Egypt. Poult. Sci. Vol (35) (III): (673- 689) (2015) (1583)

Egyptian Poultry Science Journal

http://www.epsaegypt.com

ISSN: 1110-5623 (Print) – 2090-0570 (On line)

COMPARISON OF HYDRATED SODIUM CALCIUM ALUMINOSILICATE, YEAST CELL WALL AND RICE HULLES ON COUNTERACTING AFLATOXIN IN BROILER CHICKEN DIETS

A.I. El-Faham, Nematallah G.M. Ali and M.H.S. El Sanhoury
Poult. Prod. Dept. of Agric., Ain Shams Univ., Egypt

Received: 28/06/2015 Accepted: 15/07/2015

ABSTRACT: One hundred and fifty unsexed one day-old Hubbard broiler chicks were used up to 32 days of age to study effects of Hydrated sodium calcium aluminosilicate (HSCAC); Yeast Cell Wall (YCW); Rice Hulls (as an unconventional adsorbent, RH) and Ashed Rice Hulls (ARH) on growth performance, carcass characteristics and some blood metabolites. Chicks were divided into 5 treatments, each with 3 replicates of 10 chicks each. Chicks of control group was received the basal diets (0.030 and 0.035 mg/kg total aflatoxin in starter (1-18 days) and grower (19-32 days) diet, respectively.

Treatments were the control; 2.0g (HSCAS, T_1); 20.0g (RH, T_2); 20.0g (ARH, T_3) and 1.0 g Mycofix® plus (YCW, T_4) per kg diets. Effect of treatments on body weight gain was only significant at starter period. HSCAS treatment (T_1) and RH (T_2) significant ($P<0.05$) increased body weight and gain at 18 days of age, while the effect of different treatments were not significant at the full period (0-32 days). HSCAS treatment (T_1) and RH (T_2) significantly ($P<0.05$) increased feed intake at starter and overall periods. While only YCW (T_4) resulted in a significant reduction in feed intake ($P<0.05$) and numerically improved feed conversion ratio during starter period. Moreover, during the overall period YCW (T_4) gave numerically the same figures in (body weight and gain, feed consumption or feed conversion ratio) compared the control diets for broiler chickens. Carcass characteristics were not significantly affected by different dietary treatments except total edible parts %. Chicks fed RH (T_2) diets presented highest significantly ($P<0.05$) total edible parts compared to control group. Similarly, experimental treatments had no significant effect on all measured (Tibia bone and blood plasma) parameters except ALT activity and chicks fed control diets reflected the lowest significantly ($P<0.05$) figures ALT activity compared with other treatments (T_{1-4}).

Key Words: Anti-mycotoxins, Aflatoxin, Rice Hulls, Yeast cell wall and broiler chicks

Corresponding author: nematallah1965@gmail.com

. Values of total aflatoxins excretion in broiler excreta were significant increased (P≤0.01) for broiler chicks which fed 2% (RH or ARH) as compared to those fed control, YCW or HSCAS diets. Economic efficiency values were reduced for broilers fed any of experimental diets as compared to those fed control diets

In conclusion, chicks fed on basal diet supplemented with 1.0 g Mycofix ® plus (YCW) per kg diet gave an equal performance to control diet with improving total edible parts percentage and 2% (RH or ARH) can adsorb aflatoxins and act to significantly decrease the exposure of the broiler to aflatoxins.

INTRODUCTION

Aflatoxins (AF) are secondary toxic metabolites produced by certain strains of fungi e.g. Aspergillus flavus and Aspergillus parasiticus species. AF are carcinogenic, potent toxic, immunosuppressive, mutagenic and cause a toxic disease, termed as aflatoxicosis, when ingested through contaminated feedstuff by animal and poultry (Sweeney & Dobson, 1998; Celik et al., 1999; Akande et al., 2006; Cotty and Jaime-Garcia 2007 and Salem et al. 2010) AF losses to livestock and poultry producers include subtle effects on the health status, reduced growth rate, poor feed utilization, decreased weight gain, decreased egg weight, and production, increased susceptibility to microbial stresses and increased mortality (Lesson et al., 1995) and unfavorable reproductive changes (Ortatatli et al., 2005), impairment of the humoral and cellular immune responses (Ibrahim et al. 2000; Oguz et al., 2003).Various reports on effects of aflatoxins on broiler performance and serum chemistry have been previously reviewed by Dersjant_Li et al. (2003) who concluded that each mg of AFB_1/kg diet would decrease the growth performance of broilers by 5%. However, Tedesco et al. (2004) noted 10% reduction in weight gain of broiler at 28 days of exposure to 0.8 mg AF B_1/kg diet. On the other hand, Kana, et al. (2010) reported that, the levels of AF B_1 as low as 0.02 mg/kg diet have been indicated to decrease weight gain of broilers by 5% in a 3 weeks feeding study. Furthermore, for animal feed, maximum level set by the European Commission (EC) for AFB_1 is 0.02 mg/ for all feed materials (EC, 2003 and 2006). For different complete and complementary feeding stuffs, the legal limits vary from 0.005 to 0.02 mg/kg.

Various natural and synthetic agents are known to prevent mycotoxigenic, mycotoxin formation and detoxify mycotoxin contaminated feed and feedstuffs (Rosa et al., 2001; Kim et al. 2006; Mahoney and Molyneux, 2004; Kermanshahi et al., 2009 and Mahoney et al., 2010). Hydrated sodium calcium aluminosilicate (HACAS) (Jindal et al., 1998), Bentonite (Rosa et al., 2001), Zeolite (Miazzo et al., 2000), activated charcool (Edrington et al., 1997), inorganic sorbents (Baily et al., 1998), Alive yeast, Sacchromyces cerevisiae (SC) (Aravind et al., 2003), Cell wall derivative of (SC) (Devegowda & Murthy, 2005) and a blend of organic acids and aluminosilicates (Afzali and Devegowda, 2003) have shown considerable promise in detoxifying aflatoxins in contaminated feeds.

