CODEX ALIMENTARIUS COMMISSION

Food and Agriculture Organization of the United Nations

World Health Organization

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Agenda Item 7 **CX/CF 11/5/7**
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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

<table>
<tr><td colspan="2">Codex Members and Observers wishing to submit comments at Step 3 on the proposed draft maximum levels for total aflatoxins in dried figs (Annex I), including possible implications for their economic interests, should do so in conformity with the Uniform Procedure for the Elaboration of Codex Standards and Related Texts (Codex Alimentarius Commission Procedural Manual) before <u>31 January 2011</u>. Comments should be directed:</td></tr>
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BACKGROUND

1. The 4th session of the CCCF, which was held from April 26 to 30, 2010, in Izmir, Turkey, considered the proposal prepared by the Delegation of Turkey (CRD 7) on the establishment of Maximum Levels for Total Aflatoxins in Dried Figs and agreed to submit a proposal for new work on this topic to the CAC. Subject to approval by the Commission, the Committee agreed that the Proposed Draft Maximum Levels would be developed by an electronic Working Group led by Turkey, working in English, for comments at Step 3 and consideration at the next session based on the project document.[1] The new work was approved by the 33rd session of the CAC.[2]

2. At that session, it was pointed out that sufficient time should be given to the implementation of the Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Dried Figs. The Delegation of Turkey clarified that data had been generated following implementation of the Code of Practice and that this would be taken into account in the development of the MLs for total aflatoxins in dried figs.

3. This document has been prepared by Turkey with contributions from Argentina, Austria, China, Croatia, Egypt, the European Union, Hungary, Iran, Japan, Kenya, Spain, the Syrian Arab Republic, the United Kingdom, the United States of America, WHO, FAO, and INC.

4. The proposed draft a maximum level (ML) for total aflatoxins in dried figs are presented in the ANNEX I, the background information to support the proposed ML in the ANNEX II, and list of participants in the ANNEX III to this document.

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[1] ALINORM 10/33/41, paras 112 – 114 and Appendix IX

[2] ALINORM 10/33/REP, para. 79 and Appendix VI.

ANNEX I

Based upon the incidence data of aflatoxins in dried figs evaluated within this paper, the impact upon human health of dietary exposure to aflatoxins from the consumption of dried figs, and the relationship between the implementation of the related Code of Practice and the achievable Maximum Level, the following Maximum Level for total aflatoxins (AFT) in dried fig commodities are recommended to be used in international trade:

Ready-to-eat dried figs	**Maximum Level for Total Aflatoxins** **10 µg/kg**

The present Paper on Maximum Level for Total Aflatoxins in Dried Figs leads to the following conclusions and recommendations for consideration at the 5th Session of the CCCF:

I. Dried fig production represents an important economic activity for the Aegean region in Turkey and other regions in the world.

II. The consumption of dried fig in the world is lower than that of other products such as maize, groundnuts, oilseeds, cocoa products, tree nuts, and spices.

III. JECFA has evaluated the impact upon human health of dietary exposure to aflatoxins from the consumption of ready-to-eat tree nuts and dried figs (FAO/WHO, 2008). Using the 13 GEMs/Food Consumption Cluster diets (WHO, 2006) and assuming a body weight of 60 kg, the Committee evaluated the impact of dietary exposure to aflatoxins when setting hypothetical maximum limits of 4, 8, 10, 15 or 20 µg/kg for aflatoxin in almonds, Brazil nuts, hazelnuts, pistachios, and dried figs. Its conclusion was that pistachios were the main contributor to dietary aflatoxin exposure from tree nuts in five cluster diets, with a greater than 5% contribution to overall dietary aflatoxin exposure, ranging from 0.2 to 0.8 ng/kg bw per day, equivalent to 7–45% of the aflatoxin from all sources. Almonds, Brazil nuts and hazelnuts contributed up to 0.1 ng/kg bw per day, and dried figs less than 0.01 ng/kg bw per day, in all Cluster Consumption Diets.

IV. Besides the official control system implemented in Turkey, a monitoring system has also been established by the Aegean Dried Fruits Exporters' Association with technical support by Ege University Department of Horticulture. In Turkey, dried figs are screened under UV lamps and figs with BGYF are removed so as to lower aflatoxin levels. In order to prevent the free flow of fluoresencent figs assumed to be contaminated with aflatoxin, the Aegean Dried Fruits Exporters' Association collects BGY fluorescent fruit and destroys the fruit as hazardous material with the help of the local municipality. The data given in TABLE 1 in ANNEX II show that nearly 17.95% of the samples exceeded the recognized EU limit of 2 µg/kg for AFB1, and that 16.93% of the samples exceeded the recognized limit of 4 µg/kg for AFT. If the Maximum Level is set at 10 µg/kg, this amount will be reduced. In addition, although there is a time and money consuming system to remove fluorescent fruit by using UV lamp in processing plants; it is unavoidable that nearly 3.0% of the samples will exceed the limit of 4 µg/kg for AFT (TABLE 8 in ANNEX II) that approximately 20.0% of the dried figs should be destroyed. In addition to that, although UV screening is a rather effective process to separate BGYF dried figs, the studies have shown that approximately, 32% of BGYF dried figs are false positive. It means that in every season a part of BGYF dried figs are destroyed unnecessarily as a hazardous material. If these costs occur in other producer countries, it is not an acceptable amount for the world trade since the Maximum Level is not compatible with ALARA principle and does not have scientific basis.

V. Figs are not consumed as much as tree nuts and they are not usually used as ingredients of any foodstuff. The human exposure to aflatoxins from their content in the dried figs that may be used as food ingredients will lower than the exposure from the dried fig consumption itself due to dilution factors. Clearly, the commodities used to prepare dried fig based food should be controlled to guarantee the safety of consumers and that can be accomplished within the verified safety limits set forth immediately above.

ANNEX II

INTRODUCTION

1. Aflatoxin contamination can be a potential problem in products such as tree nuts, maize, groundnuts, oilseeds, cocoa products, spices and dried fruits such as dried figs. This discussion paper is applicable to dried figs only.

2. Dried fig is the product obtained from dried ripe fruits of cultivars grown from *Ficus carica domestica L,* of Moraceae family. It is an important nutrition source for humans in the Mediterranean region since the beginning of human history. Based upon archeological findings, figs were most probably one of the first domestically used plants, ca 12000 years ago (Kislev et al., 2006).

3. Botanically, the fig fruit is a syconium, a cup-shaped structure with an ostiole, which is partly closed with scales. The fruit development displays a double sigmoid curve. The fruit diameter increases rapidly during the first growth period but the weight increase is slow. There is almost no change in fruit diameter or weight during the second growth period. The diameter and fresh and dry weight increases rapidly during the third period. Sevent percent of the dry weight and 90% of the total sugars accumulate during this growth phase which lasts between 2 to 5 weeks in most varieties (Aksoy, 1981; Flaishman et al., 2008).

