J. Animal and Poultry Prod., Mansoura Univ., Vol.3 (9): 423 - 435, 2012

THE USE OF DRIED CARROT PROCESSING WASTE IN BROILER DIETS

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ABSTRACT

This study was carried out to evaluate the effect of using broiler diets containing dried carrot processing waste (DCW) on nutrients digestibility coefficients, growth performance, carcass traits, chemical analysis of chicks meat and economical value. A total number of 150 unsexed one-day-old Hubbard broiler chicks were used in the study and were assigned into five dietary treatments in three replicates of 10 chicks each. Five dietary levels of DCW (0, 5, 10, 15 and 20%) were used. The experimental period was for 8 weeks. No significant differences were detected in digestibility coefficients of dry matter, organic matter and nitrogen free extract among dietary treatments. Control and 5% DCW groups gave the same values for CP, EE and CF digestibility coefficients and apparent, true nitrogen balance and nitrogen retained percentage. Digestibility coefficients decreased with increasing the level of DCW in the broiler diets. During the whole experimental period broiler chicks given diets containing 0.0 or 5% DCW recorded the highest live weight (LBW) and body weight gain (BWG) as compared to the other levels of DCW. Feed consumption (FC) decreased with increasing dietary DCW level. Broiler chicks given control and 5% DCW diets showed better efficiency than the other groups all over experimental periods. There were no significant differences in relative weights of carcass traits, but gizzard weight (%) was insignificantly increased. Empty intestine weight (%) was significantly increased with increasing the level of DCW in broiler diets. Broilers fed diet containing 5% DCW had the highest values for the relative weight of breast and total meat when compared to the other levels of DCW and control diet. Broiler chicks received diet contained 5 and 10% DCW showed the higher values of ash content and protein % for meat carcasses than the other experimental groups. Ether extract % in the meat decreased with increasing dietary level of DCW. Addition of DCW in broiler diets decreased price of feed compared to the control feed. Economic efficiency %, relative economic efficiency and performance index were higher for the control group, followed by 5% DCW as compared to the other experimental groups.

In general, these results indicate that using dried carrot processing waste (DCW*)* up to 5% in broiler diets enhances the productive performance and economic efficiency.

Keywords: Dried carrot processing waste, broilers, performance, digestibility, carcass traits.

INTRODUCTION

As it is commonly known, feeding is the main factor that affects poultry production. However, feeding cost for poultry is considered to be the most expensive item since it represents about 60-65% of the total production cost (Scott *et al.,* 1976). In Egypt, there is a serious problem of feed shortage for livestock especially in poultry field. There is also a continuous and rapid increase in the prices of the conventional feed ingredients. Therefore, the recent trend in poultry production is the usage of agro-industrial by-products in poultry diet to minimize the cost of feed as well as to reduce hazard of pollution resulting from these waste products. Feed diversification in the poultry diet is one of many attempts to reduce the cost of feed in the poultry industry. The utilization of waste materials from agricultural or industrial wastes (by-products) is often applied to overcome the problem of feed shortage in poultry industry. Rizal1 *et al* (2010) observed that, up to 20% of the carrot and fruits juice wastes mixture could be included in broiler diets to effectively replace about 40% corn in the diet. High crude fiber content in juice wastes mixture limits its utilization by chickens. Up to 7.5% of olive pulp can be included in the ration of broilers (Rabayaa *et al.,* 2001). Zafar *et al*., (2005) found that the apple by-product could be used in broiler diets. Tomato pomace of different processing methods could be included up to 10% in broiler diets without affecting live weight (Al-Betawi, 2005). Oluremi *et al* (2006) reported that dried sweet orange rind could also be used to replace dietary maize in broiler diets at the 15% level. Diarra *et al* (2010) recommended that the boiled manggo kernel meal could replace up to 60% of the maize in the diet of broilers without adverse effects on growth and carcass measurements. On the other hand, Sakhawat *et al* (1992) reported that Hubbard broilers fed on diets containing sun-dried carrot residue up to12% had no significant differences in weight gain, feed intake and feed conversion efficiency.

The aim of this experimental work was to study the effect of using dried carrot waste (DCW), at levels of 5, 10, 15 and 20% in broiler diets on chick performance, nutrients digestibility, carcass characteristics and economic evaluation of broiler chicks.

MATERIALS AND METHODS

The present study was carried out at the Poultry Nutrition Research Section, Department of Poultry Production, Faculty of Agriculture, Ain Shams University. The chemical analysis was conducted at laboratories of the Regional Central for Food and Feed (RCFF), Agricultural Research Center, Giza, Egypt.

