

EFFECT OF SUPPLEMENTATION OF DRIED CHICORY (*CICHORIUM INTYBUS L.*) LEAVES IN DIETS ON PERFORMANCE OF DAIRY GOATS

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(Received 4/12/2020, accepted 16/3/2021)

SUMMARY

This study was conducted to investigate the effect of inclusion different levels of dried chicory (*Cichorium intybus L.*) leaves in diets of Balady goat does on nutrients digestibilities, productive performance and some blood parameters, as well as the growth performance of their offspring. Twenty four pregnant lactating Balady goats were chosen at 1 month before parturition and divided randomly into three similar groups (8 each) in a feeding trial, where the first group was served as control (R0) and fed the concentrate feed mixture (CFM) without any supplementation, while the second and third groups (R2 and R3) were fed CFM supplemented with dried chicory leaves (DCL) at rate of 1 and 2%, respectively. The basal diet was formulated from 2.5 CFM of the live body weight (LBW) of goats plus 3kg/d fresh berseem in order to covering the nutritional requirements according to NRC (1989). Results indicated that the digestibility coefficients of most nutrients and feeding values were significantly ($P<0.05$) higher for R1 that contained 1% DCL followed by R2 that contained 2% DCL than those of un-received one (R0). Actual milk yield was significantly ($P<0.05$) higher with tested ration R1 and insignificant higher with the tested ration R2 than that of control ration. Otherwise, the yield of 4% FCM was significantly ($P<0.05$) higher with both tested rations than that of control one, being R1 had the highest yield significantly among the experimental dietary treatments. Most milk constituents (fat, lactose, SNF and ash, %) did not affected by the dietary treatments, while only the contents of milk protein and TS were increased significantly especially with R1 than those of control (R0). Totally milk composition percentages tended to increase with DCL addition in ration R1 than the other tested rations R2 and control R0. There were significant differences in respect of feed intake among dietary treatments, where the values of DMI, TDNI and DCPI were higher in R1 and R2 compared with those of control one. The feed conversion ratio was appeared to be the best with R1 while, the poorest value was occurred with R0 and the tested ration R2 had the intermediate value. Kids in R1 ration showed the highest LBW and total weight gain at each age intervals as compared to other groups, being the lowest values were associated with R0, with no significant differences among the experimental treatments. Therefore, the results indicated that using DCL as herbal additives in the dairy goat diets at level 1% led to an improvement for nutrient digestibilities, productive performance and physiological functions of these animals.

Keywords: *Goats, chicory leaves, digestibility, growth performance, milk production and blood biochemical.*

INTRODUCTION

Recently, there is growing interest among the consumers related to health considerations to consume high-quality, safe and nutritious foods which is known by functional food (Kralik *et al.*, 2012). Chicory (*Cichorium intybus L.*) is a typical Mediterranean plant, belonging to the family *Asteraceae*, indigenous to Europe, West Asia, Egypt, North America and Italy. There are many varieties of chicory having different commercial uses, with some misunderstanding about the botanical classification of such varieties. Vegetable commercial varieties (e.g., Bruxelles chicory, Treviso red chicory, Endive) all belonging to the species *intybus* have remarkable economic importance. Moreover, chicory forage had less dry matter and fewer structural carbohydrates, as it can remain green longer than other forage

species. Because of such characteristics, chicory has been highly appreciated by farmers (Sitzia *et al.*, 2006). Di Grigoli *et al.* (2012) mentioned that chicory forage potentially provide lasting good quality herb and the positive effect on dairy performance in grazing ewes. Also, Dylan Laws and Liz Genever (2013) reported that lambs grazed on chicory forage have similar growth performances to those grazing leguminous forage and better growth than those grazing grass based pastures and also they added that the rates of lamb growth can be 70% higher with grazing chicory in comparison to a standard grass sward. The addition of herbs into rations of farm animals could be affects positively on fatty acids composition in milk (Collomb *et al.*, 2002) and also improved rumen fermentation and digestibility (Ando *et al.*, 2003). Accordingly, there is greater interest in using plant extracts or medicinal herbs as alternative to manipulate ruminal fermentation and improve feed efficiency in ruminants (Hristov *et al.*, 1999 and Wang *et al.*, 2000).

