An - Najah Univ. J. Res. (N. Sc.) Vol. 22, 2008

The Effect of Using Citrus Wood Charcoal in Broiler Rations on the Performance of Broilers

اثر استخدام فحم الحمضيات في العلف على أداء صيصان اللحم

Baha Eddin Abu Bakr

بهاء الدين أبو بكر

Department of Animal Production. Faculty of Agriculture.
An-Najah National University. Nablus. Palestine

E- mail: ba.bakr@hotmail.com

Received: (25/3/2007). Accepted: (27/11/2007)

Abstract

This study was conducted to investigate the effect of feeding citrus wood charcoal on the performance, feed intake and feed conversion efficiency of broiler chicks. A total of 120 broilers of Habbard strain at 22 days of age were used in the experiment and were divided into four groups of 30 birds in each. Each group was divided into five replicates with six chicks per replicate. Birds in the experimental groups were fed citrus wood charcoal at rates of 0, 2,4 and 8% of the ration DM in replacement of yellow corn. The results showed that inclusion of citrus wood charcoal at rate of 2% had an effect on body weight gain, feed intake and feed conversion efficiency. The results indicated that the effect of citrus charcoal is an age dependent as it had no effect at ages of more than 29 days. However, inclusion of citrus wood charcoal increased birds abdomen fat.

Key Words: citrus wood charcoal; broiler; performance; feed intake; feed conversion efficiency; abdomen fat.

ملخص

أجريت هذه الدراسة لمعرفة مدى تأثير استخدام فحم الحمضيات المجروش على أداء صيصان اللحم من حيث الزيادة في الوزن واستهلاك العلف ونسبة التحويل الغذائي. استخدم في التجربة ١٢٠ طيرا من صيصان اللحم بعمر ٢٢ يوما قسمت إلى أربعة مجاميع احتوت كل منها 30 طيرا، وقسمت كل مجموعة إلى خمسة مكررات احتوى كل منها ستة طيور، وقد استخدم الفحم بنسب مختلفة ٠، ٢، ٤ و ٨% بدلا من النسب نفسها من الذرة الصفراء في العليقة النهائية والتي قدمت للصيصان لمدة ٢٠ يوما. أظهرت النتائج أنّ إضافة الفحم بنسبة ٢% كان له تأثير ايجابي على معدلات الزيادة في الوزن واستهلاك الغذاء وكفاءة التحويل الغذائي، واستمر أثره حتى عمر ٢٩ يوما، حيث أدت إلى زيادة معنوية (P< ٠,٠٥) مقارنة بالشاهد وبالمستويات الأخرى ٤, ٨% كما أدى استخدام الفحم بنسبة ٢% إلى زيادة معنوية (P< ٠,٠٥) في ترسيب دهون الأحشاء مقارنة بالشاهد وبالمستويات الأخرى ٤, ٨% وحتى عمر ٢٩ يوما من بداية التجربة.

1. Introduction

Poultry industry is one of the major branches of the animal sectors in Palestine, it contributes about 35% of the animal production income. However, this branch is facing some obstacles such as the high price of feed stuff, where feed constitutes about 75% of total cost of poultry production (Abo Omar, 2001, p.6.) (Abo Omar, et al. 2002, p.137). Many attempts were made to add ingredients such as by- products in order to decrease feed cost. The term charcoal generally refers to carbonaceous residue of wood (Kutlu, et al. 2000, p.217). This very fine, odorless, tasteless black powder, is absorbent for many toxins, gases, drugs, fat and fat soluble substances without any specific action (Kutlu, et al. 2000, p.219). The adsorptive effect could be increased treating with various substances at temperatures ranging from 500-900°C, a treatment known as activation (Kutlu, et al., 2000, p.221). The final product is called "activated charcoal" (Osol, 1975, p.35). Preventing hazards resulted from ingestion of toxic substances, including mycotoxins is one of the important therapy of the charcoal (Varma, 1986, p.189). (Mulyanto, 1988, p.7). (McLennan & Amos, 1989, p.93). (McKenze, 1991, p.148). (Jindal & Mahipal, 1999, p.40). (Kutlu, et al. 2000, p.224). There were many advantages of adding charcoal to animal diets as it controls lactic acid concentration in the gastrointestinal tract of ruminants and maintaining of pH level and microflora in the rumen of steers (Hoshi, et al. 1991, p.26). Moreover, pathogenic bacteria was controlled by charcoal (Almagambetov, et al. 1992, p.13). (Nikolaeva, et al. 1994, p.8). It is not clear if raw (inactivated) charcoal has any impact, especially on performance of broiler chicks. Therefore, the objective of this study was to investigate the effect of using citrus wood charcoal on performance, feed intake and feed conversion efficiency of broiler chicks.

