AFLATOXIN IN DRIED FIGS

WHO/FAO pre-CCEURO Workshop
29 September 2014, Den Haag

Dr. Betül VAZGEÇER

Ministry of Food Agriculture & Livestock
General Directorate of Food and Control
Food Establishments and Codex Department
WHO WE ARE
MINISTRY OF FOOD AGRICULTURE & LIVESTOCK (MoFAL)

Main policy: assurance of high level protection of human health and consumers’ interest
CODEX CONTACT POINT
IN TURKEY
• The Codex Contact Point in Turkey is General Directorate of Food & Control (GDFC) under Ministry of Food, Agriculture & Livestock (MoFAL).

• General Directorate of Food & Control (GDFC) is the main directorate of the Ministry in charge of food safety, phytosanitary, veterinary and feed safety.
81 Provincial Directorates

1 National Food Reference Laboratory

41 Food Control Laboratories

1 Food Control and Research Institute

9 Veterinary Control Institutes

9 Directorates of Veterinary Border Inspection Posts

12 Directorates of Plant Quarantines
OUTLINE
I.  What Dried Fig is

II.  International standards & their importance

III.  CCCF meetings & preparing standards
DRIED FIG
Figs – older than the human

Figs, which have a story starting with “Adam and Eve”, are accepted as sacred fruit and mentioned in all holy books.

Since the beginning of human history & based upon archeological findings in the Mediterranean region, figs were most probably one of the first domestically used plants, ca 12000 years ago.
# Dried Fig – nutrition value(*)

<table>
<thead>
<tr>
<th>√</th>
<th>X</th>
<th>Recommended Daily Allowances / dried fig (100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbohydrates</td>
<td>sodium</td>
<td>energy (10%)</td>
</tr>
<tr>
<td>dietary fibers</td>
<td>fat</td>
<td>protein (7 %)</td>
</tr>
<tr>
<td>(high water soluble)</td>
<td></td>
<td>Calcium (17 % )</td>
</tr>
<tr>
<td>At least 17 types &amp; essential amino</td>
<td>cholesterol</td>
<td>Magnesium (30 %)</td>
</tr>
<tr>
<td>acids (aspartic acid &amp; glutamic acid)</td>
<td></td>
<td>Vitamin B$_1$ (5.2 % )</td>
</tr>
<tr>
<td>phenolic compounds</td>
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<td>Vitamin B$_2$ (4.5 %)</td>
</tr>
<tr>
<td>minerals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vitamins A, B1, B2 and C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(*): Vinson, A., 1999, The Functional Food Properties of Figs, Cereal Foods World, 44(2), 82-87
Dried Figs – producing countries

- Turkey
- Iran
- The United States
- Greece
- Spain
- Italy

Turkey leads the field, both in terms of quantity and production in the world.

The annual global trade in dried figs ranges from 110,000–150,000 tons (years between 2006 – 2011).
In the world, fig production amount in 2013 is 117,800 tons and it is expected 124,000 tons in 2014.
Annual dried fig export ranges between 56,000–70,000 tons based upon the yearly conditions.
Dried Fig – cultivation

• The main area of dried figs production:
  The Aegean region

• The cultivation area:
  ~ 485.30 km square

• Dried fig farmers: generally resource poor and manage small orchards (1 - 5 ha) mainly as low-input
Figs are mainly grown on marginal land that can not be utilized for other crops.

In Turkey as is typical throughout the world, and in other Mediterranean countries, numerous small farmers are involved in the commercial dried fig production.

Worldwide, the number of farmers who produce dried figs is assumed to be at least 60,000. In addition, if the seasonal and permanent workers working in fig packaging and trading facilities and in the orchards during the harvest period are taken into account, it can be assumed that in Turkey, in addition to 30,000 growers at least 50,000 people derive income from this product. Number of people with their families making a living from dried figs either directly or indirectly are estimated to be 250,000 individuals.
Dried Fig - Aflatoxin

- Tree nuts
- Maize
- Groundnuts
- Oilseeds
- Cocoa products
- Spices
- Dried fruits (e.g. dried figs)

In dried fig
- Fruit structure
- Formation
- Harvesting
- Drying

Aspergillus flavus & A. parasiticus
CAC & CCCF
Codex Alimentarius Commission (FAO & WHO; 1963)

- standards
- guidelines
- related texts

The main purposes of this Commission;
- protecting health of the consumers
- ensuring fair trade practices in the food trade,
- promoting coordination of all food standards work undertaken by international governmental and non-governmental organizations.
1. **PREAMBLE**

1.1 **Scope**

This Standard contains the main principles which are recommended by the Codex Alimentarius in dealing with contaminants and toxins in food and feed, and lists the maximum levels and associated sampling plans of contaminants and natural toxicants in food and feed which are recommended by the CAC to be applied to commodities moving in international trade.

1.2.2 **Contaminant**

Codex Alimentarius defines a contaminant as follows:

"Any substance not intentionally added to food, which is present in food as a result of the production (including operations carried out in crop husbandry, animal husbandry and veterinary medicine), manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food or as a result of environmental contamination. The term does not include insect fragments, rodent hairs and other extraneous matter".

