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RESEARCH ARTICLE

Possibilities of Using Dried Apple Pomace in Broiler Chicken Diets

Veysel AYHAN * Asuman ARSLAN DURU * Serkan ÖZKAYA *

* *University of Suleyman Demirel, Faculty of Agriculture, Department of Animal Science, 32260, Isparta - TÜRKİYE*

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Summary

In this research, it was conducted with the effects of dried apple pomace (DAP)in broiler chicken diets on their fattening performance. A total of 96 one day-old Ross-508 broiler chicks in both sexes were used in this trial. All the birds were randomly distributed into 4 replicates groups which were fed ad-libitum with diets (22.06% CP and 3012 kcal/kg ME starter diets for 0-3 weeks of age and 19.71% CP and 3125 kcal/kg ME finisher diets for 4-6 weeks of age) containing different levels of DAP as follows: 0% (control), 5%, 10% and 15%, respectively. In conclusion it was suggested that DAP can be used as a feed ingredient in broiler chicken diets with a level of 5%.

Keywords: *Broiler, Dried apple pomace, Fattening performance*

Kurutulmuş Elma Posasının Etlik Piliç Rasyonlarında Kullanım Olanakları

Özet

Bu araştırmada, kurutulmuş elma posasının etlik piliçlerin besi performansı üzerine olan etkileri incelenmiştir. Araştırmada her iki cinsiyette günlük yaşta Ross-508 genotipine ait toplam 96 adet broiler civcivleri kullanılmış ve civcivler 4 deneme grubuna rasgele dağıtılmışlardır. Gruplara sırasıyla, %0 (kontrol), %5, %10 ve %15 düzeylerinde kurutulmuş elma posası katılarak, 0-3 haftalar arasında % 22.06 HP ve 3012 kcal/kg ME içeren başlangıç ve 4-6 haftalar arasında %19.71% HP ve 3125 kcal/kg ME içeren bitiş yemleri verilmiştir. Araştırma sonucunda, kurutulmuş elma posasının etlik piliç rasyonlarına %5'e kadar katılabileceği sonucuna varılmıştır.

Anahtar sözcükler: *Etlik piliç, Kurutulmuş elma posası, Besi performansı*

INTRODUCTION

Apple pomace a by-product of juice processing industry is a rich source of many nutrients including carbohydrates, minerals, fibers except protein [1]. Feed expenditures had a considerable percentage of cost in livestock production, especially up to 75-80% of costs in poultry production. Therefore in the last year it was investigated alternative feed resources. Various by-products such as pomaces from food industry are used alternative feed ingredients in poultry and ruminant diets. Apple pomace is especially used for livestock feed. Apple pomace, the residual material from pressing apple for juice, contains pulp, peels and cores [2]. In Turkey, it was produced 2.55 million metric ton apple in 2005 [3]. It is rich source of many nutrients including minerals, carbohydrates and fibers except protein feeding of fermented apple pomace to the broilers was found to be successful [4]. Yıldız et al.[5] reported that egg production and feed efficiency were influenced positively while live weight, egg breaking strength and egg shell thickness were not influenced by addition of 5% DAP +1000 ppm Grindazym (hemi-cellulase, pentosanase, ß-glucanase, pectinase, protease, amylase) to the layer rations. Kilinc and Ayhan [6] reported that DAP can be used up to 15% level in quail diets. However, application of Roxazyme-G enzyme (0.1%) (Cellulase, Beta-D-glucanase, Xylanase, Pectinase,

İletişim (Correspondence)
☎ +90 246 2114643
✉ vayhan@ziraat.sdu.edu.tr

Amilase) to DAP did not affect the performance. Bhat et al.[7] were assessed effects of replacing maize by apple pomace in the ration at 0, 10, 15 and 20% levels with multi enzyme mixture contained amylase, hemi-cellulase, cellulase, protease and Beta-glucanase, respectively or without enzyme supplementation, on age at sexual maturity, egg production, egg weight, and mortality. However, on age at sexual maturity, egg production and mortality didn't affect while egg weight was increased.

The present study was conducted to determine the using possibilities of the DAP replacing maize in broiler diets.

MATERIAL and METHODS

A total of 96 one day-old broiler chicks (Ross-508) in both sexes were used in this research. All the birds were replaced into battery cages at first day as 4 birds per cage. Overall the trial cage house was illuminated 24 h continuously. All the birds were randomly divided into 4 groups (each group consist of 6 replicates). on diets as follows: 0% (control), 5%, 10% and 15%. All the birds in groups were fed ad-libitum with diets during first three weeks and 4-6 weeks age, 22.06% CP and 3012 kcal/kg ME and 19.71% CP and 3125 kcal/kg ME, respectively.

Fresh apple pomace was obtained from a private enterprise in Isparta province and dried in natural conditions. Chemical composition of DAP used in this research was given in *Table 1*. Afterwards DAP was grinded and diets were prepared.

