The Evaluation of Using Toxicom on Broiler Performance During Mycotoxicosis

AL-ARAJI, FURKAN S.
Al-Qadissiya university
Colle. of Veterinary of Medicine
Forkan74@yahoo.com

GROMOV, IGOR .N.
State academy of Veterinary of Medicine
VITEBSK, VITEBSK Province,
REPUBLIC OF BELARUS, 210026

Abstract

The aim of this study is to evaluate the possible protective effect of (toxicom) 5g\kg of ration against the toxic effects of mixed mycotoxins in growing broiler chickens .Total of 75 chicks ,one week old, are divided into 5 treated groups, 15 birds for each. The first group (G1) fed a contaminated ration with mycotoxin and supplemented with toxicom 5g/kg of ration and vaccinated with Infectious Bursal Disease (IBD) vaccine at 15 and 22 days of age. The second group (G2) is fed a ration contaminated with mycotoxin and vaccinated with IBD vaccine at 15 and 22 days of age and not supplemented with toxicom. The third group (G3)is fed a commercial broiler ration and vaccinated with IBD vaccine at 15 and 22 days of age . The fourth group (G4) is only fed a contaminated ration with mycotoxins. The fifth group (G5) is fed a commercial broiler ration as a control group. The mycotoxins in diet is analyzed by ELISA and the level is as follows : Aflatoxin B1 0.001 mg/kg ,Dezoxivalenol 1.24 mg/kg ,Zearalenon 0.068 mg/kg ,Ochratoxin 0.005 mg/kg ,T2 toxin 0.09 mg/kg ,Fuminisen B1 0.2 mg/kg. Results showed that toxicom significantly ($P<0.05$) protect chicken body weight, severity of clinical signs, morbidity and mortality rate. It is concluded which produced in Vitebsk State Academy of Veterinary Medicine is protect chicken that this preparation is protect chicken bioavailability parameters in comparison with the other groups and is recommended to use it as antitoxic material Republic of Belarus.

Key Words: Broiler ,Mixed Mycotoxins, Adsorbents, Toxicom, Performance, Body Weight.

Introduction

Mycotoxins are chemical substances produced by several fungi, particularly by many species of *Aspergillus*, *Fusarium*, *Penicillium* and *Alternaria*. They comprise a group of several hundreds of chemically different toxic compounds. The most common mycotoxins are aflatoxins,ochratoxin A, trichothecenes, zearalenone, and fumonisins. (Sweeney *et al.*, 1998). Mycotoxins are often found as natural contaminants in grains (Walker, 2002).The FAO and other researchers has estimated that worldwide about 25% of crops are affected annually with mycotoxins andSince it is estimated that 25 % of the feed production per year has been contaminated with mycotoxins (Fink-Gremmels , 1999). Mycotoxins are unavoidable because

they are naturally occurring compounds. They contaminate crops before harvest or invade feedstuffs of laying hen during processing, transport or storage (Placinta *et al.*,1999).Surveys reveal sufficiently high occurrences and concentrations of mycotoxins to suggest that they are a constant concern (Yaling *et al.*,2008).chronic and low level mycotoxin contamination through naturally contaminated grains often causes reduced production efficiency and increases susceptibility to many immune related infectious diseases(Berthiller *et al.,* 2009). It has been reported that feeding mycotoxins in combinations could result in pronounced adverse effects in avians (Girish and Smith, 2008). Considering the increasing food price indices (FAO,2011). The inactivation of mycotoxins from contaminated feed becomes an important economic aspect to back up the use of new strategies for improving growth performance (Levic ,2010).

In order to avoid mycotoxicosis, several strategies have been investigated (Afzal and Zahid, 2004) which can be divided into pre- and post-harvest technologies and into biological, chemical, and physical methods.

The best procedure to prevent the effect of mycotoxins is the minimizing of the mycotoxin production itself (Doyle *et al.*,1982)) e.g. by harvesting the grain at maturity and low moisture and storing it at cool and dry conditions which is difficult to perform in countries with a warm and humid climate. Feed additives like antioxidants, sulphur-containing amino acids, vitamins and trace elements can be useful as detoxicants(Bauer ,1994)).Biological methods are not yet used in practice though the number of corresponding patents increases continuously (Ramos and Hernandez , (1997).