This study aimed to investigate the effect of supplementing dairy goats' rations with two levels of chicory herb on digestibility, feeding values, productive performance and blood parameters of the experimental rations.

MATERIALS AND METHODS

This work was carried out at Sakha Animal Production Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture.

Animals and feeding trial:

Twenty four pregnant Balady goats were chosen at 1 month before parturition with average body weight 31.5 kg at initial point of the trial and used to study the effect of addition 2 levels of dried chicory leaves (DCL) that classified as medical herbage into their rations on digestibility, milk production and composition, blood parameters and growth performance of their offspring as well . Animals were housed in groups (3 groups of 8 goats each). All experimental goats were fed ration consisted of concentrate feed mixture (CFM) and berseem. Goats in first group (control) were fed this ration without any supplementation (R0), while, the other two groups (R1 and R2) were supplemented with DCL at rate of 1 and 2% levels of CFM, respectively. The CFM used in this experiment was consisted of 9.0% undecorticated cottonseed meal, 42.0% yellow corn, 40.0% wheat bran, 2.0% limestone, 1.0% salt, 1.0% minerals and 5.0% molasses. The daily amount of CFM was accounted at 2.5% of body weight and offered in two equal portions at 8 a.m and 16 p.m hrs, in addition 3 Kg berseem in order to covering the nutritional requirements for goats according to NRC (1989). Fresh water was freely available at all times. Goats were continuously fed up to 3 months postpartum with their kids until the weaning time 3 months. The feeding period of kids ended after three months the body weight gain was monthly recorded.

Digestibility trials:

Three digestibility trials were conducted simultaneously with the same goats of the feeding trial (three animals from each group) during the post-partum period to determine the digestion coefficients and feeding values of the experimental rations. Acid insoluble ash (AIA) was used as natural internal marker and animals were fed individually where feed intake was recorded daily. Fecal samples of nearly 200 g were taken from the rectum twice daily at 8.00 am and 8.00 pm during the 7- consecutive days collection period. The daily samples of feces for each animal were immediately frozen at -20°C until the end of the collection phase and then composited sample for each animals was prepared for analysis. The procedure of AIA was done according to the method described by Van Keulen and Young (1977). Chemical analysis of feed and feces was determined according to the method of AOAC (1995).

Milk production:

Lactating goats were housed under shaded area and hand milked twice a day (6.0 and 18.0 hrs) and milk yield was recorded weekly. Milk samples from consecutive milking were pooled and the composite sample was prepared and stored for analysis latter. Samples were analyzed for total solids according to Majenier method laboratory manual (1949), fat percentage was determined according to Gerber's method as described by Ling (1963). Milk protein content was determined using the macrokjeldahle method ($N \times 6.38$). Milk total solid percentage was determined by weighing 5 ml milk followed by initial drying on sand bath for evaporating the excess water, then drying was completed in a drying oven at 105 °C for

three hours. Milk ash content was estimated according to AOAC (1995), and lactose were calculated by differences. 4% Fat corrected milk = 0.4 M + 15.0 F, Where, M = milk yield and F = fat yield.

Blood parameters:

Blood samples were taken during the middle day of the experiment being from goats and their offspring. Samples were taken from the jugular vein of animals at 8am hrs post feeding into heparinized-coated tubes and plasma were separated by centrifugation at 3000 r.p.m for 20 minutes. Plasma samples were stored in deep freezer at approximately -20 °C till chemical analysis. Plasma was used for determination of total protein (Armstrong and Carr, 1964); total albumin (Doumas *et al.*, 1971) and globulin concentration was calculated as the difference between total protein and albumin. Assay of aspartate (AST) and alanine (ALT) aminotransferase activities were conducted according to procedures of Reitman and Frankel (1957). Total cholesterol was determined according to Allian *et al.* (1974) using bio Merieux test kit. Uric acid (Tietz, 1986) and plasma glucose was determined according to the procedure of Coles (1986); creatinine was determined according to Henry *et al.* (1974).

