

Occurrence of aflatoxin M₁ in organic dairy products

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Abstract

Organic foods are perceived more nutritious, safer and healthier than conventional foods by consumers. Organic foods contain lower levels of pesticides and nitrates than conventional produce. However, studies on mycotoxin content of organic foods are limited. The aim of this study was to investigate aflatoxin M₁ (AFM₁) levels of organic milk and organic milk products produced in Turkey. In this study, 188 organic dairy products consisting of organic ultra-high temperature (UHT) milk (39 samples), organic yogurt (26 samples), organic cheese (91 samples) and organic butter (32 samples) were examined for AFM₁. ELISA was used for analysis of the samples. Samples were collected from organic markets in Turkey. AFM₁ was detected in 39 (100%) organic UHT milk samples (mean: 65 ng/kg; range: 57-78 ng/kg), 39 (43%) organic cheese samples (mean: 137 ng/kg; range: 9-487 ng/kg) and 26 (100%) organic yogurt samples (mean: 238; range: 125-269 ng/kg). AFM₁ contamination was not detected in organic butter samples. AFM₁ levels of 7 (8%) organic cheese samples, 39 (100%) organic UHT milk samples and 26 (100%) organic yogurt samples were above the maximum tolerable limit of the Turkish Food Codex. The results indicated that the level of AFM₁ in organic dairy products, especially organic yogurt and organic UHT milk, could be a potential risk for consumers.

Keywords: aflatoxin M₁, organic dairy products, organic milk

1. Introduction

Mycotoxins are toxic secondary metabolites produced by moulds growing on food commodities in field and storage conditions. The most important groups of mycotoxins in food are aflatoxins, ochratoxins, trichothecens, zearalenone and fumonisins. Mycotoxins have adverse effects on human and animals (Bennett and Klich, 2003).

Aflatoxins are highly toxic, mutagenic, teratogenic and carcinogenic compounds generally produced by certain species of *Aspergillus* especially *Aspergillus flavus*, *Aspergillus parasiticus* and *Aspergillus nomius* (Creppy, 2002). The International Agency for Research on Cancer classified aflatoxins as a class 1 human carcinogen (IARC, 1993).

Aflatoxin M₁ (AFM₁) is the hydroxylated metabolite of aflatoxin B₁ (Zinedine *et al.*, 2007). AFM₁ is mutagenic and genotoxic metabolites that formed in animals after the ingestion of aflatoxin B₁ contaminated feed. Aflatoxin B₁ is

formed by certain *Aspergillus* species during their growth on animal feeds. AFM₁ is relatively stable in dairy products and cannot be inactivated by pasteurization and sterilization (Galvano *et al.*, 2001; Jackson and Groopman, 1999).

The intake of AFM₁ from milk is calculated to be 6.8 ng/person per day for the European diet, 3.5 ng/person per day for the Latin American diet, 12 ng/person per day for the far Eastern diet and 0.1 ng/person per day for the African diet (Creppy, 2002). In Turkey, there is no information on AFM₁ intake from milk and milk products.

The maximum level of AFM₁ allowed in milk and milk products varies from one country to another. In commission regulation No. 1881/2006 of the European Community and the Turkish Food Codex, the maximum level of AFM₁ in milk and cheese are 50 ng/kg and 250 ng/kg, respectively (EC, 2006; TFC, 2002).

Organic agricultural products are grown without synthetic additives such as synthetic pesticides, synthetic fertilisers,

veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation (Winter and Davis, 2006). Organic foods are perceived as healthier, more nutritious and safer than conventional foods due to their growing practices. However, the principles and practices of organic farming do not guarantee that organic food is healthier or safer (Markus, 2001). Pesticide contamination, microbiological safety and other food safety issues of organic foods must be closely examined.

Organic foods, despite the assumption that they are safe, can also carry risks as much as conventional foods. In fact, organic crops are claimed to be more vulnerable to mould contamination because use of synthetic fungicides is not allowed. Although there is no significant evidence to support this hypothesis, some studies show that organic foods can contain mycotoxins. For example, Semaškienė *et al.* (2005) reported that organic grain were heavily contaminated and infected with toxic fungi and were not free from mycotoxin. In contrast, Vallone *et al.* (2006) reported that organic milk was less contaminated than conventional milk. Internationally there are limited data on mycotoxin contamination in organic foods.