Chemically, some mycotoxins can be destroyed with calcium hydroxide monoethylamine (Afzal and Zahid, 2004), ozone (Duvick and Rood, 2000). Particularly the ammoniation is an approved procedure for the detoxication of aflatoxin-contaminated feed insome U.S. states as well as in Senegal, France and the UK. The average ammoniation costs vary between 5 and 20% of the value of the commodity(Karlovsky, 1999). Main drawbacks of this kind of chemical detoxication are the ineffectiveness against other mycotoxins and the possible deterioration of the animals health by excessive residual ammonia in the feed.Thephysical methods are focused on the removal of mycotoxins by different adsorbents added to mycotoxin-contaminated diets (McKenzie *et al.*,1997) with the hope of being effective inthe gastro-intestinal tract more in a prophylactic rather than in a therapeutic manner.Certain bacteria, particularly strains of lactic acid bacteria, propionibacteria and bifidobacteria, appear to have the capacity to bind mycotoxins, including aflatoxin and some Fusarium produced mycotoxins (El-Nezami *et al.*,2002).Activated charcoal may be important in

binding zearalenone and/or deoxynivalenol (Haskard *et al.*, 2001). In an *in vitro* gastrointestinal model, activated carbon reduced availability of deoxynivalenol and nivalenol (Yoon and Baeck, 1999).The addition of mycotoxin binders to contaminated diets has been considered the most promising dietary approach to reduce effects of mycotoxins.The theory is that the binder decontaminates mycotoxins in the feed by binding them strongly enough to prevent toxic interactions with the consuming animal and to prevent mycotoxin absorption across the digestive tract. Therefore, this approach is seen as prevention rather than therapy(Doll *et al.*, 2004). Even though food is often contaminated with more than one mycotoxin, most studies are limited to the toxicology of a single mycotoxin.The aim of this search is studying the effect of mixed mycotoxin in chicken body weight and some bioavailability parameters and searching the effect of using Toxicom in keeping chicken performance.

Materials and Methods

This experiment is conducted to determine the effect of dietary supplementation of Toxicom (lignin derivative, synthesized in Republic of Belarus) on detoxification of mycotoxin in broilers ration. The chicks are reared from 7 to 42 days in the condition of epizootology department and pathanatomy and histology department ,Vitebsk state academy of Veterinary Medicine, Republic of Belarus. A total of (75) chicks ,one week age are used. Birds are fed starter diet during the third week of age (beginning date of experiment; 22.6% crude protein and 2870.4 kcal/kg of diet) and finisher diet (20.5% crude protein and 2920 kcal/kg of diet) until the marketing age (42 days of age). Chicks are randomly divided into 5 treated groups ,15 birds for each. First group G (1) fed a contaminated ration with mycotoxin and supplemented with Toxicom 5g/kg of diet and vaccinated with IBD vaccine at 15 and 22 days of age . Second group G (2) is fed a ration contaminated with mycotoxin and vaccinated with IBD vaccine at 15 and 22 days of age without Toxicom. Third group G (3)is fed a commercial broiler ration and vaccinated with IBD vaccine at 15 and 22 days of age . Fourth group (G4) is only fed a contaminated ration with mycotoxins. Fifth group G (5) is fed intact clean ration as a control group. the strain of vaccine is interfield 2512 that produced in Russian Federation ,the vaccine is supplemented manually intra crop for every chick with one dose .the mycotoxins analyzed in Central Research Laboratory of grain products by ELISA (ridaskrin fast) and the final level of mycotoxins are as follows : Aflatoxin B1 0.001 mg/kg , Dezoxivalenol 1.24 mg/kg , Zearalenon 0.068 mg/kg ,Ochratoxin 0.005 mg/kg ,T2 toxin 0.09 mg/kg , Fuminisen B1 0.2 mg/kg. Body weights, clinical signs, morbidity rate and mortality rate per group are recorded weekly. At the end of experiment, five birds per group are randomly selected for

determination the changes in liver and kidney in all groups. All data are analyzed by statistical program for study variation statistics, based on the significance (P<0.05). (Microsoft Excel 2003).