Statistical analysis:

The obtained data were statistically analyzed using one-way analysis of variance procedure (SAS, 2000) computer program using the following fixed model:

$$Y_i = \mu + T_i + e_i$$

Where Y_i = The individual observation; μ = Overall mean; T_i = Effect of treatments. ($i = 1, 2$ and 3) and e_i = Random error component assumed to be normally distributed. Significant differences between treatment means were determined at $P < 0.05$ by Duncan's multiple-range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition:

The chemical composition of CFM, berseem and chicory leaves as well as the experimental rations are presented in Table (1). The proximate analysis of either berseem or chicory leaves used in this study were extremely similar in respect of its CP content, but the differences between them were highly significant respecting the other nutrients (CF, EE, NFE and ash percentages), being 30.76, 2.21, 45.83 and 7.93 for berseem vs. 16.78, 3.68, 52.80 and 12.05 for chicory leaves, respectively. It could be observed that all mentioned values are in favorable of chicory leaves and in proceeding of berseem forage accordingly. Regarding the calculated composition of the experimental rations, all values of chemical composition were appeared to be so similar among the three rations.

Table (1): Chemical analysis of the experimental CFM, berseem and chicory leaves, and calculated composition of experimental rations (on DM basis, %).

Item	DM	OM	CP	CF	EE	NFE	Ash
CFM	88.40	89.82	15.98	11.54	3.05	59.25	10.18
Berseem	85.87	92.07	13.28	30.76	2.21	45.82	7.93
DCL	90.55	87.95	14.70	16.78	3.68	52.79	12.05
<i>Experimental rations:</i>							
R0	88.16	95.35	14.75	7.16	4.12	69.32	4.65
R1	88.18	95.25	14.82	7.31	4.11	69.01	4.75
R2	88.20	95.16	14.88	7.45	4.10	68.73	4.84

*R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additive into control ration.

Digestibility and feeding values:

Results of nutrient digestibilities and feeding values of experimental rations are presented in Table (2). Mostly the differences among the dietary treatments respecting nutrient digestibilities were significant in favorable of the two tested rations in relation of control one. It

could be observed that R1 ration that contained 1% chicory leaves was significantly ($P < 0.05$) having the highest values in respect of digestibilities of DM, OM, CP and NFE followed by R2 that contained 2% chicory leaves versus the lowest values that were recorded with control one (R0). Meanwhile, digestibility of CF% was significantly ($P < 0.05$) increased, while digestion coefficient of EE% was insignificantly ($P > 0.05$) increased with increasing the levels of chicory herb in comparison with those of un-supplemented one. In matching with the present results, the findings of El-Basiony *et al.* (2015) showed that lactating goats fed diet containing 10g *Cichorium intybus* had better utilized the diet than the control diet respecting the entire nutrient digestibilities (DM, OM, CP, CF, EE and NFE). This preference may be due to the ability of the *C. intybus* herb to purification of the digestion track from the parasites that may affect the balance of the rumen environment and therefore adversely affect the process of digestion of different nutrients (Molan *et al.*, 2003 and Athanasiadou *et al.*, 2007). Practically, Clark *et al.* (1990) cleared that proportions of 70% leaves and 30% stems could be eligible in chicory forage because of the digestibility of leaves was remarkably higher than that of stems. Regarding the addition of herbs into rations of farm animals, it could be potentially improved the rumen fermentation and consequently digestibility of diet (Ando *et al.*, 2003).

Table (2): Effect of experimental rations on digestion coefficients and feeding values for dairy goats.

Item	Experimental rations			±SE
	R0	R1	R2	
<i>Digestion coefficients:</i>				
DM	66.16 ^c	69.92 ^a	68.13 ^b	±0.560
OM	68.41 ^c	72.72 ^a	70.67 ^b	±0.671
CP	67.34 ^b	73.89 ^a	72.33 ^a	±1.13
CF	39.20 ^b	43.54 ^a	44.88 ^a	±1.01
EE	77.54	78.52	78.61	±0.454
NFE	76.48 ^b	80.45 ^a	77.37 ^b	±0.687
<i>Feeding values:</i>				
TDN	68.95 ^b	72.88 ^a	70.47 ^{ab}	±0.622
DCP	9.93 ^b	10.95 ^a	10.76 ^a	±0.176

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

SE=Standard error.

