Ass. Univ. Bull. Environ. Res. 1(1) (1998) 1-16

AUCES

MYCOLOGICAL EVALUATION OF POULTRY FEEDS, CONCENTRATES AND FEED INGREDIENTS

Mostafa M. Ahmed, Mady A. Ismail * , Sotohy A. Sotohy and Abddel-Moez A. Ismail

Department of Animal Hygiene, Faculty of Vet. Medicine, Assiut University.
*** Department of Botany, Faculty of Science, Assiut University.**

Received 22/5/1997, Accepted 16/6/1997

ABSTRACT :

A mycological evaluation of total eighty two samples of apparently normal poultry rations (22),concentrated mixtures(18) and feed ingredients (42) were performed. The samples were collected from some poultry processing plants in different localities at Assiut Governorate, Egypt. The moisture content of the examined samples were moderately low with mean values ranged from 4.58±0.72 to 7.06±0.17. The mean values of the total mould and yeast colony count/g were varied from $1.9x10^4$ to $5.2x10^4$. The broiler concentrate mixtures showed the minimum count ($4.4x10^3$/g) while the maximum count was observed in broiler rations ($1.3x10^5$/g). Twenty fungal genera represented by 42 species and 1 species variety were identified in the present investigation . The most prevalent fungal species were found to belong to Aspergillus followed by Penicillium. Moreover, many fungal species of less frequency distributions were also detected including *Cladosporium, Gibberella, Paeciliomyces, Emericella, Hypomyces, Mucor species* and others. The hygienic significance of the fungal isolates and the restrictive measures that must be considered were discussed.

INTRODUCTION :

Most significant researches on fungi have been conducted in the last decade, although the older literature revealed many instances where mouldy feedstuffs caused toxic results, altered nutrient values, or reduced the palatability. In 1959, at least 100,000 turkey poults and ducklings died in England as a result of feeding contaminated peanut meal imported from Brazil (Purchase, 1971). The U.S. broiler industry showed sporadic occurrence over the years of haemorrhagic syndrome suspected to be due to *Alternaria, Aspergillus clavatus, A. flavus* and *Penicillium purpurogenum* (Schaible, 1970). All these events changed the attitude towards moulds in foods and feeds.

Recently special attention was paid to provide information on the incidence and activities of fungi in the mixed feeds. The poultry feeds have not received special mycological attention, in spite of the fact that they are prepared basically from the raw plant materials (Corn, Soybean, Wheat bran, etc.) and concentrate mixtures, where fungi are the most important contaminant microorganisms (Lagrandeur & Poisson, 1968; Lovett et al., 1971; Hesseltine et al., 1976; Muntanola-Cvetkovic & Borisavljevic, 1979; Ogundero, 1980; Clarke & Hill, 1981; McGimpsey & Malone, 1981; Tabib et al., 1981; El-Kady et al., 1982. Moreno-Rome & Fernandez, 1986; Ranjan & Sinha, 1991; Chang- Yen et al., 1992 and Abarca et al., 1994). These microorganisms may be present in the final product or originate directly or indirectly from cross contamination. The unfavourable conditions of storage as high temperature and humidity were found to stimulate the fungal growth in the poultry feedstuffs (Abdel-Fattah et al.,1979 ; Ogundero, 1980; Bartov et al., 1982 and Ogundero 1987).

The mycological study of poultry feeds and feed ingredients are of significant importance for determining the distribution of the mycotoxin producing fungi as their toxic metabolites have been detected in many feed stuffs. In this sense, poultry feeds are the first stage of the chain that may carry mycotoxins to man. The present work was planned to throw light on the mycological status of commercial poultry mixed feeds and their ingredients, as well as their fungal contamination and to arise the public health awareness of such contamination on human health through poultry, as well as rescuing the birds from such contamination. Moreover, special attention was paid to the mycotoxin producing fungi, which will be reported elsewhere.

MATERIALS & METHODS :

A- Collection of the samples:

Eighty two samples of poultry feeds were collected from some poultry processing plants in different localities at Assiut Governorate (Beni-Mor, Arab El-Awamer, Dronka, Rifa and Manfalout). Out of 82 samples collected, 22 were poultry rations(final product), 18 concentrate mixtures and 42 were feed ingredients . The samples were collected in sterile polyethylene bags and transported to the laboratory for their mycological analysis.

B- Determination of the moisture content :

The moisture content of the poultry feeds was determined according to Tabib et al. , (1981) and Swelim et al. , (1994) by the oven method. Replicates of the samples of 10 gm for each were dried at 105 °C in an electric oven to a constant weight. The moisture content was calculated as percentage on oven dry basis (Tabib et al., 1981 and Swelim et al., 1994).

C-Enumeration and identification of fungi:

The dilution-plate method described by Johnson & Curl (1972) was used for the enumeration of fungi. Dilutions were prepared by shaking 10 gm of each sample in 90 ml sterile saline solution (0.88 w/v NaCl). Serial tenfold dilutions were prepared and 1 ml aliquots of the appropriate dilution were transferred into sterile petri dishes. Dicloran rose bengal medium of King et al., (1979) was used for the isolation of fungi. Five replicates for each sample were incubated at 25 °C for 7-15 days.

The growing fungal colonies were enumerated and identified based on their macro- and microscopic characteristics using the methods of Raper & Fennel (1965), Ellis (1971)& (1976); Pitt (1979); Domsch et al., (1980); Sivanesan (1984)& (1987), Kozakiewicz (1989) and Moubasher (1993).

RESULTS & DISCUSSION :

Poultry mixed feeds and their ingredients are naturally contaminated by different species of fungi, that is mainly due to their exposure to the surrounding environment and storage under humid conditions (Beer, 1969).

In general the moisture content in such feeds is considerd as the most important factor contributing to their moulding. From table (1), a moderate moisture content was observed in the examined samples. The highest moisture content was detected in the white corn (7.06±0.17) while the lowest was observed in the yellow corn (4.58±0.72).

Data in table (2) revealed that the highest mean of total fungal count /g was noted in the yellow corn ($5.2x10^4$) followed by laying rations ($4.4x10^4$), broiler rations and white corn ($4.1x10^4$), wheat bran ($3.7x10^4$), concentrate mixture of broiler ($3.3x10^4$), soybean meal ($2.2x10^4$). The lowest mean count was recorded in the concentrate mixture for layers ($1.9x10^4$). Concerning the total mould count/g, it easily demonstrated that the highest count was observed in the yellow corn and laying rations (table 2). This could be attributed to the high starch content (Shotwell et al., 1966) and/or high moisture content, beside the improper handling and storage specially in case of yellow corn (Bartov et al., 1982 and Ogundero, 1987). The high humidity enhances the fungal growth which is typical for the tropical and subtropical regions.

