PALM TREE LEAVES AS A SOURCE OF FIBER IN RABBIT DIETS.

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SUMMARY

The objective of this study was to evaluate effect of replace alfalfa hay with palm tree leaves as fiber source in rabbit diets. The study was divided into two experiments a reproductive and a growth trial. In the reproductive experiment a total number of 24 rabbit does were assigned randomly to four groups (6 does in each) to receive diets contained palm tree leaves (PTL) at 0, 10, 20 and 30% of the complete feed in which, alfalfa hay was replaced. In the growth experiment, total number of 80 weaned New Zealand White rabbits of both sex at 5 weeks old were randomly divided into four experimental groups (20 in each) to receive diets containing PTL at 0, 10, 20 and 30%. Does fed the control diet (0% PTL) showed the lowest ($P \leq 0.05$) litter size, weaning number and weaning weight as compared to other groups in the first litter, while in the second litter not significant differences were observed among the different groups. In the growth experiment, rabbits group received diet containing 30 % palm tree leaves (G4) showed the highest ($P<0.05$) daily feed intake (DFI) followed by G1 (control) and G3 (20% PTL), however lowest ($P<0.05$) DFI value was in the G2 group (10% PTL) during 6 to 9 weeks of age, while, not significant differences were found among the different groups during the period from 10 to 13 weeks of age. Replacing alfalfa hay by 10 and 20 % PTL improved apparent crude fiber digestibility in comparison with the control and 30% PLT groups. Gradually decrease of the percentage of alfalfa hay and increase of PTL caused not significant decrease ($P \geq 0.05$) in total serum protein and albumin concentrations. Rabbits fed on diets containing 10 and 20 % PTL showed lower growth rate ($P \leq 0.05$) than both control and 30% PTL group during the first period (6-9 weeks of age), while not significant effects were observed in average daily weight gain during the entire experimental period (6-13 weeks of age). Replacing alfalfa hay by 10 or 20 % PTL caused significant improvement ($P \leq 0.05$) in feed conversion ratio as compared to the control group during the second period of growth (10-13 weeks of age) as well as during the entire of experimental period (6-13 weeks).

It could be concluded that, replacing alfalfa hay with 10 to 20% of PTL in formulating rabbit diets did not cause adverse effects on productive and reproductive performance of does and growing rabbits.

***Keywords**: palm tree leaves, rabbit, performance, economic efficiency*

INTRODUCTION

Egypt suffering from shortage in fodder crops needed for feeding farm animals. Since Berseem and alfalfa is the main fodder crop in rabbit diets. Water problems are emerging as the most compelling sets of issues facing agricultural production in the 1990s. Egypt hide acute water shortages in localities, result from rapid population increase or natural scarcity (World Resource Institute, 1988). So it is clear that there is a need to search for another fodder crops as alternatives.

A potentially useful source of cheap roughage is date palm tree (*Phoenix dactilifera*) leaves which is a major crop in Egypt with population estimated at approximately 11 million trees (Agricultural Statistics, 2006). A date-palm tree annually produces approximately 20 kg of leaves, which mean producing approximately 220,000 tones of dry matter annually. However, with respect to their possible utilization, existing information concerning voluntary intake and nutritive value of date-palm leaves in herbivores is scarce (Al-Yousef et al., 1994 and Tag-El-Din, 1996). Bahman et al. (1997) suggested that date-palm leaves might be an acceptable alternative to barley straw in highly concentrated diets for dairy cows.

Rabbits are herbivorous animals, consuming high-roughage diets. Nevertheless, rabbits are poorly digest fibrous materials and their use of agricultural by-products may be limited if the lignin fraction is high. It has been shown that dietary fiber components determine growth responses in rabbits (Harris and Johnston, 1979), and physicochemical properties of structural polysaccharides are important for the development of the digesta in the gut and the utilization of nutrients. This allows obtaining a good quality

of forage all the year around and it allows using date palm leaves for feeding instead of being burned and causing pollution.

The purpose of present study was to evaluate the effect of replacing alfalfa hay with palm tree leaves on does and growing rabbit diets.