**R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additives in to control ration.*

Collectively, the feeding value that expressed as TDN and DCP% were seemed to be higher with both tested rations than those of the control one, but such values were significant increased with R1 and insignificant increased with R2, in comparison with those with control one (R0). Definitely, Hanafy *et al.* (2009) showed that using some medical herbage as feed additives in rations of growing Barki lambs could be improve the nutrient digestibilities and feeding values. Moreover, the findings of recent report on chicory forage that prepared by some researchers have been cleared that such forage potentially contained a reasonable contents of mineral, highly palatable with good digestion coefficients for livestock and poultry (Sanderson *et al.*, 2003 and Scharenberg *et al.*, 2007). El-Bordeny *et al.* (2008) concluded that supplementing lamb rations with 1.5 of chamomile flower as a natural feed additives improved nutrient digestibilities, nitrogen retention, daily gain and economic efficiency. Generally, the present results are in harmony with those reported by El-Basiony *et al.* (2015) who added 10g/h/d into dairy goats' diets of *Cichorium intybus* had led to significant improvement in digestibility and consequently the feeding value of the supplemented diet in comparison with the free one. Generally, the addition of herbs into the rations of ruminants has a positive effect of rumen fermentation and digestibility (Ando *et al.*, 2003).

Milk yield and composition:

Results of daily milk yield and its composition of goats fed the dietary treatments are illustrated in Table (3). Results demonstrated that actual milk yield was significantly ($P < 0.05$) higher for goats received 1% DCL diet (R1) and insignificant ($P > 0.05$) higher with those fed on 2% DCL diet (R2)

compared to that of control ration (R0). While, the yield of 4% FCM was significant higher for both tested rations (R1 and R2) than that of control one (R0), being R1 had significant higher yield of 4% FCM than that of R2. Milk composition of goats including the percentages of fat, protein, lactose, total solids (TS), solids not fat (SNF) and ash are presented in Table (3). Results showed that R1 was significantly ($P<0.05$) improved protein and total solid in milk, while R2 insignificant improved protein content and significant increased the milk total solid content, based on the control (R0) values. Milk composition tended to increase with chicory addition in R1 than the other rations (R0 and R2), respecting fat and SNF with no significant differences among the experimental treatments. Concerning fat and protein yields in milk, its values were superior with 1% dried chicory R1 than those of control one and the other tested ration R2. Similar trend of changes in milk yield of goats was observed by El-Basiony *et al.* (2015) who indicated that using *Cichorium intybus* as additive in the dairy goats' diets led to improvements for nutrient digestibilities and milk quality and quantity. The addition of herbs into rations has a positive effect on fatty acids composition in milk (Collomb *et al.*, 2002). Additionally, Dylan Laws and Liz Genever (2013) reported that lambs grazed on chicory forage have similar growth performance to those grazing legume forages and better growth than those grazing grass-based pastures. Also, trials with dairy cows in the southern hemisphere and from the US, have shown that grazing chicory forage can increase milk solid yields in comparison to more common grass types.

Table (3): Effect of experimental rations on daily milk yield and milk composition for dairy goats.

Item	Experimental rations			±SE
	R0	R1	R2	
Initial body weight (kg)	30.60	33.20	30.80	±0.50
Final body weight (kg)	38.00 ^b	41.00 ^a	39.80 ^{ab}	±0.424
Milk yield (kg)	1013.3 ^b	1212.2 ^a	1149.3 ^{ab}	±32.78
4% FCM (kg)	901.4 ^c	1090.3 ^a	1019.8 ^b	±30.21
<i>Milk composition and yields:</i>				
Fat (%)	3.27	3.33	3.25	±0.045
Fat yield (g)	33.07 ^b	40.36 ^a	37.33 ^b	±1.19
Protein (%)	2.67 ^b	3.18 ^a	2.97 ^{ab}	±0.086
Protein yield (g)	27.19 ^b	38.63 ^a	34.10 ^{ab}	±1.89
Lactose	4.42	4.51	4.79	±0.107
Total solids	11.17 ^b	11.74 ^a	11.69 ^a	±0.116
Solid not fat (SNF)	7.18	7.40	7.23	±0.262
Ash (%)	0.81	0.72	0.68	±0.030

*a, b and c: means in the same row with different superscripts are significantly ($P \leq 0.05$) different. SE=Standard error. *R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additives in to control ration.*

Feed consumption and feed conversion:

Results of DM intake by lactating goats during the experimental period are summarized in Table (4). The values DMI, TDNI and DCPI were significant ($P<0.05$) higher for both tested rations (R1 and R2)

Table (4): Feed intake and feed conversion of lactating goats fed the experimental rations.

