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Evaluation of Metabolizable Energy Values of Some Feeding Stuffs

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Abstract: In a trail the Apparent Metabolizable Energy (AME), Apparent Metabolizable Energy corrected to Nitrogen retention (AMEn), True Metabolizable Energy (TME) and True Metabolizable Energy corrected to Nitrogen retention (TMEn) content of some feeding stuffs for poultry were determined with cockerels. The test materials consisted of feed grade Oak *(Quercus faginea)*, Fig (*Ficus carica*), Olive (*Olea europea*) pulp with nucleolus and without nucleolus. The result showed that Oak, Fig, Olive pulp with nucleolus and without nucleolus according to their component can be noticed as an energy sources. Their crude protein was low. The nitrogen- corrected Apparent Metabolizable Energy (AMEn) values for Oak, Fig and Olive pulp with nucleolus and without nucleolus were 2775.04±29, 2558.7±35, 1347.05±64 and 3052.33±122 Kcal kg^{-1} dry matter, respectively. The nitrogen-corrected True Metabolizable Energy (TMEn) value for the respective feeding stuffs were 3177.99±30, 2999.06±33, 1537.02±59 and 3243.34±126 Kcal kg^{-1} dry matter.

Key words: Metabolizable energy, Oak *(Quercus faginea)*, Fig (*Ficus carica*), Olive (*Olea europea*) pulp, poultry

INTRODUCTION

Accurate knowledge of the nutrient content of poultry feeds is considered as essential for optimum nutrition. Energy and protein costs represent a major portion of the total cost of a diet and markedly influence the productive status of an animal. The plane of nutrition, influenced largely by the energy content of the diet, has a great influence upon rate of gain and feed utilization in growing animals and also influences reproductive performance of mature animals in terms of egg production, egg size, egg weight and feed per dozen eggs in laying hens.

The animal feed industry deals, for the most part, with ingredients that are by products or co products of processing of crops or animals for human consumption. Protein meals from extraction of oil from oilseeds, animal proteins from inedible portions of processed livestock and inedible fats from rendering of animals or recycled restaurant oils are good examples.

One of the greatest challenges to a nutritionist, therefore, is to formulate diets that adequately meet the nutrient requirements of the animal without having to provide excessive quantities of the more expensive nutrients.

The feed industry is still faced with finding an answer to the fundamental question, how much energy is available in feeding stuffs. Apparent Metabolizable Energy (AME) determination can be carried out with chickens (Hill and Anderson, 1958), laying hens (Eriksson and Hartfiel, 1967) or adult cockerels (Sibbald, 1976; Farrell, 1978). True Metabolizable Energy (TME) assay are routinely carried out with adult cockerels but can be performed with chickens and laying hens (McNab and Blair, 1988). N- corrected apparent ME (MEn) values of some diets with different energy to protein ratio were estimated in an experiment with female and male chickens (Zelenka, 1997). There is many difficulties to provide enough usual feed like corn and soybean meal for poultry in Iran, so finding the new sources of feed is the main challenge for poultry nutritionist. In Iran as like as others country there is a lot of agricultural by products that it's necessary to use in poultry industry because of economical values. For example we can notice to Oak, Fig and Olive pulp with nucleolus and without nucleolus.

There is a lack of information describing the Apparent Metabolizable Energy (AME) and True Metabolizable Energy (TME) values of mentioned feedstuffs.

MATERIALS AND METHODS

An experiment was conducted with mature Rhode Island Red cockerels in Animal Science Research Institute, Karaj- Iran. The cockerels were housed individually in metabolic cages in a temperature-controlled room with 12 h of light per day. Each cage was fitted with an individual feeder and nipple drinker. A fixed aluminum

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tray was placed under each cage to allow droppings to be collected separately. When they were not under experiment the birds had access *ad libitum* to a low nutrients diet.

Endogenous losses were obtained from 4 birds in 4 replicate for each ingredients. A group of 4 cockerels was used for each feedstuff. The experiment protocol of Sibbald (1989) was used for the measurement of Endogenous Energy Losses (EEL), AME and TME with the modification that 40 g of each feedstuff were tub fed after 48 h starvation rather than 50 g. All ingredients were used as sole dietary components. Precision fed were given to cockerels housed in individual wire cages. Total collection of excreta from a 48 h period was used to provide samples for analysis of gross energy, nitrogen and DM contents.

Excreta samples were dried at 60°C. Dry matter and nitrogen contents of the feeding stuffs and excreta samples were determined by standard AOAC (1990) methods. The gross energy contents of the feeding stuffs and excreta samples were determined by bomb calorimeter (Galenkamp) using benzoic acid as a standard.

