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Evaluation of oak acorn (*Cuercus coccifera*) as untraditional energy feedstuff for complete substitution of corn grains in fattening rabbit ration

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SUMMARY: The present study aimed to evaluate oak acorn (*Cuercus coccifera*) as a new untsaditional energy source ingredient in fattening rabbit diet to minimize the feed cost. In Jrodan the naturally growing oak trees produced annually about 20,000 tons acorn (oak fruits). This study aimed to evaluate acorn as untraditional feed for complete substitution of imported yellow corn grains in feeding rabbits. Two fattening rabbit rations were formalted and were indentical in type and percentages of their ingredients, except one contained yellow corn grains and the second contained oak acorn. Each ration fed to 20 male seven weeks-old Bauscat rabbits. Feeding oak acorn had no significant effects on rabbit performance carcass weight, internal organs, blood constituents and liver and kidney functions. Acorn also improved feed, protein and economical efficiencies. Results revealed that acorn could be considered as a new energy source and a replacer for imported yellow corn grain in feeding fattening rabbits. Further study to evaluate the fractions of CP and CF of acron is needed.

Key words: Rabbit, fattening Jordan, corn, acorn, untrditional feed, supstitution, performance, blood consituents, liver and kidney function.

Introduction

Shortage of feedstuffs is an international soundy problem specially in the Thrid World Countries. It is important that the needs of the animal do not interfere with the essential needs of man.

In Jordan there are one million oak trees (*Cuercus coccifera*) spread at least over 25000 Donams (Donam=1000^2 m). The yield per year of acorns (oak fruits) being 20,000 tons (considering 40 treas/Donam and 20 kg oak acorn/one tree) (Agricultural Statistical Year-book, 1980). Success in feeding oak acorn for substituting cereal grains in ration of domestic animals, will save sensible percentage of improted cereals in this country.

This work aimed to evaluate oak acorn as an untraditional source of feedstuff for complete substitution of yellow corn grains in fattening rabbit rations.

Material and Methods

This work was carried out at the University of Jordan Experimental Farm in the Jordan Valley and the laboratories of the Department of Animal Production, Faculty of Agriculture, University of Jordan, in 1989.

Forty males, seven week-old Bauscat rabbits were divided into two groups equal in number and average intitial body weight (932 g). The first group received control ration containing 20% yellow corn grains and the

second group fed similar ingredients of the control ration but after replacing corn by similar percentage of crushed sun roasted oak acorn (Table 1). Rabbits were housed in wooden cages and received *ed libitum* mash (unpelleted) control or tested rations. Fresh water was in free amounts. All rabbits were kept under the same managerial and hygienic conditions.

Table 1
Ingredients and proximate analysis of the experimental rations.

Items	Corn grains	Oak acorn	Rations	
			Corn	Acorn
Ingredients (%):				
Yellow corn			20.0	-
Oak acorn			-	20.0
Clover hay			42.0	42.0
Soybean meal 44%			10.0	10.0
Wheat bran			20.0	20.0
Molasses			5.0	5.0
Lime stone			1.5	1.5
Bone meal			0.8	8.8
Sodium chloride			0.3	0.3
Vitamin and mineral premix (1)			0.3	0.3
DL-Methionine			0.1	0.1
Total			**100**	**100**
Proximate analysis				
DM (%)	87.0	97.30	88.37	90.43
CP (%)	9.9	5.96	15.18	14.39
EE (%)	4.4	2.20	3.16	2.72
CP (%)	2.2	11.10	13.86	15.64
MFE CV (%)	69.2	75.84	45.85	47.18
Ash (%)	1.3	2.20	10.32	10.50
DE : (Kcal/kg)(2)	3480	3524.7	2125.9	2135.2
DE : (%) (3)	82.36 ± 3.3	69.23 ± 3.3	62.89 ± 3.3	60.51 ± 3.3

(1) : Vitamin and mineral premix at 0.10% of the ration supplies the following/kg of the ration Vit. A 10,000 IU, Vit. D3 2500 IU, Vit E 10 mg, Vit. K3 3 mg, Vit. B 1 mg, Vit, B2 4 mg, Pantothinic acid 10 mg, Folic acid 1 mg, Niacine 40mg, Vit, B6 3 mg, Vit B12 20 mcg, Mn 62mg, Zn 60mg, Cu 5mg, Se 100 mcg.