Item	Experimental rations			±SE
	R0	R1	R2	
Feed intake (kg /head/day):				
DMI	1027 ^c	1038 ^b	1053 ^a	±2.35
TDNI	708.0 ^c	732.0 ^b	767.0 ^a	±3.32
DCPI	102 ^b	112 ^a	115 ^a	±0.949
4% FCM (kg)	901.4 ^c	1090.3 ^a	1019.8 ^b	±30.21
Feed conversion (kg/gain):				
DMI / FCM	1.14 ^a	0.96 ^b	1.04 ^{ab}	±0.026
TDNI / FCM	0.767 ^a	0.656 ^b	0.723 ^{ab}	±0.017

*a, b and c: means in the same row with different superscripts are significantly ($P \leq 0.05$) different. SE=Standard error. *R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additives in to control ration.*

than those of control one (R0), and also the values of R2 respecting only DMI and TDNI were higher significantly than those of R1, but differences between them didn't significant regarding DCPI value. While, Minnee *et al.* (2017) reported that inclusion up to 20 or 40% chicory (*Chicorium intybus* L.) in dairy cattle diet at late lactation by using grazing system could be decrease DMI and milk yields in comparison with grass-based swards diet. On the other hand, Volk and Marounek (2011) showed that no significant differences in rabbits feed intake and daily weight gain were found between chicory root- ration and the chicory free one. Also, Ivarsson *et al.* (2011) showed that no differences in feed intake and daily gain for weaned piglets fed a cereal-based diet including either chicory (*Cichorium intybus*) or ribwort (*Plantago lanceolata* L.) forage.

In respect of the feed conversion trait (Table 4) the best values that expressed as DMI/FCM and TDNI/FCM were occurred with 1%-DCL ration (R1), while the poorest one was found with control one (R0), while the 2%-DCL ration (R2) was occurred in between. These results are in agreement with those obtained by Boraie *et al.* (2013) who recommended to potentially have to be utilize the medicinal herbs as feed supplements to the rations of growing lambs, since it led to an improvement ($P<0.05$) for lambs ruminal measurements, increased feed intake, accelerated daily gain, feed utilization and maximize the net profit value/kg gain. While, Volk and Marounek (2011) recorded that there were no significant effect respecting feed conversion ratio with rabbits fed chicory root inclusion diet compared with those fed the free one. Also, Ivarsson *et al.* (2011) reported that no significant differences in feed conversion ratio in case of weaned piglets fed cereal-based diet with inclusion either chicory or ribwort forage. Feed conversion ratio was improved with the rabbits diet containing 20% chicory pulp compared to that of control diet (Guermah and Maertens, 2012).

Body weight changes for kids:

Live body weight (LBW) and daily weight gain for kids at intervals from birth up to three months of age are presented in Table (5). No significant differences in birth weight for kids among the experimental dietary treatments were observed. Almostly, kids in R1 showed the highest LBW and total weight gain at each age interval as compared to other groups, being the lowest values were associated with R0. The present results are supported by Di Grigoli *et al.* (2012) who emphasized on the potential of chicory forage to provide lasting good quality herb and the positive effect on dairy performance in grazing ewes. In a recent study, Dylan Laws and Liz Genever (2013) reported that lambs grazed on chicory forage have similar growth performances to those grazing legumes forage and better growth than those grazing grass based pastures and also they added that the rates of lamb growth can be 70% higher with grazing chicory in comparison to a standard grass sward. Furthermore, Allam *et al.* (2007) obtained the best findings of growth, meat quality and economic efficiency of production in Zaraibi kids due to the addition of some medicinal herbs like blackseed, chamomile, anise seeds and mint to their diets. Similarly, Boraie *et al.* (2013) recommended to utilize medicinal herbs as feed supplements to rations of growing lambs, since it led to accelerated daily gain, feed utilization and maximize the net profit value/kg gain. Likewise,

Table (5): Effect of experimental rations on body weight and daily gain of kids.

