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EVALUATION OF THE TRADITIONAL RABBIT DIET VERSUS THE PELLETED DIET FOR GROWING RABBITS FOR SMALL SCALE UNITS

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SUMMARY: *A pilot experiment was carried out to evaluate the prevailing nonpelleted diets: berseem hay-barley and berseem hay-corn in comparison with the grower pelleted diet for rabbits from the nutritional and economical efficiencies points of view. The chemical analysis, the digestibility of nutrients, the N- utilization, the effect on the growth performance, carcass traits and blood constituents was studied. The hay-barley and hay-corn were provided separately. The digestibilities and N-utilization of the grower pelleted diet were of better values than the corresponding values for the hay-barley and hay-corn diets. The hay-barley diet was of intermediate nutritional values between the other two diets. From the nutritional and economical parameters the hay-barley diet was preferable than the expensive grower pelleted diet and the lower nutritional quality hay-corn diet. The hay-barley diet could be recommend as non-pelleted rabbit diet if it is enriched with vitamin-mineral premix as feed additive to improve more its nutritive value.*

key words: *Growing rabbits nonpelleted and pelleted diet-prevailing diet-small scale production-hay-barley diet-hay-corn diet-nutritional and economical parameters.*

INTRODUCTION:

Rabbits are particularly suited to small-scale backyard production. For small-scale home meat production, particularly in developing countries, rabbit raising could assume increasing importance in the future.

The non-pelleted diet prevailing in the rural and urban areas under the traditional production system all-over Egypt is the berseem hay and cereal grains (barley and corn) in most seasons of the year, but the welted green berseem (Trifolium Alexandrinum) with barley or corn are prevailing during the Spring season and a part time of Winter season. The pelleted rabbit diet is expensive for the small farmers and for the majority of restricted income families.

With small scale rabbit production, it might be feasible to use non-pelleted diets, either commercially prepared or home-mixed. The animal performance and growth rate were reduced with the non-pelleted diet when compared with the pelleted diet (Sanchez et al., 1984). The feed intake was much higher with the non-pelleted diets, largely because of feed wastages.

The animales sorted through the feed, preferentially seeking out the rolled grain.

In spite of the apparent economic attractiveness of using non-pelleted diets, they generally result in excessive feed wastage and greater expense than pelleted feed (Cheeke; 1987).

In the present study, a pilot experiment was designed to evaluate the two non-pelleted diets prevailing in the urban and rural areas in Egypt with a commercial pelleted grower diets for rabbits assuming more satisfactory results on the growth performance, feed intake, feed conversion, the carcass traits and blood constiuents by feeding the berseem hay separately as loose hay in separate feeder and providing the cereal grains portion as barely or corn grains separately as well.

MATERIALS AND METHODS

This study was carried out on the rabbit flock., Rabbitry of the Department of Animal production, Faculty of Agriculture, Zagazig University, Zagazig, Egypt, from January to March, 1993.

A total number of 24 growing NZW rabbits, 7 week old were divided into 3 groups (8 each)., The first group was used as a control fed on a grower pelleted diet and the other two groups were fed on berseem hay in separate feeders and the barley grains for the second group and the yellow corn for the third group, each in separate feeders on free choice feeding as well to avoide the wastage of the nonpelleted feed. Ingredients and chemical composition of these 3 rations are presented in Table 1.

The animals were raised in a flat deck battary system. All battaries were located in a windowed house, naturally ventilated and provided with electric fans. The batteries were also accomodated with feeders and automatic drinkers. The animals were alloted each four rabbits in a cage unit. All the experimental rabbits were kept under the same managerial and hygienic conditions.

Regarding digestibility trials, four NZW growing rabbits from each experimental group was taken at the end of the experimental period and wire housed individually in metabolic cages with special modifications. The experimental diets were offered twice daily at 9.00 and 18.00 hr. The collection period was five days. The collected samples of faeces and urine were analysed according to A.O.A.C. (1980). All values of chemical analysis were expressed on dry matter basis. Digestible energy was calculated according to Cheeke (1987).

