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NUTRITIONAL PERFORMANCE OF GOATS FED NON-CONVENTIONAL DIETS BASED ON OLIVE PULP IN SINAI

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SUMMARY

Due to the acute shortage of feed ingredients in the desert of Egypt, particularly during summer and autumn season, it was necessary to improve the utilization of local feed resources. Different levels of olive pulp were used in rations of goats during feeding (90 days) followed by a digestibility trial (15 days). Twenty eight mature bucks (averaged 23.8 kg body weight) were randomly assigned to four groups of 7 animals each). The groups were given *ad. libitum* in addition berseem hay (25% of the maintenance requirements). Ration I (R_1) contained 100% commercial concentrate feed mixture (CFM): ration 2 (R_2) was made from 79% olive pulp + 1% urea + 20% molasses ,ration 3 (R_3) contained 59% olive pulp + 1% urea + 20% date seeds + 20% molasses and ration 4 (R_4) was formulated from 40% olive pulp + 20% date seeds + 20% sunflower meal + 20% molasses.

Results of the feeding trail indicated that the maximum voluntary intake of supplement was achieved by goats fed the R_4 (DM/kg BW). The CP, CF and NFE nutrients were efficiently digested by goats given the R_4 while most nutrients showed slightly better values for ration 2. TDN and DCP intakes showed much better values for ration 4 (23.3 and 2.39 g/kg B.W., respectively). All animals were in positive N balance and the highest N retention was attained for goats offered ration 4.

Feed conversion values were 12.76, 13.02, 11.98 and 12.82 kg DM/kg B.W gain for groups fed rations 1,2,3 and 4. respectively. Feed cost /kg B.W gain were 5.37, 2.68, 2.46 and 3.28 L.E. for groups fed rations 1,2,3 and 4, respectively. It was recommended to use olive pulp in ruminant rations during drought season since these feed ingredients are available and feed costs would be reduced.

Keyword: non-conventional feed, goats, olive pulp, Date seeds, digestibility, nutritive value,

INTRODUCTION

In arid and semi arid desert conditions, grazing animals are seasonally subjected to shortage of feed. Under such conditions supplemental feeding has become a common practice. Moreover, the non conventional diet supplements are recommended when the pasture is extremely poor and this could substantially reduce the conventional diet supplements and cost of meat production.

Several workers investigated the efficiency of agro-industrial by-products for different classes of livestock and under varying conditions (Hathout et al, 1977, Abou El-Nasr, 1985, Khamis et al. 1989 and Eid, 1998). The olive pulp is a by- product that may be used a part in ruminant rations in periods of deficit in summer and autumn. The objective of this work was to investigate the possibility of using olive pulp as a supplement feed for goats in draught seasons.

MATERIALS AND METHODS

This study was conducted on 28 mature bucks, in Ras Sudr research station, southern Sinai Governorate, Egypt and lasted for 105 days (90 day feeding trial followed 15 day digestibility trial). Animals were allotted at random into four groups, each of 7 animals. Average initial body weight were 24.4, 23.2., 24.0 and 23.5 kg for groups 1, 2, 3 and 4 respectively. The animals in first group (control) received concentrate feed mixture only (R_1) while those in groups 2, 3 and 4 were offered olive pulp at three levels equivalent to 79% (R_2), 59% (R_3) and 40% (R_4) of the supplemental concentrate mixture respectively.

The composition of rations and chemical analysis of ingredients are presented in Tables 1 and 2.

Animals in each groups were housed in pens, and the supplemental feeds were offered *ad. libitum*, in addition to berseem hay at level of 25% of maintenance requirements according to Kearl (1982).

During the feeding trial (90 days) each group was feed and watered once daily and refusals were collected just before offering the next day's feed. Daily voluntary feed intake was recorded for each group. Animals were weighed biweekly on two consecutive days.

Immediately after end of feeding trial, three animals from each group were randomly selected and housed in individual metabolism cages to evaluate the supplemental rations for 2 weeks in a digestibility trail. During this trail the experimental rations were adjusted to 90% of the voluntary feed intake measured previously. On the last 7 days total fecal, urine excretion, feed offered and refusals, were recorded daily. Representative samples of feed rations offered and refusals as well as feces were collected, dried at 65°C to a constant weight and ground through 2mm screen for proximate analysis (A.O.A.C. 1984). Urinary nitrogen was determined by the standard micro-Kjeldahl.