In the same manner, Arafa (2014) reporter that, Rice hulls (RH) can used as natural anti-mycotoxin to detoxify aflatixin contaminated broiler diets.

Moreover, Arafa et al. (2012) reported that using (RH) at 2.5% in low-level aflatoxin (naturally contaminated) diets, had no adverse effects on broiler performance or carcass traits. The objective of the present study was to determine the anti-mycotoxin capacity of some feed additives, i.e., Hydrated Sodium Calcium Aluminosilicate (HSCAS), Yeast cell Wall (YW) in comparing with raw rice hulls (RH) or Ashed rice hulls (ARH), and their effects on broiler performance, carcass trait and blood plasma parameters.

MATERIALS AND METHODS

The trial was conducted at the Poultry Production Unit, Agricultural Experiment and Research Station at Shalakan, Qaluobia, Faculty of Agriculture, Ain Shams University, Egypt. It was designed to investigate a comparison between Rice hulls (as an unconventional adsorbent, R.H) and two famous adsorbents [Hydrated sodium calcium aluminosilicate (HSCAC) and Yeast Cell Wall (YCW)] in hubbard broiler chicks fed low level of Aflatoxin diets.

A total of 150 Hubbard broiler chicks (mixed sex) at one-day old were obtained from a local commercial hatchery (Cairo Poultry Company) and randomly distributed into 5 groups each in three replicates of 10 chicks each and allocated in the experimental unit (a pen of 1 x 1.5 m). Average initial weight of chicks at the experimental start ranged between and with insignificant differences among the experimental groups. All chicks were housed on deep litter in open house system. Birds fed starter diet (23.12% CP and 3071 Kcal ME/Kg, from 0-18 days), then fed grower diet (21.13% CP and 3045 Kcal ME/Kg from 19-32 days) to cover all recommended nutrient requirements according to NRC (1994).

Birds were vaccinated against main diseases according to commercial practices. Feed and water were provided ad-libitum. During each specific feeding phase, the 1st group of chicks were fed the basal diet without any supplementation (control) while the 2nd, 3rd, 4th and 5th groups were fed the same basal diet supplemented with 2.0g (HSCAS, T_1), 20.0g (RH, T_2), 20.0g (Ashed RH, T_3) and 1.0g Mycofix ® plus (YCW, T_4) per Kg diets, respectively. The composition and calculated analysis of the experimental diets with different feed additives are shown in Table (1).

HSCAS: Hydrates Sodium Calcium Aluminosilicate 100% (origin-USA).

YCW: Mycofix®plus is the product of Biomin®GmbH., Austria, Contained blend of synergistic minerals, biological constituents, phytogenic substances and phycophytic constituents.

ARH: Air dry Rice Hulls were ashing in ash oven SSOC for 3 hours to eliminate organic mater and obtain the Ash and reduce bulk size.

The body weight and feed consumption were by recorded replicate at 0, 18 and 32 day old. From these data body weight gain, and feed conversation ratio were calculated cumulatively.

Aflatoxin assessment: Aflatoxin in diet and excrete were determined according to Roos et al (1997) and A.O.A.C. (2005) using HPLC technique (Agillent 1100 series U.S.A. with column C_{18}, Lichosphez 100 RP-18, 5 µm x 25 cm).

At the end of the trial (32 days of age), three chickens at random per each replicate were chosen, weighted, slaughtered and eviscerated. Carcass, heart, liver and gizzard were weighed and relative weights to live body weight were calculated. At the same time, blood samples were collected from slaughtered chicks and obtained in heparinized tubes. Blood samples were centrifuged at 3000 rpm/minute for 10 minutes. Clear plasma samples were separated into Ependorph tubes and kept in the deep freezer at -20°C until chemical analysis. Quantitative determination of blood serum was included the following: total protein, albumin, glbbulin (calculated by subtraction the value of albumin from its corresponding value fro total protein). Uric acid, total lipids, triglycerides, cholesterol and liver enzymatic activity (AST and ALT) concentrations by using Atomic

Absorption spectrophotometer and suitable commercial diagnostic kits following the same steps as described by manufactures (Bio-Diagnostics company, Egypt). Right tibia were removed and cleaned from soft tissues, then weighted and length, width of each was measured using caliper to the nearest mm. The tibia were dried (105° for 3 hrs), weighted and tibia Seeder Index were calculated According to Seedor et al. (1991).An economic efficiency was calculated as net return/total cost. Data were analyzed statistically, using the statistical analysis system (SAS, 2001) and Duncan, Multiple Range Test (1955).

RESULTS AND DICUSSION

Effect of nutritional treatments on productive performance:

The effect of feeding different mycotoxin adsorbents on productive performance of broiler chicks can be shown as follows: Live body weight and body weight gain:It is worth to note that broiler chicks fed control or T_3 diet during starting period (0-18 days) reflected the lowest body weight (BW) and body weight gain (BWG) compared with other treatments and the corresponding values were 623.0 and 614.67 g for (BW) and 577.33 and 568.17 g. for (BWG) respectively.

Moreover, feeding diets supplemented by (HSCAS. T_1) or (RH. T_2) gave the highest BW (687.67 and 678.67g.) and BWG (637.17 and 634.50g.) respectively. Besides, the differences between treatments were significant.

During the growing period (19-32 days), chicks fed different dietary treatments (T_{1-4}) had no significant effect on BWG compared with control and the corresponding values ranges between 1129.50 and 1179.50g.