Experimental Diets:-

Experimental diets were formulated to meet the nutrient requirements of broiler chicks based on NRC (1994) recommendation. Dried carrot processing waste *(DCW)* was incorporated in the starter and grower, finisher mash diets. Five dietary levels of DCW (0, 5, 10, 15 and 20%). The composition and calculated chemical analysis of the experimental diets were presented in Tables (1, 2 and 3). All the experimental diets were nearly iso-nitrogenous and iso-caloric. The experimental period was for 8 weeks, 1-3 weeks of age (starter period), 3-7 weeks of age (growth period) and 7-8 weeks of age (finisher period).

Experimental Chicks and Their Management: -

A total number of 150 unsexed one-week-old Hubbard broiler chicks were used in the study. The broiler chicks were nearly equal in the initial live weight and were divided randomly into five treatment groups of 30 chicks each. Each experimental group included 30 chicks in 3 replicates (10 chicks/replicate). Feed and water were supplied *ad-libitium* during the experimental period. Chicks were raised in brooders with wire floor mesh and exposed to 24 hours of constant light. All chicks were kept under the same managerial hygienic and environmental conditions. Individual body weight was recorded at first week, three, seven and eight weeks of age. Live weight, weight gain, feed consumption, feed conversion ratio (g feed/g gain) and mortality rate recorded during these periods were recorded.

Digestion Trails: -

At 8 weeks of age, 6 birds from each experimental group were used to determine the digestibility coefficients of nutrients. Faecal nitrogen (FN) was determined by separating method of trichloro acetic acid according to Jakobsen *et al.* (1960).

Carcass Traits: -

At the end of experimental period (8 weeks old), six birds (3 male and 3 female birds) from each experimental treatment group were weighed and slaughtered by slitting the jugular vein, then scalded and defeathered. Carcasses were manually eviscerated and weighed. Liver, heart, gizzard, intestine and abdominal fat were removed and weighed as a percentage of live body weight. The rest of the body was weighed to determine the dressed weight which includes the front parts with wings, hind parts and the neck. The dressed birds were portioned into right and left sides. The right side of each carcass was halved into forequarter (breast and wings) and hindquarter (thigh and drumstick). Thereafter, each quarter was weighed and dissected into meat, fat and bone and each of them was weighed. The edible organs (heart, empty gizzard and liver) were also individually weighed. Representative individual samples of meat from the forequarter and hindquarter were taken, dried in a forced air oven at 60°C for 24 hours (air DM), packed in labeled plastic bags and stored in a deep freezer at approximately-20°C until required for chemical analysis.

Chemical analysis:

The proximate analysis of the dried carrot processing waste (DCW), experimental diets, meat and excreta were analyzed according to A.O.A.C. (1990). Dried carrot processing waste was analyzed for fiber fractions, neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) using Tecator Fibretic System according to Goering and Van Soest (1970) procedures. Hemicellulose was calculated as the different between NDF and ADF, while cellulose was calculated as the difference between ADF and ADL. Amino acids concentrations were measured using a Bekman 7300 High performance Amino Acids Analyzer according to the methods of A.O.A.C. (1990) at the RCFF, Agricultural Research Center, Giza, Egypt. The chemical score (CS) value was calculated according to Block and Mitchell (1946). Calculated values were based on the amount of the essential amino acid present in greatest deficit in the tested protein compared with the level present in a reference protein, using the following equation:

$$CS = \frac{\text{g amino acid/100g of tested protein}}{\text{g amino acid/100g reference protein}}$$

Economic evaluation:

The economic efficiency (EEf) was calculated according to the following equation: EEP = A-B/B X 100. Where A is selling cost of obtained gain (LE per kg) and B is the feeding cost of this gain. The performance index (PI) was calculated according to the equation described by North (1981) as follows:

PI = Live body weight (Kg)/ Feed conversion x 100

Statistical analysis: -

The obtained data were statistically analyzed using the general linear model procedure described in SAS User's Guide (SAS, 1998). Differences among means were tested using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

1- Chemical analysis of dried carrot waste (DCW):

The proximate analysis of DCW is presented in Table (4). It is shown that, the DCW has reasonable amounts of protein and carbohydrates (nitrogen free extract and crude fiber). Moderate amounts of ash and low amount of EE were also found. The nutritive value of DCW is within the results reported by Sikder *et al.* (1998) who found that dried carrot meal prepared from fresh carrot was found to be a moderate source of protein (18.83%) and energy (2510 kcal/kg) with low level of fiber (8 %), while DM, EE and NFE content were 89.5, 3.5 and 66.17 %, respectively. The results of amino acid contents (%) shown in Table (4), indicated that DCW used in this study was poor in the essential amino acids, while rich in alanine and glutamic acid.