Statistical analysis were carried out in a completed randomized design SAS (1990). Difference in means between groups were checked by Duncan's multiple range test (1971).

RESULTS AND DISCUSSION

Chemical composition of the experimental feeds compared with concentrate feed mixture (control) are presented in (table 3). The analysis indicated that the control group (CFM) had highest value of DM% (90.3). However, the three experimental groups were nearly similar. They were 85.8, 86.7, 86.40%. For R_1, R_2 R_3 respectively. The lowest percent of organic matter recorded for the control group (R1) followed by animals fed R4, R2 and R3 (being 84.90 *vs* 93.02, 92.28 and 94.54 respectively. Mean values of crude protein were nearly similar for all groups of the experiment (9.95%).

The data in Table (3) showed that the ether extract percentage increases with increase olive pulp concentration in the mixture. It is high (10.19) with 79% OPC in the mixture (R_2) and (6.66%) with 40% (OPC) in (R_4).

However higher values of nitrogen free extract (NFE) were recorded for the goat fed R_3 and R4 (62.63 and59.97) respectively the lowest value of NFE (59.1) observed with R_1.

Body weight gain:

Average values of body weight changes (kg) and daily body weight gain (g) of goat throughout the feeding trial (90 day) are shown in table (4). The results obtained in this study showed that body weight changes was 5.4 kg for

Table 1. Composition of supplements (%)

Ingredients	R_1	R_2	R_3	R_4
Concentrate feed mixture*	100	-	-	-
Olive pulp	-	79	59	40
Date seeds	-	-	20	20
Sunflower meal	-	-	-	20
Urea	-	1	1	-
Molases	-	20	20	20

***Concentrate feed mixture (CFM) is only included 22% yellow corn, 35% undecorticated cotton seed meal, 33% wheat bran , 4% rice bran. ,3% molasses, 2% limstone and 1%salt.**

Table 2. Chemical analysis of feedstuffs (on DM basis).

Feedstuffs	Chemical composition %						
	DM	OM	Ash	C.P	CF	EE	NFE
Concentrate feed mixture	90.3	84.9	15.1	10.1	13.8	1.9	59.1
Olive pulp	86.4	91.5	8.50	9.10	19.2	12.9	50.3
Date seeds	88.2	97.8	2.20	7.78	11.25	4.9	73.8
Sunflower meal	90.0	94.3	5.70	27.3	27.0	2.6	37.4
Molasses	73.0	89.7	10.3	3.30	-	-	86.4
Berseem hay	87.0	87.4	12.6	12.8	27.8	2.30	44.5

Table 3. Chemical composition of the supplemental feeds fed to goats (% on DM basis).

Chemical composition %	R_1	R_2	R_3	R_4
Dry matter	90.30	85.80	86.70	86.40
Organic matter	84.90	92.28	94.54	93.02
Ash	15.10	7.72	5.46	6.98
Crude protein	10.10	9.98	9.74	10.06
Crude fiber	13.80	15.17	13.58	16.33
Ether extract	1.90	10.19	8.59	6.66
Nitrogen free extract	59.10	56.94	62.63	59.97

R_1 = concentrate feed mixture (control)
R_2 = 79% olive pulp + 1% urea + 20% molasses.
R_3 = 59% olive pulp + 20% Date seed + 1% urea + 20% molasses.
R_4 = 40% olive pulp + 20% Date seed + 20% sunflower meal + 20 % molasses.

control group and 4.7, 5.9 and 6.1 kg for R2, R3 and R4 respectively. Moreover daily body gain was 60.0, 52.2, 61.1 and 67.8 g/day for the same groups. The greatest daily body gain was observed with (R_4) that contain 40% olive pulp followed by (R_3) which contained 59% olive pulp. The least average daily gain (ADG) value was record for R2 that contain the highest level of olive pulp (79%). This finding agree with Abdou (1998), Omar *et al.* (1995) on sheep.

The data showed that the values of ADG were significantly ($P \leq 0.05$) varied among treatments.