(2) : According to Fekete and Gippert (1986):
(DE kcal/kg d.m. = 4253 - 32.6 (CF,% d. m.) - 114.4 (Ash, % d.m.).

(3) : According to: Parigi-Bini and Dalle Rive (1977):
(DE % = 86.1 - 1.48 (CF, % d.m.) ± 3.3).

Individual live body weight and feed consumption were recorded at weakly intervals during 6 weeks experimental period.

Feed conversion (Feed (kg) /kg gain), feed efficiency (Feed (g) /g gain), protein efficiency ratio (gain (g) /g protein) and economical efficiency were estimated.

Proximate analysis of oak acorn, corn grains and their rations were carried out according to A.O.A.C. (1980).

At the end of the experiment, 4 animals from each group were taken for blood samples and slaughter test. Blood samples were taken from rabbits by heart puncture and centrifuged within 2 hours of collection. Blood and serum were analyzed for glucose, total protein, albumin total lipids, cholesterol, alkaline phosphatase, glotamate-oxaloacetate transaminase (COT), glotamate pyruvate transaminase (CPT), urea and creatinine using the commercial kits of wiener Lab., (2000-rosario-argentina).

Statistical analyses were conducted according to Snedecor and Cochran (1982).

Results

Proximate anlysis:

Replacing 20% oak acorn in place of 20% yellow corn grains decreased CP% and incresed CF% and ash % (Table 1).

Rabbit performance

Final body weight, daily gain, daily feed intake decreased insignifcantly in rabbits fed acorn. However, feed efficiency and protein efficiency ratio were improved with the presence of oak acorn in ration (Table 2).

Carcass traits

Table 3 shows no significant differences in carcass traits, and internal organs, between the two rations.

Blood analysis

Table 4 shows that blood constituents and enzymes activity were insignificantly defferent when feeding oak acorn instead of corn grains.

Discussion

According to the criteria and classification of feedstuffs suggested by Cheeke (1987) for rabbits, oak acorn may be classified under energy source materials, as well as the corn, except its higher content of CF (11.10%) and lower content of CP (5.96%) than the corn (2.20 and 9.90%, respectively). The proximate analysis in Table 1 revealed higher DE of oak acorn (3524.7 kcal./kg) and higher level of NFE (75.84%) than those of the corn (3480 Kcal./kg and 69.20%, respectively). Replacing of corn by acorn in the diet for the fattening rabbits resulted in an increase in CF% and NFE% and about the same CP and DE levels.

Although, daily gain and daily feed intake of rabbits fed acorn ration were lower than those of rabbits fed corn ration, feed efficiency and protein efficiency were improved. This might be due to higher percentage of CF or better protein quality of acorn ration.

In corn srains, it is well known that the low protein quality, due to its low content of critical essential amino acids (lysine, methionine and tryptophan), beside its high DE and low CF contents may promote lower utilization of the ration and insidence of enteritis in the growing rabbits. The relative high CF content in the acorn ration may act well with the high energy and starch stressors and provoke enteritis in the rabbits (Cheeke, 1987). However, further studies should be carried out on oak acorn to evaluate the nutritional value of acorn with special reference to fractions of its CP and CF contents and to throw lights on it as a new energy source in the fattening ration of rabbits.

The oak acorn diet performed better than the corn diet, concerning the lower feed intake, better feed conversion and better protein efficiency ratio of the fattening rabbits. The economical efficiency of the oak acorn ration

Table 2

Performance (x± SE) [1] and ecomomical efficiency [2] of rabbits fed fattening ration containing oak acorn in place of yellow corn for 6 weeks-experimental period.

