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*Full Length Research Paper*

# Mycological investigation of compounded poultry feeds used in poultry farms in southwest Nigeria

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**Different feed types (chicks, growers and layers mash) were collected from some large and medium scale farms in south west of Nigeria and subjected to mycological examination. Four different types of fungi identified include *Aspergillus flavus*, *Fusarium* spp., *Rhizopus* spp. and *Aspergillus niger*. The result revealed that no feed was completely free of contamination by mold.**

**Key words:** Poultry feed, fungi, poultry, farms.

## INTRODUCTION

Mold and mycotoxin contamination of feed and feed ingredients occurs worldwide and because of the ubiquitous nature of these micro-organisms they cannot be totally eliminated from feeds and ingredients (Trenholm et al., 2000). In 1985 the Food and Agriculture Organization (FAO) of the United Nations estimated that annually, 25% of world's grain supply is contaminated with mycotoxins. Mold will always be a problem as long as the storage time and conditions favour their growth. Moldy feed causes direct economic damages, rejection by the end users, lowers margins and damages good-will (Doerr and Hamilton, 1981). The detrimental effects of moldy feed on animals as noted by Oyedeji (1986) include reduction in energy, degradation of essential nutrients (amino acids and vitamins) and mycotoxicosis. Because climatic conditions in tropics favour mold proliferation, feed producers consider control as an important priority in their quality program; reducing the moisture content of grains and feed is the basic method of controlling molds in the ingredient storage and feed production.

Moisture control alone cannot prevent mold proliferation in feed. The energy required to dry grains below 14% moisture is extremely expensive. When storage temperature changes, condensation occurs inside the silo. Once molds start to grow, moisture will be generated as a result of metabolism of grain sugar into carbon dioxide, water and heat which further favour the growth of mold inside the silo. This study therefore, focused on identifying the possible types of fungi in the feeds used and produced in the listed farms in south west of Nigeria.

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## MATERIALS AND METHODS

Poultry feed samples were taken from some poultry farms located in south-western Nigeria (Ondo, Abeokuta Ibadan, Oshogbo, and Lagos) where commercial poultry farmers are located. The samples were collected aseptically from the bags of different feed types (Broiler, Chick and Layer's mash). About 50 g of each feed types was collected from feeds compounded by some farms that have private feed milling systems.

The method described by Norris (1970) was used in the analysis of the feeds. Four (4 g) of potato dextrose agar was weighed, diluted to 100 ml and boiled to dissolve completely. Nine (9 ml) of sterile water was pipetted into the bijou bottles for each sample. The prepared plates (Petri dishes), bottles of distilled water and dissolved agar were sterilized in an autoclave under a temperature 121°C for 15 min. After sterilization, the agar was allowed to cool to 45°C. Chloramphenicol tablet was added as bacteriostatic agent to the agar to inhibit the growth of bacteria. One milliliter (1 ml) of each dilution was pipetted into the center of the Petri dishes. The agar was poured on top of the dilution in the Petri dishes. The prepared plates were left to gel. The medium was allowed to set and kept between five to six days. After the sixth day, several fungi species are counted and later subcultured. All the species were subcultured separately in different plates. Each representation of the plates were picked and purified on the same medium (Potato Dextrose Agar). Incubation for fungal isolation was done at room temperature (28 – 30°C) for all the samples.

**Table 1.** Different species of fungi identified with their frequency of occurrence in various feed samples.

| Type of feeds | Species of fungi identified | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of sample | *Aspergillus flavus* | *Fusarium* spp.. | *Rhizopus* spp. | *Aspergillus niger* | *Aspergillus flavus* and *Fusarium* | *Aspergillus flavus* and *Rhizopus* | *A.flavus* and *Aspergillus niger* | *Rhizopus* and *Aspergillus niger* | *Fusarium* and *Rhizopus* | *Fusarium* and *Aspergillus niger* | *Fusarium,Rhizopus* and *A. flavus* | *Rhizopus* and *A.niger* | *Fusarium, Rhizopus* and *A. niger* |
| Chicks mash | 15 | 1 | 1 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | - | 1 | - | 1 |
| Layers mash | 25 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 3 | 2 | 2 | 2 |
| Growers mash | 10 | 2 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| Total | 50 | 6 | 5 | 5 | 6 | 5 | 4 | 2 | 2 | 4 | 3 | 3 | 2 | 3 |

