Aflatoxins Residues in Some Poultry Meat Products

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Abstract

Mycological evaluation and detection of Aflatoxins residues in chicken processed meat product were carried out to evaluate the quality and safety of the examined samples which sold in local markets at Zagazig City in EL-Sharkia governorate, Egypt. A total of One hundred samples of different chicken meat products represented by luncheon, burger, coated fillet, Fillet and Liver (20 of each). The average total mould counts in the examined samples of chicken meat products were $6.25 \times 10^2 \pm 1.85 \times 10^2$, $3.78 \times 10^2 \pm 1.14 \times 10^2$, $2.34 \times 10^2 \pm 0.78 \times 10^2$, $2.19 \times 10^2 \pm 0.43 \times 10^2$ and $2.01 \times 10^2 \pm 0.53 \times 10^2$ respectively. Nine mould genera were could be isolated and identified. The identified mould genera were Aspergillus, Penicillium, Cladosporium, Rhizopus, Alternaria, Acremonium, Paecilomyces, Aurobasidi and Absidia with incidence rate of 58(58%) , 19 (19%), 13(13%), 11(11%), 10 (10%), 9(9%), 6 (6%), 4 (4%) and Absidia 2 (2%), respectively. On other hand, Aspergillus species were further identified into five species. The identified Aspergillus species were A. niger; 28 (28%) A.flavus 23 (23%), A.fumigatus 6 (6 %), A. terreus 1 (1%) and A .parasiticus 3 (3%). The results revealed that the mean value of the total aflatoxins residues ($B_1 + B_2 +G_1 + G_2$) in the examined luncheon, burger, coated fillet, fillet and liver chicken meat product samples were $0.87 \pm 0.14$, $1.12 \pm 0.23$, $2.53 \pm 0.31$, $0.20 \pm 0.03$ and $0.82 \pm 0.19$ ppb, respectively. The public health significance of isolated mould species and aflatoxins residues was discussed.

Introduction

Chicken meat and chicken meat products are not only tasty, economical, quick and easy to prepare food but also provide a unique well balanced source of minerals, vitamins, proteins and healthy fats for all ages. Moreover, their high quality, low caloric value and ease to digestibility make chicken valuable in many therapeutic diets for adults. Poultry industry suffers from greater economic losses due to greater susceptibility to fungal growth and toxin production which are considered challenges to food safety especially in tropical and subtropical regions. Fungi comprise a large group of microorganisms which are ubiquitous in nature due to easy dissemination and their vegetative spores, which are produced in large numbers and can present in the environment for a long period. The contamination of chicken meat with fungi starts in the environment of the slaughter halls due to a lack of hygienic measures through air, wall, floor, utensils, hides and intestinal contents of the slaughtered birds (Mansour, 1986); also during handling procedures and processing of meat products through the use of contaminated additives which are considered the most important source of mould contamination in meat products (Abd El-Rahman, 1987). Also Gourama and Bullerman 1995 stated that mould contamination of some meat products indicated improper sanitary and hygienic conditions during handling, processing and storage, also the adding of bad or inferior quality of flavoring agents which may increase the load of contamination of such products with mould. Flavorings, especially spices, added to meat can considerably contribute to the mould contamination of the final products. Fungi are not only major spoilage agents of meat results in a reduction of quality with significant economic losses but also cause contamination of meat with secondary metabolites called mycotoxins. The ingestion of such mycotoxins has enormous public health significance, because these toxins are capable of causing diseases in man and animals ranging from death to chronic interference with the function of the nervous, cardiovascular, pulmonary and endocrine systems as well as alimentary tract.
The most well-known among the mycotoxins are aflatoxins (AFs), which are a group of heterocyclic metabolites produced by the fungi of the genus Aspergillus, particularly *Aspergillus flavus* and *Aspergillus parasiticus* that frequently contaminate animal feed and human food (Giambrone et al., 1985 and Magnussen and Parsi, 2013). The four naturally occurring AFs: aflatoxins B₁, B₂, G₁ and G₂, are toxic, mutagenic and carcinogenic compounds (CAST, 2003), having been classified by the International Agency for Research on Cancer as belonging to group 1 (substances that are carcinogenic for humans) (IARC, 1993). A potential immunosuppressant and nutritional interference effect has also been reported (Williams et al., 2004), as have mutagenic, teratogenic and hepatotoxic effects (Kenser et al., 2011)

Out of AFs group, B₁ is the most toxic and is classified as human carcinogen (Talebi et al., 2011). B₁ is usually the most predominant in foods and feeds, as well as the most potent hepatocarcinogen known in experimental animals and humans (Lopez et al., 2002). Human exposure to AFs is primarily from a consumption of contaminated food directly like cereals, seeds, fruits, etc., or indirectly by eating food products and by products obtained from animals consuming contaminated feeds (Galvano et al., 2005). The present study is planned to throw a light on the mould contamination of some chicken meat products with special attention to aflatoxigenic species of Aspergillus, and aflatoxins production in chicken meat products.