On the other hand, during the overall experimental period (0-32 days), responses of chicks fed diets supplemented with different aflatoxin absorbents (T_{1-4}) showed that chicks fed (RH, T_2) diets supported the highest (BWG) than those fed the three other treatments diets (T_1, T_3 and T_4). The corresponding figures were 1780.20, 1766.67, 1747.67 and 1742.87 g, respectively and the differences failed to be insignificant compared with those fed control diets (1741.47 g).

Feed Consumption and Feed Conversion Ratio: Data in Table (2) indicated that feed consumption (FC) per bird (g) was significantly ($P<0.05$) affected by feeding treatments diets compared with those fed control diets.

During starting period, the addition of the HSCAS or RH to experimental treatments (T_{1-2}) led chicks to consume significantly ($P<0.05$) more feed than control, while chicks fed diet supplemented with YCW, T_4 feed consumption reduced significantly ($P<0.05$) compared to control. On the other hand, the effect of different dietary treatments (T_{1-4}) showed no significant differences on feed conversion ratio (FCR) compared with control and the corresponding values ranged between 1.48 and 1.78.

It was obvious from (Table 2) that effect of different dietary treatments (T_{1-4}) on feed consumption and feed conversion during growing period (19-32 days) increased and the differences failed to be significant. Feed control diet showed the lowest (1919.67g) feed consumption followed by those fed T_1 diet, while chicks fed T3 diet had the highest FC (2079.67g.).

Moreover, feeding control diets gave the best feed conversion ratio (1.65) compared the different dietary treatments (T_{1-4}) and the corresponding values were 1.80, 1.80, 1.76 and 1.82 when chicks were fed T1, T2, T3 and T4, respectively, however, the differences failed to be significant. In the same order, the figures of FC indicated significant differences between chicks fed different dietary treatments during overall experimental period (0-32 days). The lowest FC was detected for the chicks fed control diets (2938.67 g.) or T4 diets (2959.67 g.) On the other hand, the highest FC was found in chicks fed T2 diets (3173.0g) or T_1 diet (3167.0g). The differences among treatments were significant. Feed Conversion Ratio (FCR) showed the same trend since chicks fed control or T4 diets were more efficient in converting their food into BWG compared with those fed (T1-3) diets with insignificant differences between treatments. The best FCR was detected for the chicks fed control diets while, the worst FCR was found in chicks fed (HSCAS diets, T_1). The corresponding figures were 1.69 versus 1.79 with insignificant differences between the two treatments.

These findings are agreement with the results obtained by Arafa et al. (2012) who concluded that chicks fed 2.5% RH, HSCAS or YC had no adverse effect on body weight or feed conversion. However, feed consumption significant increased compared with that fed control diets.

In addition, previous reports on growth performance of broilers fed varying levels of dietary clay agree considerably with the findings of the present study. Nasir and Haq (2001) fed sodium bentonite to broilers at 0-4% levels and reported improved average weight gain at 1% supplementation. Eser et al. (2012) reported improved body weight and overall weight gain in broiler fed special clay. Feed conversion ratio was not significantly influenced by clay supplementation which agrees with the findings of Nasir and Haq (2001), Damiri et al. (2010) and Eser et al (2012). However, Pasha et al. (2008) and Katouli et al (2010) reported significant effect of bentonite, Kaolin and Zeolite on the FCR of broiler chicks.

On the other hand, these findings are in contrast with the results obtained by Shebl et al. (2010) who declared that feed intake were not affected by using (HSCAS) as antimycotoxin in broilers.

Moreover, Abdelaziz et al. (2015) suggested that incorporation of Peppermint Oil, Thyme Oil, Biological Anti-toxin (YCW) or Rice Hulls (RH) in Hubbard broiler diets had some beneficial effects on productive performance, with no favorable effect on economic efficiency.

Carcass characteristics: Table (3) shows the effect of different dietary treatments on carcass characteristics for the chickens slaughtered at 32 days of age. Experimental treatments (T_{1-4}) had no significant effect on most studied parameters compared with control. The corresponding values for dressing percentages ranged between 69.6 and 72.4%, while giblets percentages ranged between 3.33 and 4.91%. On the other hand, the highest carcass% were detected for the chickens fed (T_3 or T_4) diets being the same figure (72.4%). Contrary to that, the lowest giblets % were found in chickens fed T_3 diets (3.33%) or T_4 diets (3.74%) without significant differences between treatments. On the same order, No significant differences were observed on abdominal fat % due to experimental dietary treatments (T_{1-4}) compared with control and the overall mean were ranged between 1.39% (T_4) and 2.10% (T_1). In the same order, the figures of total edible parts (carcass weight + giblets weight) percentages indicated significant differences and ranged between 73.70 and 77.40%. Although, chicks fed control diets gave the lowest figure while, chicks fed RH diets (T_2) gave the highest figure. These differences among treatments were significant. These findings are in contrast with the results obtained by Abdelaziz et al. (2015) and Arafa et al. (2012), they concluded that using RH or YCW in broiler diets as antitimycotoxin had no significant effect on carcass characteristics. Similarly, Basalan et al (2006) found that carcass weight, dressing percentage, internal organ weights did not differ among the groups except gizzard weights. Abdel-Azeem (2002) who reported that hot carcass traits and internal organs were not affected due to addition of yeast culture at 1g/kg broiler diet.

Tibia measurement:Table (4) shows the effect of different experimental diets on some tibia measurements for chickens at 32 days of age. Experimental treatments with different aflatoxin absorbents (T_{1-4}) had no significant effect on studied parameters compared with control. The corresponding values for wet tibia weight ranged between 8.76 and 9.52g., tibia length ranged between 7.87 and 8.17 mm while tibia width ranged between 0.53 and 0.58 mm and tibia Seeder Index (SI) ranged between 0.53 and 0.57. On the other hand, the chicks fed control diets gave the highest figures for wet tibia weight (g) and SI, while chicks fed T_2 or T_3 diets gave the highest figures for tibia length and width (mm).