This standard applies to any substance that meets the terms of the Codex definition for a contaminant, including contaminants in feed for food-producing animals, except:

1) Contaminants having only food and feed quality significance (e.g. copper), but no public health significance, in the food(s) given that the standards elaborated within the Codex Committee on Contaminants in Foods (CCCF) has the objective to protect public health.

Pesticide residues, as defined by the Codex definition that are within the terms of reference of the Codex Committee on Pesticide Residues (CCPR).

3) Residues of veterinary drugs, as defined by the Codex definition, that are within the terms of reference of the Codex Committee on Residues of Veterinary Drugs in Foods (CCRVDIF).

4) Microbial toxins, such as botulinum toxin and staphylococcus enterotoxin, and microorganisms that are within the terms of reference of the Codex Committee on Food Hygiene (CCFH).

5) Residues of processing aids that are within the terms of reference of the Codex Committee on Food Additives (CCFA)\(^1\).
Contaminant levels in food and feed shall be **as low as reasonably achievable** through best practice such as Good Agricultural Practice (GAP) & Good Manufacturing Practice (GMP) following an appropriate risk assessment.
Turkey introduced the document of ‘Discussion Paper on the Development of a **Maximum Level for Aflatoxins in Dried Figs**’ contained in CX/FAC 06/38/40 and proposed that the Committee consider new work on the development of a **Maximum Level for aflatoxins in dried figs** and of a **Code of Practice** for the prevention and reduction of aflatoxin contamination in dried figs.
In 2006, the Turkish National Code was taken as the basis to prepare the Draft Codex Code of Practice. In other words, although international Code of Practice for dried figs was only first published in 2008, the Code of Practice for dried figs has been applied in Turkey for a decade.
CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF AFLATOXIN CONTAMINATION IN DRIED FIGS

INTRODUCTION

1. The elaboration and acceptance of a Code of Practice for dried figs by Codex will provide uniform guidance for all countries to consider in attempting to control and manage contamination by various mycotoxins, specifically aflatoxins. It is of high importance in order to ensure protection from aflatoxin contamination in both producer and importer countries. All dried figs should be prepared and handled in accordance with the Recommended International Code of Practice – General Principles of Food Hygiene\(^1\) and Recommended International Code of Hygienic Practice for Dried Fruits\(^2\) which are relevant for all foods being prepared for human consumption and specifically for dried fruits. It is important for producers
Joint FAO/WHO Food Standards Programme

Codex Committee on Contaminants in Foods

Sixth Session
Maastricht, The Netherlands, 26 – 30 March 2012

10 Priority List of Contaminants and Naturally Occurring Toxicants Proposed for Evaluation by JECFA

- Comments (in response to CL 2009/34-CF)

11 Other Business and Future Work
New substances – JECFA evaluation

Nomination of new substances for the Priority List of Contaminants and Naturally Occurring Toxicants for evaluation by JECFA

1. Basic information

1) Proposal for inclusion submitted by:

2) Name of compound; chemical name(s):

3) Identification of (additional) data (toxicology, metabolism, occurrence, food consumption) which could be provided to JECFA:

4) List of countries where surveillance data are likely to be available, and if possible list of contact person who could provide such data, including quality assurance information on the data.

5) Timeline for data availability:

2. Detail information

1) Whether or not the occurrence of the compound in commodities will have potential to cause public health and/or trade problems;

2) Whether or not commodities containing the compound are in international trade and represent a significant portion of the diet; and,
In 2006 - 2008

Occurrence data (~ 37,622) in dried figs between the years 2003 – 2006 reported and toxicological evaluations of aflatoxins done by JECFA 68th meeting
AFLATOXINS: IMPACT OF DIFFERENT HYPOTHETICAL LIMITS FOR ALMONDS, BRAZIL NUTS, HAZELNUTS, PISTACHIOS AND DRIED FIGS

National surveillance data were collected all around the world
10 Priority List of Contaminants and Naturally Occurring Toxicants Proposed for Evaluation by JECFA

- Comments (in response to CL 2009/34-CF)

11 Other Business and Future Work
Goal 1. Promoting sound regulatory frameworks
The result of this work will assist in promoting sound regulatory frameworks in international trade by using scientific knowledge. With a view to promoting maximum application of Codex standards, this work will provide harmonized regulations for developed and developing countries, leading to enhanced fair trade.

Goal 2. Promoting widest and consistent application of scientific principles and risk analysis
This work will help establish risk-management options based upon scientific evaluation.

Goal 3. Strengthening Codex work-management capabilities
The establishment of a maximum level for total aflatoxin in dried figs is a way to manage risks associated with the consumption of highly-contaminated food.

Goal 4. Promoting maximum application of Codex standards
Due to the international nature of this problem, this work will support and embrace all aspects of this objective by requiring participation of both developed and developing countries to conduct the work.
PROJECT DOCUMENT
PROPOSAL FOR NEW WORK ON
A MAXIMUM LEVEL FOR TOTAL AFLATOXIN IN DRIED FIG

1. The purpose and scope of the project

This project aims to establish a maximum level for total aflatoxin in ready-to-eat dried figs.