2. Materials and methods

Samples

In this study, a total of 188 organic milk and dairy products were collected from organic product markets in Turkey between February 2010 and February 2011. All the samples had an organic food label. The samples consisted of organic ultra-high temperature (UHT) milk (n=39), organic yogurt (n=26), organic cheese (n=91) and organic butter (n=32). The weight of organic cheese and yogurt samples ranged from 250 to 500 g. The weight of organic butter and organic UHT milk samples was 250 g and 1,030 g, respectively. The samples were transported from the organic markets to the laboratory in ice boxes and stored at -18 °C until further analysis.

Sample preparation

Preparation of the samples was performed according to the method described by R-Biopharm GmbH (RIDASCREEN® Aflatoxin M₁ 30/15, no. R1111, Darmstadt, Germany).

Organic UHT milk samples

Organic UHT milk samples were centrifuged at 3,500×g for 10 min at 10 °C. After centrifugation the upper cream layer was removed completely by aspiration through a Pasteur pipette. Skimmed milk was used in the test.

Organic cheese samples

40 ml dichloromethane was added to 2 g triturated organic cheese samples. The mixture was extracted by shaking for 15 min. After the filtration of suspension, 10 ml of the extract was evaporated at 60 °C under a weak N₂ stream. 0.5 ml methanol, 0.5 ml phosphate buffered saline (PBS) buffer and 1 ml heptane were added to the oily residue and mixed thoroughly. The mixture was centrifuged at 2,700×g for 15 min. The upper heptane layer was removed completely. Aliquot of the lower methanolic aqueous phase was poured off carefully and 400 µl buffer 1 was added to 100 µl of this aliquot (1:5 dilution). 100 µl of the diluted samples was used in the test.

Organic butter samples

Organic butter samples were centrifuged at 3,000×g for 1 min in a screw cap vial. After centrifugation, organic solid butter samples were melted in a water bath at 40 °C. 3 ml n-hexane and methanol (70%) were added to the butter and mixed vigorously for 15 min on a vortex. Organic butter samples were centrifuged at 4,000 rpm for 10 min at 10 °C. 50 µl aliquot of the aqueous layer was diluted with 800 µl buffer 1. 100 µl of this dilution was used in the test.

Organic yogurt samples

Organic yogurt samples were heated in a water bath at 80 °C for 3 min, after which the samples were cooled to room temperature. 5 ml of PBS buffer was added to 1 ml of organic yogurt sample. 100 µl of the diluted samples was used in the test.

Analysis of AFM₁ by ELISA

100 µl of standard solutions and prepared samples were added into separate duplicate wells. After mixing the plate manually, plates were incubated for 30 min at room temperatures in the dark. The liquid was poured out of the wells, than wells were washed twice with washing buffer. After this step, 100 µl of the diluted enzyme conjugate was added to the wells and incubated for 15 min at room temperature in the dark. The washing procedure was repeated. 100 µl substrate/chromogen was added to each well, mixed gently by shaking the plate manually and incubated for 15 min at room temperature in the dark. Finally, 100 µl of the stop solution was added to each well. The absorbance of standard solutions and samples was measured immediately at 450 nm by ELISA (ELX800, BioTek® Instruments, Inc., Winooski, VT, USA). AFM₁ levels of samples were evaluated according to the Gen 5™ computer program prepared by BioTek® Instruments, Inc.

Evaluation of data

AFM₁ levels of samples were evaluated according to the Gen 5™ computer program prepared by BioTek® Instruments, Inc. Based on the instructions of the RIDASCREEN® kit, the detection limits of the kit for milk, cheese, yogurt and butter were 5, 50, 5 and 5 ng/kg, with recovery rates of 95, 102, 90 and 100.2%, respectively.

Statistical analysis

Results were analysed using the SAS statistical analysis system (SAS, 2001) and analysis of variance (ANOVA) was applied using the PROC GLM procedure of SAS.

3. Results and discussion

The AFM₁ concentration detected in organic UHT milk, cheese, yogurt and organic butter samples are shown in Table 1.