MATERIALS AND METHODS

The present study was carried out at the Centre of Agricultural Studies and Consultations (CASC), Rabbits Production Unit (RPU), and laboratory of Animal Nutrition, Department of Animal Production, Faculty of Agriculture, Ain Shams University, Cairo, Egypt. The study divided into two experiments:

Reproduction experiment

A total number of 24 New Zealand White (NZW, 1.5 years old and 3.35 kg weight) does were randomly divided into four experimental groups (six does in each). Four pelleted approximately isocaloric, and isonitrogenous experimental diets were formulated. . All experimental diets meet the recommended nutrient requirements of rabbits does according to NRC (1977) and Cheeke (1987), in which alfalfa hay was replaced by palm tree leaves (PTL) at 0, 10, 20 and 30% of the complete feed.

Growth experiment

A total number of 80 weaned New Zealand White (NZW) rabbits of both sex of 5 weeks old were randomly divided into four experimental groups (20 rabbits per group). Each group was subdivided into five replicates, each of 4 rabbits, and the initial live body weights in all of the experimental groups were similar. Four pelleted isocaloric and isonitrogenous experimental diets were formulated. . The diets were meet the recommended nutrient requirements of growing rabbits according to NRC (1977) and Cheeke (1987), in which alfalfa hay was replaced by PTL at 0, 10, 20 and 30% of the complete feed. The growth experiment lasted for 8 weeks.

1. Measurement of the apparent digestibility of nutrients

At the last week of the growth experiment, digestibility trials were conducted using 20 rabbits (5 male rabbits from each treatment group), which were housed individually in metabolic cages that allow feces and urine separation. The adaptation period was 7 days and the collection period was 3 days. Feed intake was determined individually and daily, feces were collected daily, weighed and dried at 60-70°C for 24 hours, bulked, finely ground and stored for chemical analysis. The apparent digestibilities of DM, OM, CP, CF, EE and NFE for the tested diets were estimated. The total digestible nutrients (TDN) were calculated according to the classic formula (Cheeke *et al.*, 1982). The digestible energy (DE) of PTL was calculated according to Fekete and Gippert (1986) by applying the equation: DE (kcal/kg) = 4253-32.6 (CF%) -144.4 (total ash%).

2. Blood samples

Blood samples were collected at slaughtering into heparinized glass tubes (6 samples per each treatment group). Blood plasma was separated by centrifugation at 4000 rpm for 15 minutes. The collected plasma was stored at -20°C until being assay.

Animal management

The experimental rabbits were housed in galvanized metal wire cages (80 × 50 × 40 cm for length, width and height respectively), and provided with feeders and automatic watering system, with one doe per each cage or four growing rabbits per each cage. The cages were located in a naturally ventilated and lighted building. The experimental diets were offered to the rabbits ad libitum and fresh water was freely available.

Analytical methods

The chemical composition of alfalfa hay, PTL, experimental diets and dried feces were analyzed according to AOAC (1995). Neutral detergent fiber (NDF), assayed without using sodium sulfite and expressed inclusive of residual ash, acid detergent fiber (ADF), expressed inclusive of residual ash, and acid detergent lignin ADL were determined according to Van Soest et al. (1991). Total protein content of blood plasma was determined as described by Armstrong and Carr (1964), albumin content was determined as described by Doumas et al. (1971). Globulin content was calculated by difference between

total protein and albumin. A: G ratio was calculated by dividing the value of albumin on the value of globulin. Creatinine content was determined by the method of Husdan (1968). Activities of ALT and AST were determined by the method of Reitman and Frankel (1957).

Economical evaluation

The economic efficiency (EEF) was calculated according to the following equation: EEF = A-B/B × 100. Where A is selling cost of obtained gain (LE) and B is the feeding cost of this gain. The performance index (PI) was calculated according to the equation described by North (1981) by applying the equation: PI = Live body weight (kg)/ Feed conversion (kg/kg) × 100

Statistical analysis

Data were analyzed according to statistical analysis system User's Guide, (SAS, 1999). Separation among means was carried out by using Duncan's multiple range test (Duncan, 1955). The model used was as follows: $Y_{ij} = \mu + T_i + e_{ij}$

Where: Y_{ij} = the observation on the I^{th} treatment μ = Overall mean

T_i = Effect of the I^{th} treatment e_{ij} = Random experimental error

RESULTS AND DISCUSSION

Chemical analysis of PTL, alfalfa hay and experimental diets:

The data presented in Table (1) clearly indicated that, PTL had higher DM, OM, CF and NDF content than alfalfa hay. On the contrary, alfalfa hay had higher CP, EE, crude ash and ADL, while ADF content were similar in two fiber sources. Similar trend was obtained by El-Faham (2005) and Abdel-Azeem and El-Bordeny (2007) when compared PTL with clover hay. The data proved that, it is possible to use palm tree leaves as a replacer of alfalfa hay as a source of fiber in rabbit diets.

