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EFFECT OF FEEDING DIFFERENT TYPES OF SILAGE (BERSEEM OR KOCHIA AND THEIR MIXTURE WITH FODDER BEET) ON GROWTH PERFORMANCE OF GROWING MALE GOATS.

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ABSTRACT

This work was carried out on growing male Zaraibi goats to investigate the effect of substitution berseem by Kochia as source of protein in silage rations on digestibility, rumen and blood parameters and growth performance for kids. Eighteen Zaraibi kids (average 20.0 kg live weight and 5-6 months old) were divided into 3 similar groups (6 kids each). Half of crude protein requirements for kids were covered from concentrate feed mixture and the other half of crude protein was covered from: berseem silage in the first group (G1), (50% berseem+50% fodder beet) silage in second group (G2) and (50% Kochia+50% fodder beet) silage in third group (G3) for 16 weeks as an experimental period. At the end of feeding trials, three digestibility trials were conducted on male Zaraibi goats to determine digestibility and the feeding value of the experimental rations.

Results indicated that the CF, CP and Ash contents were higher while, EE, NFE, NDF and hemi cellulose were lower with berseem silage compared with the other silages. Meanwhile, the differences in contents of DM, OM, ADF and cellulose among the different types of silages were so narrow. The effect of the experimental rations on ruminal pH values and microbial protein content were not significant. Whereas, ruminal ammonia-N concentrations at 3 hrs and 6 hrs post-feeding were significantly lower with G2 compared to that of control ration, but the differences were not significant between G1and G3 rations in this item. On the contrary, the values of ruminal total VFA's were significant higher with the two tested rations than that of control ration at the two post feeding samples. Most blood constituents did not significant inflounced by dietary treatments. The effect of the tested rations on digestion coefficients of most nutrients was not significant. Only CP digestibility was significantly ($P<0.05$) higher with G1 (73.82%) compared with G2 and G3 (72.05 and 71.70 %, respectively). The same trend was also observed with DCP which recorded 10.27, 9.45 and 9.61 % for G1, G2 and G3, respectively. Regarding growth performance results indicated that the highest value of daily body weight gain was recorded with G1 (90.80 g) followed by G2 (83.30g) and lastly G3 (79.91 g) with significant differences only between G1 and G3. But the effect the tested rations on final weight were not significant in comparison with control one. The feed conversion (kg intake/kg gain), based on DM, TDN and DCP was not influenced by dietary treatments, with scanty better of feed conversion with control ration than the tested ones. The economical efficiency was the best with Kochia-Fodder beet ration in comparison with those containing berseem silage or berseem + fodder beet silage. So feeding growing male goats on 50 % CFM plus 50 % Kochia. Fodder beet silage ration appeared to decrease feed cost and increase econ omic efficiency.

Keywords: Berseem silage, kochia, fodder beet, growth performance, rumen parameters, economic efficiency.

INTRODUCTION

In Egypt, feed and food production are highly associated, whereas increasing one of them will lead to decrease the other due to the highly competition on limited cultivated area during winter and spring seasons where berseem and wheat crops are occupying the same limited area and increasing the cultivation of one of them significantly being deceasing the production of the other (Eweedah *et al*., 2007) Therefore, searching for unclassical plants or new sources of green crops to be used in farm animals feeding is visible route to overcome this problem and would help in raising animal production with reducing the feed costs and in turn the prices of animal products (Ahmed *et al*., 2012). More green forages in summer season are grasses such as sorghum and Teosinte which have low protein content and therefore many attempts were carried out to introduce some green forages or silages containing higher protein content such as Sesbania, cowpea and *Kochia indica* (Soliman *et al*., 1997, Ahmed *et al*., 2001 and El-Emam *et al.,* 2014). Singly or as mixtures with grasses, Tag El-Din *et al*.,(1991) reported that Kochia Indica could be used as a good green fodder for ruminants for its high content of crude protein compared to berseem hay which is becoming scarce and expensive. Similarly, Fahmy and Afaf (2000) reported that both sheep and goats were in good nutritional states when fed on *Kochia indica* diet and it could be highly recommended to use Kochia indica hay particularly during the summer season as good quality roughage instead of berseem hay.