The obtained results revealed that the mean fungal count/g were ranged from $1.9x10^4$ to $5.2x10^4$. The maximum count was found in both broiler rations and yellow corn ($1.3x10^5$) and a minimum count in the broiler concentrate mixture ($4.4x10^3$). The obtained results are more or less coincident with fungal densities ($7x10^2$ - $3.2x10^5$/g) obtained by Lovett et al. (1971) and 5 to $1.2x10^5$/g obtained by Tabib et al. (1981). On the other hand,

obtained results are lower than that recorded by Abarca et al.,1994 (up to 10^8 CFU/g).

Concerning the differential mould & yeast count in poultry feeds, concentrate mixtures and feed ingredients that recorded in tables (3, 4, 5). The present data showed that the most dominant species are *Aspergillus fumigatus, A. flavus, Penicillium chrysogenum, Gibberella fujikuroi, Aspergillus niger and A. terreus.* It was observed that *A. fumigatus* mean count/g was 8.5x10^3; 4.8x10^3, 9.7x10^3; 7.0x10^3; 1.0x10^4; 1.1x10^4 and 8.4x10^3 in laying rations, laying concentrate mixture, broiler concentrate mixture, soybean meal, wheat bran, yellow corn and white corn, respectively. Moreover, the *Aspergillus flavus* mean count was 8.3x10^3; 3.7x10^3; 8.8x10^3 in broiler rations, wheat bran and yellow corn, respectively. However, the mean count of *Aspergillus niger* was 1.4x10^3; 1.7x10^3 in the laying concentrate mixture and soybean meal respectively while *A. terreus* was 7.3x10^3 in the broiler concentrate mixture. On the other hand, tables 3,4 and 5 revealed that *Penicillium chrysogenum* mean count/g was 9.6x10^3; 7.1x10^3; 7.1x10^3; 5.4x10^3; 8.2x10^3; 1.2x10^4 and 8.5x10^3 in laying rations, laying concentrate mixture, broiler concentrate mixture, soybean meal, wheat bran, yellow corn and white corn respectively. *Gibberella fujikuroi* was isolated from laying rations, broiler rations, white corn by 5.2x10^3; 1.2x10^4 and 1.3x10^4, respectively.

Table (1): Statistical analysis of moisture content in the different poultry feed, concentrates and feed ingredients.

Poultry feeds, concentrates and feed ingredients	No.of ex. samples	Moisture content %		
		Min.	Max.	Mean
Poultry rations :-				
Laying rations	9	5.99	6.62	6.33±0.08
Broiler rations(starters)	13	6.12	6.58	6.33±0.06
Concentrates:				
Conc.(Layers)	7	5.64	6.12	5.87±0.06
Conc.(Broilers)	11	4.00	5.88	5.04±0.28
Feed Ingredients :-				
Soyabean meal	13	3.92	8.16	5.61±0.59
yellow corn	14	2.00	7.14	4.58±0.72
White corn	3	6.48	7.84	7.06±0.17
Wheat bran	12	6.12	8.51	7.0±0.29

Table (2): Statistical mould & yeast count of poultry feeds, concentrates and feed ingredients.

Feeds & feed ingredients	No. of samples	Total mould & yeast count/g		
		Min	Max	Mean
Laying rations	9	$1.9x10^4$	$9.8x10^4$	$4.4x10^4 \pm 9.7x10^3$
Broiler rations	13	$4.6x10^3$	$1.3x10^5$	$4.1x10^4 \pm 9.9x10^3$
Conc. layer	7	$5.2x10^3$	$5.3x10^4$	$1.9x10^4 \pm 7.0x10^3$
Conc. broiler	11	$4.4x10^3$	$8.7x10^4$	$3.3x10^4 \pm 8.7x10^3$
Soybean meal	13	$6.4x10^3$	$4.7x10^4$	$2.2x10^4 \pm 3.8x10^3$
Yellow corn	14	$1.6x10^4$	$1.3x10^5$	$5.2x10^4 \pm 9.7x10^3$
White corn	3	$2.6x10^4$	$5.3x10^4$	$4.1x10^4 \pm 9.6x10^3$
Wheat bran	12	$1.2x10^4$	$8.3x10^4$	$3.7x10^4 \pm 5.4x10^3$

Table (3): Differential mould & yeast count/g in poultry rations.

Fungal species	Laying rations (9)			Broiler rations (13)		
	Min	Max	Mean	Min.	Max.	Mean
Alternaria alternata	0	0	0	0	$2x10^2$	1.5x10
A. chlamydospora	0	0	0	0	$2x10^2$	1.5x10
Aspergillus alutaceus	0	$4.0x10^2$	4.4x10	0	$1.4x10^3$	$1.2x10^2$
A. flavus	$8x10^2$	$1.9x10^4$	$4.8x10^3$	$4.0x10^2$	$3.2x10^4$	$8.3x10^3$
A. fumigatus	$1.2x10^3$	$2.6x10^4$	$8.5x10^3$	$8.0x10^2$	$1.6x10^4$	$6.2x10^3$
A. niger	$2.0x10^2$	$2.4x10^4$	$4.7x10^3$	$2.0x10^2$	$5.2x10^3$	$2.5x10^3$
A. oryzae	0	0	0	0	$6.0x10^2$	4.6x10
A. sydowii	0	$1.2x10^3$	$1.3x10^2$	0	0	0
A. tamarii	0	$2.0x10^2$	2.2x10	0	0	0
A. terreus	0	$3.8x10^3$	$9.3x10^2$	0	$3.4x10^3$	$1.2x10^3$
Cladosporium cladosporioides	0	$4.0x10^2$	6.7x10	0	$4.0x10^2$	3.0x10
Emericella nidulans	0	$4.0x10^2$	6.7x10	0	$1.2x10^3$	$2.0x10^2$
E. quadrilineata	0	0	0	0	$2.4x10^3$	$1.8x10^2$
Fennellia flavipes	0	$6.0x10^2$	$1.3x10^2$	0	$2.0x10^2$	1.5x10
Gibberella fujikuroi	0	$2.1x10^4$	$5.2x10^3$	0	$7.6x10^4$	$1.2x10^4$
Paecilomyces voriotii	0	$1.2x10^4$	$1.8x10^3$	0	$6.0x10^2$	6.1x10
Penicillium aurantiogriseum	0	$9.0x10^3$	$2.9x10^3$	0	$7.6x10^3$	$2.2x10^3$
P. chrysogenum	0	$3.1x10^4$	$9.6x10^3$	$2.0x10^2$	$1.6x10^4$	$7.3x10^3$
P. citrinum	0	$8.0x10^3$	$1.2x10^3$	0	$3.8x10^3$	$2.9x10^2$
P. duclauxii	0	$2.6x10^3$	$2.9x10^2$	0	$1.0x10^3$	$1.4x10^2$
P. funiculosum	0	$2.2x10^4$	$3.9x10^3$	0	$1.2x10^3$	$1.4x10^2$
P. variabile	0	0	0	0	$2.0x10^2$	1.5x10
Trichoderma harzianum	0	$2.0x10^2$	2.2x10	0	0	0

