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INFLUENCE OF SOME MEDICINAL PLANTS MIXTURES AS FEED ADDITIVES ON BALADY LACTATING GOAT PERFORMANCE AND SOME BLOOD PARAMETERS.

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ABSTRACT

Completely randomized block design was applied to study the effect of three different natural additives mixtures NAM (NAM1, NAM2 & NAM3) on goat does performance. Forty pregnant Balady does with an average live body weight of 38.5 ±1.5 kg (LBW) and aged 3-4 years were divided into four similar groups. The control diet (CD) consisted of concentrate feed mixture (CFM) , berseem hay (BH) and wheat straw (WS) which was free from feed additives. Tested diets (TD) were composed of control diet (CD) plus 10 g / head /day NAM1, NAM2 or NAM3, namely TD1, TD2 and TD3 diets, respectively. Animals were fed according to NRC (1989) allowances for goats.

Results showed that both NAM1 and NAM2 mixtures (TD1 and TD2 diets) significantly ($P<0.05$) increased digestion coefficients of DM, OM, CP and CF and nutritive values as TDN, ME and DCP over those of CD diet, which had the lowest values among experimental diets. Also, NFE digestibility was significantly ($P<0.05$) increased for additives groups (TD1 and TD2) diets as compared with CD diet. The NAM2 mixture significantly ($P<0.05$) raised digestion coefficients of DM, OM, CP and CF and NFE than those of NAM1 mixture (TD1 diet), while nutritive values insignificantly improved than those of NAM1 mixture (TD1 diet). Both average daily milk yield (ADMY) and fat corrected milk (FCM) of TD1 and TD2 were significantly ($P<0.05$) increased than those of CD group. The highest improvement of the (ADMY) and (FCM) was recorded with TD2 group, while the lowest improvement of (ADMY) and (FCM) was recorded with TD3 group. Meanwhile, there were no significant differences among tested groups concerning the fat (F), protein (P), total solids (TS), solids not fat (SNF) and lactose (L) percentages which were almost similar for all tested diets. Although, values of (F, P, TS, SNF and L) yields / head /day were clearly significantly ($P<0.05$) higher for TD1 and TD2 groups than for CD group. No significant differences were detected among most of blood parameters of all tested groups. Moreover, the average feed cost / kg FCM decreased by 3.0, 13.24.and 1.5% for TD1,TD2 and TD3 diets, respectively., which was reflect on the improvement of economic return by 24.71, 75.86 and 16.10 % for TD1, TD2 and TD3 diets, respectively. as compared with the control group. This study, recommends using NAM2 mixture as feed additive with lactating does ration to improve average daily milk yield and economic return. Further studies are needed on a commercial scale.

Kewords:, Natural additives mixtures, balady goat , digestibility, nutritive values, blood parameters, milk production, economic return.

INTRODUCTION

Feed additives are important materials that can improve feed efficiency and animal performance. However, the use of chemical products especially

antibiotics and hormones may cause unfavorable side effects. Moreover, there is evidence indicating that these products could be considered as pollutants for human and threaten their health on the long-run.

On the other hand, attempts to use the natural materials as alternative growth promoters such as medicinal plants are widely accepted. Studying the effect of extracted effective constituents of a medicinal plants can not explain exactly how it works as a whole , in other words the value of a medicinal plant cannot be reduced simply to a list of its constituents Chevallier, (1996). Boulos, (1983) found that some medicinal plants (MP) are used as tonics and restoratives such as *Trigonella foenum , Majorme hortens* and *Lepidum sativa.* Other plants were found to have an anti-helminthes and vernifuge action as *Rosmarinas officinalls* and *Punica granatum.* Moreover, Mericli (1990) recorded that *Matricaria chamamilla* has anti-inflammatory, anti-septic and spasnolytic activities in addition to some properties as antiseptic, antibacterial activities against microorganisms treatment of gesture–intestinal complaints and tonic. Hanafy and Hatem (1991) reported that *Nigella sativa* seeds extracts inhibited Gram-positive and Gram-negative bacteria. Ferdous *et al* ., (1992) indicated that the oil of *Nigella sativa* seeds has therapeutic potential for the treatment of diarrhea caused by 37 isolates of *shigella* species and 10 strains of *V. cholerae* and *E. coli.* Also, local studies indicated that supplementing medicinal plants mixture to rations of lactating rabbit does (Soliman *et al* ., 1995), lactating animals (El-Saadany *et al.*, 1996 and Abouel-Fotouh 2000) and growing lambs (Khinizy ,1999) improved live weight gain of offsprings and increased milk yield by dams.

