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Comparing the Effect of Different Feeding Allowances on Performance of Egyptian Zaraibi Goats and their kids.

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ABSTRACT

Thirty females Zaraibi goats (27.40 ±0.60 kg LBW and aged 3-4 years) at late pregnancy(two months before parturition) and postpartum periods (seven months after parturition) were used in five equal groups(6 animals each) to compare the effect of five different feeding allowances on feed intake, nutrients digestibility, milk yield and composition, some blood constituents, and feed and economic efficiencies during suckling and milking periods (210 days) as well as their offspring performance from birth to weaning. Each group was allotted to receive G1, feeding allowance of APRI (2009),G2 and G3 as 100 and 80 % of NRC feeding allowance (1981), respectively, G4 as Kearl feeding allowance (1982) and G5 as traditional production system as control. All does were fed a ration consisted of concentrate feed mixture (CFM), berseem as fresh or hay and rice straw according to the previous feeding allowances. The obtained results indicated that does fed G4 or G1showed the highest digestibility and nutritive value of the most nutrients except CF% and DCP% and their values were nearly similar. While, those fed G5 had the lowest digestibility and nutritive values in all nutrients except NFE%. The body weight changes was numerically increased with animals fed G2, G3, G4 and then G1, respectively during lactation period. While, animals fed G5 had a slight decrease in live body weight (– 0.4 kg) during lactation periods. Milk yield during both suckling and milking periods for goats fed nutrient allowances of G1, G2, G4 and then G3, respectively was significantly ($P < 0.05$) higher compared with those fed G5 allowance. Also, the daily milk yield during all lactating periods (210 days) of Zaribi goats were increased by (69.57%) for G1, G2 and G4 and by (33.33%) for G3, respectively compared with G5. The milk contents of fat, protein, lactose, TS and SNF% were decreased with goats fed G5 compared to those fed G1, G2,G3and G4 with significant differences among them. Results of the blood plasma constituents indicated that total protein, globulin, albumin, urea-N, creatinine, ALT and AST values were within the normal ranges. Goats fed G5 had the lowest feed efficiency compared with other feeding allowance groups in both of suckling and milking periods. The economic return (LE/goat/day) was higher with G1 followed by G2, G4 and then G3 feeding groups, respectively during suckling periods. While, G2 was the highest values followed by G3, G1 and then G4 feeding groups, respectively during milking periods. Whereas, G5 group was the lowest one in both suckling and milking periods. Birth weight of born kids, weaning weight and daily weight gain of kids were significantly ($P < 0.05$) higher with goats fed G1 than those fed other feeding allowances. It could be concluded that for optimum productivity of goats, at early lactation (suckling period), 80% of NRC 1981 or APRI 2009 allowances can be used in Zaraibi goats feeding. On the other side, at late lactation (milking period), 100 % NRC 1981 or both of 80% of NRC 1981 and APRI 2009 allowances can be used according to the concentrate feed mixture price and the purpose of breeding. More studies are needed to determine the nutrient requirements for all goats breeds under Egyptian condition.

Keywords: Zaraibi goats, feeding allowance, digestibility, milk yield, feed efficiency and economic, kids performance

INTRODUCTION

In Egypt, the small ruminant population is estimated as 5.5 million sheep and 4.2 million goats (MOA, 2015). Although, Zaraibi goats (Nubain) population size is small (2% of the total goat population in Egypt), the breed has a good reputation in Egypt and Near East region, due to its high prolificacy and milk production (Galal *et al*., 2005). The milk yield of Zaraibi goats approximately is 250 kg in average during lactation periods (210 days) and the litter size ranged between 1 to 5 with an average 2.1 kids (Raheem, 1998). Goats are raised under harsh environments where water deficiency, high ambient temperature and feed shortage are the main constrains to their production traits. The available feedstuffs are often low in both of energy and digestible protein that fail in most cases to cover their maintenance requirements (Ben Salem and Nefzaoui,2003). Egyptian dairy goats (Zaraibi goats) have not received much attention in research due to their relative low milk productively. Nutrition and nutritional deficiency play an important role in productive and reproductive performance as growth, pregnancy, lactation and birth weight of born kids. The level of nutrition influences the reproductive performance through many mechanisms, whereas, the most likely possibilities include direct or indirect regulation of the uterine environment. Nutritionally mediated changes to the uterine environment may occure by changing components of uterine secretion or by influencing the circulating concentrations of progesterone that regulate uterine environment (George *et al*., 2007). Furthermore, Yusuf *et al*. (2009) show that energy supplementation activated growth performance by improving the physical consistency of mash type diet, enhances micro ingredients palatability and feed intake. On the other hand, protein quantity and quality play a major role in re-establishment of ovarian activity and effect on reproductive performance (Rosales-Nieto *et al*., 2011). Also, Hafez *et al*. (2011) found that high energy feed intake cause higher significantly pregnancy rate, increased number of kids born, fertility rate, kidding number, triplets rate and kid birth weight than low energy intake. Min *et al*. (2005) detected a positive correlation between amount of metabolizable energy and either milk yield or milk composition.

The present experiment aimed to study the effect of five different feeding allowances of Zaraibi goats on nutrients digestibility, feed intake, milk yield and composition, some blood constituents, and feed and economic efficiencies during sucking and milking periods as well as their offspring performance from birth to weaning .

MATERIALS AND METHODS

Animals and feeding trials:

Thirty females Zaraibi goats at the last two months of gestation were divided into five similar groups (six animal each) at Sakha Experimental Station at Kafr El-Shikh province belonging to Animal Production Research Institute. Does averaged 27.4±0.60 kg live body weight and aged 3-4 years. The experimental treatments lasted nine months (two months before kidding date and continued up to seven months of lactation period, 210 days). Feeding requirements were adjusted biweekly according to weight changes and milk production. The animals were randomly assigned to receive one of the nutritional requirements as following: APRI (2009) G1, 100% and 80% of NRC (1981) G2 and G3, respectively, 100 % of Kearl (1982) G4 and Traditional production system G5 as control. All does were fed a ration consisted of concentrate feed mixture (CFM) as pellets, berseem as fresh or hay and rice straw according to mention allowances. The concentrate feed mixture (El-Marg manufactory) consisted of 40% wheat bran, 30% yellow corn, 24% undecorticated cotton seed meal, 3% molasses, 2% limestone, 1% sodium chloride. The chemical composition of the ingredients (% on DM basis) are illustrated in Table 1.