Results and Discussion

After seven days of the first IBD vaccine ,Dietary mycotoxins and IBD vaccine group (G2) and (G4)significantly (P<0.01) depressed body weight in comparison with control group(G5) , but, the body weight of toxicom group (G1) is not effected in comparison with the control(P>0.05). The effect of mycotoxins with or without vaccine is very clear after 7 days of second IBD vaccine in (G2) and (G4) which recorded decrease in bodyweight (P<0.05) in comparison with control group. The weight of toxicom group (G1) is not effected in comparison with the control(P>0.05).

After 14 days of the second IBD vaccine the weight of all groups are less than control group ,But, Addition of toxicom in G1, is very effective in keeping the body weight to that of control one(figure 1,2)

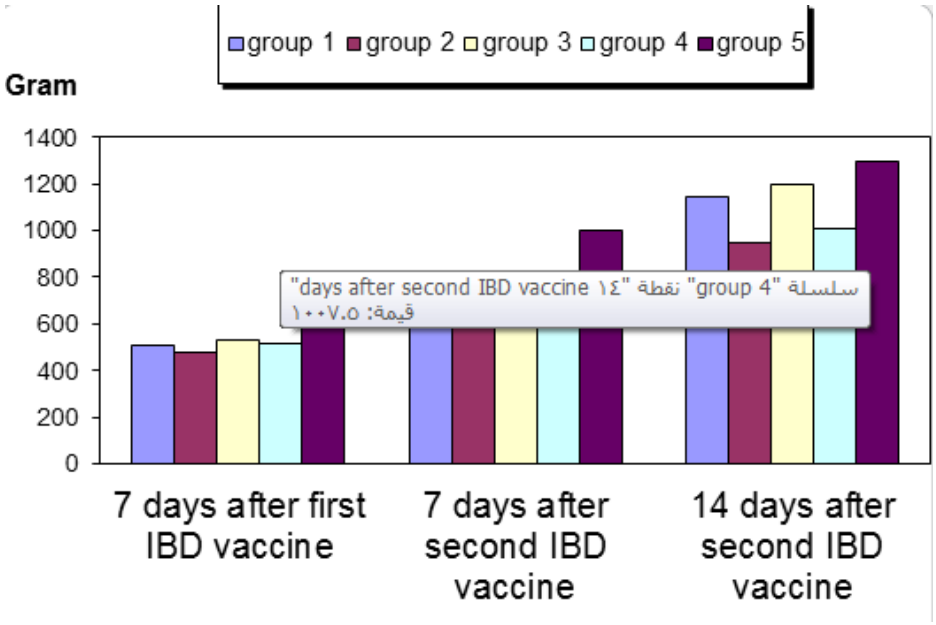


Figure (1) : The Effect of Toxicom in Protecting Chickens Body Weight in Comparison with the Other Groups that Fed Mycotoxins Contaminated Ration

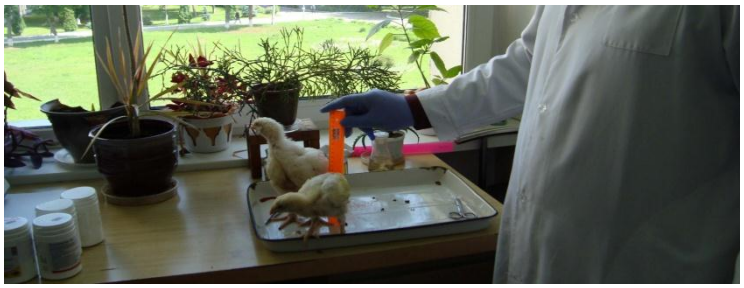


Figure (2) : Clear Difference in Size and Body Weight Between Control Group(G5) and Vaccinated with Mycotoxin Group (G2)

The influence of mycotoxin in body weight is very clear in (G4) that recorded weight less than the control. These results agree with(Saif *et al.*,2003) who refer that the mycotoxin cause reductions in body weight , anemia, and malformed feathers and impaired performance of broilers.This could be attributed to reduced protein and energy utilization (Dalvi *et al.*, 1984) which impaired nutrient absorption and reduced pancreatic digestive enzyme production (Verma *et al.*, 2002) and consequently reduced appetite (Osborne and Hamilton ,1981).The body weight of chickens did not differ significantly ($p<0.05$) between vaccinated group (G3) and the control throughout the period of the experiment. The differences in body weight between the groups narrowed down and towards the end of the experiment, are not statistically significant ($p< 0.05$). These results agree with (Chi *et al.*,1981) who refer that the body weight of vaccinated group with IBD vaccine is less than the control. On the other hand, the most decrease in body weight is in vaccinated group that fed a ration with mycotoxins (G2) along the period of experiment in comparison with control group which recorded ($p<0.05$) in first week after first vaccination and ($p<0.05$)after second vaccination, that may be reveal the synergistic effect of both (vaccine and mycotoxin) which causes very clear effect in performance and weight gain, these results agreed with (Kubena,1985) who refers that the use of live vaccines can result in vaccination reactions and decrease body weight especially if the birds are stressed, furthermore, many researchers cleared that mycotoxins and stress factors result in decrease body weight

