Studies on Mycological Status of
Sundried Jew's-Mallow Leaves and Okra Fruits in Egypt

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Abstract: Thirty samples of each of sundried jew's mallow leaves and okra fruits collected from six Governorates in Egypt were analyzed for their mould contamination and potential presence of mycotoxins. Mycological investigation revealed that twenty-six species and two varieties belonging to 13 genera of fungi were identified on Czapek's-dextrose and potato-dextrose agar media at 28±2°C using dilution-plating method. Okra fruit samples were highly contaminated with fungal spores (total counts were 47523 and 30563 colonies g⁻¹ sample) than jew's mallow leaves samples (16608 and 6045 colonies), while the relative diversity and broad number of fungal genera and species was recorded on jew's mallow leaves (10 genera, 20 species + one variety and 6 genera, 10 species) than okra fruit samples (8, 16 + 2 and 3, 9 + 1) on the two used media, respectively. Aspergillus was the highest occurrence (100% of the samples) and represented by 13 species + one variety of which, A. flavus, A. niger, A. fumigatus, A. awamori, A. foetidus and A. ficiun were the predominant. Mucor, Rhizopus, Fusarium, Myrothecium, Emericella and Cochliobolus were fungal genera isolated with different occurrences in high or/and moderate from the two plants samples tested on the two used media. Mycotoxin analysis proved that jew's mallow leave samples were free from any detectable mycotoxins, while five samples of dried okra fruits out of 30 tested (16.7%) were proved to be toxic. It is the first record of mycotoxins contamination of okra fruits in Egypt. The ability of 347 isolates of recovered fungi was screened for production of mycotoxins and extracellular cellulase enzymes.

Keywords: Fungi, Mycotoxins, Jew's mallow leaves, okra fruits, cellulase enzymes

INTRODUCTION

The genus Corchorus comprises certain herbs and shrubs. It contains about 100 species, which are distributed in the tropics and subtropics, chiefly South East Asia and South America (Ahmad et al., 1998). One of these species is Corchorus olitorius L. plant (Fam. Tiliaceae), which is cultivated to provide bark for the production of fibres (Jute) and mucilaginous leaves for using in food as a vegetable. C. olitorius is known by many names jute in Bengal, jew's-mallow leaves, alias melokhia in Japan and melochia in Egypt (Gupta and Mikerji, 1982, Tanda, 1998; Hasan, 2002).

The seeds are used as a purgative and the leaves as a tonic and diuretic (Oliver-Bever, 1986). The leaf powder and its water-soluble viscous solution were found to decrease total serum and liver cholesterol concentrations and increase the fecal excretion of bile acids, total neutral sterols and cholesterol (Imani et al., 1995). Two digitoxigenin glycosides (coroloside and gluceovia trinomoside), as well as, four strophantidine glycosides (erysimoside, olitoriside, corchorosid A and helveticoside) were identified as main cardiac glycosides in the methanol extract of leaves (Goda et al., 1998). Three cardenolides were isolated from C. olitorius seed-leaves and their cytotoxic activities were evaluated against six cancer cell lines (Abdel-Wahab et al., 1999). Four flavonoid glycosides; astraagaline,
tolifolin, isosquaretin and juglanin, as well as oleanolic acid glyceryl monopalmitate, β-sitosterol and β-sitosterol-3-glycoside, were isolated from the leaves of C. olitorius (Kohda et al., 1994).

Six phenolic antioxidative compounds were identified in the leaves and their antioxidant activities were measured and caffeoylquinic acid was proved to be a predominant phenolic antioxidant in C. olitorius leaves (Azuma et al., 1999). Phytoalexins are antimicrobial compounds synthesized by a plant in response to infection or stress. Five coumarins (scopeolin, fraxinel, isopimpinellin, xanthotoxol and paeonal) were found to be produced as phytoalexins (stress metabolites) from the fresh young leaves of C. olitorius L. plant, in response to inoculation with biotic stress agent such as the spore suspension of the fungus Helminthosporium turcicum and with chemical stress agents, such as aqueous solution of mercuric chloride and cupric chloride (Abou-Zeid, 2002).