Daily voluntary feed intake of the experimental animal groups are summarized in Table (4). Berseem hay was used as a basal diet in all experimental groups in amounts to cover 25% of maintenance requirements of total digestible nutrients.

The maximum daily dry matter intakes of the different supplements were recorded for animals fed R4 (37g/kg B.W), this ration is the most palatable of the four supplements because it contains olive pulp, Date seed and sunflower cake in concentration with molasses (El Shaer *et al.* 90, 91, 96 and Khamis *et al.* 1989).

Feed conversion and economic efficiency:

As shown in Table 4 the bucks fed the diet (R_3) containing (59% olive pulp + 20% date stone + 20% molasses and 1% urea) consumed the lowest amount of kg DM/kg gain(11.98kg/kg gain) followed by R_1 (control and R_4 were nearly similar (12.76, 12.82 kg/kg gain). Whereas the bucks fed R_2 had non-significant highest value of feed as DM intake/kg gain (13.02). The animals fed R_4 had higher values of TDN/kg LBW gain (8.08 kg) than other groups.

Results clearly indicated that the cost of one kilogram body gain for bucks fed (R_3) was the lowest 2.46 LE/kg gain followed by R_2 (2.68) and R_4 (3.28) L.E/kg gain. However the control group (R_1) had the highest cost of one kilogram body gain. It is of interest to notice that rations (R_2), (R_3) and (R_4) reduced daily feed costs by about 47% compared to control ration (R1). Similar results were observed by El Shaer *et al.* (1986, 1996) and Khamis *et al.* (1989) on sheep and goats fed combination of some agro-industrial by products.

Digestibility coefficients and nutritive values:

Average values of nutrient digestibility and nutritive values of goats fed rations without and with olive pulp are shown in Table (5). The data clearly showed similar values of dry matter digestibility for R_2 (53.6%) and R_4 (53.1%) followed by R_3 (55.6). However the control group (R_1)had significant ($P \leq 0.01$) highest value of DMD(61.4%).

Crude protein (CP) digestion by bucks ranged from 63.4% in R_4 and 56.7% in R_2. Differences between treatments were statistical highly significant ($P \leq 0.01$). When comparing between three types of experimental rations which containing olive pulp (R_2, R_3 and R_4), the average digestion coefficients of CP, CF and NFE increased with decreasing the level of olive pulp. Similarly, Abou El-Nasr (1985) found that increasing amount of fat in diets of ruminants decreased digestibility.

The present study indicated that goat fed R_4 had significantly ($P \leq 0.01$) higher value of CF digestibility (64.6%) followed by R1, R3 and R2 (61.1, 58.9 and 56.5) in descending order.

Animal treated with 40% olive pulp (R_4) had highest value of NFE digestibility 68.7%. However the lowest value of NFE was noticed for animal treated with 79% olive pulp (R_2). The differences between treatments were non significant.

Table 4. Performance of goats fed the different rations during feeding trial.

Items	R1	R2	R3	R4	S.±E.
No. of animals	7	7	7	7	
Duration of trial (days)	90	90	90	90	
Initial body weight, (kg)	24.4[a]	23.2[a]	24.0[a]	23.5[a]	0.56
Final body weight, (kg)	29.8[a]	27.9[b]	29.9[a]	29.6[a]	0.15
Average daily gain, (g)	60.0[a]	52.2[b]	61.1[a]	67.8[c]	1.75
Daily voluntary feed intake,g /DM/kg B.W.)					
Berseem hay	6.80[a]	7.30[a]	5.80[a]	6.30[a]	0.66
Supplement rations	24.6[a]	22.0[b]	24.7[a]	30.7[c]	1.80
Total	31.4[a]	29.3[a]	30.5[a]	37.0[b]	1.70
Feed conversion:					
DM/kg L.B.W. gain (kg)	12.76[a]	13.02[a]	11.98[a]	12.82[a]	0.76
TDN/kg LBW gain (kg)	7.03[a]	7.75[a]	7.50[a]	8.08	0.75
Feed cost;					
Cost of gain, L.E./kg gain	5.87	2.68	2.46	3.28	

*** values with the different superscripts on the same line differ at (P≤0.05).**

*** Cost of rations R_1, R_2, R_3 and R_4 were calculated as 45.9, 21.0, 20.5 and 26.0 piasters/kg, respectively.**

Table 5. Apparent digestibility and nutritive values of the experimental rations in the metabolism trial.

