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PERFORMANCE ATTRIBUTES OF BROILER FED COMMERCIAL AND SELF-FORMULATED DIET DURING WET SEASON MAIZE

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Abstract
Contamination of maize by mycotoxin happens to be a challenging problem in wet season maize. This study evaluated the chemical composition of wet season maize from selected feed mills in Ile-Ife and the feeding value of such maize. Three representative maize samples were collected from three popular feed mills within Ile-Ife for chemical screening. One of the maize samples was used to formulate the experimental diet while a popular brand of commercial feed was also obtained from Ile-Ife as a control. Eighty day old broiler chicken were used and randomly distributed into two groups of four replicates, each replicate contained 10 birds. Feeding trial was carried for six weeks to determine performance attributes. Two birds per replicate were dissected for clinical observations of internal organs at the end of feeding trial. Data obtained on performance traits were subjected to T-test. Results indicated that, there were variations in proximate composition among the samples. Crude protein fell by 11.54%; ether extract by 12.72% and 1.12% in ash while the total aflatoxin content in the sampled maize rose appreciably to 267.41 µg/kg from 0.23µg/kg in Aflasafe maize. FCR of bird on self-formulated rose such that cost per kilogram body weight of the birds almost double that of birds placed on the commercial feed. Clinical signs observed include: stunted growth, cloaca prolapse, diarrhea, ascite, liver cirrhosis, widespread lesions in gizzard and high mortality. It was concluded that wet season maize should be cautiously used in formulating feed for broilers
Key words: aflatoxin, broiler, maize, performance, self-formulated diets

Introduction

Maize is an indispensable feed ingredient, it is the leading energy ingredient for feeding animals all over the world. Currently, about 60% of the maize produced in Nigeria are used to manufacture poultry feeds which constitute up to 70% of feeds for poultry production in Nigeria. The production of maize is about 11 million metric tonnes in 2019 (FAO, 2019).

Unscreened wet season maize find their way into animal feed due to the availability and comparative lower cost. Mould growth are essentially promoted by humid and warm environment, a prevailing weather condition during wet season in the tropics, contamination by mycotoxin of wet season maize are then most likely. Many unprofessional toll feed-millers who prefer monetary gains over product standard allow use of such grains in animal feed. Poultry are particularly affected because they depend heavily on compounded ration. There were reported cases of poor growth response and high mortality of chickens fed self-formulated diet from many Nigerian toll-feed mills during this season. Moulds like other microorganisms will assimilate and utilize the most readily available nutrients in the material and spoilage may result in the loss of 5% and up to 100% of the nutrients in the feed (Akande *et al*., 2016). Beside, nutrient compromise, they produce mycotoxins which contaminate maize and thus pose a serious economic loss and health risk on livestock. Wet season maize are essentially prone to mould contamination during storage such that mouldy maize are found in open markets and many farmers use it ignorantly in making animal feeds. This study therefore attempts to assess wet season maize for mycotoxin at selected toll feed mills and determine performance attributes of chicken fed such maize.

Materials and Method

Experimental site

This study was carried out at the Poultry Unit of Teaching and Research Obafemi Awolowo University located at the rain forest zone south-western part of the country.

Sample collection and Experimental Diets

A total of three representative maize samples of 1kg per sample were collected from three different feed mills across Ile-Ife. Other ingredients were sourced from one of the feed mills while a reputable commercial feed brand was purchased within Ile-Ife.

Experimental Animals

Eighty day-old Arbor acres broiler chicks were purchased from a reputable hatchery and transferred to the Poultry Unit of the Teaching and Research Farm Obafemi Awolowo University, Ile-Ife. The birds were raised on a deep litter system and randomly allocated into two groups. Each group was replicated four times with 10 birds per replicate.

Data collection

The performance traits as well as the clinical changes in birds were recorded on weekly basis. Two birds per replicate was randomly selected, dissected and changes in internal organs were recorded.

Chemical Analysis

Proximate composition of feeds were determined using procedure of AOAC, 2009. The determination of total aflatoxins in maize was done using a semi quantitative test in which a commercial immunological test kits, aflascan (from Rhone – Diagnostics and Technologies Ltd., Glasgow, Scotland) were used according to procedure of Bullerman, (1979).

Results and Discussion

Chemical composition of maize samples and experimental diets

Results of chemical composition of maize sample is shown in Table 1. There were differences in the moisture content of the maize samples collected compared to the Aflasafe maize. The percentage change in moisture content rose up to 40% in sample 3. The high moisture creates an avenue conducive for fungal growth and possible mycotoxin contamination as earlier reported by Magan *et al*., (2004), Nyange, (2005) and Akande *et al.* (2006). Hence, low moisture content of less than 15% should be considered appropriate for storage as earlier reported by Chunk-Hernandez *et al.*, (2012).

