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DRIED POULTRY DROPPINGS AS A NON-CONVENTIONAL FEED INGREDIENT IN BROILER DIETS

(With 10 Tables)

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زرق الدواجن الجاف كمكون علف غير تقليدي في علائق بدارى التسمين

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أجريت هذه التجربة لدراسة تأثير إضافة مستويات مختلفة من زرق الدواجن الجاف كمصدر بروتيني غير تقليدي إلى علائق بدارى التسمين في عدد أربعة محاولات تجريبية تم خلالها استخدام عدد ٢٠٠ كتكوت اربوايكرز فى عمر يوم قسمت عشوائيا إلي عشر مجموعات بكل منها عدد ٢٠ كتكوت. هذا وقد غذيت المجموعة الضابطة فى المحاولة الاولى على ثلاث علائق (البادى والنامى والناهى) معتمدة على الذرة ومسحوق فول الصويا كمصدر للبروتين وخالية من زرق الدواجن الجاف بينما تم استخدام ثلاث مجموعات في كل محاولة لدراسة مستوى واحد لزرق الطيور (٥،١٠،١٥ %). بالنسبة للمجموعة الأولى في كل محاولة فقد تم تغذيتها على زرق الدواجن الجاف خلال فترات النمو الثلاث (البادى والنامى والناهى)، بينما غذيت المجموعة الثانية على المستوى ٥ % فى فترتى النامى والناهى والمجموعة الثالثة غذيت عليه خلال فترة الناهى فقط وتم اتباع نفس النظام في المحاولات الثالثة والرابعة. شمل البحث أيضا تقدير المقاييس الخاصة بتقييم كفاءة الاداء ونمو الجسم ومعدل الزيادة فى وزن الجسم ومعدل استهلاك العليقة بالاضافة الى كفاءة التحويل الغذائي، وقد حدث نقص في معدل النمو بمقدار ٨، ٢٧ ،٣٦ % في المجموعة الأولى المغذاة على٥،١٠،١٥ % زرق الدواجن خلال فترات النمو الثلاث. المجموعات المغذاه على علائق تحتوى على ١٠،١٥ % زرق الدواجن فقد استهلكت كمية من العلف اقل من المجموعة الضابطة مع حدوث نقص فى كفاءة التحويل الغذائى مقارنة بالمجموعة الضابطة. أما المجموعة المغذاة على عليقة تحتوى على ٥ % زرق الدواجن خلال فترات النمو الثلاث استهلكت تقريبا نفس كمية العلف مثل المجموعة الضابطة مع وجود نقص طفيف فى معدل التحويل الغذائي. بالنسبة للمجموعات المغذاة على علائق تحتوى على ١٠،١٥ % زرق الدواجن خلال فترتى النامى والناهي فقد استهلكت كمية قليلة من العلف واعطت اقل زيادة فى وزن الجسم مقارنة بالمجموعة الضابطة. وأخيرا فان المجموعات المغذاة على علائق تحتوى على مستويات مختلفة من زرق الدواجن خلال فترة الناهي كان معدل النمو بها اقل نسبيا من المجموعة الضابطة مع استهلاك كمية اكبر من العلف. من هذه

الدراســة نســتنتج أنه يمكن تقليل تكلفة علائق الدواجن باستخدام زرق الدواجن الجاف حتي نسبة ١٥% خلال فترة الناهي بدون أي تأثير سيئ علي أداء ونمو الطيور.