In previous studies, authors investigate the effect of using some medicinal plants on ewes performance (Mohamed et al ., 2003) and lambs performance and carcass quality (El-Saidy et al ., 2003). The objective of the present study was to compare the effect of supplementing three different natural mixtures as feed additives on nutrient digestion, feeding values, milk yield and some blood parameters of lactating goat does. Also economical evaluation of tested diets was considered.

MATERIALS AND METHODS

Fourty Egyptian baladi lactating goat does of an average live body weight of 38.5kg $\pm$1.5 kg and aged 3-4 years in the 3rd season of lactation were divided randomly according to their live body weight into four similar groups. Formulation of the three tested natural additives mixtures (NAM1, NAM2 and NAM3) were suggested by authors according to the previous studies are shown in Table (1).

The control diet (CD) consisted of concentrate feed mixture (CFM) to cover 50% of protein and energy requirements according to NRC (1989) allowances for goats, whereas berseem hay (BH) and wheat straw (WS) were used as forages, which was free from feed additives. Tested diets (TD) were composed of control diet (CD) plus 10 g / head /day from one of the following NAM (NAM1, NAM2 or NAM3), namely TD1, TD2 and TD3 diets, respectively. The experiment continued for ninety days and animals were fed twice daily at 8 A.m and 4 P.m (in group feeding). Feeding requirements

were adjusted biweekly according to weight changes and milk yield. Fresh water was offered freely and animals were kept under routine veterinary supervision through the experiment period (90 days).

Table (1): Ingredients of tested medicinal plants mixtures (%).

Ingredients	Natural additive mixtures		
	NAM1	NAM2	NAM3
Majorme hortens	7	4	-
Matricaria chamamilla	-	14	9
Trignella foenum	16	11	14
Nigella sativa	19	13	7
Rosmarinas officinalls	-	4	-
Eucalypties globules	4	8	-
Cymbopogen proximus	-	-	3
Allium sativum	-	3	1
Cymbopoygen cittratus	-	2	4
Germs ground wheat	23	16	26
Dried condensed corn distiller	24	18	29
Yeast	3	3	3
Minerals	4	4	4

Milk yield was weekly estimated individually, through the lactation period. Does were completely hand milked till stripping the udder (morning & evening) daily through two successive days during suckling and milking periods. Kids suckled other dams in days of milk estimation. Composite milk samples were prepared from morning and evening milking for chemical analysis. Milk energy was calculated according to McDonald et al ., (1978) equation. Fat corrected milk (4% FCM) was obtained by using Gaines (1923) equation . Feed conversion of the tested diets was calculated and expressed in terms of DM (kg), TDN (kg), ME (k cal) and DCP (g) required to produce one kg of fat corrected milk (FCM).

Blood samples were taken in a heparnized tubes from the jugular vein, of three tested animals from each group, for 3 successive days each month at 4-hrs post morning feeding during the experimental period. Blood serum samples were separated by centrifugation at 4000 rpm for 10 minutes, then frozen at -20^{0}C until analysis.

Digestion Trials

Six mature bucks of average live body weight of 40.4kg were used to conduct four digestibility trials, (three animals each trial) to determine the digestibility and nutritive values of the tested diets in response to the tested additives. Each trial lasted for two weeks as a preliminary period followed by one week as collection period. Every group was fed one of the tested diets mentioned before and the total amount of ration introduced to the animal was 2.5% of its live body weight. Diets were offered twice daily at 8.00 and 16 hrs to the animals and fresh water was available freely. Feces were collected daily during the collection period , 5% of the daily amount was frozen for chemical analysis.