These results have indicated that it may be (RH) have improved of Ca metabolism and consequently increased the tibia length by hyperplasia and hypertrophy of osteoclast cells, and these results needs more investigation on the bone by histology examination to reply about these questions.

Blood plasma parameters:Table (5) shows the effect of different treatments on some plasma parameters.All plasma parameters were not significant different compared with control group except ALT activity. All broiler chicks were susceptible to aflatoxicosis as detected by total plasma protein, albumin, and cholesterol. AS shown in Table (5), T3 and T4 were effect on the total protein and albumin by decreased their concentrations compared with the rest of treatments and control group. On the other hand, most of blood parameters have revealed non significant differences between dietary treatments and control group but, some blood parameters have lowest concentrations compared with control group, for example, triglycerides, cholesterol, and AST [62.33, 140.40 and 28.51] for T_4, T_1 and T_4 respectively.

In regarding to immunity, T_2 revealed the highest values for globulin compared with control and the rest of dietary treatments and that means T_2 has improved the birds immunity.

The obtained results confirmed the previous findings of several researches (Abdel-Azeem, 2002 and Abou El-Naga, 2012) who found that yeast supplementation had no adverse effects on blood components or liver function. Basalan et al. (2006) found that (AST) levels in control group were significantly lower that those of broilers fed with 2.5g HSCAS/kg of feed, while total protein, cholesterol and ALT were not significant differences for birds received diets supplemented with HSCAS at levels of 0.0, 1.0 and 2.5g/kg of feed.

These results in agreement with Abdelaziz et al. (2015) who stated that Rice Hulls had no significant effect on the some blood parameters in Hubbard chicks from these results, it could be concluded that these natural additives must be supplemented to broiler diet to overcome on the aflatoxcosis contaminated diets without any adverse effect on the performance or biochemical parameters of birds.

Aflatoxins residue: Data obtained in the present experiment, illustrated that broilers fed on basal diets containing total aflatoxins: in starter (3.0μg/ kg feed) while the grower diet was (3.5 μg/ kg feed). Values of residue of aflatoxins in excreta are presented in Table (6). Bird groups which fed diets containing 2% RH, 2% ARH, 0.2% HSCAS or 0.1% YCW had significantly ($P>0.01$) increased total aflatoxins excretion in their excreta as compared to those fed control diet. Moreover, chickens fed diets supplemented with 2% RH (T_2) showed the highest figures (10.31 μg/kg) while, chickens fed diets supplemented with 0.1% YCW (T_4) or control diet, had the lowest figures being 1.69 and 0.69 μg/kg respectively and T_3 (2% ARH) or T_1 (0.2% HSCAS) were in the middle (7.61 and 6.17

μg/kg respectively). The differences among treatments were significant.

Huwing et al. (2001) reviewed the efficiency of different materials, such as activated charcoal, zeolites, hydrated sodium calcium aluminosilinate, other clays, polymers, yeast and yeast products, as adsorbents for different mycotoxins. They found that HSCAS showed almost total protection against the adverse effects of aflatoxins but were very limited in counteracting the mycotoxin zearalenone. HSCAS clay acts as an alflatoxin enterosobent that tightly and reactively binds these poisons in the gastrointestinal tract of animals, decreasing their bioavailability and associated toxicities. These data suggest that HSCAS (even at levels as low as 0.1% in the diet) can adsorb aflatoxins in vivo and act to significant decrease the exposure of the animals to alfatoxins (Davidson, et al., 1987). Modified glucomannan alleviated the growth depression in broilers caused by mycotoxin contaminated diets (Aravind et al., 2003).

Economic Evaluation: Data for economical evaluation are summarized in Table (7). The results of net return, economical efficiency (EE) and Relative EE (REE) estimated for experimental diets are based on the recent of local market for feed ingredients and selling price of live broiler chicks. Chicks fed control diets had the best economical and relative efficiency values being 67.68 and 100% respectively. This may be due to total cost/chick and Net return (LE). Whereas, chicks fed basal diet supplemented with RH (T_2) had the lowest corresponding values being 59.64 (EE) and 88% (REE). On the other hand, using HSCAS; ARH or YCW particular (T_1, T_3 or T_4) reduced EE and REE of broiler chicks compared with those fed the control diet during the whole experimental period (1-32 days) and the corresponding reduction values in REE were 10, 7 and 2%, respectively. These results are in general agreement with those reported by Abdelaziz et al. (2015) who reported that using natural feed additives (peppermint oil, Thyme oil, Mycofix® plus or Rice Hulls) Reduced EE and REE as compared to those fed control diet for broiler chicks. On the other hand, these findings were in contrast with the results obtained by Arafa et al., (2012) who stated that feeding broiler chicks 2.5% Rice Hulls presented similar economic efficiency compared to those of control group

.