In a recent study on using some protein sources such as berseem or Kochia silage and their mixture with fodder beet in rations of lactating goats, Maged *et al.* (2014) found that both milk yield and feed conversion were better with berseem silage and their mixture with fodder beet compared with the others, but milk fat percentage was significantly ($P<0.05$) higher with silage made from Kochia and fodder beet together compared with berseem silage singly or as mixtures with fodder beet.

Literature on using some protein sources such as berseem or Kochia and their mixtures with fodder beet in feeding male Zaraibi goats is scarce, therefore the aim of this study was to evaluate the effect of substitution of berseem silage by the mixtures of berseem with fodder beet silage or Kochia with fodder beet silage in the rations of growing Zaraibi kids on their growth performance. Also, digestibility and feeding values of experimental rations were determined as will as rumen and blood parameters were investigated.

MATERIALS AND METHODS

This study was conducted at El- Serw Animal Production Research Station (Damietta Governorate), that belonging to Animal Production Research Institute, Agricultural Research Center, Egypt. The aim of this study was to investigate the effect of substitution berseem silage by silage mixtures which were prepared from berseem with fodder beet or Kochia with fodder

beet forages in the rations of growing male goats on their growth rate, digestibility, rumen and blood parameters, feed conversion and economic efficiency.

Animals and feeding:

Eighteen growing Zaraibi kids were chosen from El- Serw Station flock with an average age of 5 to 6 months and 20 Kg weight and divided according to their body weight into 3 similar groups (6 each). Each group was housed in a semi- roofed yard (4x3x5 meters). Animals were weighted at the beginning trail then biweekly. Kids were fed for 2 weeks as a transitional period on the experimental rations before the start of the actual experimental work. Feeding trail was lasted 16 weeks and at the end of this phase, three digestibility trials were conducted using 9 male Zaraibi goats (3 each) to evaluate the digestibility and feeding values of the experimental rations. All groups were fed on restricted amount of concentrate feed mixture (CFM), in order to cover 50% of the crude protein requirements that recommended by NRC (1981) for goats and the different silages for three groups were fed ad libitum. So the dietary treatments were consisted of CFM+ berseem silage (G1), CFM+ (50% berseem + 50% fodder beet) silage (G2) and CFM+ (50% Kochia – 50% fodder beet) silage (G3). Berseem , fodder beet and Kochia indica were cultivated in El-Serw Experimental Station. Kochia indica were harvested during May and June at mid-bloom stage as reported by Shehata *et al.* (2001) and Maged *et al.* (2014). Berseem silage in the first group was prepared by adding 3% molasses on fresh basis as reported by Ahmed et al. (2013) and El-Emam et al. (2014). The chemical composition of the rations ingredients was presented in (Table 1). Water was available at all times and was measured as average for each group (ml/h/d). Rations were offered twice daily at 8 am and 3 pm, any refused were daily recorded. Proximate chemical analysis of the feeds and feces was carried out according to A.O.A.C. (1995).

Rumen fluid samples:

Rumen fluid samples were taken from 3 animals of each experimental group using stomach tube before feeding (0 times) and at 3 and 6 hrs post-feeding at the end of feeding trail period. The samples were filtered through 3 layers of gauze and immediately subjected to the determination of pH value by pH meter. Ammonia nitrogen (NH3-N) concentration was measured according to the method of Conway (1957). Microbial protein was determined according to Schultz and Schultz (1970), whereas total volatile fatty acids (VFA's) were determined according to the technique that described by Warner (1964).

Blood samples:

Blood samples were collected from jugular vein once before feeding (3 animals in each) at the end of feeding trail period. Blood samples were centrifuged at 4000 rpm for 20 min. and part of the separated serum was directed to enzymes activity determination, while the other part was stored at

-20°c till the biochemical analysis. Commercial kits were used for colorimetric biochemical determinations.

Economic efficiency:

Economic efficiency was calculated as total output/ input according to the local prices (where 1 ton of CFM cost 2500 L.E, BS cost 300 L.E, BS- FB cost 235 L.E and 1 ton Kochia- fodder beet, KH- FB silage cost 175 L.E while 1 kg live body weight of male Zaraibi goats equal 33 L.E).

Statistical analysis:

Data were statistically analyzed using One-Way layout with means comparisons procedure SAS (2003).