* N.C.I. = Number of cases of isolations .

Table (4): Differential mould & yeast count/g in poultry concentrate mixtures.

Fungal species	Conc. layers (7)			Conc. broilers (11)		
	Min.	Max.	Mean	Min.	Max.	Mean
Acremonium strictum	0	2.0×10^2	2.9×10	0	2.0x102	1.8×10
Alternaria alternata	0	0	0	0	2.4×10^3	2.2×10^2
A. chlamydospora	0	0	0	0	1.2×10^3	2.0×10^2
Aspergillus alutaceus	0	0	0	0	2.0×10^2	3.6×10
A. carbonarious	0	2.0×10^2	2.9×10	0	0	0
A. flavus	0	2.4×10^3	1.0×10^3	2.0×10^2	4.0×10^3	1.1×10^3
A. fumigatus	8.0×10^2	1.1×10^4	$4.8. \times 10^3$	2.0×10^3	2.6×10^4	9.7×10^3
A. niger	0	5.2×10^3	1.4×10^3	0	1.4×10^4	2.3×10^3
A. oryzae	0	6.0×10^2	1.1×10^2	0	1.0×10^3	9.1×10
A. sydowii	0	2.4×10^3	4.3×10^2	0	2.0×10^2	1.8×10
A. terreus	0	8.4×10^3	1.6×10^3	0	6.0×10^4	7.3×10^3
A. ustus	0	2.0×10^2	2.9×10	0	2.0×10^2	1.8×10
A. versicolor	0	2.0×10^2	2.9×10	0	0	0
Cladosporium cladosporioides	0	2.0×10^2	8.6×10	0	0	0
Emericella nidulans	0	6.0×10^2	2.0×10^2	0	2.4×10^3	4.2×10^2
E. quadrilineata	0	6.0×10^2	1.1×10^2	0	0	0
Eupenicillium spp.	0	2.0×10^2	2.9×10	0	0	0
Eurotium chevalieri	0	2.0×10^2	2.9×10	0	0	0
Fennellia flavipes	0	0	0	0	6.2×10^3	5.6×10^2
Gibberella fujikuroi	0	2.0×10^2	2.9×10	0	4.0×10^2	3.6×10
Humicola minima	0	0	0	0	2.0×10^2	1.8×10
Paecilomyces voriotii	0	1.2×10^3	1.7×10^2	0	1.4×10^3	1.3×10^2
Penicillium aurantiogriseum	2.0×10^2	4.2×10^3	1.4×10^3	0	6.8×10^3	1.9×10^3
P. chrysogenum	6.0×10^2	2.4×10^4	7.1×10^3	8.0×10^2	2.2×10^4	7.1×10^3
P. citrinum	0	0	0	0	1.8×10^3	1.6×10^2
P. duclauxii	0	0	0	0	3.6×10^3	3.5×10^2
P. funiculosum	0	0	0	0	7.0×10^3	8.0×10^2
Pleospora tarda	0	6.0×10^2	8.5×10	0	0	0
Scopulariopsis brevicaulis	0	2.0×10^2	2.9×10	0	0	0
S. candida	0	4.0×10^2	8.6×10	0	0	0

Table (5): Differential mould & yeast count/g in poultry feed ingredients.