SUMMARY

Dried poultry droppings (DPD) was incorporated in broiler chick diets at levels of 5, 10 and 15% as a non protein nitrogenous source in four experimental trials. Two hundred, one day old Arbor acre broiler chicks were randomly distributed into ten equal experimental groups of 20 chicks each. A control group in the first trial was fed on three diets, the starter, grower and finisher, based on corn and soybean meal and free from dried poultry droppings. In the other three trials, three groups were assigned for each. The first group in each trial was fed three phases diets containing 5, 10 and 15% DPD, while in the second group, the grower and finisher diets were both had DPD and in the third one, only the finisher diet was contained DPD. The growth performance, body weight development, weight gain, feed intake and feed conversion efficiency were assessed. The chicks appeared to be affected differently by the dietary regimens. In the first group of 5, 10 and 15% DPD test trials in which chicks fed on DPD throughout the whole experimental period, there were a reduction in the growth rate by about 8, 27 and 36 % than control respectively, consuming less amount of food and had high feed conversion indices (2.92, 3.37 & 3.21) compared with 2.66 in control group. In the second group of all trials where birds raised on DPD during growing-finishing periods, feed consumption and weight gain were less than control group. In the third group of all treatments in which DPD was limited to the finishing period, growth rate was nearly less, while more feed consumption resulting in a feed conversion indices slightly higher than the control one. Thus, It could be concluded that, the cost of poultry diets can be reduced by using DPD up till 15% of the chick diets through the finishing phase without any adverse effect under the experimental condition.

Key Words: *Dried poultry droppings, broilers, performance*

INTRODUCTION

Pollution from poultry farms has currently become one of the most challenging environmental problems (Taiganides, 2002). The wastes associated with poultry farming have an increased significance today as people become more aware of the harmful effect of polluting the environment. Manure is by far the number one waste problem and its problems can be due to a number of different issues including disposal, odour, assoociated nuisance, and soil water and air pollution (Sims and Wolf, 1994; Henuk, 2001 and Bell, 2002). Much efforts is being made to study the possibilities of utilizing poultry wastes in the nutrition of animals including poultry (Day, 1977; Henuk and Dingle, 2002). This can lead to a reduction of traditional feed ingredients such as maize, wheat and soybeans that can be consumed by humans and considered as animal feeds (El-Boushy and Van der poel, 2000). In addition, utilizatoin of animal excreta for feed nutrients may help to alleviate pollution problems, decrease feed costs and increase the supplies of available nitrogen and essential mineral sources (Arndt *et al.*, 1979). The composition of dried poultry droppings contains moderate total protein ranging from 19.2 to 31.08% and the wide variation in crude protein composition might be due to the duration and storage of the wet manure (Trakulachang and Ballon, 1975; El-Boushy and Van der poel, 2000). The primary deficiency in dried poultry waste is its low metabolizable energy content which has been estimated to range from 660 to 2050 kcal/Kg (Biely *et al.*, 1972; Young and Nesheim,1972; Shannon *et al.*, 1973; El-Boushy and Vink, 1977; Sharara *et al.*, 1992). Dried poultry waste contains high ash 23.76- 36.40 % (Biely *et al.*, 1972; Coon *et al.*, 1975), significant quantities of calcium (7%) and phosphorus (2%) of high availability (Blair and Knight, 1973). Dried poultry waste after proper treatment could be used as a feedstuff because it contains undigested feed, metabolic excretory products and residues resulting from microbial synthesis. Micro-organisms in the poultry excreta convert some of the uric acid to microbial protein which can be utilized by poultry (El-Boushy and Vink, 1977). The present study was conducted to evaluate the effect of different levels of poultry droppings on the performance of broiler chicks during three stages of rearing.

MATERIALS and METHODS

Experimental chicks:

A total number of 200 one day old broiler chicks (Arbor Acre) obtained from a local commercial source, were used in this study at the Faculty of Veterinary Medicine, Assiut University. The chicks were nearly of a uniform weight, averaging 55g, and randomly distributed into ten equal experimental groups, 20 chicks each. The chicks were reared on the floor in an experimental room, of ten compartments, bedded with