RESULTS AND DISCUSSION

Chemical composition of the experimental silages:

The data in (Table 1) indicated that the highest value of CP was recorded with G1 (berseem silage) (14.09%) followed by G3 (Kochia-fodder beet silage) (12.53%) while the lowest value (11.97%) was occurred with G2 (berseem-fodder beet silage). In the contrary, the content of NFE was lower in G1 (berseem silage) by 42.67 % compared with berseem-fodder beet and Kochia-fodder beet silages being 54.38 and 53.96, respectively.

Table (1): Chemical composition of feed ingredients (%) on DM basis.

Item	100% berseem silage	50% berseem 50% fodder beet silage	50% Kochia 50% fodder beet silage	CFM*
DM %	27.35	26.30	26.70	91.5
OM	87.85	89.70	88.27	94.15
CF	28.90	21.05	19.11	16.00
CP	14.09	11.97	12.53	14.30
EE	2.19	2.30	2.67	3.30
NFE	42.67	54.38	53.96	60.55
Ash	12.15	10.30	11.73	5.85
NDF	56.30	58.50	61.50	42.50
ADF	38.50	39.00	40.30	19.50
ADL	7.00	6.70	7.50	5.30
Hemicellulose	17.80	19.50	21.20	2.30
Cellulose	31.50	32.30	32.80	14.20

***Concentrate feed mixture (CFM) consists of 40% yellow corn, 27% undecornecated cotton seed meal, 25% wheat bran, 4% molasses, 2.5 limestone, 1% common salt and 0.5% minerals mixture.**

Moreover, both CF and Ash percentages were higher (28.90 and 12.15%, respectively) in berseem silage compared with those in two mixture silages. The content of EE, NDF, ADL and hemicellulose were higher being 2.67, 61.50, 7.50 and 21.20 %, respectively, in Kochia-fodder beet silage than those in other silages. While the contents of DM, OM, ADF and cellulose

were nearly similar in the three experimental silages. Similar results on the some types of tested silages were reported by Maged *et al*. (2014). In this respect, Ahmed *et al*. (2013) found that berseem silage contained 29.50% DM, 87.95% OM, 29.67% CF, 14.15% CP, 2.03% EE, 42.10% NFE and 12.05% Ash.

Silage quality:

The different types of silages had a good physical characteristics expressed as natural color and pleasant aroma as well as a good fermentative quality (Table 2) expressed as lowering of pH (3.97 to 4.43%), increasing lactic acid (5.95 to 6.61%) and little contents of butyric acid and ammonia-N. Data presented in (Table 2) showed that pH concentration were in normal range of good silage quality, being 3.97, 4.21 and 4.43 % for berseem, berseem plus fodder beet and Kochia plus fodder beet silages, respectively. The same trend was observed with acetic acid concentration, where the Kochia plus fodder beet silage had the lowest concentration of acetic acid (2.25 %) followed by berseem plus fodder beet (2.29 %) and berseem silage (2.40 %). In this respect, butyric acid concentration recorded 0.25, 0.31 and 0.35 % for berseem, berseem plus fodder beet and Kochia plus fodder beet silages, respectively. Ammonia –N concentration took the same trend of butyric acid concentration. These results are in line with the finding of Shehata *et al.* (2001) with Kochia silage and/ or Teosinte silage

Table (2): Fermentation characteristics of different typs of silages.

Items	100 % berseem	50% berseem 50% fodder beet	50% Kochia 50% fodder beet
pH value	3.97	4.21	4.43
Lactic acid, % DM	6.35	6.15	5.95
Acetic acid, % DM	2.40	2.29	2.25
Butyric acid, % DM	0.25	0.31	0.35
Ammonia, % DM	0.17	0.20	0.23

Daily feed intake and water consumption:

Daily feed intake and water consumption data are presented in (Table 3). The daily total DM intake as g/h or g/kgw$^{0.75}$ tended to slightly decrease with tested rations (G2 and G3) compared with control group G1, being 683 and 676 vs. 705 g/h and 61.87 and 61.51 vs. 62.22 g/kgw$^{0.75}$, respectively. Similar results were reported by Maged *et al.* (2014) with dairy goats. They found that the highest values of daily feed intake as g/h or g/kgw0.75 were recorded with berseem silage (1141 or 75.31, respectively) then berseem-fodder beet silage (1120 or 73.01) and lastly, Kochia-fodder beet silage (1099 or 71.78) respectively. They reported that these results were essentially related to the silage quality.

Table (3): Daily feed intake * and water consumption by Zaraibi kids fed the experimental rations.