Chicken Bioavailability

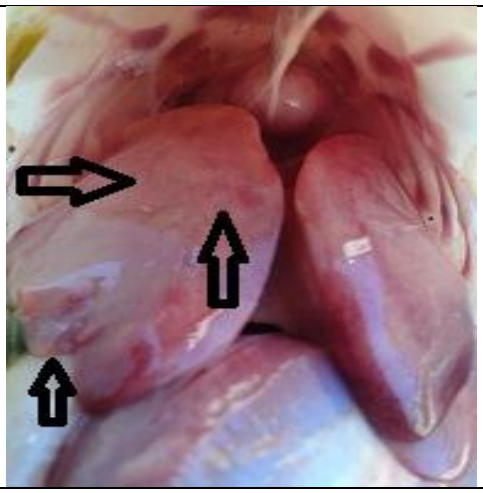
The effect of mycotoxins is very clear in G(4) which revealed reductions in appetite and , reduction of growth, poor feathering, loss of coordination and inability to stand, these clinical signs agreed with(Parkhurst *et al.*, 1992). On the other hand, the high morbidity rate is recorded in G(2) and G(4) because of the influence of mycotoxins , But, G (1) not recorded any mortality rate and that may be due to the supplementing of antitoxicant Toxicom in ration of this group which negated the effects of mycotoxins, these results agreed with (Reams *et al.*,1997). Further more, the mortality rate is very high in (G2) with 27% and (G4) 20% , but the toxicom group not recorded any mortality(0%). and that may be due to the supplementing of antitoxicant Toxicom in ration of this group which negated the effects of mycotoxins, these results agreed with (Bennett et al.,1995). On the other hand it is obvious that mycotoxins had a negative effect on the liver parenchyma of broiler chicks in group (2), when compared with that of control group (G5),by changing liver color from mahogany (Figure 3), to that which characterized by enlarged muddy or even to yellowish discoloration, with friable consistency and sub capsular

hemorrhages (Figure 4).The addition of Toxicom to the diet of broilers in group (1), is effective in restoring the normal red brown liver color to that of chicks in treatment 5 (Figure 5). Kidney is also affected by feeding mycotoxins (G2 and G4), in obvious manner when compared with all other treatment groups (figure 6). They are enlarged, swollen and pale in color, that may be due to liver and kidney function is detoxification of mycotoxins, therefore it is may indicate less detoxifying capacity or damage of functions to some extent, these results agreed with (Jouany, 2007). The results of this experiment clearly indicated that mycotoxicosis in broiler chickens can be influenced by supplementation the Toxicom to the contaminated diet. Supplementing of Toxicom with a dose 5g/kg ration essentially negated the effects of mycotoxins.

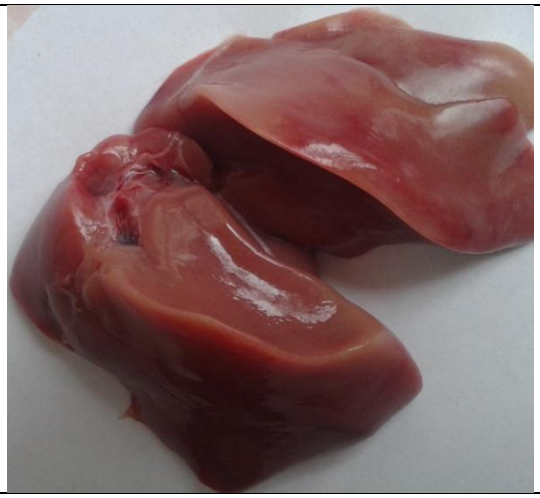
Table (1): The Effect of Toxicom in Clinical Signs, Morbidity Rate, Mortality Rate and Post Mortem Findings of Liver and Kidney.