Okra, Abelmoschus esculentus L. Moench (Syn. Hibiscus esculentus L.) is of the Malvaceae or mallow family. It is known by many names: Lady fingers, okro, ochro, okoro, quinombho, bhindi, bindi, baima, bamiya, bamieh (Raffray, 2001). Okra edible part is the fruit pod, which varies in color from yellow to green. Okra can be served raw, marinated in salads or cooked on its own and goes well with tomatoes, onions, peppers and eggplant. Whole, fresh okra pods also make excellent pickles. Its subtle flavor can be compared to eggplant, though the texture is somewhat unusual. Many people prefer breaded and fried okra, because the slippery substance is less pronounced (Bodin, 1995).

Okra, fruit of a large vegetable plant thought to be of African origin, was brought to the United States three centuries ago by African slaves. The word, derived from the West African nkruna, was in use by the late 1700s. Okra grows wild in the upper watershed of the Nile and domestication of the plant began in the Nile basin in Egypt, where Egyptians have cultivated it for centuries. It spread through North Africa and onto the Mediterranean and India and first appeared in new world in Brazil and Dutch Guiana. Today, the major US centers for okra production are in the southeast: Texas, Georgia, Florida, California, Tennessee and Alabama (Raid and Palmateer, 2006).

In Egypt, okra fruits and jew's mallow leaves are important fresh vegetable crops in spring and summer for cooking, also used as dry vegetables for all year round cooking (EL-Shaikh, 2005). Large poverty population sundried okra fruits and jew's mallow leaves in dusty humidity weather and stored in unhealthy conditions, therefore, many microbes especially fungi can grow and secrete their toxic substances with human health, hazardous risk.

Extensive studies have been carried out on mycoflora and mycotoxins of several agricultural commodities such as seeds, grains, medicinal plants, dried raisins (EL-Kady and Youssef, 1993; Youssef, 1995, 1999; Youssef et al., 2000, 2002). On the other hand no published studies exist on mycoflora and mycotoxins contamination of dried okra fruits or jew's mallow leaves, therefore the purpose of this research is to study fungal and mycotoxins contamination of these dried vegetables, which used in cooking as cheapest and popular foodstuffs in Egypt.

MATERIALS AND METHODS

Collection of Samples

Thirty samples of each of dried okra fruits and dried jew's mallow leaves about (250-300 g, each) were collected at March 2006 after 20-22 storage weeks from different retail markets of vegetable crop seeds and plants of six Governorates in Egypt namely; EL-Faiyum, EL-Miria, Assiut, Sohag, Qena and Aswan. Each sample was placed in a sterile polyethylene bag, transferred to the mycological laboratory and kept in a cool place (3-5°C) until fungal determination and mycotoxin analysis.

Determination of Moisture Content

Twenty gram of each sample were ground in an electric mill and dried in an oven for 24 h and 105°C, then cooled in a desiccator and re-weighted to a constant weight. The moisture content was
calculated as percentage of the dry weight according to the technique of the International Seed Testing Association (1966).

**Determination of Fungi**

The dilution-plate method as described by Johnson and Curl (1972) was used for isolation of fungi. Modified Czapek’s-dextrose agar medium (g L\(^{-1}\): sodium nitrate 3.0, magnesium sulphate 0.5, potassium chloride 0.5, di-potassium hydrogen phosphate 1.0, iron sulphate 0.01, glucose 10.0, agar agar 15.0-20.0, pH 7.3±0.1) and potato-dextrose agar medium (g L\(^{-1}\): 200 g potatoes infusion, 20 g dextrose, agar agar 20.0 g) were used as isolating media. Chloramphenicol (0.5 mg mL\(^{-1}\)) and rose Bengal (30 ppm) were added to the medium as bacteriostatic agents (AL-Doory, 1980; Martin, 1950). Twelve plates, six for each medium were used for each sample. The plates were incubated at 28±2°C for 7-15 days and the developing fungi were identified, counted and calculated per g dry weight of tested sample. The colonies of slow growing fungi as well as mycelial bits were transferred to slants to ensure precise counting then to plate for identification.