Item	Groups		
	G1	G2	G3
Daily feed intake, g/h			
CFM	340	336	333
Silage	365	347	343
Total DM intake	705	683	676
DM intake, g/kg	62.22	61.87	61.51
Roughage:	52: 48	51: 49	51: 49
Water consumption			
L/h	1.85	1.93	2.11
ml/ kg BW	72.66	78.52	86.40
ml/ kg $w^{0.75}$	163	175	192
ml/ g DM intake	2.62	2.83	3.12

*** Group feeding.**

Generally, the roughage to concentrate ratio values did not differ significantly among the dietary treatments and that might be considering as a good evidence for the quality respecting the fermentation characteristics of three types of silage and in turn they had similar good quality degree as shown in (Table 2).

Concerning daily water consumption, kids consumed the least amount of water when fed on berseem silage (1.85 L/h or 163 ml/kg$w^{0.75}$), while the highest consumption was reduced with those fed Kochia-fodder beet silage (2.11 L/h or 192 ml/kg$w^{0.75}$) as shown in (Table 3). When the daily water consumption was related to DM intake (ml/g DM intake) similar trend among treatments was observed. The values of water consumption in this study are nearly similar to those obtained by El-Kholany *et al.* (2013) on growing goats that ranged from 3.11 to 3.36 ml/g DM intake. Generally, the daily water consumption with Kochia-fodder beet silage was markedly higher than those with the others (G1 and G2) which is mostly due to the halophytic effect of Kochia as reported by Ahmed *et al.* (2001) and Shehata *et al.* (2001) who using Kochia silage in goats rations.

Ruminal fermentation parameters:

Data of some ruminal liquor parameters of Zaraibi kids fed the experimental rations are shown in (Table 4). The maximum pH values were recorded at 0 time sampling with all groups without significant differences among treatments and then decreased to the minimum values at 3 hrs post-feeding and tended to increase again at 6 hrs post-feeding with all groups and also the differences among the dietary treatments did not significant over the two sampling times. Similar trends were observed by Zaid *et al.* (2009) and Ibrahim *et al.* (2012) with the Zaraibi kids and Rahmani lambs, respectively. In the same time, ruminal ammonia- N concentration was greatly higher post- feeding than before feeding. The maximum values of ruminal NH_3 were reduced at 3 hrs post- feeding samples then decreased at

6 hrs post feeding with all dietary treatments. Differences among treatments respecting ammonia- N concentration was not significant at zero sampling time, while at 3 hrs post feeding sampling time, ammonia- N concentration of G2 was lower significantly ($P<0.05$) than G1 and insignificant than G3. Similar trend was observed in case of 6 hrs post feeding sample. And also, no significant difference was found between G1 and G3 rations. Similar results were observed by Zaid *et al.* (2009) and El-Kholany *et al.* (2013). The high content of ruminal ammonia-N concentration in G1 may be due to the high content of crude protein in berseem silage as shown in (Table 1). Similar results were observed by Ahmed *et al.* (2013) who found that the concentration of ammonia-N at the 3 hrs was significantly higher with berseem silage (22.73) compared with mixture silage of berseem × Triticale (21.60) and Triticale silage (21.00) only.

Table (4): Effect of experimental rations on ruminal pH value, ammonia-N concentration, microbial protein content and total VFA's of Zaraibi kids.

Item	Hours	Groups		
		G1	G2	G3
pH value	0	7.00±0.06	7.07±0.09	6.97±0.03
	3	6.43±0.03	6.47±0.03	6.50±0.06
	6	6.73±0.03	6.70±0.06	6.67±0.03
Ammonia- N (mg/100 ml)	0	16.93±0.35	17.00±0.23	17.07±0.18
	3	23.13±0.33^{a}	21.87±0.13^{b}	22.13±0.27^{ab}
	6	21.60±0.40^{a}	20.13±0.18^{b}	20.67±0.24^{ab}
Total VFA's (mEq/100ml)	0	8.83±0.17	9.07±0.07	9.00±0.17
	3	11.73±0.13^{b}	12.93±0.35^{a}	12.73±0.18^{a}
	6	11.00±0.12^{b}	12.07±0.24^{a}	11.93±0.18^{a}
Microbial protein (g/100ml)	0	0.33±0.01	0.32±0.01	0.32±0.00
	3	0.55±0.02	0.56±0.01	0.55±0.01
	6	0.47±0.01	0.48±0.01	0.47±0.01

a-b Means in the same row with different superscripts differ significantly at P < 0.05 .