4. Fig varieties/types are classified under four horticultural groups based on cropping and pollination characteristics as Common type (female), San Pedro type (female), Smyrna type (female) and caprifig (male). Smyrna and San Pedro type fig varieties require pollination by the fig wasp to set the main crop (Flaishman et al., 2008). Condit (1955) in his monograph of fig varieties classified 78% of edible (female) fig varieties as Common type, less than 4% as San Pedro types, and the remaining 18% are Smyrna types. Major fig varieties as Sarılop (Calimyrna), Bursa Black, Kalamata, and Zidi belong to the Smyrna type that requires caprification for fruit set (Stover et al., 2007).

5. Figs have high ecological adaptability and are distributed from Asia Minor, Iran and Syria, the main gene center, to Middle East and Southern Europe and to regions with mild climate in Africa, Asia, America and Australia. Fig trees are especially well adapted to the Mediterranean climate with cool winters and hot, dry summers, but they can be grown in more humid regions, including the tropics and subtropics especially for fresh consumption – although the incidence of fruit splitting and disease will eventually increase (Stover et al., 2007).

6. For figs, the optimum average temperature for growth is 18-20°C, but they require a higher temperature (ca 30°C) during fruit ripening and drying in August and September. For growing a high-quality crop, the relative humidity should be around 40-50% during the drying period. The pH value of the soil should be between 6.0 and 7.8 (Aksoy et al., 2001; Anonymous, 2008).

7. Fig trees are widespread in suitable climates however, for commercial production the orchard site and variety selection exert significant effect on yield and quality. In order to obtain high quality in commercial dried fig production (FIGURE 1), soil properties, fertilization, caprification (for Smyrna and San Pedro type varieties), pest and disease management, and harvesting and drying procedures require special attention for the prevention and reduction of aflatoxins in the production at farm level (Aksoy et al., 2001; CAC/RCP 65-2008; Irget et al., 1998).

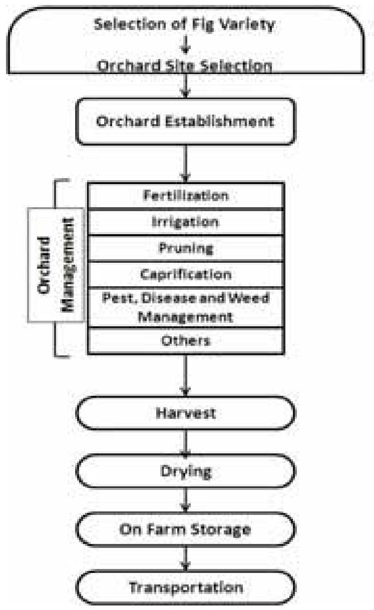

FIGURE 1: Dried Fig Production Chart at Farm Level

8. Fresh fig is not suitable for transportation; therefore it is mostly known and consumed locally in areas where it is grown, whereas sun-dried fig has been traded world-wide for centuries (Aksoy et al., 2001). Major fig varieties for drying are Sarılop (syn. Calimyrna) in Turkey; Kalamata in Greece; Adriatic, Conadria, Mission, Kadota and Calimyrna in California, the USA; Zidi in North Africa; and Sultani in Egypt and Tunisia (Stover et al., 2007).

9. In the world fig trade, Turkey, Iran, and Greece rank in the top. Fig production has decreased in Italy and Spain over the last decades and increased in Turkey, Syria, Algeria, and Brazil (Flaishman et al., 2008).

FACTORS AFFECTING THE PRESENCE OF AFLATOXIN IN DRIED FIGS

10. In order to develop an efficient strategy to prevent and reduce aflatoxin contamination in figs, it is necessary to evaluate the process of fruit infection by the toxigenic *Aspergillus* species. Fig fruit inoculated with *A. flavus* were shown to be resistant to fungal growth during its unripe green stage and contained no or very low levels of aflatoxins. Fungus development and toxin accumulation only started when the inoculated fruit reached the firm-ripe stage and continued throughout ripening, reaching maximal level in sun-dried fruit (Buchanan et al., 1975). Boudra et al. (1994) confirmed the critical role of the firm-ripe stage for the first contamination step. Inoculation of fig fruit at later stages of fruit maturity namely shriveled and dried stages with *A. flavus* did not result in aflatoxin production. However, Aksoy et al. (2010) reported high aflatoxin levels in fruit remaining shriveled on the tree and stressed that fig fruit are susceptible until fully dried in the drying yard, since the average water activity levels were already below the critical value (aw=0.65).

11. Demir and coworkers (1989) surveyed 30 fig orchards in Izmir and Aydın provinces of Turkey and collected samples at 6 different stages of production from the green fruit stage to the dried fruit stage at farm storage. They reported that aflatoxin production occurs while the fruit is on the tree and that the level does not increase during storage. Similarly, Ozay and Alperden (1991) collected and analyzed a total of 103 samples (1988 year crop) from 11 different orchards (firm ripened, shrivelled ripened), during drying, from farmer store houses, and from different fig processing plants; they concluded that contamination of dried figs with aflatoxins begins to occur while the fruit is on the tree.

12. In the first (breba or spring crop) and main (summer) crops of the fruit of Conadria and Calimyrna fig varieties, decay by the aflatoxin-producing fungi *A. flavus* and *A. parasiticus* occurred at relatively low incidences, but was nevertheless found in the fruit of both crops. Aflatoxins were detected in both first-crop and main-crop figs, but only infrequently. The percentage of *A. flavus* isolates found in decayed main crop fig fruit was 81.2% and of *A. parasiticus* 18.8%. All seven *A. flavus* isolates from first-crop figs belonged to the L strain whereas, for the isolates from main-crop figs, 10 isolates belonged to the L strain and 3 isolates belonged to the S strain. The first crop figs are not the major source of aflatoxin contamination. In California, first crop figs are left on the ground where they can become decayed and then mixed with the second crop during harvests in both Calimyrna and Conadria fig orchards. Thus it is recommended that first crop figs be removed during harvest or during processing. The second effect of the first crop is that fungal colonies on the first-crop figs could produce abundant spores on the external surface of the first crop that could then contribute to infection of main-crop figs, (Doster and Michailides, 2007). In contrast to California Calimyrna figs, the Calimyrna (Sarılop) variety sets only few first crop figs during years with mild winters (Aksoy, 1981). Thus climatic conditions may play a vital role not only directly in the prevalence of fungi but also through the cropping pattern of fig that in turn may promote spore abundance in the fig orchard.

13. Among 127 isolates obtained from dried figs sampled in Aydın-Turkey, 53.8% were identified as *Aspergillus* spp. Seventeen *Aspergillus* spp. were potential aflatoxin producers, one was *A. parasiticus* and sixteen were *A. flavus*. Further analyses revealed that three isolates of *A. flavus* and one *A. parasiticus* were aflatoxin producers. The quantitative analyses showed that these four isolates had produced AFB1 and AFB2 (Isman and Bıyık, 2009).