Table 1: Chemical composition of feed ingredients during experimental periods (% on DM basis)

Item	%DM	Nutrients % of DM					
		OM	CP	CF	EE	Ash	NFE
Concentrate feed mixture (CFM)	91.81	92.86	14.70	10.85	3.10	7.14	64.21
Berseem	15.31	86.55	13.90	30.78	1.30	13.45	40.57
Berseem hay	90.86	87.88	13.23	33.43	1.20	12.12	40.02
Rice straw	92.11	85.24	4.80	39.20	1.32	14.76	39.92

Animals were fed twice daily at 8.00 a.m and 3.00 p.m according to their feeding allowance and drinking water was offered freely. Body weights of does was recorded biweekly at 8.00 a.m before the morning feeding and watering. The new born kids were also weighed after kidding and thereafter at biweekly intervals until weaning (120 days). The five experimental groups were housed separately and group fed on the experimental diets. All animals were housed in semi- open sheds that provide enough shade and ventilation in summer and protection from rain and wind in winter.

Digestibility trials:

The digestibility trials were conducted during the mid-term of the experimental period using three goats from each experimental group to determine the nutrients digestibility and nutritive value of the experimental rations. Acid Insoluble Ash (AIA) technique according to Van Keulen and Young (1977) was used as internal marker to determine the nutrients digestibility. Dry matter digestibility and all nutrients were estimated using as the following equation:

%Nutrient digestibility=100 - (% DM digestibility) (Nutrient in feces/ Nutrient in feed)

Feces grap samples were handily collected from the rectum twice daily at 7 a.m and 5 p.m.for three successive days. Feed and faces samples were dried, ground and kept for later analysis. Chemical composition of the different feed ingredients and feces were analyzed according to A.O.A.C. (2000).

Blood sampling:

Blood samples were collected monthly via the jugular vein from three does in each group during late pregnancy and postpartum periods. Blood plasma was separated after adding heparin and centrifuged at 4000 r.p.m. for 20 minutes, then stored at -20C^{o} until analysis for the different blood parameters. Blood plasma was tested for total protein, albumin, blood urea-N (BUN), creatinine concentrations and ALT and AST activity using commercial Kits.

Milk production:

Milk yield was recorded individually , once weekly throughout the lactation period. Estimation of milk yield during suckling period (120 days) was conducted through two successive days by measuring the difference between kids weight after and before suckling plus stripping the udder in the test day. Milk samples from consecutive milking were pooled and the composite samples were prepared and stored for chemical analysis latter using Milko Scan procedure**.**

Statistical Analyses:

Data were statistically analyzed by one way analysis of variance (completely randomized design) according to General Linear Models (GLM) procedures of SAS (2004) according to the following model:

$$Y_{ij} = \mu + x_i + e_{ij}$$

Where Y_{ij} =observation. μ=mean, x_i= the effect of treatment, e_{ij} =experimental error. The significance of the differences among treatments was tested by Duncan (1955).

RESULTS AND DISCUSSION

Chemical composition of the experimental rations:

Chemical composition of the experimental rations during the different physiological stages of Zaraibi goats (late pregnancy, suckling and milking periods) is presented in Table 2. Data showed that DM content ranged between 76.06 to 66.89%, 77.24 to 60.98 % and 91.82 to 91.43% in pre lambing, suckling period and milking period, respectively. The variation in DM content was due to the roughage which goats fed, since these were fed fresh green berseem and rice straw in pre lambing and suckling periods (during winter season) while, they were fed on berseem hay with rice straw in milking periods (during summer season). The CP content was ranged between 12.53 to 10.14 %, 13.83 to 13.39% and 13.57 to 11.91 %, the CF ranged between 23.79 to 19.95%, 20.60 to 17.97% and 23.12 to 19.04% and NFE content ranged between 54.63 to 52.16%, 56.85 to 53.21% and 54.38 to 49.33% for pre lambing, suckling and milking periods, respectively. The variation among the experimental rations may be due to the differences in roughage to concentrate ratio between rations used among groups that based on the nutrients requirements during different physiological stages.

Table 2: Chemical composition of the experimental rations during different physiological stages of Zaraibi goats .

Item	DM	%On Dry matter basis					
	%	OM	CP	CF	EE	Ash	NFE
pre lambing(60 days):							
G1	72.22	88.50	11.69	20.96	1.75	11.50	54.10
G2	75.91	87.79	10.18	23.79	1.66	12.21	52.16
G3	76.06	87.77	10.14	23.88	1.65	12.23	52.11
G4	71.13	88.35	11.34	21.96	1.73	11.65	53.32
G5	66.89	88.92	12.53	19.95	1.80	11.08	54.63
Suckling period* :							
G1	77.24	90.76	13.39	17.97	2.66	9.24	56.74
G2	60.98	89.85	13.78	20.60	2.27	10.15	53.20
G3	60.68	89.84	13.73	20.32	2.22	10.16	53.57
G4	64.58	90.16	13.83	19.63	2.35	9.84	54.35
G5	66.12	89.97	13.43	20.41	2.32	10.03	53.81
Milking period**:							
G1	91.79	87.86	12.72	19.04	1.72	12.14	54.38
G2	91.43	87.00	13.57	22.46	1.64	13.00	49.33
G3	91.43	87.00	13.57	22.46	1.64	13.00	49.33
G4	91.46	87.20	13.60	21.57	1.66	12.80	50.37
G5	91.82	86.98	11.91	23.12	1.61	13.02	50.35

*** Suckling period : after lambing until kids weaning (120 days) .**
**** Milking period: after weaning kids until the end of lactating period (90 days).**

Feed Intake:

Feed intake of Zaribi goats fed different feeding allowances during different physiological stages is shown summarized in Table 3. Data cleared that animal groups fed G2 and G5 recorded the highest feed intake expressed as DM and TDN (kg/h/d) followed by those fed G1 compared with those fed G3 and G4 during pre lambing. The differences among groups may be attributed to the variation between the ratio of roughage to concentrate which recorded 50:50 for both G1and G4, 59 : 41 for both G2 and G3 and 43 : 57 for G5. While, DCP intake (kg/h/d) was nearly similar among all animals fed the different feeding allowances. On the other hand, in suckling periods, goats of G1 showed the highest total DM, TDN and DCP intake (kg/h/d) followed by G4, G2 and then G5, respectively. While, group G3 had the lowest values. The substantial variation in feed intake among groups may refer to the differences in both of CFM amount in goat rations and the variation in concentrate to roughage ratio. In milking periods, total DM, TDN and DCP intake (kg/h/d) were the highest with G4 followed by G2, G1 and then G3, respectively. While, those fed G5 consumed the lowest intake values. The variation in total DM, TDN and DCP intake may be attributed to differences in the amounts of CFM, berseem hay and rice straw among different feeding allowances groups.

Table 3: Average feed intake (kg/goat/day) of Zaraibi goats fed difference feeding allowances during different physiological stages (pre lambing, suckling and milking periods).

Item	Experimental groups				
	G1	G2	G3	G4	G5
Pre lambing (60 days):					
Feed intake on DM basis:					
Concentrate feed mixture (CFM)	0.60	0.55	0.44	0.53	0.73
Berseem	0.28	0.28	0.23	0.28	0.41
Rice straw	0.33	0.51	0.42	0.26	0.14
Total DM intake	1.21	1.34	1.09	1.07	1.28
TDN intake*	0.71	0.76	0.62	0.64	0.79
DCP intake*	0.10	0.10	0.08	0.10	0.08
Suckling period :					
Feed intake on DM basis:					
Concentrate feed mixture (CFM)	1.38	0.83	0.66	1.02	0.78
Berseem	0.38	0.72	0.57	0.72	0.54
Rice straw	0.23	0.09	0.07	0.10	0.14
Total DM intake	1.99	1.64	1.30	1.84	1.46
TDN intake **	1.42	1.10	0.84	1.35	0.94
DCP intake **	0.21	0.18	0.13	0.21	0.14
Milking period:					
Feed intake on DM basis:					
Concentrate feed mixture (CFM)	1.19	1.02	0.82	1.32	0.73
Hay	0.36	1.01	0.81	1.11	0.36
Rice straw	0.23	0.10	0.08	0.10	0.32
Total DM intake	1.78	2.13	1.71	2.53	1.41
TDN intake *	1.08	1.28	1.02	1.53	0.82
DCP intake *	0.15	0.18	0.14	0.18	0.11

*** TDN and DCP intake values during pre lambing and after weaning kids until end of lactating period (90days) were calculated according to feeding values in feed composition tables of animal nutrition (Scientific and Practical) used in Egypt (1997), APRI, Ministry of Agric., Egypt.**

*** * TDN and DCP intake values during suckling period until kids weaning (120 days) were calculated according to feeding values in Table 3.**

Digestibility and nutritive values:

Digestibility coefficients and nutritive values of the different feeding allowances fed to lactating Zaraibi goats are presented in Table 4. The digestibility coefficients % of DM, OM, EE, NFE and nutritive values % as TDN and DE Mcal/ kg DMI were significantly (P< 0.05) higher for both of G1 and G4 than those fed other allowances G2, G3 and G5. However, CP digestibility increased significantly (P<0.05) with G1, G2 and G4 compared with those fed G3 or G5. While, does fed G5 allowances showed significant (P<0.05) decrease in CF digestibility than those fed G2 and G4, also insignificant decrease in CF digestibility was noticed with those fed G1 and G3, respectively.

Table 4: Nutrients digestibility and nutritive values of lactating Zaraibi Goats fed different nutrient allowances

Items	Experimental rations G1	G2	G3	G4	G5	±SE
Digestibility coefficients, %						
DM	71.36^{a}	67.34^{b}	63.40^{c}	74.58^{a}	63.30^{c}	1.16
OM	75.54^{a}	72.32^{b}	69.68^{c}	78.47^{a}	69.34^{c}	1.50
CP	80.68^{a}	79.30^{a}	72.94^{b}	81.41^{a}	73.22^{b}	0.81
CF	61.43^{ab}	66.39^{a}	63.80^{ab}	66.25^{a}	60.74^{b}	1.51
EE	84.38^{a}	78.51^{b}	76.45^{b}	82.61^{a}	70.57^{c}	0.96
NFE	78.23^{a}	72.55^{b}	70.83^{b}	81.95^{a}	71.58^{b}	1.23
Nutritive values (%):						
TDN%	71.16^{a}	67.21^{b}	64.78^{bc}	73.18^{a}	64.43^{c}	0.81
DCP%	10.80^{b}	10.92^{ab}	10.05^{c}	11.26^{a}	9.84^{c}	0.11
DE Mcal/Kg DMI*	3.14^{a}	2.96^{b}	2.86^{bc}	3.23^{a}	2.84^{c}	0.09

*: **DE (Mcal/Kg DMI) = 0.04409 x TDN% . (NRC, 1988)** **SE= standard error**

a, b and c: Means in the same rows with differ rent superscripts are significantly different at P< 0.05.

On the other hand, DCP% recorded the highest value with G4 and G2 than other allowances (G1,G3 and G5), respectively with significant differences among them .The does fed G5 had the lowest digestibility and nutritive values in all nutrients except in NFE %. While, G4 and G1 allowances showed the highest digestibility and nutritive value of the most nutrients except with CF and DCP% and their values were nearly similar. These results seem to agree with Haynes *et al*.(1955) who noticed that a linear increase in total nutrient digestibility of rations with increasing concentrate level up to 66%. Also, Kumar *et al*. (1981) found that the increase in dietary energy improved the digestibility of all nutrients except CF digestibility with male buffalo calves. In the present study, the improvement in the nutrients digestibility in most nutrients of all feeding allowances (G1, G2, G3, G4 and G5) was due to the effect of feeding a high quality feed (berseem and CFM). Mahmoud and Ebeid (2014) revealed that a high quality forage provide stimulatory factors to cellulolytic bacteria and other rumen bacteria, hence improved the digestive function, increased the availability and utilization of nutrients in the rumen and giving positive impact on digestion and nutritive values of the experimental rations.

