


## Possibilities of Using Biscuit or Wafer Waste in Broiler Chicken Diets

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Makale Kodu (Article Code): KVFD-2012-6344

### Summary

This study was conducted to investigate the dietary supplementation of efficiency biscuit and wafer wastes (BWW) on performance, carcass traits and some of blood biochemical parameters in broiler chickens. The present experiment was carried out in a completely randomized design (CRD) includes 144 one-day-old chicks fed experimental diets included 0, 8, 16 and 24% of BWW in 4 treatments and 3 replicates to 42 days of age. All experimental diets those supplemented with 8, 16 and 24% biscuit and wafer wastes had significantly more feed intake, but didn't observe considerable differences for weight gain or feed conversion ratio (FCR). Dietary supplementation of different percent of biscuit and wafer waste couldn't cause any significant difference for carcass traits. In serum biochemical measures, significant elevation of blood glucose was observed for groups supplemented with 16% or 24% biscuit-wafer wastes ( $P<0.01$ ) in comparison with control or 8% supplemented groups, also total cholesterol and triglyceride were higher in biscuit supplemented groups. As conclusion, utilization of commercial biscuit and wafer wastes up to 24% of diet as corn replacement didn't have any adverse effect on performance or carcass quality of broiler chickens. It was suggested that low cost rations can be formulated with utilization of biscuit or wafer wastes (up to 24%) in poultry diet when the price of corn is an expensive feed ingredient.

**Keywords:** Biscuit and wafer waste, Performance, Blood biochemical measures, Broiler

## Bisküvi ve Gofret Kalıntısının Etlik Piliç Rasyonlarında Kullanım Olanakları

### Özet

Bu çalışma, 4 uygulama ve 3 tekrardan oluşarak 144 adet 1. günden 42. güne kadar %0, %8, %16 ve %24 oranlarında bisküvi ve gofret kalıntısı ile deneysel rasyonla beslenen piliçlerden oluşan tamamen rastgele dizayn (CRD) ile gerçekleştirildi. %0, %8, %16 ve %24 oranlarında bisküvi ve gofret kalıntısı içeren deneysel rasyonlar önemli düzeyde yem alımı sağlamasına rağmen anlamlı düzeyde canlı ağırlık kazanımı ve besleme dönüşüm oranı (FCR) gözlemlenmedi. Ayrıca, bu tür bir rasyon karkas özellikleri bakımından önemli bir değişikliğe de yol açmadı. Serum biyokimyasal değerlerine bakıldığında, %16 veya %24 oranında bisküvi ve gofret kalıntısı içeren diyetle beslenenlerde ( $P<0.01$ ) kontrol veya %8 ile beslenenlere oranla önemli düzeyde artan kan glukoz değerleri belirlendi. Ayrıca, kolesterol ve trigliserit değerleri bisküvi eklenen diyetle beslenenlerde yüksek bulundu. Sonuç olarak, rasyonda mısır değişikliği gibi %24'varan oranda ticari bisküvi ve gofret kalıntısı kullanımı piliçlerde performans ve karkas özellikleri üzerine herhangi bir ters etkiye sahip değildir. Mısırın diyet içeriği olarak maliyetli olduğu durumlarda bisküvi ve gofret kalıntısı kullanımı ile (%24'e kadar) ucuz rasyonların formüle edilebileceği tavsiye edilmektedir.