Table (1): Feed ingredients and calculated analysis of basal diets

Ingredients %	Dietary Treatments*	
	Starter	Grower
Yellow corn	46.45	54.44
Soybean meal (44%)	36.20	30.15
Full fat soya	9.00	9.00
Soya + Sunflower oil	3.65	2.00
Mono calcium phosphate	1.85	1.68
Limestone	1.60	1.48
Salt (Nacl)	1.85	1.68
Mono-cal-phosphate	0.08	0.22
DL Methionine	0.34	0.20
Lysine	0.40	0.40
Premix**	0.30	0.30
Choline Chloride 50%	0.13	0.13
Total	100.00	100.00
Calculated analysis		
Crude protein %	23.12	21.13
ME (Kcal/kg)	3071	3045
Calcium %	1.02	0.93
Non-Phytate –P%	0.50	0.46
Lysine %	1.39	1.39
Methionine %	0.69	0.53
Methionine + cysteine %	1.06	0.887

* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

** Vitamin & mineral premix supplied each kg of feed with: Vit. A:12000 IU; Vit. D3 2000 IU; Vit. E: 40 mg; Vit. K3: 2 mg; Vit. B1: mg; Vit. B2: 4mg; Vit. B6: 1.5 mg, Pantothenic acid: 10 mg; Vit. B12 0.01 mg; Folic acid: 1.5 mg; niacin: 20 mg; biotin: 0.05 mg; zn: 55 mg; Fe: 30 mg; I: 1 mg; Se: 0.1 mg; Mn: 55 mg; Cu: 0.5g; Co.: 0.25 mg and ethoxyguin 3000 mg.

Table (2): Effect of dietary treatments on growth performance of broiler chicks

Items	**Dietary treatments***					**SE**	**Significant of differences**
	control	T_1	T_2	T_3	T_4		
Body weight (g)							
Initial, 1 day	45.67	46.50	44.17	46.50	46.33	1.10	NS
18 days	623.00^{c}	683.67^{a}	678.67^{ba}	614.67^{c}	646.00^{cb}	7.92	*
32 days	1787.13	1813.17	1824.37	1794.17	1789.20	31.02	NS
	0-18days						
Body weight gain (g)	577.33^{b}	637.17^{a}	634.50^{a}	568.17^{b}	599.67^{ab}	7.43	*
Feed consumption (g)	1019.00^{b}	1132.00^{a}	1108.00^{a}	990.00^{b}	885.00^{c}	14.03	*
Feed conversion (g feed/g gain)	1.76	1.78	1.74	1.74	1.48	0.02	NS
	19-32 days						
Body weight gain (g)	1164.13	1129.50	1145.70	1179.50	1143.20	25.93	NS
Feed consumption (g)	1919.67^{b}	2030^{ba}	2065.00^{a}	2079.67^{a}	2074.67^{a}	30.87	*
Feed conversion (g feed/g gain)	1.65^{b}	1.80^{a}	1.80^{a}	1.76^{ab}	1.82^{a}	0.03	*
	0-32 days						
Body weight gain (g)	1741.47	1766.67	1780.20	1747.67	1742.87	30.96	NS
Feed consumption (g)	2938.67^{b}	3167.00^{a}	3173^{a}	3069.67^{ab}	2959.67^{b}	39.13	*
Feed conversion (g feed/g gain)	1.69	1.79	1.78	1.76	1.70	0.02	NS

a,b,c Means in the same raw with different superscripts in the same raw are significantly (P≤0.05) different.
N.S.: non significant
* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

Table (3): Effect of feeding different experimental diets on carcass characteristics at 32 days of age

Items	Dietary treatments*					SE	Significant of differences
	control	T_1	T_2	T_3	T_4		
Live body weight (g)	1741.67	1663.33	1606.6	1601.67	1695.00	42.24	NS
Carcass weight (%)	1211.67	1178.33	1178.33	1160.00	1226.67	34.24	NS
Carcass (%)	69.60	70.80	72.20	72.40	72.40	2.60	NS
Liver (%)	2.40	2.09	2.08	1.87	2.07	0.25	NS
Gizzard (%)	1.24	1.31	1.46	1.15	1.18	0.16	NS
Heart (%)	0.48	0.51	0.52	0.31	0.49	0.09	NS
Giblets (%)	4.12	4.91	4.06	3.33	3.74	0.29	NS
Total edible parts (%)**	73.70^{b}	74.77^{ba}	77.40^{a}	75.75^{ba}	76.10^{ba}	0.99	*
Abdominal fat (%)	1.83	2.10	1.56	1.55	1.39	0.35	NS

a,b,c Means in the same raw with different superscripts in the same raw are significantly (P≤0.05) different.
N.S.: non significant
* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

** Total edible parts = carcass weight + giblets weight

Table (4): Effect of feeding different experimental diets on some Tibia measurements

Items	Dietary treatments*					SE	Significant of differences
	control	T_1	T_2	T_3	T_4		
Wet tibia weight (g)	9.52	8.81	8.91	9.02	8.76	0.39	NS
%	0.55	0.53	0.56	0.56	0.52	0.03	NS
Tibia length (mm)	7.93	7.87	8.17	8.30	8.07	0.14	NS
Tibia width (mm)	0.57	0.53	0.58	0.58	0.55	0.03	NS
Tibia Seedor Index (SI)	0.57	0.55	0.53	0.54	0.56	0.02	NS

* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

Table (5): Effect of feeding different experimental diets on some plasma parameters

Items	Dietary treatments*					SE	Significant of differences
	control	**T_1**	**T_2**	**T_3**	**T_4**		
Total protein (g/dl)	6.10	6.13	7.19	6.38	6.60	0.46	NS
Albumin (g/dl)	4.04	4.01	4.01	3.77	3.90	0.10	NS
Globulin (g/dl)	2.06	2.12	3.18	2.61	2.70	0.50	NS
Uric acid (mg/dl)	6.88	4.18	6.04	4.82	4.34	0.58	NS
Total lipids (mg/dl)	365.36	339.86	423.49	588.37	391.45	95.76	NS
Triglycerides (mg/dl)	78.66	75.00	78.00	91.66	62.33	10.15	NS
Cholesterol (mg/dl)	161.60	140.40	153.36	180.20	188.63	10.46	NS
AST (RFU/ml)	37.80	37.96	35.83	31.03	28.51	5.34	NS
ALT (RFU/ml)	27.80^{b}	53.74^{a}	50.65^{a}	51.12^{a}	59.28	4.60	*

a,b,c Means in the same raw with different superscripts in the same raw are significantly (P≤0.05) different.