The gross energy excreted was corrected to zero nitrogen balance using a factor of 8.72 Kcal kg^{-1} nitrogen changes (Hill and Anderson, 1958). Using data from this study, AME, TME, AMEn and TMEn values of the feeding stuffs were determined according to Sibbald (1989) method.

RESULTS AND DISCUSSION

The results showed that Oak, Fig, Olive with nucleolus and Olive without nucleolus according to their component can be noticed as an energy source and their crude protein is low (Table 1).

Fasted cockerels in Oak, Fig and Olive groups excreted 0.876, 1.876 and 2.085 g nitrogen during the 48 h of experimental period, respectively (Table 2). These values are similar to those of Shires *et al*. (1979) and McNab and Blair (1988).

Sibbald (1976) in two experiment concluded that fasted cockerels excreted 2.72 and 3.73 g dry matter per day.

The nitrogen and energy had a per found effect on the amount and variability of the energy voided by starved birds (Table 3) and also on the variability of AME and TME estimates (Sibbald and Mores, 1983; Sibbald, 1982). Because nitrogen retention was negative the AMEn values of feeding stuffs were higher than the corresponding AME values.

Nitrogen correction resulted in a 4.22, 5.55 and 7.22% reduction in the TME values of Oak, Fig and Olive with nucleolus. On the contrary the nitrogen corrected TME in Olive without nucleolus increased 3.1%.

When the AME and TME systems were compared, TME and TMEn values for the mentioned feedstuffs were higher than the corresponding AME and AMEn values (Table 4). These results are in agreement with the finding of Askbrant (1988). The Data from the present study provide new Information on the ME values of some feedstuffs and increase the possibility of using these in poultry nutrition. Olive pulp without nucleolus Oak and Fig. are good sources for providing MEn requirement of poultry. Other feed sources need to be investigated. The present assay offers a relatively rapid and simple approach for determine metabolizable energy for poultry. It is needed to investigate nutrient digestibility especially amino acids digestibility in those feed.

Table 1: Chemical composition of the feeding stuffs (g kg^{-1} dry matter)

Feeding stuff	Dry matter	Crude fiber	Ether extract	Crude protein	Calcium	Total phosphorous	Gross energy (Kcal kg^{-1})	Ash
Oak	848	37.5	44.50	57.0	2.0	1.2	4284.3	8.6
Fig	937	-	-	55.8	7.8	2.9	3967.5	-
Olive with nucleolus	925	553.0	106.40	63.0	4.9	6.0	5112.5	28.50
Olive pulp without nucleolus	920	413.0	90.00	66.0	2.6	-	5228.4	61.50

Table 2: Endogenous losses of nitrogen and energy (EEL and EELn values)

	Oak		Fig		Olive	
Parameters	Mean's	Min-Max	Mean's	Min-Max	Mean's	Min-Max
Endogenous losses of nitrogen (g/bird/ 48 h)	0.8764±0.44	0.563-1.375	1.877±0.676	1.295-2.867	2.085±0.845	1.099-3.131
EEL (Kcal/bird/48 h)	17.896±7.44	11.958-26.245	29.193±4.865	23.687-35.519	24.226±7.015	14.878-31.96

Table 3: Nitrogen and energy balances of fed cockerels (mean ±SD)

Parameters	Oak	Fig	Olive with nucleolus	Olive without nucleolus
Nitrogen intake (g)	0.338	0.25	0.3312	0.2042
Energy intake (Kcal)	108.88	111.526	144.30	141.87
Excreta voided (g)	11.57±2.04	17.00±5.09	30.69±3.38	23.78±3.71
Nitrogen loss (g)	0.81±0.08	1.60±0.621	1.97±0.70	2.88±1.39
Excreted energy (Kcal)	42.47±7.55	51.40±15.31	121.62±15.11	81.15±22.00

Table 4: AME, AMEn, TME and TMEn values of feeding stuffs (means, Kcal kg^{-1} dry matter)

Dietary components	Oak	Fig	Olive with nucleolus	Olive without nucleolus
AME	2614.408±296.92	2138.88±544.7	821.18±544.60	2305.50±797.26
AMEn	2775.036±290.90	2558.7±359.15	1347.04±648.32	3052.33±1225.94
TME	3317.874±443.03	3175.4±635.32	1656.92±561.04	3145.79±996.38
TMEn	3177.999±308.17	2999.06±335.22	1537.20±590.61	3243.34±1268.15

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