Item	Experimental rations			
	R0	R1	R2	±SE
Body weight (g/h/d):				
Birth weight (kg)	4.05	4.10	4.02	±0.33
Weight (kg) / 1 st month	8.40	9.18	9.01	±0.71
Weight (kg) / 2 nd month	11.45	12.40	12.35	±0.88
Weight (kg) / 3 rd month	15.00	16.91	15.96	±0.98
Daily gain (g):				
From birth to 1 st month	145	169	166	±21.45
From 1 st to 2 nd month	102	107	112	±18.05
From 2 nd to 3 rd month	118	150	120	±16.22
From birth to 3 rd month	122	142	133	±14.10

*R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additives in to control ration.

Ivarsson *et al.* (2011) reported that inclusion up to 160 g chicory forage /kg diet for weaned piglets did not negatively affect performance and was promising as feedstuffs for these animals. Also, in line with the present results, Yusrizal and Chen (2003) and SooBo (2005) recorded that addition chicory or inulin were affect growth performance positively in monogastric animals (rabbit, chicken, pig and rat), especially in young animals. Also, Castellini *et al.* (2007) and Attia *et al.* (2014) showed that root and forage of chicory are of interest as fiber source in poultry nutrition.

Blood parameters:

The values of some blood constituents of goats fed the different experimental rations are presented in Table (6). Results showed that the differences in concentrations of total protein, albumin, globulin, glucose, total cholesterol, aspartate (AST) and alanine (ALT) aminotransferase activities among the dietary treatments of goats were not significant. Meanwhile, plasma uric acid and creatinine concentrations were remarkably decreased in treated groups as compared to those of control one, being the lowest values occurred in tested ration (R1). Similar results were reported by El-Basiony *et al.* (2015) who recorded that slightly increases of each blood serum total protein, globulin, glucose, and in the meanwhile albumin, AST and ALT, cholesterol and urea concentrations were slightly decreased in diet of goats that supplemented with 10g *cichorium intybus*/h/d compared with the control group that free from chicory. These results are in agreement with El-Saadany *et al.* (2008) who worked on lactating Zaraibi goats. Recently, Mahmoud (2017) pointed that rabbits fed diet contained 1% dry chicory leaves (DCL) had the highest ($P<0.05$) concentrations of total blood protein, albumin, globulin, AST and ALT, whereas, the lowest values ($P<0.05$) was associated with 2% DCL compared with those of control one. Similarly, Allam *et al.* (2007) mentioned that decreased plasma cholesterol and total lipids in Zaraibi kids due to the addition of some medicinal herbs as blackseed, chamomile, anise seeds and mint to their diets. While, Mahmoud *et al.* (2014) found that with calves born from cows fed ration supplemented with 1% basil, globulin concentration was significantly higher in their blood compared with those born from cow fed 2% basil supplementation and the control one, otherwise all the rest of blood metabolites didn't significant affected by such additives. Definitely, Hanafy *et al.* (2009) concluded that using some medical herbage as feed additives in rations of growing Barki lambs could be improve the nutrient digestibilities, feeding values, daily gain and decrease serum cholesterol concentration which are favorably reflected on lambs performance and economic efficiency. On the other hand, serum total cholesterol, LDL and triglycerides concentrations were significantly ($P<0.05$) decreased in broiler chickens group fed on basal diet plus 200 ppm of both *Nigella sativa* and chicory extract compared to those of control group that free from herb (Behboud Jafari *et al.*, 2011). In line with the present results El-Basiony *et al.* (2015) mentioned that the control ration had significantly the highest level of creatinine when compared with that of goats fed diet supplemented 10 g *Cichorium intybus*/h/d.

Table (6): Effect of experimental rations on blood parameters of lactating goats.

Item	Experimental rations			
	R0	R1	R2	± SE
Total protein (g/dl)	8.53	8.72	8.47	±0.201
Albumin (g/dl)	4.21	4.66	4.47	±0.144
Globulin (g/dl)	4.32	4.06	4.00	±0.166
Glucose (mg/dl)	79.13	75.50	77.95	±2.30
Cholesterol (mg/dl)	149.50	138.26	146.10	±3.261
AST (U/I)	68.23	66.50	67.26	±0.630
ALT (U/I)	58.60	54.53	56.60	±2.128
Uric acid (mg/dl)	4.66 ^a	4.10 ^b	4.29 ^{a,b}	±0.155
Creatinine (mg/dl)	1.58 ^a	1.33 ^c	1.43 ^b	±0.016

*a, b and c: means in the same row with different superscripts are significantly ($P \leq 0.05$) different. SE=Standard error. *R0, control ration, R1, with 1% and R2, with 2% chicory leaves as an additives in to control ration.*

CONCLUSION

It could be concluded that 1% chicory addition into the required concentrate feed mixture could be useful as it improved nutrient digestibility, growth performance and milk production and its composition of dairy goats. Moreover, chicory addition appears to reflect a good hepatic function that correlate very well with high productive performance.

