

Research Application Summary

## Contamination of indigenous chicken feeds with mycotoxigenic fungi and mycotoxins in Western Kenya

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### Abstract

Feed safety, quality and supply are closely related, ranging from origin, handling, processing and storage measures. In addition, safety awareness can influence feed quality and quantity at different levels. In Western Kenya, mid plant based chicken feeds are an important part of indigenous chicken (*Gallus gallus domesticus*) production. Farmers normally feed their chicken on rejected or rotten feed/foodstuffs which are normally associated with mycotoxins contamination (secondary metabolites of fungi). However, it is not established whether these feeds are indeed contaminated. The objective of this study was to determine the indigenous chicken feed types, their handling and storage with respect to mycotoxin contamination. It also aimed at finding out farmers' level of understanding on aflatoxin contaminations. A baseline survey was conducted targeting youth and women farmer groups, where a 3-stage strata sampling design was used for data collection. Data collected included feeds types, handling and storage methods in addition to the farmers' understanding on feed safety and aflatoxin. Semi-structured questionnaire was used to cover 180 selected indigenous chicken farmers in three Western Kenya Counties (Siaya, Busia and Kakamega). These are mid agro-ecological zones experiencing warm and humid weather conditions which promotes moulds and mycotoxins developments. Most of the farmers used plant based feeds, with maize (*Zea mays*) being the most common. Commercial feeds, though not used on a regular basis indicated that farmers used what is readily available and generally affordable. It was also found that 72% of the farmers had heard of aflatoxins and 43% knew what they were and their effects on human and chicken. However, most farmers used discarded grains as well as unhealthy grains as feeds and this might be contributing to the aflatoxin contamination.

**Key words:** Aflatoxin contamination, feed safety, indigenous chicken feeds, *Gallus gallus domesticus*, Kenya

## Résumé

La sécurité des aliments d'élevage, leur qualité et offre sont étroitement liées, allant de l'origine, de la manutention, des mesures de traitement et de stockage. En outre, la sensibilisation sur la sécurité des aliments peut influencer sur leur qualité et quantité à différents niveaux. Au Ouest du Kenya, les aliments à base mi végétales de la volaille constituent des éléments importants dans la production du poulet local (*Gallus gallus domesticus*). Les agriculteurs ont l'habitude de nourrir leurs poulets avec des débris d'aliments, des provendes ou produits alimentaires pourris qui sont contaminés par des mycotoxines (métabolites secondaires des champignons). Toutefois, il n'a pas été établi si ces aliments sont effectivement contaminés. L'objectif de cette étude était donc de déterminer les types d'aliments de poulets locaux, leur manutention et stockage par rapport à la contamination par les mycotoxines. Elle visait également à évaluer la connaissance des agriculteurs sur les contaminations d'aflatoxine. Une enquête initiale a été réalisée en ciblant les groupes d'agriculteurs de jeunes et de femmes. Une technique d'échantillonnage en strates à 3 étapes a été utilisée pour la collecte des données. Les données recueillies regroupaient les types d'aliments, leur manutention, et les méthodes de stockage en plus de la compréhension des agriculteurs sur la sécurité alimentaire et l'aflatoxine. Un questionnaire semi-structuré a été utilisé pour couvrir les 180 producteurs de poulets locaux sélectionnés dans trois comtés de l'Ouest du Kenya (Siaya, Busia et Kakamega). Ce sont des zones agro-écologiques du centre qui connaissent des conditions climatiques chaudes et humides favorisant le développement des moisissures et les mycotoxines. La plupart des agriculteurs utilisent les aliments à base de plantes, avec le maïs (*Zea mays*) le plus communément utilisé. En ce qui concerne les aliments commerciaux, bien que peu utilisés, l'enquête a indiqué que les agriculteurs utilisent ceux qui sont facilement disponibles et abordables. Il a été également constaté que 72% des agriculteurs sont informés sur les aflatoxines et 43% reconnaissent ses effets sur l'homme et le poulet. Cependant, la plupart des agriculteurs ont utilisé des grains mis au rebut ainsi que les grains malsains comme aliments, ce qui pourrait contribuer à la contamination par les aflatoxines.