14. Various surveys have shown the presence of aflatoxins in dried figs of different origins. Haydar et al. (1990) surveyed 63 samples of 19 commodities consumed in Syria and found the highest contamination of AFB1 in dried figs (11.8 μg/kg). Ionnou-Kakouri et al. (1999) in their surveillance program collected local fig products from market in Cyprus between years 1992 – 1996 and analyzed 24 figs and fig pie samples; 4 samples were contaminated with aflatoxins. The average values were determined as 3.7 μg/kg AFB1, 1.2 μg/kg AFB2, 1.4 μg/kg AFG1 and 4.2 μg/kg AFG2. The ranges were 1.4-6 μg/kg for AFB1, 0.9–1.5 μg/kg for AFB2 and 0.8–2.1 μg/kg for AFG1. Iamanaka et al. (2006) collected samples of worldwide origin (Argentina, Chile, Iran, and Turkey) from market in Brazil and analyzed 62 dried fruit samples composed of Black and White Sultanas (raisins) and dried figs for the presence of aflatoxins *A. flavus* and *A. parasiticus*. No isolates of *A. parasiticus* and one isolate of an aflatoxin producing *A. flavus* was found to be producers of AFB1 and AFB2. Aflatoxins were detected in 11 of 19 (58%) dried fig samples however all except one (1500 μg/kg of AFB1) were below 2.0 μg/kg.

15. Trucksess and Scott (2008) in their review on the occurrence of mycotoxins in botanicals and dried fruits stated that the contamination of figs with aflatoxins begins during sun drying while the fruit is still on the tree

and continues during drying on the ground. It was noted that contamination levels could be very high: up to 76,000 µg/kg AFB1 (samples taken from Switzerland); 72 µg/kg AFB2 and 180,000 µg/kg AFG1 (samples taken from Turkey).

16. Senyuva et al. (2007) monitored aflatoxin contamination in ready-to eat dried figs from 2003, 2004, 2005, and up to June 2006. The incidence of AFB1 contamination exceeding 2 µg/kg averaged 0.6, 2.0, 4.0, and 2.4% for 2003, 2004, 2005, and up to June 2006, respectively. The percentage of samples found to be contaminated with AFT at levels exceeding 4 µg/kg was 2.6, 3.0, 5.1, and 2.7%, respectively.

17. Bircan et al. (2008) analyzed 4917 dried fig samples collected from different exporting companies located in Aydın province in Turkey during September–December 2007 after a very dry vegetation period. For 9.8% of the samples, total aflatoxins exceeded 4 µg/kg. The authors reported a substantial increase in the incidence of aflatoxins as compared to previous years due to drought stress, high temperatures and low relative humidity. Ninetyseven percent of the samples were contaminated with AFB1 and 47% were contaminated with AFG1. AFB2 was present in 24%, and AFG2 in 6% of the dried fig samples. Irget et al. (2008) pointed out the effect of fertilization utilizing K and Ca on sunscald and ostiole-end crack incidences in fig fruit and mentioned that drought can be overcome by proper fertilization strategies. Bircan et al. (2008) reported that water stress under extended drought conditions will induce the formation of free amino acids such as proline that stimulate toxin production by *A. flavus* and *A. parasiticus*. Cotty and Jaime-Garcia (2007) reported that climate can influences contamination, in part, by direct effects on the growth of causative fungi.

18. Juan et al. (2008) analyzed 20 dried fig samples in their survey for aflatoxin contamination among nuts and dried fruit sold in Rabat (Morocco) markets. Aflatoxin incidence as 5% for AFB1 and 30% for AFT. The percentage of samples exceeding 4 µg/kg AFT was 15%. In dried figs only one sample had AFB1 whereas other products examined had AFG1 ranging between 0.28–32.9 µg/kg.

PRACTICE FOR THE PREVENTION AND REDUCTION OF AFLATOXIN CONTAMINATION IN DRIED FIGS

19. Since the 1940s, it has been noticed that drying is the most important stage in the post-harvest treatment of raw figs and they should never be placed directly on the ground. Condit (1947) gave information about various drying methods that were used in different countries. In Turkey, it was reported that drying was carried out on the cut canes. Other researchers, Ülkümen and coworkers (1948), stated that figs were dried on a bed of dry reeds, dry bucket and mat plants. In the fig-producing regions, drying techniques and tools used for this purpose were also the subject of a paper (Öncel, 1969). In this study, weather conditions, knowledge of producers, varieties of trees and storage conditions were the most important parameters affecting the aflatoxin contamination in dried figs. The use of ground wire and standing litter was the best and most common and hygienic method of drying. Usage of different drying methods and trays were researched for their effects upon both drying duration and quality (Eroğlu, 1976). In conclusion, similar to that has been stated in CAC/RCP 65-2008.

20. Between the years 1982 and 1984, in order to produce dried figs free from pests, a project was planed by the Turkish Ministry of Agriculture and Rural Affairs in Aydın and Izmir Provinces. The main goals of the project were the education of technical persons and producers, publishing, inventory work, biological control, and demonstration studies (Özar et al., 1986). Between the years 1986 and 1987, aflatoxin levels in dried figs that were exported to Switzerland and Germany caused problems; in 1988, the first large-scale integrated project to address this issue was started in the Bornova (Aegean region) Regional Plant Protection Institute (Project No TOAG-429). This project was carried out in 30 orchards and 39 processing plants in order to evaluate the factors affecting the presence of aflatoxin and the role of pest in carrying the fungi. During this project, it was decided that the important factor in the formation of aflatoxins, the "profichi" (caprifig) fruits, should be either supplied or controlled by official authority. The effect of harvesting methods such as covering the soil surface with mesh, plastic or canvas on the formation of aflatoxin in dried figs has been researched many times. One of them was studied by the Erbeyli Fig Research Institute, Ministry of Agriculture and Rural Affairs between the years 2004–2006. It was concluded that it is not possible to completely prevent the presence of aflatoxin in some fig fruits (Özen et al., 2008).

21. Since the early 1960s different types of analytical techniques have been applied for the analysis of aflatoxin-contaminated agricultural commodities. A simple non-chemical screening test is the "bright greenish-yellow fluorescence (BGYF)" or "black light" test. Suspected samples (e.g., corn and figs) are inspected under a long-wave UV-lamp. The characteristic fluorescence under ultraviolet light (at 365 nm) is associated with the presence of kojic acid formed by aflatoxin producing fungi like *A. flavus* or *A. parasiticus*. The BGYF test indicates the growth of the fungi that may have resulted in the production of aflatoxins (Aksoy et al., 2001).