Chemical analysis

Chemical analysis of feedstuffs, feces, milk samples (milk protein, milk lactose, total solids and ash) was determined according to the methods of A.O.A.C. (1995). Milk fat was determined according to Gerber 's method as described by Ling, (1963). Amino acids of the tested NAM, were estimated using amino acids analyzer (LKB Alpha plus high performance amino acid analyzer LKB Biochrom LTD, England), according to the method of Winder and Eggum, (1966). Blood serum was analyzed using kits for Total protein (*Weichselbaum*, 1946), urea (*Patton and Crouch*, 1977), Glucose, glutamic oxalocaetic transminase (GOT) and glutamic pyruvate transminase (GPT) (*Siest et al .,* 1981), Albumin (Drupt,1974) and the methods reported by biochemistry laboratory reagents and products. The serum globulin (GL) was calculated by the difference between TP and Al.

Statistical analysis

Completely randomized design was functioned to design this experiment and to analyze data obtained according to (Snedecor and Cochran ,1980). Means were tested for differences using Duncan 's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of natural additives mixtures, feedstuffs and experimental diets

Data in Table (1) represent ingredients of different natural additives mixtures (NAM). Inspecting data in Table (1) show that feed additive mixtures (NAM) composed of 8-12 ingredients, and ratios of their component ranged between 4-24, 2-18 and 1-29%, in total of the three mixtures (NAM1, NAM2 and NAM3, respectively). The effective groups and their medicinal effects for most comprised in feed additive mixture are, shown in Table (2).

Data in Table (3) show that NAM1 had higher EE and CF content than NAM2, which had higher CP content than other mixtures. Concerning the essential amino acids (Cysteine, Methionine, Valine, Lysine and Arginine) recorded the high values with MPM2 as compare with the other mixtures, while both Leucine and Phenylalanine recorded the highest values with NAM1. Amino acids represent one of the most important factors which effect on the rumen microfloura activity (Kaufmann and Lupping, 1982).
Meanwhile, the data in Table (4) show that chemical composition of the experimental feed ingredients was similar to average chemical compositions

Table (2): Parts used, effective groups and their medicinal effect as experimental medicinal plants.

Scientific name	Used part	Effective groups	Medicial effect	Author
Rosmarinas officinalls	Leaves	Borneol , Cineol and Terpenes	Digestive Carminative , stimulant for nervous , expectorant tonic	Galisteo, et al ., (2000)
Majorme hortens	Leaves	Terpinol , Geroniol, Eugenol and Linalol	Carminative , Costipotion, Digestive , applizer, tonic, Amenorhea	El-Shayeb and Mabrouk(1984)
Trigonella foenum graecum	Seeds	Trigunelin, saponins (diosgenin, gitogenin , Tigogenin) Mucilage	Anti –diabetics prevent arteries and vein clots, useful for treating Asthma, Throat, inflammations, stomach ulcer, Galactagougue	Block et al (1986) Sharma (1986)
Eucalypties globules	Leaves	Alkaloids, bitter materials, spartion	Tonic for C.N.S., heart and circulatory system, liver, bile secration and spleem digestive anti- hypertension	Boulos (1983)
Cymbopogen proximus	Herbs	Aldehdes, pinenc alpha-teriined flavoids	Carminative, diuretic and urinary antiseptic	Mericli (1990)
Matricaria chamamilla	Flower	Azulene, Cynaroside, Lateo-lin Umbelliferone , Herniar-in, Niugellone	Anti –inflammatory, Wound healing Antisptic ,Spasmolytic, Appetizer, Blood-cirealatory stimulant	Mericli (1990) & Abou-Zeid (1986)
Nigella Sativa	Seeds	Niugellone	Carminative-Diuretic, Anti-bacterial, Antiinflamation , CNS-depressant , Analgeesic acttivities, Bronchodilator , Hypoglycnemic activity, Castric stimulant , Anti bacterial and anti -fungal	Nergiz and Otles (1993) & Aqel (1993)
Allium sativum	Bulb	Allicine, Dially Disulphide, Dially trisulphide, Allyl-Methyl Disulphide,	Gastric stimulant , Anti bacterial , Anti Fungal	Dewit et al (1979)
Cymbopoygen cittratus	Leaves	Ceteral ,	Anti-worms,	Edinger (1982)

as those of A.P.R.I. (1997). Concerning the chemical composition of tested diets, nutrients content of experimental diets were almost similar.