Table (1): Chemical composition and cell wall constituents of alfalfa hay and palm tree leaves (PTL).

Item	On dry matter basis	
	Alfalfa hay	PTL
Dry matter (%)	90.65	92.88
Organic matter (%)	89.91	90.20
Crude protein (%)	14.86	5.32
Ether extract (%)	2.17	0.96
Crude fiber (%)	27.00	38.21
NFE (%)	45.88	45.71
Crude ash (%)	10.09	9.80
Cell wall constituents		
NDF	51.23	58.61
ADF	42.11	42.28
ADL	12.25	9.71
Cellulose	29.86	32.57
Hemicellulose	9.12	16.33

It is well established from data of Table (2 and 3) that, the different ingredients used by different ratio to formulate the four experimental diets to get balanced diet for each production purpose. Those contained approximately similar percentage of methionine + cystine and lysine, also calcium and phosphorus.

Replacement of alfalfa hay with PTL in does diets resulted gradual increase in crude ash, CF, NDF, ADF, cellulose and hemicellulose content parallel with the gradually increased PTL level, while gradually decreased the NFE and ADL content. Inclusion of PTL in the growing rabbit diets resulted gradual increase in NDF and hemicellulose content up to 20% PTL level, then dramatically increased at 30 % PTL inclusion. ADF and cellulose contents increased gradually, while ADL content decreased gradually.

These results may be due to that PTL had higher NDF and ADF and lower ADL contents as compared to alfalfa hay (Table 1).

Table (2): Composition and nutrient content of experimental does diets

Ingredients (%)	D1	D2	D3	D4
Alfalfa hay	30	20	10	-
Yellow corn	5	10	15	19
Barley	13	13	15	15
Wheat bran	23	19.3	13.2	11
Palm tree leaves	-	10	20	30
Soybean meal (44% CP)	25	24	23.5	22.1
Limestone	1.9	1.6	1.3	1.0
Premix*	0.3	0.3	0.3	0.3
Common salt	0.3	0.3	0.3	0.3
Dicalcium phosphate	1.4	1.4	1.3	1.2
DL-Methionine	0.1	0.1	0.1	0.1
Total	100	100	100	100
Determined nutrient content (on DM basis):				
Dry matter (DM%)	88.94	87.43	89.57	89.16
Organic matter (OM%)	91.22	89.08	90.46	89.97
Crude protein (CP%)	18.09	18.10	18.03	18.00
Crude fiber (CF%)	13.14	13.15	13.06	13.19
Ether extract (EE%)	3.82	3.96	3.94	4.01
Nitrogen free extract (NFE%)	56.17	53.87	55.43	54.77
Crude ash (%)	8.78	10.92	9.54	10.03
NDF	25.54	27.04	30.06	32.23
ADF	18.11	18.48	19.17	19.69
ADL	4.50	4.27	4.11	3.91
Cellulose	13.61	14.21	15.06	15.78
Hemicellulose	7.43	8.56	10.89	12.54
Calculated analysis:				
DE (kcal/kg)	2690	2675	2667	2652
Methionine + cystine (%)	0.64	0.66	0.68	0.70
Lysine (%)	0.95	0.98	1.03	1.06
Calcium (%)	1.15	1.17	1.16	1.16
Total phosphorous (%)	0.69	0.68	0.65	0.63

** One kilogram of premix provides: 2000.000 IU vit. A, 150.000 IU vit. D, 8.33g vit. E, 0.33g vit K, 0.33g vit. B1, 1.0g vit. B2, 0.33g vit. B6, 8.33g vit. B5, 1.7 mg vit. B12, 3.33g Pantothenic acid, 33mg Biotin, 0.83g Folic acid, 200g Choline chloride, 11.7g Zn, 12.5g Fe, 16.6 mg Se, 16.6 mg Co, 66.7g Mg and 5g Mn.*

Reproduction experiment

Reproduction performance

The data of Table (4) showed that, the control group (0% PTL) showed the lowest ($P \leq 0.05$) litter size, weaning number and weaning weight as compared to the groups received diets containing PTL in the first litter, but not significant differences were observed in the second litter. In addition not significant differences ($P \geq 0.05$) were noticed among the experimental groups in birth weight in the two litters.