**Sample Preparation for Mycotoxins Analysis**

**Extraction Procedures**

Fifty gram of each sample were defatted by extraction with cyclohexane (150 mL) for 10 h using Soxhlet-type extractor. The defatted residue was extracted with ethyl acetate (three times, 50 mL each). The extracts were combined, dried over anhydrous sodium sulphate, filtered and then concentrated under vacuum to near dryness and transferred into brown glass vial and evaporated under nitrogen stream. For preparing the crude extracts, the crude extract was suspended in 1 mL chloroform and applied to 14×0.8 cm column containing 2.5 g Kiesel gel 60, 70/230 silica gel. The washing and eluting solvents (8 mL, each) were carried out according to AOAC (1984).

**Mycotoxins Production by Fungal Isolates**

A number of 347 fungal isolates (represented 26 species + 2 varieties appertaining to 13 genera) were firstly grown on potato-dextrose agar slants at 28°C for 7-10 days. For each isolate, an inoculum (10\(^{6}-10^{7}\) spores mL\(^{-1}\)) was cultivated on Czapek’s-dextrose medium profited by 2 g yeast extract and 10 g peptone per liter and incubated at 28°C for 12 days. After the incubation period had finished, the culture in each flask (medium + mycelium) homogenized for 5 min in a high-speed blender (1,600 rpm) with chloroform (three times, 75 mL, each). The combined extracts were dried over anhydrous sodium sulphate, filtered, then concentrated under vacuum and transferred into a brown vial with a small amount of chloroform.

**Bioassay of Toxins**

Brine shrimps (Artemia salina L.) larvae were used for mycotoxins bioassay test according to Korpinen (1974).

**Thin Layer Chromatography (TLC)**

For qualitative detection of mycotoxins, thin layer chromatography technique was employed using precoated silica gel plates type 60 F\(_{254}\) TLC (E, Merck, Germany). Aflatoxins B\(_1\), B\(_2\), G\(_1\) and G\(_2\), ochratoxin A and B, sterigmatocystin, citrinin, T\(_2\)-toxin, diacetoxyscirpenol, patulin, fumigillin, terrin,
gliotoxin, rubratoxin B, roquefortin and zearealenone were applied as standard references. The developing solvent system was ethyl acetate-hexane (v/v, 30: 70) and the developed plates were viewed under short wave length UV (252 nm) light according to AOAC (1984) and Dormer (1998).

High Performance Liquid Chromatography (HPLC)

HPLC analysis was done using Spherisorb 5sil column (250×4.6 mm). Mobile phase was chloroform-methanol (v/v, 97:3) with flow rate 1.2 ml. min⁻¹ for 20 min. The quantitative determination of mycotoxins was carried out compared with standard mycotoxins (Sigma).

Screening for Extracellular Cellulase Enzymes Production by Isolated Fungi

Agar overlay assay technique was used as described by Schneider and Kubelka (1989) and Zani et al. (1991) to determine the fungal cellulolytic activity. Different sterilized Czapek’s-cellulose agar media containing 2% of carboxy-methyl cellulose or avecel or cellulose powder instead of 1% glucose were used. Four cylinder reservoirs (7×7 mm) were made using a narrow cork-borer. Similar volume 100 μL of tested fungus filtrates (pre-cultivated in the three Czapek’s-cellulose liquid media for 12 days transferred into each reservoir. One hundred microliter sterilized distilled water were transferred into the last reservoir as control. The dishes were incubated for 48 h at 30°C. After incubation, the congo-red solution was transferred into each reservoir for 15 min, the clear zone diameters around the reservoirs were determined using Vernier caliper as indication of cellulase enzyme activity of each fungus on different cellulolytic agar media.

RESULTS AND DISCUSSION

The moisture content of sundried jew’s mallow leaves and okra fruit samples was considerably low and ranged between 3.6-8.1 and 5.2-6.8, respectively.

Mycological analysis of samples based on dilution-plating method using Czapek’s-dextrose and potato-dextrose agar media at 28°C revealed that twenty-six species and two varieties belonging to 13 genera were identified. The gross total viable count, as well as number of fungal genera and species collected from sundried jew’s mallow leaves samples were (16608 colonies g⁻¹ dry weight sample, 10 genera and 20 species + one variety) and (6045 colonies, 6 genera and 10 species). While from okra fruit samples were (47523 colonies, 8 genera and 16 species + 2 varieties) and (30563 colonies, 3 genera, 9 species + 1 variety) on the two media, respectively (Table 1, 2).