In this study, AFM₁ was found in 104 (55%) of 188 organic dairy samples with contamination levels ranging from 9-487 ng/kg. Although AFM₁ was detected in all yogurt and UHT milk samples, it was not detected in the butter samples. AFM₁ was detected in 100% of UHT milk samples, 43% of cheese samples and 100% of yogurt samples, respectively. The levels of AFM₁ in 39 (100%) UHT milk samples, 7 (8%) cheese samples and 26 (100%) yogurt samples exceeded the Turkish Food Codex limit.

The range of contamination levels were between 9 and 487 ng/kg, with an average value of 137 ng/kg in organic cheese, 57-78 ng/kg with an average value of 65 ng/kg in organic UHT milk, and 125-269 ng/kg with an average value of 238 ng/kg in organic yogurt. Statistical evaluation showed that there were significant differences ($P < 0.05$) among AFM₁ levels of organic yogurt samples.

Studies on mycotoxin content of organic dairy products are limited. Woese *et al.* (1997) reported that the concentrations of AFM₁ were lower in organic milk than those in conventional milk. In another study, the levels of ochratoxin A in Norwegian organic milk were lower than those of conventionally produced milk (Skaug, 1999). In comparison to other previous studies, the AFM₁ levels of organic UHT milk samples in our study were much higher than those found for conventionally produced dairy products in other studies (Blanco *et al.*, 1988; Ertaş *et al.*, 2011; Fallah, 2010; Kamkar, 2005; Martins and Martins, 2000; Nuryono *et al.*, 2009; Razza, 2006; Roussi *et al.*, 2002; Tekinşen and Eken, 2008; Zinedine *et al.*, 2007).

Çaglar and Kara (2010) have determined AFM₁ levels in 120 raw milk samples in Afyonkarahisar, Turkey. They have reported that 22.5% of the samples exceeded the allowable limit reported in the Turkish Food Codex (50 ng/l). Aydemir Atasever *et al.* (2010c) have studied 150 UHT milk samples in Erzurum, Turkey, and reported that 59% of the milk samples was AFM₁ positive. They further reported that AFM₁ levels in 10.7% UHT milk samples exceeded the maximum tolerable limit of the Turkish Food Codex. Aksoy *et al.* (2010) analysed 36 samples of raw cow's milk consumed in Samsun, Turkey. In their study, 61% of the raw cow's milk samples were positive for AFM₁. Er *et al.* (2010) have determined the AFM₁ levels in milk consumed in the Ankara region in Turkey. They have investigated 120 pasteurised milk and 30 raw milk samples from seven different companies. The mean levels of the AFM₁ in pasteurised milk of two companies were higher than the acceptable limits reported in the Turkish Food Codex. The organic UHT milk samples in our study had higher AFM₁ levels than theirs. Sarimehmetoglu *et al.* (2004) reported that the AFM₁ levels in milk are affected by season, country and geographical region. The higher AFM₁ concentration in our study could be attributed to aforementioned reasons. In our study, there were no significant differences in AFM₁ levels among organic UHT milk samples ($P > 0.05$).

Table 1. Levels of aflatoxin M₁ (AFM₁) contamination in organic ultra-high temperature (UHT) milk, cheese, butter and yogurt samples from Turkey.

Type of samples	Number of samples tested	Number of positive samples ¹	Number of samples exceeding legal limit ¹	Frequency distribution of samples (ng/kg)						AFM ₁ concentration (ng/kg)		
				0-30	31-50	51-100	101-200	201-300	>300	minimum	maximum	mean
Organic cheese	91	39 (43)	7 (8)	5	5	12	7	5	5	9	487	137
Organic UHT milk	39	39 (100)	39 (100)	0	0	39	0	0	0	57	78	65
Organic butter	32	0 (0)	0 (0)	0	0	0	0	0	0	0	0	0
Organic yogurt	26	26 (100)	26 (100)	0	0	0	6	20	0	125	269	238
Total	188	104 (55)	72 (38)	5	5	51	13	25	5	9	487	109

¹ Percentages given within brackets.

In our study, organic butter samples were free of AFM₁. Similar, AFM₁ incidences in butter samples were reported by several researchers (Bakırcı, 2001; Fallah, 2010; Maqbool *et al.*, 2009). Aydemir Atasever *et al.* (2010a) have investigated AFM₁ levels in 80 butter samples consumed in Erzurum, Turkey, and reported that 66 samples were found to be contaminated with AFM₁ and 13 samples exceeded the maximum legal limit accepted by Codex Alimentarius Commission (CAC, 2001). Their samples had higher contamination levels than our samples. AFM₁ is highly soluble in the aqueous phase of milk, but is insoluble in fat due to its affinity to casein in milk. Thus, butter may contain less amounts of AFM₁ compared to the other dairy products (Bakırcı, 2001).