2-Nutrients digestibility coefficients:

Digestibility coefficients of nutrients in experimental diets are illustrated in Table (5). No significant differences in digestibility coefficients of dry matter, organic matter and nitrogen free extract among dietary treatments. Significant differences (P< 0.05 or 0.01) were observed in digestibility coefficients of crude protein, ether extract and crude fiber as well as apparent, true nitrogen balance and nitrogen retained percentage due to adding dietary DCW level in the broiler diets. In general, control and 5% DCW groups gave the same values for CP, EE and CF digestibility coefficients, thus decreasing these digestibility coefficients with increasing the level of DCW in the broiler diets. Additionally, it could be observed that, a gradual reduction in apparent, true nitrogen balance and nitrogen retained percentage by increasing dietary DCW level in the broiler diets. Broiler groups which fed control and 5% DCW diets recorded the better values for the most nutrients digestibility coefficients. This may be due to more palatable of these diets than other experimental diets. Abdel-Azeem and Hemid (2006) found that, highest apparent digestibility coefficients of OM, CP, EE, CF and NFE were observed with broiler group fed 8% barley radicel level compared with any of the other dietary treatments.

Table (1). Composition and calculated analysis of experimental starter diets.

Ingredients	Control	5% DCW	10% DCW	15% DCW	20% DCW
Yellow corn	57.50	53.00	53.00	48.40	42.80
Soybean meal (44%)	29.10	26.30	14.20	12.60	11.20
Corn gluten meal (62%)	8.90	10.20	17.78	18.28	18.98
DCW	0.00	05.00	10.00	15.00	20.00
Plant Oil	1.08	02.08	01.00	01.70	02.90
Di-Cal-Phosphate	1.00	01.00	01.60	01.60	01.70
Lime stone	1.82	01.82	01.82	01.82	01.82
Salt (NaCl)	0.30	00.30	00.30	00.30	00.30
Premix*	0.30	00.30	00.30	00.30	00.30
Total	100.00	100.00	100.00	100.00	100.00
Calculated chemical analyses					
CP %	23.00	23.10	23.15	23.17	23.26
ME (Kcal/Kg)**	3001	3040	3060	3075	3100
Calcium %	1.00	1.04	1.10	1.11	1.15
Available phosphorus %	0.42	0.41	0.41	0.40	0.39

**** Each 3Kg of vitamins and minerals premix used in formulating the experimental diets contains: vit. A 12000000 IU. Vit. D_3 2000000IU,vit. E 10000 mg, vit. K 2000 mg, vit. B_1 1000mg, vit. B_2 5000 mg, vit. B_6 1500 mg, vit. B_{12} 10mg, Pantothenic acid 10000, Niacin 30000 mg, Folic acid 1000mg, Biotin 50mg, Manganese 60000 mg,Zinc 50000 mg, Copper 10000 mg, Iron 30000 mg, Iodine 1000 mg, Selenium 100 mg, Cobalt 100 mg and Calcium carbonate 3000mg. ** Calculated according to NRC (1994).**

Table (2). Composition and calculated analysis of experimental grower diets.

Ingredients	Control	5% DCW	10% DCW	15% DCW	20% DCW
Yellow corn	62.20	60.00	59.20	53.58	50.20
Soybean meal (44%)	27.70	20.80	11.90	10.90	06.00
Corn gluten meal (62%)	4.20	08.30	13.88	14.00	16.98
DCW	0.00	05.00	10.00	15.00	20.00
Plant Oil	2.48	02.48	01.50	03.00	03.10
Di-Cal-Phosphate	1.00	01.20	01.50	01.50	01.70
Lime stone	1.82	01.62	01.42	01.42	01.42
Salt (NaCl)	0.30	00.30	00.30	00.30	00.30
Premix*	0.30	00.30	00.30	00.30	00.30
Total	100.00	100.00	100.00	100.00	100.00
Calculated chemical analyses					
CP %	20.20	20.3	20.38	20.45	20.50
ME (Kcal/Kg)**	3076	3100	3120	3130	3150
Calcium %	1.03	0.98	0.96	0.95	0.99
Available phosphorus %	0.32	0.35	0.39	0.38	0.40

**** Each 3Kg of vitamins and minerals premix used in formulating the experimental diets contains: vit. A 12000000 IU. Vit. D_3 2000000IU,vit. E 10000 mg, vit. K 2000 mg, vit. B_1 1000mg, vit. B_2 5000 mg, vit. B_6 1500 mg, vit. B_{12} 10mg, Pantothenic acid 10000, Niacin 30000 mg, Folic acid 1000mg, Biotin 50mg, Manganese 60000 mg,Zinc 50000 mg, Copper 10000 mg, Iron 30000 mg, Iodine 1000 mg, Selenium 100 mg, Cobalt 100 mg and Calcium carbonate 3000mg. ** Calculated according to NRC (1994).**

Table (3). Composition and calculated analysis of experimental finisher diets.