22. Konca and Gülseri (1989) analyzed 92 fruit showing BGYF and 72 non-fluorescent fig fruit and found aflatoxins in 41.3% of the fluorescent and 1.6% of the non-fluorescent figs at varying concentrations. Demir et al. (1989) reported that BGY fluorescent occured in 0.1 to 5% of the fruit in Sarılop dried fig samples and that 95% of the BGY fluorescent fruit showed presence of aflatoxins. Özer (1996) also analyzed individual

fluorescent and non-fluorescent figs. Non-fluorescent figs contained no aflatoxins, while 44% of fluorescent figs did. Fig fruit showing BGY fluorescence were classified into four groups as (i) those with bright fluorescence inside fruit cavity (38.6%), (ii) bright (43.2%) or (iii) pale (13.6%) external fluorescence on the skin and (iv) BGYF accompanied with smut *(A. niger)* (4.5%). The average aflatoxin levels were 278.6, 649.4, 5.2 and 412.3 µg/kg, for (i) to (iv) respectively. Although the highest mean aflatoxin concentration was found in group (ii) with bright external BGYF, the ratio of fruit contaminated with AFB1 was 36.8% in this group- slightly lower than the group with internal BGYF (42.1%).

23. Fifty fluorescent fig fruits were analyzed individually and the results revealed that 68% contained aflatoxins at levels ranging from 5–3828 µg/kg (Şahin, 2003). In 2000, fig-fruit samples of Sarılop cultivar taken from the orchards/drying yards 47.9% of those had varying number of fluorescent figs and 34.2% of the samples with fluorescent figs had no aflatoxin contamination. In 2001, 64.8% of the samples analyzed contained fluorescent figs and 31.2% of these samples had no detectable levels of aflatoxin. In conclusion, although all dried figs were screened under UV lamps and BGYF dried figs were removed, dried figs between 31-34% were free from aflatoxin when BGYF dried figs were analyzed (Şahin, 2003). Despite the higher external BGYF under Turkish conditions, in California, BGYF was more visible internally (after cutting open the fig) in products of Calimyrna (syn. Sarılop) variety. Higher percentages of external/internal BGYF were found for cull figs. The authors concluded that although not as promising as originally hoped, BGYF may be of use in removing aflatoxin-contaminated figs in certain specific situations in California (Doster and Michailides, 1998).

24. Based upon the relationship between BGYF and aflatoxin contamination, a control system of checking dried figs under long wave UV and removal of BGYF dried fig fruit so as to reduce the level of contamination was started voluntarily at the end of 1980s by all Turkish exporters through the decision of Aegean Dried Fruits Exporters' Associations. Major steps of aflatoxin control employed at the processing plant are (1) the purchase of raw materials based upon a certain threshold number of BGYF fruits per kg, (2) screening of all lots under UV, (3) removal of BGYF fruits, and (4) internal control of the efficiency of UV checks (FIGURE 2).

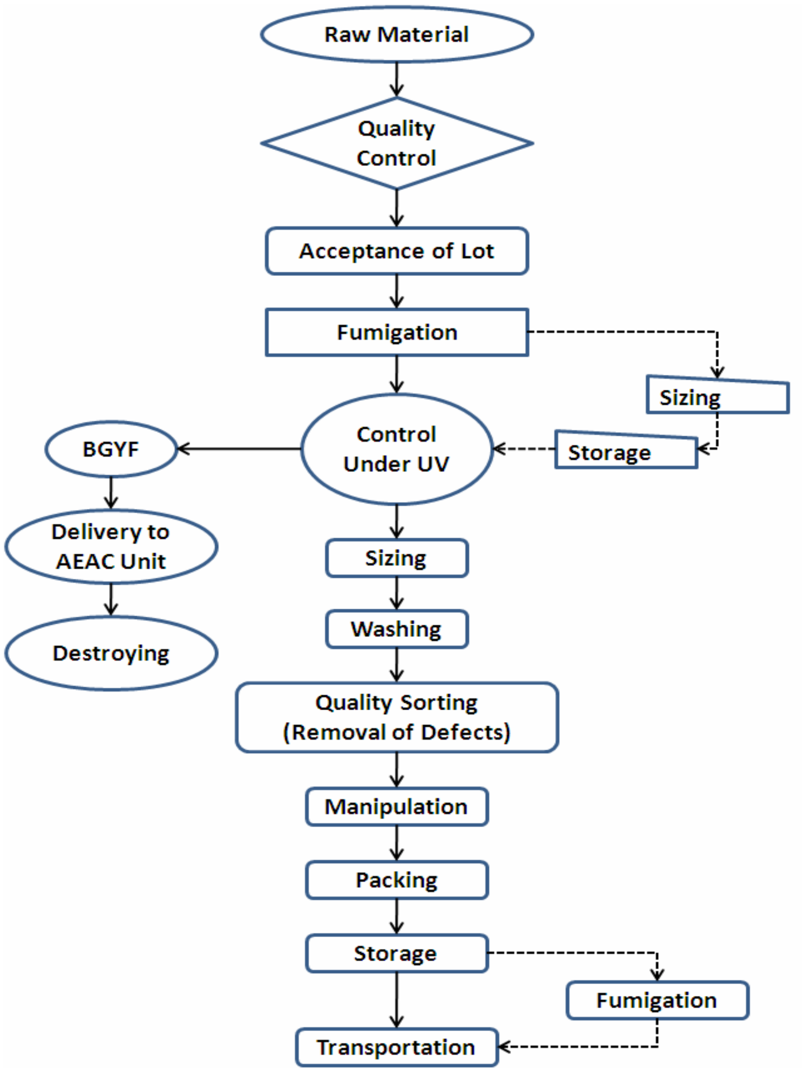

FIGURE 2: A Sample Flow Chart of a Dried Fig Processing Plant

25. The BGYF fruit is removed repeatedly during the product flow, either in sequence or performed at different stages e.g. before storage, after sorting, before manipulation and in some cases during manipulation. In Turkey, fruit showing (external) BGYF fluctuate yearly between 0.8–2% according to the prevailing weather conditions. Among fruit showing BGYF, ca 90% have fluoresence on the outer surface and 10% show fluoresence inside the fruit (Aksoy et al., 2009). Aksoy et al. (2010) evaluated the effect of removing of BGYF fruit under UV during processing and reported that in 2009 crop year, within the raw matter accepted for processing, totally 1.57% of 9,054 fig fruit showed BGYF (1.07% external and 0.50% internal fluorescence). After removal of mainly fruit with external BGYF, the ratio was almost reduced by half (0.83%) at the final product stage. However the removal of external fluorescent figs left higher internal BGYF (0.73%) ratio than those with external fluorescence (0.10%).

26. In order to monitor the aflatoxin incidence in dried figs for each crop year, 35 to 65 aggregate samples were taken randomly from the raw material entering the processing plants located in the Aegean region in Turkey over a 4 year period beginning in 2005 (TABLE 1). The paper gives an overview of the monitoring system used and evaluates the aflatoxin levels in Turkish dried figs for 4 years. The results show that the frequency of samples contaminated with aflatoxin and the mean levels fluctuate according to the yearly climatic conditions (Aksoy et al., 2009).