Body weight change, milk yield and composition:

Data in Table 5 showed that body weight changes was numerically increased with animals fed G2, G3, G4 and then G1, respectively. While, animals fed G5 showed a slight decrease in live body weight (–0.4 kg). These results reflect the mobilization of body reserves, as indicated by the positive energy balance expect G5. Lactating goats fed nutrient allowances of G1, G2, G4 and G3, respectively had a positive effect on the amounts of milk yield compared with those fed G5 allowance with significant differences(P<0.05) among them during both suckling and milking periods. Also, goats fed G1 and G4 allowances produced higher quantity of milk than those fed G2 and G3 allowances. The decrease in milk yield of G5 feeding allowance may be due to the decrease in both of nutrients digestibility and nutritive values as shown in Table (4) or less fiberolytic bacteria population which in turn resulted in less CF digestibility.

Table 5 : Body weight changes (kg), daily milk yield and composition of Zaraibi goats fed different feeding allowances during lactation periods (210 days).

Item	Experimental groups G1	G2	G3	G4	G5	±SE
Body weight, kg:						
Initial body weight	27.3	28.0	28.8	25.7	27.4	-
Final body weight	28.5	33.3	33.0	29.5	26.9	-
Duration, days	210	210	210	210	210	-
Change in body weight	1.3	5.3	4.3	3.8	-0.4	-
Average milk yield(kg/h/d):						
Suckling periods (early)	1.52^{a}	1.35^{ab}	1.14^{ab}	1.43^{a}	0.98^{b}	0.10
Milking periods (late)	0.82^{ab}	0.98^{a}	0.70^{b}	0.90^{ab}	0.40^{c}	0.106
All lactation periods	1.17^{a}	1.17^{a}	0.92^{b}	1.17^{a}	0.69^{c}	0.040
Milk composition (%):						
Fat	4.03^{ab}	4.15^{ab}	4.25^{a}	4.02^{b}	4.00^{b}	0.071
Protein	3.05^{a}	2.86^{ab}	2.67^{b}	2.83^{ab}	2.56^{b}	0.108
Lactose	4.49^{a}	4.23^{dc}	4.41^{ab}	4.14^{d}	4.31^{bc}	0.040
Total solids	12.13^{a}	11.94^{ab}	11.99^{ab}	11.67^{ab}	11.56^{b}	0.155
Solids not fat	8.10^{a}	7.78^{ab}	7.75^{b}	7.65^{b}	7.56^{b}	0.108

a, b,c and d : Means in the same rows with different superscripts are significantly different at P< 0.05.

The daily milk yield during all lactating periods (210days) of Zaribi goats was increased by (69.57%) for those fed G1, G2 and G4 and by (33.33%) for G3, respectively compared with G5. Such increase may be due to the dietary energy content given greater efficiency of metabolizable energy for milk production. Similar results were observed by Cieslak *et al*.(2010) who found that milk production is fundamentally determined by the energy balance, that greater factor is import than aspects related to diets characteristics. Also, Min *et al* .(2005) observed a positive correlation between the amount of metabolizable energy and either milk yield or milk composition. The daily milk yield during suckling period was higher than that in milking periods (Table 5 and Figure1).

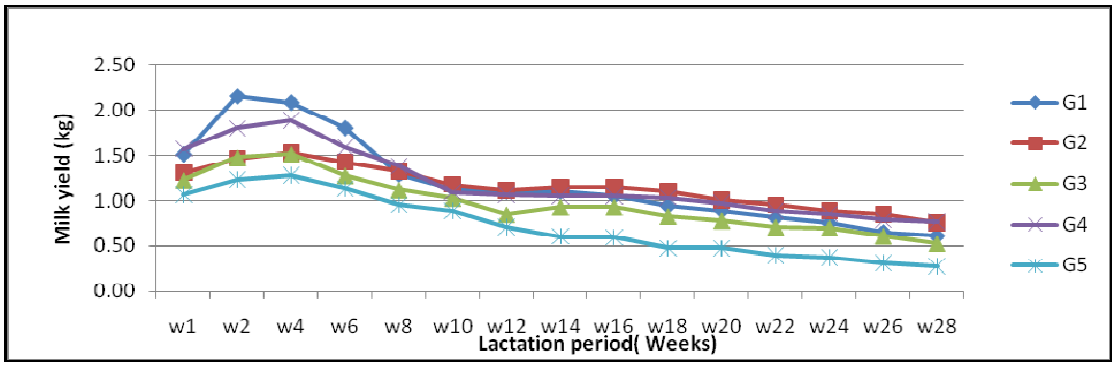

Figure 1: Milk yield of Zaraibi Goats fed different feeding allowances during lactation period.

Figure 1 showed that the peak of lactation curve and persistency of milk yield continued for three weeks (W2 up to W4) in all studied groups. This finding was in agreement with Pala and Koyuncu (2007) who reported that the average rate of persistency period through milk production attained at 2-4 weeks of lactation curve. Also, Mousa (1996) indicated that daily milk yield of Zaraibi goats reached a peak at 2nd and 4th week of lactation with restricted rations 100% NRC 1981.

Animals nourished G1 and G4 exhibited a higher lactation curves and longer persistency weeks followed by those fed G2 and G3, respectively compared with those fed G5 which recorded the lowest one. Then milking yield reduced gradually with progress of lactating weeks in all groups except with G5 which sharply declined till the end of the experimental period. Pala and Koyuncu (2007) defined that the worse persistency is probably because of lost secretory cells and the existing cells have less secretory activity.