Fungal species	Soybean meal (13)			Wheat bran (12)			Yellow corn (14)			White corn (3)		
	Min	Max	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min	Max	Mean
Acremonium strictum	0	$2.0x10^2$	1.5x10	0	$2.4x10^3$	$2.0x10^2$	0	$4.0x10^2$	2.9x10	0	$4.0x10^2$	1.3x10
Alternaria alternata	0	$6.0x10^2$	9.2x10	0	0	0	0	$6.0x10^2$	7.1x10	0	0	0
A. chlamydospora	0	$2.6x10^3$	$2.2x10^2$	0	$2.0x10^2$	1.7x10	0	0	0	0	$1.6x10^3$	$5.3x10^2$
Aspergillus alutaceus	0	0	0	0	$2.0x10^2$	1.7x10	0	$1.6x10^3$	$2.0x10^2$	0	0	0
A. clavatus	0	$6.0x10^2$	6.4x10	0	0	0	0	0	0	0	0	0
A. flavus	0	$3.4x10^3$	$1.0x10^3$	0	$1.2x10^4$	$3.7x10^3$	0	$3.6x10^4$	$8.8x10^3$	$8.0x10^2$	$3.2x10^3$	$2.1x10^3$
A. flavus var columnaris	0	0	0	0	$6.0x10^2$	5.0x10	0	0	0	0	0	0
A. fumigatus	$2.2x10^3$	$1.6x10^4$	$7.0x10^3$	$3.2x10^3$	$2.3x10^4$	$1.0x10^4$	$3.0x10^3$	$2.6x10^4$	$1.1x10^4$	$1.4x10^3$	$1.4x10^4$	$8.4x10^3$
A. melleus	0	$6.0x10^2$	4.6x10	0	0	0	0	$2.0x10^2$	2.9x10	0	0	0
A. niger	0	$1.1x10^4$	$1.7x10^3$	$2.0x10^2$	$1.0x10^4$	$3.1x10^3$	0	$3.2x10^4$	$4.8x10^3$	$2.6x10^3$	$7.4x10^3$	$4.5x10^3$
A. oryzae	0	$2.0x10^2$	1.5x10	0	0	0	0	0	0	0	0	0
A. sydowii	0	$2.4x10^3$	$2.0x10^2$	0	2.0x102	1.7x10	0	$1.2x10^3$	8.6x10	0	0	0
A. tamarii	0	$2.0x10^2$	1.5x10	0	0	0	0	0	0	0	0	0
A. terreus	0	$3.6x10^3$	$6.6x10^2$	0	$5.6x10^3$	$2.3x10^3$	0	$2.2x10^4$	$2.9x10^3$	0	$1.0x10^3$	$3.3x10^2$
A. versicolor	0	$4.0x10^2$	3.1x10	0	$1.8x10^3$	$2.0x10^2$	0	$8.0x10^2$	$1.0x10^2$	0	0	0
Chrysosporium tropicum	0	$6.0x10^2$	4.6x10	0	$2.0x10^2$	1.7x10	0	0	0	0	0	0
Cladosporium cladosporioides	0	$2.2x10^3$	$3.8x10^2$	0	0	0	0	0	0	0	0	0
Emericella nidulans	0	$1.2x10^3$	$2.5x10^2$	0	$3.2x10^3$	$4.8x10^2$	0	$1.2x10^3$	$1.4x10^2$	0	$2.6x10^3$	$1.0x10^3$
E. quadrilineata	0	0	0	0	$2.0x10^2$	1.7x10	0	0	0	0	0	0
Fennellia flavipes	0	0	0	0	$2.4x10^4$	$3.2x10^3$	0	0	0	0	0	0
Gibberella fujikuroi	0	$7.6x10^3$	$1.8x10^3$	0	$4.2x10^3$	$6.0x10^2$	0	$3.0x10^4$	$3.4x10^3$	0	$4.1x10^4$	$1.3x10^4$
Humicola grisea	0	$2.0x10^2$	1.5x10	0	0	0	0	0	0	0	0	0
Hypomyces chrysospermus	0	$6.0x10^2$	6.2x10	0	$2.0x10^2$	1.7x10	0	$9.6x10^3$	$6.9x10^2$	0	$2.0x10^2$	$1.3x10^2$
Mucor racemosus	0	0	0	0	0	0	0	$4.0x10^2$	2.9x10	0	0	0
Paecilomyces voriotii	0	$1.4x10^3$	$1.7x10^2$	0	6.0x10	6.7x10	0	$5.4x10^3$	$9.4x10^2$	0	$2.0x10^2$	6.7x10
Penicillium aurantiogriseum	0	$3.8x10^3$	$9.4x10^2$	$8.0x10^2$	$7.6x10^3$	$3.4x10^3$	0	$1.7x10^4$	$3.6x10^3$	$2.0x10^2$	$3.6x10^3$	$1.7x10^3$
P. chrysogenum	$6.0x10^2$	$2.1x10^4$	$5.4x10^3$	$1.4x10^3$	$3.6x10^4$	$8.2x10^3$	0	$5.8x10^4$	$1.2x10^4$	$3.0x10^3$	$1.8x10^4$	$8.5x10^3$
P. citrinum	0	$6.0x10^2$	6.2x10	0	$6.0x10^2$	5.0x10	0	$1.0x10^4$	$7.6x10^2$	0	0	0
P. duclauxii	0	$2.2x10^3$	$2.0x10^2$	0	0	0	0	$2.8x10^3$	$4.1x10^2$	0	0	0
P. funiculosum	0	$7.2x10^3$	$1.1x10^3$	0	$4.8x10^3$	$6.7x10^2$	0	$3.6x10^3$	$7.0x10^2$	0	0	0
P. oxalicum	0	$4.0x10^2$	3.1x10	0	0	0	0	0	0	0	0	0
Pleospora tarda	0	$2.0x10^2$	1.5x10	0	$2.0x10^2$	1.7x10	0	0	0	0	0	0
Scopulariopsis brevicaulis	0	$6.0x10^2$	4.6x10	0	0	0	0	0	0	0	0	0
Scytalidium lignicola	0	0	0	0	0	0	0	$7.2x10^3$	$5.1x10^2$	0	0	0
Torula spp.	0	0	0	0	$2.0x10^3$	$1.7x10^2$	0	0	0	0	0	0
Yeasts	0	$4.0x10^2$	3.1x10	0	0	0	0	0	0	0	0	0

Table (6): Frequency distribution and incidence percentages of moulds & yeasts in poultry rations.

Fungal isolates	Laying rations (9 samples)			Broiler rations (13 samples)			Overall incid. %	Overall freq. %
	N.C.I.*	Incid. %	Frq. %	No. of isolates	Incid. %	Frq. %		
Alternaria alternata	0	0	0	1	1	7.69	0.58	4.54
A. chlamydospora	0	0	0	1	1	7.69	0.58	4.54
Aspergillus alutaceus	1	1.39	11.11	2.	2	15.38	1.74	13.64
A. flavus	9	12.5	100	13	13	100	12.79	100
A. fumigatus	9	12.5	100	13	13	100	12.79	100
A. niger	9	12.5	100	13	13	100	12.79	100
A. oryzae	0	0	0	1	1	7.69	0.58	4.54
A. sydowii	1	1.39	11.11	0	0	0	0.58	4.54
A. tamarii	1	1.39	11.11	0	0	0	0.58	4.54
A. terreus	5	6.94	55.55	10	10	76.92	8.72	68.18
Cladosporium cladosporioides	2	2.78	22.22	1	1	7.69	1.74	13.64
Emericella nidulans	2	2.78	22.22	3	3	23.08	2.91	22.73
E. quadrilineata	0	0	0	1	1	7.69	0.58	4.54
Fennellia flavipes	2	2.78	22.22	1	1	7.69	1.74	13.64
Gibberella fujikuroi	6	8.33	66.66	9	9	69.23	8.72	68.18
Paecilomyces voriotii	3	4.17	33.33	2	2	15.38	2.91	22.73
Penicillium aurantiogriseum	7	9.72	77.78	10	10	76.92	9.88	77.27
P. chrysogenum	8	11.11	88.88	13	13	100	12.21	95.45
P. citrinum	2	2.78	22.22	1	1	7.69	1.74	13.64
P. duclauxii	1	1.39	11.11	2	2	15.38	1.74	13.64
P. funiculosum	3	4.17	33.33	2	2	15.38	2.91	22.73
P. variable	0	0	0	1	1	7.69	0.58	4.54
Trichoderma harzianum	1	1.39	11.11	0	0	0	0.58	4.54
Total	72			100				

* N.C.I. = Number of Cases of Isolations .

