

Field study on the effect of aluminum silicate adsorbent on performance of 51 weeks old broiler breeder chickens

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In 9 weeks field study, a total of 14100 (Ross broiler breeders) 51 weeks-old chickens fed on the same ration, placed in 2 houses (6600 female + 450 male / house). Birds of house 1 were treated with antimycotoxin adsorbent aluminum silicate (G-V-tox®) 5 kgm/ ton, while those of house 2 were kept as non treated controls. Productivity and reproductivity parameters were calculated for comparison. Treated flock showed improved average egg production (Average 62.2%/week) compared with non treated (Average 61.7%/week), but all still lower than farm stander (Average 76.4%/week). Marked improvement was in the 1st 3 weeks (51-53) of treatment only. Total 9 weeks production declined was 5.5% and 8.4% in control and silicate treated flock; with weekly average of 0.61, and 0.93; respectively. Control flock was slower in decline of production (0.61%/week) than treated flock (0.93%/week). Average weekly egg production and hatching eggs/ hen in treated flock was lower than standard and higher than non treated. Hatchery parameters of treated were improved in treated at the first 3 weeks post treatment. The fertility was higher in aluminum silicate treated group (77.2%), than the untreated one (72.19%). The hatchability was in silicate treated (63.66%) versus (62.25%) in the untreated control. Culls % in hatched chicks was 1.91% in treated flock and lower than in non treated (2.85%). Difference percentage between fertility and hatchability of G.V. tox treated chickens was (10.84%) higher than untreated control (16%). The number of marketable chicks 1100 was also improved in treated than non treated. In conclusion, our field study cleared that administration of Silicate in ration for treatment of broiler breeders resulted in an improved production and hatchery performance as compared with non medicated control. However; it did not restore it to the farm stander. Consequently the results indicated that we still in need for more effective products to be used to control mycotoxins in breeder chicken.

Mycotoxins are toxic and carcinogenic metabolites of fungi that occur in poultry feed under conditions of high temperature and high moisture (Bacon, *et al.*, 1973). Aflatoxins are toxic metabolic product of *A. flavus*, *A. parasiticus*, and *Penicillium puberulum*, while Ochratoxin A (OA) is the most toxic product of *Penicillium viridicatum* and *Aspergillus ochraceus* (Dwivedi and Burns, 1986) causing disease conditions (Wyatt and Hamilton, 1975; Abdullah and Lee, 1981; Choudary and Rao, 1982; Jones *et al.*, 1982; Hetzel *et al.*, 1984; Dafalla, *et al.*, 1987; Shoyinka *et al.*, 1987; Anjum, 1994; Saif *et al.*, 2003).

Nowadays, hundreds of mycotoxins are recognized (Uraguchi and Yamazaki, 1978). The synergistic interaction between OA and

Aflatoxins was recorded (Huff *et al.*, 1983, 1992). Mycotoxins affects poultry production by lowering weight gain (Asplin and Carnaghan, 1961), feed efficiency, egg production (Prior

and Sisodia, 1978; Bryden *et al.*, 1980) and reproductive performance, increased susceptibility to infectious disease (Wyatt and Hamilton, 1975; Bryden *et al.*, 1980) immunosuppression (Pier, 1973; Burns and Dwivedi, 1986; El-Karim *et al.*, 1991), vaccination failure (Anjum, 1994; Azzam and Gabal, 1997, 1998; Bunaciu *et al.*, 1998) interaction with mineral metabolism (Gardiner and Oldroyd, 1965), low hatchability due to embryonic death in broiler breeders (Cottier, *et al.*, 1969; Choudhury *et al.*, 1971; Niemiec *et al.*, 1995) and impaired egg production (Kratzer *et al.*, 1969 and Huff *et al.*, 1975).