Concerning total VFA's concentration, it could be noticed that ruminal total VFA's concentration at 3 and 6 hrs post-feeding were significantly lower with berseem silage ration (control) than those of two tested rations with no significant differences between them. Otherwise differences among treatments at zero time did not significant respecting this item. These results were related to the content of carbohydrate (NFE) in the tested types of silages as reported earlier in (Table 1). Similar results were observed by El-Emam et al. (2014) who found that ruminal total VFA's concentrations during 3 and 6 hrs post-feeding significantly lower with berseem silage group than those of triticale silage or berseem × triticale silage. The present results indicated that concentration of T VFA's showed a reverse trend of ruminal pH value, thus the rumen pH in general decreased with increasing the T

VFA's concentration. Fouad (1991) reported that the rumen pH value in general decreased with increasing the T VFA's concentration in lamb's rumen. Variation in rumen pH might be responsible for the changes in other ruminal metabolites. He found that the changes in rumen pH potentially affected on microorganisms activations and consequently the mutability concentrations of the fermentative and metabolites.

Regarding to microbial protein content, the obtained results indicated that microbial protein content was not significantly affected by the tested experimental rations at all sampling times (Table 4). The very slightly differences among treatments might be attributed to that the dietary protein required for kids and their whole microorganisms population are in full covering by the three experimental ration. Similar results were observed by El- Kholany *et al.* (2013).

Blood parameters:

The effects of the experimental rations on most blood serum parameters were not significant as shown in (Table 5). Otherwise, serum glucose was significantly ($P<0.05$) lower with the two tested rations (G2 and G3) compared with control one (G1). The differences among the dietary treatments regarding the concentrations of triglycerides, total protein, albumen, globulin, AST and ALT were statistically non significant. Lack of effect of tested rations on the mentioned blood constituents was some probably due to the similarity of fermentative characteristics and the quality of different types of silages consumed by kids. And also due to the similarity of CP and fiber fractions contents over the three types of silage as shown in Tables 1 & 2. Concerning Ca and P contents in blood, despite diminishing differences among treatments, Ca content with G3 ration was lesser significantly than that of G1 and G2 ones, while P content was higher significantly with both tested rations than control one. The obtained values are within the normal physiological ranges that reported by Kaneko (1989) for healthy goats and in the line with the findings of Ahmed *et al.* (2001) and Maged *et al.* (2014) who used mixture of silages such as Kochia-Teosinet and Kochia-fodder beet in rations of dairy goats. The present results are in harmony with those obtained by Fahmy and Fayed (2000) who found insignificant differences respecting contents of total protein, albumen and globulin in blood of sheep and goats fed Kochia indica hay vs. berseem hay in addition concentrate feed mixture to cover 50 % of their energy requirements. Also, the percent results are in agreement with the findings of Runkins and smith (1991). Definitely, results recorded by Fahmy and Fayed (2000) indicated that both sheep and goats were not in catabolism status and kidney function was affected by Kochia indica diet and consequently animals were in a good nutritional condition.

Table (5): Blood parameters of male Zaraibi goats as affected by different experimental rations.

Item	Groups		
	G1	G2	G3
Glucose	96.67±0.88[b]	73.33±0.88[a]	72.00±0.58[a]
Triglycerides, mg/dl	77.67±2.33	81.00±2.08	78.00±1.53
Total protein, g/dl	6.27±0.15	6.37±0.23	6.23±0.15
Albumin, g/dl	2.60±0.17	2.57±0.17	2.67±0.19
Globulin, g/dl	3.67±0.15	3.80±0.38	3.57±0.24
AST, u/l	75±1.73	77±1.73	79±1.45
ALT, u/l	15.00±1.15	16.67±1.20	16.33±1.45
Calcium, mg/dl	10.50±0.12[ab]	10.57±0.09[a]	10.20±0.06[b]
Phosphorus (inorganic), mg/ dl	8.13±0.03[b]	8.33±0.03[a]	8.27±0.03[a]

a-b Means in the same row with different superscripts differ significantly at P < 0.05 .