Table(7): Frequency distribution and incidence percentages of moulds & yeasts in poultry concentrate mixtures.

Fungal isolates	Laying concentrates (7 samples)			Broiler concentrates (11 samples)			Overall incid. %	Overall freq. %
	N.C.I.*	Incid. %	Frq. %	No. of isolates	Incid. %	Frq. %		
Acremonium strictum	1	1.67	14.28	1	1.19	9.09	1.39	11.11
Alternaria alternata	0	0	0	1	1.19	9.09	0.69	5.55
A. chlamydospora	0	0	0	3	3.57	27.27	2.08	16.67
Aspergillus alutaceus	0	0	0	2	2.38	18.18	1.39	11.11
A. carbonarious	1	1.67	14.28	0	0	0	0.69	5.55
A. flavus	4	6.67	57.14	11	13.09	100	10.42	83.33
A. fumigatus	7	11.67	100	11	13.09	100	12.50	100
A. niger	6	10	85.71	9	10.71	81.81	10.42	83.33
A. oryzae	2	3.33	28.57	1	1.19	9.09	2.08	16.67
A. sydowii	2	3.33	28.57	1	1.19	9.09	2.08	16.67
A. terreus	5	8.33	71.43	9	10.71	81.81	9.72	50.0
A. ustus	1	1.67	14.28	1	1.19	9.09	1.39	11.11
A. versicolor	1	1.67	14.28	0	0	0	0.69	5.55
Cladosporium cladosporioides	3	5.0	42.86	0	0	0	2.08	16.67
Emericella nidulans	3	5.0	42.86	0	0	0	2.08	16.67
E. quadrilineata	2	3.33	28.57	4	4.76	36.63	4.17	33.33
Eupenicillium spp.	1	1.67	14.28	0	0	0	0.69	5.55
Eurotium chevalieri	1	1.67	14.28	0	0	0	0.69	5.55
Fennellia flavipes	0	0	0	1	1.19	9.09	0.69	5.55
Gibberella fujikuroi	1	1.67	14.28	1	1.19	9.09	1.39	11.11
Humicola minima	0	0	0	1	1.19	9.09	0.69	5.55
Paecilomyces voriotii	1	1.67	14.28	1	1.19	9.09	1.39	11.11
Penicillium aurantiogriseum	7	11.67	100	9	10.71	81.81	11.11	88.89
P. chrysogenum	7	11.67	100	11	13.09	100	12.50	100
P. citrinum	0	0	0	1	1.19	9.09	0.69	5.55
P. duclauxii	0	0	0	2	2.38		1.39	11.11
P. funiculosum	0	0	0	3	3.57	18.18	2.08	16.67
Pleospora tarda	1	1.67	14.28	0	0	27.27	0.69	5.55
Scopulariopsis brevicaulis	2	3.33	28.57	0	0	0	1.39	11.11
S. candida	1	1.67	14.28	0	0	0	0.69	5.55
Total	60			84		0		

* N.C.I. = Number of Cases of Isolations .

Table (8): Frequency distribution and incidence percentages of isolated mould & yeast from poultry feed ingredients.

Fungal Isolates	Soybean meal (13)			Wheat bran (12)			Yellow corn (14)			White corn (3)			Overall	Overall
	N.C.I	Inc. %	Frq. %	NCI	Inc%	Frq.%	N.CI	Inc%	Frq.%	N.CI	Inc %	Frq.%	Incid. %	Frq. %
Acremonium strictum	1	0.88	7.69	1	1	8.33	1	0.9	7.14	1	4.17	33.33	1.15	9.52
Alternaria alternata	3	2.65	23.1	0	0	0	2	1.8	14.28	0	0	0	1.44	11.9
A. chlamydospora	2	1.77	15.38	1	1	8.33	0	0	0	1	4.17	33.33	1.15	9.52
Aspergillus alutaceus	0	0	0	1	1	8.33	2	1.8	14.28	0	0	0	0.86	7.14
A. clavatus	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
A. flavus	10	8.8	76.9	11	11	91.67	12	10.81	85.71	3	12.5	100	10.34	85.71
A. flavus var columnaris	0	0	0	1	1	8.33	0	0	0	0	0	0	0.29	2.38
A. fumigatus	13	11.5	100	12	12	100	14	12.61	100	3	12.5	100	12.1	100
A. melleus	1	0.88	7.69	0	0	0	2	1.8	14.28	0	0	0	0.86	7.14
A. niger	8	7.1	61.54	12	12	100	12	10.81	85.71	3	12.5	100	10.1	83.33
A. oryzae	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
A. sydowii	2	1.77	15.38	1	1	8.33	1	0.9	7.14	0	0	0	1.15	9.52
A. tamarii	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
A. terreus	7	6.19	53.8	11	11	91.67	12	10.81	85.71	1	4.17	33.33	8.91	73.81
A. versicolor	1	0.88	7.69	2	2	16.67	2	1.8	14.28	0	0	0	1.44	11.9
Chrysosporium tropicum	1	0.88	7.69	1	1	8.33	0	0	0	0	0	0	0.57	4.76
Cladosporium cladosporioides	7	6.19	53.8	0	0	0	0	0	0	0	0	0	2.01	16.67
Emericella nidulans	5	4.42	38.5	4	4	33.33	3	2.7	21.43	2	8.33	66.7	4.02	33.33
E. quadrilineata	0	0	0	1	1	8.33	0	0	0	0	0	0	0.29	2.38
Fennellia flavipes	0	0	0	4	4	33.33	0	0	0	0	0	0	1.15	9.52
Gibberella fujikuroi	3	2.85	23.1	4	4	33.33	6	5.4	42.86	1	4.17	33.33	4.02	33.33
Humicola grisea	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
Hypomyces chrysospermus	2	1.77	15.38	1	1	8.33	1	0.9	7.14	2	8.33	66.7	1.72	14.28
Mucor racemosus	0	0	0	0	0	0	1	0.9	7.14	0	0	0	0.29	2.38
Paecilomyces voriotii	4	3.54	30.77	2	2	16.67	4	3.6	28.57	1	4.17	33.33	3.16	29.19
Penicillium aurantiogriseum	11	9.73	84.6	12	12	100	12	10.81	85.71	3	12.5	100	10.92	90.48
P. chrysogenum	13	11.5	100	12	12	100	13	11.71	92.86	3	12.5	100	11.78	97.62
P. citrinum	2	1.77	15.38	1	1	8.33	2	1.8	14.28	0	0	0	1.44	11.9
P. duclauxii	2	1.77	15.38	0	0	0	3	2.7	21.43	0	0	0	1.44	11.9
P. funiculosum	7	6.19	53.8	3	3	25.0	5	4.5	35.71	0	0	0	4.31	35.71
P. oxilacum	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
Pleospora tarda	1	0.88	7.69	1	1	8.33	0	0	0	0	0	0	0.57	4.76
Scopulariopsis brevic aulis	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
Scytalidium lignicola	0	0	0	0	0	0	1	0.9	7.14	0	0	0	0.29	2.38
Torula sp.	0	0	0	1	1	8.33	0	0	0	0	0	0	0.29	2.38
Yeasts	1	0.88	7.69	0	0	0	0	0	0	0	0	0	0.29	2.38
Total	113			100			111			24				