Items	R_1	R_2	R_3	R_4	S.±E.
No. of animal	3	3	3	3	
Initial body weight (kg)	29.5a	27.5b	28.9a	29.0a	0.65
Daily voluntary feed intake (g DM/kg B.W.)					
Berseem hay	6.50[a]	7.20[a]	6.0[a]	6.20[a]	0.58
Supplement rations	23.6[a]	21.6[b]	23.6[a]	29.5[c]	1.75
Total intake	30.1[a]	28.8[a]	29.6[a]	35.7[b]	1.80
Apparent digestibilities (%)					
Dry matter (DM)	61.4[a]	53.2[b]	55.6[b]	53.1[b]	1.02
Organic mater (OM)	62.1	58.5	61.5	64.2	1.00
Crude protein (CP)	61.5[a]	56.7[b]	59.0[a]	63.4[a]	0.76
Crude fiber (CF)	61.1[a]	56.7[b]	58.9[ab]	64.6[a]	0.90
Ether extract (EE)	58.6[a]	56.5[b]	59.9[a]	57.9[a]	0.26
Nitrogen free extract (NFE)	63.8[a]	59.9[a]	64.1[a]	68.7[a]	1.51
Total digestible nutrients (TDN)					
g/kg B.W.	17.3[b]	16.8[b]	19.1[b]	23.3[a]	0.76
% of DM intake	57.5[b]	58.3[b]	64.5[a]	65.3[a]	0.96
% of MR.*	135.1	131.3	149.2	182.0	
Digestible crude protein (DCP)					
g/kg B.W.	1.98[b]	1.74[b]	1.81[b]	2.39[a]	0.76
% of DM intake	6.58a	6.04[b]	6.11[b]	6.69[a]	1.15
% of MR.*	165.0	145.0	150.8	199.2	

Values with the different superscripts on the same line differ at (P≤0.5).

***MR : Maintenance requirements.**

Table 6 : Nitrogen retention of different rations in the metabolism trial.

Items	R1	R2	R3	R4	S.E.
Nitrogen intake :					
mg/kg B.W	515[b]	492[b]	491[b]	602[a]	14.76
Faecal nitrogen:					
mg/kg B.W.	198.3[c]	213.0[b]	201.3[c]	220.3[a]	2.56
% of nitrogen intake	38.5[b]	43.2[a]	41.0b[a]	36.5[b]	5.01
Urinary nitrogen:					
mg/kg 0B.W.	185.2[a]	178.0[b]	153.0[c]	189.0[a]	6.44
% of nitrogen intake	35.9[a]	36.1[a]	31.1[b]	31.4[b]	3.22
Nitrogen retention:					
mg/kg B.W.	131.5[b]	101.0[c]	136.7[b]	192.7[a]	7.78
% of nitrogen intake	25.5[b]	20.5[c]	27.8[b]	33.0[a]	3.01

Values with the different superscripts on the same line differ at ($P \leq 0.05$).

Goats fed R_3 showed the maximum digestion coefficients of EE (59.9%) whereas the lowest values (56.5%) was recorded for goats fed (R_2), there were high significant ($P<0.01$) differences among treatments. This finding may be related to high level of fat in R_2

The highest TDN and DCP intakes were recorded for animals fed R_4 (23.3 and 2.39 g/Kg BW, respectively) and is due to higher intake , whereas the lowest values were noticed for R_2 (16.8 and 1.74 g/Kg BW, respectively) which had the lowest intake.

When TDN and DCP intakes were expressed as percentage of dry matter intake, TDN% and DCP% were highest for animals fed R_4. All animals on all rations were able to cover their maintenance requirement for energy and protein. Moreover the TDN intake was exceeded by 35.1, 31.3, 49.2 and 82.0%, while DCP intake was exceeded by 65.0, 45.0, 50.80 and 99.2% for R_1, R_2, R_3 and R_4, respectively, compared with the recommendation outlined by Kearl (1982).