Ingredients	Control	5% DCW	10% DCW	15% DCW	20% DCW
Yellow corn	62.20	65.10	62.40	58.40	54.60
Soybean meal (44%)	27.70	15.00	08.80	05.40	------
Corn gluten meal (62%)	4.20	09.30	12.90	14.70	18.60
DCW	0.00	05.00	10.00	15.00	20.00
Plant Oil	2.48	02.18	02.48	02.98	03.18
Di-Cal-Phosphate	1.00	01.20	01.30	01.40	01.50
Lime stone	1.82	01.62	01.52	01.52	01.52
Salt (NaCl)	0.30	00.30	00.30	00.30	00.30
Premix*	0.30	00.30	00.30	00.30	00.30
Total	100.00	100.00	100.00	100.00	100.00
Calculated chemical analyses					
CP %	18.77	18.47	18.66	18.86	19.00
ME (Kcal/Kg)**	3188	3200	32222	3208	3225
Calcium %	1.03	0.97	0.94	0.95	0.96
Available phosphorus %	0.32	0.32	0.34	0.35	0.36

**** Each 3Kg of vitamins and minerals premix used in formulating the experimental diets contains: vit. A 12000000 IU. Vit. D_3 2000000IU,vit. E 10000 mg, vit. K 2000 mg, vit. B_1 1000mg, vit. B_2 5000 mg, vit. B_6 1500 mg, vit. B_{12} 10mg, Pantothenic acid 10000, Niacin 30000 mg, Folic acid 1000mg, Biotin 50mg, Manganese 60000 mg,Zinc 50000 mg, Copper 10000 mg, Iron 30000 mg, Iodine 1000 mg, Selenium 100 mg, Cobalt 100 mg and Calcium carbonate 3000mg. ** Calculated according to NRC (1994).**

Table (4): Composition and chemical analysis of the dried carrot waste.

A- Proximal analysis (%) as an air dry basis		C- Amino acid contents (%)	
Dry matter (DM%)	90.25	Methionine	0.14
Organic matter (OM%)	79.20	Cystine	0.18
Crude protein (CP%)	18.00	Lysine	0.29
Crude fiber (CF%)	13.50	Theronine	0.28
Ether extract (EE%)	1.77	Arginine	0.29
Nitrogen free extract (NFE%)	45.93	Isoleucine	0.37
Crude ash (%)	11.05	Leucine	0.48
ME (kcal/kg)*	2840	Valine	0.53
		Histidine	0.26
B- Fiber fractions (%)		Phenylalanine	0.23
		Glycine	0.46
NDF	27.92	Serine	0.31
ADF	14.29	Alanine	1.26
ADL	1.27	Aspartic acid	0.66
Hemicellulose	13.63	Glutamic acid	0.92
Cellulose	13.02	Proline	0.33

The ME was calculated according to Carpenter and Clegg (1956) by applying the equation:-
ME (kcal/kg) = (35.3*CP %)+(79.5*EE %)+(40.6*NFE %) +199.

Table (5): Effect of different levels of Carrot by products on the digestibility coefficients of nutrients and nitrogen balance.

Items	Control	5%	10%	15%	20%	Sig.
DM	84.48± 0.87	87.68±1.39	85.98± 0.12	81.68±1.95	85.97±0.15	NS
OM	86.05± 0.74	88.82± 1.33	87.22± 0.33	83.59± 1.88	87.49± 0.45	NS
CP	92.08^{ab}±0.7	93.12^{a}±0.24	91.36^{b}±0.50	87.40± 0.42	84.73^{d}±0.17	**
EE	92.88^{a}±0.36	93.21^{a}±0.48	91.28^{ab}±1.0	89.83^{b}±0.65	92.22^{b}±0.11	*
CF	54.49^{a}± 0.34	56.64^{a}±1.31	47.96^{b}±0.27	42.19^{c}±0.20	40.52^{c}±0.25	**
NFE	91.92±1.66	93.96±0.86	93.33±0.09	92.16±2.66	92.18±0.38	NS
ANB	03.38^{a}±0.04	03.38^{a}±0.03	02.73^{b}±0.05	02.25^{c}±0.07	01.95^{d}±0.02	**
TNB	03.50^{a}±0.02	03.51^{a}±0.03	02.86^{c}±0.05	02.32±0.07	02.04± 0.03	**
NR%	76.66^{a}±0.21	77.87^{a}±1.63	70.31^{b}±0.91	62.60^{c}±0.81	53.68^{d}±1.41	**

A,b,c,d means with the same letter are not significantly different. NS= not significant * (P<0.05) ** (P<0.01)

3- Productive Performance:-

The data presented in Table (6) shows carrot processing waste (DCW) at levels of 0, 5, 10, 15 and 20% at the different periods (starter, grower and finisher).