Rabbits were individually weighed weekly from 7 to 13 weeks of age. Feed intake was recorded and feed conversion, weight gain were estimated. Economical efficiency at 13 weeks of age was calculated according to the following equation:

$$Y = \frac{A - B}{B} X\ 100$$ where:

A is the selling price of the obtained gain and B is the feeding cost of this gain.

By the end of the experiment three animals were taken randomly from each experimental group and were slaughtered to estimate the carcass traits and chemical composition of the meat. Blood samples were taken at the time of slaughter to estimate blood components.

Analysis of variance was carried out according to Snedecor and Cochran (1982). The following model was used:
$Y_{ik} = u + t_i + e_{ik}$ where
y_{ik} = An observation, u = Overall means, t_i = Effect of different diets i (1 - 3), e_{ik} = Random error.

Significant differences were determined by Duncan's method (Duncan, 1955).

RESULTS

Results in Table 2 indicated that dry malter intake was relatively higher for the group fed on the pelleted grower diet (86.82 g), when compared to the corresponding for the group fed on berseem hay and barley (53.07 g) or berssem hay and yellow corn (51.30 g) on basal metabolic weight basis. The berseem hay and corn diet was of higher digestibilities for DM, OM, Cf and EE than both grower pelleted diet and berseem hay and barley diet. The digestibility of CP and NFE was of higher values for the grower pelleted diet than the two non pelleted diets. The barley diet was of medium digestibility values between the grower pelleted diet and the corn diet. The nutritive value of the grower pelleted diet was higher in DE and DCP than the corresponding in the other two non-pelleted diets. The N-utilization (N-intake, N-excreted either in the feaces or in the urine, N-absorbed and N-balance (g/h/day) was of higher values for the grower pelleted diet than the non pelleted diet in the present study. The barley diet was of intermediate estimates between the grower pelleted and the corn diets in this respect.

The DCP% was 12.15, 8.80 and 7.21, for the grower pelleted diet, the barley diet and the corn diet, respectively.

Results in Table 3 showed that the final weight at 13 weeks of age and the daily weight gain (7-13 wks) did not show significant difference among the three experimental diet groups, in spite of the heavier live weight and daily gain of both grower pelleted diet and the barley diet than that of the corn diet. The feed intake g/d was more (88g/d) for the rabbits fed the grower pelleted diet than the non pelleted diet groups (73 and 69 g/d), respectively. However, the feed conversion efficiency was the best for the barely diet group (3.5), compared with the grower diet group (4.2) or the corn diet group (4.7). Awide difference in the feed cost of the grower pelleted diet (1.76) and each of the barley (0.83) and the corn diets (0.86). It is worthy noting that the ecomomical efficiency % was very pronounced for the barley diet (479.52), followd by the corn diet (291.86) and the least efficient economically was the grower pelleted diet (172.73).

Results in Tables 4 and 5 concerning carcass traits, chemical analysis of meat, and blood components were not affected by pelleted or non-pelleted diet from the statistical point ($P < 0.05$).

DISCUSSION

The prevailing diet from berseem hay and barley or berseem hay and corn for the traditional rabbit production system is well known since a long time ago all over Egypt. Accroding to the potentiality of the local rabbit breeds, this diet seems acceptable for the samll scale family units and especially the small farmers. Evaluating the two diets as non-pelleted with the grower pelleted diet for the growing rabbits supported the findings of Sanchez et al, (1984) concerning the reduced growth with the non-pelleted diet, but disagree with results concerning the increase in feed intake. The feed intake for berseem hay and barley or corn diets was less than that of the grower pelleted diet. However, the final live weight and gain were the same for the grower pelleted diet and the hay-barley diet groups. It is worthy to detect the better feed conversion for the hay-barley diet than that of the grower pelleted diet and the hay-corn diet. The economical efficiency% threw lights on the profitability of utilizing the hay-barley diet than the grower pelleted diet. The hay-corn diet was more economical than the grower pelleted diet but not as much

as the hay - barley diet.