The total count of filamentous fungi recovered from the samples tested widely fluctuated between 312-592 and 1120-1680 colonies g⁻¹ dry weight sample on Czapek’s-dextrose agar medium and from 186-280 and 740-1183 on potato-dextrose agar medium from sundried jew’s mallow leaves and okra fruit samples, respectively. The lowest spectrum of fungal species may be related to the highly contamination of samples with Aspergillus species, which have a powerful competitive ability against other fungal species. This result agrees with the data recorded by Srivastava and Dayal (1982), Gupta and Mukerji (1982), Adabanjo and Shopeju (1993) and Youssef et al. (2000, 2002, 2003).

Aspergillus is the highest occurrence on the two media from all samples tested (100%) of jew’s mallow leaves and okra fruits. It occupied the first order (13113 colonies g⁻¹ dry weight, 78.95% of total count and represented by 11 species + one variety) and (4710, 77.91% and 5) from jew’s mallow leaves, while (44811, 94.29% and 9 + 1) and (28312, 92.63% and 6 + 1) from okra fruits on Czapek’s-dextrose and potato-dextrose agar media, respectively. A. awamori, A. flavus, A. niger, A. fumigatus, A. foetidus, A. versicolor and A. ficium were the most common species (Table 1, 2). These results are in agreement with results obtained by Dayal and Srivastava (1973), Srivastava and Dayal (1982), Gupta and Mukerji (1982), Adabanjo and Shopeju (1993), Youssef et al. (2000, 2002) and Siddiqui et al. (2004).
On Czapek's-dextrose agar, *Mucor* ranked the second order in number of cases of isolation 24 and 22 cases in spite of its count is low 390 and 282 colonies g⁻¹ from jow's mallow leaves and okra fruits, respectively. *Myrothecium* occupied the third order in jow's mallow, while *Fusarium* come in the third place from okra fruits. On the other hand on potato-dextrose agar *Rhizopus* occupied the second order in both tested plants, while *Mucor* ranked third place in case of jow's mallow leaves and *Fusarium* in case of okra fruits (Table 1, 2).

The remaining fungal genera and species were less frequent on the two isolation media. Most of the recorded fungal species in this study had identified before from rhizosphere of okra fruits in India (Dayal and Srivastava, 1973; Srivastava and Dayal, 1982), from leaf surface of four varieties of jow's mallow leaves in Bengal (Gupta and Mukerji, 1982), from some sundried vegetables including okra fruits and jow's mallow leaves in Nigeria (Adebanjo and Shojeiu, 1993) and from different seeds, grains, medicinal plants and other sources in Egypt (El-Kady and Youssef, 1993; Youssef, 1995, 1999; El-Maghraby et al., 1995, Youssef et al., 2000, 2002, 2003).

In case of jow's mallow leaves, 11 species and one variety belonging to 6 genera were isolated only on Czapek's-dextrose agar medium and completely missed on potato-dextrose agar medium and these were: *A. foetidus, A. versicolor, A. parasiticus*, *A. flavo-fuscatus, A. ochraceus, A. terreus*, *A. flavus* var. *columnaris*, *Myrothecium verrucaria*, *Emericella nidulans*, *Fusarium equiseti*, *Papillaspera immersa*, *Cladosporium cladosporioides* and *Eurotium tonophilus*. While, *Penicillium* was represented by *P. purpurogenum* and *isolated only on potato-dextrose agar medium and completely missed on Czapek's-dextrose agar medium (Table 2).

On the other hand in case of okra fruits (9 species + one variety and 6 genera) were recovered on Czapek's-dextrose and completely disappeared on the other medium and these were: *A. flavo-fuscatus, A. foetidus, A. carbonarius, A. terreus, Emericella nidulans, E. variecolor* var. *astellata*, *Penicillium oxalicum*, *Cladosporium cladosporioides, Mucor racemosa* and *Apoicera chrysosperma*. While, *A. parasiticus* and *Fusarium oxysporum* were the only two species recovered on potato-dextrose agar medium only and completely missed on other medium (Table 2).