Table (3): Chemical composition of the experiment medicinal plants mixtures (% on DM basis) and essential amino acids content (% CP)

Chemical composition %	Tested natural additives mixtures		
	NAM1	NAM2	NAM3
DM	91.16	90.24	91.35
CP	22.72	27.45	20.82
EE	8.53	6.82	5.73
CF	12.25	9.64	11.57
NFE	48.78	50.76	54.71
Ash	7.42	5.33	7.17
Essential Amino Acids % of CP			
Leucine	12.65	7.85	3.34
Threonine	0.53	1.17	0.14
Lysine	1.43	2.07	1.10
Methionine	2.94	1.62	0.61
Tryptophan	0.47	0.52	0.17
Histidine	2.42	3.62	1.74
Valine	9.32	16.77	1.83
Arginine	1.42	2.16	0.34
Phenyl alanine	6.60	4.54	3.27

Table (4): Chemical composition of ingredients and tested diets

Chemical composition	Feedstuffs			Tested diets			
	CFM	BH	WS	CD	TD1	TD2	TD3
DM	90.82	90.32	90.32	100	100	100	100
OM	90.0	89.87	83.66	88.22	88.67	88.77	88.63
CP	16.58	12.60	4.15	12.26	12.43	12.92	11.78
CF	13.32	25.14	36.64	26.22	25.09	24.82	26.18
EE	3.45	2.36	1.36	2.04	2.08	2.21	2.10
NFE	56.73	49.77	41.51	47.70	49.07	48.82	48.57
Ash	9.92	10.13	16.34	11.78	11.33	11.23	11.37

Digestion coefficients and nutritive values

Results in Table (Table 5) showed that the NAM2 significantly ($P<0.05$) increased digestion coefficients of (DM, OM,CP , CF and NFE) and nutritive values as TDN, ME and DCP with TD2 diet than those of the control diet (CD), which mostly had the lowest values among tested groups.

Also, NAM2 mixture with TD2 significantly ($P<0.05$) increased digestion coefficients of (DM, OM, CP and CF), while the nutritive values as TDN, ME or DCP were insignificantly higher as compared with NAM1 added to TD1

diet. Also, NAM3 mixture with TD3 showed insignificantly higher digestion coefficients of all nutrients and nutritive values than those of CD diet. However, the better improvements of digestion coefficients were recorded with (NAM2) mixture, supplemented with TD2 diet, whereas the lower values of nutrient digestion improvement were recorded with (NAM3) mixture supplemented with (TD3) diet. Results herein agree with Hmamochi *et al* .,(1992) who mentioned that feed additives might improve ruminal fermentation by increasing bacterial activity, which in turn increases degradability of ligno - cellulose tissues and flow of microbial protein from the rumen to next parts. Also, these findings are in harmony with El-Saadany *et al* .,(1999), Allam *et al* .,(1999) and Mohamed *et al* ., (2003) who reported that supplementing *Matricaria chamamilla , Nigella sativa, or Rosmarinas officinalls* to ewes ration improved digestion and nutritive values. Results obtained agree also, with those found by Rode *et al* ., (1989) , Chevallier (1996) and Galisteo *et al*.,(2000) who mentioned that the *Matricaria chamamilla, Nigella sativa, Rosmarinas officinalls and Allium sativum* act as anti-diarrhea, anti–dysentery, anti-bacterial, protozoa cider expelling to tee and worms and antiseptic which decrease losses of digested nutrients due to parasites and save digested nutrients to improve production *versus* other groups. Also, Data obtained were in harmony with El- Shayeb and Mabrouk (1984), Perry *et al* .,(1995) and Mira, *et al* .,(1998) who found that the Fenugreek extract inhibited *Aspergillus flavors* growth and aflatoxen production.