Many commercial products including mycotoxin-binding agents are used for detoxification contaminated feeds. Inorganic mineral adsorbents as silica containing products are more practical and economical feed additives to ameliorate the toxic effects of mycotoxins and ochratoxin A (Prior and Sisodia, 1978; Huff *et al.*, 1992; Kubena *et al.*, 1993; Harvey *et al.*, 1993; Bailey *et al.*, 1998).

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This study was carried out as a field trial to evaluate the preventive value of commercial products including Aluminum silicate as adsorbent (G.V- tox.) in Ross broiler breeders where reproductivity and hatchery parameters were determined during period of production to evaluate the total effect income of breeder flocks.

Materials and methods

Chicken. A total of 14100 Ross broiler breeders 51 weeks old chickens including 13200 females and 900 males housed in 2 closed houses; approximately 6600 females with 450 males in each house.

Ration. Mash, corn, Soya, 16% protein broiler breeder layer ration manufactured according to Ross breeders management guide and adjusted to fulfill the requirements of layer breeder according to (NRC, 1984).

Detection of mycotoxins. The used ration was analyzed for detection of mycotoxins according to (Soares and Rodrigez-Amaya, 1989) and found to contain Aflatoxins (4 ppb) and Ochratoxin (2.45 ppb). The aflatoxin content of ration were analyzed by using immunoaffinity columns (Vicam AflaTest® Affinity Column) and quantified by high performance liquid chromatography (HPLC) (Agilent 1100 Series).

Diagnosis of mycotoxicosis. In relation to low reproductivity and detection of toxins in ration dead cases had lesions including hydropericardium and ascites. Liver was shrunken firm nodular or yellow fatty, ocher discoloration, hemorrhages in the capsular surface, distended gall bladder, white foci also seen in hepatic tissues. Kidneys were pale with increased urates and catarrhal enteritis (Saif *et al.*, 2003).

Detoxifying products. The detoxifying commercial product G-V-tox® (aluminum silicate adsorbents) was used according to producer's recommendations in ration of breeder chickens in rate of 5 kg / ton for 9 successive weeks.

Performance. The calculated parameters in this field study were compared with a control untreated house and farm standard for Ross breeder chickens for 9 weeks post medication between 51 and 59 weeks of age. Hen day production and hatching eggs were determined to evaluate the effect of used drug on productivity, while hatchery parameters including fertility and hatchability, difference between fertility and

hatchability; culled chicks %, number of marketable chicks/1000 housed hens/day and weekly chicks / hen were calculated as average during the whole production period.

Experimental design. Both hens and cockerels were fed on the same ration. Breeder house 1 was fed with aluminum silicate in ratio of 5 kg/ton of ration, while house 2 was kept as control non treated. Obtained results are shown in (Table 1, 2, Fig. 1-4).

Results and Discussion

There are various approaches to control or combat mycotoxin problems. The simplest method based on the prevention or minimizes formation of mycotoxins in ration by good storage and prevention of grain damage during processing, shipping and handling (Dawson, 2001; Saif *et al.*, 2003). Silica adsorbents as more practical and economical feed additives are added to poultry feeds to ameliorate the toxic effects of mycotoxins (Prior and Sisodia, 1978; Huff *et al.*, 1992; Kubena *et al.*, 1993; Harvey *et al.*, 1993; Bailey *et al.*, 1998).

Weekly egg production rates were declined gradually as a physiological state, but this production was lower as compared to Ross Farm standard. The condition was diagnosed as a result of mycotoxicosis. As decrease in egg production was reported as a sign of mycotoxicosis in breeder chickens (Choudhury *et al.*, 1971; Prior and Sisodia, 1978; Page *et al.*, 1980; Niemiec *et al.*, 1995).