Mots clés: contamination par les aflatoxines, sécurité des aliments, aliments pour poulets locaux, *Gallus gallus domesticus*, Kenya

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## Background

Feed safety is an essential element in the world today and can be compromised in the value chain at origin, handling, processing or storage. In addition, feed safety awareness can also influence quality and safety at different level in the value chain (Pinotti *et al.*, 2011). Among the most important safety risk in animal feed and security are mycotoxins. These are secondary metabolites of fungi (Zain, 2010) which have major impacts on human and animal health, international trade and economy at large (Nemati *et al.*, 2014). Despite efforts to manage feed safety, there are still reports of its contamination in feedstuffs and food (Darwish *et al.*, 2014). It is also of great concern due to its negative effects on animals, especially in poultry production. Furthermore, there is a possibility of carry-over of mycotoxins to consumers directly or indirectly. Feed contamination signifies hazard in food safety of animal origin and often contribute to mycotoxins intake in human (Habib *et al.*, 2014).

Recent studies estimate that about a quarter of human foods and animal feeds are contaminated with mycotoxins globally (Patil *et al.*, 2014). In Kenya, there have been repeated outbreaks of aflatoxicoses in the eastern region of the country (Muthomi *et al.*, 2009), while on the western region of the country there have been reports of high levels of mycotoxins in food (Alakonya *et al.*, 2009).

Safe feeds are a vital component in chicken production (whether exotic or indigenous), ensuring high productivity. Possibility of mycotoxins contamination of indigenous chicken feeds due to unsuitable handling and storage techniques, in addition to feed safety awareness is a major concern in Western Kenya. The aim of this study, conducted in western Kenya was to determine the types, handling and storage methods of indigenous chicken feeds, as well as farmers' awareness about feed safety with regards to aflatoxin contamination. Findings will aid in alerting farmers on the proper handling and storage methods of feed for their indigenous chicken.

### **Materials and methods**

**Study area.** The study was carried out between February and March, 2016 and it covered Siaya (Alego, Gem and Ugenya Sub Counties), Kakamega (Lugari, Navakholo and Lurambi Sub Counties) and Busia (Matayos, Nambale and Teso South Sub Counties) Counties. A semi-structured questionnaire was used for data collection from 180 selected indigenous chicken farmers from identified farmer groups. The study targeted youth and women farmer groups keeping indigenous chicken in this region. This was done with the aim of economically empowering women and youths in accordance to Kenya Vision 2030. A 3 stage strata sampling design was used. First, Busia, Kakamega and Siaya districts were purposely selected because of their wide rearing of indigenous chicken. These three districts are in mid-agro ecological zones experiencing warm and humid weather conditions which promotes moulds growth and mycotoxins production (Kaaya *et al.*, 2006). Secondly, three Sub Counties per County were selected based on the number of farmer groups and activeness of farmer groups involved in indigenous chicken production. Third, random sampling was used for selecting four farmer groups, two youth groups, and two women groups in each sub-county, involved in indigenous chicken production per Sub County. In each group five farmers were randomly selected from each of the three groups, except in one where one of the farmers was replaced by an individual farmer who did not belong to any poultry farmer group. Information gathered included types of feeds; feed storage practices and knowledge on mycotoxins, among others.