Our results indicate that AFM₁ levels in the organic yogurt samples were higher than those in other conventionally produced yogurt samples. For example, Fallah (2010) reported that the mean AFM₁ level of yogurt samples was 32 ng/kg. Galvano *et al.* (1998) reported that 1.8% of 114 yogurt samples had higher AFM₁ levels than the maximum tolerated limits (50 ng/kg). In Portugal, Martins and Martins (2004) studied the presence of AFM₁ in 96 yogurt samples. AFM₁ was detected in 18 samples and its concentration 19 to 98 ng/kg. Akkaya *et al.* (2006) reported that 11.53% of ordinary yogurt samples, 9.52% of fruit yogurt samples and 21.15% of strained yogurt samples had AFM₁ levels exceeding 50 ng/kg. Moreover, Ertaş *et al.* (2011) reported that 7 of 50 yogurt samples had AFM₁ levels exceeding 50 ng/kg and contamination levels ranged from 2.5 to 78 ng/kg. Gurbay *et al.* (2006) reported that 80% of 40 yogurt samples had AFM₁ levels exceeding 50 ng/kg. They indicated that AFM₁ was found in samples with contamination levels ranging from 62 to 366 ng/kg. These contamination levels were relatively comparable with our results.

In this study, AFM₁ levels in 8% (7/91) organic cheese samples were found to be higher than the maximum acceptable limit (250 ng/kg). AFM₁ levels of organic cheese samples were significantly different ($P < 0.05$). The concentrations of AFM₁ in organic cheese samples were in the range of 9-487 ng/kg.

The AFM₁ concentrations of the organic cheese samples analyzed in this study were higher than those reported by Dashti *et al.* (2009), Ertaş (2011), Tekinşen and Uçar (2008) and Yaroğlu *et al.*, (2005) and lower than those reported by Sarımehtemetoğlu *et al.* (2004) and Tekinşen and Tekinşen (2005). Aydemir Atasever *et al.* (2010b) investigated 85 white cheese, 75 kashar cheese, 62 civil cheese and 82 cream cheese samples for AFM₁ contamination in Erzurum, Turkey. They reported that according to the European Commission limit (EC, 2006), the sample incidence exceeding the acceptable limits were 27.1%, 34.7%, 17.1% in white cheese, kashar cheese and cream cheese samples,

respectively. These findings have also higher rates than the samples in our study.

The results of this study showed that organic milk and dairy products were contaminated with AFM₁. Animals are exposed to aflatoxins by consumption of feeds that are contaminated by aflatoxin-producing fungal strains during the vegetation period, harvest and storage. When cows are fed with contaminated feed, aflatoxin B₁ is converted by hydroxylation to AFM₁, which is subsequently secreted in the milk of lactating cows. To eliminate AFM₁ in food, synthetic antifungal agents are used in conventional farming. However, organic agriculture produces food without use of synthetic antifungal agents. Therefore, it has been suggested that organic food may be more prone to contamination by mycotoxins produced by moulds than conventional food, because they are not treated to the same extent with anti-fungal agents. Our findings are in line with this conclusion. We suggest to check organic feed regularly to prevent aflatoxin formation in milk and milk products and to use efficient farming methods and alternative antifungal agents.