Although the digestibility values, the nutritive value and the N-utilization of the well balanced grower pelleted diet was better than that of the hay barley and the hay corn diets, the effect on growth and conversion efficiency was not advantageous. It was clear that the hay - barley diet was compatable to the grower pelleted diet on the performance of the growing rabbits and was of more favourable effect than hay - corn diet. Data of Pote et al., 1980 showed no decrease in gains of fryers when alfalfa meal completely replaced cereal grain in the diet. Berseem hay, as alfalfa, has considerable buffering capacity. The digestibility of berseem hay protein is less than 50% in swine and poultry, where as it is 70 - 75% in rabbits. In rabbits, the forage amino acids are utilized directly, which is significant because leaf protein have a high quality (good amino acid balance). The ability of rabbits to use forage proteins efficiently is related to the phenomenon of ceucotrophy, in which the animal consumes the ceacal contents (night or soft feaces). This allows for efficient extraction of protein from dietary ingredients. There is some evidence that grains highest in starch and DE are the least satisfactory for rabbits. For example, Hall and Jonston (1976) compared growth and lactation responses with corn, wheat, barley and oat-based diets, and found better performance with the low-energy grains, oats and barley, than with wheat and corn. Cheeke (1974) in feed preference trials, found that rabbits preferred barley to corn and wheat.

The hay and barley should be provided separately to avoid the waste of feed, and inclusion of rabbit vitamin-mineral premixes is also advised to enrich the nutritive value of the non-pelleted diet. Barley has a higher protein content and better protein quality than corn. It is lower in starch and high in fiber. These characteristics make it suitable as a rabbit feed ingredient. It contains B-glucans which may provoke enterities (Cheeke, 1987). On the other hand, while corn is an excellent source of energy, it has a low (8-9%) protein content , and the protein is of quite low quality, being low in lysine methionine and tryptophan. Alone, among the grains yellow corn possesses vitamin A activity. Although corn is considered the premier feed grain for most livstock; it may not be so for rabbits. Its high energy content promotes enteritis, and it seems to be somewhat unpalatable (Cheeke, 1987). The present results support the fair comparison between barley and corn. The ratio of hay: barley indicated the higher consumption of barley than corn in the hay: corn. Although yellow corn was used in the present study, the majority of people accustom to use the white corn as available corn grains produced in Egypt and cheaper than the imported yellow corn. However, it could be concluded that hay-barley as a diet from local available ingrdients is recommended as a replacer for the grower pelleted diet from the economical and nutritional point of view, but not the hay-corn diet.

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Table (1): Ingredients and chemical analysis of the experimental diets.

Energy sources	1	2	3
Items	Grower diet (Control)	Berseem hay + Barley	Berseem hay + Yellow Corn
Ingredients (%):			
Yellow Corn	-	-	30.00
Barley	32.00	40.00	-
Berseem hay	28.00	60.00	70.00
Cotton seed meal	3.00	-	-
Soybean meal	10.00	-	-
Wheat bran	21.00	-	-
Molasses	2.85	-	-
Mixture of vitamins and minerals*	0.30	-	-
Bone meal	2.50	-	-
Sodium chloride	0.25	-	-
Dl-Methionine	0.10	-	-
Total	100.00	100.00	10.00
Chemical analysis:		-	-
Calculated DE (kcal/kg diet)	2525	2326	2310
DM %	92.90	90.10	90.26
OM %	82.14	81.10	80.76
CP %	16.20	15.25	15.10
CF %	14.40	14.75	14.85
EE %	1.80	2.40	2.65
NFE %	49.74	48.70	48.16
Ash %	10.76	9.00	9.50
C/P ratio	155.86	152.52	152.98
Cost of each Kg diet (L.E)	0.48	0.27	0.30