Chemical composition of milk are shown in Table 5. Data indicated that milk constituents (fat, protein, lactose, TS and SNF%) were less in goats fed G5 compared with other groups. Regarding fat content of milk, it was significantly (P<0.05) higher in goats fed G3 than those fed G4 and G5, respectively, while, there were no significant differences among G3 and those fed G1 and G2 allowances. The milk fat% is affected directly by energy intake (EL-Sanafawy, 2008). The animals fed G1 had significantly (P<0.05) higher protein content than those fed G3 and G5 and insignificant with those fed G2 and G4. The higher percentage of milk protein for goats fed G1 was due to the lower roughage intake accompanied with increased CFM amount in their feeding allowance that usually resulted in better digestibility and utilization of CP. Similar trend was observed by Mould and Orskov (1983).

Milk content of lactose was significantly (P<0.05) higher with group G1 than those fed G2, G4 and G5 and insignificant with G3. This trend agree with Abdel-Rahman *et al* (2003) who found that milk lactose was lower with increasing roughage. Milk TS was significantly (P<0.05) higher with G1 than those fed G5 and insignificant with other feeding allowances (Table5). Similar trend was noticed by Morand-Fehr and Sauvant (1980) and EL-Alamy *et al*. (1987) who found higher values of milk TS could be fairly attributed to lower fiber level and higher energy intake. Milk SNF content was significantly (P<0.05) higher with G1 than those fed G3,G4 and G5 allowances. These results were in a liner with finding of Sachdeva *et al* (1974) and Devendra (1982) who found that, milk SNF content increased with decreasing dietary fiber level and the changes are mainly accounted for change in milk protein content.

Blood plasma parameters:

Data in Table 6 could be used as indicators for the nutritional and physiological status of the experimental Zaribi goats during pre lambing, suckling and milking periods. It was noticed that plasma total protein and creatinine concentrations ranged between (6.14 to 6.65 g/dl) and (0.97 to 1.15 g/dl), respectively with no significant differences among groups fed different feeding allowance during physiological status. On the other hand, plasma albumin concentration was significantly (P<0.05) higher with groups fed G3 and G5 than those fed other allowance at before lambing while, there were no significant differences among groups throughout one and four months after lambing. At the last lactating month, plasma albumin concentration was significantly (P< 0.05) decreased in goats fed on 100% NRC allowances (G2) compared with those fed G4 while, there were no significant differences among other groups. Yousef and Zaki (2001) showed that the increase in digestibility of CP may be the reason for the increase in each of serum total

protein and albumin concentration. Also, Ashour *et al*. (2004) found that albumin level is a reflection of liver function, the increase of albumin indicate higher ability of the animal to synthesize and store more protein. Plasma globulin concentration was significantly (P< 0.05) greater with groups fed G1 (3.60) and G2 (2.52) compared with those fed other allowances at post lambing. However, at 1st and 4th months after lambing the plasma globulin values were significantly unaffected by different feeding allowances. At the last lactating month, group (G2) had significantly (P< 0.05) higher plasma globulin values than those fed G3 while it was insignificant with other groups. Blood urea-N (BUN) concentration was significantly (P<0.05) lower in group G5 compared with other groups at pre lambing while, G4 was significantly (P<0.05) higher than those in G2 and G5 groups and it was insignificant higher with G1and G3 groups at 4 months after lambing. Goats fed G3 had significantly (P<0.05) lower BUN than G4 and G5 groups and insignificant (P<0.05) lower content compared with G1 and G2 groups at last lactating month. Activity of ALT did not influenced by feeding allowances. While, AST activity was significantly (P<0.05) higher with goats fed G5 than those fed G1, G2 and G3 feeding allowances and it was insignificant higher with G4 at post lambing.

Table 6 : Some blood parameters of Zaraibi Goats fed different feeding allowances during 210 days.

Item	Time	Experimental groups G1	G2	G3	G4	G5	SE±
T. protein (g/dl)	Before lambing	6.78	6.00	6.03	5.49	5.89	0.50
	After lambing (1 month)	6.60	6.41	7.01	6.20	6.49	0.38
	After lambing (4 month)	7.02	6.84	6.98	6.55	6.76	0.25
	After lambing (7 month)	6.20	6.30	5.58	6.31	6.50	0.30
	Overall mean	6.65	6.39	6.40	6.14	6.41	0.23
Albumin (g/dl)	Before lambing	3.19^{c}	3.49^{bc}	4.29^{a}	3.85^{ab}	4.15^{a}	0.15
	After lambing (1 month)	4.87	4.17	4.09	4.47	3.98	0.45
	After lambing (4 month)	4.43	3.87	4.15	3.69	4.10	0.27
	After lambing (7 month)	3.86^{ab}	3.67^{b}	4.30^{ab}	4.55^{a}	4.28^{ab}	0.24
	Overall mean	4.09	3.80	4.21	4.14	4.13	0.203
Globulin (g/dl)	Before lambing	3.60^{a}	2.52^{ab}	1.74^{b}	1.64^{b}	1.74^{b}	0.46
	After lambing (1 month)	1.73	2.23	2.92	1.72	2.51	0.61
	After lambing (4 month)	2.59	2.97	2.83	2.86	2.66	0.42
	After lambing (7 month)	2.34^{ab}	2.62^{a}	1.29^{b}	1.76^{ab}	2.22^{ab}	0.39
	Overall mean	2.56	2.59	2.19	2.00	2.28	0.30
Alb: Glob (ratio)	Before lambing	0.91	1.40	2.55	2.77	5.11	1.58
	After lambing (1 month)	7.29	2.33	1.47	3.68	1.91	2.63
	After lambing (4 month)	2.36	1.31	1.54	1.33	1.60	0.55
	After lambing (7 month)	1.67	1.49	7.16	2.58	2.17	7.59
	Overall mean	3.06	1.63	3.18	2.59	2.70	0.98
Urea-N (mg/dI)	Before lambing	51.33^{a}	52.67^{a}	58.00^{a}	48.33^{a}	24.67^{b}	5.86
	After lambing (1 month)	45.00	41.50	38.00	33.33	36.00	4.92
	After lambing (4 month)	35.50^{ab}	28.33^{b}	34.67^{ab}	44.33^{a}	32.33^{b}	3.14
	After lambing (l7 month)	36.43^{ab}	33.67^{ab}	19.67^{b}	58.33^{a}	54.00^{a}	7.59
	Overall mean	42.07	39.04	37.58	46.08	36.75	5.82
Creatinine(mg/dI)	Before lambing	1.18	0.88	1.00	0.91	0.73	0.16
	After lambing (1 month)	0.83	1.02	0.76	0.49	0.63	0.22
	After lambing (4 month)	1.20	1.58	1.41	1.82	1.27	0.31
	After lambing l7 month)	0.98	1.02	1.44	0.92	1.26	0.18
	Overall mean	1.05	1.13	1.15	1.04	0.97	1.82
AST (IU/L)	Before lambing	19.67^{b}	19.33^{b}	21.00^{b}	23.67^{ab}	29.33^{a}	2.05
	After lambing (1 month)	29.33	27.33	22.33	29.00	27.33	2.65
	After lambing (4 month)	22.67^{bc}	29.33^{a}	26.33^{ba}	20.00^{c}	20.00^{c}	1.41
	After lambing (7 month)	20.67	28.67	24.33	23.67	28.67	3.00
	Overall mean	23.08	26.17	23.50	24.08	26.33	1.97
ALT (IU/L)	Before lambing	12.67	12.33	15.33	13.00	12.00	1.32
	After lambing (1 month)	14.67	13.00	18.33	17.00	14.67	2.14
	After lambing (4 month)	16.00	15.67	11.00	13.33	12.67	2.42
	After lambing (7 month)	16.33	17.00	12.67	13.67	16.00	2.14
	Overall mean	14.92	14.50	14.33	14.25	13.83	1.11