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References

- Akkaya, L., Birdane, Y.O., Oguz, H. and Cemek, M., 2006. Occurrence of aflatoxin M₁ in yogurt samples from Afyonkarahisar, Turkey. *Bulletin of the Veterinary Institute in Pulawy* 50: 517-519.
- Aksoy, A., Yavuz, O., Guvenc, D., Das, Y.K., Terzi G. and Celik, S., 2010. Determination of aflatoxin levels in raw milk, cheese and dehulled hazelnut samples consumed in Samsun province, Turkey. *Kafkas Universitesi Veteriner Fakultesi Dergisi* 16: S13-S16.
- Aydemir Atasever, M., Adiguzel, G., Atasever, M. and Ozturan, K., 2010b. Determination of aflatoxin M₁ levels in some cheese types consumed in Erzurum Turkey. *Kafkas Universitesi Veteriner Fakultesi Dergisi* 16: S87-S91.
- Aydemir Atasever, M., Adiguzel, G., Atasever, M., Ozlu, H. and Ozturan, K., 2010c. Occurrence of aflatoxin M₁ in UHT milk in Erzurum, Turkey. *Kafkas Universitesi Veteriner Fakultesi Dergisi* 16: S119-S122.
- Aydemir Atasever, M., Atasever, M., Ozturan, K. and Urcar, S., 2010a. Determination of aflatoxin M₁ level in butter samples consumed in Erzurum, Turkey. *Kafkas Universitesi Veteriner Fakultesi Dergisi* 16: S159-S162.
- Bakırcı, I., 2001. A study on the occurrence of aflatoxin M₁ in milk and milk products produced in Van province in Turkey. *Food Control* 12: 47-51.
- Bennett, J.W. and Klich, M., 2003. Mycotoxins. *Clinical Microbiology Reviews* 16: 497-516.