TABLE 1: AFB1 and AFT contamination in unprocessed dried fig samples collected from the Aegean region in Turkey between years 2005 and 2008

# sample	Percentage of samples with aflatoxins within indicated µg/kg range							
	Type	**<LOD**	**>LOD-2**	**>2-4**	**>4-8**	**>8-10**	**>10-15**	**>15**
195	AFB1	116 (59.49%)	44 (22.56%)	7 (3.59%)	4 (2.05%)	2 (1.03%)	4 (2.05%)	18 (9.23%)
	T	134 (68.72%)	23 (11.79%)	5 (2.56%)	7 (3.59%)	2 (1.03%)	2 (1.03%)	22 (11.28)

27. As the average of these four years, 17.95% of the samples exceeded limit 2 µg/kg for AFB1, and 16.93% and 11.28% of the samples contained AFT above 4 µg/kg and above 10 µg/kg, respectively (TABLE 1). The ratio of samples possessing AFT above the limit 4 µg/kg was 15.17% in 2005, 11.84% in 2006, 21.74% in 2007 and 30.00% in 2008. To evaluate the impact of yearly climatic conditions, since 2007, data loggers have been placed at certain locations so as to be representative of the entire region (Aksoy et al., 2009).

28. In addition to the official control system in Turkey, a monitoring system has been established by the Aegean Dried Fruits Exporters' Associations with technical support by Ege University Department of Horticulture. Since 2001, an independent Committee that was established in that year has been operated jointly by the institutions involved in dried fig production and trade in Izmir and Aydın provinces in Turkey, and each fig processing unit is visited without prior notice based upon a decision taken in the Committee's general assembly of Agean Dried Fruits Exporters' Association. The measures taken at various steps of processing to prevent or reduce aflatoxins are evaluated (Aksoy et al, 2009). Dried figs are screened under UV lamps and figs with BGYF are removed to reduce aflatoxin levels. The cost associated with the marketing of dried figs in foreign or domestic market, removing cull, BGYF testing, destruction of false-positive BGYF fruit and the voluntary system established for reducing aflatoxin levels increases, the production cost significantly. The cost of the figs destroyed yearly ranged between ca 1,485,900 to 3,402,760 US dollars (TABLE 2).

TABLE 2: Regional mean (%) BGY fluorescent fruits and amount of fluorescent dried figs destroyed by the Aegean Dried Fruits Exporters' Association between years 2000 and 2009

Crop year	Amount destroyed (Metric Tons)	Mean BGYF rate (%)
2000	657	2.00
2001	877	2.00
2002	548	1.15
2003	617	1.25
2004	657	1.25
2005	738	1.25

2006	730	1.20
2007	719	1.25
2008	419	1.00
2009	381 (*)	0.80

(*) : as of August 25th, 2010.

TOXICOLOGICAL EVALUATIONS

29. Aflatoxins were evaluated by the JECFA at several meetings. At its 49th meeting in 1997, JECFA considered estimates of the carcinogenic potency of aflatoxin and the potential risks associated with their intake. At that meeting, no numerical TDI (Tolerable Daily Intake) was proposed since these compounds are genotoxic carcinogens. The potency estimates for human liver cancer resulting from exposure to AFB1 were derived from epidemiological and toxicological studies. JECFA reviewed a wide range of studies conducted with both animals and humans that provided qualitative and quantitative information on the hepatocarcinogenicity of aflatoxins. The Committee evaluated the potency of these contaminants, linked those potencies to estimates of intake, and discussed the potential impact of two hypothetical standards on peanuts (10 or 20 µg/kg) on sample populations and their overall risk. It was concluded that reducing the permitted quantity of AFB1 in peanuts from 20 µg/kg to 10 µg/kg would not result in any observable difference in rates of liver cancer (FAO/WHO, 2008).

30. In the evaluation at its 68th meeting in 2008, the JECFA reported that Turkey is the main country producing dried fruits, having approximately 63% of the world market. A large amount of data (40,822 individual data on total aflatoxin levels) was provided for dried figs to JECFA for this evaluation by Turkey for the period 2003–2006, where the mean concentration of AFT in dried figs was around 1.0 µg/kg. JECFA concluded that setting a ML for AFT in dried figs of anywhere between 4 and 20 µg/kg would result in mean concentrations approximately 2 times lower than the actual mean concentration of AFT (from 0.6 to 0.4 µg/kg vs 1.0 µg/kg). However, there would be no impact on the overall dietary exposure to AFT from the consumption of dried figs (below 0.3%, equivalent to a dietary exposure of <0.01 ng/kg bw per day), whatever hypothetical ML scenario was applied (no ML, 4, 8, 10, 15 or 20 µg/kg). The proportion of rejected dried fruit 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 (FAO/WHO, 2008).

PRODUCTION, EXPORT AND IMPORT DATA FOR DRIED FIGS

31. Aydın and Izmir, located in mid-western Turkey, are the two provinces providing dried figs destined for the export market. Fig production is solely based on the Calimyrna (Sarılop) fig variety. Almost 90% of the dried fig production is exported. Fig processors, with handling capacities from 100 to 5,500 tons per year, are involved in processing figs for the export market (Aksoy et al., 2009).

32. All dried figs are consumed within a year either as whole dried figs for table consumption or processed as paste, sliced or cubed for use in the food industry. According to the figures of the Aegean Dried Fruits Exporters' Associations, Turkey exports 48,000 to 60,000 tons of dried figs annually. The European Union member states are the major importers having a market share of 70 to 75% of Turkish exports (Aksoy et al., 2009).

33. The production, export and import data for dried figs are given in TABLE 3, 4 and 5.

TABLE 3: World Production (Dried Fig – tons)

COUNTRIES	**YEARS**				
	2006/07	**2007/08**	**2008/09**	**2009/10**	**2010/2011(*)**
Turkey	60,393	43,500	42,500	56,590	58,662
Iran, Islamic Rep of	43,000	25,000	22,000	23,000	22,500
USA	12,000	13,100	11,000	11,000	10,000
Greece	12,000	10,000	8,000	9,000	7,500
Spain	3,500	5,000	4,500	5,000	5,000
Italy	5,000	4,000	4,000	4,000	3,500
Portugal	4,000	4,000	4,000	n.a.	n.a.
TOTAL	**139,893**	**104,600**	**96,000**	**108,590**	**107,562**

(*): Estimated values. The value for Turkey reflects the result of the report of Evaluation Board for Harvest and may change ±5%.