Does feed consumption and feed conversion ratio

The data of Table (5) showed that, replacing alfalfa hay with different levels of PTL caused not significant increase ($P \geq 0.05$) in daily and total feed consumption of does as compared to the control group. Regarding to feed conversion ratio (FCR), does group fed on diet containing 20% PTL instead of alfalfa hay (G3) showed the best ($P \geq 0.05$) FCR followed by G1 and G2 while the worst ($P > 0.05$) FCR was recorded for G4.

Table (3): Composition and nutrient content of experimental growing rabbit diets

Items	D5	D6	D7	D8
Alfalfa hay	30	20	10	-
Yellow corn	10	5.0	1.0	1.0
Barley	20	20	20	10
Wheat bran	24.2	27.5	29.7	39.0
Palm tree leaves	0.0	10	20	30
Soybean meal (44% CP)	13.6	14.85	16.25	16.50
Limestone	0.7	1.0	1.27	1.7
Premix*	0.3	0.3	0.3	0.3
Common salt	0.3	0.3	0.3	0.3
Dicalcium phosphate	0.8	0.9	1.0	1.0
DL-Methionine	0.1	0.15	0.18	0.20
Total	100	100	100	100
Determined nutrient content (on DM basis):				
Dry matter (DM%)	89.88	90.65	90.74	89.34
Organic matter (OM%)	88.40	87.62	90.15	89.15
Crude protein (CP%)	16.01	16.04	16.04	16.07
Crude fiber (CF%)	14.13	14.10	14.00	14.01
Ether extract (EE%)	4.02	3.71	4.09	4.38
Nitrogen free extract (NFE%)	54.24	53.77	56.02	54.69
Crude ash (%)	11.60	12.38	9.85	10.85
NDF	32.41	35.12	35.14	39.46
ADF	19.32	19.83	20.16	20.92
ADL	4.90	4.44	4.72	4.29
Cellulose	14.42	15.39	15.44	16.63
Hemicellulose	13.09	15.29	14.98	18.54
Calculated analysis:				
DE (kcal/kg)	2552	2564	2587	2579
Methionine + cystine (%)	0.65	0.65	0.66	0.65
Lysine (%)	0.89	0.86	0.82	0.78
Calcium (%)	0.95	0.96	0.96	0.98
Total phosphorous (%)	0.62	0.64	0.65	0.68

** One kilogram of premix provides: 2000.000 IU vit. A, 150.000 IU vit. D, 8.33g vit. E, 0.33g vit K, 0.33g vit. B1, 1.0g vit. B2, 0.33g vit. B6, 8.33g vit. B5, 1.7 mg vit. B12, 3.33g Pantothenic acid, 33mg Biotin, 0.83g Folic acid, 200g Choline chloride, 11.7g Zn, 12.5g Fe, 16.6 mg Se, 16.6 mg Co, 66.7g Mg and 5g Mn.*

Table (4): Effect of palm tree leaves levels in does diet on their performance

Item	G1	G2	G3	G4	SE
1st litter size	4.83[b]	7.83[a]	7.17[ab]	6.83[ab]	0.89
2nd litter size	8.00	7.17	6.66	8.00	0.76
1st weaning number.	3.66[b]	6.50[a]	5.16[ab]	4.83[b]	0.49
2nd weaning number.	6.33	5.83	5.83	6.00	0.47
1st birth total weight (g)	325.50	466	425.50	393.17	51.1
2nd birth total weight (g)	479.8	479.3	430.80	431.2	36.1
1st weaning total weight (g)	2014.2[b]	3293.5[a]	2773.3[ab]	2438.6[b]	255
2nd weaning total weight (g)	2966.5	2973.7	3005.6	3132.8	187

Means within the same row with different superscripts are significantly different ($p< 0.05$).