**Table 2.** Types of fungi isolates and their occurrence.

| Name of organism identified | No of samples examined | Frequency of occurrence in feed | % occurrence |
|---|---|---|---|
| *Aspergillus flavus* | 50 | 20 | 40 |
| *Fusarium* spp. | 50 | 21 | 42 |
| *Rhizopus* spp. | 50 | 22 | 44 |
| *Aspergillus niger* | 50 | 19 | 38 |

**Fungal identification**

Each of the distinct colonies obtained above was inoculated on the same agar media (potato dextrose agar) using point inocu-lation, and were incubated at room temperature (28 – 30°C). Observations were made of the appearance and pigmentation of the colonies of each isolate, the number of days at which growth was first noted, rapidity and luxuriance of growth and texture of growth. Ascospore formation, pseudo mycellum or true mycellum, pellicle formations were also observed. The distinct colonies were stained on a slide using Lactophenol cotton blue.

## RESULTS AND DISCUSSION

Out of the 50 samples collected from various commer-cial poultry farms located in the study area, no feed was found completely free from fungi contaminant (Table 1). The result from cultures revealed that four different types; *Aspergillus flavus, Fusarium* spp., *Rhizopus* spp. and *Aspergillus niger* were the common fungi found in the feeds. *Rhizopus* spp. had the highest frequency of occurrence (44%), *Fusarium* spp. 42%, *A. flavus* 40%, occurrence and *A. niger*, the lowest (38%) (Table 2, Figures 1, 2, 3 and 4).

Based on the above finding that no feed was completely free of fungi and the fact that this study was carried out during the rainy season (July and August), the occurrence of *A. flavus* could have been due to the humidity or moisture which is higher during the season. According to Christensen et al. (1978) all fungi have preferred conditions for growth with respect to feeds and feeding stuffs, moisture temperature and acidity. Fungi which tend to grow best at 25 – 30°C. These are referred to as mesophilic while psychophillic grow best at about +20°C although they still grow slowly at –10°C. Some are thermophilic and have a high optimum temperature. Most fungi are killed by moist heat at 100°C (Olutiola et al., 1991).

The worldwide nature of the mold problem cannot be over emphasised; molds are very ubiquitous and the extent of their occurrence is greater in some parts of the world than in others because of climatic variation. Wet conditions favour mold growth as well as synthesis of mycotoxins. The ability of the mold to produce toxic metabolites depends not only upon the strain involved but also upon the condition under which it is grown. Mycotoxins, considered as highly undesirable, contaminants of feeds, is a collective term referring to the toxic metabolites produced by several species of fungi and molds.

Occurrence of mycotoxin in feed will depend on location as well as environmental condition during harvesting and storage. *A. flavus* synthesizes aflatoxin which tends to predominate in grain produced in warmer climates. This contrasts with grain produced in cooler climates where *fusarium* toxin such as deoxnivalenol, zearaleone and fumorism are more prevalent. The occurrence of aflatoxin is not specific to groundnut; it has been found in bean, cottonseed and maize meals (FAO, 1990). It may also occur in cottonseed, rice and sorghum. The nutriational implication of mycotoxin has to do with their effect when ingested or inhaled with or from the feeds and feedstuffs by fungi, which have damaging effect on the livestock animals.