Digestion coefficients and feeding value:

The effects of tested rations on digestion coefficients of most nutrients were not significant when compared with control one as shown in (Table 6). Only CP digestibility was significantly declined by the two tested rations compared with that of control one, with no significant difference between the tested rations (G2 vs. G3). Similar trend was observed with DCP among treatments being 10.47 for G1 vs. 9.45 and 9.61 % for G2 and G3, respectively (Table 6). This result was related to the crude protein content as reported earlier in (Table 1). Otherwise, very slightly differences among treatments in respect of TDN value were observed. Similar results were observed by Shehata *et al.* (2001) with substitution Teosinte forage by Kochia in silage form and offered with concentrate mixture to Zaraibi bucks. In other study, Fahmy and Fayed (2000) definitely indicated that sheep fed Kochia hay was able to digest DM, CP, EE, NFE, NDF and ADL much better than those fed berseem hay as roughages. They added that the lower digestibility of berseem hay deit may be due to the higher ADF content compare to that of Kochia hay diet. Total digestible nutrients (TDN) content and intake were similar for sheep fed either Kochia hay or berseem hay diets, while DCP % of berseem hay diet was higher than that of Kochia hay one (7.44 vs. 6.21). Additional results achieved by Hanafy *et al.,* (2013) indicated that Kochia silage superior the fresh as hay forms in both nutrients digestibility and nutritive values when all were fed to goats under the desert condition of Sinai in Egypt. Generally, the diminishing variations in digestibility among the experimental rations especially in CF might be due to the equality of concentrate mixture portion in the rations and in turn declined the negative associative effect and as well as being equal among dietary treatments (Huhtanen, 1991) He explained that the negative associative effect occurs most often when the level of concentrates supplementation is high, leading to reduced the digestibility of forage portion in ruminant's rations. In support to this point, Mostafa *et al.,* (2010) indicated that lower percentage of CFM in

silage ration (50 %) alleviated its negative effect on the digestibility of forage – CF in relation the higher percentage that involved in control which reached to (60 %).

Table (6): Digestibility and feeding values of experimental rations fed to Zaraibi kids.

Item	Groups		
	G1	G2	G3
Digestibility (%)			
DM	67.85±0.35	67.07±0.62	66.92±0.62
OM	70.65±0.45	69.89±1.04	68.53±0.42
CF	62.71±0.60	63.15±0.48	63.09±0.23
CP	73.82±0.49[a]	72.05±0.55[b]	71.70±0.34[b]
EE	82.00±0.68	79.86±0.41	80.10±0.59
NFE	70.86±0.77	69.16±0.71	68.85±0.62
Feeding values (%)			
TDN	66.05±0.35	65.90±0.52	65.45±0.45
DCP	10.47±0.07[a]	9.45±0.07[b]	9.61±0.05[b]

a-b Means in the same row with different superscripts differ significantly at P < 0.05 .

Growth performance:

Growth performance data of male Zaraibi goats, in relation to different treatments are presented in (Table 7). Data indicated that there were no significant difference among dietary treatments in respect of the final body weights of kids, with the highest value occurred with control G1 and the lowest value was associated with the tested ration G3.Also data indicated that both total body gain and daily body gain were reduced insignificantly by tested ration G2, but significantly by tested ration G3, with no significant difference between G2 and G3 rations (Table 7). It might be due to higher nutrient digestibility and feeding value of this treatment. Also, increasing total and daily weight gain of this group (G1) may be due to higher DM intake than the other groups. Similar results were observed by Maged *et al.* (2014) who substitution berseem by Kochia in rations of dairy goats. The reduction in daily gain with Kochia – fodder beet silage ration (G3) probably attributed to somewhat the higher content of some anti nutritional factors like oxalates, alkaloids and tannins, compared to berseem hay (Hanafy *et al.;* 2013). On the other hand, these results could be explained by the fact that in addition of digestibility effect, there are interaction effects among the components of the diet in which the utilization of ME can be changed up and down and these interactions can not be easily predicted by any of the current feed evaluation systems (Huhtanen, 1991). The author added that metabolically partitioning of energy (e.g. body tissues vs. milk, protein vs. fat accretion) is crucial in effectiveness and determining animal performance.

Table (7): Effect of experimental rations on growth performance and feed conversion of kids.