* Each 1 kg of the mixture contains: vita A 2000.00 Iu-Vit D_3 150.00 Iu Vit. E 8333.33 mg-Vit.K 333.3 mg-Vit B_1 333.3 mg-vit. $B_2$1000.0 mg-Vit B_6 333.33 mg- Vit B_{12} 1.67 mg-pantothenic acid 333.39- Nicotinic acid 833.3g-Folic acid 833.3 mg-choline chloride 200.0 mg-Biotin 33.3 mg-Manganese 500 mg-Zinc 11666.67 mg-Iron 12500 mg-copper 500 mg-cobalt 16.67 mg-Iodine 33.33 mg-Selenium 16.67 mg-Magnisium 66666.67 mg.

Table (2): Digestion Coefficient, nutritive value and N-Utilization of growing NZW rabbits (7-13 weeks of age) as affected by the experimental diets.

Energy sources		1	2	3
Items		Grower diet (Control)	Berseem hay + Barley	Berseem hay + Yellow corn
Average initial weight:	Kg/h	^{a}1.36±0.16	^{a}1.53±0.08	^{a}1.12±0.10
	$Kgw^{0.75}$	^{a}1.26±0.11	^{a}1.38±0.05	^{a}1.09±0.07
Dry matter intake:	g/h/d	^{a}109.39±0.79	^{b}73.24±3.01	^{c}55.92±0.96
	g/Kgw $^{0.75}$	^{a}86.82±8.28	^{b}53.07±1.21	^{b}51.30±3.43
Digestion coefficient (%)				
	DM	^{a}67.77±1.04	^{a}61.70±2.52	^{a}69.65±2.55
	OM	^{a}68.49±1.03	^{a}62.94±2.06	^{a}69.99±2.56
	CP	^{a}71.18±0.62	^{b}61.62±0.89	^{b}60.12±0.52
	CF	^{a}23.04±1.39	^{a}24.84±1.77	^{a}27.25±0.66
	EE	^{b}68.99±0.95	^{b}72.51±1.32	^{a}78.65±0.93
	NEF	^{a}80.71±1.24	^{c}68.14±3.44	^{b}76.12±3.11
Nutritive value:				
	DE (kcal)	2525	2326	2310
	TDN (%)	^{b}61.77±0.92	^{b}60.34±2.58	^{a}70.31±2.67
	DCP (%)	^{a}12.15±0.11	^{b}8.80±0.20	^{c}7.21±0.18
N-utilization				
N-intake:	g/h/d	^{a}3.11±0.02	^{b}1.74±0.06	^{c}1.12±0.04
	g/kg $W^{0.75}$	^{a}2.47±0.24	^{b}1.26±0.03	^{c}1.03±0.06
N-Ecxcreted:	Fecal-N	^{a}0.90±0.02	^{b}0.67±0.03	^{c}0.44±0.02
	Urinary-N	^{a}1.35±0.02	^{b}0.26±0.02	^{c}0.18±0.01
	Total-N	^{a}2.25±0.03	^{b}0.93±0.03	^{c}0.62±0.02
N- Absorbed		^{a}2.21±0.03	^{b}1.07±0.03	^{c}0.68±0.02
N-balance:	g/h/d	^{a}0.86±0.03	^{a}0.81±0.04	^{b}0.50±0.03
	g/kg $W^{0.75}$	^{a}0.68±0.14	^{a}0.59±0.04	^{a}0.46±0.04

a,b,c means with different suprscripts in the same row differ significantly at ($p < 0.05$)

Table (3): Growth performance and economical efficiency of growing NZW rabbits (7-13 weeks of age) as affected by the experimental diets.