Groups	Birds No.	Clinical signs	Morbidity Rate	Mortality Rate	Changes in liver and kidneys
G1	15	Reduction in appetite and growth	46 %	0%	Normal red brown liver and normal kidney
G2	15	Reductions in appetite and growth, poor feathering, nervousness, loss of coordination, inability to stand, and mortality	100%	27 %	Changing liver color from mahogany to that which characterized by enlarged muddy or even to yellowish discoloration, with friable consistency and sub capsular hemorrhages, Kidney enlarged, swollen and pale in color.
G3	15	Reduction in appetite for some days	0 %	0 %	Normal red brown liver and normal kidney
G4	15	Reductions in appetite and , reduction of growth, poor feathering, nervousness, loss of coordination, inability to stand, and mortality	100%	20 %	Changing liver color from mahogany to that which characterized by enlarged muddy or even to yellowish discoloration, with friable consistency and sub capsular hemorrhages, Kidney enlarged, swollen and pale in color.
G5	15	No clinical signs	0%	0%	Normal red brown liver and normal kidney

Figure(3) Mahogany normal liver at 42 days in G(5)



Figure(4) Enlarged muddy yellowish discoloration, with friable consistency and sub capsular hemorrhages (42 days) in G(2)



Figure(5)Toxicom group normal red brown liver color in (G1) at 42 days

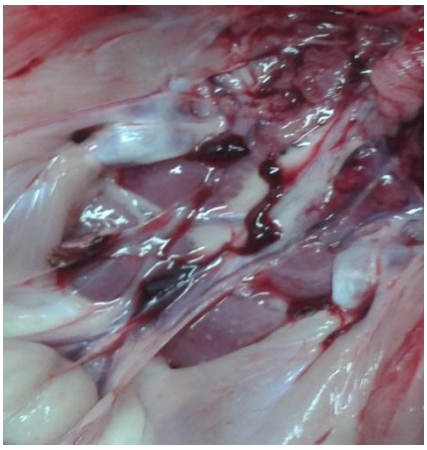


Figure (6) Swollen, pale and enlarged Kidneys (G4) at 42 days

Conclusion

The results of this experiment clearly demonstrated that mycotoxicosis causes loss of body weight in broiler chickens and decreasing the chicken performance. Furthermore, mycotoxicosis can be influenced by supplementation the Toxicom to the contaminated diet. Supplementing of toxicom with a dose 5g/kg ration essentially negated the effects of mycotoxins.

References

Afzal M. and Zahid, A. (2004). Effects of addition of a mycotoxindetoxifier in poultry feed containing different levels ofaflatoxins on the performance of broilers. Asian-Aust. J. Anim.Sci. 17(7):990-994.

Bauer J.(1994). Perspectives on mycotoxin decontamination procedures. Monatsh.Veterina¨rmed.49,175 –181.Park, D.L., 1993. Food Addit. Contam. 10, 49–60.(German language)

Bennett L , Cote M, and Buck W.(1995). Serohematologic alterations in broiler chicks on feed amended with *Fusarium proliferatum* culture material on fumonisin B1 and moniliformin. J Vet Diagn. Invest. 7:520—526.

Berthiller F, Schuhmacher R, Adam G,and Krska R.(2009).Formation, determination and significance of masked and other conjugated mycotoxins.Analytical and Bioanalytical Chemistry.

Chi M , Mirocha J, Kurtz J,Weaver G, Bates F,Robison T, and ShimodaW.(1980). Effect of dietary zearalenone on growing broiler chicks. Poult.Sci., 59:531—536.

Dalvi RR and Ademoyero A A.(1984). Toxic effects of aflatoxin B1 in chickens given Feed contaminated with *Aspergillus flavus* and reduction of the toxicity by activated charcoal and some chemical agents. Avian Disease, 28: 61-69.

Döll S, Dänicke S, Valenta H, and Flachowsky G.(2004). In vitro studies on the evaluation of mycotoxin detoxifying agents for their efficacy on deoxynivalenol and zearalenone. Arch. Anim. Nutr. 58:311-324.

Doyle M P, Applebaum R S, Brackett R E,and Marth E H.(1982). Physical, chemical and biological degradation of mycotoxins in foods and agricultural commodities. J. Food. Prot. 45: 946–971.