Administration of silicate adsorbent to breeder chicken flock for 9 weeks (from 51-59) resulted in increase in weekly egg production than control flock (Table1, Fig. 1). Treated flock showed improved average egg production (Average 62.2%/week) compared with non treated (Average 61.7%/week), but all still lower from farm standard (Average 76.4%/week). Marked increased egg production was seen in the 1st 3 weeks (51-53) of treatment only. Production declined in 9 weeks reached 5.5% and 8.4% in control and silicate treated with average weekly decline 0.61 and 0.93; respectively. Control flock was slower in decline than treated flocks. This result indicated that silicate was of value in amelioration of the toxic effects of mycotoxins and ochratoxin A (Prior and Sisodia, 1978; Huff *et al.*, 1992; Kubena *et al.*, 1993; Harvey *et al.*, 1993; Bailey *et al.*, 1998).

Average weekly cumulative egg production/

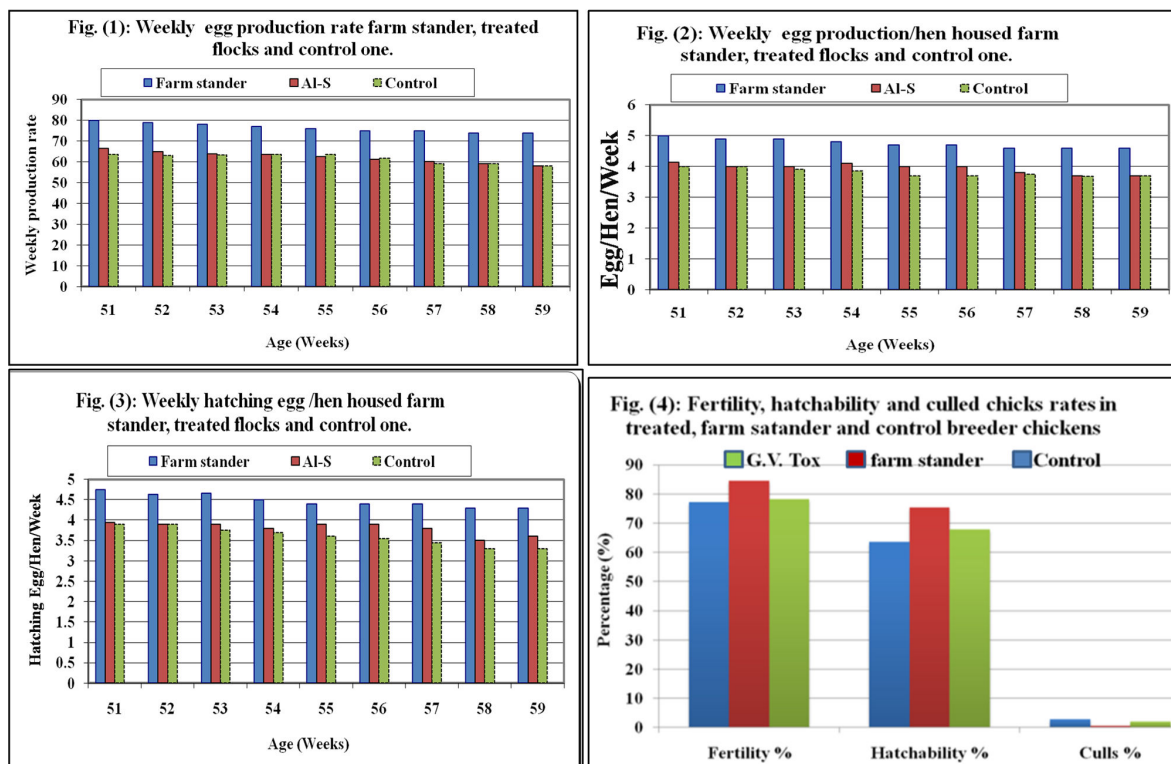


Table (1): Weekly average hen egg production, egg produced and hatching eggs/hen housed/week of treated flock compared with farm stander and non treated control.