Table (5): Effect of palm tree leaves levels in Does diet on their feed consumption and feed conversion

Items	G1	G2	G3	G4	SE
Number of does	6	6	6	6	
Number of days	105	105	105	105	
Daily feed consumption (g/doe)	205	253	228	272	34.5
Total feed consumption (kg/doe)	21.55	26.56	23.88	28.60	2.29
Total weaning weight (kg)	4.98	6.27	5.78	5.57	
Feed conversion ratio (kg feed/kg gain)	4.24	4.27	4.17	5.35	0.42

Growing experiment

Feed consumption (g/rabbit/day)

The data of Table (6) showed that, the group received diets containing 30 % palm tree leaves (G4) showed the highest (P≤0.05) daily feed consumption (DFC) followed by G1 (the control) then G3, while the lowest (P≤0.05) DFC recorded for G2 during 6 to 9 weeks of age. On the other hand, not significant differences were recorded among the different experimental groups during the period from 10-13 weeks of age. Moreover, during the entire experimental period (6 to 13 weeks of age), the data revealed that the average DFC in the G4 group was higher (P≤0.05) than in the groups G2 and G3, while not significant differences were observed between the experimental groups as compared to the control (G1).

These results may be attributed to that the different diets were approximately isocaloric and isonitrogenous and those contained similar percentage of methionine + cystine, lysine, calcium and phosphorus,. Abdel-Azeem and El-Bordeny, 2007 observed that, replace clover hay with PTL by 12, 24, 36% caused not significant (P≥0.05) differences in feed consumption among the different experimental groups through all the experimental periods.

The mean feed intake was low during the first period (6 to 9 weeks of age) then increased during the following weeks (10 to 13 weeks of age) as shown in Table (6). **NRC (1977)** reported that rabbits, like most animals, voluntarily adjust their feed intake to meet their needs. In addition, it can be seen that all experimental diets have similar percentage of methionine. However, **Colin et al., (1973)** reported that the increase in methionine percentage cause a large decrease in feed intake in rabbits.

Nutrient digestibility coefficients:

Replacing alfalfa hay by 10 and 20% of PTL not significantly increased (P≥0.05) the values of apparent CF digestibility in comparison with the control and 30% PLT groups. Also replacing alfalfa hay by 10 or 20 % PTL not significantly affect (P≥0.05) apparent digestibility of DM, OM, CP and NFE, while 30% PLT not significantly decrease (P≥0.05) apparent digestibility of DM, OM, CP, NFE and CF as compared to the control group (Table 6). On the contrary, inclusion PTL in rabbit diets decreased (P≤0.05) the apparent digestibility of EE as compared to the control diet.

The groups received experimental diets containing 10 and 20 % PTL showed similar TDN and DCP values as compared to the control group, while the lowest DCP and TDN values was recorded in the group received 30% PTL (Table 3). Abdel-Azeem and El-Bordeny (2007) found that, replacing clover hay by 12% PTL resulted significant (P≤0.05) increase in the apparent digestibility of CP and CFas well as DCP and TDN values as compared to the other groups. Also using 36% PTL increased (P≤0.05) the EE digestibility than the other groups, but no differences were found in DM, OM and NFE digestibility.

Blood parameters:

Gradually decrease alfalfa hay and increase PTL caused gradually but not significant decrease (P≥0.05) in total plasma protein and albumin concentrations as it is showed in Table (7). Although the different diets were approximately isocaloric, isonitrogenous, these results parallel with the gradual decrease (P≥0.05) of apparent CP digestibility (Table 6). Bush (1991) reported a positive correlation between dietary protein and plasma protein concentration. The same author also stated that the low level of plasma proteins may be attributed to a decrease in the protein absorbed and synthesized and an increase in protein losses. Cornelius (1970) stated that, albumin is affected more readily than globulin by

nutritional factors, e.g., restricted protein intake because of their different functions, metabolism and sites of origin.

These results are different with those obtained by Abdel-Azeem and El-Bordeny (2007) who found that, replacing clover hay by PTL caused not significant increase ($P \geq 0.05$) in total plasma proteins, albumin and globulin concentrations as compared to the control.

Creatinine concentration of blood plasma did not different among the different experimental groups. . On the other hand significant differences were observed in the activities of AST and ALT among the different experimental groups. The control group recorded the highest value ($P \leq 0.05$) of AST activity followed by the group received 30% then 10% PTL, while the lowest value was that of the group received 20% PTL. However, the obtained results in the present study were within the normal values reported for rabbits by Hillyer and Quesenberry (1994).

