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USING DRIED LEFTOVER FOODS AS UNTRADITIONAL FEED IN MUSCOVY DUCK DIETS

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ABSTRACT

The current work was conducted to investigate the effect of dietary leftover food inclusion on growth performance, carcass traits and some blood biochemical parameters of Muscovy ducks. Thirty six (36) two-week old ducks (average weight 393.2 g) were obtained from local commercial source and randomly distributed into 4 groups (9ducks/each). In the first group, ducklings were fed ad-libitum on grower-finisher control diet (diet 1), while birds in the second, third and fourth groups fed on diets containing 10%, 20% and 30% leftover food, respectively (diets 2, 3, 4). The experimental diets were formulated in a mash form (yellow corn, soybean meal, wheat bran and sunflower oil) to meet the minimum nutrient requirements cited by NRC (1994) for ducks. Ducklings were fed according to one phase feeding program (grower- finisher, 14- 70 days). Growth performance, carcass traits and some blood biochemical parameters were assessed. The results showed that, ducks fed on diets containing 10, 20, 30% leftover food achieved significantly ($p<0.05$) higher body weight gain (3084.2±30.3, 3141.5±30.8, 3169.0±29.1 g), respectively compared with the control (2945.2±22.3g) with lower feed intake. Highest weight gain averages with best feed conversion (3.22, 3.14, and 3.11) respectively compared with the control. The highest dressing percentage was recorded in ducks fed on diet containing 30% leftover food (79.3%), while the lowest was observed in control group (75.6%). Addition of leftover food to duck diets had no significant effect ($p<0.05$) on the weights of internal organ. Total serum protein, albumin and globulin values were decreased significantly ($p<0.05$) by increasing the level of dietary leftover food. Inclusion of leftover food to duck diets increase significantly ($p<0.05$) triglycerides and had no significant effect on serum cholesterol. Results of the current study concluded that, the best growth performance and economical feed efficiency was observed in ducks fed on diet containing 30% leftover food which surpassing all treated groups and achieved the best body weight gain.

Key words: *Growth performance, carcass traits, leftover food, ducks*

INTRODUCTION

Poultry industry is one of the most dynamic agribusiness trades worldwide. The importance of feed supplementation in poultry production has increased in the last years with the aim of improving the economic situation of poultry projects. Therefore, it is highly essential to improve feed efficiency of poultry to produce meat economically and also food safety is more seriously considered than before. On the other hand, economy of food production is also a factor that cannot be ignored. Livestock production in many developing countries is constrained because of poor nutrition, short supply of animal feeds and poor quality of available feeds (International Atomic Energy Agency, IAEA 2011). Furthermore, it was recognized that utilization of alternative feedstuffs may play a crucial role in livestock production; especially as substitute for the traditional feedstuffs that are not readily available or are expensive. For a sustainable development of the livestock sector, it is essential to secure sufficient supply of balanced feed from resources that have no use in human nutrition. Leftover food is defined as any edible waste from food production, transportation, distribution and consumption; it is also referred as garbage, swill, and / or kitchen waste (Kornegay *et al.,* 1965 and Price *et al.,* 1985). Feedstuffs such as kitchen leftovers can be used in Egypt, and could be invaluable feed resources for small and medium size holders of livestock. Food leftover (food wastes) are not fully utilized and substantial amounts of nutrients lost during preparation of food, especially from cafeterias of universities, hospitals and hotels. Currently, large amounts of food waste generated from household and

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industries have become one of the main factors to cause environmental pollution. To overcome this problem the change of food leftover to useful materials is the best option. The best recycling way of food waste to minimize the pollution is converting it to animal feed (Kim *et al.*, 2001). Therefore, dried leftover could be used as a supplemental feed or a feed ingredient for swine and poultry (Kim *et al.*, 1995) not only to decrease the use of expensive feed ingredients, such as imported feeds, but also to reduce environmental pollution (Yang *et al.*, 2001). This study was conducted to estimate the nutritive value of leftover food and the effects of its inclusion to duck diets on growth performance, carcass traits and some blood biochemical parameters.