Osborne DJ and Hamilton PB(1981). Decreased pancreatic digestive enzymes during aflatoxicosis. Poult.Sci., 60: 1818-1821.

Duvick J and Rood TA.(2000). Zearalenone detoxification compositions and methods.U.S.US 6074838.

El-Nezami, HS, Chrevatidis A, Auriola S, Salminen S and Mykkänen H.(2002a).Removal of common Fusarium toxins in vitro by strains of Lactobacillus and Propionibacterium.FoodAddit.Contam., 19:680-686.

Fink-Gremmels J.(1999). Mycotoxins: Their implications for human and animal health. Vet. Quart. 21, 115-120

Food and Agriculture Organization of the United Nations (FAO), Food Price Indices – 2011.http://www.fao.org/worldfoodsituation/wfs-home/en/. Accessed February 15th 2012.

Galvano F, Piva A, Ritieni A, and Galvano G.(2001). Dietary strategies to counteract the effects of mycotoxins: A review. J Food Prot. 64:120-131.

Girish C K, and Smith T K.(2008).Impact of feed-borne mycotoxins on avian cell-mediated and humoralimmune responses. World Mycotoxin Journal **1**(2), 105, 121.

El-Nezami H S, Polychronaki N, Salminen S, and Mykkänen H(2002b). Binding rather than metabolism may explain the

interaction of two food grade Lactobacillus strains with zearalenone and its derivative a-zearalenol. Appl. Environ. Microbiol. 68:3545-3549.

Haskard C, El-Nazami H, Kankaanpaa P,Salminen S, and Ahokas J.(2001). Surface binding of aflatoxin B1 by lactic acid bacteria. Appl. Environ. Microbiol. 67:3086-3091.

Huff W, Kubena L,Harvey R, Corrier D, and Mollenhauer H.(1986). Progression of aflatoxicosis in broiler chickens. Poult.sci.,65:1891—1899.

Huwing A, Freimund S, Kappeli O,and Dulter H.(2001). Mycotoxin detoxification of animal feed by different adsorbents. Toxicol. Lett. 122, 179-188.

Jouany J P(2007). Methods for preventing ,decontaminating and minimizing the toxicity of mycotoxins in feed. Anim. Feed Sci. Technol. 137, 342-362

Karlovsky P.(1999). Biological detoxification of fungal toxinsand its use in plant breeding, feed and food production.Nat. Toxins 7:1–23.

Kubena L F, Swanson S P, Harvey R B,Fletcher O J, Rowe L D, and Phillips T D.(1985). Effects of feeding deoxynivalenol (vomitoxin)- contaminated wheat to growing chicks.poult.sci.,64:1649—1655.

Levic J, Djuragic O, Juragic S , Sredanovic S.(2010). Use of new feed from brewery by-products for breeding layers. Romanian Biotechnological Letters **15**(5), 5559-5565 .

McKenzie K S, Sarr A B, Mayura K, Bailey R H, Miller DR , Rogers, T D, Norred W P, Voss K A , Plattner R D, Kubena L F,Phillips T D.(1997). Oxidative degradationand detoxification of mycotoxins using a novelsource of ozone.Food Chem. Toxicol. 35:807–820.

Nahm K H.(1995). Possibilities for preventing mycotoxicosisin domestic fowl.WorldPoult. Sci. J. 51, 177–185.

Osborne DJ and Hamilton PB(1981). Decreased pancreatic digestive enzymes during aflatoxicosis. Poult.Sci., 60: 1818-1821.

Parkhurst C R, Hamilton P B, and Ademoyero A A(1992). Abnormal feathering of chicks caused by scirpenol mycotoxins differing in degree of acetylation. Poult.Sci.,71:833—837.

Placinta C M, D'Mello, J P, Macdonald, A M.(1999). A review of worldwide contamination of cereal grains and animal feed with Fusarium mycotoxins. Anim. Feed Sci.Technol. 78: 21–37.

Ramos A J and Hernandez E (1997). Prevention of aflatoxicosisin farm animals by means of hydrated sodium calcium aluminosilicate addition to feedstuffs. review.Anim.Feed Sci. Technol. 65:197–206.