Table (5) : Average daily dry matter intake and digestion coefficients and nutritive values of tested diets

Item	Tested diets			
	CD	TD1	TD2	TD3
Digestion coefficients %				
DM	60.34^{c}	64.25^{b}	67.54^{a}	62.83^{bc}
OM	64.85^{c}	68.37^{b}	71.62^{a}	66.75^{bc}
CP	65.82^{c}	70.42^{b}	74.56^{a}	68.52^{b}
CF	56.38^{c}	60.62^{b}	64.43^{a}	58.82^{b}
EE	80.52	80.26	80.22	80.36
NFE	70.62^{c}	74.18^{b}	77.32^{a}	73.36^{c}
Nutritive values %				
TDN	60.18^{c}	64.12^{ab}	67.38^{a}	62.93^{bc}
ME	10.10^{c}	10.65^{ab}	11.16^{a}	10.40^{bc}
DCP	8.00^{c}	8.75^{ab}	9.63^{a}	8.10^{bc}

***ME : calculated according to MAAF (1975)**

a, b, c Means in the same row with different superscripts differ (P<0.05)

Milk production and composition.

Data in Table (6) represent average daily milk yield (ADMY), fat corrected milk (FCM) and composition as affected by the experimental supplements. Data revealed that TD1 and TD2 produced significantly (P<0.05) higher (ADMY) and (FCM) than CD diet. Both TD1 and TD2 diets increased (ADMY) and (FCM) by (41.86 and 67.4%) and (26.44 and

16.10%), respectively than control diet. Meanwhile TD3 group had insignificant higher (ADMY) value than CD group. Moreover, the highest improvement of (ADMY) and (FCM) were recorded with TD2, followed by TD1 and TD3 diets. There were no significant differences among different groups in fat (F), protein (P), total solids (TS), solids not fat (SNF) and lactose (L) percentages. However, yields of F, P, TS, SNF and L for (TD1 and TD2) diets were significantly ($P<0.05$) higher than those of CD control diet. No significant differences were found between TD1 and TD2 diets in yields of milk constituents. Meanwhile, TD2 showed the highest yields of F, P, TS, SNF and L, whereas, TD3 showed the minimum increased of milk yield constituents. Such differences in milk fat and milk protein yields could be attributed to the differences in (ADMY) and milk composition

Table (6) : Average daily milk yield, fat corrected milk, milk composition with lactating does fed tested diets.

Tested diets	CD	TD1	TD2	TD3
Daily milk yield kg/ h	0.86^{c}	1.22^{b}	1.44^{a}	1.07^{bc}
Fat corrected milk kg /h	0.87^{c}	1.01^{ab}	1.10^{a}	0.96^{bc}
Milk composition				
Fat %	3.52	3.45	3.42	3.47
Av. Fat yield g/ h	30^{c}	42^{ab}	49^{a}	37^{b}
Protein %	3.88	3.82	3.80	3.85
Av. protein yield g/ h	33^{c}	47^{ab}	55^{a}	41^{b}
Lactose %	4.15	4.06	4.05	4.07
Av. Lactose yield g / h	36^{bc}	50^{ab}	58^{a}	44^{b}
Total solids (TS) %	12.38	12.14	12.07	12.20
Av.Total solids yield (TS) g / h	107^{d}	148^{bc}	174^{a}	131^{c}
Solids not fat %	8.86	8.69	8.65	8.73
Av. Solids not fat yield g / h	77^{d}	106^{b}	125^{a}	93^{c}
Ash %	0.83	0.81	0.80	0.81
Ash yield g /h	0.714	0.988	1.15	0.87

These differences in the yields reflect the differences in daily milk yield, which might due to the improvement of digestibility and nutritive value as TDN, ME and DCP attained for all tested diets as a result to the availability of effective groups (El-Saadany *et al* .,(1999) and amino acids, (Lundquist, *et al* ., 1982) with additive mixtures. Findings herein agree with Vihan and Panwar (1987) who found that *Nigella sativa* powder was useful as a supplement to goat ration at the rate of 100 mg/kg body weight. Chevallier (1996) mentioned that chamomile increases milk yield . Also, the present results were in harmony with EL-Saadany *et al* ., (2003) who found that rations contained chamomile or *Nigella sativa* increased ($P<0.05$) daily milk yield and yields of F, P, TS and SNF of lactating cows. These findings might indicate that the effective groups contained in NAM (*Rosmarinas officinalls, Nigella sativa, Trigonella foenum graecum and Matricaria chamamilla)* might acted as antiseptic against the ruminal antagonistic flora and stimulate efficiently rumen functions (Khanna *et al* ., 1993, Allam *et al* .,1999 and Salem and

El-Mahdy 2001) and stimulate the digestive enzymes and processes and hence result in higher milk yield.