Also, in a survey of fungi contamination in commercial

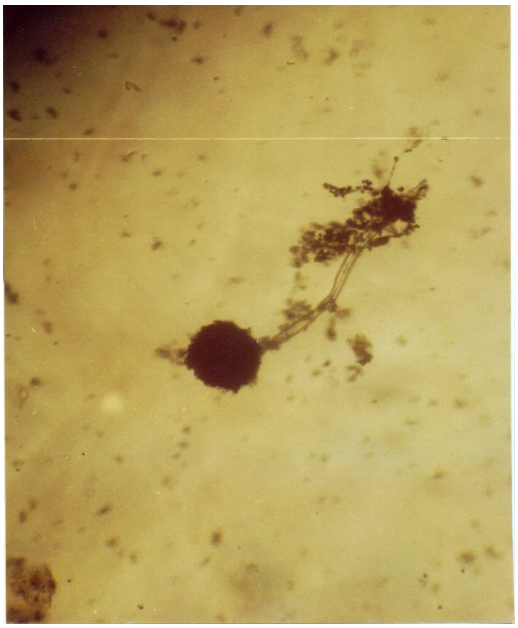

**Figure 1.** *Aspergilus flavus* isolated from compounded poultry feeds in southwest Nigeria.

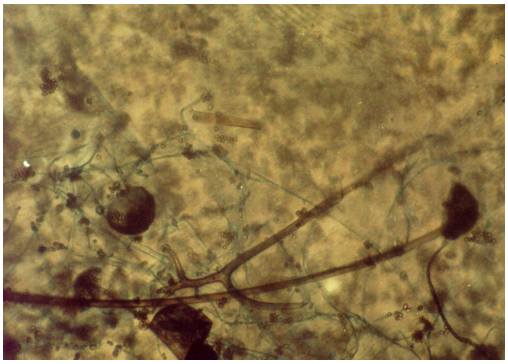

**Figure 2.** *Rhizopus* spp. isolated from compounded poultry feeds in southwest Nigeria.

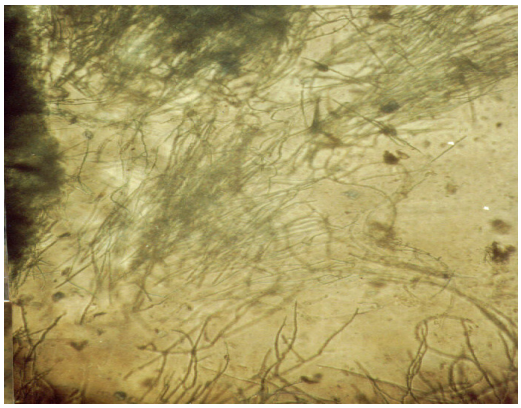

**Figure 3.** *Fusarium* spp. isolated from compounded poultry feeds in southwest Nigeria.

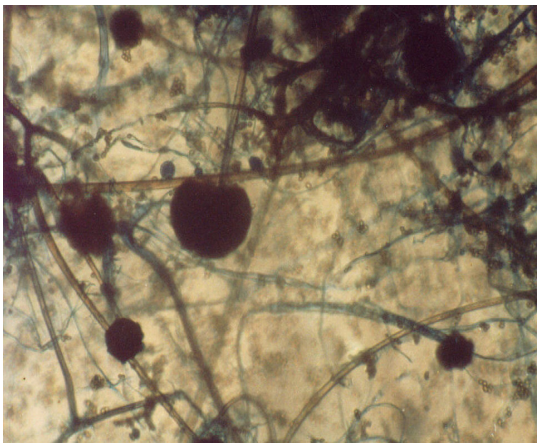

**Figure 4.** *Aspergilus niger* isolated from compounded poultry feeds in southwest Nigeria.

poultry feeds in five Southern States of Nigeria, Oyedeji (1986) reported that 57 – 62% of the chick and broiler starter, grower broiler, finishers and layer rations were contaminated with aflatoxin. Methods of detoxifying grains (feed ingredients) include physical, chemical or biological processes. Some of these methods, such as ammoniation at high temperature and pressure, have proved to be successful in reducing the aflatoxin content of cottonseed meal and maize in the United States. The addition of mycotoxin sequestering agents to feed has shown limited success depending on the mycotoxin involved. These include Alfalfa, activated charcoal, yeast and hydrated sodium calcium aluminosilicate (HSCAS).

## Conclusion

Feeds and feedstuffs are excellent media for the growth of fungi and so a very high standard of hygiene is necessary to avoid feed contamination which can lead to disease of mycological origin traceable to livestock feed. Though it is not always possible to detect contaminated feeds merely by tasting, smelling or looking at the food proper, analysis of the feeds and feedstuffs should be carried out to find out the presence of molds and mycotoxins in the feeds before the feeds are given. The harvesting, processing, and storing feed varies from country to country; whatever the degree of variation, care needs to be taken to prevent fungal invasion. Crops need to be harvested, dried and stored properly to prevent growth of mold and mycotoxin production. Industrial grain handlers need to understand what can be done to prevent further mold and mycotoxin contamination, by drying harvested grain and maintaining relatively low moisture content during storage. One of the best ways to control feed contamination and mycotoxin problem is to prevent biosynthesis of these secondary metabolites in feeds. An understanding of the factors that control mycotoxins production and application of the information in ways suitable to a given

feed processing, storing and distributing systems should help to minimize contamination of our feeds with molds and mycotoxins.

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