### Material and Methods

#### I-Quantitative and Qualitative Estimation of Mould:

**Collection of Samples:** A total of one hundred chicken meat product samples represented by luncheon, burger, coated fillet, fillet and liver (20 of each) were collected from different localities at Zagazig City. The samples were taken aseptically in sterile polyethylene bags without undue delay and transferred to the laboratory in ice box for mycological examination and aflatoxins residues detection.

**Preparation of Samples (ICMSF, 1980):** Ten-fold dilutions up to 10⁶ using sterile peptone water (0.1%) were prepared from each sample. Estimation of the Total Mould Count (APHA 1985): Total mould count was carried out by using Malt extract and Czapek’s-Dox agar (pH: 4.5) media. The plates were incubated at 25°C for 5~7 days and the mould colonies were calculated per gram the isolated mould colonies were further identified.

**Identification of Mould isolates:** The identification of mould colonies was carried out by careful observation and measurements of the mould colonies macroscopically and microscopically. The identification of mould genera and species was carried out, in which the genus Aspergillus was identified according to Rapper and Fennel (1965) and Samson (1979), the genus Penicillium according to Rapper and Thom (1949) and other mould genera according to Arx Von (1967), Zycha et al. (1969), Barenett and Hunter (1972) and Shipper (1978).

#### II. Quantitative Estimation of Aflatoxins Residues in Chicken Meat: (AOAC 1999)

**Standard Solutions:**

The stock and working standard solutions were prepared according to the method recommended by (AOAC 1999). Different concentrations of Aflatoxins were carried out for B₁, B₂, G₁ and G₂ from the standard (Supple co, Bellefonte, PA, USA).

**Extraction of Aflatoxins:** 100 grams of the sample were homogenized. 10 mL of 20% citric acid was added and mixed well; 200 mL of dichloromethane were added and kept in automatic shaker for 30 minutes. The mixture was filtered and the filtrated materials were evaporated under vacuum. Adding hexane to redissolve the extracted material.

**The Clean-Up:** The procedure for the extracts was performed through using Solid-phase extraction (SPE) columns which is made of porous silica modified to absorb impurities or mycotoxins.

**Derivatization:** Pre-column Derivatization enhances the detection and recoveries of Aflatoxins through treatment with TFA (trifluoroacetic acid).
Analysis Conditions: Analysis of AF was performed by Agilent HPLC apparatus (Agilent quaternary gradient pump, auto sampler, fluorescence detector and HPLC 2D Chemstation software (Germany). Analytical column(a reversed-phase column (Extend-C18, Zorbax column, 4.6 mm i.d., 250 mm, 5 µm, Agilent Co), kept in column oven at 30°C at flow rate of 1mL/min. Isocratic mobile phase consisting of De-ionized water: acetonitrile: methanol (60:20:20 v/v/v). The fluorescence detector is set at wave length 360 nm excitation and 440 nm emissions. 10 µL was the injection volume.

Results and Discussion

Total mould count.

The results in Table (1) show that mean values of total mould counts per gram (TMC/g) in the examined chicken meat product samples of luncheon, burger, coated fillet, fillet and liver were $2.01 \times 10^2 \pm 0.53 \times 10^2$ CFU/g, $3.78 \times 10^2 \pm 1.14 \times 10^3$ CFU/g, $2.34 \times 10^2 \pm 0.78 \times 10^3$ CFU/g, $2.19 \times 10^2 \pm 0.43 \times 10^2$ CFU/g and $6.25 \times 10^2 \pm 1.85 \times 10^2$ CFU/g, respectively. Concerning the samples of chicken luncheon, the results achieved seems to be in agreement with that reported by Hameida et al. (1986), El-Gazzar (1995), Farag (2000), Mohamed (2004), Hussein (2008), El-Diasty et al. (2013) and Gamal (2013). Higher values were mentioned by Abdel-Rahman et al. (1984), Shaltout (1996), Zayed (1999) and Saleh et al. (2013), meanwhile lower counts were obtained by Wadee (2010).

