g/h/d, respectively) in the rations of ewes compared to control.

From the previous results, it could be concluded that supplementing goat's diet with fennel, caraway and fenugreek seeds improved most of nutrients digestibility and nutritive values. Moreover, these additives increased milk, fat, protein and total solid yields as well as ADG of kids, also improved feed conversion and economical efficiency, while decreased feed cost. Using these additives increased serum albumin concentration and decreased the serum cholesterol concentration.

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الملخص العربي

تأثير استخدام بعض الإضافات الغذائية الطبيعية علي أداء الماعز الحلابة

محمد فريد السيد علي
قسم الإنتاج الحيواني، كلية الزراعة، جامعة كفر الشيخ

أجريت هذه الدراسة علي ٢٨ من ألماعزالدمشقى في الشهر الأخير من الحمل، متوسط عمرها ٣-٥ سنوات، و تزن٥٢,٩٦ ±١,٢٧ كجم. قسمت إلي ٤ مجموعات متماثلة (٧ حيوانات في كل مجموعة) في تجربة استمرت ٦٠ يوما فترة رضاعة و ١٥٠ يوما فترة حليب. غذيت المجموعة الاولي (الكنترول) علي العليقة الأساسية (ع١) والتي تكونت من ٥٠ % مخلوط العلف المركز + ٥٠% مادة مالئة (٣٥% برسيم اخضر + ١٥% تبن قمح أثناء فترة الرضاعة أو ٥٠% دريس برسيم أثناء فترة الحليب) بدون إضافات. بينما غذيت المجموعة الثانية والثالثة والرابعة علي المعاملات ع٢، ع٣، ع٤ والتي تكونت من العليقة الأساسية (ع١) مضاف إليها ١٠٠، ١٠٠، ٢٠٠ مجم من بذور الشمر والكروية والحلبة / كجم وزن حي/ يوم على الترتيب لدراسة تأثير هذه الإضافات علي أداء الماعز الحلابة. في نهاية فترة الحليب أستخدم ١٢ حيوانا لإجراء أربع تجارب هضم (٣ حيوانات من كل مجموعة) لتقييم العلائق التجريبية باستخدام طريقة AIA، كما أخذت عينات من سائل الكرش و الدم في

نهاية فترة التجربة. تم تقدير معدل النمو للنتاج خلال فترة الرضاعة كما تم إجراء تجربة نمو عليها بعد الفطام استمرت ١٥٠ يوما وأوضحت النتائج ما يلي:

١- ازدادت معاملات هضم كل المركبات الغذائية و القيمة الغذائية (مجموع المركبات الغذائية المهضومة، البروتين المهضوم، الطاقة القابلة للتمثيل) للمعاملة الثانية (ع٢) والثالثة (ع٣) معنويا (٠,٠٥) مقارنة بمعاملة الكنترول (ع١). كما ازدادت معاملات هضم الدهن الخام والكربوهيدرات الذائبة بينما انخفض معامل هضم الألياف الخام معنويا (٠,٠٥) للعليقة الرابعة (ع٤) مقارنة بمعاملة الكنترول (ع١). كما أن إضافة الحلبة (ع٤) أدت إلي زيادة معنوية (٠,٠٥) في قيم ال TDN و الطاقة القابلة للتمثيل.

٢- أدت كل الإضافات الغذائية إلي زيادة تركيز الالبيومين وانخفاض تركيز الكلسترول في سيرم الدم معنويا (٠,٠٥).

٣- تحسن وزن الفطام والوزن النهائي ومتوسط الزيادة اليومية للنتاج معنويا (٠,٠١) بإضافة بذور الشمر والكروية والحلبة، كما تحسن معامل تحويل الغذاء والكفاءة الاقتصادية بينما انخفضت تكلفة الغذاء باستخدام الإضافات الثلاثة.

٤- تحسن معنويا (٠,٠٥) إنتاج اللبن واللبن المعدل (٤% دهن) ومعامل تحويل الغذاء باستخدام هذه الإضافات في علائق الماعز.

٥- لم يتأثر التحليل الكيماوي للبن معنويا باستخدام هذه الإضافات ما عدا نسبة البروتين في معاملة الحلبة كانت اعلي معنويا عنها في الكنترول بينما ازداد معنويا (٠,٠٥) الإنتاج الكلي من الدهن والبروتين والمواد الصلبة.