Table 3: Composition of the experimental diets in the finisher period

Composition	Diets			
	Control	5% DPD	10% DPD	15% DPD
Physical composition (%):				
Corn, ground	69.40	66.72	64.42	62.13
Soybean meal	20.95	18.15	15.18	12.14
Fish meal	4.00	4.00	4.00	4.00
Vegetable oil	3.13	3.77	4.25	4.79
Dried poultry dropping	------	5.00	10.00	15.00
Dicalcium phosphate	0.67	0.53	0.40	0.25
Limestone, ground	1.31	1.25	1.13	1.00
Common salt	0.22	0.22	0.22	0.22
Lysine	0.02	0.06	0.10	0.15
Methionine	------	------	------	0.02
Premix	0.30	0.30	0.30	0.30
Chemical composition:				
Crude protein, %	18.00	18.03	18.03	18.00
ME , Kcal/kg	3201	3203	3200	3200
Cal/protein ratio	177.8	177.6	177.8	177.8
Methionine, %	0.32	0.33	0.32	0.32
Meth + cystine, %	0.61	0.60	0.57	0.54
Lysine, %	0.85	0.85	0.85	0.85
Calcium, %	0.80	0.80	0.80	0.80
Total phosphorus, %	0.52	0.57	0.63	0.58
Available phosphorus, %	0.30	0.30	0.30	0.30

Growth performance:

The birds were weighed individually at the beginning of the experiment and every week thereafter for 7 weeks at the growing phase. The chicks were checked twice daily and the weight of dead birds was used to adjust the average feed consumption. Feed consumption and body weight of the chicks were weekly recorded and the feed conversion efficiency was calculated for the different groups.

Carcass parameters:

Five randomly selected birds from each group were slaughtered at the end of the experiment for carcass parameters evaluation. Dressed carcass as the weight of the slaughtered birds after removal of feathers, head and feet but including all the offals (edible or not) was recorded. The weights of some internal organs of birds including gizzard, proventriculus, liver, spleen and heart were recorded at the end of the experiment.

Processing of poultry droppings:

Care was exercised in collecting the droppings of the birds to exclude extraneous materials. The droppings were collected daily on polyethelene sheets. The droppings were air dried for 24 hours at 30 - 35°C (Kese and Dokoh, 1982), then subjected to dry heat for 2 hours in hot air oven at a temperature ranges between 102 to 105°C (Trakulchang and Ballon, 1975).

Economical evaluation:

Total feed cost, total production cost, price of body weight and net revenue were calculated, economical feed efficiency and relative economical feed efficiency were calculated as follow:

$$\text{Economical efficiency} = \frac{\text{Net revenue}}{\text{Total production cost}} \times 100$$

$$\text{Relative economical feed efficiency} = \frac{\text{Econ. eff. of test group}}{\text{Econ. eff. of control group}} \times 100$$

Statistical analysis:

Statistical analysis of the experimental crude data was carried out according to procedures of completely random design SAS (1995).

RESULTS and DISCUSSION

The results obtained for broiler performance in terms of body weight development, feed intake, weight gain and feed conversion are presented in tables 5, 6, 7 and 8. Dressed carcass of chicks and economical evaluation are shown in tables 9 and 10.

Poultry production enterprises gain is usually affected not only by the kind of diet formulation and need satisfaction but also by feed prices, shortage, and the local running qualities. To guard against any extra expenses, expensive feed substituted by others of low prices satisfying the same nutrients and qualities. Also, due to these conflicting factors, a trend is now sponsored to use the unconventional non protein nitrogen source, the poultry droppings, in order to replace part of the most expensive protein and reduce cost and pollution. The diets were mixed as control diet containing soybean meal and fish meal (trial I) or test diets containing 5, 10 and 15% dried poultry dropping (DPD) in trials II, III & IV.