These variations were attributed to the variations in the amount and types of additives used for the manufacturing of chicken luncheon; the time/temperature exposure of the products and the hygienic measure adopted during processing. The obtained results obtained from the chicken burger seem to be in agreement with that reported by Brr (2004) and Hussein (2008). Higher values were mentioned by Zayed (1999) and Hegazy et al. (1992), meanwhile lower counts were obtained by Edris et al. (1992). Concerning the samples of coated chicken fillet, the results were nearly similar to what has been obtained by Mohamed (2004). Higher values were mentioned by Agamy and Hegazy (2011) and Saleh et al. (2013), meanwhile lower counts were obtained by Maamoun (2010) and Wadee (2010). Results were nearly similar to that obtained by Eldaly et al. (2002), Mohamed (2004) and El-Diasty et al. (2013). Higher values were mentioned by Hegazy et al. (1992), Gamal (2013) and Saleh et al. (2013), meanwhile lower counts were obtained by Saleh et al. (1990).

Regarding the results recorded for chicken fillet samples seem to be nearly similar to that obtained by Eldaly et al. (2002), Mohamed (2004) and El-Diasty et al. (2013). Higher values were mentioned by Hegazy et al. (1992), Gamal (2013) and Saleh et al. (2013), meanwhile lower counts were obtained by Saleh et al. (1990). Concerning the samples of chicken liver, the results were nearly similar to that obtained by Morshdy (1992), Eldaly and Neveen (2004), Mohamed (2004) and Gamal (2013). Meanwhile lower counts were obtained by Saleh et al. (1990). The obtained results declared that the examined chicken liver samples had the highest mould count, this may be due to contamination from the slaughter unite environment beside the hygienic level of equipments, followed by burger samples, then coated chicken fillet, chicken fillet and luncheon, while luncheon samples had the lowest count. These findings may be attributed to the heat treatment of luncheon which affects the fungal spore, while other products were processed and dispatched without any heat treatment. Also the variation of mould count in samples may be due to different levels of hygiene during manufacturing and storage.

Table (1): Statistical analytical results of total mould count / g of examined chicken meat products

<table>
<thead>
<tr>
<th></th>
<th>luncheon</th>
<th>burger</th>
<th>C. fillet</th>
<th>fillet</th>
<th>liver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>30</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>1 \times 10^2</td>
</tr>
<tr>
<td>Max</td>
<td>0.6 \times 10^3</td>
<td>2 \times 10^3</td>
<td>1.1 \times 10^3</td>
<td>0.7 \times 10^3</td>
<td>3 \times 10^3</td>
</tr>
<tr>
<td>Mean</td>
<td>2.01 \times 10^2</td>
<td>3.78 \times 10^3</td>
<td>2.34 \times 10^3</td>
<td>2.19 \times 10^3</td>
<td>6.25 \times 10^3</td>
</tr>
<tr>
<td>SE</td>
<td>0.53 \times 10^3</td>
<td>1.14 \times 10^3</td>
<td>0.78 \times 10^3</td>
<td>0.43 \times 10^3</td>
<td>1.85 \times 10^3</td>
</tr>
</tbody>
</table>

Isolated mould species: The results given in table (2) showed that Aspergillus; Penicillium;
Alternaria; Cladosporium; Rhizopus; Acremonium and Paecilomyces could be isolated from 8 (40%); 3 (15%); 2 (10%); 4 (20%); 3 (15%); 2 (10%) and 1 (5%) of luncheon samples, respectively. Nearly similar isolates obtained by Zayed (1999), Mohamed (2004), Hussein (2008) and Gamal (2013).

Aspergillus; Penicillium; Cladosporium; Rhizopus; Aurobasidium and Absidia could be isolated from 11 (55%); 5 (25%); 3 (15%); 2 (10%); 2 (10%) and 1 (5%) of examined chicken burger samples, respectively. Such moulds genera could be isolated by Edris et al. (1992), Zayed (1999) and Hussein (2008).

On the other hand Aspergillus; Penicillium; Alternaria; Cladosporium; Acremonium and Paecilomyces could be identified from 10 (50%); 4 (20%); 3 (15%); 4 (20%); 2 (10%) and 3 (15%) of the examined coated chicken fillet samples, respectively. These isolates nearly similar to that obtained by Mohamed (2004), Maamoun (2010) and Agamy and Hegazy (2011).