2. Materials and Methods:

2.1 Collection and preparation of citrus wood charcoal.

Citrus wood charcoal used in this experiment was obtained from local market, charcoal was then ground through 1 mm screen prior to the diet preparation. The chemical composition of citrus wood charcoal is shown in Table (1)

Table (1): Chemical composition of citrus wood charcoal (%) DM-bases.

Nutrients	**(%)**
Dry matter	95
Crude protein	2
Crude fiber	77
Crude fat	1
Ash	15

2.2 Dietary treatments

The diets used in the experiment as shown in Table (2) were:

1. Basal diet without citrus wood charcoal.
2. Basal diet with 2% citrus wood charcoal.
3. Basal diet with 4% citrus wood charcoal.
4. Basal diet with 8%citrus wood charcoal.

Citrus wood charcoal was added to replace similar percentages of yellow corn. The feed and water were provided as ***ad –libitum.***

All rations were formulated to meet the NRC requirements (1994, p.33) from day 1 to the end of the third week of age, chicks were fed a commercial broiler ration. The experimental ration Table (2) was fed starting from day 22 till the end of the experiment which was lasted for 42 days. Feed and water were always available. Samples of feed and feed refusals were taken for later analyses. Feed intake, body weight and mortality were weekly recorded and weight gain and the feed conversion efficiency were then calculated. At end of the experiment, five birds from each replicate were killed following the routine practice in commercial slaughter house. The abdomen fat weight was recorded.

Table (2): Formulation of the finisher rations fed to broiler chicks from the age of 22 days

Groups	**Ration 1 (Control)**	**Ration 2 (2%)**	**Ration 3 (4%)**	**Ration 4 (8%)**
Ingredients:				
Maize	40	38	36	32
Wheat	20	20	20	٢٠
Soybean meal	31	31	31	31
DCP	1.5	1.5	1.5	1.5
Sand	1.5	1.5	1.5	1.5
Oil	5	5	5	5
Premix	1	1	1	1
Charcoal	0	2	4	8
Chemical analysis:				
Dry matter	90.7	89.2	87.9	87.3
Crude protein	19.9	19.8	19.6	19.7

… Continue table (2)

Groups	Ration 1 (Control)	Ration 2 (2%)	Ration 3 (4%)	Ration 4 (8%)
Crude fiber	4.8	5	5.1	5.2
NFE	56	54	53	52
Crude fat	5	5	4.6	4.7
Ash	5	5.4	5.6	5.7
Calcium	1	1	1	1
Phosphorus	.6	.67	.66	.7
Methionine + Cystine	.55	.55	.55	.55
Lysine	.85	.85	.85	.85
ME (MJ/kg)	13.2	13	13	13

2.3 Chemical analysis:

Feed samples were analyzed for dry mater, crude protein, crude fat, crude fiber and ash according to AOAC (1984).

2.4 Statistical analysis:

All data of the experiment were analyzed by using the general linear procedure of SAS (SAS, 1997).

3. Results and Discussion:

The results of the experiment showed that addition of citrus wood charcoal improved weigh for only one week from starting the experiment. Average body weights were significantly higher ($P<0.05$) for birds consuming 2% of citrus wood charcoal. However, average body weights for birds in the control group and birds consuming 4 and 8% citrus wood charcoal were the same Table (3). Citrus wood charcoal had no effect on chicks body weights beyond week four Table (3) similarly, citrus wood charcoal improved ($P<0.05$) feed intake and feed conversion efficiency. Birds fed on 2% citrus wood charcoal had heavier ($P<0.05$) abdomen fat compared to birds in other groups. The results indicated that addition of citrus wood charcoal has considerable improvement in feed intake, body weight gain and feed conversion ratio up to 29 days of age. These results are in agreement with these reported by Kutlu, et al., (2000, p.215) where oak charcoal showed similar results in broilers up to 28 days of age. The increased feed intake might be the reason behind the increase in body weights. Assuming the properties of charcoal as an absorbent, it had an effect on cell membranes, surface tension and eliminating of gases and toxins in the gastro intestinal tract. Therefore, improved utilization and absorption of nutrients across cell membranes. The improvement in broilers performance could be associated with the conditioning of digestion at early ages. It was concluded that effect of wood charcoal is age dependent.