3-a. Live body weight (LBW) and body weight gain (BWG):

Statistical analysis indicated that, there were no significant differences in LBW at one week old among different treatments. During the starter period (1-3 weeks of age), it could be noticed that broiler chicks given diets containing 5% DCW recorded the highest LBW and BWG followed by those received diets containing 0.0% carrot by-product (control diet). But, the lowest values for LBW and BWG were recorded with broilers received diets containing 10, 15 or 20% DCW as compared with control and 5% DCW diets. However, analysis of variance of LBW and BWG showed no significant differences between control diet and 5% DCW diet and highly significant with the other levels of DCW. Similar trend was observed for LBW and BWG during the grower, finisher and the whole experimental period. This may be attributed to the higher of crude fiber content of DCW (13.50%), particularly the higher percent of cellulose, hemicellulose and lignin of cell wall constituents of DCW. Angele and Weber (1981) who found that, diets containing 6% fiber of different sources (wheat bran, corn bran, oat hulls, rice bran and cellulose) did not influence growth of chicks except the wheat bran diet which reduced growth rate. While, Haugh (1985) used BDG up to 20% for feeding poultry obtained reasonable findings, but more than 20% gave poor FCR due to high crude fiber content.

3-b. Feed consumption (FC) and feed conversion ratio (FCR):

As shown in Table (6), values of feed consumption were higher for the group given 5% DCW followed by those fed control diet. While, there was a decrease in the feed consumption with increasing dietary levels of DCW in the broiler diets. Statistically, these differences were highly significant (P≤0.01) through the different experimental periods. Generally, total feed consumption was reduced with increasing dietary levels of DCW compared with control diet or 5% DCW. Broiler chicks given control and 5% DCW diets converted their feed into BWG more efficient than the other experimental groups during the different experimental periods. It was observed in this experiment, increasing dietary level of DCW in the broiler diets resulted in the worst FCR compared with control group and 5% DCW. These results disagreed with those of Rizal1 *et al* (2010) observed that, increasing juice wastes mixture levels in diets increased feed consumption and average daily gain, while improving feed utilization efficiency. Findings of Sikder et al (1998) reported that body weight gain and feed conversion of laying hens were not significantly affected due to dietary addition of dried carrot meal (DCM) and no mortality was observed during the experimental period. On the other hand, Sakhawat *et al* (1992) reported that Hubbard broilers fed on diets containing sun-dried carrot residue up to12% had no significant differences in weight gain, feed intake and feed conversion efficiency. Abdel-Azeem and Hemid (2006) found that, feed utilization was impaired with increasing the fiber content. Feed consumption (FC) was decreased with increasing dietary barley radicel levels. Oluremi *et al* (2006) assigned to five dietary groups in which sweet orange (Citrus sinensis) rind (SOR) replaced maize at 0, 5, 10, 15, and 20% levels in both starter and finisher diets and they found that, no significant effect on feed intake, body weight gain, feed conversion ratio and feed cost per broiler while final live weight was affected significantly (p<0.05). Increasing dietary SOR content beyond 15% reduced growth rate, which cumulatively caused a decrease in final live weight.

3-c. Mortality rate:

It is worthy to notice that all broilers within the experimental treatments were healthy during the different experimental treatments.

Table (6). Effect of different levels of Carrot by products on growth performance of chicks.