Item	Groups		
	G1	G2	G3
Initial body weight (kg)	20.38±0.36	19.92±0.31	19.95±0.40
Final body weight (kg)	30.55±0.64	29.25±0.46	28.90±0.55
Total body gain (kg)	10.17±0.39[a]	9.33±0.29[ab]	8.95±0.42[b]
Daily body gain (g)	90.80±3.45[a]	83.30±2.20[ab]	79.91±3.79[b]
Total DM intake, g/h/d:-	705	683	676
TDN intake, g/h/d.	466	450	442
DCP intake, g/h/d.	74	65	65
Feed conversion:			
kg DM/ kg gain	7.76	8.20	8.46
kg TDN / kg gain	5.13	5.40	5.53
kg DCP / kg gain	0.815	0.780	0.813

a-b Means in the same row with different superscripts differ significantly at P < 0.05 .

Feed conversion:

Feed conversion that expressed as kg feed unit intake per one kg gain are presented in (Table 7). Feed conversion efficiency did not affected significantly by treatments respecting OM, TDN and DCP/kg gain with better feed conversions associated with control ration (G1) respecting DM and TDN. But the values of feed conversion based on DCP were better with G2 (0.780) compared with the other groups. The higher protein content in berseem silage ration (G1) might be caused a favorable effect on microorganisms activities in rumen, digestion of diet, increased nutrients absorption and anabolic tissue metabolism that all potentially affect on feed utilization and feed conversion as well. Similar results were observed by Maged *et al.* (2014). The obtained values of feed conversion are within the normal range given by Ahmed *et al.* (2000) and Ahmed (2003) for growing Zaraibi goats. Moreover, El-Kholany *et al.* (2013) found that the values of feed conversion (kg DM / kg gain) of male Zaraibi goats ranged from 8.51 to 8.80.

Economic efficiency:

Economic efficiency estimated as price of gain weight divided by cost of feed consumed per head are presented in (Table 8). Results indicated that cost of consumed feed per head was reduced with using of mixture silages especially with Kochia-fodder beet silage (1.137 L.E/h) compared to berseem silage (1.33 L.E/h). Therefore, the feed cost / kg gain was reduced with substitution berseem by Kochia in silage ration (G3) and the values were 14.685, 14.790 and 14.230 for G1 (berseem silage), G2 (berseem fodder beet silage) and G3 (Kochia-fodder beet silage) respectively. Thus, the economical efficiency was slightly higher with Kochia-fodder beet (G3) than that of G1 and G2 rations. Similar results were recorded by Ahmed *et al.* (2001) with substitution of Teosinte by Kochia silage and Maged *et al.* (2014) with substitution of berseem by Kochia in dairy goat's rations. In perspective

Kochia plant was presented as natural salt tolerant plant and drought resistant and it could be used more efficiently as hay or silage rather than in fresh state since the feed processing would improve their palatability and nutritive value (Youssef et al., 1999).

Table (8): Economic efficiency of Zaraibi kids fed on different experimental rations.

Item	Groups		
	G1	G2	G3
Average daily gain, g	90.77	83.30	79.90
Daily feed intake (g/h) as feed			
CFM	373	369	365
Silage	1335	1319	1285
Cost of consumed feed, L.E/h	1.333	1.232	1.137
Price of weight gain, L.E	2.995	2.749	2.637
Feed cost/ kg gain, L.E	14.685	14.790	14.230
Economical efficiency, %	2.25	2.23	2.32

CONCLUSION

Based on the findings of this study, it could be concluded that silage prepared from Kochia plant plus fodder beet in equal percentages are valid substitution for berseem silage solely or mixed with fodder beet in the rations of growing male goats. Additionally it could be saving an economical alterative for new and untraditional feeds that potentially contributing in alleviating feed shortage in Egypt.

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تأثير التغذية على انواع مختلفة من السيلاج (البرسيم أو الكوخيا ومخاليطهم مع بنجر العلف) على أداء النمو لذكور الماعز النامية.