N.S.: non significant

* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

Table (6): Average residue of aflatoxin in excreta of broiler fed different dietary treatments at 32 days of age.

Items	Treatments*					SE	Significant of differences
	Control	T_1	T_2	T_3	T_4		
Total aflatoxin (μg/kg)	0.69^e	6.17^c	10.31^a	7.61^b	1.69^d	0.0026	**

a,b,c Means in the same raw with different superscripts in the same raw are significantly ($P \leq 0.05$) different.

* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

Table (7): Effect of different dietary treatments on economic traits

Items	Dietary treatments*				
	Control	T_1	T_2	T_3	T_4
Average Feed Intake (kg)	2.94	3.17	3.17	3.07	2.96
Feed cost (LE)	10.58	11.48	11.44	11.08	10.70
Total cost (LE)	17.08	17.98	17.94	17.58	17.20
Live body weight (kg)	1.79	1.81	1.79	1.79	1.79
Total Return (LE) **	28.64	28.96	28.64	28.64	28.64
Net Return (LE)	11.56	10.98	10.70	11.06	11.44
Economic Efficiency (EE)	67.68	60.57	59.64	62.91	66.51
Relative EE (REE)	100	90	88	93	98

* Control, T_1 (0.2% HSCAS); T_2 (2% RH); T_3 (2% ARH); T_4 (0.1% YCW).

** According to the local price of kg LB which was 16.00 LE

REFERENCES

A.O.A.C. (2005). Association of official analytical chemists of official methods of analysis, 18th Ed., Washington. D.C.

Abdel-Azeem, F. (2002). Digeston, neomycin and yeast supplementation in broiler diets under Egyptian summer conditions. Egypt. Poult. Sci. 22(1): 235-257.

Abdelaziz, M.A.M.; A.I. El-Faham and Nematallah, G.M. Ali (2015). Using natural feed additives as alternative antimycotoxins in broiler diets. Egypt. Poult. Sci., 35 (I): 291-310.

Abou El-Naga, Manal K. (2012). Effect of dietary yeast supplementation on broiler performance. Egypt. Poult. Sci., 32(1): 95-106.

Afzali, N. and Devegowda, G. (2003). In vitro evaluation of binding ability of modified mannanlogosaccharide inactivated yeast and UTPP on aflatoxinB1 in liquid media. Proc. Aust. Poult. Sci. Sys: 188-191.

Arafa, A.S.M. (2014). Using some feed ingredients as antitoxins in broiler diets. M. Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt.

Arafa, A.S.M.; F. Abdel-Azeem; M. El-Sanhoury and M.A. Shebl (2012). Using rice hulls as antitoxin in broiler diets. 11th Conf. Agric. Dev. Res., Fac. Agric., Ain Shams Univ., Egypt. 70-82.

Aravind, K.L.; Patil, V.S.; Devegowda, G.; Umakantha, B and Ganpule S.P. (2003). Efficacy of esterified glucomannan to counteract mycotoxicosis in naturally contaminated feed on performance and serum biochemical and haematological parameters in broilers. Poult. Sci. 82: 571-576.

Bailey, R.; Kubena, L.; Harvey, R.; Buckley, S.; Rottinghaus, G. (1998). Efficacy of various inorganic sorbents to reduce the toxicity of aflatoxin and T-2 toxin in broiler chickens. Poult. Sci. 1998, 77, 1623-1630.

Basalan, M.; Gungor, T.; Aydogan, I.; Ege Hismiogullari, S. and Erdem, E. (2006). Effects of feeding mycotoxin binder (HSCAS) at later ages on gastrointestinal environment and metabolism in broilers. Archiva Zootechnica volume 9:5-9.

Celik, K.; Uluocak, A.N., Ayaşan, T., Doran, F., Öztürkcan, O. (1999). The effects of different levels of mycotoxin (AFB_1) on Japanese quail's performance and its histopatholigycal characteristics. VIV Poultry YUTAV'99 Uluslararası Tavukçuluk Fuarı ve Konferansı, 3-6 Haziran 1999. İstanbul. YUTAV'99 Bildiriler Kitabı. S:222-230.

Cotty, P.J. and R. Jaime-Garcia (2007). Influences of climate on aflatoxin producing fungi and alflatoxin contamination. Int. J. Food Microbial; 119, 1-2: 109-115.

Damiri, H.; M. Chaji; M. Bojarpour, M. Eslami and M. Mamoci (2010). The effects of sodium bentonites on economic value of broiler chickens diet. J. J. Anim. Vet. Adv., 9(20): 2668-2670.

Davidson, J.N., J.G. Babish, K.A. Delaney, D.R. Taylor, and T.D. Phillips (1987). Hydrated sodium calcium aluminosilicate decreases the bioavailability of aflatoxin in the chicken. Poultry Science 66 (Supplement 1): 89.

Dersjant Li, Y.; Verstegen, M.W.A.; Gerrits, W.J.J. (2003). The impact of aflatoxin, deoynivalenol or fumonisin in diets on growing pigs and poultry. Nutr. Res. Rev., 16: 223-239.

Devegowda, G.; Murtht, T.N.K. (2005). Mycotoxins: Their effects in poultry and some practical solutions. In The Mycotoxin Blue Book: Diaz, D.E. Ed.; Nottingham University Press: Nottingham, UK, 25-56.

Duncan, D.B. (1955). Multiple range amd multiple of test. Biometrics, 11: 1-42.