Age / weeks	Weekly hen production			produced eggs / hen housed / week			Hatching eggs / hen housed / week		
	E. St.*	Al. S.**	Control	F. St.	Al. S	Control	F. St.*	Al. S	Control
51	80.0	66.5	63.5	5.00	4.13	4.00	4.75	3.95	3.90
52	79.0	64.9	63.2	4.90	4.00	4.00	4.64	3.90	3.90
53	78.0	64.0	63.4	4.90	4.00	3.90	4.66	3.90	3.75
54	77.0	63.5	63.6	4.80	4.10	3.85	4.50	3.80	3.70
55	76.0	62.5	63.7	4.70	4.00	3.70	4.40	3.90	3.60
56	75.0	61.2	61.7	4.70	4.00	3.70	4.40	3.90	3.55
57	75.0	60.1	59.0	4.60	3.80	3.75	4.40	3.80	3.45
58	74.0	59.2	59.1	4.60	3.70	3.68	4.30	3.50	3.30
59	74.0	58.1	58.0	4.60	3.70	3.70	4.30	3.60	3.30
Av. /w #	76.4	62.2	61.7	4.76	3.94	3.81	4.48	3.81	3.61
Diff ##	6.0	8.4	5.5	0.40	0.43	0.30	0.45	0.45	0.60
Dic/w***	0.66	0.93	0.61	0.04	0.05	0.03	0.05	0.05	0.07

* F. St.: Farm Stander ** Al. S : Aluminum Silicate *** Dic/w: Average weekly decline.
 # Av./w: average weekly production. ## Diff: production of week 51- production of week 59.

Table (2): Fertility, hatchability and difference in-between, culs, marketable chicks/1000 in treated and control breeder chickens.

Treatment	Fertility %	hatchability %	Fert. – Hatch.	Culls %	Marketable Ch./1000
Farm stander	84.50	75.33	8.17	0.53	749.8
Al. S.	77.20	63.66	13.54	1.91	667.36
Control.	78.25	62.25	16.00	2.85	637.71

hen housed in the treated flock was higher (3.94/hen) than non treated (3.81/hen) and both were lower than standard (4.76/hen). Treated flock show higher and stale average cumulative egg production (4.0 eggs / hen) from the 2nd week (week 52) to the weeks 56th week of age. In contrast non treated chickens showed gradual weekly decrease. Generally, the silicate treated birds were higher in egg production (Table 1, Fig 2).

Cumulative hatching egg/hen housed (Table 1, Fig. 3) of treated and non treated control were lower than the standard level. The treated group showed the higher average cumulative hatching egg (3.81 hatching egg/hen) than non treated (3.61 hatching egg/hen). The treated flock showed improved hatching egg/hen (3.95) in the 51st weeks and remains higher till the 59th. This result proved that the determined aflatoxin and Ocratoxin in ration had adverse effect on egg quality (Page, *et al.*, 1980; Prior and Sisodia, 1978; Prior, *et al.*, 1981; Niemiec *et al.*, 1995). Also, aflatoxins affect calcium and phosphorus metabolism by altering the metabolism of vitamin D3 and parathyroid hormone as reported by (Glahn *et al.*, 1991). The periodical improvement in number of hatched eggs can be attributed to the limited effect of Silica in removal of the Ocratoxin A or synergism of Aflatoxin and Ocratoxin A (Huff *et al.*, 1983, 1992).

Hatchery parameters in (Table 2) including fertility, hatchability and culled chicks of treated with control flock at the first 3 weeks post treatment as average rates; the higher fertility in silica treated flocks (77.2%) and the untreated control show 72.19% fertility. This result indicated the effect of mycotoxins on fertility as reported by (Ortalatli *et al.*, 2002) who detected microscopically abnormal spermatozoa and cessation spermatogenesis in seminiferous tubules in aflatoxin feed cocks.

The hatchability was 63.66% in treated; while it was 62.25% in untreated control. Percentages of culls in hatched chicks were the lower in non treated flock (1.91%) than in treated flocks (2.85%). Loss of hatchability was attributed to embryonic death in broiler breeders and leghorns induced by aflatoxin (Cottier *et al.*, 1969; Howarth and Wyatt, 1976) and Ocratoxin A (Oloudhury *et al.*, 1971; Prior and Sisodia, 1978; Tohala, 1983; Niemiec *et al.*, 1995) that had teratogenic effect on chicken embryo (GHani *et al.*, 1975).