Table (3): Effect of dietary citrus wood charcoal on growth performance of broiler chicks.

Age	**Treatment**	**Group 1**	**Group 2**	**Group 3**	**Group 4**	**SED**	**Sig. (0.05 level)**
22-29 Days	Body weight gain (g/ bird)	450	500	457	446	15	*
	Feed intake (g)	750	820	770	765	27	*
	Feed conversion ratio	1.66	1.64	1.68	1.71	.01	*

… Continue table (3)

Age	Treatment	Group 1	Group 2	Group 3	Group 4	SED	Sig. (0.05 level)
30-42 Days	Bodyweight gain (g/ bird)	1100	1140	1100	1090	50	ns
	Feed intake (g)	1980	2020	1980	1962	100	ns
	Feed conversion ratio	1.8	1.77	1.8	1.8	1	ns
22-42 Days	Abdominal fat (g/bird)	21	24	20	19	2	*

4. Recommendations

1. Citrus wood charcoal can be used partially in broiler ration especially at the early stage of feeding.
2. More research is needed to investigate the digestibility and the efficiency of visceral organs of broiler chicks fed with citrus wood charcoal and its effect on carcass structure.

5. References

- A.O.A.C. (1984). Official Methods of Analysis. 14th Edition. Assoc. of Official Analytical Chemists. Washington. DC, USA.
- Abo Omar, J. (2001). Feed industry in Palestine. Palestine Economic Center. Nablus. Palestine.
- Abo Omar, J. Othman, R. Abu Baker, B. & Zaazaa, A. (2002). "Response of broiler chicks to a high olive pulp diet supplemented with two antibiotics". Dirasat. (30). 137-142.

- Almagambetov, K. Bonderenko, V.M. Gorskaia, E.M. & Pavlova. L. A. (1992). "The prevention of the translocation of intestinal microflora after the rescue of an organism from a terminal state". Mikrobiol. Epidemiol. Immunobiol. 5-6. 11-14.
- Hoshi, K. Yamamoto, T. Takemura, N. Sako, T. & Koyama, H. (1991). "Effects of activated charcoal on intra ruminal lactic acid". Bull. Nippon Vet. Zootech. Coll. (40). 22-28.
- Jindal, N. & Mahipal, S.K. (1999). "Toxicity of aflatoxin B1 in broiler chicks and its reduction by activated charcoal". Res Vet Sci. (56). 37-40.
- Kutlu, H. R. Unsal, I.M. & Gorgulu, J. (2000). "Effects of providing wood (oak) charcoal to broiler chicks and laying hens". Animal Feed Science & Tech. (90). 213-226.
- McKenze, R.A. (1991). "Bentonite as therapy for Lantana camara poisoning of cattle". Aust. Vet. J. (68). 146-148.
- McLennan, M.W. & Amos, M.L. (1989). "Treatment of lantana poisoning in cattle". Austr. Vet. J. (66). 93-94.
- Mulyanto, M. (1988). "Active charcoal as an alternative for neutralizing poisoning effect of lantana camara fed by cattle". Bull. Media Q. (4). 7-8.
- National Research Council (NRC). (1994). "Nutritional requirements for poultry". National Academy Press. Washington. DC, 33-34.
- Nikolaeva, L. Grigor'ev, A.V. Znamenskii, V. & Kuval'chuc, V.K. (1994). "An experimental study of the efficacy of entersorbents in salmonellosis". Zh. Mikrobiol. Epidemiol. Immunobiol. (2). 7-11.
- Osol, A. (1975). Remington's Pharmaceutical Sciences. 15th Edition. Mack publishing Co. Pennsylvania. USA.
- SAS. (1997). SAS User's Guide: Statistics. 1997 Edition. SAS Institute Inc. Carry, NC. USA.
- Varma, R. K. (1986). "Antidotal treatment of experimental Kalanchoe integra poisoning". Ind. J. Anim. Sci. (56). 411.