**Anahtar sözcükler:** Bisküvi ve gofret kalıntısı, Performans, Kan biyokimyasal değerler, Broyler

### INTRODUCTION

Feedstuffs or ration cost in broiler farms is around 60-70% of total cost of broiler rearing period<sup>1</sup>. Application of food industry and agricultural processing wastes such as

dried apple pomace<sup>2</sup>, macaroni<sup>3</sup>, wheat screening<sup>1</sup> and corn flakes waste<sup>4</sup> were considered as efficient feedstuffs for broiler diet in past studies. Nkosi *et al.*<sup>5</sup> had suggested



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popcorn waste products can replace up to 50% of the maize in diets for growing lambs. Biscuit Wastes (BW) has some advantage for submission in broiler diets; it has high energy concentration, skimmed milk or milk powder, vegetable fat, sugar, salt and flavor materials. BWW is a palatable and contains considerable amount of nutrients include protein and minerals required for animal growth and productive performance <sup>6,7</sup>. Also BWW has no anti-nutritional factor in considerable amount and could be a suitable replacement for maize and other cereal grains in fattening animal diets<sup>7</sup>. BW can be supplemented in the diet of broiler which has resulted in reduction in the cost of feed without any adverse effect <sup>8</sup>. Eniolorunda <sup>7</sup> had stated that supplementation of BW in fattening rams diet caused better dry matter digestibility, crude protein digestibility, energy digestibility and feed cost per gram declined significantly. Apata *et al.*<sup>9</sup> had showed that biscuit wastes (25-50%) based diet can improve both of external and internal ofal and non-carcass components of rams. BW supplementation in non-ruminants was investigated by Narayanan *et al.*<sup>10</sup> for piglets. But a complete study about biscuit or wafer waste supplementation in broiler diets is not available. For identification of BW efficiency in poultry diet and with attention to BW efficiency in nutrition of farm animals (rams and piglets) that was reported in past studies, this study was conducted for investigate the efficiency of dietary supplementation of biscuit and wafer wastes on performance and carcass characterizes of broiler chickens.

## MATERIAL and METHODS

This experiment based on completely randomized design (CRD) include 144 one-day-old chicks that were fed experimental diets include 0, 8, 16 and 24% of BWW in 4 treatments and 3 replicates to 42 days of age was conducted at shabestar branch , Islamic Azad University's poultry farm during summer 2010. The experimental diets were iso-caloric and iso-nitrogenic according to NRC (1994)<sup>11</sup> recommendations.

Biscuit and wafer wastes (*Table 1*) were provided from an industrial biscuit factory. The utilized biscuit was in simple form and without cream or extra bran. Biscuit mixture used in experimental diet was containing 60% biscuit with 40% wafer flour blended and prepared for supplementation. The provided waste was analyzed chemically by methods of the Association of Official Analytical Chemists<sup>12</sup> and the data were used for diets formulating.

Weight gain, feed intake and feed conversion ratio (FCR) were recorded weekly to 42-days of broiler. At the end of experiment, some of biochemical parameters, total cholesterol, triglycerides and glucose in serum were assayed using a commercial kit supplied by (Pars azmoon Co., Ltd.) and detected by Auto Analyzer system (Alyson, 300, USA).

**Table 1.** Chemical composition of experimental biscuit and wafer waste mixture (%)

**Tablo 1.** Bisküvi ve gofret kalintisi karışımının kimyasal bileşimi (%)

Composition	%
Dry Matter	92
Moisture	8
Crude Protein	12.6
Crude Ash	2.2
Ether Extract	4.05
Crude Fiber	2.55
ME (kcal/kg)	3300
Calcium	0.5
Phosphorus	0.2
Linoleic Acid	0.7
Methionine	0.41
Lysine	0.91
Arginine	0.99

Three broilers from each treatment were slaughtered and carcass characterizes (carcass, thighs, breast muscle and wings) were determined after feather removal and presented as percent of chilled carcass weight.

All data were analyzed by ANOVA using the general linear model (GLM) procedures <sup>13</sup> Duncan's multiple range tests were applied for detection of significant differences.

## RESULTS

Performance, carcass traits and some of serum biochemical measures of broilers consuming different levels of biscuit wastes and wafer mixture are presented as *Table 3, 4 and 5*.

Interestingly, all of supplemented groups with 8%, 16% and 24% BWW had significantly higher feed intake ( $P < 0.05$ ) but did not have considerable differences for weight gain or FCR values among the four experimental groups (*Table 3*).