MATERIALS AND METHODS

The current work was carried out at the Veterinary research farm, Department of Animal Nutrition and Clinical Nutrition, Faculty of Veterinary Medicine, South Valley University (March- May 2017).

Experimental ducks and housing:
Thirty six Muscovy ducks (two weeks old) with average weight of 393.2 ±18.5g were randomly distributed into 4 groups, each of 9 ducks. Ducks were housed in floor pens and kept under the same managerial system and environmental conditions. A cycle of 16 hours light and 8 hours dark were applied throughout the experiment and hygienic disposal of organic washes were followed. For controlling diseases and increase viability, ducks were subjected to a prophylactic and pharmacological program against viral and bacterial diseases.

Diets and feeding:
The standard control diet (diet 1) was formulated in a mash form (yellow corn, soybean meal, wheat bran and sunflower oil) to meet the minimum nutrient requirements cited by NRC (1994) for ducks. Three experimental diets were formulated to contain 10, 20 and 30 % leftover food (diets 2, 3, 4). In the first group, ducklings were fed ad-libitum on grower-finisher standard control diet (diet 1). This group assigned as a control which the other groups were compared. Ducklings in the second, third and fourth groups were fed ad-libitum on grower-finisher diets containing 10%, 20% and 30% leftover food, respectively. Ducklings were fed according to one phase feeding program (grower- finisher, 14- 70 days). Ducks were fed ad-libitum on the respective diets in mash form and given free access to fresh water throughout the experimental period. The physical and chemical composition and energy values of the feed ingredients and experimental diets are presented in Table (1& 2).

Table 1: Chemical composition and metabolizable energy values of the ingredients.

Ingredients	Chemical composition (%) (As fed basis)						ME (kcal/kg)*
	DM	CP	EE	CF	NFE	ASH	
Yellow corn, ground	88.50	9.50	3.70	2.11	70.97	2.22	3350
Soybean meal	91.12	45.00	1.90	6.55	32.36	5.31	2230
Wheat bran	91.00	14.51	4.45	11.00	55.36	5.68	1300
Sunflower oil	99.00	---	99.00	---	---	---	8600
Leftover food	55.60	17.40	14.50	5.00	10.50	8.20	3380

* ME= Metabolizable energy cited by NRC (1994)

Collection & Processing of leftover food:
Leftover food was collected from Quick door restaurant and Dream Hotel by veterinary farm workers. Leftover food was minced then heated and dried in hot air oven at 85˚C for 4 hours at Animal & Clinical Nutrition lab., Fac. Vet. Med., South Valley University. Chemical composition of leftover food including DM, CP, EE, CF, ash and NFE was estimated according to the methods of Association of Official Analytical Chemists (AOAC, 1990). Energy value of leftover food was measured by bomb calorimeter at Animal & Clinical Nutrition lab, Fac. Vet. Med, Assuit University.

Table 2: Composition and energy values of the experimental diets.

Items	1	2	3	4
Physical composition (%)				
Yellow corn, ground	64.60	52.00	49.00	43.40
Soybean meal	18.80	16.00	13.70	11.00
Wheat bran	10.00	15.00	12.00	12.10
Sunflower oil	3.40	4.30	2.60	1.50
Leftover food	---	10.00	20.00	30.00
Mono sodium phosphate	0.9	0.6	0.6	0.4
Limestone, ground	1.50	1.20	1.20	0.70
Common salt	0.30	0.30	0.30	0.30
Methionine	0.20	0.30	0.30	0.30
Premix*	0.30	0.30	0.30	0.30
Chemical composition%				
Dry matter	86.76	84.05	74.89	77.59
Crude protein	16.00	16.00	16.00	16.00
Ether extract	6.54	7.13	6.62	8.16
Crude fiber	3.69	4.28	4.24	5.42
Nitrogen-free extract	57.45	44.77	47.94	44.19
Ash	2.98	3.66	4.12	4.68
Calcium	0.60	0.60	0.60	0.60
Phosphorus, available	0.30	0.30	0.30	0.30
Lysine	0.66	0.65	0.67	0.66
Methionine	0.40	0.50	0.50	0.50
ME (Kcal/kg)	3005	3001	3002	2999