Edrington, T.S.; L.F. Kubena; R.B. Harvey and G.E. Rottinghaus (1997). Influence of super activated charcoal on the toxic effects of aflatoxins or T-2 toxin in growing broilers. Poult. Sci. 76: 1205-1211.

Eser, H.; S. Yalcin and A. Shu (2012). Effects of sepiolite usage in broiler diets on performance, carcass traits and some blood parameters. Kafkas Univ. Vet Fak Derg 18(2): 313-318.

European Commission (EC) (2003). Commission Directive 2003/100/EC of 31 October 2003 amending Annex I to Directive 2002/32/EC of the European Parliament and of the Council on undesirable substances in animal feed. Official Journal of the European Union L 285: 33-37.

European Commission (EC) (2006). Commission recommendation 2006/576/EC of 17 August 2006 on the presence of deoxynivalenol, zearalenone, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding. Official Journal of the Eurpean Union L 229: 7-9.

Huwig, A., Freimund, S., Kappeli, O. and Dutler, H. (2001). Mycotoxin detoxification of animal feed by different adsorbents. Toxicology Letters 122: 179-188.

Ibrahim, I.K.; Shareef, A.M. and Al-Joubory, K.M.T. (2000). Ameliorative effects of sodium bentonite on phagocytosis and Newcastle disease antibody formation in broiler chickens during aflatoxicosis. Research in Veterinary Science 69, 119-122.

Jindal, N.; Mahipal, S.K. & Mahajan, N.K. (1994). Toxicity of aflatoxin B_1 in broiler chickens and its reduction by activated charcoal. Res. Vet. Sci. 56, 37-40.

Kana, J.R.; Teguia, A.; Tchoumboue, J. (2010). Effect of dietary plant charcoal from Canarium schweinfurthii Engl. and maize cob on aflatoxin cob on aflatoxin B1 toxicosis in broiler chickens. Adv. Anim. Bio Sci., 1: 462-463.

Katouli, M.S.; F. Boldaji; B. Dastar and S. Hassani (2010). Effect of different levels of kaolin, bentonite and zeolite on broilers performance. J. Biol. Sci., 10: 58-62.

Kermanshahi, Hassan A.R. Hazegh, N. Afzali (2009). Effect of sodium bentonite in broiler chickens fed diets contaminated with aflatoxin B. Journal of Animal and Veterinary Advances, 8: 1631-1616.

Kim, J.H.; Mahoney. N.; Chan, K.L.; Molyneux, R.J. and Campbell, B.C. (2006). Controlling food-contaminating fungi by targeting their antiioxidative stress-response system with natural phenolic compounds. Applied Microbiology and Biotechnology 70: 735-739

Leeson, S.; Diaz, G. and Summers, J.D. (1995). Aflatoxins. In: Leeson, S., Diaz, G. Summers, J.D. (Eds.), Poultry Metabolic Disorders and Mycotoxins. University Books, Canada, Ont., pp. 248-279.

Mahoney, N. and Molyneux, R.J. (2004). Phytochemical inhibition of aflatoxigenicity in Aspergillus flavus by constituents of walnut (Jujlans regia). Journal of Agricultural and Food Chemistry 52: 1882-1889.

Mahoney, N.; Molyneux, R.J.; Kim, J.H.; Campbell, B.C. Waiss, A.C. and Hagerman, A.E. (2010). Aflatoxigenesis induced in Aspergillus flavus by oxidative stress and reduction by phenolic antioxidants from tree nuts. World Mycotoxin Journal 3: 49-57.

Miazzo, R.; Rosa, C.A.; De Queiroz Carvalho, E.C.; Magnoli, C.; Chiacchiera, S.M.; Palacio, G.; Saenz, M.; Kikot, A.; Basaldella, E. Dalcero,

A. (2000). Efficacy of synthetic zeolite to reduce the toxicity of aflatoxin in broiler chicks. Poult. Sci. 79: 1-6.

Nasir, A.T. and N. Haq (2001). Performance and economics of broiler chicks fed on rations supplemented with different levels of sodium bentaintite. Intl. J. Agri. Biology 3(1): 149-150.

NRC; National Research Council (1994). Nutrient Requirements of Poultry. 9th revised Ed. National Academy press, Washington, DC. USA.

Oguz, H.; Hadimli, H.H.; Kurtoglu, V., Erganis, O. (2003). Evaluation of humoral immunity of broilers during chronic aflatoxin (50 and 00 ppb) and clinoptilolite exposure. Revue de Medicine Veterinaire 154, 483-486.

Ortatali, M.; Oguz, H.; Hatipoglu, F. and Karaman M. (2005). Evaluation of pathological changes in broiler during chronic aflatoxin (50 and 100 μg AFB_1/kg feed) and clinoptilolite exposure. Res. Vet. Sci. 78, 61-68.

Pasha, Talat Naseer; Amir Mahmoud, Farina Malik Khattak, Makhdoom Abdul Jabbar, Allah Dita Khan (2008). The effect of feed supplemented with different sodium bentointe treatments on broiler performance. Turk. J. Vet. Anim. Sci. 32(4): 245-248.

Roos, A.H.; H.J. Van der Kamp and E.C. Marley (1997). Comparison of immununeaffinity columns for the determination of aflatoxin in animal feed an maize. Mycotoxin Research, 13: 1-10.

Rosa, C.A.; Miazzo, R.; Magnoli, C.; Salvano, M.; Chiac, S.M.; Ferrero, S.; Saenz; M. Carvalho, E.C. and Dalcero, A. (2001). Evaluation of the bentonite from the south of Argentina to ameliorate the toxic effects of aflatoxin in broilers. Poult. Sci. 80: 139-144.