Table (6): Effect of palm tree leaves levels in rabbit diets on feed consumption and apparent digestibility of nutrients.

Item	G1	G2	G3	G4	SE	Sig.
A-Daily feed consumption (g):						
) 9 weeks of age	82.42 ^{ab}	58.9 ^{b}	72.5 ^{ab}	97.54 ^{a}	5.63	*
to 13 weeks of age	131.05	143.2	124.7	139.85	13.66	Ns
erage	106.7 ^{ab}	101.1 ^{b}	98.6 ^{b}	118.7 ^{a}	4.87	*
B-Apparent digestibility of nutrients coefficients:-						
Dry matter (DM)	65.49	65.99	64.63	61.33	2.38	Ns
Organic matter (OM)	65.73	65.66	65.21	61.82	2.37	Ns
Crude protein (CP)	66.45	66.78	65.56	62.68	2.31	Ns
Ether extract (EE)	79.31 ^{a}	72.92 ^{b}	76.11 ^{ab}	72.85 ^{b}	1.72	*
Crude fiber (CF)	22.52	26.37	25.08	20.54	5.03	Ns
Nitrogen free extract (NFE)	75.47	75.30	75.37	72.24	1.71	Ns
C- Nutritive values						
DCP%	10.64	10.71	10.52	10.07	0.37	Ns
TDN%	55.81	55.22	56.87	52.8	1.97	Ns

Means within the same row with different superscripts are significantly different ($p < 0.05$).

Table (7): Effect of palm tree leaves levels in rabbit diets on blood plasma constituents.

Item	G1	G2	G3	G4	SE	Sig.
Total protein (g/L)	64.1	63.3	60.3	58.7	3.1	Ns
Albumin (g/ L)	36.7	35.4	35.2	34.6	1.7	Ns
Globulin (g/ L)	27.4	30.4	24.7	25.4	5.2	Ns
A / G ratio	1.41	1.51	1.43	1.37	0.28	Ns
Creatinine (g/ L)	7.4	7.2	7.6	7.6	0.7	Ns
AST(U/L)	30.3 ^{a}	20.6 ^{ab}	13.9 ^{b}	21.6 ^{ab}	2.2	*
ALT(U/L)	18.53 ^{a}	20.04 ^{a}	19.23 ^{a}	11.74 ^{b}	2	*

Means within the same row with different superscripts are significantly different ($p < 0.05$).

Growth performance

The data of Table (8) showed that, not significant differences were observed in initial body weight at 5 week of age (beginning of the fattening experiment), and during the first period (4 weeks after weaning), it could be observed that rabbits fed on diets containing 10 and 20 % PTL grew slower ($P \leq 0.05$) than the control group and the group received diet containing 30% PTL. There were also not significant effects in average daily gain during the period from 10-13 weeks of age and during the entire experimental period (6-13 weeks of age). This may be due to the similar values of the apparent digestibility of nutrients in the groups received PTL as compared to the control (Table 6) which is in parallel with the not significant differences observed in feed consumption. In this connection, Abdel-Azeem and El-Bordeny (2007) observed that the rabbits fed diets containing PTL were grew faster than the controls.

Regarding to feed conversion ratio (Table 8), the data indicated that, replacing alfalfa hay by 10 or 20 % of PTL caused significant improvement ($P \leq 0.05$) in feed conversion ratio as compared to the control group during the second experimental period (10-13 weeks of age) as well as during the entire of experimental period (6-13 weeks). This indicates that rabbits fed on different dietary levels of PTL converted their feed into body weight gains more efficient than those received control diet. This improvement may be attributed to the greater palatability and utilizable of PTL containing diets. In this connection, Abdel-Azeem and El-Bordeny (2007) observed that, using PLT in the growing rabbit diets improved significantly FCR as compared to the control diet.

Mortality rate

The data of Table (8) showed that replacing alfalfa hay with 20 or 30 % PTL decreased mortality rate compared to the control group and $G2_{II}$ Abdel-Azeem and El-Bordeny (2007) stated that inclusion PTL in rabbit diets in different levels as the main source of fiber did not affect mortality rate.