a, b and c: Means in the same rows with different superscripts are significantly different at P< 0.05.

However, AST level of group G2 was significantly (P<0.05) higher than other groups at 4th months after lambing, while, AST activity did not affect by feeding allowance levels at 1st month after lambing and last lactating month. Values of ALT and AST were within the normal range and indicated that the animals were in a good nutritional status and their livers in a normal health. Tibbo *et al*. (2008) recorded that the mean normal serum enzymes levels ranged from 14.0 - 20.2 IU/L for ALT and from 43.2 - 49.3 IU/L for AST in goats. Generally, the obtained values of blood plasma parameters are within the normal ranges given by Ahmed (1995) for healthy goats.

Feed efficiency:

Data in Table 7 showed that total DM intake (kg/h/d) was decreased with G3 (1.30) and G5 (1.41) groups in each of suckling and milking periods, respectively compared with those in other groups. This reduction due to the decrease in the amount of CFM in both of G3 and G5 rations. Data of feed efficiency as kg milk/kg DMI, TDNI and DCPI indicated that goats fed G5 had the lowest feed efficiency compared with other feeding allowances group in both of suckling and milking periods. Whereas, G2 and G1 had the highest value during milking periods followed by G3 and G4. On the other hand, G4 and G1 had intermediate values during suckling periods.

Data in Table 8 display feed intake and feed efficiency during the whole lactation Periods (210 days). It indicated that total DM intake (kg/h/d) was higher with G4 (2.19) followed by G2 (1.90), G1 (1.89) and lastly G3 (1.51), respectively. While, those fed G5 had the lowest values (1.44). Feed efficiency as kg milk/kg DMI, TDNI and DCPI was superior with those fed G3 and G2 then G1 and lastly G4. Whereas, those fed on G5 had the lowest values.

Table 7: Feed intake and feed efficiency of lactating Zaraibi goats fed feeding allowance during suckling and milking periods.

Item	Feeding groups during suckling periods					Feeding groups during milking periods				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
Feed intake (kg/h/d) as DM basis:										
Concentrate feed mixture (CFM)	1.38	0.83	0.66	1.02	0.78	1.19	1.02	0.82	1.32	0.73
Berseem	0.38	0.72	0.57	0.72	0.54	-	-	-	-	-
Hay	-	-	-	-	-	0.36	1.01	0.81	1.11	0.36
Rice straw	0.23	0.09	0.07	0.10	0.14	0.23	0.10	0.08	0.10	0.32
Total DM intake	1.99	1.64	1.30	1.84	1.46	1.78	2.13	1.71	2.53	1.41
Milk production (kg/h/day)	1.52^{a}	1.35^{ab}	1.14^{ab}	1.43^{a}	0.98^{b}	0.82^{ab}	0.98^{a}	0.70^{b}	0.90^{ab}	0.40^{c}
Feed efficiency (kg milk/ kg feed intake) as:										
kg milk/kg DM intake	0.76	0.82	0.88	0.78	0.67	0.46	0.46	0.41	0.36	0.28
kg milk/kg TDN intake	1.07	1.23	1.36	1.06	1.04	0.75	0.77	0.69	0.59	0.48
kg milk/kg DCP intake	7.24	7.50	8.77	6.81	6.53	5.47	5.44	5.00	5.00	3.64

a, b and c: Means in the same rows with different superscripts are significantly different at P< 0.05.

Table 8: Feed intake and feed efficiency of lactating Zaraibi goats during whole lactating period 210 days.