Items	0.0%	5.0%	10.0%	15.0%	20.0%	Sig.
Live Body Weight (g) at :						
One week	140.67±0.88	140.33±1.45	140.67±1.20	141.00±0.85	139.33±0.88	NS
3 weeks	490.33^{a}±28.6	504.33^{a}±8.74	348.33^{b}±12.7	343.0^{b}±16.26	321.67^{b}±5.49	**
7 weeks	1795.7^{a}±85.5	1796.0^{a}±88.6	1079.0^{b}±44.9	928.0^{b}±37.55	726.67^{c}±6.33	**
8 weeks	2165.3^{a}±50.4	2159.0^{a}±76.3	1412.7^{b}±39.4	1113.0^{c}±35.3	876.33^{d}±21.9	**
Body Weight Gain (BWG) (g) at :						
1-3 weeks	349.67^{a}±27.74	364.0^{a}±7.77	207.67^{b}±12.0	202.0^{b}±16.4	182.33^{b}±6.36	**
3-7 weeks	1305.3^{a}±11.01	1291.7^{a}±83.9	730.67^{b}±38.1	585.0^{bc}±22.1	405.0^{c}±9.17	**
7-8 weeks	369.67^{a}±73.10	363.0^{a}±35.1	333.67^{ab}±58.5	185.0^{bc}±53.1	149.67^{c}±21.8	**
1-8 weeks	2024.8^{a}±50.2	2018.7^{a}±74.9	1272.0^{b}±39.8	0972.0^{c}±52.7	0737.0^{d}±22.7	**
Feed Consumption (g/bird) at:						
1-3 weeks	643.67^{a}±39.8	704.33^{a}±13.7	512.33^{b}±22.2	491.00^{b}±31.9	430.33^{b}±49.8	**
3-7 weeks	2608.7^{a}±135	2710.3^{a}±210	2166.3^{b}±78	1833.3^{bc}±75	1605.0^{c}±51	**
7-8 weeks	812.67^{a}±71	787.67^{ab}±151	689.67^{ab}±16	606.33^{ab}±28	509.0^{b}±71	**
1-8 weeks	4065.0^{a}±185	4202.3^{a}±68.8	3368.3^{b}±99.5	2930.7^{c}±120	2544.3^{d}±144	**
Feed Conversion (g feed/g gain) at:						
1-3 weeks	1.84^{b}±.0.03	1.94^{b}±0.03	2.47^{a}±0.05	2.43^{a}±0.04	2.35^{a}±0.22	**
3-7 weeks	2.01^{c}±0.08	2.11^{c}±0.17	2.97^{b}±0.09	3.13^{b}±0.03	3.97^{a}±0.21	**
7-8 weeks	2.49^{ab}±0.75	2.23^{b}±0.51	2.21^{b}±.0.42	3.71^{a}±.76	3.45^{a}±0.34	*
1-8 weeks	2.01^{d}±0.07	2.08^{d}±0.06	2.64^{c}±0.07	3.02^{b}±0.15	3.45^{a}±0.12	**

All values within rows with the same superscript or no superscript are not significantly different. NS= Not significant P≤(0.05) p ≤((0.01).

4- Carcass traits and carcass cuts:

Data concerning the effect of DCW on carcass traits and carcass cuts for experimental groups of broilers are shown in Tables (7 & 8). No significant differences were detected in relative weights of carcass traits. It is interesting to notice that, gizzard weight (%) was insignificantly increased and significantly increased empty intestine weight (%) with increasing the level of DCW in broiler diets. These results agreed with those of Rizal1 *et al* (2010) who found that no significant affects on carcass, liver, pancreas, gizzard or heart percentages due to feeding broilers on juice wastes mixture levels. Abdel-Azeem and Hemid (2006) observed that, a gradual decrease in the abdominal fat, gizzard fat and total non-carcass fat, while the relative weight of gizzard was increased by increasing barley radicel levels in the broiler diets.

Analysis of variance showed no significant differences in relative weight of thigh, drumstick, wing, total fat and total bone among experimental groups. Broilers group fed diet containing 5% DCW had the highest values (P< 0.05 or 0.01) for the relative weight of breast and total meat when compared to the other levels of DCW and control diet. Orr and Moron (1976) and Hegazay *et al* (1998) indicated that the different by-products used in broiler diets had little or no effect on the dressing percentages or edible giblets as long as the diet contained the requirements of protein and energy. Oluremi *et al* (2006) showed that, the diets had significant effects only on thigh +drumstick and the abdominal fat deposit of broilers. The relative weights of thigh +drumstick significantly increased in broilers receiving the sweet orange (Citrus sinensis) rind (SOR) based diets up to 15% SOR replacement and thereafter decreased. Generally, the values obtained for carcass cuts of birds on the SOR diets were higher than for the control. The abdominal fat content of 0.28% to 0.65% live weight showed a significant increasing effect (p<0.05) from 0% to 20% SOR replacement.

5- Chemical composition of chicks meat*:*

Table (9), shows that, no significant differences (P>0.05) were found among dietary treatments in percentages of dry matter and moisture content. However, the high levels of DCW in the broiler diets were insignificantly increased in moisture content and decreased in dry matter compared to the control group. Table (10), shows that, broiler chicks received diet contained 5 and 10% DCW, scored the higher (P ≤ 0.01) values of ash content and protein % than the other experimental groups. It is interesting to notice that, gradual reduction for ether extract % in the meat chicks was affected by dietary levels of DCW up to 20% in the diet. Moreover, the higher value of content for the control group was compared to the other experimental treatments, these differences were highly significant (P ≤ 0.01). In this concern, Saad (1998) reported that the inclusion of tomato waste meal in either tilapia or carp diets (10 and 5.63% respectively) had no significant effect on whole body composition (moisture, CP, EE and ash contents). Similarly, Soltan (2002) found that replacing 50% of soy bean meal by tomato waste meal in tilapia diets had no significant effect on moisture and CP contents in fish bodies.

Table (7). Effect of different levels of Carrot by products on carcass traits of chicks.