Aspergillus; Penicillium; Alternaria; Rhizopus; Acremonium and Aurobasidium could be isolated from 14 (70%); 4 (20%); 2 (10%); 3 (15%); 3 (15%) and 2 (10%) of examined chicken fillet samples, respectively.

These results substantiate what have been reported by Saleh et al. (1990), Wafaa (1995), Eldaly et al. (2002), Mohamed (2004) and Gamal (2013).

At the same time, Aspergillus; Penicillium; Alternaria; Cladosporium; Rhizopus; Acremonium; Paecilomyces and Absidia could be isolated from 15 (75%); 3 (15%); 3 (15%); 2 (10%); 3 (15%); 2 (10%); 2 (10%) and 1 (5%) of examined chicken liver samples, respectively. Nearly similar isolates obtained by Saleh et al. (1990), Morshdy (1992), Eldaly and Neveen (2004), Mohamed (2004) and Gamal (2013).

The arrangement of isolated and identified mould genera from the aforementioned results, cleared that Aspergillus had the highest incidence 58 (58%) followed by Penicillium 19 (19%), Cladosporium 13 (13%), Rhizopus 11 (11%), Alternaria 10 (10%), Acremonium 9 (9%) then Paecilomyces 6 (6%), Aurobasidium 4 (4%), and Absidia 2 (2%) in descending manner from all examined samples.

Table (2):

| Incidence of isolated mould genera in examined chicken meat products. |
|-------------------|--------|--------|--------|--------|--------|--------|--------|
|                  | Luncheon | Burger | C. Fillet | Liver | Total |
| Aspergillus       | 8       | 10     | 11       | 15     | 58     |
| Penicillium       | 3       | 5      | 4        | 4      | 16     |
| Alternaria        | 2       | 2      | 3        | 2      | 13     |
| Cladosporium      | 4       | 3      | 2        | 3      | 13     |
| Rhizopus          | 3       | 5      | 2        | 3      | 15     |
| Acremonium        | 2       | 2      | 3        | 2      | 9      |
| Paecilomyces      | 1       | 1      | 2        | 2      | 5      |
| Absidia           | -       | 2      | 1        | -      | 4      |

Identified Aspergillus species: The results presented in table (3) showed that incidence of identified Aspergillus species in the examined chicken meat and chicken meat product samples and declared that A. niger could be isolated from 3 (15%), 5 (25%), 5 (25%), 7 (35%) and 8 (40%) of the examined samples of chicken luncheon, chicken burger, coated chicken fillet, chicken fillet and chicken liver, respectively followed by A. flavus could be isolated from 3 (15%), 5 (25%), 4 (20%), 5 (25%) and 6 (30%) of the same examined sample, respectively. A. fumigates could be isolated from 2 (10%) from each chicken luncheon, chicken fillet and chicken liver samples. On the other hand A. terreus could be identified only from luncheon 1 (5%). Meanwhile A. parasiticus could be isolated from 2 (10%) of chicken burger and 1 (5%) of coated chicken fillet. These findings are nearly similar to those obtained by Saleh et al. (1990), Zayed (1999), Mohamed (2004), Hussein (2008), Maamoun (2010) and Wadee (2010).

Table (3):

| Incidence of identified Aspergillus species in examined chicken meat products (N= 20). |
|-------------------|--------|--------|--------|--------|--------|--------|
|                  | Luncheon | Burger | C. Fillet | Liver | Total |
| A. niger          | 3       | 13     | 5        | 5      | 23     |
| A. flavus         | 3       | 13     | 5        | 2      | 23     |
| A. fumigates      | 2       | 18     | -        | -      | 20     |
| A. terreus        | -       | -      | -        | -      | -      |
| A. parasiticus    | -       | 2      | 1        | 3      | 6      |

Aspergillus is a ubiquitous soil-dwelling fungus. Human infections are usually acquired by...
inhilation of airborne spores from inanimate sources. Pulmonary Aspergillosis can present as different forms, including pulmonary aspergillum, chronic necrotizing pulmonary aspergillosis, invasive pulmonary aspergillosis and allergic broncho-pulmonary aspergillosis, depending on the atopic and immune status of the host and the site of involvement within the respiratory system (Wong et al., 2008).

Aspergillus has been implicated in allergen-mediated disease such as asthma and hypersensitivity reactions (Roilides et al., 1993). Aspergillus species may induce pulmonary Aspergillosis, pulmonary allergy, skin infection, nasal infection (sinusitis) as well as nail and external ear infection, furthermore; cutaneous Aspergillosis has been encountered in neonates (Papouli and Roilides, 1996). Aspergillus flavus and A. niger caused lung disease when they grow and produce spores in the lungs. They were opportunistic and invade wounds, cornea and external ear in immunosuppressed patients, it could cause pneumonia (Jacquelum, 1999).