Supplementation of different amounts of biscuit and wafer waste couldn't statistically cause any difference for carcass traits (*Table 4*).

The increases of serum glucose were observed for groups supplemented with 16% or 24% biscuit/wafer wastes mixture ( $P < 0.01$ ) in comparison with control or 8% supplemented groups (*Table 5*), on the other hand total cholesterol and triglyceride of groups consuming feeds with biscuit/wafer wastes mixture were higher than control group (*Table 5*).

## DISCUSSION

Odetallah *et al.*<sup>14</sup> showed that when poultry diets contains higher level of wheat or formulated in wheat-

**Table 2.** Experimental ration for broiler chicks fed different levels of biscuit and wafer waste mixture (1-21 d and 21-42 d)**Tablo 2.** Bisküvi ve gofret kalıntısı karışımı içeren etlik piliç rasyonu (1-21 ve 21-42 günlük)

Composition (%)	Periyot							
	1-21 d				21-42 d			
	Control	8% Wastes	16% Wastes	24% Wastes	Control	8% Wastes	16% Wastes	24% Wastes
Corn	49.60	42.3	35.77	29.51	44.89	38.26	31.42	24.08
Wheat	10.80	10.80	10.80	10.80	21	21	21	21
Soybean Meal	29.22	28.35	27.3	26.35	23.22	22.20	21.13	20.30
Fish Meal	5	5	5	5	4.80	4.80	4.80	4.80
Biscuit and Wafer Waste	-	8	16	24	-	8	16	24
Poultry Fat	2.50	2.50	2.17	1.80	3.40	3.20	3	3.03
Oyster Meal	1.10	1.31	1.25	1.18	1.10	1.10	1.10	1.19
DCP	1.12	1.06	1.05	0.70	0.90	0.75	0.85	0.89
Vitamin Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Mineral Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.03	0.05	0.03	0.03	0.05	0.05	0.06	0.07
Salt	0.13	0.13	0.13	0.13	0.14	0.14	0.14	0.14
<b>Calculate</b>								
ME, kcal/kg	3000	3001	2998	3001	3097	3099	3097	3099
Crude Protein %	21.26	21.26	21.26	21.26	19.22	19.22	19.22	19.22
Ether Extract (EE)%	2.1	2.51	2.86	3.01	2.21	2.54	2.77	3.12
Crude Fiber %	3.50	3.48	3.48	3.47	3.18	3.17	3.16	3.16
Calcium %	1.02	1.01	1.01	1.00	0.90	0.90	0.90	0.90
Phosphorus %	0.47	0.45	0.45	0.46	0.40	0.40	0.40	0.40
Energy/Protein	141.11	141.15	140.90	140.95	161.13	161.23	161.13	161.23

<sup>1</sup> Vitamin premix provided the following per kilogram of feed: vitamin A, 4,800 IU (retinyl acetate); cholecalciferol, 880 IU; vitamin E, 10 mg (dl- $\alpha$ -tocopheryl acetate); vitamin K (menadione sodium bisulfate), 1.2 mg; thiamin, 0.8 mg; riboflavin, 2.4mg; pantothenic acid, 12 mg; niacin, 3 mg; vitamin B12, 0.006 mg; biotin, 0.04 mg; pyridoxine, 0.8 mg; choline chloride 100 mg; anti oxidant 4 mg;<sup>2</sup> Mineral premix provided the following per kilogram of feed: manganese, 40 mg; zinc, 24 mg; iron, 16 mg; copper, 2 mg; iodine, 0.4 mg; selenium, 0.08 mg; Ca, 280 mg and choline chloride 100 mg

**Table 3.** Effects of different levels of biscuit and wafer wastes mixture on performance in broilers.**Tablo 3.** Farklı düzeylere Bisküvi ve Gofret kalıntıları karışımlarının etlik piliçlerin performansı üzerinde etkisi