Item	Feeding groups				
	G1	G2	G3	G4	G5
Average feed intake (kg/h/day) on DM basis:					
Concentrate feed mixture (CFM)	1.29	0.93	0.74	1.17	0.76
Berseem & hay	0.37	0.87	0.69	0.92	0.45
Rice straw	0.23	0.10	0.08	0.10	0.23
Total DM intake	1.89	1.90	1.51	2.19	1.44
Milk production(kg/h/d)	1.17	1.17	0.92	1.17	0.69
Feed efficiency(kg milk yield/kg feed intak)as :					
Kg milk yield/Kg DM intake	0.61	o.64	0.65	0.57	0.48
kg milk yield/ kg TDN intake	0.91	1.00	1.03	0.83	0.76
kg milk yield/ kg DCP intake	6.36	6.62	6.89	5.91	5.09

Economic efficiency :

Data in Table 9 indicated that feed cost (LE/goat/day) was higher in suckling period than in milking periods for all feeding groups. The economic return (LE/goat/day) which was higher with G1 followed by G2, G4 and then G3, respectively during suckling periods. While, G2 was the highest values followed by G3, G1 and then G4, respectively during milking periods. Whereas, G5 showed the lowest economic return in both suckling and milking periods. The highest economic efficiency was shown with G1 and G3 followed by G2 and G4 being 1.83, 1.82, 1.74 and 1.66, respectively during suckling periods. While, it was the highest with G2, G3, G1and G4, being 1.79, 1.62, 1.45 and 1.31, respectively during milking periods. Whereas, G5 was the lowest value in both suckling and milking periods . On the other hand, the highest relative economic efficiency values were recorded with those fed on G1 (122) and G3 (121) followed by G2 (116) and G4 (110) during suckling periods, while, it was higher with G2 (164) followed by G3 (148) , G1 (133) and then G4 (120) compared with G5 during milking periods.

Table 9: Economic evaluation of feeding Zaraibi goats on different allowances during suckling and milking periods.

Item	Feeding groups during suckling periods					Feeding groups during milking periods				
	G1	G2	G3	G4	G5	G1	G2	G3	G4	G5
Feed intake (kg/goat/day) as fed:										
Concentrate feed mixture (CFM)	1.5	0.9	0.72	1.11	0.85	1.3	1.11	0.89	1.44	0.8
Berseem	2.5	4.67	3.73	4.67	3.5	-	-	-	-	-
Hay	-	-	-	-	-	0.4	1.11	0.89	1.22	0.4
Rice straw	0.25	0.10	0.08	0.11	0.15	0.25	0.11	0.09	0.11	0.35
Feed cost (LE/goat/day)	3.74	3.50	2.82	3.88	2.95	2.54	2.46	1.97	3.10	1.65
Milk yield (kg/h/d)	1.52	1.35	1.14	1.43	0.98	0.82	0.98	0.70	0.90	0.40
Price of Milk production (LE/goat/day)	6.84	6.08	5.13	6.44	4.41	3.69	4.41	3.17	4.05	1.80
Net revenue(LE/goat/day)*	3.10	2.58	2.31	2.56	1.46	1.15	1.95	1.20	0.95	0.15
Economic efficiency **	1.83	1.74	1.82	1.66	1.50	1.45	1.79	1.62	1.31	1.09
Relative economic efficiency	122	116	121	110	100	133	164	148	120	100

Price of feedstuffs and supplementation (2014): 1800 LE/Ton of concentrate feed mixture (CFM), 400 LE/Ton of Berseem hay and 150 LE/Ton rice straw, and 4.5 LE/kg raw milk.

*** Net revenue (LE/goat/day) = money output – money input** **** Efficiency = money output/money in put**

Kids performance:

Data in Table 10 showed that kidding percentage was higher in goats fed G4 feeding allowance (100%) than other groups of feeding allowances (66.7%). Letter size was significantly (P<0.05) higher in goats fed on G2 feeding allowance than those fed G1 and G4 feeding allowances, while, there were no significant differences among G2, G3 and G5 feeding allowances group.

Table 10 : Effect of feeding allowance on fertility, litter size and growth performance of kids born during weaning period (120 days).

	Experimental rations				
Item	**G1**	**G2**	**G3**	**G4**	**G5**
Does bred	6	6	6	6	6
Does kidding	4	4	4	6	4
Kidding %[1]	66.7	66.7	66.7	100	66.7
Kids born	5	8	7	8	6
Letter size [2]	1.25^{b}	2.00^{a}	1.75^{a}	1.33^{b}	1.50^{ab}
Duration, days	120	120	120	120	120
Birth weight (kg)	2.7^{a}	2.1^{c}	2.5^{ab}	2.3^{bc}	2.4^{bc}
Final weight (kg)	14.2^{a}	9.7^{b}	9.04^{b}	8.66^{b}	9.46^{b}
Gain (kg)	11.50^{a}	7.60^{b}	6.54^{b}	6.36^{b}	7.06^{b}
ADG (g)	95.83^{a}	63.33^{b}	54.50^{b}	53.00^{b}	58.83^{b}

a, b and c: Means in the same rows with differ rent superscripts are significantly different at P< 0.05.
[1].No.of does kidding /does bred × 100. **[2].No.of kids born / does kidding .**

Birth weight of kids was significantly (P<0.05) heavier with each of G1 group (2.7 kg) and G4 group (2.5 kg) than those in G2, G3 and G5 groups (Table 10 and Figure 2). Also, kids in G1 group had significantly (P<0.05) the highest final weight (weaning weight) compared with those in G2, G3, G4 and G5 groups.

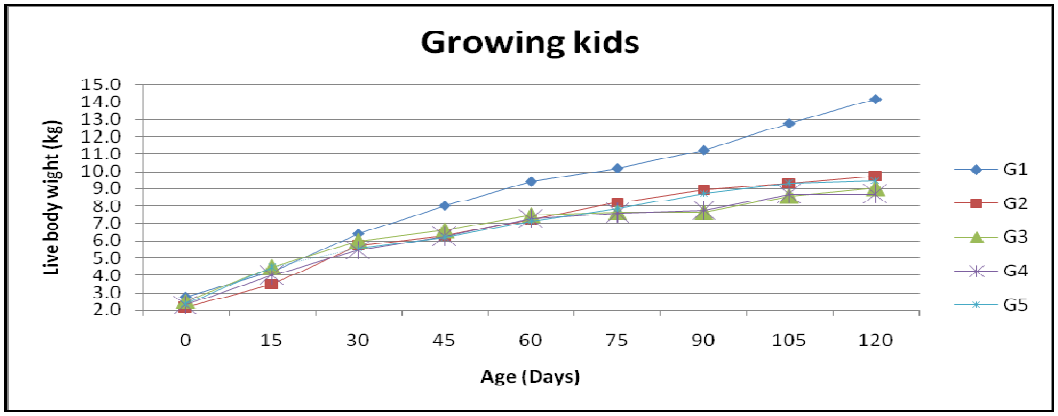

Figure 2: Body weight changes of goat kids as influenced by feeding allowance.