The total aflatoxins residues ($B_1 + B_2 + G_1 + G_2$): It is evident from the results presented in table (4) the total aflatoxins residues ($B_1 + B_2 + G_1 + G_2$) could be detected from the examined chicken luncheon, chicken burger, coated chicken fillet, chicken fillet and chicken liver samples with a mean value of 0.87 ± 0.14, 1.12 ± 0.23, 2.53 ± 0.31, 0.20 ± 0.03 and 0.82 ± 0.19 ppb, respectively. The obtained results declared that examined coated chicken fillet samples have the highest level of toxins followed by burger then luncheon and liver while the lowest level found in fillet samples. These may be related to the amount of additives used in processing. The higher values were found by Asim (1990), Shabana (1999), Mohamed (2004) and Wadee (2010).

At the same time, the mean values of detected aflatoxins in the examined samples were lower than the maximum permissible limit recommended by the United States federal government (20ppb).

**Table (4):**
Statistical analytical results of total aflatoxins residues ($B_1+B_2+G_1+G_2$) in PPb of examined chicken meat products.

<table>
<thead>
<tr>
<th></th>
<th>Chicken Luncheon</th>
<th>Chicken Burger</th>
<th>Coated Fillet</th>
<th>Chicken Fillet</th>
<th>Chicken Liver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Min</strong></td>
<td>0.48</td>
<td>0.47</td>
<td>1.64</td>
<td>0.09</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>Max</strong></td>
<td>1.26</td>
<td>1.78</td>
<td>3.44</td>
<td>0.31</td>
<td>1.38</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>0.87</td>
<td>1.12</td>
<td>2.53</td>
<td>0.20</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>SE</strong></td>
<td>0.14</td>
<td>0.21</td>
<td>0.31</td>
<td>0.03</td>
<td>0.19</td>
</tr>
</tbody>
</table>

The types of aflatoxins residues ($B_1$, $B_2$, $G_1$, $G_2$): In coated chicken fillet samples, the results achieved in table (5) revealed that the highest level of aflatoxins residues detected from coated chicken fillet samples were $B_2$ (with a mean value of 0.95±0.1 ppb), followed by $B_1$ (with a mean value of 0.8±0.2 ppb), then $G_1$ (with a mean value of 0.69±0.3 ppb) and $G_2$ (with a mean value of 0.09±0.007 ppb).

**In chicken burger samples:** The results achieved in table (5) revealed that the highest level of aflatoxins residues detected from examined burger samples were $G_1$ (with a mean value of 0.64±0.32 ppb) followed by $B_1$ (with a mean value of 0.43±0.14 ppb) then $B_2$ and $G_2$ (with a mean value of 0.02±0.003 ppb) for each.

**In chicken luncheon samples:** The results achieved in table (5) revealed that highest level of aflatoxins residues detected from examined luncheon samples were $B_2$ (with a mean value of 0.40±0.08 ppb) followed by $B_1$ (with a mean value of 0.36±0.05 ppb), $G_1$ (with a mean value of 0.09±0.01 ppb) and $G_2$ (with a mean value of 0.01±0.003 ppb).

**In chicken liver samples:** The results of liver samples achieved in table (5) revealed that $B_1$ had the highest level (with a mean value of 0.48±0.1 ppb) followed by $G_1$ (with a mean value of 0.31±0.2 ppb) then $G_2$ (with a mean value of 0.03±0.01 ppb), meanwhile $B_2$ was not detected.

**In chicken fillet samples:** Concerning to the results of chicken fillet samples achieved in table (5) revealed that $B_1$ had the highest level (with a mean value of 0.09±0.02 ppb) followed by $G_1$ (with a mean value of 0.07±0.04 ppb) then $B_2$ and $G_2$ (with a mean value of 0.02±0.008 ppb) for each.