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تأثير إضافة أوراق الشيكوريا الجافة للعلائق على أداء الماعز الحلابة

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تم استخدام 24 عنزة حلابة بلدى قبل الولادة بشهر لدراسة تأثير إضافة مستويين من أوراق الشيكوريا الجافة بنسبة 1 و 2% من العلف المركز المقدم لهذه الامهات على معاملات الهضم و القيمة الغذائية وإنتاج اللبن وكذلك تأثير ذلك على نمو الجديان الناتجة من هذه الامهات. تم تكوين ثلاثة مجاميع من الماعز الحلاب، غذيت المجموعة الاولى على عليقة بدون أى اضافات "المجموعة الضابطة" والمجموعتين الثانية والثالثة غذيت على العلف المركز المضاف اليه عشب الشيكوريا الجاف عند مستويات 1 و 2% على التوالي من العلف المركز. وغذيت الماعز بمعدل 2,5% من وزن جسمها علف مركز بالإضافة الى 3 كجم برسيم/يوم/للرأس وذلك لتغطية احتياجات الماعز قبل أو بعد الولادة طبقاً ل (NRC 1989).

أظهرت النتائج إلى وجود زيادة ($P < 0.05$) معنوية في معظم قيم معاملات الهضم للمواد الغذائية وفي قيم المركبات المهضومة الكلية وذلك عند إضافة 1% من الشيكوريا الجافة في المجموعة الثانية تلتها المجموعة الثالثة المغذاة على 2% من الشيكوريا الجافة مقارنة بالمجموعة الضابطة (المقارنة).

كما أشارت النتائج إلى أن محصول اللبن الحقيقي ارتفع معنويًا مع المجموعة المختبرة التي تغذت على المجموعة الثانية وكان الارتفاع غير معنوي مع المجموعة الثالثة مقارنة بالمجموعة الضابطة. ومن جهة أخرى وجد أن اللبن المعدل لنسبة 4% دهن ارتفع معنويًا مع المجموعتين الثانية والثالثة مقارنة مع مجموعة المقارنة. بينما كانت المجموعة الثانية هي الأعلى معنويًا مقارنة بالمجموعات الأخرى. ودلت النتائج على عدم وجود اختلافات معنوية في مكونات اللبن (دهن، لاكتوز، SNF والرماد %) للماعز نتيجة للامداد بالمستويات المختلفة من عشب الشيكوريا الجافة عند مقارنتها بالمجموعة الضابطة. كما دلت النتائج على وجود زيادة معنوية في نسب البروتين و الجوامد الكلية فقط في اللبن خاصة للحيوانات المغذاة على 1% شيكوريا طوال فترة التجربة مقارنة بالمجموعة الضابطة.

كما أوضحت النتائج أيضا إلى أن المعاملات التجريبية المختبرة عند مستوى 1 أو 2% من الشيكوريا الجافة أدت إلى زيادة معنوية ($P < 0.05$) في كميات المأكول اليومي بالمقارنة مع مجموعة المقارنة أثناء فترة التجربة. وأوضحت النتائج أيضا إلى وجود تحسن ملحوظ في معدل الكفاءة التحويلية في المجموعة الثانية بينما كانت الأقل في مجموعة المقارنة.

وكانت هناك زيادة غير معنوية ($P > 0.05$) لوزن الجديان الرضيعه وأيضا في معدلات الزيادة اليومية مع المجموعة التي تغذت على المجموعة الثانية مقارنة بالمجموعتين الأخرى. في حين كانت الأقل مع المجموعة التي تغذت على مجموعة المقارنة وذلك في مراحل العمر المختلفة. مع عدم وجود فروق معنوية بين المعاملات التجريبية المختلفة.

نخلص من هذه النتائج أنه يمكن إضافة عشب الشيكوريا عند مستوى 1% من العلف المركز في علائق الماعز الحلابة ونتائجها.