Source: Aegean Dried Fruits Exporters' Associations and INC

TABLE 4: World Export (Dried Fig)

COUNTRIES	YEARS					
	2006		2007		2008	
	Tons	USD (1000)	Tons	USD (1000)	Tons	USD (1000)
Turkey	56,268	125,008	47,590	168,442	42,695	187,202
Iran, Islamic Rep of	7,776	17,424	n.a.	n.a.	n.a.	n.a.
Spain	6,134	9,442	4,765	8,461	5,477	n.a.
USA	5,004	14,442	3,047	11,819	3,721	15,479
Syrian Arab Rep	4,922	3,886	2,894	2,799	n.a.	n.a.
The Netherlands	3,788	10,723	2,881	14,504	2,732	15,081
China	1,176	1,384	226	724	173	799
Greece	3,214	8,081	1,699	6,107	1,349	6,217
Germany	3,233	9,569	2,047	10,061	2,031	11,721
France	2,217	9,462	2,107	10,891	1,878	11,528
Italy	1,785	4,092	1,497	4,172	2,571	7,193
Others	9,729	23,350	9,650	29,204	9,806	37,421
TOTAL	**105,246**	**236,863**	**78,403**	**267,184**	**72,433**	**292,640**

Source: UN Comtrade

TABLE 5: World Import (Dried Fig)

COUNTRIES	YEARS					
	2006		2007		2008	
	Tons	USD (1000)	Tons	USD (1000)	Tons	USD (1000)
France	15,895	37,247	12,619	48,085	13,694	58,026
Germany	14,307	37,156	13,316	42,102	10,742	49,758
India	3,706	23,203	4,691	31,087	4,973	32,950
Italy	6,791	17,082	4,054	18,242	3,916	21,042
UK	6,401	16,636	5,486	19,580	4,312	18,809
Switzerland	3,433	10,602	1,459	6,695	3,097	16,878
Canada	3,652	10,858	3,212	11,369	3,418	13,346
Belgium	2,579	6,725	2,385	7,868	2,685	12,766
The Netherlands	3,693	10,664	2,968	12,155	2,709	10,481
Austria	2,751	7,227	2,530	9,154	1,960	9,897
USA	6,000	10,041	5,800	10,672	2,367	9,357
Others	36,640	73,378	35,601	91,642	67,729	99,402
TOTAL	**105,848**	**260,819**	**94,123**	**308,653**	**121,601**	**352,712**

Source: UN Comtrade

SAMPLING & ANALYTICAL METHODS

34. Aflatoxins may be very heterogeneously distributed within a lot, in particular in a lot consisting of large particle size products, such as dried figs or groundnuts (Aksoy et al., 2001; EFSA, 2007). As the distribution of mycotoxins is generally non-homogeneous, sampling and analytical methods are important factors for the evaluation of maximum levels for aflatoxins in dried figs. The laboratory samples should be prepared, and especially homogenized, with extreme care. The entire laboratory sample obtained from an aggregate sample is to be used for the homogenization/grinding of the sample. The laboratory sample should be finely ground and mixed thoroughly using a process that approaches as complete homogenization as possible (EC Regulation No 401/2006). It is generally recommended making a slurry paste with water in matrix such as dried figs.

35. A suggested sampling plan (EC Regulation No 401/2006) may include the following. Each lot which is to be examined for aflatoxin should be sampled separately. If sizes of lots are more than 15 tons, the lots should be subdivided into sublots to be sampled separately. The subdivision can be done following provisions laid down in TABLE 6 below. A minimum of 100 incremental samples should be taken and combined to give an aggregate sample of 30 kg. The aggregate sample is divided into three equal laboratory samples of 10 kg each before grinding (this division into three laboratory samples is not necessary in those instances where dried figs are subjected to further sorting or other physical treatment and of the availability of equipment that is able to homogenize a 30 kg sample). Each laboratory sample should be finely grinded and mixed thoroughly using a process that has been demonstrated to achieve complete homogenisation.

TABLE 6: Subdivision of large lots

Commodity	Lot weight (ton)	Weight of sublots	Number of incremental samples	Aggregate sample weight (kg)
Dried figs	≥ 15	15-30 ton	100	30
	< 15	--	10-100 (*)	≤30

(*): Depending on the lot weight - see TABLE 7

36. If the sizes of the lots are less than 15 tons, then the number of incremental samples that should be taken would depend upon the weight of the lot, with a minimum of 10 and a maximum of 100. The figures in the following TABLE 7 may be used to determine the number of incremental samples to be taken. In cases where the aggregate sample weights are ≤ 30 kg, the aggregate sample should be divided into two or three equal laboratory samples of ≤ 10 kg before grinding according to the aggregate sample weight (this division into two or three laboratory samples is not necessary in case of dried figs, subjected to further sorting or other physical treatment and of the availability of equipment which is able to homogenize up to 30 kg samples).

TABLE 7: Number of incremental samples to be taken depending on the weight of the lot and number of subdivisions of the aggregate sample

Lot weight (tons)	# incremental samples	Aggregate sample weight (kg)	# laboratory samples from aggregate sample
≤ 0.1	10	3	1 (no division)
> 0.1-0.2	15	4.5	1 (no division)
> 0.2-0.5	20	6	1 (no division)
> 0.5-1.0	30	9(- < 12 kg)	1 (no division)
> 1.0-2.0	40	12	2
> 2.0-5.0	60	18(- < 24 kg)	2
> 5.0-10.0	80	24	3
> 10.0-15.0	100	30	3

37. In cases where the aggregate sample weights are less than 30 kg, the aggregate sample shall be divided into laboratory samples according to following guidance:

< 12 kg : no division into laboratory samples;

≥ 12 – < 24 kg : division into two laboratory samples;

≥ 24 kg : division into three laboratory samples.

38. The weight of the incremental sample should be approximately 300 grams or greater, depending upon the total number of increments, to obtain an aggregate sample of 30 kg.

39. There are a number of analytical methods available for the determination of aflatoxins. In general, the methods include the following steps; sample preparation, extraction, clean up and quantification. After an effective homogenization, a solvent extraction step is applied using a mixture of acetonitrile or methanol and water. Sample clean-up uses either liquid-liquid partition or solid phase extraction (SPE), with sorbents such as silica, florisil, C18, aluminium oxide and immunosorbents as an immunoaffinity column (Gilbert and Vargas, 2003). Methods for identification and quantification normally used are thin layer chromatography (TLC or HPTLC) or high performance liquid chromatography (HPLC), with fluorescence detection. Liquid chromatography-tandem mass spectrometry with electrospray ionization or atmospheric pressure chemical ionization (LC-MS/MS) methods for determination and confirmation of AF contamination in different foodstuffs has been developed (Bacaloni et al., 2008; Spanjer et al., 2008). A method involving direct injection into a LC-MS/MS after extraction with acetonitrile:water was developed by Spanjer et al. (2008) for 33 mycotoxins, including aflatoxins B and aflatoxin G. The limit of detection (LOD) or quantification (LOQ) for each aflatoxin depends upon the matrix, the clean-up procedure and the detection method and normally are within the 0.1 to 1 µg/kg range (Marklinder et al., 2005, Sobolev, 2007).

40. Antibody-based test kits for aflatoxin analysis are mostly used for screening purposes. The AOAC International website (AOAC, 2009) lists different kit formats for AFB1 and AFT, with antibodies coated onto cups, ELISA plates, columns, cards and tubes. However, few kits have been validated by a full interlaboratory collaborative study (Gilbert and Vargas, 2003).

OCCURENCE DATA

41. Since the occurrence data on AFB1 and AFT in dried fig between years 2003 – 2006 has been already analyzed by JECFA, this document reports on the data between the years 2007 – 2010 (until the month of July).