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Table (5):
Statistical analytical results of different types of aflatoxins residues (B\(_1\), B\(_2\), G\(_1\), G\(_2\)) PPb of chicken meat product

<table>
<thead>
<tr>
<th>samples</th>
<th>Min</th>
<th>Max</th>
<th>Mean ± S.E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B(_1)</td>
<td>B(_2)</td>
<td>G(_1)</td>
</tr>
<tr>
<td>Luncheon</td>
<td>0.24</td>
<td>0.29</td>
<td>0.21</td>
</tr>
<tr>
<td>burger</td>
<td>0.40</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>C.fillet</td>
<td>0.07</td>
<td>0.77</td>
<td>0.05</td>
</tr>
<tr>
<td>Fillet</td>
<td>0.05</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>liver</td>
<td>0.03</td>
<td>-</td>
<td>0.06</td>
</tr>
</tbody>
</table>

From the achieved results, it is clear that the highest levels of B\(_1\), B\(_2\), AFG\(_1\) and G\(_2\) were in coated chicken fillet samples while the lowest level found in fillet samples. These may be related to the amount of contaminated additives used in processing of such products, most of meat additive and spices used in Egypt in meat processing factory imported by shipping which provide suitable condition for mould growth and production of aflatoxins as: presence of oxygen, temperature between 4°C and 40°C, pH-value between 2.5 and 8 (with an optimum between 5 and 8), minimum water activity of 0.80, maximum salt concentration of 14% (Ostry, 2001).

Food and Drug Administration (FDA) established regulatory working guidelines on the acceptable levels of aflatoxins in human foods set at 20 ppb for total aflatoxins, with the exception of milk which has an action level of 0.5 ppb of aflatoxins (Bullerman, 1979). At the same time, the mean values of detected aflatoxins in the examined samples were lower than the maximum permissible limit recommended by European community (EC) No 1881/2006 in food for human consumption of 10 µg/kg for total aflatoxins B\(_1\), B\(_2\), G\(_1\) and G\(_2\), and 5 µg/kg for aflatoxin B\(_1\). but it should be noted that the production of aflatoxins may be accelerated by improper production and handling of foods.

The most effective mean to prevent aflatoxigenic mould contamination of meat products is through application of strict hygienic measures during the processing of meat products and using good quality meat additives, as well as application of HACCP system in handling during the production stages of the products. Educational programs and training courses must be applied for meat handlers and workers.

**References**


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بقايا السموم الفطرية في بعض مصنعت الدواجن

علي الدين محمد علي مرشد و محمد إبراهيم عبد الرحمن عبد العال

قسم مراقبة الأغذية والمعمل المركزي بكلية الطب البيطرى جامعة الزقازيق

التعرض لمصنعت الدواجن للتلوث بالفطريات المتشرة في أماكن إعدادها كما أن هذه الفطريات لها القدرة على إنتاج السموم الفطرية التي تسبب في خسائر اقتصادية فادحة في صناعة الدواجن فضلا عن تأثيرها الخطر على صحة كلا من الإنسان والحيوان. لذلك تم فحص عد 100 عينة ميكولوجيا من لحوم و بشرة و شرائح صدور المغطاة ببطيئة من إضافات اللحوم والتوابل و شرائح صدور المخلية و غير المغطاة وأكياس الدجاج بواقع عدد 20 عينة من كلا منهم ثم تجميعها عشوائيا من أماكن بيع مختلفة بمدينة الزقازيق محافظة الشرقية.

وبعد أن أوضح النتائج أيضا أن عينات أكياس الدجاج و عينات أكياس الدجاج المخلية و غير المغطاة و شرائح الدجاج المخلية ببطيئة من إضافات اللحوم والتوابل و شرائح صدور الدجاج و شرائح نواة اللوز و نواة الخضروات و نواة الفواكه، و ظهرت النتائج ضد التلوث الميكولوجي و وجب أن فطر الأسبريلجس هو الأعلى انتشارا ليلية البنسليميوم ثم الكلادوسوريويم ثم الريبوس ثم البرازينكس ثم آكراونيم يليه الباسيلوميس ثم الارلسبيديوم وأخيرا الأبسيديا وأظهرت النتائج أيضا أن هناك خصائص أنواع من فطر الأسبريلجس تم عزلها من العينات و قد تبين من النتائج أن أسبريلجس نيجر هو الأكثر كرارة و ويليه أسبريلجس فلافيكس و أسبريلجس فيمينيس، و أسبريلجس تيريس و أسبريلجس برازيتكس. و قد أوضح النتائج تلوث العينات بأنواع مختلفة و نسب متفاوتة من بقايا سموم الأفلاتوكسينات، ب، ج، ج، ج، و. ووجد أن جميع هذه العينات لم تمت الأد الأقصى المسموح به وهو 20 جزء في المليون و تمت مناقشة الأهمية الصحية لأنواع الفطريات المعزولة و بقايا سموم الأفلاتوكسين على صحة الإنسان.