Blood parameters

Values of some blood metabolites are presented in Table (7) . There were no significant differences among all studied blood constituents of lactating goats fed tested diets. The obtained values are within the normal range reported by Gihad, *et al* .,(1987) ; Allam *et al* ., (1999) and Gabr, *et al* ., (2001) for healthy animals.

Table (7): Effect of feeding the tested diets on some blood plasma parameters of goat does

Item	Tested diets			
	CD	TD1	TD2	TD3
Total protein, gm/100	7.24	7.36	7.32	7.40
Albumin, gm /100ml	3.68	3.83	3.73	3.80
Globulin, gm / 100 ml	3.56	3.53	3.59	3.60
Al / Gl ratio	1.03	1.10	1.04	1.06
Glucose, mg/100 ml	61.38	62.46	60.54	59.89
GPT ,U/L	8.72	7.82	9.62	9.43
GOT , U/L	61.32	63.18	64.62	66.38
Urea mg/100 ml	43.82	43.27	44.11	42.93

Feed conversion and economical return for experimental diets

The results of feed conversion for milk production and economical efficiency of the experimental diets are presented in Table (8). Total nutrients intake / head as TDN, ME and DCP intake by lactating does were higher as compared with control group Natural additives mixtures improved the feed conversion values in terms of kg TDN, and DCP and kcal of ME /1 kg FCM as compared with the control group. Does fed TD2 diet had the best value of feed conversion followed by TD1, while TD3 recorded the lowest improvement value as kg TDN, and DCP and kcal of ME /1 kg FCM. Amount of TDN and DCP required to produce one kg FCM were higher than those found by Gabr, *et al* ., (2001). Meanwhile, Gihad *et al*., (1987) reported almost similar intake of DM, TDN and DCP per kg FCM than those obtained in the present study.

Meanwhile, TD1 and TD2 diets showed higher daily feed cost / head /day, but they also showed the high improvement % in economic efficiency than other groups. Results obtained herein agree with Abouel-Fotouh, *et al* , (2000) who found that a ration which contained 0.6 - 0.9% Chamomile improved feed conversation. Economic return was calculated asthe differences between the prices of milk and fed cost LE / head . The profit (return) above feeding cost (Table 8) was higher with medicinal plants additives diets than control diet. On the mean time when comparing between the feed additives used , it was observed that NAM2 was the best followed by NAM1 and the last was NAM3. These results are in agreement with similar trends observed by EL- Saadany *et al*. (1999). Also, these results were in harmony with Allam *et al*., (1999) who found that using Chamomile feed

additive decreased feed cost of 1 kg FCM by 31.86% and increased economical return by 93.51% kg than the control group.

Table (8): Total dry matter (DM) intake, feed conversion and economic efficiency with lactating goats fed experimental rations during 90 days productions.

Item	Tested diets			
	CD	TD1	TD2	TD3
Total DM intake kg	122.85	18.62	115.92	119.52
Total TDN intake kg / h	73.93	76.06	78.11	75.21
ME intake MJ. Cal/h	1240.8	263.3	1293.7	1243.0
DCP intake kg/h	9.83	10.4	11.16	9.68
Av. milk yield ,kg /h	78.3	91.0	99	86.4
Feed conversion				
Kg DM/ kg FCM	1.57	1.31	1.17	1.38
Kg TDN /kg FCM	0.94	0.84	0.79	0.87
Kcal ME /kg FCM	15.9	13.90	13.10	14.5
Kg DCP/kg FCM	0.126	0.114	0.113	0.112
Economic efficiency				
Total feed cost LE/doe	53.10	60.30	58.50	57.60
Av. feed cost/ kg of FCM	0.68	0.66	0.59	0.67
Price of milk , LE / h	70.50	82	89.10	77.8
Return LE	17.4	21.7	30.60	20.20
Economic efficiency	1.32	1.36	1.52	1.35
The Economic Return %	-	1.25	1.76	1.16

***Economic of this study was evaluated on the light of market prices during year 2001-2002**

In conclusion, NAM2 mixture is the most promising additive than the other two mixtures and could be recommended as milk promoter in dairy goats diets since it tends to modulate digestion coefficients and nutritive values which are mostly reflected in improving does performance. Further studies are required to confirm results of feeding with this natural additive mixtures at a commercial scale.