*Each 3 kg contains: Vit. A, 1200000 IU; Vit. D_3, 300000 IU; Vit. E, 700 mg; Vit. k_3, 500 mg; Vit. B_1, 500 mg; Vit. B_2, 200 mg; Vit. B_6, 600 mg; Vit. B_{12}, 3 mg; Vit. C, 450 mg; Niacin, 3000 mg; Methionine, 3000 mg; Pantothenicacid, 670 mg ; Folicacid 300 mg; Biotin, 6 mg; Choline chloride, 10000 mg; Magnesiumsulphate, 3000 mg; Copper sulphate, 3000 mg; Ironsulphate, 10000 mg; Zinc sulphate, 1800 mg; Cobalt sulphate, 300 mg.

Growth performance parameters:
Live body weight of ducklings was individually recorded at the beginning of experiment and then weekly throughout the 8 weeks of the experimental period. Individual LBW was totalized and divided by the number of ducks to obtain the average LBW. Body weight gain of ducklings for each week was calculated by subtracting the LBW at the beginning of each week from that at the end of the same week. The amount of feed intake was weekly recorded in each of the different experimental groups. Average amount consumed by each bird was calculated by dividing the weekly consumed food by its respective number of birds in each group at this week. FCR was calculated weekly as kg feed intake / kg gain of body weight.

Carcass traits:
At the end of the experiment, three birds from each group were slaughtered after fasting overnight, processed and the weight of dressed carcass (the weight of slaughtered birds after removal of feathers, head and feet but including all the edible offal's), liver, spleen, gizzard and heart were recorded the organ weights were expressed as relative weight to pre-slaughter weight.

Blood samples:
Blood samples were collected from the three slaughtered birds in non-heparinized tubes. Serum was separated by centrifugation at 3000 rpm for 10 minutes and stored at -18°C till further analysis. Total serum protein, albumin, globulin, total cholesterol and triglycerides were determined using standard kits supplied by Bio-Merieux (Baines/France).

Economical evaluation:
Total feed cost, total production cost, price of body weight, net revenue and economical feed efficiency were calculated.

Statistical analysis:
Statistical analysis of the obtained raw data was carried out according to procedures of completely random design SAS (1995).

RESULTS

Weekly body weight development of ducks fed diets containing different levels of leftover food are presented in Tables 3. The performance measurements of ducks including body weight gain, feed consumption, feed conversion ratio (weekly and during whole experimental period) are shown in Tables 4, 5 & 6.

Table 3: Body weight development (g) of ducks fed the different experimental dietshc.

Age/group	1	2	3	4
2 weeks	395.3±19.7[a]	416.0±18.3[a]	391.5±178 [ab]	370.1±16.2[b]
3 weeks	852.5±23.8[ab]	803.8±27[ab]	736.3±20[b]	902.5±20.6[a]
4 weeks	1273±39.3[ab]	1236±25[ab]	1163±38.1[b]	1298±36.3[a]
5 weeks	1615±38.3[ab]	1633±32.7[ab]	1509±50[b]	1653±32.7[a]
6 weeks	2014±74[a]	2129±30.5[a]	1964±41.8[b]	2121±55.5[a]
7 weeks	2419±61.2[b]	2600±42.3 [a]	2525±49.1[ab]	2638±56.5 [a]
8 weeks	2769±54.2[b]	2969±31.2 [a]	2935±54.3 [a]	2902±65.7 [a]
9 weeks	3050±45.3[b]	3250±26.7 [a]	3224±62 [a]	3258±53 [a]
10 weeks	3340±40.8[b]	3500±37.8 [a]	3533±45.8 [a]	3539±52.3 [a]

[a] Significant difference when compared with control when (P<0.05)
[b]Significant difference when compared with other treated groups when (P<0.05)

Table 4: Body weight gain (g) of ducks fed the different experimental diets.