2. Relevance and timeliness

Aflatoxins were evaluated by the JECFA at its 31st, 46th, 49th and its 56th meetings (AFM1 only). At its 49th meeting in 1997, JECFA considered estimates of the carcinogenic potency of aflatoxin and the potential risks associated with their intake. In the evaluation at its 68th meeting in 2008, the JECFA reported that Turkey is the main country producing dried figs, covering approximately 63% of the world market. The proportion of rejected dried figs samples from the world market would be between 1% for an ML set at 20 µg/kg or 10 µg/kg and 3% for an ML set at 4 µg/kg.

“A Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Dried Figs (N10-2007)” was adopted by the Codex Alimentarius Commission at its 31st Session. Therefore, there is a need for an international regulatory level, based upon scientific evidence, having as its goal the protection of human health with a minimum of economic impact on international trade.

3. The main aspects to be covered
In 2010

- Sending invitation letter to EWG members
- Updating occurrence data (~ 15,538) in dried figs between the years 2007 – 2010
- Preparing draft proposal document (at step 3)
  (14 countries, 1 international NGO, FAO and WHO)
## Difficulties – Dried Fig

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<th>B</th>
<th>I</th>
<th>J</th>
<th>S</th>
<th>T</th>
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### Antalya İl Kontrol Laboratuvar Müdürlüğü

**2007-2008-2009-2010 Yıllarına Ait Kuru İncir ve İncir Ezmesi Numunelerindeki Aflatoksin Miktarlarını**

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<tr>
<th>Sıra No</th>
<th>Yıl</th>
<th>Kapor No</th>
<th>Denetim</th>
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Agenda Item 7

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

5th Session

The Hague, The Netherlands, 21 – 25 March 2011

PROPOSED DRAFT MAXIMUM LEVELS FOR TOTAL AFLATOXINS IN DRIED FIGS

(N11-2010)

Prepared by the Electronic Working Group led by Turkey
Sampling plan – Dried Fig

**In 2011**

- Sending invitation letter to EWG members
- totally 1280 dried fig samples were **analyzed**, and the results of analyses were further evaluated statistically.
- Preparing draft proposal sampling plan
  
  (24 countries, 1 international NGO, FAO and WHO)
A highly experienced team performed the sampling plan (who also prepared sampling plan for hazelnut)

- Sampling plan study structured by Dr. Tom Whitaker
- Statistical analysis by Dr. Tom Whitaker & Mr. Andrew Slate
- Sampling and analyses by TUBITAK Marmara Research Center in Turkey
- Sampling by authorized personnel of Aydın Provincial Directorate of MoFAL
- Other stakeholders (International Nut and Dried Fruit Foundation (INC), & the Aegean Dried Fruits Exporters’ Association, Ege University, Fig Research Institute, Commodity Exchange, Farmers Cooperatives) provided support for the project at different stages
Sampling plan design – Dried Fig/2

Operating Characteristic (OC) curve is the function of
✓ Sample size
✓ Multiple samples
✓ Accept/reject level

- Sample size
- Multiple samples
- Accept/reject level

- C \leq C_{ML} (good lots)
- C > C_{ML} (bad lots)

(Seller’s risk)
(Buyer’s risk)
Sampling plan design – Dried Fig/3

Sampling plan 2x10 kg or 3x10 kg
≤ 10 µg/kg

Aflatoxin in Dried Figs
- Laboratory Sample Size Shown
- Test Portions 55g, Slurry Grind
- Analysis, HPLC 1 aliquot
## PROPOSED DRAFT MAXIMUM LEVELS FOR TOTAL AFLATOXINS IN DRIED FIGS
(Including Sampling Plan)

(At Step 5/8)

<table>
<thead>
<tr>
<th>Product Name</th>
<th>ML (µg/kg)</th>
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</thead>
<tbody>
<tr>
<td>Dried Figs</td>
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</tbody>
</table>

### Annex

**SAMPLING PLAN FOR AFLATOXIN CONTAMINATION IN DRIED FIGS**

**DEFINITION**
AFTER CCCF
Farmers and industries together with governmental leadership have been making considerable efforts voluntarily since the 1940s and consciously since 1988, to prevent fungal growth and aflatoxin formation in dried figs.

Particularly, in the case of dried figs, the climatic conditions cannot be controlled. The frequency and level of aflatoxin contamination shows variations according to yearly climatic conditions. Drought and excessive rain during maturation and drying period seem to trigger toxin formation.
Drying tunnels
Inside the tunnels:
Higher temperatures & quick drying
Collection of climatic data

- **Sıcaklık oC**
- **İsafaklar**: Akmescit, Hasköy, Eğrikavak

![Graph showing temperature changes over time for different locations.](image)

- **Oransal nem (%)**
- **İsafaklar**: Akmescit, Hasköy, Eğrikavak

![Graph showing relative humidity changes over time for different locations.](image)
TEŞEKKÜRLER
&
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kodeks@tarim.gov.tr
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Turkey what a feeling