Table 1. *Chemical composition of DAP, %*
Tablo 1. *Kurutulmuş elma posasının kimyasal kompozisyonu, %*

Chemical Composition	DAP
Dry Matter	89.56
Crude Protein	5.47
Crude Fat	4.81
Crude Fiber	17.99
Crude Ash	3.36
Starch	12.28
Sugar	4.85
ME (kcal/kg)	1379

Third and sixth week live weights were measured individually, feed consumptions and feed conversion rates were determined for each replicate by a 0.1 g sensitivity electronic scale. Dry matter content in DAP was determined by oven-drying at 105°C for 16 h. Crude protein was determined by the Kjeldahl metod (AOAC [8]). Crude fat was obtained by the Soxhlet extraction using anhydrous diethyl ether. Crude fiber was determined using 12.5 % H_2SO_4 and 12.5% NaOH solitions (Nauman and Bassler [9]). Crude ash was analyzed according to the procedures of AOAC [8]. The experimental data were analyzed statistically by using Completely Randomized Plats designs. All the collected and recorded data was entered to the MINITAB [10], then statistically evaluated and interpreted by Oneway ANOVA [11].

Significances were determined by Duncan's Multiple Range Test.

The starter diets contained 22.06% CP and 3012 kcal/kg ME and finisher diets contained 19.71% and 3125 kcal/kg ME. Ingredients and chemical composition of the starter and finisher diets used in this research were given in *Table 2* and *Table 3*, respectively.

Table 2. *Composition of the starter diets (0-3 weeks of age), %*
Tablo 2. *Başlangıç yemlerinin kompozisyonu (0-3 haftalık yaş), %*

Ingredients	Groups			
	Control	DAP 5%	DAP 10%	DAP 15%
Corn	53.00	42.27	34.61	26.94
Soybean meal	26.62	30.40	31.18	31.95
Wheat	10.00	10.00	10.00	10.00
Dried apple pomace	-	5.00	10.00	15.00
Fish meal	6.00	6.00	6.00	6.00
Vegetable oil	1.720	3.60	5.48	7.36
Limestone	1.04	1.00	0.96	0.92
Dicalcium Phosphate	0.88	1.00	1.04	1.10
Salt	0.35	0.35	0.35	0.35
Vit+Min. Premixes*	0.25	0.25	0.25	0.25
DL-Methionine	0.14	0.13	0.13	0.13
Calculated Nutrient Composition				
ME, kcal/kg	3012	3012	3012	3012
Crude Protein, %	22.06	22.06	22.06	22.06
Calcium, %	1.09	1.09	1.09	1.09
Phosphor, %	0.75	0.75	0.75	0.75
Methionine, %	0.55	0.55	0.55	0.55
Lysine, %	1.17	1.22	1.26	1.31

***** *2.5 kg vitamin and mineral premixes contain 10.000.000 IU vitamin A, 3.500.000 IU vitamin D_3, 30.000 mg vitamin E, 3000 mg vitamin K_3, 1.500 mg vitamin B_1, 7000 mg vitamin B_2, 3000 mg vitamin B_6, 20 mg vitamin B_{12}, 500 mg folic acid, 10.000.000 mg Calcium dipentethenate, 50.000.000 mg Vitamin C, 500.000 mg cholin chloride, 35.000 mg nicotin amid, 100 D-Biotin, 80.000 mg Mn, 50.000 mg Fe, 60.000 mg Zn, 10.000 mg Cu, 1.100 mg I, 200 mg Co, 150 mg Se*

Table 3. *Composition of the finisher diets (4-6 weeks of age), g/kg*
Tablo 3. *Bitiş yemlerinin kompozisyonu (4-6 haftalık yaş) g/kg*

Ingredients	Groups			
	Control	DAP 5%	DAP 10%	DAP 15%
Corn	53.60	45.10	37.14	29.10
Soybean meal	29.64	29.85	30.77	31.70
Wheat	10.00	10.00	10.00	10.00
Dried apple pomace	-	5.00	10.00	15.00
Vegetable oil	3.20	5.20	7.25	9.34
Fish meal	2.00	2.00	2.00	2.00
Limestone	1.26	1.20	1.14	1.10
Dicalcium Phosphate	0.86	0.95	1.00	1.06
Salt	0.35	0.35	0.35	0.35
Vit+Min. Premixes*	0.25	0.25	0.25	0.25
DL-Methionine	0.10	0.10	0.10	0.10
Calculated Nutrient Composition				
ME (kcal/kg)	3125	3125	3125	3125
Crude Protein, %	19.70	19.71	19.71	19.71
Calcium, %	0.90	0.90	0.90	0.90
Phosphor, %	0.60	0.60	0.60	0.60
Methionine, %	0.45	0.45	0.45	0.45
Lysine, %	1.01	1.04	1.09	1.14