Age/group	1	2	3	4
2-3 wks	451.3±18.7[a]	396.8±11.7[ab]	350±10.5[b]	478.8±20[a]
3-4 wks	420±19[a]	432.5±12[a]	426.3±24.3a	395.0±28[b]
4-5 wks	342.5±24.6	396.3±19.3	346.3±27.1	355±17
5-6 wks	390±39.6a[b]	480±37[a]	472.5±29.3a	491.3±34.3[a]
6-7 wks	418.8±32.8[b]	487.5±31[ab]	543.8±22[a]	493.8±24[a]
7-8 wks	350±19a[b]	368.8±25[ab]	410±30.1[a]	356.3±24[ab]
8-9 wks	306.3±24[a]	281.3±18.7[b]	288.8±16.3[ab]	301.3±22.7[a]
9-10 wks	266.3±27.2[ab]	250±20 [b]	303.8±27[a]	297.5±20.5[a]
Total (2-10)	2945.2±22.3[b]	3084.2±30.3[ab]	3141.5±30.8 [a]	3169±29.1[a]

[a] Significant difference when compared with control when (P<0.05)
[b]Significant difference when compared with other treated groups when (P<0.05)

Table 5: Feed consumption (g/chick) of ducks fed the different experimental diets.

Age/group	1	2	3	4
2-3 wks	700.9± 19.7	550.3± 15.5	615.8± 22.4	610.5± 23.9
3-4 wks	1020± 21.6	1130± 28.1	1040± 20.00	1010± 21.5
4-5 wks	1143± 35.3	1100± 34.1	1140± 33.1	1100.7± 23.4
5-6 wks	1250± 51.9	1299± 67.5	1207± 56.31	1210± 34.9
6-7 wks	1400± 89.2	1355± 80.3	1300± 78.5	1390± 46.8
7-8 wks	1418± 92.5	1440± 90.7	1453± 86.5	1490± 67.2
8-9 wks	1500± 100.6	1500± 101.2	1530± 98.9	1500± 73.9
9-10 wks	1580± 120	1582± 110.4	1600± 117.8	1553.80.2
Total (2-10wks)	10011.9	9956.9	9886.00	9864.2

Table 6: Feed conversion index for ducks fed the different experimental diets.

Age/group	1	2	3	4
2-3 wks	1.56±0.06^{ab}	1.38±0.04^{ab}	1.72±0.05^{a}	1.28±0.05^{b}
3-4 wks	2.46±0.11a^{b}	3.62±0.07^{a}	2.5±0.16^{b}	2.64±0.17^{ab}
4-5 wks	3.44±0.22^{a}	2.81±0.13^{b}	3.42±0.24^{ab}	3.14±0.13^{ab}
5-6 wks	3.41±0.30^{a}	2.81±0.20^{ab}	2.61±0.16^{b}	2.53±0.15^{ab}
6-7 wks	3.5±0.27^{a}	2.85±0.17^{b}	3.41±0.23^{ab}	2.86±0.14^{ab}
7-8 wks	4.13±0.22^{ab}	4.0±0.25^{ab}	3.68±0.29^{b}	4.29±0.24^{a}
8-9 wks	5.12±0.42	5.53±0.43	5.41±0.31	5.19±0.42
9-10 wks	6.38±0.56^{a}	6.56±0.44^{a}	5.48±0.50^{b}	5.82±0.50^{ab}
Total (2-10)	3.39± 0.34^{a}	3.22± 0.45^{ab}	3.14± 0.17^{ab}	3.11± 0.06^{b}

Carcass traits including dressed carcass weights, dressing percentages, percentages of some internal organs of ducks are revealed in Table 7. The effect of leftover food addition to duck diets on serum biochemical parameters including total protein, globulin, albumin, cholesterol and triglycerides are tabulated in Table 8. Table 9 revealed economical evaluation of duck performance in the different experimental groups.