Nitrogen utilization:

Data concerning the nitrogen utilization for goats fed the concentrate diet containing different levels of olive pulp are presented in table 6.

The data shown that the minimum nitrogen (492-491 g/kg BW) consumed by bucks were noticed with (R_2, R_3) which contained 79 , 59% respectively, olive pulp. While the highest value of nitrogen intake was observed with (R_4) (602 mg/kg BW) which contained 40% olive pulp. However the control group (R1) which fed on CFM without olive pulp had a middle value of nitrogen intake (515mg/kg BW) .

Data in Table 6 clearly showed that animals fed (R_4) excreted the highest amounts of fecal and urinary nitrogen 220.3, 189 mg/kg BW respectively. This may be due to increase nitrogen intake. The lowest values of urinary nitrogen (153 mg/kg BW was observed with (R_3). Animals fed R_1 and R_2 ration had middle values of urinary nitrogen 185.2, 178 mg/kg BW respectively.

Data in Table 6 show the average values of nitrogen retained mg/kg B.W. The presented data indicated that all animal groups were in positive nitrogen balance. They retained different values of nitrogen. The highest value 192.7 mg/kg B.W was recorded for animals fed R_4 whereas the lowest one 101.0 mg/kg B.W. was noticed for bucks Fed (R_2). However, similar values (134 mg/kg B.W) were observed with R_1 and R_3. The data also showed that nitrogen retained values as percentage of intake were highest 33.0% with (R_4) followed by R_3. 27.8%, R_1 25.5% and R_2 20.5% of intake in descending sequence.

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الأداء الغذائى للماعز المغذاة على علائق غير تقليدية تعتمد فى تكوينها على تفلة الزيتون

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نظرا لنقص مصادر الغذاء فى الصحارى المصرية وخاصة فى فصل الخريف والصيف كان من الأرجح الإهتمام بالمخلفات الموجودة بهذه المناطق مثل تفلة الزيتون حيث تكثر زراعة الزيتون لذا استخدمت تفلة الزيتون بمستويات مختلفة لعمل علائق لتغذية الماعز .

لذا أجريت تجربة تغذية إستمرت ٩٠ يوما تلتها تجربة هضم إستمرت ١٥ يوما وأستخدم فى هذه التجربة ٢٨ ذكر ماعز تام النمو بمتوسط وزن ٢٣,٨ كجم وقسمت الحيوانات لأربع مجموعات بكل منها ٧ حيوانات.المجموعة ١ تم تغذيتها على علف مركز وهى مجموعة المقارنة . المجموعة ٢ تم تغذيتها على عليقة تتكون من ٧٩% تفلة زيتون ، ١% يوريا ، ٢٠ % مولاس . المجموعة ٣ تغذت على عليقة تتكون من ٥٩ % تفلة زيتون ،١ % يوريا ، ٢٠% نوى بلح ،٢٠ % مولاس .المجموعة ٤ تغذت على عليقة تحتوى على ٤٠ % تفلة زيتون ، ٢٠ % نوى بلح ، ٢٠ %كسب عباد شمس ، ٢٠ % مولاس . وأظهرت النتائج تفوق الماعز المغذاة على العليقة الرابعة من حيث كمية المأكول كمادة جافة ، مجموع المركبات الكلية المهضومة ،البروتين الخام المهضوم لكل كيلو جرام من وزن الجسم وكذلك هضم البروتين والألياف الخام والمستخلص الخالى من النتروجين بينما أظهرت الماعز المغذاة على العليقة الثانية تفوقا طفيفا فى هضم المتبقى من المركبات الغذائية . وكان النتروجين المحتجز اعلى ما يمكن بالنسبة للعليقة الرابعة.بينما كان معدل تحويل الغذاء أعلى فى الحيوانات المغذاه على العليقه الثالثه تلتها الاولى ثم الرابعه وبحساب تكلفة كيلو جرام نمو كانت أقل العلائق تكلفه العليقه الثالثه ثم الثانيه ثم الرابعه .

مما سبق يمكن أن نستخلص أنه يمكن إضافة تفلة الزيتون فى علايق الماعز نسبة ٤٠ % مع الحفاظ على إداء جيد لها .