** 2.5 kg vitamin and mineral premixes contain 10.000.000 IU vitamin A, 3.500.000 IU vitamin D_3, 30.000 mg vitamin E, 3000 mg vitamin K_3, 1.500 mg vitamin B_1, 7000 mg vitamin B_2, 3000 mg vitamin B_6, 20 mg vitamin B_{12}, 500 mg folic acid, 10.000.000 mg Calcium dipentethenate, 50.000.000 mg Vitamin C, 500.000 mg cholin chloride, 35.000 mg nicotin amid, 100 D-Biotin, 80.000 mg Mn, 50.000 mg Fe, 60.000 mg Zn, 10.000 mg Cu, 1.100 mg I, 200 mg Co, 150 mg Se*

RESULTS

Live weights

Measured live weights at the end of the third and sixth weeks of age were given in *Table 4*.

Table 4. *Live weights in groups ($\bar{X}\pm S\bar{x}$)*
Tablo 4. *Grupların canlı ağırlıkları ($\bar{X}\pm S\bar{x}$)*

Groups	Live weights (g)	
	3th week	6th week
Control	562.70±11,60	1723.00±35.10[a]
DAP 5%	530.30±8,43	1645.90±25.40[ab]
DAP 10%	556.00±4,18	1646.30±10.80[ab]
DAP 15%	531.00±10,40	1577.80±15.60[b]

[a,b]: Different letters in the same column denote significant differences between means (P<0.01)

There is no significant difference between control and DAP supplemented diet groups at the end of the third weeks (P>0.01). However, there is significant difference between control and 15% DAP level and also resulted lower live weight than control group at the end of the sixth weeks (P<0.01) *(Table 4)*.

Feed consumption

Cumulative feed consumptions per bird were given in *Table 5*.

Table 5. *Cumulative feed consumption in groups ($\bar{X}\pm S\bar{x}$)*
Tablo 5. *Grupların kümülatif yem tüketimleri ($\bar{X}\pm S\bar{x}$)*

Groups	Feed consumption (g/bird)	
	0-3 Weeks	4-6 Weeks
Control	667.50±19.60 [b]	2275.00±45.40
DAP 5%	660.70±15.60 [b]	2350.00±34.00
DAP 10%	738.83±6.84 [a]	2331.10±33.10
DAP 15%	732.30±32.10 [a]	2398.00±40.40

[a,b]: Different letters in the same column denote significant differences between means (P<0.01)

There is no significant difference between control and DAP supplemented diet groups during 4-6 weeks *(Table 5)* (P>0.01). However, 10 and 15% DAP level resulted higher feed consumption than control and 5% DAP during 0-3 weeks (P<0.01).

Feed Conversion Ratio

Feed conversion ratios for 0-3 and 4-6 weeks of age were given in *Table 6*.

Table 6. *Feed conversion ratio ($\bar{X}\pm S\bar{x}$)*
Tablo 6. *Yemden yararlanma oranı ($\bar{X}\pm S\bar{x}$)*

Groups	Feed consumption (g/bird)	
	0-3 Weeks	4-6 Weeks
Control	1.28±0.06 [b]	2.01±0.08
DAP 5%	1.39±0.03 [ab]	2.03±0.04
DAP 10%	1.43±0.03 [a]	2.18±0.05
DAP 15%	1.49±0.06 [a]	2.21±0.05

[a,b]: Different letters in the same column denote significant differences between means (P<0.01)

Table was showed that there is no significant difference between control and DAP supplemented diet groups during 4-6 weeks of age *(Table 6)* (P>0.01) and 10 and 15% DAP levels in 0-3 weeks of age resulted higher feed conversion ratio than control group (P<0.01).

DISCUSSION

In last decades, there are a lot of researches on using of food industry by-products (such as pomaces) in ruminant accompanied with development in Turkish

food industry. But, there is no sufficient report in scientific literature using these by-products as an alternative resource in poultry nutrition because of juicy structure of them.

In this study was showed that there is no significant difference between control and DAP supplemented diet groups at the end of the third weeks (P>0.01). However, increased DAP level finisher broiler chicken diets resulted lower live weight (P<0.01). It also observed there is no mortality in any group during trial. These results were similar with Yildiz et al.[5] whose reported that live weight were not influenced by addition of 5% DAP + 1000 ppm Grindazym to the layer rations. Results showed that apple pomace can be used up to 10% level in broiler diets especially in terms of body weight. However, Kilinc and Ayhan [6] reported that DAP can be used up to 15% level in quail diets. In addition, Feed consumption increased when the DAP used up to 10 or 15% level and also 15% level of DAP was increased to feed conversion ratio. It may be concluded that maize could be replaced in broiler diet by 5% DAP without any adverse effect.

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