The results revealed that Czapek's-dextrose agar medium is better than potato-dextrose agar medium in cultivation and enrichment of fungi. Also, the gross total count of fungi from okra fruits is
Table 2: Total counts (TC, calculated per g dry sample), number of cases of isolation (NCI, out of 30 samples) and occurrence remarks (CR) of fungal genera and species isolated from sun-dried Jew’s mallow leaves and dried fruits. Chi-squared-breast and potato-dextrose agar media at 28°C using dilution-plating method.

<table>
<thead>
<tr>
<th>Sample name</th>
<th>Sun-dried Jew’s mallow leaves</th>
<th>Sun-dried dry fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TC</td>
<td>TC %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cladosporium</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beijerinckia (total count)</td>
<td>13113</td>
<td>78.95</td>
</tr>
<tr>
<td>A. flavus Link</td>
<td>2585</td>
<td>15.36</td>
</tr>
<tr>
<td>A. niger Van Tieghem</td>
<td>1325</td>
<td>11.09</td>
</tr>
<tr>
<td>A. fumigatus Freesius</td>
<td>405</td>
<td>2.92</td>
</tr>
<tr>
<td>A. cryophilum Pihlamar</td>
<td>7000</td>
<td>42.63</td>
</tr>
<tr>
<td>A. tenuis (Nakae)</td>
<td>810</td>
<td>5.07</td>
</tr>
<tr>
<td><strong>Thorn</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. versicolor (Vollheim)</td>
<td>90</td>
<td>0.54</td>
</tr>
<tr>
<td>P. italicum (Bach)</td>
<td>300</td>
<td>1.81</td>
</tr>
<tr>
<td><strong>Humin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. flavus var. coeruleus</td>
<td>25</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>B. cinerea (Pers.)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. parrotii Spegarie</td>
<td>10</td>
<td>0.67</td>
</tr>
<tr>
<td>A. flavus-fujinum</td>
<td>15</td>
<td>0.94</td>
</tr>
<tr>
<td>A. ochraceus Wilhem</td>
<td>15</td>
<td>0.94</td>
</tr>
<tr>
<td>A. terestris Torst</td>
<td>15</td>
<td>0.94</td>
</tr>
<tr>
<td>A. alternatae (Purcell)</td>
<td>15</td>
<td>0.94</td>
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<td>A. alternatae (Purcell)</td>
<td>15</td>
<td>0.94</td>
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<tr>
<td>A. alternatae (Purcell)</td>
<td>15</td>
<td>0.94</td>
</tr>
</tbody>
</table>

very highly (47523 and 30563 colonies g⁻¹ dry weight) in comparison of Jew’s mallow leaves (16608 and 6045) on the two media used, respectively. This result is agreed with Bailey and Mansfield (1982) and Abou-Zeid (2002) that fresh young leaves of Jew’s mallow produced phytoalexins in response to
microbial infection, which are antimicrobial compounds played an important role in inhibition growth and secondary metabolites production of field and storage fungi.

The toxicity test using brine shrimp larvae (Artemia salina L.) revealed that the ethyl acetate extracts of five samples (16.7%) out of 30 dried okra fruits proved to be toxic. Based on TLC and HPLC analysis, aflatoxin B1 was detected in two samples with concentration 8.8 and 10.2 μg kg⁻¹ of dried sample. While, aflatoxins B2 and G2 were detected in one sample (9.8 and 8.2 μg kg⁻¹) whereas aflatoxins B1, B2, G1, and G2 were recorded in two samples (8.9-12.2 μg kg⁻¹). These toxic samples were heavily contaminated with many members of Aspergillus flavus group (A. flavus, A. parasiticus, A. flavo-fuscatus and A. flavus var. commuteus). On the other hand one sample was contaminated with zearalenone (9.6 μg kg⁻¹) and another sample was contaminated with dicaetoxyscirpenol (DAS, 10.2 μg kg⁻¹) and these samples were contaminated with Fusarium species (F. oxyssporum and F. equiseti) highly toxins-producers (Table 3, Fig. 1).

It is worth to mention that in case of jaw's mallow leaves, no mycotoxin could be detected in any sample using TLC and HPLC, in spite of the toxicity test using brine shrimp revealed that all samples are very toxic (100% death). This result may be due to the highly phytotoxins content of jaw's mallow leaves, which played an important role in prevent mycotoxins production and lead to death of larvae. The obtained results are in harmony to those recorded by Bailey and Mansfield (1982) and Abou-Zeid (2002).