Energy sources	1	2	3
Items	Grower diet Control	Berseem hay + Barley	Berseem hay + Yellow corn
Initial number of rabbit	8	8	8
live weight (g)			
Initial (7 weeks of age)	a 841.0±51.0	a 852.0±35.0	a 886.0±60.0
Final (13 weeks of age)	a 1713.0±148.0	a 1727.0±84.0	b 1499.0±90.0
Daily gain (g/d)			
7-13 weeks	a 20.8±2.7	a 20.8±1.7	a 14.6±1.8
Body gain (g) per 100g body weights			
7-13 weeks	68.29	67.86	51.40
Feed Intake (g/d)			
7-13 weeks	88.0±3.4	73.0±1.8	69.0±2.3
Feed conversione (g feed/g gain)			
7-13 weeks	4.2	3.5	4.7
Feed cost*			
7-13 weeks	1.76	0.83	0.86
Return from body gain**			
7-13 weeks	4.80	4.81	3.37
Economical efficiency %	172.73	479.52	291.86

a,b means with different superscripts in the same row differ significantly at ($p<0.05$).
* Price 1 Kg of ration, 0.48, 0.27 and 0.30 LE for groups 1, 2 and 3, respectively.
** Price of selling 1Kg of rabbit live weight = 5.5 L.E.

Table (4): Carcass traits and chemical analysis of meat for growing NZW rabbits (7-13 weeks of age) as affected by the experimental diets.

Energy sources		1	2	3
Items		Grower diet (control)	Berseem hay + Barley	Berseem + Yellow corn
Pre-slaughter weight	(g)	1911.7±132.1	1880.0±85.1	1741.7±141.5
Dressing weight	(g)	1055.0±71.1	1016.7±32.8	930.0±90.7
	(%)	55.2±0.5	45.1±0.8	53.4±0.9
Liver weight	(g)	53.3±4.4	56.7±4.4	53.3±6.0
	(%)	2.8±0.2	3.0±0.1	3.1±0.1
Forelimbs weight	(g)	250.0±23.6	248.30±0.1	221.7±23.2
	(%)	13.1±0.3	13.2±0.3	12.7±0.4
Trunk weight	(g)	296.7±33.7	280.0±7.6	245.0±28.4
	(%)	15.5±0.7	14.9±0.5	14.1±0.6
Hindlimbs weight	(g)	388.3±13.0	371.7±14.8	346.6±42.1
	(%)	20.4±0.7	19.8±0.3	19.7±0.7
Chemical analysis	(%)			
Moisture		69.7±0.1	69.4±0.2	69.8±0.3
CP		20.5±0.3	20.8±0.2	20.3±0.3
EE		6.2±0.5	6.2±0.3	6.3±0.2
Ash		2.6±0.1	2.6±0.1	2.6±0.2

All the differences between mean were not statistically significant ($p<0.05$).

Table (5): Blood components of growing NZW rabbits (7-13 weeks of age) as affected by the experemental diets.

Energy sources	1	2	3
Items	Grower diet (Control)	Berseem hay + barley	Berseem hay + Yellow corn
Throxine (T4) mg/ml)	a 1.40±0.06	a 1.95±0.32	a 1.65±0.38
Total protein (g/100ml)	a 5.91±0.03	a 5.88±0.01	a 6.03±0.05
Albumin (A) (g/100ml)	a 3.02±0.04	a 2.93±0.01	a 3.10±0.07
Globulin (G) (g/100ml)	a 2.89±0.05	a 2.95±0.03	a 2.93±0.01
A/G ratio	a 1.04±0.01	a 1.00±0.01	a 1.06±0.03
Total lipids (mg/100ml)	b 249.00±4.62	a 273.30±4.34	a 274.30±2.03
Cholesterol (mg/100ml)	a 89.00±0.58	a 88.30±0.88	a 83.00±6.93
Creatinine (mg/100ml)	a 0.96±0.03	a 1.07±0.02	a 0.95±0.04

a, b means with different superscripts in the same row differ significantly at ($p<0.05$).