The isolated mycoflora from mixed poultry feeds pose problems due to the ability of some of them to invade the animal tissues (*A. fumigatus*) as well as their ability to grow on feed, causing their spoilage beside production of mycotoxins (Moreno-Rome & Fernandez, 1986). So it is necessary to note the high prevalence of these mycoflora in general and with special emphasis on which comprise the most important and well known mycotoxin producing fungi affecting the mixed poultry feeds and their ingredients.

The frequency distribution and incidence percentages of the isolated fungi were shown in tables (6-8). A total of 20 genera; 42 species and one species variety were isolated from all examined samples. The most prevelant genera were *Aspergillus* that represented by overall frequency percentages of 100% in both of laying and broiler rations, followed by *Penicillium* spp., *Cladosporium* spp., *Gibberella* spp., *Paciliomyces* spp., *Emericella* spp., *Hypomyces* spp., *Fennellia* spp., *Alternaria* spp., *Trichoderma* spp. and *Mucor* species. The remaining identified genera had lower frequencies of isolation and they were designated as mycoflora of rare occurrence in poultry mixed feeds and their ingredients (Ogundero, 1980).

A. fumigatus was the dominant species isolated from all examined samples with an overall frequency of 100 %. *The* fungus causes respiratory disease in man and poultry (Lacey, 1975). The ingestion of spoiled poultry feeds with the toxic fungal metabolites is responsible for the poultry toxicosis (Lovett, 1972). Furthermore, *A. fumigatus* is very dangerous for patients with reduced immunological competence as a consequence of chronic diseases including diseases of lung, liver and kidney, leukemia, tuberculosis, diabetes and kidney and AIDS (Reiss, 1995).

A. flavus is considered as a dominant species in the poultry feeds, concentrate mixtures and feed ingredients (tables 3-5). The mean values/g of *A. flavus* were $8.8x10^3$, $8.3x10^3$,$4.8x10^3$, $3.7x10^3$, $2.1x10^3$, $1.1x10^3$, $1.0x10^3$ and $1.0x10^3$ in yellow corn; broiler rations; laying rations; wheat bran; white corn; broiler concentrate mixtures; layer concentrate mixture and soybean meal respectively. It was recovered with an over all frequency of 100% from laying and broiler rations; 85.71% from poultry feed ingredients and 83.33% from laying and broiler concentrate mixtures. *A. flavus* is considered the main fungus that produces aflatoxins causing mycotoxicosis which has been recognized throughout the world as a major problem in poultry and animal industry (Mirocha & Christensen, 1974 and Abarca et al., 1994).

Generally *Aspergillus* species are incriminaed in poultry mycotoxicosis as many of them are toxic producer including *A. flavus, A. fumigatus, A. terreus, A. clavatus* and *A. glaucus* (Forgacs, 1966 and Lovett, 1972). Furthermore, avian aspergillosis which is caused by several species of *Aspergilli* as *A. fumigatus, A. nidulans* and *A. niger* (Singh & Singh, 1970; Hubbert et al., 1975 and Muller, 1984).

Penicillium species were recovered with high frequency distributions as *P. chrysogenum* which showed an overall frequency of 100; 97.62 and 95.45% in poultry concentrate mixtures, feed ingredients and poultry rations respectively. *Penicillum* spp. are implicated in pulmonary mycosis, gastrointestinal disturbances and poultry mycotoxicosis (Christensen et al., 1968 and Lovett, 1972).

The two species of *Alternaria* that could be isolated were *Alternaria alternata* and *Alternaria chlamydospora*. *A. alternata* was recovered with overall frequency of 11.9; 5.55 and 4.54% from feed ingredients, concentrate mixtures and poultry rations respectively. On the other hand, *A. chlamydospora* was recorded with overall frequencies of 16.67; 9.52 and 4.54% in concentrate mixtures, feed ingredients and poultry rations respectively. *Alternaria* spp. are reported as saprophytes however, they have been recorded as opportunistic causative agent of poultry mycotoxicosis (Abrams, 1965 and Forgacs et al., 1962).

The highest overall frequency of *Gibberella fujikuroi* was obsereved in poultry rations(68.18%), followed by feed ingredients (33.33%). The fungus produces estrogenic substance which inhibits ovulations and significantly reduce egg production and feed consumption in laying hens (Schaible, 1970 and Adams & Tuite, 1976).

The remaining identified genera including *Cladosporium cladosporioides; Mucor racemosus; Paeciliomyces voriotii; Scopulariopsis brevicaulis* and *Trichoderma harzianum* occurred with variable overall frequencies in the examined samples. From the hygienic point of view *Cladosporium* spp. are implicated in some cases of dermatitis in chickens and poultry mycotoxicosis (Christensen et al., 1968 and Lovett, 1972). The *Mucor* spp. representing health hazard of the birds as they incriminated in mucormycosis of birds and man (Jand & Dhillon, 1973 and Al-Doory, 1980). *Paeciliomyces* spp. are incriminated in some pulmonary affections of chickens and usually isolated from the lungs and air sacs of diseased birds (Chute et al., 1956 and Eckman & Morgan, 1979). Furthermore, *Paeciliomyces* were implicated in poultry mycotoxicosis (Abrams, 1965 and Forgacs, 1966). *Scopulariopsis* spp. are incriminated in pulmonary affection of chickens and in some cases of mycotoxicosis (Chute, et al., 1956; Christensen et al., 1968 and Lovett, 1972). Moreover, *Scopulariopsis* have been reported as a causative agent for nail affections and in deep seated granulomatus lesions (Al-Doory, 1980). *Trichoderma* spp. were recorded as a pathogen to young broiler chicks and usually isolated from the lungs and air sacs beside they are incriminated in avian mycotoxicosis (Chute, et al., 1956; Christensen et al., 1968 and Lovett, 1972). Finally the fungal contamination of poultry feeds and their ingredients leads to losses of their nutrient constituents beside the determintal effects on poultry health and production, so, it is of urgent need to evaluate and control the mycological quality (Buhatel et al., 1982).

