Field Studies on Effect of Probiotic on Reproductivity of 51 Weeks Old Broiler Breeder Chickens Fed on Mycotoxins Contaminated Ration

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Abstract: A total of 14100 Ross broiler breeders aged 51 weeks showing signs of mycotoxicosis were used in 9 weeks field study. The chickens were pleased in 2 houses each contain 6600 female + 450 male. Birds of house 1 were treated with Senertox® (enzymes, organic acids and yeast extract) 0.5 ml/liter drinking water and house 2 was kept as nontreated. Reproductivety parameters were calculated for comparison of their effect. Treated flocks showed improved average egg production compared with nontreated, but all still lower than farm stander in the 1st 3 weeks (51-53) of treatment. Total 9 weeks production declined was 5.6% and 8.4% in Senertox and control flocks respectively . Control flock was slower in decline than treated flocks. Average cumulative egg production/ hen in treated flocks were lower than standard and nontreated. The Senertox show high weekly cumulative average egg production and hatched egg/hen (3.92 and 3.80) than nontreated control (3.83 and 3.73). Hatchery parameters of treated were improved in treated at the first 3 weeks post treatment; fertility and hathability rates in Senertox (78.25% and 67.19%) were higher than those of nontreated (76.91% and 62.25); respectively. Culls % in hatched chicks was highest in nontreated flock (2.22%) than Senertox (1.91%). The difference between fertility - hatchability of treatment Senertox chickens was 10.84, while it was 9.72 in control. The drinking water treatment did not restore reproductively of treated flock to farm stander. In conclusion, our field study cleared that administration of antimycotoxins in drinking water as treatments of Ross broiler breeders resulted in a higher reproductive performance as compared with nonmediated control. So we still in need for more effective products to be used against mycotoxins in breeder chicken.
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1. Introduction:

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 ochraceous (Dwivedi and Burns, 1986 and Aravind et. al, 2003)* causing disease conditions *(Choudary and Rao, 1982; Jones, et al., 1982; Hetzel, et al., 1984; Dafalla, et al. , 1987; Shoyinka, et al., 1987; Anjum, 1994 and Saif, et al 2003).*

Nowadays, hundreds of mycotoxins are recognized *(Uraguchi and Yamazaki, 1978).* The synergistic interaction between OA and Aflatoxins was recorded by *Huff, et al. 1975* and *and1992).* These mycotoxin contaminated feedstuffs when consumed, produce a range of severe devastating effects on the general well-being and productivity of farm animals and poultry *(Devegowda et al., 1998).* Mycotoxins affects poultry production by lowering weight gain *(Asplin and Carnaghan, 1961),* feed efficiency, egg production *(Prior and Sisodia, 1978 and Bryden, et al, 1980)* and reproductive performance, increased susceptibility to infectious disease *(Wyatt and Hamilton, 1975 and Bryden, et al, 1980)* due to immune-suppression *(Pier, 1973; Burns and Dwivedi. 1986 and El-Karim, et al,. 1991)* , vaccine failure *(Anjum, 1994; Azzam and Gabal, 1997 and 1998 and Bunaciu, et al., 1998)* and 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 *Zohair, et al., 2010)* and impaired egg production *(Kratzer, et al. 1969; Huff, et al., 1975* and *Zohair, et al., 2010).* Aflatoxin B1 (AFB1) is the most toxic and carcinogenic of aflatoxins *(Wogan and Newberne, 1967).* AFB1 has received considerable attention because it has revealed hepatotoxic potential in all single stomach animals studied to date *(Moss, 1996).*
Probiotic is a live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance *(Fuller, 1989).* Probiotic preparations are being increasingly used in poultry diets to enhance growth rate, improve feed utilization and to control intestinal infections. Interestingly, some reports showed that probiotics can improve

appetite, egg size, egg weight *(Nahashon et al., 1992 and 1993)* and egg production *(Abdularahim et al., 1996).* In poultry production dietary acids *(Hyden, 2000),* live microfloral additives *(Bedford, 2000)* and mannanoligosaccharides *(Demir et al., 2001*) in diets of chickens may help digestion by inhibiting bacteria growth and regulate pH value in intestines when incorporated into diet formulations.