Traits	0.0%	5.0%	10.0%	15.0%	20.0%	Sig.
Carcass wt %	71.50±1.05	71.93±0.85	74.21±4.96	67.26±0.49	70.31±1.31	NS
Giblets wt %	03.56±0.39	03.34±0.12	03.03±0.01	03.73±0.06	03.90±0.34	NS
Edible parts wt %	74.61±0.70	75.26±0.73	77.24±4.70	70.98±0.43	74.20±1.65	NS
Inedible parts wt %	25.39±0.70	24.74±0.73	22.77±4.70	29.02±0.43	25.80±1.65	NS
Heart wt %	00.40±0.02	0.28±0.01	00.31±0.02	00.40±0.03	00.37±0.02	**
Liver wt %	01.86±0.26	01.64±0.08	01.20±0.07	01.53±0.03	01.57±0.03	NS
Gizzard wt %	01.18±0.12	01.30±0.05	01.44±0.05	01.64±0.02	01.83±0.33	NS
Intestines wt %	01.74±0.10	01.64±0.09	02.07±0.04	02.18±0.08	02.80±0.29	**
Blood wt %	03.00±0.36	03.49±0.18	03.41±0.25	03.84±0.02	03.39±0.08	NS
Feather wt %	03.56±0.39	03.34±0.12	03.03±0.01	03.73±0.06	03.90±0.34	NS
Non carcass fat wt %	03.21±0.42	03.79±0.22	05.50±0.54	03.61±0.13	04.46±0.55	*

All values within rows with the same superscript or no superscript are not significantly different.\ NS= Not significant P≤(0.05) p ≤((0.01).

Table (8). Effect of different levels of Carrot by products on carcass cuts of chicks.

Traits	0.0%	5.0%	10.0%	15.0%	20.0%	Sig.
Thigh wt %	17.76±0.48	18.64±1.47	17.27±0.17	17.73±0.02	16.09±1.39	NS
Drumstick wt %	11.79±0.59	11.79±0.59	11.73±0.64	11.95±0.77	10.88±0.14	NS
Breast wt %	25.80^{b}±1.25	31.45^{a}±0.43	24.82^{bc}±0.44	22.86^{c}±0.50	19.82^{d}±0.78	**
Wing wt %	06.47±0.39	06.12±0.12	06.54±0.40	05.94±0.05	05.74±0.73	NS
Total Meat %	42.37^{b}±1.87	50.39^{a}±1.17	39.92^{bc}±0.61	38.78^{bc}±3.65	34.70^{c}±1.17	*
Total Bone %	11.03±1.83	10.27±1.27	11.02±0.83	12.03±1.55	10.99±1.07	NS
Total Fat %	08.42±0.26	07.32±0.88	09.38±1.81	07.38±0.79	06.84±0.23	NS

All values within rows with the same superscript or no superscript are not significantly different. NS= Not significant P≤(0.05) p ≤((0.01).

Table (9). Effect of different levels of Carrot by products on proximate analysis of meat chicks.

Items	0.0%	5.0%	10.0%	15.0%	20.0%	Sig.
Moisture %	71.29±1.43	74.33±0.39	73.49±0.73	72.75±0.62	73.19±1.02	NS
Dry matter %	28.71±1.43	25.67±0.39	26.51±0.73	27.25±0.62	26.81±1.02	NS
CP as a % of DM	68.97^{d}±0.26	81.55^{a}±0.20	76.55^{b}±0.14	73.85^{c}±0.33	66.50^{e}±0.17	**
EE as a % of DM	23.89^{a}±0.33	21.91^{b}±0.20	17.56^{c}±0.12	16.29^{d}±0.12	15.57^{e}±0.25	**
Ash as a % of DM	03.73^{b}±0.33	04.45^{a}±0.14	04.42^{a}±0.02	03.75^{b}±0.03	04.10^{ab}±0.12	*

All values within rows with the same superscript or no superscript are not significantly different. NS= Not significant P≤(0.05) p ≤((0.01).

6- Economic evaluation:

From data in Table (10) observed that, the estimated cost for each Kg feed mixture was 2.138, 2.118, 2.093, 2.072 and 1.994 for diet containing 0.0, 5.0, 10.0, 15.0 and 20.0% DCW respectively. Whereas the value of 11.00 LE was the current selling price of one Kg live body weight of broiler chicks during the experimental period, these results indicate that, addition of

DCW in broiler diets decreased price of feed compared to the price of control feed. Concerning economic efficiency, relative economic efficiency and performance index values were higher for the control group, followed by 5% DCW group as compared to the other experimental groups. Saad (1998) reported that the inclusion of 10% tomato waste meal in tilapia diets reduced feed cost by 15% Also, Soltan (2002) found that replacing 50% of soybean meal by tomato waste meal in tilapia diets reduced feed cost by 10.93%.