42. Between the years 2007 – 2010, dried figs ([1]) designated for export were analysed ([2]) by the Turkish Ministry of Agriculture and Rural Affairs and the results of 15,538 analyses are reported in TABLE 8.

TABLE 8: Aflatoxin levels for AFB1 and AFT in dried fig between years 2007 – 2010 in Turkey

Year	# sample	Proportion of samples with aflatoxins within indicated µg/kg range						
		Type	**<LOD**	**>LOD-2**	**>2-4**	**>4-8**	**>8-10**	**>10**
2007	**3302**	AFB1	67.11%	22.44%	4.06%	2.67%	0.55%	3.18%
		T	63.14%	23.41%	5.03%	3.06%	0.82%	4.54%
2008	**3937**	AFB1	58.72%	26.67%	5.51%	3.81%	1.04%	4.27%
		T	56.46%	23.19%	7.04%	5.21%	1.07%	7.04%
2009	**6837**	AFB1	75.33%	17.30%	3.30%	2.06%	0.38%	1.63%
		T	74.87%	15.59%	3.29%	2.77%	0.64%	2.84%
01/01/2010-31/07/2010	**1512**	AFB1	82.96%	13.18%	2.06%	0.99%	0.09%	0.72%
		T	82.69%	12.93%	1.83%	1.22%	0.17%	1.16%

([1]): In Turkey, dried figs are harvested from the mid-August until the beginning of October. Exportation starts at a date predetermined by the General Assembly of Aegean Dried Fruits Exporters' Associations and/or Undersecretariat for Foreign Trade. This date changes every year according to the conditions of the crop starting from mid-September to the first week of the October. Consequently, the above calendar year figures belong to two different crops.

([2]): In Turkey, the LOD and LOQ for aflatoxin (AFB1 or AFT) in dried figs are set at 0.10 µg/kg and 0.30 µg/kg, respectively. The method used is the AOAC Official Method 999.07:2000.

43. In Turkey, the export season for dried figs starts either from the second half of September or at the very beginning of October. The first export shipment usually reaches the European customs about one or two weeks later. Meanwhile, the results of aflatoxin analysis would be available from the middle of October and onwards. Over 3/4ths of the crop is exported until the beginning of the following March. So, from September 2007 to November 2010, 259 Rapid Alert System for Food and Feed (RASFF) notifications for were raised with regard to aflatoxin contamination in dried figs exported from Turkey (TABLE 9).

TABLE 9: Total RASFF number for dried figs exported from Turkey between years 2007 – 2010 (until the mounth of December)

Year	# RASFFs (raised at current ML of 4 µg/kg)	# Hypothetical RASFFs (if ML was 10 µg/kg)	# RASFF (decrease % if ML was raised at 10 µg/kg)
2007	57	33	42
2008	96	37	61
2009	63	28	56
2010	43	17	60

44. The EU RASFF data between the years 2007–2010 (until the mounth of December) indicate that if Maximum Level for total aflatoxins in dried figs was established at 10 µg/kg instead of 4 µg/kg, the decrease in the percentage of the total RASFF notifications would be 42%, 61%, 56%, and 60% in 2007, 2008, 2009, and 2010 (until the mounth of December) respectively (TABLE 9). Therefore, the decrease in consignments rejected would certainly have a considerable economic impact upon the commercial trade of dried figs. If a consignment (approximately 20 tons) was rejected due to excess of aflatoxin contamination, the estimated economic impact on the exporter would be nearly USD 35,000–40,000. When a consignment is rejected it can be either re-dispatched to Turkey or destroyed according to the procedures involving aflatoxin controls. Following re-dispatch, the consignment is analysed further and the aflatoxin limit can be found to be below 10 µg/kg which is the maximum limit according to the Turkish regulation. If the consignment is destroyed, the economic loss for the exporter and Turkey for a consignment of 20 tons, would be at least USD 1000,000, all the costs involved. If rejected consignments averaged 40 – 50 tons, then the annual extra cost for the dried-fig producers would be nearly $1.5 – 2.0 million. If the aflatoxin limit is 10 µg/kg, the number of rejected consignment numbers would be reduced by almost 50%.

45. In addition, between the years 2007 – 2009, data on dried figs exported from Greece, Kazakhstan, Iran and Syria were reported in the RASFF reports (TABLE 10).

TABLE 10: Aflatoxin level in dried fig originated from Greece, Kazakhstan, Iran and Syria in the RASFF report between years 2007 – 2009

Dired Fig Origin	Year	AFB1 (µg/kg)	AFT (µg/kg)
Greece	2007	720	1320
		43.78	70.62
	2009	5.8	7.0
		47.9	86.7
Kazakhstan	2007	14.6	19.8
Iran	2008	2.2	6.4
		2.8	3.0
Syria	2009	12	15

DIETARY EXPOSURE

46. Cereals (mainly corn), groundnuts, oilseeds, tree nuts, dried fruits, spices and copra are the main products contaminated with aflatoxins. The most important dietary sources containing aflatoxins are corn, groundnuts and their products, which form an essential part of the diet in some countries.

47. Dried figs are not consumed regularly as a part of a daily diet but are mostly consumed on special occasions such as Christmas. Dried figs are not consumed as much as tree nuts and certainly they are not as widely used as a food ingredient. In fact, fresh fig fruit is consumed locally throughout its production zone from the tropics to cold temperate areas. The consumption of dried fig is lower than fresh fig (TABLE 11).

TABLE 11: Consumption in g/day for figs as given by 13 GEMS/Food Consumption Cluster Diets, 2006

	A	B	C	D	E	F	G	H	I	J	K	L	M
Figs	0,1	2,7	4,4	0,3	0,7	0,6	0,0	0,1	0,0	0,0	0,2	0,0	0,4
Dried figs	0,0	0,6	0,4	0,0	0,2	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,1

48. JECFA has evaluated the impact on human health due to dietary exposure to aflatoxins from the consumption of the ready-to-eat tree nuts and dried figs at its 68th meeting (FAO/WHO, 2008). Using the 13 GEMs/Food Consumption Cluster diets (WHO, 2006) and assuming a body weight of 60 kg, the Committee evaluated the impact on dietary exposure to aflatoxins by setting hypothetical maximum limits of 4, 8, 10, 15 or 20 µg/kg for aflatoxin in almonds, Brazil nuts, hazelnuts, pistachios and dried figs. The mean contribution to dietary aflatoxin exposure from human consumption of almonds, Brazil nuts, hazelnuts, pistachios and dried figs ranged from 0 ng/kg bw per day (clusters A, G, I and J; nut consumption reported as zero for these clusters) up to 0.8 ng/kg bw per day (clusters B and D). Pistachios were the main contributor to dietary aflatoxin exposure from tree nuts. In five cluster diets (B, C, D, E and M), they contributed over 5% to the overall dietary aflatoxin exposure, ranging from 0.2 to 0.8 ng/kg bw per day, equivalent to 7–45% of the aflatoxin from all sources. Almonds, Brazil nuts and hazelnuts contributed up to 0.1 ng/kg bw per day, and dried figs less than 0.01 ng/kg bw per day, in all Cluster Consumption Diets.