Difference between fertility and hatchability of treatment chickens in treated (13.54) was higher than untreated control (16%).

Regarding the improved cull percentage in treated than non treated (1.91 and 2.85) and accordingly the number of marketable chicks/1000 hens (667.36 and 637.71) can be due to removal of the effect of aflatoxins on calcium and phosphorus metabolism as reported by (Glahn *et al.*, 1991). Our field study pointed out that the administration of silicate as adsorbent in ration for control of mycotoxins in breeders resulted in slight improvement in reproductive performance in the 1st weeks after administration and over all average weekly egg and hatching egg production, also, hatchery performance data in treated birds was higher than non medicated control. Aluminum silicate was not able to treat flock to reach the farm standard.

Consequently our results indicated that Aluminum silicate was of value but we still in need of more effective products for mycotoxins in breeder chicken flocks especially those showing chronic affection.

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دراسة حقلية عن تأثير سلكات الألمنيوم كمجمع للسموم الفطرية على إنتاجية أمهات دجاج التسمين عمر ٥١ أسبوع

في دراسة حقلية لمدة ٩ أسابيع على ١٤١٠٠ من أمهات دجاج التسمين الروس عمر ٥١ أسبوع والمرباة في عنبرين (٦٦٠٠ أم + ٤٥٠ ديك في كل عنبر) تتغذى على علائق واحدة. أضيفت سلكات الألمنيوم كمجمع للسموم الفطرية (جيفى توكس) بمعدل ٥ كيلو جرام/طن للعنبر الأول وأعتبر الثانى كضابط غير معالج، تم حساب معدلات الإنتاج والتكاثر للمقارنة واستبيان تأثير سلكات الألمنيوم. أظهر دجاج العنبر المعالج زيادة في متوسط إنتاج البيض بمتوسط أسبوعى ٦٢.٢ % من العلاج بالمقارنة بغير المعالج ٦١.٧% إلا أنهما ظلا دون الإنتاجية العيارية للمزرعة ٧٦.٤ % . كان معدل التحسن فى إنتاج البيض واضحاً فى الثلاث أسابيع الأولى من العلاج. كان الإنخفاض فى الإنتاج فى ٩ أسابيع ٨,٤% فى المعالج و ٥.٥% فى غير المعالج بينما العيارى ٦ % بمتوسط أسبوعى ٠.٩٣ % ، ٠.٦١ ، ٠.٦٦ على التوالي. معدل الإنخفاض فى الدجاج غير المعالج اقل من المعالج. متوسط إنتاج البيض الاسبوعى وكذا البيض الصالح للتفريخ لكل دجاجة فى المعالج اعلى من غير المعالج وقل من العيارى. تحسنت معدلات التفريخ فى الدجاج المعالج بسلكات الألمنيوم حيث كان معدل الإخصاب والفقس ٧٧,٢ % و ٦٣,٦٦ % اعلى من الغير معالج ٧٢,١ % و ٦٢,٢٥ % ; على التوالي. وكذا انخفض معدل الكتاكيت غير الصالحة للبيع فى المعالج (٩١,١%) عن غير المعالج (٢٨,٥%) وكان الفرق بين نسب الفقس والإخصاب ١٠.٨٤ % فى بيض الدجاج المعالج و ١٦% فى غير المعالج وبالتالي عدد الكتاكيت المباعة لكل ألف دجاجة كان أعلى فى المعالج. أوضحت الدراسة أن إضافة سلكات الألمنيوم إلى علف الأمهات أدى إلى تحسن فى الإنتاجية وكذا معدلات التفريخ إلا أنها لم تصل بهما إلى المستوى القياسى للمزرعة مما يوضح أننا مازلنا فى حاجة الى مستحضرات أكثر فاعلية لإستخدامها لمواجهة التسمم الفطري المزمّن خاصة فى الأمهات.