Table 7: Carcass traits of ducks as influenced by the different experimental diets.

Parameter/group	1	2	3	4
Pre-slaughter wt.	3133±218.6^{ab}	3133±66.7^{ab}	3317±148^{b}	3450±160.7^{a}
Hot carcass weight (g)	2704±239^{b}	2725±89.5^{ab}	2907±150 ^{a}	2920±130 ^{a}
Dressed weight (g)	2379±220^{b}	2389±89.5^{ab}	2619± 116^{a}	2631±137.5 ^{a}
Dressing (%)	75.6±2.0	77.2±0.46	76.5±0.54	79.3±0.59
Gizzard %	3.38±0.12	3.14±0.06	3.37±0.10	3.45±0.10
Liver %	1.78±0.09^{a}	1.57±0.17^{b}	1.57±0.17^{b}	1.78±0.07^{a}
Heart %	0.65±0.14	0.70±0.04	0.69±0.08	0.74±0.03
Spleen%	0.10±0.14	0.07±0.01	0.06±0.01	0.10±0.01

a Significant difference when compared with control when (P<0.05)
bSignificant difference when compared with other treated groups when (P<0.05)

Table 8: Serum biochemical parameters of ducks fed the different experimental diets.

Parameters/group	1	2	3	4
Total protein(g/dl)	4.4±0.57^{a}	2.93±0.23^{ab}	2.73±0.06^{ab}	3.7±1.0^{b}
Albumin (g/dl)	1.43±0.08	1.33±0.12	1.23±0.06	1.63±0.06
Globulin (g/dl)	3.0±0.66^{a}	1.6±0.11^{ab}	1.5±0.0^{ab}	2.06±0.08^{b}
Cholesterol (mg/dl)	144.3±5.8^{a}	136.7±12.8^{ab}	130.7±24.2^{b}	155±11.5^{a}
Triglycerides (mg/dl)	36.0±13.0^{b}	51.6± 0.88^{ab}	65.0±13.8^{ab}	78.3±17.5^{a}

a Significant difference when compared with control when (P<0.05)
b Significant difference when compared with other treated groups when (P<0.05)

Table 9: Economical evaluation of ducks fed the different experimental diets.

Item/group	1	2	3	4
Average feed intake kg/bird	10.06	10.46	10.53	10.73
Price/kg feed (L.E)	5.83	5.36	4.64	4.00
Total feed cost (L.E)	58.64	56.10	48.85	42.92
Totalproduction cost (L.E)	80.64	78.10	70.85	64.92
Body weight (kg/bird)	3.340	3.500	3.533	3.539
Price/kg body weight (L.E)	30.00	30.00	30.00	30.00
Net revenue (L.E)	19.56	26.90	35.14	41.25
Economic feed efficiency (%)	24.25	34.44	49.59	63.53
Relative economic feed efficiency	100.00	142.02	204.49	261.97

DISCUSSION

Growth performance:

There were significant differences ($p<0.05$) in the weekly body weight development and weekly weight gain between the different experimental groups as shown in Tables 3&4. At the end of the experiment, leftover food supplemented groups (groups 2, 3&4) recorded higher body weight (3500±37.8, 3533±45.8 and 3539±52.3g, respectively) than that recorded by control group (3340±40.8g). The highest body weight gain was recorded in the fourth group (3169±29.1g) while the lowest value was recorded in the control group (2945.2±22.3g). These results agreed with that reported by Chen *et al.* (2007) who found that addition of 5% dehydrated food waste product to broiler diets increased body weight gains during the 4 to 8 weeks of age. Farhat *et al.* (2001) revealed that, ducks fed on partial food wastes had significantly ($p<0.05$) higher growth performance including body weight gain. In contrast Cho *et al.* (2004) found that body weight gain was slightly higher in control group than dried leftover food supplemented groups. Concerning the feed intake, addition of dried leftover food to duck diets had no significant effect. For the whole experimental period, groups fed on diets containing 10, 20, and 30% leftover food consumed numerically less feed (9956, 9886, 9864 g/bird) than control (10011g/bird). These results are supported by the findings of Farhat *et al.* (2001) who found that addition of food waste to Muscovy duck diets decrease feed intake. On the contrary, Cho *et al.* (2004) found that average daily feed intake of group fed diets containing 20% dried leftover food was significantly higher than control ($p<0.05$). Inclusion of leftover food to duck diets had no significant effect on the feed conversion ratio. The best feed conversion ratio was recorded by the fourth group fed on diet containing 30% leftover food (3.11) in comparison with control (3.39) Cho *et al.* (2004) revealed that feed conversion ratio of broilers fed on diets containing leftover food was higher than that recorded in control group. Chen *et al.* (2007) found that feed conversion ratio linearly increased with increasing the level of food waste inclusion. This may be due to the ability of duck gastrointestinal tract to digest the relatively high fiber content of the leftover food (Chen *et al.,* 2007). Also, the increase in digestibility may be due to the proportion of saturated fatty acids to the unsaturated one (Farahat *et al.*, 1998).

Carcass traits:

The inclusion of leftover food to the duck diets did not affect significantly the dressing percentages, carcass weights and relative weights of gizzard, heart and spleen. Similar results were obtained by Chen *et al.* (2007) who reported that diets contain dried leftover food had no significant effect ($p<0.05$) on the dressing percentage, carcass weight and relative weights of the liver, heart. In this respect, Cho *et al.* (2004) found that the proportion of crop, heart, liver and gizzard to body weight was increased with increasing the level of dried leftover food in the diet.

Serum biochemical parameters:

Serum biochemical values revealed significant differences ($p<0.05$) among the experimental groups by adding leftover food to the diets. Total serum protein were decreased in groups containing 10, 20 and 30% leftover food respectively (2.93, 2.73, 3.70g/dl) compared with control (4.4). Concerning serum cholesterol content, addition of leftover food to duck diets had no significant effect ($p<0.05$) on serum cholesterol value and ducks fed diet containing 30% leftover food recorded the highest serum cholesterol value (155 mg/dl) when compared with control (144mg/dl). According to the previous researches, one of the factors affecting content of cholesterol in the blood was fiber content in the feed. Balmer and Zilversmit (1974) suggested that cellulose as an indigestible material controlled the cholesterol metabolism and affected concentration of cholesterol in blood and cholesterol turnover rate. Results in Table 7 revealed that cholesterol content of birds fed on diet had 30% leftover food was higher than other treated groups and control. The results showed significant increase of triglycerides content of all treated groups. Group 4 fed diet containing 30% leftover food had the highest value (78.3±17.5mgdl), followed by third group (65.0±13.8 mg/dl) and the lowest value was recorded in control group (36±13.0 mg/dl).

Economical evaluation:

The influence of the different dietary treatments on economic feed efficiency (EFE) and relative economic efficiency (REE) was measured by feed cost / kg live body weight relative to control group of ducks. The economical evaluation of ducks including total feed cost, total production cost, net revenue, economical feed efficiency, and relative economic efficiency in different dietary treatments are summarized in Table 9. The total feed cost was lowest (42.92 LE) in group 4 fed on diet containing 30% leftover food and the highest (58.64 LE) in the control group. Net revenue, economical feed efficiency and relative economical feed efficiency were higher in all treated groups than that recorded by control one. The highest economical feed efficiency was recorded in birds of the fourth group fed on diet had 30% leftover food (63.53 %) followed by birds in the third group (49.59 %) while the worst value was recorded in control group (24.25 %). The data of the economical evaluation in ducks revealed that adding different levels of leftover food improved economic feed efficiency. Priority of economical feed efficiency in the fourth groupfed diet containing 30% leftover

food may be due to better feed and energy utilization and conversion. Similar result was reported by Cho *et al*. (2004) who found that feed cost per unit kg was decreased with increasing the level of dried leftover food in diet and recommended that in viewpoint of economies, dried leftover food could be included at least more than 10% in broiler diet for the starter period and up to 30% in broiler chicks diet for the finisher period.