There are many commercial products are used for detoxification including mycotoxin-binding agents holds promise for using contaminated feeds *(Piva and Galvano, 1999).* Esterified- glucomannan, a cell wall derivative of *Saccharomyces cerevisiae,* was protective against aflatoxin B1 and ochratoxin. *Lactobaccillus* cultures prevented absorption of aflatoxin from intestine *(El-Nezami, et al., 2000).*

This study was carried out as a field trial to evaluate preventive value of detoxifying commercial product mixture including soluble enzymes, yeast extract and organic acids (Synertox) in Ross broiler breeders where reproductivety and hatchery parameters were determined during period 9 weeks of production to evaluate the total effect income of breeder flock.

2. Material 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 chromategraphy (HPLC) (Agillent 1100 Series).

Detoxifying products:

The following detoxifying commercial products were used according to producer's recommendations.

1. Nutritox (yeast extract and organic acids) 200 grams/ton of ration.
2. Senertox (enzymes, organic acids and yeast extract) 0.5 ml/liter drinking water. Medication was used for 3 successive days/ week and repeated for 3 successive weeks.

Performance:

The calculated parameters in this field study were compared with control untreated house and farm stander for Ross breeder chickens for 9 weeks post medication between 51 and 59 weeks of age. Hen day production, hatching egg to evaluate effect of used drugs on productivity, while fertility, hatchability, difference between fertility and hatchability; culled chicks %, number of marketable chicks/1000 housed hens/day and weekly chicks / hen were calculated for reproductively.

Diagnosis of Maycotoxicosis:

In relation to low reproductively and detection of toxins in ration Dead cases had hydropericardium and ascites. Liver was shrunken firm nodular or yellow fatty discolored, hemorrhages in the capsular surface, distended gallbladder, white foci also seen in hepatic tissues. Kidneys were pall with increased ureates and catarrhal enteritis *(Saif, et al., 2003).*

Experimental Design:

Both chickens and cockerels were fed same ration, houses 1 were fed Nutritox in ratio of 200 grams per ton of ration; houses 2 were given Senertox in ratio of 0.5 ml/liter drinking water for three successive days per week and repeated for three successive weeks, house 4 were kept as control nontreated. Results are shown in tables (1 and 2).

3. Results and Discussion:

Detoxifying agents and adsorbents are added to the manufactured poultry feed to prevent or minimize its toxic effect where we have no sufficient laboratory capability to confirm the purchase of ingredients free of mycotoxins. In addition, proper storage of ingredients, and feed processing, shipping and handling procedures are necessary to minimize mycotoxin formation *(Dawson, 2001 and Saif et al., 2003).*

Weekly egg production rates were declined gradually as a physiological state, but this production was lower as compared to Ross Farm standard. Decline rates were slower in control flock than the treated flocks (Table 1).

The condition was diagnosed as a result of mycotoxicosis. As decrease in egg production was reported as signs of mycotoxicosis in breeder chickens *(Choudhury, et al., 1971; Prior and Sisodia, 1978; Page, et al., 1980; Niemiec, et al., 1995 and Zohair, et al., 2010).*

Treated flock showing improved average weekly egg production compared with nontreated, but all still lower from farm stander in the 1st 3 weeks (51-53) of treatment only. Production declined in 9 weeks was 8.40% and 5.5% in control and Senertox flocks; with average weekly decline 0.93 and 0.61; respectively.

On comparing average weekly egg production/ hen housed Senertox the flock show highest average egg production (4.1 eggs/hen) at the 54th week and cumulative mean of 3.83 eggs/ hen (Table 1). This result explore that the used antitoxin increased egg production by detoxifying the myotoxins in treated flock as reported by ***Gazia et al (1991)*** who found that acitic acid detoxifying ration contaminated aflatoxins.

Cumulative hatching egg per hen housed (Table 1) of treated with nontreated control and standard, the Senertox show the higher average cumulative egg production were (3.80 hatching egg / hen) with a cumulative hatching egg / hen of 3.9 - 3.8 for 5 weeks (52^{nd} - 57^{th}) and remain at 3.5 - 3.6 egg / hen for 2 weeks; than nontreated flocks as average cumulative hatching egg production were 3.73 egg / hen with irregular manner a trend 3.95, 3.55, 4, 3.8 remain at 4 eggs/ hen till the 56th week of age; followed by control treated flock where it was 3.95 - 3.85 eggs / hen in 52nd - 55th week with average 3.75 and 3.65 for 5 weeks in between 52^{nd} and 57^{th} weeks to reach 3.45 at 59^{th} weeks. (Table1). The decrease in hatching egg/hen may be due to the effect of mycotoxins on egg quality as reported by *Page et al (1980)* who reported excessive number of egg shell stains and decreased egg production and *Niemiec et al (1995)* found that Ocratoxin A 2.1 and 4.1 ppm in chicken feed affect egg quality (thickness and crushing strength). This effect was explained by *Prior et al (1981)* reduced egg production in hens may be due to interference with synthesis, transport or deposition of egg constituents as proteins or by change in ovulation times.