Mortality rate:

The mortality rate was nearly normal as only 2 chicks died from the 20 chicks of the control and the groups fed on diets contain 5% DPD during growing-finishing and finishing periods. 3 chicks were died from group fed on 5% DPD during all phases, second and third groups of 10 %DPD test trial and group raised on 15% DPD during finishing only as

Economical evaluation:

Total feed cost, total production cost, price of body weight and economical feed efficiency were calculated and presented in table (10). Feeding 5% DPD during all phases reduced economical feed efficiency by about 24.39%, while feeding DPD during growing-finishing phase and finishing only decreased economical feed efficiency by a range of 14.35% when compared with the control. In trial III, feeding 10% DPD during whole experimental period, growing-finishing period reduced the economical feed efficiency by 73.12 & 55.54%, respectively while feeding 10% during finishing period only reduced by 14.82% when compared with the control. Feeding 15% DPD (trial IV) during all phases, grower and finisher phases reduced the economical feed efficiency by 56.83 & 71.63%, respectively, while feeding during finishing period only reduced by 29.88%.

It could be concluded that, the cost of poultry diets can be reduced by using DPD up till 15% of the chick diets through the finishing phase without any adverse effect under the experimental condition.

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Table 4: Mortality rate in the different experimental groups

Weeks	Groups									
	Trial I (Control)	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
		1	2	3	1	2	3	1	2	3
1	1	1	--	--	2	--	--	2	--	1
2	--	1	--	1	1	1	1	1	--	--
3	1	--	--	--	1	--	--	1	1	1
4	--	1	1	--	--	--	--	1	2	--
5	--	--	1	1	--	1	1	--	1	--
6	--	--	--	--	--	1	1	--	--	1
7	--	--	--	--	--	--	--	--	--	--
Total	**2**	**3**	**2**	**2**	**4**	**3**	**3**	**5**	**4**	**3**

Table 5: Feed intake (g) of the broiler chicks during the all experimental trials.

Weeks	Groups									
	Trial I (Control)	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
		1	2	3	1	2	3	1	2	3
0-1	104	117	118	119	104	120	128	116	113	127
1-2	271	324	277	265	289	291	286	252	253	264
2-3	340	364	365	319	292	368	358	326	367	388
3-4	669	618	638	678	563	627	694	503	597	772
4-5	792	755	790	784	668	761	764	638	721	865
5-6	853	888	880	850	780	797	862	600	775	956
6-7	982	979	953	991	938	903	1001	575	843	934
Total	4011	4035	4021	4006	3634	3867	4093	3010	3669	4306

Table (6): Body weight development (gm) for the experimental chicks

Weeks	Groups									
	Trial I (Control)	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
		1	2	3	1	2	3	1	2	3
0	55.0 ±0.62	54.9 ±0.60	55.0 ±0.59	54.9 ±0.60	55.4 ±0.73	53.2 ±0.50	54.0 ±0.73	54.0 ±0.92	55.2 ±0.82	53.8 ±0.76
1	105.3 ±3.65	98.0 ±2.45	106.0 ±4.12	111.0 ±5.32	97.0 ±3.01	113.0 ±5.17	116.0 ±4.98	93.0 ±3.15	110.0 ±4.15	119.0 ±4.32
2	236.0 ±4.12	210.0 ±3.75	216.0 ±4.80	239.0 ±4.90	208.0 ±3.65	221.0 ±4.92	248.0 ±5.01	194.0 ±3.68	223.0 ±5.10	252.0 ±5.76
3	374.0 ±8.32	352.0 ±7.16	373.0 ±8.10	382.0 ±9.15	328.0 ±6.72	389.0 ±8.61	393.0 ±7.98	304.0 ±9.20	397.0 ±9.81	421.0 ±9.77
4	629.0 ±12.64	605.0 ±10.90	596.0 ±9.35	645.0 ±9.67	551.0 ±10.13	566.0 ±10.22	672.0 ±9.90	454.0 ±10.11	558.0 ±11.03	691.0 ±11.37
5	952.0 ±20.37	864.0 ±15.32	900.0 ±18.12	945.0 ±17.16	725.0 ±14.12	759.0 ±13.85	958.0 ±18.02	585.0 ±15.02	704.0 ±15.80	980.0 ±16.40
6	1237.0 ±25.64	1165.0 ±20.10	1202.0 ±23.16	1188.0 ±22.10	909.0 ±18.10	979.0 ±20.32	1196.0 ±23.10	790.0 ±18.10	891.0 ±17.12	1228.0 ±20.12
7	1560.0 ±25.52	1438.0 ±23.15	1483.0 ±23.36	1510.0 ±24.18	1135.0 ±19.62	1243.0 ±18.60	1494.0 ±20.12	993.0 ±18.50	1110.0 ±19.32	1486.0 ±20.34
Time of initial	**28.36**	**26.19**	**26.96**	**27.50**	**20.49**	**23.36**	**27.67**	**18.39**	**20.11**	**27.62**

