

# Trends of Research in Modern Science



**Efficacy of Toxiban MAX (TMAX) to reduce the toxicity of aflatoxin or a combination of mycotoxins in broilers**



Novus

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By

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# Aflatoxin

- Aflatoxins are secondary metabolites (poison) produced by toxigenic '*Aspergillus flavus*' and '*A. parasiticus*'
- Aflatoxins are also suspected of causing a variety of human diseases, including some forms of cancer
- their presence in agricultural commodities may result in serious economic losses



Plate 1: *Aspergillus flavus*

# Aflatoxin Contamination



**Aflatoxin**  
*Aspergillus*  
sp.

Occurrence



Aspergilloma found at post-mortem in the lung of a child with leukaemia



Aspergillosis in air sacs of a hen during an epidemic of aspergillosis in poultry. (Courtesy C.V.L. Weybridge, England).

- ▶ 14,000 Turkey died in 1960 (Moreau, 1978)
- ▶ In 1977 a large number of dogs and poultry died in Eldoret, Mombasa, and other parts of the country
- ▶ 12 people died in Machakos after consuming Aflatoxins contaminated maize..
- ▶ 2004-- 331 people in eastern Kenya affected resulting in 125 deaths• 2005-- 75 people in eastern Kenya affected resulting in 32 deaths Thika,2009)
- ▶ Over 2.3 million bags of maize contaminated aflatoxin were destroyed in 2010 (Thika,2009)

# Occurrence

- In Nigeria, the death of some children who consumed mouldy Kulikuli (Groundnut cake) in Ibadan was suspected to be due to aflatoxicosis (Ikeorah and Okoye 2005)
- Aflatoxins have been found in the urine of liver disease patients in Zaria, in Blood in Southern Nigeria, and organs of children who died of kwashiorkor in Western Nigeria, and in human semen in Benin city (Onyemelukwe 1992, Oluyide 1993, Adegoke *et al.* 1996 and Oluwafemi 2005)
- Similarly Aflatoxin M1 has been found in breast milk and in the blood of umbilical cord of 27 babies in the country (WHO 1997 and Adejumo *et al.* 2012)

# Economic Importance

- It has been estimated that mycotoxin-contaminated grains cost grain handlers and the livestock industry several hundred million dollars annually (Council for Agricultural Science and Technology, 1989)

# Objective

- determine the efficacy of Toxiban MAX (TMAX) to prevent or reduce the toxic effects of aflatoxin (AF) or a combination of mycotoxins in broilers fed dietary treatments from hatch to day 21 and 35



Plate 2: *Day 1 chick*



Plate 3: *Day 21 chick*

# Goals

- to find a practical, cost effective and non-toxic method to prevent fungal deterioration of field crops
- Hence, the use of natural plant extracts as bio-control agents provides an opportunity to avoid chemical preservatives

# MATERIALS AND METHODS



## In Vitro Study

### *Adsorption assay*

- procedures described by Ledoux and Rottinghaus (1999)
- supernatant analyzed by HPLC
- Percent mycotoxins bound by TMAX were calculated from the difference between the initial and final AF concentration in the supernatant after equilibrium

### *Desorption assay*

- the adsorbent pellet was re-suspended in 4 mL of pH 6.5 buffer



# In Vivo Study - 1



- day-old male broiler chicks were purchased from a commercial hatchery, weighed, wing-banded, and assigned to chick batteries in a temperature controlled room

# In Vivo Study - 1

- Chicks were maintained on a 24-hour constant-light schedule and allowed access to feed and water
- A completely randomized design was used with 5 replicate pens of 5 chicks assigned to each of 8 dietary treatments from hatch to day 21

# In Vivo Study - 1

- Chicks were weighed at the beginning (day 1) and at the end of the experiment on day 21. Feed intake was determined at day 21 and feed conversion was calculated
- Mortality was recorded as it occurs and dead birds were necropsied
- In addition, chicks were inspected daily and any health related problems were recorded.

# In Vivo Study - 1

- On day 22, 15 birds per treatment (5 reps of 3 birds each) were anesthetized with carbon dioxide and blood samples (cardiac puncture) were collected for determination of serum chemistries
- the same 15 birds per treatment (5 reps of 3 birds each) were euthanized and livers and kidneys were removed and weighed for determination of relative liver and kidney weights Livers and kidneys were harvested from 12 birds per treatment for gross and histopathologic evaluation

# Effects of dietary treatments on growth performance and organ weight



# Invited Talk/ Presentation

- One of the four member panel selected to represent Africa on Women & Girls as Agents of Change organized by Bill and Melinda Gates foundation at 2014 Grand Challenges meeting in Seattle, USA. On October 6<sup>th</sup> 2014 as part of the [Gates Foundation Grand Challenges](#) round table discussions
- 2014 *Bertha Fink* Opportunities for International Women Scholarship awarded by CAFNR, MU, USA to participate in the 2014 World Food Prize Event in Des Moines, Iowa from October 14-17

# Invited Talk/ Presentation

- Invited Speaker as one of the panel discussion member organized by Globalgood Intellectual Ventures in Alleviating the harmful effect of aflatoxins on people, livestock and crops
- Title of the discussion: Challenges and Opportunities perspective from Nigeria @ Intellectual Ventures, Camarasaurus Conference Room, Bellevue, WA, USA on December, 2<sup>nd</sup> 2014

# Research team





# Invited Talk/ Presentation

- Invited Speaker as one of the 4 panel discussion member in the Beyond the farm Gate organized at 2014 Farm Journal Forum @ Washington DC, USA on 11<sup>th</sup> December, 2014



# In-vivo Research



# In-vivo Research





# Research supervisor













# Conclusion/Recommendation

- The Bio-control formulation was 100% effective against aflatoxin and fumonisin
- Development of a gender responsive agricultural research
- Collaboration with farmers and some International organizations for global impact on agriculture
- Finally, Institutional capacity development can contribute to a high performing agricultural innovation system to feed the world by 2050
- [www.feedthefuture.gov](http://www.feedthefuture.gov)
- [www.cast-science.org](http://www.cast-science.org)
- [www.BorlaugLEAP.org](http://www.BorlaugLEAP.org)

**THANK YOU  
FOR YOUR ATTENTION**