Table (10). Effect of feeding different levels of carrot by-products on the economical value of broiler chicks

Items	0.0%	5.0%	10.0%	15.0%	20.0%
Price/Kg feed (LE)[A]	2.138	2.118	2.093	2.072	1.994
Total feed intake/chick (kg)	4.065	4.202	3.368	2.931	2.544
Total feed cost/chick (LE)	8.69	8.90	7.05	6.07	5.07
Price/kg live weight (LE)[B]	11.00	11.00	11.00	11.00	11.00
Total revenue	22.275	22.205	13.992	10.692	8.107
Net revenue/chick (LE)	13.85	13.31	6.94	4.18	3.06
Economical efficiency (EEf) %	156.30	149.54	98.49	64.23	60.76
Relative EE[C]	100	95.67	63.01	41.09	38.87
Performance Index	100.72	95.59	48.00	32.19	22.41

A- Based on the price of different ingredients available in the market at the experimental period.
B- According to the local market price at the experimental time.
C- Assuming that the relative EEf of the control diet equals 100.

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استخدام مخلف تصنيع الجزر المجفف في علائق بداري التسمين

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أجريت هذه الدراسة بهدف تقييم علائق كتاكيت اللحم المحتوية على مخلف تصنيع الجزر المجفف على المعاملات الهضمية والأداء الإنتاجي ومواصفات الذبيحة وقطعياتها والتركيب الكيماوى لها وكذالك التقييم المالى. أستخدم عدد 150 كتكوت غير مجنس من سلالة الهبرد حيث تم توزيعها على خمس معاملات غذائية كالآتى 0, 5, 10,15, 20 من مخلف تصنيع الجزر المجفف واستمرت التجربة لمدة ثمانية أسابيع وفيما يلى أهم النتائج المتحصل عليها .

- لاتوجد فروق معنوية فى المعاملات الهضمية الظاهرية للمادة الجافة العضوية والستخلص الخالى من الأزوت بين المعاملات الغذائية المختلفة.
- الكتاكيت التى غذيت على عليقة الكنترول و 5% مخلف جزر أعطت نفس القيم الهضمية للبروتين الخام ومستخلص الإثير والألياف وكذلك نسبة النيتروجين المحتجز الظاهرى والحقيقى ثم بعد ذلك حدث تناقص واضح لهذه القيم الهضمية مع زيادة مستوى مخلف تصنيع الجزر فى علائق الكتاكيت.
- مجاميع الكتاكيت التى غذيت على عليقة الكنترول و 5% مخلف جزر أعطت أعلى القيم لوزن الجسم الحى ووزن الجسم المكتسب إذا ما قورنت بالمعاملات الغذائية الأخرى فى نهاية التجربة ككل.
- معدل إستهلاك العلف يتناقص مع زيادة مستوى مخلف تصنيع الجزر المجفف فى العلائق المغذاة للكتاكيت.
- مجموعة الكتاكيت المغذاة على عليقة الكنترول و 5% مخلف الجزر الجاف كان معدل التحويل الغذائى لها أفضل من باقى المعاملات الغذائية الأخرى خلال فترة التجربة ككل.
- لا توجد فروق معنوية فى الوزن النسبى لمواصفات الذبيحة ولكن الوزن النسبى للقونصة زاد معنويا والوزن النسبى للأمعاء الفارغة زادت زيادة معنوية مع زيادة مستوى المخلف فى العلائق المقدمة للكتاكيت.
- مجموعة الطيور التى غذيت على عليقة 5% مخلف جزر أعطت أعلى القيم للوزن النسبى للصدر وكذلك كمية اللحم إذا ما قورنت بالمستويات الأخرى من المخلف وعليقة الكنترول.
- الطيور التى غذيت على علائق 5% و 10% مخلف جزر سجلت قيما مرتفعة من نسبة البروتين الخام والرماد الخام فى لحوم الطيور إذا ماقورنت بالعلائق الأخرى.
- مستخلص الإثير فى لحم الكتاكيت حدث له إنخفاض مع زيادة مستوي المخلف المقدم للطيور.
- إضافة مخلف الجزر فى علائق الكتاكيت أدى إلى خفض تكاليف العلف مقارنة بعليقة الكنترول
- فيما يتعلق بالتقييم المالى وجد أن الكفاءة الإقتصادية والكفاءة الإقتصادية النسبية ودليل الأداء كان مرتفعا فى مجموعة الكنترول ثم يليها على نفس القدر مجموعة الكتاكيت التى غذيت على عليقة 5% مخلف الجزر إذا ما قورنت بالمستويات المختلفة من هذا المخلف.

الخلاصة:

بصفة عامة أشارت هذه النتائج إلى إمكانية استخدام مخلف تصنيع الجزر المجفف حتى 5% فى علائق بدارى اللحم مما يعزز من الأداء الإنتاجي والتقييم الإقتصادي.

قام بتحكيم البحث

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