Crude protein fractions and other nutrients reduced significantly as indicated in the Table 1. The high reduction in the nutrient value of all maize samples except Aflasafe is attributed to the debilitating effect of Fungi in the infected sample. The decrease was in line with the report of Akande *et al* (2006), Ratcliff (2000) and Hernandez *et al*., (2012) who earlier observed that beside the potential mycotoxins produced by mouldiness, the nutritive value of the infected cereal grain reduces substantially. The crude fiber of the contaminated maize however, increased significantly by 19.51%, 21.95% in Sample 1 and 2 respectively with sample 3 having the highest of 31.70% which is in line with the report of Ape *et al.*, (2016) that increase in crude fiber is as a result of the impact formed by the fungus activities because the nutrients had been utilized by the fungi for their metabolic needs, thereby leaving insoluble fiber behind.

The total aflatoxin content in mouldy maize rose exponentially from nearly zero in aflasafe maize to 198.5µkg/g in sample 1, 84.7µg/kg in sample 2 and 267.4µg/kg. The high content of aflatoxin in formulated was the major noticeable factor between it and commercial feed. The level of aflatoxin in these samples and diet are too high and unbearable by poultry as compared to the recommendation made by the World Health Organization of 20µg/kg total Aflatoxin concentration (WHO, 2006 and FAO, 2004). Any concentration above this level is hazardous to the birds thereby leading to series of clinical signs including death of birds.

Table 1: Chemical composition of maize samples and experimental diets

Component, %	*Aflasafe	Sample 1	Sample 2	Sample 3	Commercial	Self-formulated
Moisture	9.63	16.30	14.50	17.25		
Crude Protein	9.10	8.50	9.10	8.05	22.00	23.00
Ether extract	4.01	3.80	4.10	3.5	4.50	5.00
Crude fibre	4.10	4.90	5.00	5.4	5.00	3.64
Ash	10.13	9.70	9.10	10.10		
Total Aflatoxing µ/Kg)	0.23	198.50	84.70	267.40	2.25	101.50
ME, (Kcal/kg)	2884	27766	2861.98	2687.40	2950	2947

***Aflasafe maize : Akande et al., (2019)

Effect on the performance of broilers

Feed consumption of broilers reduced significantly leading to poor and stunted growth as a result of malabsorption syndrome in all the birds on self-formulated diet. The result is similar to the report of Shephard (2008) that the impacts of impaired absorption of vital nutrient on the performance of poultry are poor growth and low weight gain. Increased mortality and heterogeneous flocks characterized the experimental birds. The most consistent findings in chickens suffering from aflatoxicosis was immune suppressive effects including susceptibility to diseases, decreased response to medication, decreased resistance to environment stress and high level of respiratory problem. These changes were observed in the experimental birds. During the post mortem diagnoses, most common pathological lesions associated with aflatoxicosis in chickens were found as indicated in Figure 1. The liver appeared enlarged, pale in colour, friable and haemorrhagic. The gizzard was also enlarged and filled with lesions. This was complicated with ascites commonly known as water belly and scientifically called Pulmonary Hypertension Syndrome caused by the accumulation of fluid in abdominal cavity. Cloaca prolapse was also observed in some of the chickens.

Table 2: Performance traits of broilers fed commercial and self-formulated feed

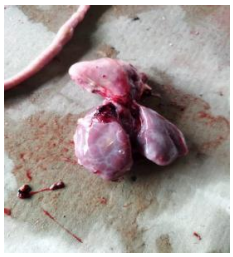
Parameters	Birds on commercial diet	Birds on self- formulated diet	SD
Weight at day old. (g)	42.44^{a}	41.78^{b}	
Final body weight(g)	2264.28^{a}	1464^{b}	
Body weight gain (g)	2321.84^{a}	1422.34^{b}	
Total feed intake (g)	3944.21^{a}	3598^{b}	
Feed conversation ratio	1.74^{b}	2.53^{a}	
FC/kg feed	308	302	
FC/kg weight gained	537^{b}	764^{a}	
Mortality (%)	$4\%^{b}$	$33\%^{a}$	

ab- means along rows with different superscript are significantly different ($p<0.05$)


Dead chicken


Necrotic gizzard


Cloaca Prolapse


Liver cirrhosis


Ascites (water belly)


Water belly

Figure1: Clinical changes in birds fed aflatoxin contaminated diet

Conclusion

Self-formulated feed through the toll-milling feed mill should be discouraged during wet season as a result high contamination of maize with aflatoxins. Instead, the use of commercial feed of reputable brands should be encouraged and when self-formulation cannot be avoided, good mycotoxin binder should be used in the feed.

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