Table (7): body weight gain (g) of the experimental chicks

Weeks	Groups									
	Trial I (control)	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
		1	2	3	1	2	3	1	2	3
0-1	50.3 ±1.02	43.1 ±0.96	51.0 ±0.75	56.1 ±1.12	41.6 ±0.68	59.8 ±1.45	62.0 ±1.82	39.0 ±0.85	54.8 ±1.10	65.2 ±1.15
1-2	130.7 ±3.70	112.0 ±2.80	110.0 ±2.15	128.0 ±3.26	111.0 ±2.19	108.0 ±2.30	132.0 ±3.45	101.0 ±2.76	113.0 ±2.61	133.0 ±3.51
2-3	138.0 ±6.40	142.0 ±5.98	157.0 ±6.71	143.0 ±5.20	120.0 ±4.76	168.0 ±6.90	145.0 ±5.82	110.0 ±3.92	174.0 ±5.60	169.0 ±5.10
3-4	255.0 ±8.55	253.0 ±8.15	223.0 ±7.62	263.0 ±8.76	223.0 ±7.01	177.0 ±5.12	279.0 ±8.32	150.0 ±4.15	161.0 ±5.31	270.0 ±7.16
4-5	323.0 ±10.01	259.0 ±9.32	304.0 ±10.70	300.0 ±9.98	174.0 ±8.12	193.0 ±8.70	286.0 ±10.13	131.0 ±7.42	146.0 ±6.80	289.0 ±10.13
5-6	285.0 ±13.55	301.0 ±12.90	302.0 ±12.51	243.0 ±9.34	184.0 ±6.10	220.0 ±8.17	238.0 ±13.10	205.0 ±9.15	187.0 ±7.10	248.0 ±11.32
6-7	323.0 ±11.65	273.0 ±9.13	281.0 ±10.10	322.0 ±12.10	226.0 ±9.85	264.0 ±9.70	298.0 ±11.03	203.0 ±8.60	219.0 ±9.42	258.0 ±12.01
Total	**1505.0** ±20.52	**1383.0** ±15.42	**1428.0** ±17.030	**1455.0** ±18.10	**1079.6** ±10.32	**1189.8** ±12.15	**1439.0** ±18.14	**939.0** ±7.32	**1054.0** ±8.10	**1432.0** ±19.32