CONCLUSION :

The results of this study showed a high incidence of a wide variety of fungi from the poultry feeds and their ingredients. Presence of *Aspergillus flavus* and others in some of these feeds may include pathogenic strains producing aflatoxins which may constitutes a potential health hazards to poultry and man. Additional comprehensive monitoring programmes with regular intervals must be considered to evaluate the hygienic fitness of such poultry feeds and their ingredients to overcome and minimize the economic losses in the Egyptian poultry farms and to safeguard human health. Moreover, the authors recommended the prevention of initial mould growth by using good hygienic stores for the poultry feeds and the use of proper antifungal agents. In this respect the use of mould inhibitors in the mixed feeds may be of economical importance during periods when feeds may have to be stored under conditions where heating is the major significant factor (Hafez et al.,1995).

REFERENCES :

1- Abarca, M. L.; Bragulat, M. R.; Castella, G. and Cabanes, F. J. (1994): Mycoflora and aflatoxin-producing strains in animal mixed feeds. J. food production. 57 (3): 256-258.

2- Abdel-Fattah,H.M. ; Kammel,Y.Y. ; Megalla,S.E. and Hafez,A.H. (1979): Aflatoxins and aflatoxicosis : Fungal flora of some food and animal feeds with special references to aflatoxin-producing abilities. Mycopathologia, 77 : 129-135.

3- Abrams, L. (1965): Mycotoxins in Vet. Medicine. South Africa Med. J. 39: 767-771.

4- Adams, R. L. and Tuit, J. (1976): Feeding Gibberella zeae damaged corn to laying hens. Poultry Sci., 55: 1991-1993.

5- Al-Doory, Y. (1980): Laboratory medical mycology. Hand book, Lea & Febiger. Philadelphia, part II, P. 112-132.

6- Bartov, I.; Paster, N. and Lisker, N. (1982): The nutritional value of mouldy grains for broiler chicks. Poultry Sci., 61: 2247-2254.

7- Beer, J. V. (1969): Isolation of pathogenic fungi from water fowl. In: Isolation methods for microbiologists (Eds: Shaton, D. A.; Gould, G. W.) Academic press, New York and London.

8- Buhatel, T.; Silvia, V. and Todea, V. (1982) : Effect of feeding moldy forage to broilers. Proc. Int. Symp. Mycotoxins, pp. 317-320.

9- Chang-Yen, I.; Bidasee, K. and Rampersad, G. (1992): Mycoflora and mycotoxin-producing potential fungi from poultry feeds and feed ingredients in Trinidad. J. Sci., Food Agric. 60: 283-286.

10-Christensen, C. M.; Nelson, G. H.; Mirocha. C. J. and Baste, F. (1968): Toxicity to experimental animals of 943 isolates of fungi. Cancer Research, 28: 2293-2295.

11-Chute, H. L.; O' Meara, D. C.; Tresner, H. D. and Locombe, E. (1956): The fungus flora of chickens with infections of the respiratory tract. Am. J. Vet. Res., 17: 763-765.

12-Clark, J. H. and Hill, S. T. (1981): Mycoflora of moist barley during sealed storage in farm and laboratory soils. Trans. Brit. Mycol. Soc. 77: 557-565.

13-Domsch, K. H.; Gams, W. and Anderson, T. H. (1980): Compendium of soil fungi. Academic Press.

14-Eckman, M. K. and Morgan, J. G. (1979): Fungus species isolated from commercial hatcheries in Alabama. Avian Dis., 23 (1): 204-208.

15-El-Kady, I. A.; Abdel-Hafez, S. I. and El-Maraghy, S. S. (1982): Contribution to the fungal flora of cereal grains in Egypt. Mycopathologia 77: 103-109.

16-Ellis, M. B. (1971): Dematiaceous hyphomyceted. C. M. I., Kew, England.

17-Ellis, M. B. (1976): More Dematiaceous hyphomyceted. C. M. I., Kew, England.

18-Forgacs, J. (1966): Mycoses and mycotoxicosis in poultry. Part II. Feedstuffs, 38: 26-30.

19-Forgacs, J.; Koch, H.; Carll, W. T. and White-Stevens, R. H. (1962): Mycotoxicoses. 1- Relationship of toxic fungi to moldy feed toxicosis in poultry. Avian Diseases, 6: 362-380.

20-Hafez,A.H. ; Megalla,S.E. and Mousa,S.A. (1995): A recomended safe and powerful inhibitor to storage fungi in poultry rations. International Congress on Environmental toxicology "Gretox 1995" Thessaloniki.

21-Hesseltine, G. W.; Shotwell, O. L.; Kwolek, W. F.; Lillehoj, E. B.; Jachson, W. K. and Bothast, R. J. (1976): Aflatoxin occurrence in 1973 corn at harvest. II-Mycological studies. Mycologia 68: 341-353.

22-Hubbert, W. T.; Moculoch, W. F. and Schunerenberger, P. R. (1975): Diseases transmitted from animals to man. 16 th Ed., Charlen, C.; Thomas, Publisher, spring field, ill, nols, U. S. A.

23-Jand, S. K. and Dhillon, S. C. (1973): Fungi associated with respiratory diseases of poultry. Indian Vet. J., 50 (3): 211-215.

24-Johnson, L. F. and Curl, E. A. (1972): Methods for research of soil borne pathogens, Minneapolis, Burgress, Publ. Co.

25-King, A. D., Hocking, A. D. and PiH, J. I. (1979): Dichloran-rose bengal medium from enumeration and isolation of moulds from foods. Applied and Environmental Microbiology, 37: 959-964.

26-Kozakiewicz, Z. (1989): Aspergillus species on stored products. Mycological papers No. 161, C. A. B. International mycological Institute, Kew, England.

27-Lagrandeur, G. and Poisson, J. (1968): La microflora du mais: Son evaluation en function des hydriques et thermiques de stochange en atmosphere renouvelee. Ind. Alim. Agric. 85: 775-788.