Also, kids in G1 group had a significantly (P< 0.05) highest daily gain (95.50 g) than those in other groups. These results are in agreement with Weinberg *et al*. (2003) and Yahaya *et al*. (2004) who stated that increasing milk yield of dams will lead to increase weaning weight of the offspring.

CONCLUSION

According to the above mentioned results of this work, it can be recommended that:

1- In early lactation (suckling period), 80% of NRC 1981 or APRI 2009 allowances can be used for Zaraibi goats feeding. It is interesting to note APRI allowance had the highest milk yield up to 1.5 kg/h/day which reveres on the performance of kids born including live body weight and average daily gain (95.8 g), it increased all nutrients digestibility and improved economic efficiency (1.83).

2- In late lactation (milking period) , 100% NRC 1981 or both of 80% of NRC and APRI 2009 allowances can be used according to the concentrate feed mixture price and the purpose of breeding. Therefore, these factors need to be carefully considered, if the holder amid to obtain heavier born kids only without interest to milk quantity and economic condition favor these system ,it can be use APRI allowance which its economic efficiency was relatively lower than both of 100% NRC and 80% NRC allowances due to the price of concentrate feed mixture was expensive.

3- It is necessary to carry more research for a long term feeding on nutrient requirements for all goats breeds in Egypt.

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مقارنة تأثير الاحتياجات الغذائية المختلفة على أداء الماعز الزرايبى المصرى ومواليدها

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أجريت هذه التجربة على ٣٠ عنزة زرايبى حلابة متوسط أوزانها ٢٧.٤ ±٠.٦٠ كجم وتتراوح أعمارها من ٣-٤ سنين فى المرحلة الأخيرة من الحمل (شهرين) ثم مرحلة الحليب (٧ شهور بعد الولادة). وتم تقسيمهم إلى خمس مجموعات فى كل مجموعة ٦ حيوانات.لمقارنة تأثير المقررات الغذائية المختلفة على المأكول ومعاملات الهضم ومحصول اللبن و مكوناته، وبعض مكونات الدم وكذلك الكفاءة الغذائية والاقتصادية للماعز الحلاب أثناء مرحلة إرضاع المواليد وفترة الحليب (٢١٠ يوما) بالإضافة الى أداء المواليد من الولادة وحتى الفطام. وغذيت الحيوانات على المقررات كالتالي: المجموعة الأولى G1 : مقررات معهد بحوث الإنتاج الحيواني ٢٠٠٩م, المجموعة الثانية G2 : مقررات ١٠٠% NRC (١٩٨١م), المجموعة الثالثة G3 : مقررات ٨٠% NRC (١٩٨١ م), المجموعة الرابعة G4 : مقررات Kearl (١٩٨٢م), المجموعة الخامسة G5 : النظام المتبع عند صغار المربين (كنترول), كل العنزات تغذت على العلف المركز والبرسيم الأخضر أو دريس وكذلك قش الأرز طبقا لمقرراتهم الغذائية السابقة. وكانت النتائج كالتالي : المجموعة الأولى والرابعة أعلى قيما فى معظم المركبات الغذائية ماعدا CF، DCP% ، بينما كانت المجموعة الخامسة منخفضة فى القيم الهضمية والغذائية لكل المركبات الغذائية ماعدا NFE%. أما التغيرات فى وزن الجسم تزداد مع المجموعة الثانية والثالثة والرابعة ثم يليهم المجموعة الأولى أثناء فترة الحليب. بينما ينخفض الوزن الحى للعنزات أثناء فترة الحليب فى المجموعة الخامسة.أما إنتاج اللبن فزاد معنويا مع التغذية على مقررات المجموعة الأولى والثانية والرابعة ويليهم المجموعة الثالثة أثناء فترة الرضاعة والحليب مقارنة بالمجموعة الخامسة. وكانت نسبة الزيادة فى فترة الحليب الكلية ٢١٠ يوما أعلى معنويا فى المجموعة الأولى والثانية والرابعة بمعدل ٥٧.٦٩% بينما كانت ٣٣.٣٣% للمجموعة الثالثة مقارنة بالمجموعة الخامسة (الكنترول). وكانت مكونات اللبن من الدهن والبروتين واللاكتوز والمواد الكلية الصلبة والمواد الصلبة اللادهنية تنخفض مع العنزات فى المجموعة الخامسة مقارنة بالمجاميع الأخرى معنويا. أما مكونات الدم (البروتين الكلى والجلوبيولين والالبيومين واليوريا والكرياتينين وALT, AST) فكانت فى معدلاتها الطبيعية دون تأثير على صحة الحيوان. وتنخفض الكفاءة الغذائية وكذلك العائد الإقتصادى للمجموعة الخامسة بالمقارنة بالمجموعة الأولى والثانية والثالثة والرابعة أثناء كل من فترة الرضاعة و الحليب. وكان وزن الميلاد للمواليد ووزن الفطام ومعدل النمو اليومي أعلى معنويا للمجموعة الأولى بالمقارنة بالمجاميع الأخرى. يمكن أن نستخلص من النتائج السابقة: أن التغذية على مقررات معهد بحوث الإنتاج الحيواني٢٠٠٩م وكذلك ٨٠% من NRC١٩٨١م للعنزات الزرايبى أدى إلى الإنتاجية المثلى فى المرحلة الأولى من فترة الحليب . أما فترة الحليب المتأخرة فيمكن استخدام مقررات ١٠٠% NRC١٩٨١م ،٨٠% من NRC١٩٨١م ،مقررات معهد بحوث الإنتاج الحيواني٢٠٠٩م وذلك طبقا لسعر العلف المركز والغرض من التربية. لذلك نوصى بمزيد من الدراسات على الاحتياجات الغذائية لكل سلالات الماعز تحت الظروف المصرية.