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تأثير إضافة مخاليط مختلفة من الأعشاب الطبية كإضافات أعلاف على أداء الماعز الحلاب وبعض مقاييس الدم

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استخدمت ٤٠ عنزة بلدي عشار متوسط وزنها ٣٨,٥كجم±١,٥ وعمرها ٣-٤سنوات تم تقسيمها إلى ٤ مجموعات متماثلة ، حيث غذيت الماعز عشوائيا على إحدى العلائق الآتية عليقه المقارنة ع م (خالية من الإضافات) وكونت عليقه المقارنة(ع م) من مخلوط علف مركز ودريس برسيم وتبن قمح ، بينما تكونت العلائق المختبرة من عليقه المقارنة مع إضافة ١٠جم/للرأس/اليوم من أحد مخاليط الإضافات الطبيعية التالية م ا ط١، م ا ط٢ ، م ا ط٣ للمجموعات المختبرة ع١،ع٢،ع٣ على التوالي. وقد تم تغذية الماعز طبقا لمقررات (NRC 1989) .

أظهرت النتائج زيادة معنوية (احتمال ٠,٠٥ و ٠) في معاملات الهضم لكل من المادة الجافة والمادة العضوية والبروتين الخام والألياف الخام والقيمة الغذائية على صورة مركبات غذائية مهضومة كلية وطاقة ممثلة وبروتين خام مهضوم لكل من العليقتين ع١ ، ع٢ المختبرة عن عليقه المقارنة. كما أظهرت العليقه ع٢ أعلى مقدار للتحسن لكل من معاملات الهضم والقيمة الغذائية بينما كانت العليقه ع٤ أقل المجموعات تحسنا مقارنة بمجموعة ع م . كذلك حققت ع٢ أعلى متوسط من محصول اللبن اليومي واللبن معدل الدهن بمعدل ٦٧,٤٤ ،٢٦,٤٤% على التوالي ،بينما كانت أقل المجموعات المختبرة تحسنا هي ع٣ عن المجموعة ع م. بالنسبة لمكونات اللبن من للدهن والجوامد الصلبة الكلية و الجوامد الصلبة اللادهنية والبروتين الخام واللاكتوز كنسب مئوية لم توجد فروق معنوية فيما بين المجامع المختبرة ، بينما حققت العليقه ع٢ أعلى قيم (احتمال ٠,٠٥) لمحصول يومي للرأس بالنسبة للدهن والجوامد الصلبة الكلية والبروتين الخام واللاكتوز عن ع م . كما تحسنت كفاءة التحويل الغذائي في صورة مركبات غذائية مهضومة كلية /كجم لبن معدل الدهن بنسبة ١٠,٦ ، ١٥,٩٦، ٧,٤٥% ، بينما تحسنت كفاءة التحويل في صورة طاقة ممثلة /كجم لبن معدل الدهن بنسبة ١٢,٥٨، ١٧,٦١، ٨,٨١% ، وكان التحسن في كفاءة التحويل فى صورة بروتين خام مهضوم /كجم لبن معدل الدهن بنسبة ٩,٥٢، ١٠,٣٢، ١١.١١% وذلك للمجاميع ع١،ع٢،ع٣ على التوالي مقارنة بالمجموعة ع م. كذلك انخفضت تكلفة التغذية اللازمة لانتاج كجم لبن بنسبة ٢،٤٤ ، ١٣،٢٥ ،١،٥%. كما زاد العائد الاقتصادي بمقدار ٢٤,٧، ٧٥,٨٦، ١٦,١٠% للمجاميع ع٢،ع٣،ع٤ على التوالي وكانت المجموعة ع٢ أعلى العلائق من حيث العائد الاقتصادي بينما كانت ع٣ أقلها مقارنة مع المجموعة ع م. وتوصى الدراسة باستخدام المخلوط م اط٢ كإضافة غذائية طبيعية لعلائق الماعز الحلاب لتحسين أداءها الإنتاجي والعائد الاقتصادي ، بعد اجراء المزيد من الدراسات على نطاق تجارى.