The present study shows the correlation of aflatoxin B1 concentration as effective toxic agent and mortality of brine shrimp larvae (Fig. 2). In addition, it is clear that identified mycotoxins have been produced by infecting toxicogenic fungi during long drying period of okra fruits in dusty humidity warm weather contaminated with aspergilli spores. These results are in harmony to those recorded by

Table 3: Sample number (SN), sample source, biological assay (Brine shrimp), natural occurring of mycotoxins identified and common mycotoxin-producing fungi isolated from the toxic okra fruit samples

<table>
<thead>
<tr>
<th>SN</th>
<th>Sample source (Geography)</th>
<th>Mycotoxin identified (μg kg⁻¹)</th>
<th>Mycotoxin producing fungi</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>El-Minia</td>
<td>Aflatoxin B1 (16.2 μg kg⁻¹)</td>
<td>A. flavus, A. parasiticus</td>
</tr>
<tr>
<td>6</td>
<td>El-Fayyum</td>
<td>Aflatoxin B1 (8.4 μg kg⁻¹)</td>
<td>F. oxysporum, F. equiseti</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Zearalenone (9.6 μg kg⁻¹)</td>
<td>A. flavus, A. parasiticus</td>
</tr>
<tr>
<td>9</td>
<td>El-Fayyum</td>
<td>Aflatoxin B1 (8.4 μg kg⁻¹)</td>
<td>F. oxysporum, F. equiseti</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DAS (10.2 μg kg⁻¹)</td>
<td>F. oxysporum, F. equiseti</td>
</tr>
<tr>
<td>17</td>
<td>Sohag</td>
<td>Aflatoxin B1 and G2 (9.8 and 8.2 μg kg⁻¹)</td>
<td>A. flavus, A. parasiticus, A. flavo-fuscatus, A. flavus var. commuteus</td>
</tr>
<tr>
<td>22</td>
<td>Qena</td>
<td>Aflatoxin B1, B2, G1 and G2 (10.4-12.2 μg kg⁻¹)</td>
<td>A. flavus, A. parasiticus, A. flavus var. commuteus</td>
</tr>
</tbody>
</table>

*5 toxic okra fruit samples (16.7%) out of 30 tested

Fig. 1: Natural occurrence of mycotoxins in sundried toxic okra fruit samples
Adebanjo and Shopeju (1993), Yousef (1999) and Yousef et al. (2000, 2003). On the other hand, ochratoxin A and B, T3 toxin, patulin, terrin, gliotoxin, rubratoxin B, sterigmatocystin, citrinin, fumigillin and roquefortin could not be detected in any sample tested. It is the first record of mycotoxins in okra fruits in Egypt.
Testing the ability of fungal isolates (represented 26 species + 2 varieties appertaining to 13 genera) to produce mycotoxins revealed that 128 isolates (36.9%) proved to be mycotoxin-producers (Table 4). The ability of toxin production as well as the amount of released toxins differs not only among the fungal species but also among the different isolates of the same species. The obtained results are in harmony with those obtained by Youssef et al. (2000, 2003).

Since enzymes are important chemical weapons aiding the fungal pathogen to invade host tissues, it was essential to shed some light on the ability of isolated fungi to produce cellulase enzymes. These enzymes were detected in 28.1% of tested fungal cultures (Table 4). Hussein (2004) recorded similar results by testing the ability of fungi isolated from agricultural wastes (wheat straw, sugar-cane bagasse and water hyacinth) to produce cellulase enzymes. In Egypt, several investigations had been done for isolation of cellulolytic fungal species from different seeds and grains (Moubasher et al., 1972; Moubasher and Mazen, 1990; Samia-Soliman, 1999).

In conclusion, it is evident that sundried vegetables in unhealthy conditions and bad storage system in tropical and subtropical areas is considered a vehicle for numerous fungal pathogens contamination. As a result of mycological proliferation and the risk of mycotoxins as carcinogenic and hepatotoxic agents should be taken into consideration especially for babies, pregnant women and people with low immunity. So, for human public health, sundried vegetables in retail markets must be subjected to quality control and can be dried under antiseptic conditions and must be bagged in safety and healthy form.

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