49. In the worst case scenario, with no maximum limit the intake of aflatoxin from the consumption of tree nuts and dried figs contributed to more than 5% of the total dietary aflatoxin exposure only for the GEMS/Food cluster diets B, C, D, E and M (24.6, 20, 45, 16.8 and 9.3 %, respectively).

50. JECFA estimated that an enforced maximum limit of 20, 15, 10, 8 or 4 µg/kg results in dietary exposures to aflatoxin ranging from 0.12, 0.10, 0.08, 0.07 and 0.06 ng/kg bw per day in the cluster with the highest exposure (D) to 0.03, 0.02, 0.02, 0.02 and 0.01 ng/kg bw per day in the cluster with the lowest exposure (M).

51. The Scientific Panel on Contaminants in the Food Chain (CONTAM) of the European Food Safety Authority was asked to advise on the potential increase in risks to consumer health associated with an increase in current EU maximum levels for almonds, pistachios and hazelnuts, taking into account the consumption patterns of these nuts in the EU. In its opinion N° EFSA-Q-2006-174, the Panel concluded that changing the maximum levels for AFT from 4 to 8 or 10 µg/kg aflatoxin would have minor effects on the estimates of dietary exposure and cancer risk.

REGULATORY LEVELS FOR AFLATOXIN IN DRIED FIGS

52. On a worldwide basis, at least 99 countries had mycotoxin regulations or guidelines for food and/or feed in force as of 2003. The aflatoxin regulations are often detailed and specific for various foodstuffs, including dairy products and for feedstuffs. Regarding AFB1, the worldwide accepted levels in food range between 1 and 20 µg/kg (EFSA, 2007).

53. With respect to the sum of AFB1, AFB2, AFG1 and AFG2, the worldwide accepted levels range between 0 and 35 µg/kg. A maximum limit of 20 µg/kg for the sum of AFB1, AFB2, AFG1 and AFG2 was harmonized by MERCOSUR (Mercado Común del Sur, Southern Common Market), a customs union among Argentina, Brazil, Uruguay, Paraguay and Venezuela, and is also applied in a total of 17 countries, with half of them in Latin America. Also, The United States also follows this 20 µg/kg maximum limit (EFSA, 2007).

54. In Turkey, the maximum level for aflatoxin in dried fig has been set at 10 µg/kg for AFT.

55. The European Union has established its maximum level as 2 µg/kg for AFB1 and 4 µg/kg for AFT for dried fruit and processed products thereof, when intended for direct human consumption or use as an ingredient in foodstuffs; and 5 µg/kg for AFB1 and 10 µg/kg total AFT for dried fruit to be subjected to sorting, or other physical treatment, before human consumption or use as an ingredient in foodstuffs.

SOCIO-ECONOMIC IMPORTANCE OF DRIED FIGS

56. Figs have a great importance in nutrition because they are important sources of carbohydrates, dietary fibers, essential amino acids, phenolic compounds, minerals and vitamin A, B1, B2 and C. Dried figs were evaluated by the DRI (Dietary Reference Intakes of Food and Nutrition Board of U.S. Institute of Medicine), and it was found that they do not contain sodium, fat or cholesterol but they do contain at least 17 types of amino acids include aspartic acid and glutamic acid. Compared with the other fruits, dried figs contain a high water-soluble dietary fiber which has been reported to help with reducing weight by controlling blood sugar and cholesterol (Vinson, 1999). In Turkey, estimated consumption of dried fig is around 150–200 g /person/year.

57. In Turkey as is typical throughout the world, and in other Mediterranean countries, numerous small farmers are involved in the commercial dried fig production. Figs are mainly grown on marginal land that can not be

utilized for other crops. Çobanoğlu (2007) reported that Turkish dried fig production comes from rain-fed and low-input systems on slopes and that the average farm size is 3.0 hectares composing of fragmented plots, while in developed countries like the U.S. there are a few large-scale farmers. If the number of dried-fig producers in countries such as Iran, Egypt, and Morocco is included, it is clear that the number is increased even further. World production of dried figs and nearly half of exports is carried out from Turkey; 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. The numbers of people with their families making a living from dried figs either directly or indirectly are estimated to be 250,000 individuals.

58. The annual global trade in dried figs ranges from 92,000–136,000 tons. The trade numbers increase if fresh figs are also taken into account. Almost half of that tonnage is produced by Turkey (TABLE 3). It is known that the other producing countries are Iran, the United States, Greece, Spain and Italy. Yet, Turkey leads the field, both in terms of quantity and production in the world. For this reason, from the point of view of Turkish agricultural exports, dried figs have a very important economic value.

59. Depending upon the product season and under normal weather conditions, production volume of dried figs and products thereof can reach the level of 65,000 tons in Turkey. Export of products between the years 2004 to 2006 reached the level of 56,000–62,000 tons. However, in 1997, 2007, and 2008, because of adverse climatic conditions as intense drought or low temperatures in winter resulting in insufficient amount of the "profichi" (male caprifig) fruit the export volume decreased to 40,000 tons. In Turkey, dried figs are produced on a total of 438,600 hectares of land. Approximately, there are 5.5 million trees and 2,0 million trees in Aydın and Izmir province, respectively.

60. Because of the socio-economic importance of dried figs in Turkey, many studies have been conducted over the years by researchers either at institutes or at universities but primarily by official authorities. The findings from these studies have been published officially, have been implemented, and have even been used in the fig-production stages both in orchards and processing plants. All these results were shared and referenced during the preparation of the related Code of Practice entitled CAC/CRP 65-2008. Therefore, it should be recognized and accepted that all of the data appearing in this Code, as well as in JECFA's 68th document, were obtained from dried figs which were produced using this 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.

61. 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. In this respect, farmers are trained in how to mitigate drought under rain-fed conditions and how to implement good practices during harvesting, drying and storage.

62. In 1988 and 1989, two "International Dried Fig and Aflatoxins" Symposia were organized in Izmir – Turkey and all researchers and experts were invited to discuss the issue. Apart from the "Aflatoxin Monitoring Project" and Project of Destroying of BYGF figs, the Aegean Dried Fruits Exporters' Association, together with Ege University and Erbeyli Fig Research Institute as well as other trade-related institutions lead and support projects and programs aiming at uplifting product quality by educating growers, middleman and packers. As along with preparing educative brochures and pamphlets, the Association also organizes meetings to inform growers, traders, technical personnel and packers. The Association also buys and disseminates drying trays and their components since 1999 (53,000 pieces in 2009; 50,000 pieces in 2010) and bags for "profichi" (caprifig) (2 million pieces in 2009, 3 million pieces in 2010) to be hung on to the fig trees. These equipment aims at reducing aflatoxin formation and preventing contamination.

63. The Association also supports fig growers against the negative and destructive effects of severe drought in the production area by financing the construction of 4 ponds in Aydın Province to be used for irrigation of fig orchards when necessary.

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