Table (8): Effect of palm tree leaves levels on growing rabbit performance

Item	G1	G2	G3	G4	SE
Body weight (g)					
5 weeks	592.9	563.2	566.4	576.7	±43
9 weeks	1497.7^{a}	1209.1^{b}	1261.8^{b}	1440.2^{ab}	49
13 weeks	2118.0	2110.5	2066.8	2225.8	83
Daily weight gain (g)					
6-9 week	32.31^{a}	23.1^{b}	24.84^{b}	30.84^{ab}	2.2
10-13 weeks	22.15	32.19	28.75	28.06	2.8
6 -13 weeks	27.23	27.65	26.80	29.45	1.6
Feed conversion ratio (FCR)					
6-9 weeks	2.55	2.55	2.92	3.16	0.29
10-13 weeks	5.92^{a}	4.45^{b}	4. 34^{b}	4.98^{ab}	0.43
6 -13 weeks	3.92^{a}	3.66^{b}	3.68^{b}	4.03^{ab}	0.19
Mortality rate (%)	4	4	1	2	

Means within the same row with different superscripts are significantly different ($P \leq 0.05$).

Economic efficiency

Replacing alfalfa hay with 10 and 20 % of PTL resulted ($P \leq 0.01$) a gradual decrease in total feed cost (Table 9), while 30% not significantly decrease the feed cost as a result to increase feed intake in this group. This may be attributed to the not significant difference which was observed in feed consumption (Table 6) in parallel to the gradual increase in PTL percentage, which led to decrease cost of kg feed as shown in Table (9). Economic efficiency (EEF), relative economic efficiency (REEF) and PI were markedly increased ($P \leq 0.01$) with increasing dietary PTL in the diets. The present results show that, EEF,

and REEF of the rabbits were highest with 20% PTL being (141.73 and 137.98) respectively. The performance index (PI) increase may by relate to the improvement in feed conversion ratio for the group received diets containing PTL.

CONCLUSION

It is well established from the previous results that, replacing alfalfa hay with 10 to 20% of PTL in the diet of rabbit does had not any adverse effect on reproduction performance, feed consumption and feed conversion ratio and may led to improve does performance. Palm tree leaves also can be use successfully by 10 to 20% of growing rabbit diets without any adverse effect on performance. It can be useful in reducing production cost. Also using PTL in rabbit diets can be one of the alternative solutions to clean our environment especially in Sinay and El-Waddi El-Gedied governorate, where the palm tree leaves and fronds accumulated and caused many environmental hazards.

Table (9): Economic traits of NZW rabbits as affected by dietary levels of palm tree leaves.

Item	Dietary levels of palm tree leaves#				SE.
	0.0%	10.0%	20.0%	30.0%	
Average of feed consumed (kg/rabbit)	5.979	5.660	5.523	6.649	0.27
Price/kg feed (L.E)#	2	1.902	1.804	1.706	
Total feed cost (L.E)	11.96^{a}	10.76^{ab}	9.96^{b}	11.34^{ab}	0.52
Average weight gain (g/rabbit)	1525	1547	1500	1649	91
Price/kg live body weight (L.E)	16.00	16.00	16.00	16.00	
Total return (L.E)	24.40	24.75	24.00	26.38	1.46
Net return (L.E)	12.44	13.99	14.04	15.04	1.16
Economic efficiency (EE)	104.01^{b}	130.02^{a}	140.96^{ab}	132.63 ^{ab}	11
Relative economic efficiency(REE)+	100.00	125.01	135.52	127.51	
Performance index	54.03	57.66	56.14	55.23	4.2

Means within the same row with different superscripts are significantly different at (P≤0.01)

 # Price / ton of palm tree leaves= 500 L.E

+ Assuming that the Relative Economical Efficiency of control diet equals 100.