28-Lacey, J. (1975): Potential hazards to animal and man from microorganisms in fooders and grain. Trans. Brit. Mycol. Soc., 65(2): 171-184.

29-Lovett, J. (1972): Toxigenic fungi from poultry feed and litter. Poultry Sci., 51:309-313.

30-Lovett, J., Messer, J. W. and Reod, R. B. (1971): The microflora of southern Ohio poultry litter. Poultry sci., 50: 746-751.

31-McGimpsey, H. and Malone, J. P. (1981): The fungal flora of stored undried barley grains with special reference to harmful organisms. Rec. Agric. Res. 29: 99-102.

32-Mirocha, C. J. and Christensen, C. M. (1974): Fungus metabolites toxic to animals. Annu. Rev. phytopathologia, 12: 303-330.

33-Moreno Rome, M. A. and Fernandez, G. S. (1986): Mycoflora of commercial poultry mixed feeds. Poultry sci., 65: 284-287.

34-Moubasher, A. H. (1993): Soil fungi in Qatar and other Arab countries. The Scientific and Applied Research centre, University of Qatar, Doha, Qatar.

35-Muller, L. J. (1984): Occurrence and significance of Aspergillus infection in a broiler hatchery. Fachbereich Veterinar-medizin der Freien Universitat Berlin , pp. 73.

36-Muntanola-Cvetkovic, M. and Borisovljevic, J. (1979): Mycopopulations in non dried and dried corn grains. Acta Biol. Iugosl. 5: 1-21.

37-Ogundero, V. W. (1980): Fungal flora of poultry feeds. Mycologia, 72: 200-202.

38-Ogundero, V. W. (1987): Toxigenic fungi and the deterioration of Nigerian poultry feeds. Mycopathologia, 19: 75-83.

39-Pitt, J. I. (1979): The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces. Academic Press, London.

40-Purhase, I.F.H. (1971): Symposium on Mycotoxins in Human Health, The MacMillian Press Ltd, London, UK.

41-Ranjan, K. S. and Sinha, A. K. (1991): Occurrence of mycotoxigenic fungi and mycotoxins in animal feed from Bihar, India. J. Sci. Food Agric. 56: 39-47.

42-Raper, K. B. and Fennell, D. I. (1965): The genus *Aspergillus*. Williams & Wilkins, Baltimore, U. S. A.

43-Reiss, J. (1995): Moulds in containers with biological wastes. Microbiol. Res., 150: 93-98.

44-Schaible, P. J. (1970): "Poultry feeds and nutrition" Weatport, Connecticut. The AVI Publishing company, INC., P. 339-406.

45-Shotwell, O. L.; Hesseltine, C. W.; Stubblefield, R. D. and Sorenson, G. W. (1966): Production of aflatoxin on rice. Applied Microbiol., 14: 425-428.

46-Singh, N. P. and Singh, C. M. (1970): Aspergilli associated with respiratory tract of poultry, buffalos, sheep and goats. Indian Vet. J., 47: 624.

47-Sivanesan, A. (1984): The bitunicate Ascomycetes and their anamorphs. Straus & Cramer, Germany.

48-Sivanesan, A. (1987): Graminicolous species of Bipolaris, Curvularia, Drechslera, Exserohilum and their teleomorphs. Mycological papers No. 158, C. A. B., International Mycological Institute, Kew, England.

49-Swelim, M. A.; Baha, Z. A.; El-Dohlob, S. M.; Hazzaa, M. M. and El-Sayed, T. I. (1994):Mycoflora of stored poultry fodder in Egypt and their ability to produce aflatoxins. Microbiol. Res., 149 (4): 435-442.

50-Tabib, Z.; Jones, F. T. and Hamilton, P. B. (1981): Microbiological quality of poultry feed and ingredients. Poultry sci., 60: 1392-1397.

Ass. Univ. Bull. Environ. Res. 1(1) (1998) 1-16

التقييــــــم الفطــــرى لعلائق الدواجـــن
وبعض المركزات والمكونات خاصتها

مصطفى محمد أحمد ، ماضى أحمد إسماعيل* ، سطوحى أحمد سطوحى ، عبد المعز أحمد إسماعيل

قسم صحة الحيوان - كلية الطب البيطرى - جامعة أسيوط - ج٠م٠ع

*قسم النبات - كلية العلوم - جامعة أسيوط

أجريت هذه الدراسة للوقوف على الحالة الصحية لبعض علائق الدواجن ومكوناتها وذلك بالتقييم الفطرى لها . وإستيفاءاً لهذا الغرض فإنه قد تم تجميع وإجراء الفحوص الميكولوجية لإجمالى عدد ٨٢ عينة شملت ٢٢ عينة عليقة منتج نهائى ، ١٨ عينة مركزات أعلاف هذا بالإضافة إلى ٤٢ عينة من المكونات الأولية لهذه العلائق والتى تم تجميعها من وحدات متخصصة لإنتاج علائق الدواجن المختلفة .

وقد أظهرت النتائج وجود محتوى مائى تمثل فى متوسطات قيم الرطوبة النسبية لبعض هذة العلائق ومكوناتها والتى تراوحت بين ٤,٥٨ ± ٠,٧٢ إلى ٧,٠٦ ± ٠,١٧ هذا بالإضافة إلى وجود أعداد من الفطريات والخمائر تمثلت بمتوسطات قيم تقع بين (١,٩×$١٠^{٤}$ إلى ٥,٢×$١٠^{٤}$) وذلك للعد الطبقى القياسى لكل ١ جرام عند درجة حرارة الغرفة والتى قدرت بقيمة عد أدنى ٤,٤ × $١٠^{٣}$ لكل ١ جم من مركزات العلائق وكذلك عد أقصى قدره ١,٣ × $١٠^{٥}$ لكل ١ جم من علائق الدواجن . وقد أسفرت الدراسة عن عزل العديد من عترات الفطريات والتى لها أهمية بالغة لصحة وإنتاجية الدواجن وصناعتها والتى بلغ إجمالها ٦٦٤ عترة لعدد ٢٠ جنس من الفطريات المختلفة وقد تمت مناقشة الأهمية الصحية لأهم عترات الفطريات المعزولة هذا بالاضافة للتوصيات والاشتراطات الصحية الواجب توافرها للحصول على منتج ذى مواصفات جيدة يخلو من مسببات الأمراض والتى قد تنجم عن وجود بعض الفطريات المفرزة للسموم حفاظا على الثروة الداجنة .