Salem, M.F.I.; E.M. Abd El-Raouf; N.M. Eweedah and B.S. Mohamed (2010). Influence of some medicinal plants as anti-mycotoxins in Nile tilapia diets. Proc. Global Fisheries & Aquaculture Research Conf., 24-26 October, PP 227-242.

SAS Institute (2001). SAS/STAT. User's guide: Statistics, 9th edu. SAS Institute Inc., Gary NC.USA.

Seedor, J.G.; H.A. Quarruccio and D.D. Thompson (1991). The biophosphonate alendronate (MK-217) inhibits bone loss due to ovariectomy in rats. Journal of bone and Mineral Research, 6: 339-346.

Shebl, M.A.; H.F.A. Motawe; T.M. Yehia and A.A. Abo Hagger (2010). Aflatoxicosis in poultry 1-Efficacy of hydrated sodium calcium aluminosilicate and yeast cell wall to ameliorate the adverse effects of aflatoxin on broiler performance. Mansoura Univ., 7: 301-316.

Sweeney, M.J. and Dobson, A.D.W. (1998). Mycotoxin production by Aspergillus, Fusarium and Penicillium species. Int. J. Food Microbiol. 43: 141-158.

Tedesco, D.; Steidler, S.; Galletti, S.; Tameni, M.; Sonzogni, O. and Ravarotto L. (2004). Efficacy of silymarin-phospholipid complex in reducing in the toxicity of aflatoxin B_1 in broiler chicks. Poult. Sci., 83: 1839-1843.

الملخص العربى

مقارنة (هيدريتيد صوديوم كالسيوم الومنيوم سليكات) و جدر خلايا الخميرة وسرسة الأرز كمضادات للسموم الفطرية فى علائق بدارى التسمين.

أحمد إبراهيم سليمان الفحام ونعمة الله جمال الدين محمد على ومراد حامد شاكر السنهورى

استخدم ١٥٠ كتكوت هبرد عمر يوم ولمدة ٣٢ يوم لدراسة تأثير هيدريتد صوديوم كالسيوم ألومنيوم سليكات وجدر خلايا الخميرة وسرسة الأرز كمضادات سموم فطرية على الأداء الإنتاجى وصفات الذبيحة ومقاييس الدم. قسمت الكتاكيت إلى ٥ معاملات تجريبية احتوت على ٣ مكررات بكل منها ١٠ كتاكيت.

غذيت الكتاكيت على عليقة قاعدية (BD) احتوت على (٣& ٣،٥ ميكروجرام /كجم) من السموم الفطرية (أفلاتوكسين) فى عليقة البادئ (١-١٨ يوم) والنامى (١٩-٣٢ يوم) على التوالى.

والمعاملات الغذائية للكتاكيت هى الكنترول غذيت الكتاكيت على عليقة قاعدية (BD) ، T_1 (BD + ٠،٢% سليكات الألومنيوم)، T_2 (BD + ٢% سرسة الأرز) ، T_3 (BD + ٢% رماد سرسة الأرز ، T_4 (BD + ٠،١% جدر خلايا الخميرة).

أوضحت النتائج وجود فروق معنوية بين المعاملات التجريبية لوزن الجسم الحى ولوزن الجسم المكتسب فى فترة البادئ (١-١٨ يوم) وسجلت الكتاكيت المغذاة على علائق T_1 ، T_2 أعلى القيم عند عمر ١٨ يوم. بينما لم يكن هناك فروق فى وزن الجسم الحى والوزن المكتسب طول الفترة التجريبية (١-٣٢ يوم) بين المعاملات المختلفة.

سجلت الكتاكيت المغذاة على علائق T_1، T_2 أعلى استهلاك علف معنوياً فى فترة البادئ وأيضاً طول الفترة التجريبية.

بينما سجلت الكتاكيت المغذاة على عليقة T_4 أقل استهلاك علف معنوى وأفضل قيمة غير معنوية لمعامل تحويل غذائى فى فترة البادئ.

أظهرت الكتاكيت المغذاة على عليقة T_4 قيم مشابهة لعليقة الكنترول (وزن الجسم الحى ووزن الجسم المكتسب واستهلاك العليقة ومعامل التحويل الغذائى)، طول الفترة التجريبية (١-٣٢ يوم).

لم تتأثر خصائص الذبيحة بالمعاملات التجريبية باستثناء الأجزاء الكلية المأكولة % حيث سجلت الكتاكيت المغذاة على عليقة T_2 أعلى القيم معنوياً.

لم تتأثر خصائص عظمة الساق وكذلك لم تتأثر مقاييس بلازما الدم بالمعاملات الغذائية فيما عدا قيم ALT حيث أظهرت الكتاكيت المغذاة على علائق الكنترول أقل القيم معنوياً بالمقارنة بالمعاملات الغذائية المختلفة (T_{1-4}).

الكتاكيت التى غذيت على ٢% سرسة الأرزT_2، ٢% رماد سرسة الأرز T_3 سجلت زيادة فى مستوى إخراج الأفلاتوكسين فى الزرق بصورة معنوية بالمقارنة بالمعاملات الأخرى. الكفاءة الاقتصادية انخفضت بالتغذية على أى من العلائق التجريبية عند مقارنتها بعليقة الكنترول.

الخلاصة:

الكتاكيت المغذاة على عليقة مضاف إليها ١ جم/كجم علف جدر خلايا خميرة (T_4) أعطت أداء إنتاجى مساوى لعليقة الكنترول وحسنت الأجزاء الكلية المأكولة كنسبة مئوية.

ويمكن استخدام ٢% (سرسة الأرز أو رماد سرسة الأرز) فى علائق بدارى التسمين كمضاد للسموم الفطرية.