Items		Corn ration	Acorn ration
Performance			
Mumber of rabbits		20	20
Initial body weight	(g)	932 ± 40	932 ± 42
Final body weight	(g)	2007 ± 60	1978 ± 70
Total body gain	(g)	1075 ± 20	1046 ± 30
Daily body gain	(g)	25.6 ± 1.1	24.9 ± 1.3
Daily feed intake	(g)	135.0	127.5
Daily protein intake	(g)	20.49	18.35
Feed conversion		5.27	5.12
Feedefficiency	(g)	0.190	0.195
Protein efficiency ratio		1.249	1.357
Mortaity %		0.00	0.00
Economical efficiency			
Feed cost [2]/kg body gain (J.D.)		0.5	0.42
Economical efficiency [3]		150	199

(1) : All differences were not significant.

(2): Considering 80 J.D/Ton yellow corn grains and 40 J.D./ Ton of oak acorn (collection, transpart and preparation).

(3) : Economical efficiency (y) = $\frac{A - B}{B}$ x 100,

where, A = Selling cost of an amount of gain and
B = Feeding cost of this gain.

Table 3

Carcass traits (x ± SE) [1] of rabbits as affected by replacing corn grains by oak acorn in rabbit fattening rations.

Items		Corn ration	Acorn ration
Slaughter traits:			
Number of slaughtered rabbits		4	4
Preslaughter weight	(g)	2000 ± 10	2000 ± 20
Alimentary tract weight	(g)	353.5	388
Hot carcass weight	(g)	1222.5	1198
Dressing	(%)	61.13	59.91
Internal organs (Edible viscera):			
Liver	(g)	60.0	58
Heart	(g)	5.5	5.3
Kidney	(g)	12.5	12.5
Spleen	(g)	0.7	0.7
Lungs	(g)	9.0	9.0
Total edible viscera :	(g)	87.7	85.5
	(%)	4.385	4.275

(1) : All differences were not significant.

Table 4

Blood and serum components (x ± SE) [1] and liver and kidney functions as affected by replacing yellow corn by oak acorn in rabbit fattenins ration.

Items		Corn ration	Acorn ration
Glucose	(mg/dl)	91.2 ± 2.4	89.3 ± 2.0
Totalprotein	(g/dl)	6.1 ± 0.3	6.0 ± 0.5
Albumin(A)	(g/dl)	3.7 ± 0.1	3.6 ± 0.1
Clobulin (G)	(g/dl)	2.4 ± 0.1	2.4 ± 0.1
Totallipids	(mg/dl)	310.0 ± 4.1	306.0 ± 3.3
Cholesterol	(mg/dl)	102.5 ± 3.2	96 ± 2.50
Alkalinephosphatase	(IU/L)	45.10 ± 5.1	41.0 ± 2.5
Liver fuction:			
GOT	(U/L)	47.20 ± 1.8	48.21 ± 1.9
GPT	(U/L)	21.10 ± 2.0	22.20 ± 3.1
A/G ration		1.54	1.50
Kidney funetion A/G rato			
Urea (U)	(mg/dl)	19.5 ± 0.4	20.0 ± 0.5
Creatinine(C)	(mg/dl)	1.0 ± 0.07	1.01 ± 0.03
U/Cratio		19.5	19.8

(1) : All differences were not significant.

was improved, because of its lower cost than corn rations. There was no significant effect for corn or acorn rations on markting weight, carcass traits and internal organs of the fattening rabbits.

The insignificant changes in serum albumin, A/G ratio, GOT and GPT between rabbits fed corn or acorn rations indicate insignificant changes in liver function of rabbits fed these rations. It is known that the change in albumin level reflects the change in albumin synthesis, which in turn reflects the change in liver function. Jones and Bark (1979) reported that the liver is the site of albumin synthesis, but globulin is formed by lymphatic synthesis. In addition Zimmerman (1976) reported that the decrease in A/G ratio indicated a decrease in production of albumin by the liver reflecting mal-hepaticfunction.

The insignificant changes in serum urea and creatinine between rabbits fed corn or acorn indicate insignificantly changes in kidney function of rabbits fed these rations.

Conclusion:

Generally from the nutritional, productive and economical points of view, it could be concluded that the acorn could be recommended as a new energy source for fattening rabbits in Jordan.

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