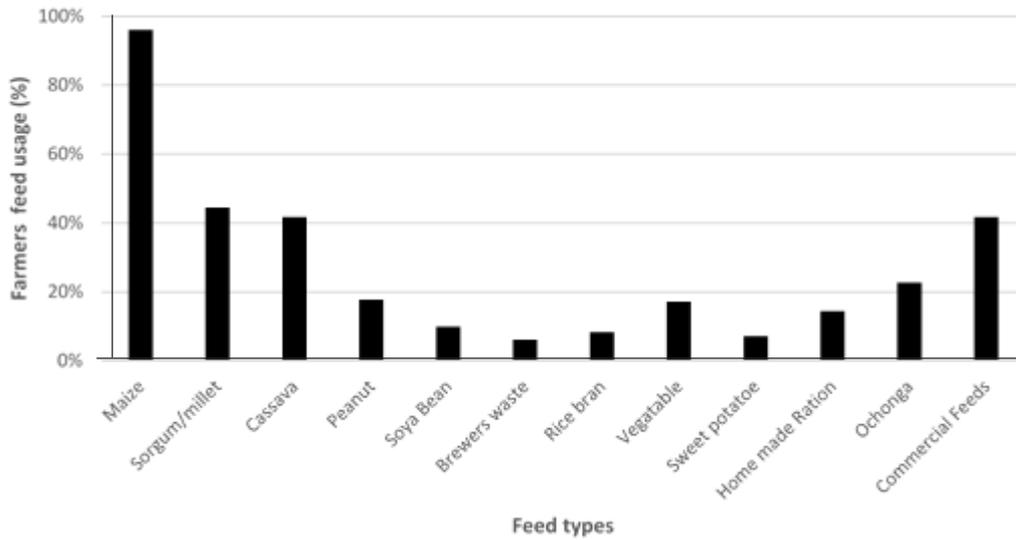
For data analysis, descriptive statistics were obtained for key variables. This was done using IBM SPSS Statistical for Windows, Version 20.0 Armonk, NY: IBM Corporation and Microsoft Excel for Windows, Microsoft Office 13.

### **Results and discussion**

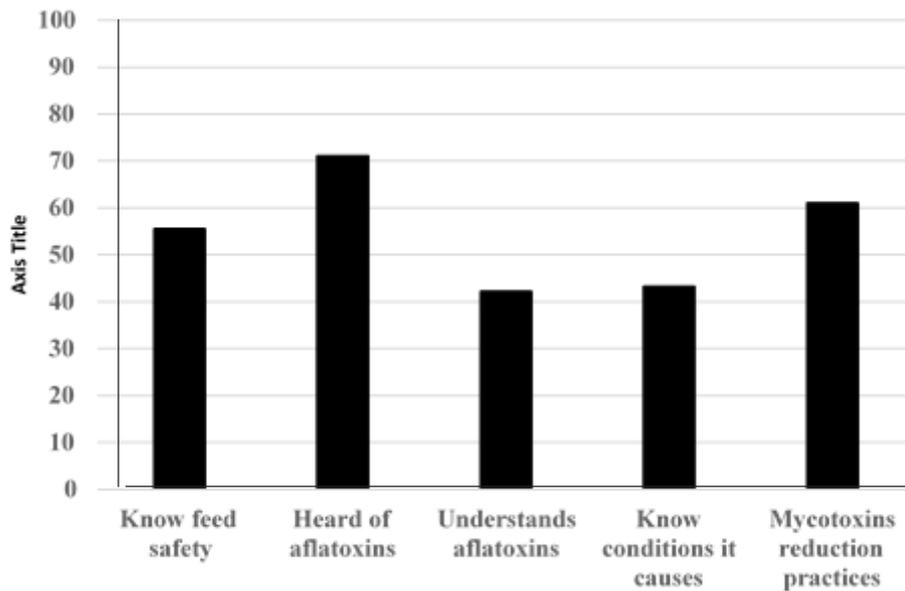
These farmers used various types of feeds; maize, beans, sorghum, commercial feeds, cassava, millet and soya beans, among others. It was also observed that 96% of farmers

used maize as chicken feed closely followed by *ugali* which is prepared majorly from a product of maize, while 42% used commercial feeds (Fig. 1).

Although, 72% of the farmers in Western Kenya had heard about aflatoxins from various sources, only 43% understood what it is and the conditions it causes in both human and poultry. Fortunately, 63% of the farmers put in place some practices to avoid contamination of their chicken feeds with mycotoxins (Fig. 2). However, there was also inclusion of rotten,



**Figure 1. Indigenous chicken feeds and the proportions of usage by indigenous chicken farmers in Western Kenya**



**Figure 2. Farmers knowledge on mycotoxin in indigenous chicken feeds in Western Kenya**

broken, unsorted and insect infested grains as feeds, which could be predisposing factors to aflatoxins contamination. Moreover, 57% of farmers were unable to tell what aflatoxins are and their effects on human and indigenous chicken.

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