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سعف النخيل كمصدر للألياف في علائق الأرانب النامية

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يحتوي سعف النخيل علة نسبة مرتفعة من الألياف و التي تقترب من محتوى دريس لبرسيم الحجازي منها، و عليه فيمكن إحلال الدريس الحجازي أو دريس البرسيم بسعف النخيل في أعلاف الأرانب و لهذا تمت هذه الدراسة لتقييم تأثير استخدام سعف النخيل كبديل للدريس بنسبة صفر، 10، 20، 30 % كمصدر للألياف في علائق أمهات الأرانب و الأرانب النامية شملت الدراسة تجربتين ،

التجربة الأولى: على أمهات الأرانب استخدم فيها 24 أم من سلالة النيوزيلاندي الابيض ،قسمت عشوائيا على أربعة مجموعات (6 أمهات لكل مجموعة) لتتغذى كل مجموعة على أحد أربعة علائق تجريبية متماثلة تقريبا في محتواها من الطاقة و البروتين تحتوي على صفر، 10، 20، 30 % سعف نخيل. و كانت أهم النتائج المتحصل عليها :- حققت المجموعات التي غذيت على علائق تحتوي على 10 و 20 % سعف نخيل أعلى معدلات حجم بطن و عدد فطام و وزن فطام في الولادة الأولى و كانت اقل مجموعة هي المجموعة الضابطة التي غذيت عليقة تحتوي على صفر % سعف نخيل و كانت الفروق معنوية عند مستوى 5 %، بينما لم يلاحظ أي فروق معنو ية في الولادة الثانية . كما لم يلاحظ فروق معنوية في اجمالي وزن الولادات و كمية استهلاك العلف و كفاءة التحويل بين المجموعات التجريبية في كلا من الولادة الأولى و الثانية.

التجربة الثانية: استخدام فيها عدد 80 أرنب غير مجنس من سلالة النيوزيلاندي الابيض في عمر 5 أسابيع و قسمت عشوائيا على أربعة مجموعات (20 أرنب لكل مجموعة). تم تركيب و إعداد أربعة علائق تجريبية لتكون متماثلة في محتواها من الطاقة و النيتروجين تقريبا و تحتوي على صفر، 10، 20، 30 % سعف نخيل . و كانت أهم النتائج المتحصل عليها :- حققت المجموعة الرابعة التي غذيت على علائق تحتوي على 30% سعف نخيل أعلى معدلات مأكول تبعها المجموعة الأولى ثم الثالثة بينما حققت المجموعة الثانية أقل معدل استهلاك علف خلال أول 4 أسابيع (6-9 أسبوع)و كانت الفروق معنوي عند مستوى 5%، بينما لم يلاحظ أي فروق معنوية في الفترة من 10-13 أسبوع أو متوسط الفترة التجريبية. لوحظ أن إحلال الدريس الحجازي بسعف النخيل بمعدلات 10 و 20 % أدى إلى زيادة معدلات هضم الألياف الخام بالمقارنة بالمجموعة الضابطة و المجموعة الرابعة التي غذيت على علائق تحتوي على 30% سعف نخيل. لم يلاحظ أي فروق معنوية في معدلات هضم لكلا من المادة الجافة و المادة العضوية و البروتين الخام و المستخلص الخالي من النيتروجين و أيضا لم تتأثر القيم غذائية كبروتين مهضوم و مركبات كلية مهضومة . لوحظ انخفاض تدريجي في محتوى الدم من البروتينات الكلية و الألبيومين مصاحبة لزيادة نسبة سعف في العلائق. و كانت الفروق غير معنوية عند مستوى 5 %. استبدال الدريس بسعف النخيل بمعدل 10 و 20 % أدى الى بطئ النمو بالمقارنة بالمجموعة الضابطة و المجموعة الرابعة التي غذيت على علائق تحتوي على 30% سعف نخيل خلال المرحلة التجريبية الأولى 6-9 اسبوع ، بينما لم يلاحظ أي فرق معنوي خلال الفترة من 10-13 اسبوع و متوسط الفترة التجريبية . و كذلك أدى استبدال الدريس بسعف النخيل بمعدل 10 و 20 % الى تحسن كفاءة تحويل الغذاء بالمقارنة بالمجموعة الضابطة خلال الفترة من 10-13 اسبوع و متوسط الفترة التجريبية .

و الخلاصة انة يمكن استبدال الدريس بسعف النخيل في علائق أمهات الارانب و الأرانب النامية بمعدلات من 10-20 % دون حدوث أي تأثير سلبي على الأداء التناسلي و الانتاجي للأمهات و الأداء الانتاجي للأرانب النامية. استخدام هذه المخلفات ربما يساعد في حل بعض المشاكل البيئية في بعض المحافظات مثل محافظة سيناء و محافظة الوادي الجديد و منطقة رشيد و التي قد يتراكم فيها مخلفات النخيل بدرجات عالية .