Reams R Y, Thacker H L, Harrington D D, Novilla M N, Rottinghaus G E, Bennett G A, and Horn J(1997). A sudden death syndrome induced in poults and chicks fed diets containing *Fusarium fujikuroi* with known concentrations of moniliformin. Avian Dis. 41:20—35.

Saif Y M, Barnes H J, Fadly A M; Glisson J R,and Swayne DE (2003): Poultry Diseases, 11th Ed.,Iowa State Press, Iowa.

Sweeney MJ and Dobson AD.(1998). Review: mycotoxin production by Aspergillus, Fusarium and Penicillium species. Int. J. Food Microbiol. 43: 141–158.

Verma J,Swain B, and Johri T.(2002) Effect of various levels of aflatoxin and ochratoxin A and combinations thereof on protein and energy utilisation in broilers. Journal of Science Food and Agriculture, 82:1412–1417.

Walker R.(2002). Risk assessment of ochratoxin: Current views of the European Scientific Committee on Food, the JECFA and the Codex Committee on Food Additives and Contaminants. Advances in Experimental Medicine and Biology. 504: 249-255.

Yaling W, Tongjie C, Guozhong L, Chunsan Q,Huiyong D,Meiling Y, Bert-Andree Z, and Gerd S.(2008). Similtaneous detection of airborne aflatoxin, ochratoxin and zearlaenone in poultry house by immunoaffinity column and high performance liquid chromatography. Environ. Res.107: 139-144.

Yoon Y, and Baeck Y.(1999). Aflatoxin binding and antimutagenic activities of *Bifidobacterium bifidum* HY strains and their genotypes. Korean J. Dairy Sci. 21:291-298.

تقييم استخدام التوكسيكوم على اداء فروج اللحم المغذى بعليقة تحتوي السموم الفطرية

الاعرجي ،فرقان
كلية الطب البيطري – جامعة القادسية

غروموف ،ايكور
الاكاديمية الحكومية للطب البيطري في فيتبسك

تاريخ استلام البحث : 2015/4/5 **تاريخ قبول النشر : 2015/5/10**

الخلاصة

كان الهدف من هذه الدراسة تقييم التأثير الوقائي المحتمل لاستخدام (التوكسيكوم) وبجرعة 5 غم/ كغم علف ضد السموم الفطرية الملوثة لعلائق فروج اللحم. استخدم في هذه التجربة 75 فرخا بعمر اسبوع واحد قسمت الى خمسة مجاميع بواقع 15 طير لكل مجموعة . المجموعة الاولى اعطيت العليقة الملوثة بالسموم الفطرية مع مادة التوكسيكوم بجرعة 5 غم/ كغم علف ولقحت بلفاح الكمبورو بعمر 15 و22 يوما، تم تغذية المجموعة الثانية العليقة الملوثة بالسموم الفطرية ولقحت ايضا بعمر 15 و 22 يوما،

المجموعة الثالثة اعطيت العلف السليم الخالي من السموم الفطرية ولقحت ايضا بعمر 15 و22 يوما، اما المجموعة الرابعة فقد اعطيت العلف الملوث ولم تلقح وقد تركت المجموعة الخامسة كمجموعة سيطرة.تم تحليل العلف الملوث طبيعيا بواسطة الاليزا وكانت نسب السموم الفطرية كالاتي : الافلاتوكسين 0.001ملغم/ كغم ،الديزوكسيفالينول 1.24 ملغم/ كغم ،الزيرالينون0.068 ملغم/ كغم ، الاوكراتوكسين 0.005 ملغم/ كغم ، سموم T2 0.09 ملغم/ كغم والفومنيسين B1 0.2 ملغم/ كغم.
اظهرت النتائج ان التوكسيكوم يقلل وبصورة معنوية فقدان وزن الجسم وشدة العلامات السريرية ونسبة الاصابة ونسبة الهلاكات. تم الاستنتاج بان مادة التوكسيكوم المحضرة في اكاديمية فيتبسك الحكومية للطب البيطري كانت فعالة في حماية الدجاج من فقدان الوزن وبعض الصفات الحيوية اعلاه وتقليل تاثير السموم الفطرية مقارنة بباقي المجاميع وقد تمت التوصية باستخدامها كمادة مضادة للسموم في جمهورية بيلاروسيا.

الكلمات المفتاحية: دجاج اللحم، السموم الفطرية المختلطة ، الممتزات، التوكسيكوم ، الأداء، وزن الجسم.