Treatments	Feed Intake (g)	Weight Gain (g)	FCR <sup>1</sup>
Control	753 <sup>b</sup>	382	1.904
8% Waste	777.5 <sup>a</sup>	379	1.89
16% Waste	776.2 <sup>a</sup>	404	1.86
24% Waste	776.8 <sup>a</sup>	369	1.89
P Value	*	ns	ns
SEM	2.13	8.75	0.11

*ns: P>0.05, \*: P<0.05, <sup>1</sup>FCR: Feed conversion ratio*

based composition, specific enzyme supplementation is required for optimizing growth performance. It was reported that improved growth performance can be expected for male and female broiler chickens with supplementation of the tested enzyme complex to wheat-based diets<sup>15</sup>. It seems that processed wheat based wastes because of high temperature and humidity in processing have less anti nutrients<sup>16</sup> when compared with raw wheat grain; In similar study with wheat based wastes (without any enzyme supplementation), Gheisari *et al.*<sup>3</sup> stated that it is possible to use macaroni Wastes and grade-1 wheat

feed screening at 45% and 30% levels in the diet of broiler chicks, respectively, any undesirable effects on their performance. In the present study, addition of BWW up to 24% regardless to any adverse effect on performance and carcass characterizes, increased feed intake in BWW fed groups. Increase in glucose, total cholesterol and triglyceride of blood related to feed palatability and sugar and oil contents of BWW that stimulate hyperglycemia, and higher plasma lipids may be because of higher oil contents of BWW (in comparison with biscuits, made from wheat), on other hand similar serum profile for glucose, cholesterol

**Table 4.** Carcass traits of broilers in experimental groups in 42-day old (%).**Tablo 4.** Deneme gruplarındaki 42 günlük piliçlerin karkas özellikleri (%)

Treatments	Carcass Yield <sup>1</sup>	Breast *	Thigh *	Heart, Gizzard and Liver *	Abdominal Fat *
Control	72.37	22.28	20.34	3.93	3.18
8% Waste	72.01	21.70	20.29	3.97	3.06
16% Waste	73.69	22.58	20.90	3.86	3.14
24% Waste	73.11	22.30	20.66	3.85	3.02
P Value	ns	ns	ns	ns	ns
SEM	0.84	0.45	0.1	0.08	0.6

<sup>1</sup> Carcass yield was determined as percent of body weight, \* carcass characterizes were announced as percent of chilled carcass weight

**Table 5.** Some of serum measures of experimental groups in 42-day old broilers (mg/dl)**Tablo 5.** 42 günlük yaşta etlik piliçlerin bazı serum parametreleri (mg/dl)

Treatments	Glucose	Total Cholesterol	Triglyceride
Control	205.11 <sup>c</sup>	129.77 <sup>b</sup>	77.83 <sup>b</sup>
8% Waste	206.23 <sup>c</sup>	144.66 <sup>a</sup>	85.44 <sup>a</sup>
16% Waste	227.31 <sup>b</sup>	153.68 <sup>a</sup>	91.05 <sup>a</sup>
24% Waste	239.71 <sup>a</sup>	156.03 <sup>a</sup>	90.28 <sup>a</sup>
P Value	**	*	*
SEM	1.19	0.92	0.33

\* P<0.05; \*\* P<0.01

and triglyceride has been observed in Hajati *et al.*<sup>17</sup> study that had wheat-based and enzyme supplemented ration. Present findings show that wheat-based biscuit or wafer wastes such as other wheat-based processed wastes<sup>1,3</sup> were an efficient choose as corn replacement in broiler nutrition and could supplemented up to 24% of ration without any considerable adverse effect.

As conclusion, utilization of commercial biscuit and wafer wastes mixture up to 24% of diet as corn replacement didn't have any adverse effect on performance or carcass traits of broiler chickens. It is seen that utilization of biscuit or wafer wastes (up to 24%) in poultry diet is possible when BWW is enough material and cheap.

## ACKNOWLEDGEMENTS

Authors are thankful to Shabestar Branch, Islamic Azad University for their financial support.

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