Results of the current study concluded that the best growth performance and economical feed efficiency was observed in ducks fed on diet containing 30% leftover feed which surpassing all treated groups and achieved the best body weight gain.

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استخدام بقايا الطعام المجفف كمواد علف غير تقليدية في علائق البط المسكوفي

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أجريت هذه الدراسة لمعرفة تأثير إضافة بقايا الطعام المجفف علي كفاءة الأداء وخواص الذبيحة وبعض التغيرات البيوكيميائية في مصل دم البط المسكوفي. تم استخدام عدد ٣٦ بطة مسكوفي في عمر ١٥ يوم (متوسط الوزن ٣٩٣,٢٢ ±١٧,٥ جم) من مصدر تجاري محلي وقسمت عشوائيا إلي ٤ مجموعات بكل منها عدد ٩ بطات. تم تغذية البط في المجموعة الأولي علي عليقة نامي-ناهي ضابطة (عليقة ١) ، بينما غذيت الطيور المجموعات ٢، ٣، ٤ علي علائق تحتوي علي ١٠%، ٢٠%، ٣٠% من بقايا الطعام المجفف علي التوالي (علائق ٢، ٣، ٤). تم تكوين العليقة الضابطة والعلائق التجريبية في صورة مسحوق يتكون من (ذرة صفراء، كسب فول صويا ونخالة القمح وزيت عباد الشمس) لتلبية الحد الأدني من الاحتياجات الغذائية التي يوصي بها المجلس الوطني للبحوث ١٩٩٤. تم تغذية البط في فترة واحدة (نامي-ناهي من ١٤-٧٠ يوم). تم تقييم كفاءة الأداء اسبوعيا، خواص الذبيحة وتم تقدير بعض التغيرات البيوكيميائية في دم الطيور وتم الحصول علىالنتائج التالية: سجل البط الذي تم تغذيته علي علائق بها تركيزات١٠، ٢٠،٣٠% بقايا الطعام المجفف زيادة معنوية في معدلات النمو (٣٠,٣ ٣٠٨٤±، ٣٠,٨±٣١٤١، ٣١٦٩ ٢٩,١±جم) مع نقص رقمي في استهلاك العلف مقارنة بالمجموعة الضابطة كما لوحظ تحسن في معدلات التحويل الغذائي (٣,٢٢، ٣,١٤، ٣,١١) في المجموعات المختبرة مقارنة بالمجموعة الضابطة (٣,٣٩). كان أعلي معدل للتصافي (٧٩,٣%) في المجموعة الرابعة بينما اقل معدل تصافي (٧٥,٦%) سجلته المجموعة الضابطة. لا توجد أي فروق معنوية في اوزان الاعضاء الداخلية للبط بين المجموعات المختبرة والمجموعة الضابطة. لوحظ وجود نقص في تركيز البروتين الكلي، الألبيومين والجلوبيولين مع زيادة نسبة اضافة بقايا الطعام المجفف على العلائق. وجد ان هناك زيادة معنوية في مستوي الدهون الثلاثيةمع عدم وجود فروق معنوية في مستوي الكوليستيرول في الدم بإضافة بقايا الطعام المجفف إلي علائق البط. نستخلص من هذه التجربة أن مجموعة البط الذي تم تغذيته علي عليقة تحتوي على ٣٠% من بقايا الطعام المجفف سجلت اعلى كفاءة في الأداء وافضل جدوى إقتصادية عن المجموعات المختبرة الاخرى حيث سجلت طيور هذه المجموعة اعلى معدل زيادة في وزن الجسم.