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أجرى هذا العمل البحثى لدراسة تأثير إحلال كلا من سيلاج البرسيم المخلوط مع بنجر العلف او سيلاج نبات الكوخيا المخلوط ايضا مع بنجر العلف محل سيلاج البرسيم فى علائق ذكور الماعز النامية على أداء النمو و الهضم والكفاءة الاقتصادية حيث تم استخدام عدد ١٨ ذكر ماعز زرايبى نامى (متوسط وزن ١٩ كجم وعمر ٥-٦ شهور) فى ثلاث مجموعات متساوية وقد أعطى العلف المصنع ليغطى ٥٠% من الاحتياجات الغذائية طبقا لمقررات الـ NRC ١٩٨١ ، فى حين تم التغذية على سيلاج البرسيم كعليقة مقارنة (ج١) ومخلوط البرسيم مع بنجر العلف (بنسبة ١:١) فى المجموعة الثانية (ج٢) وسيلاج الكوخيا مع بنجر العلف فى المجموعة الثالثة (ج٣)، وفى نهاية تجربة التغذية تم إجراء ثلاثة تجارب هضم لتقييم العلائق التجريبية الثلاثة المختبرة وكانت أهم النتائج كالتالى:

زاد محتوى الألياف الخام والبروتين الخام والرماد بينما انخفض كلا من الدهن والمستخلص الخالى من الأزوت (NFE) و مستخلص الألياف المتعادل (NDF) والهيميسليلوز فى سيلاج البرسيم مقارنة بانواع السيلاج الاخرى، بينما تقاربت نسبة المادة الجافة والمادة العضوية و ADF والسليلوز فى أنواع السيلاج الثلاثة، فيما يتعلق بقياسات سائل الكرش فقد أظهرت النتائج أن تأثير العلائق المختبرة على حموضة سائل الكرش والبروتين الميكروبى كان غير معنوى، فى حين انخفضت تركيزات آمونيا سائل الكرش فى عينات بعد الأكل (٣ و ٦ ساعات) فى العلائق المختبرة ج٢ و ج٣ مقارنة بعليقة الكنترول ج١ و الفروق كانت معنوية فقط بين ج١ و ج٢و على العكس ارتفعت معنويا مجموع الأحماض الدهنية الطيارة الكلية فى العلائق المختبرة (ج٢، و ج٣) مقارنة بالكنترول (ج١) و لكن لا توجد فروق معنوية بين (ج٢، ج٣) ، أما فيما يتعلق بمقاييس الدم فقد لوحظ أن معظم قياسات الدم لم تتأثر معنويا بالعلائق التجريبية المختبرة. وأيضا لم تتأثر معظم معاملات الهضم لمعظم العناصر الغذائية والمركبات المهضومة الكلية بالمعاملات المختبرة، فى حين انخفض معامل هضم البروتين معنويا مع العلائق المختبرة ج٢، ج٣ (٧٢.٠٥ ، ٧١.٧٠% على التوالى) مقارنة مع الكنترول ج١ وكان للمعاملات التجريبية نفس التأثير على قيم البروتين المهضوم (DCP) كالتالى ١٠.٤٧، ٩.٤٥، ٩.٦١ % للمجموعات الثلاثة على التوالى. فيما يتعلق بمعدل النمو فقد سجلت أعلى قيمة مع ج١ (٩٠.٨٠ جم) ثم مج٢ (٨٣.٣٠ جم) وأخيرا كانت اقل قيمة مع ج٣ (٧٩.٩١ جم) والاختلافات كانت معنوية بين ج١ و ج٣، فى حين لم تظهر اختلافات معنوية بين المجموعات الثلاثة المختبرة فيما يتعلق بالوزن النهائى. أما بالنسبة لكفاءة التحويل الغذائى محسوبة على أساس المادة الجافة والمركبات المهضومة الكلية كانت الفروق بين المعاملات غير معنوية و كانت الكفاءة الاقتصادية أفضل مع المجموعة الثالثة (الكوخيا- بنجر العلف) مقارنة بمجموعتى البرسيم (ج١، ج٢).

توصى الدراسة باستخدام نبات الكوخيا في سيلاج المخاليط حتي ٥٠% مع ٥٠% بنجر علف مع العلف المركز فى علائق الماعز النامية كبديل جيد لمصادر البروتين الاخري مثل سيلاج البرسيم بمفردة او مع بنجر العلف لتوفير بدائل علفية جديدة اقتصادية تساهم فى التخفيف من مشكلة نقص الأعلاف الخضراء فى الصيف، دون تأثير سلبي علي الاداء الانتاجى للماعز النامية ، مع الأخذ في الاعتبار أهمية إجراء دراسات مستقبلية علي حيوانات المزرعة الاخري أثناء مراحل فسيولوجية مختلفة وهذا بدوره يساهم فى حل مشكلتى نقص الأعلاف الخضراء والبروتين فى فصل الصيف .