Table (8): Chick performance of experimental groups compared with control

Weeks	Groups									
	Trial I (control)	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
		1	2	3	1	2	3	1	2	3
Feed intake (g)										
0-3	715	805	760	703	685	779	772	694	733	779
3-5	1461	1373	1428	1462	1231	1388	1458	1141	1318	1637
5-7	1835	1867	1833	1841	1718	1700	1863	1175	1593	1890
0-7	4011	4045	4021	4006	3634	3867	4093	3010	3644	4306
Weight gain (g)										
0-3	319 ±13.65^{a*}	297.1 ±10.70^{b}	318 ±12.95^{a}	327.0 ±13.15^{a}	272.6 ±11.32^{b}	335.8 ±12.90^{a}	339 ±13.01^{a}	250 ±10.95^{b}	341.8 ±13.22^{a}	367.2 ±13.82^{a}
3-5	578 ±15.76^{a}	512 ±14.90^{b}	527 ±13.75^{b}	563 ±16.12^{a}	397 ±10.90^{c}	370 ±10.50^{c}	565 ±12.42^{a}	281 ±8.70^{b}	307 ±8.10^{d}	559 ±12.52^{a}
5-7	608 ±17.65^{a}	574 ±15.10^{a}	583 ±16.12^{a}	575 ±14.93^{a}	410 ±13.22^{c}	484 ±12.81^{b}	535 ±14.15^{a}	408 ±13.99^{d}	406 ±13.76^{c}	506 ±14.15^{a}
0-7	1505 ±20.45^{a}	1383 ±18.22^{b}	1428 ±18.01^{a}	1455 ±17.62^{a}	1079.6 ±15.14^{d}	1189.8 ±16.82^{c}	1439 ±18.10^{a}	939 ±12.15^{c}	1054 ±16.01^{d}	1432 ±18.22^{a}
Feed conversion										
0-3	2.24	2.71	2.39	2.29	2.51	2.32	2.28	2.78	2.15	2.12
3-5	2.53	2.68	2.71	2.60	3.09	3.75	2.58	4.06	4.29	2.93
5-7	3.02	3.25	3.14	3.20	4.19	3.51	3.48	2.88	3.92	3.74
0-7	2.66	2.92	2.82	2.75	3.37	3.25	2.84	3.21	3.46	3.01

* Figures in the same row having the same superscripts are not significantly different (($P<0.05$)

Table (9):Carcass parameters of chicks fed on poultry droppings

Weights	Groups									
	Trial I	Trial II (5%DPD)			Trial III (10%DPD)			Trial IV (15%DPD)		
	(Control)	1	2	3	1	2	3	1	2	3
Live body wt, kg	1.560	1.438	1.483	1.510	1.135	1.243	1.494	.993	1.110	1.486
Dressed carcass wt, kg	1.281	1.161	1.203	1.232	.888	.981	1.185	.758	.856	1.156
Dressing %	82.12	80.74	81.12	81.59	78.24	78.92	79.32	76.33	77.12	77.79
Heart wt, g/kg LBW	6.20	5.82	5.71	5.93	4.65	4.92	5.63	4.32	4.78	5.88
Liver wt, g/kg LBW	25.80	26.90	25.30	25.30	20.78	21.92	24.90	18.30	19.90	24.30
Spleen wt, g/kg LBW	1.99	1.89	1.92	1.96	1.85	1.84	1.93	1.73	1.82	1.91
Gizzard wt,g/kg LBW	23.42	22.90	23.02	23.71	18.22	18.95	21.30	18.03	19.55	22.81
Proventriculus, g/kg	5.27	5.12	5.23	5.52	3.92	4.19	4.95	3.38	4.02	5.11

Table (10): Economical evaluation of broiler performance in the different experimental groups compared with control

Parameters	Groups									
	Trial I	Trial II (5% DPD)			Trial III (10% DPD)			Trial IV (15% DPD)		
	(Control)	1	2	3	1	2	3	1	2	3
Total feed cost, LE	6.74	6.59	6.60	6.80	5.80	6.10	6.70	4.50	5.60	7.01
Total production cost, LE	8.74	8.59	8.60	8.80	7.80	8.10	8.70	6.50	7.60	9.01
Body weight,g/chick	1560	1438	1483	1510	1135	1243	1494	993	1110	1486
Price of body weight, LE	11.70	10.79	11.12	11.33	8.51	9.32	11.21	7.45	8.33	11.15
Net revenue, LE	2.96	2.20	2.52	2.53	.71	1.22	2.51	.95	0.73	2.14
Economic feed eff.	33.87	25.61	29.30	28.75	9.10	15.06	28.85	14.62	9.61	23.75
Rel.Econ.feed eff.	100	75.61	86.51	84.88	26.88	44.46	85.18	43.17	28.37	70.12