- Blanco, J.L., Domingues, L., Gomez-Lucia, E., Garayzabal, J.F.F., Goyache, J. and Suarez, G., 1988. Behavior of aflatoxin during the manufacture, ripening and storage of Manchego-type cheese. *Journal of Food Science* 53: 1373-1376.
- Çaglar, A. and Kara, H.H., 2010. Occurrence of aflatoxin M₁ in raw cow milk in the Afyonkarahisar province of Turkey. *Archiv für Lebensmittelhygiene* 61: 179-182.
- Codex Alimentarius Commission (CAC), 2001. Comments submitted on the draft maximum level for aflatoxin M₁ in milk. Codex Committee on food additives and contaminants 33rd session, the Hague, the Netherlands.
- Creppy, E.E., 2002. Update of survey, regulation and toxic effects of mycotoxins in Europe. *Toxicology Letters* 127: 19-28.
- Dashti, B., Al-Hamli, S., Alomirah, H., Al-Zenki, S., Bu Abbas, A. and Sawaya, W., 2009. Levels of aflatoxin M₁ in milk and cheese consumed in Kuwait and occurrence of total aflatoxin in local and imported animal feed. *Food Control* 20: 686-690.
- Er, B., Demirhan, B., Kanyak Onurdag, F. and Yentur, G., 2010. Determination of aflatoxin M₁ level in milk and white cheese consumed in Ankara region, Turkey. *Journal of Animal and Veterinary Advances* 9: 1780-1784.
- Ertaş, N., Gönülalan, Z., Yıldırım, Y. and Karadal, F., 2011. A survey of concentration of aflatoxin M₁ in dairy products marketed in Turkey. *Food Control* 22: 1956-1959.
- European Community (EC), 2006. Commission regulation No. 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs. *Official Journal of European Union L* 364: 5-24.
- Fallah, A.A., 2010. Assessment of aflatoxin M₁ contamination in pasteurized and UHT milk marketed in central part of Iran. *Food and Chemical Toxicology* 48: 988-991.
- Galvano, F., Galofaro, V., De Angelis, A., Galvano, M., Bognanno, M. and Galvano, G., 1998. Survey of the occurrence of aflatoxin M₁ in dairy products marketed in Italy. *Journal of Food Protection* 61: 738-741.
- Galvano, F., Galofaro, V., Ritieni, A., Bognanno, M., De Angelis, A. and Galvano, G., 2001. Survey of the occurrence of aflatoxin M₁ in dairy products marketed in Italy: second year of observation. *Food Additives and Contaminants* 18: 644-646.
- Gurbay, A.S., Engin, A.B., Çaglayan, A. and Sahin, G., 2006. Aflatoxin M₁ levels in commonly consumed cheese and yogurt samples in Ankara, Turkey. *Ecology of Food and Nutrition* 45: 449-459.
- International Agency for Research on Cancer (IARC), 1993. IARC monograph on the evaluation of carcinogenic risks to humans, volume 56. Some naturally occurring substances: food items and constituents, heterocyclic aromatic amines and mycotoxins. IARC, Lyon, France.
- Jackson, P.E. and Groopman, J.D., 1999. Aflatoxin and liver cancer. *Baillieres Best Practice and Research in Clinical Gastroenterology* 13: 545-555.
- Kamkar, A., 2005. A study on the occurrence of aflatoxin M₁ in raw milk produced in Sarab city of Iran. *Food Control* 16: 593-599.
- Maqbool, U., Anwar-Ul-Haq and Ahmad, M., 2009. ELISA determination of aflatoxin M₁ in milk and dairy products in Pakistan. *Toxicological and Environmental Chemistry* 91: 241-249.
- Markus, M.B., 2001. Organic foods offer peace of mind – at a price. *US News World Report* 130: 48-50.
- Martins, M.L. and Martins, H.M., 2000. Aflatoxin M₁ in raw and ultra high temperature-treated milk commercialized in Portugal. *Food Additives and Contaminants* 17: 871-874.
- Martins, M.L., and Martins, H.M., 2004. Aflatoxin M₁ in yogurts in Portugal. *International Journal of Food Microbiology* 91: 315-317.
- Nuryono, N., Agus, A., Wedhastri, S., Maryudani, Y.B., Sigit Setyabudi, F.M.C., Bohm, J. and Razzazi-Fazeli, E., 2009. A limited survey of aflatoxin M₁ in milk from Indonesia by ELISA. *Food Control* 20: 721-724.
- Razza, R., 2006. Occurrence of aflatoxin M₁ in the milk marketed in the city of Karachi, Pakistan. *Journal of the Chemical Society of Pakistan* 28: 155-157.
- Roussi, V., Govaris, A., Varagouli, A. and Botsoglou, N.A., 2002. Occurrence of aflatoxin M₁ in raw and market milk commercialized in Greece. *Food Additives and Contaminants* 19: 863-868.
- Sarımehtemtoğlu, B., Kuplulu, O. and Celik, H., 2004. Detection of aflatoxin M₁ in cheese samples by ELISA. *Food Control* 15: 45-49.
- SAS, 2001. SAS/STAT user's guide. Release 6.03. SAS Institute, Inc., Cary, NC, USA.
- Semaškienė, R., Mankevičienė, A., Dabkevičius, Z. and Leistrumaitė, A., 2005. Toxic fungi infection and mycotoxin level in organic grain. *Botanica Lithuanica* 7: 17-25.
- Skaug, M.A., 1999. Analysis of Norwegian milk and infant formulas for ochratoxin A. *Food Additives and Contaminants* 16: 75-78.
- Tekinşen, K.K. and Eken, H.S., 2008. Aflatoxin M₁ levels in UHT milk and kashar cheese consumed in Turkey. *Food and Chemical Toxicology* 46: 3287-3289.
- Tekinşen, K.K. and Tekinşen, O.C., 2005. Aflatoxin M₁ in white pickle and Van otlu (herb) cheeses consumed in southeastern Turkey. *Food Control* 16: 565-568.
- Tekinşen, K.K. and Ucar, G., 2008. Aflatoxin M₁ levels in butter and cream cheese consumed in Turkey. *Food Control* 19: 346-349.
- Turkish Food Codex (TFC), 2002. Gıda maddelerinde belirli bulaşanların maksimum seviyelerinin belirlenmesi hakkında tebliğ. *Resmi Gazete*, 23 Eylül 2002. Sayı 24885. Başbakanlık Basımevi. TFC, Ankara, Turkey.
- Vallone, L., Boscariol, D. and Dragoni, I., 2006. Aflatoxins in organic milk and dairy products. *Veterinary Research Communications* 30: 369-370.
- Winter, C.K. and Davis, S.F., 2006. Organic foods. *Journal of Food Science* 71: 117-124.
- Woese, K., Lange, D., Boess, C. and Bogl, K.W., 1997. A comparison of organically and conventionally grown foods - results of a review of the relevant literature. *Journal of Science Food and Agriculture* 74: 281-293.
- Yaroğlu, T., Oruc, H.H. and Tayar, M., 2005. Aflatoxin M₁ levels in cheese samples from some provinces of Turkey. *Food Control* 16: 883-885.
- Zinedine, A., Gonzalez-Osnaya, L., Soriano, J.M., Molto, J.C., Idrissi, L. and Manes, J., 2007. Presence of aflatoxin M₁ in pasteurized milk from Morocco. *International Journal of Food Microbiology* 114: 25-29.