Table (1): Average weekly egg production rate, egg/hen production and hatching egg/hen of farm stander treated and control flocks.

Age/weeks	Weekly egg production			Weekly/Egg/hen production			Weekly hatching egg/hen		
	Stander	Senertox.	Control.	Stander	Senertox.	Control.	Stander	Senertox.	Control.
51	80.0	63.5	66.5	5.95	4.00	4.10	4.90	3.90	4.00
52	79.0	63.2	64.9	4.90	4.00	4.00	4.64	3.90	3.95
53	78.0	63.4	64.0	4.90	4.00	3.90	4.66	3.90	3.55
54	77.0	63.6	63.5	4.80	4.10	3.85	4.50	3.80	4.00
55	76.0	63.7	62.5	4.70	4.00	3.85	4.40	3.90	3.8
56	75.0	61.7	61.2	4.70	4.00	3.90	4.40	3.90	3.75
57	75.0	59.0	60.1	4.60	3.80	3.75	4.40	3.80	3.65
58	74.0	59.1	59.2	4.60	3.70	3.60	4.30	3.50	3.45
59	74.0	58.0	58.1	4.60	3.70	3.55	4.30	3.60	3.45
CAWEP*	76. 4	61.7	66.5	4.86	3.92	3.83	4.50	3.80	3.73
Difference**	6.0	5.5	8.4	0.99	0.08	0.27	0.40	0.10	0.27

* CAWP: Cumulative average weekly production.
** Difference: production of week 51- production of week 59.

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 highest fertility were in Senertox (78.25%) then nontreated control (76.91%). On comparing difference between fertility and hatchability of treatment chickens the highest was in Senertox treated (10.84) and nontreated control were (9.72). The hatchability was in Senertox flock (67. 91%) and it was 67, 19% in nontreated control. The reducing effect of mycotoxins on fertility and hatchability of breeder chickens was also reported by *Cottier, et al. (1969), Choudhury, et al. (1971), Niemiec, et al.(1995)* and *Zohair, et al., (2010).* While *Prior and Sisodia (1978)* found no significant difference in hatchability in white leghorn aged 26-32 weeks feed Ocratoxin A in concentration of 1-4 ppm. The reduced hatchability was attributed to Ocratoxin that affect egg shell quality lead to greater loss of egg weight during incubation and lowered hatchability

(Niemiec et al., 1995). Additionally, *Cottier, et al. (1969) and Howarth and Wyatt (1976)* reported that loss of hatchability due to embryonic death was the most sensitive indicator of aflatoxicosis in broiler breeders and also for Ocratoxin (*Gilani, et al., 1975).* So, the improved results in the treated flock can be attributed to the used antimycotoxin as reported by *Murthy and Devegowda (2004)* who demonstrated that modified glucomannan (a cell wall derivative of yeast) had the ability to adsorb more than 75 % of the aflatoxin within 30 minutes after feeding the aflatoxin-contaminated diet.

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

Treatment	Fertility %	hatchability %	Fert. – Hatch%	Culls %	Marketable Ch./1000	Chicks/ hen/week
Farm stander	84.50	75.33	9.17	0.53	572.70	4.00
Senertox	78.25	67.91	10.84	1.91	411..55	2.88
Control.	76.91	67.19	9.72	2.22	410.16	2.87

Percentages of culls in hatched chicks were the lowest in Senertox flock (1.91%), than nontreated (2.22%). The increased cull percentage can be attributed to the teratogenic effect of Ochratoxin A on chicken embryos (*Gilani, et al., 1975).* Number of marketable chicks/1000 hen/day in Senertox and nontreated was 411.55 and 410.16); accordingly; marketable chick/hen/week was 2.88 and 2.87 in Senertox and control; respectively.

In conclusion, our field study pointed out that the administration of antimytoxins in water as treatments of Ross broiler breeders resulted in a lower performance data as compared with nonmediated control; consequently our results indicated that we still in need of more save products for mycotoxins in breeder chicken flocks.

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