Iran J Public Health, Vol. 52, No.2, Feb 2023, pp.446-448

Letter to the Editor

Investigation the Level of Patulin Contamination in Fruit Leathers Produced By Traditional and Commercial Methods

Parisa Abedi [1], *Roshanak Daie Ghazvini [1], Seyed Jamal Hashemi [1,2], Zahra Rafat [3], Pegah Ardi [1], Mahdi Zareei [1], Hasati Kamali Sarvestani [1]

1. *Department of Medical Parasitology and Mycology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*
2. *Food Microbiology Research Center, Tehran University of Medical Sciences, Tehran, Iran*
3. *Department of Medical Microbiology, School of Medicine, Gilan University of Medical Sciences, Rasht, Iran*

***Corresponding Author:** Email: rdaie@tums.ac.ir

(Received 18 May 2021; accepted 27 May 2021)

Dear Editor-in-Chief

Patulin is a mycotoxin with mutagenic (1), neurotoxic (2), immunotoxic (3), genotoxic (1), and gastrointestinal effects which often found in fruit and fruit products (e.g., fruit leathers). In recent years, methods for preparation fruit leathers transferred from a homemade preparation (traditional methods) into commercial techniques.

In commercial techniques fruit pulps are mixed with appropriate quantities of sugar, pectin, acid, and color and then dried into sheet-shaped products. Due to the high presence of sugar content in fruit leathers which is suitable for fungal growth, there is an increased probability for patulin production in this product. Furthermore, the surfaces of damaged fruits are suitable hosts for mold growth and the subsequent production of patulin (4). The U.S. Food and Drug Administration (FDA) has recommended a maximum concentration of 50 μg/L patulin for apple products (5). Most surveys on patulin incidence concerned apples, apple juices, apple purees and other fruit juices, but a few reports on patulin in apple leather or other fruit leathers could be found.

The present study was carried out on a total of 46 samples (23 traditional fruit leathers and 23 commercial fruit leathers), including fruit bars prepared from peach, orange, kiwi, pomegranate, apricot, barberry, plum, apple-sour cherry, apple-plum, cherry, greengage, strawberry, barberry-pomegranate, apple-pomegranate, green apple, sour cherry, apple, apple-apricot, raspberry, sole and fruit leathers include a mixture of sour cherry, apricot, cornelian cherry, and greengage. Samples were randomly purchased from different supermarkets during 2019 in Tehran, Iran. The detection of patulin was accomplished using high-performance liquid chromatography (HPLC) method.

Patulin was detected in 25 samples (54.34 %) at concentrations ranging from 1.44 to 32.62 ng/mL (Table 1). The mean patulin concentration was 16 ng/mL. Any of the fruit leather samples investigated had not patulin level higher than 50 ng/mL. The highest level of patulin concentration was related to kiwi leather (32.62 ng/mL) made by commercial methods and the lowest was related to barberry leathers (1.99 ng/mL).

Table 1: The concentration of patulin in different types of fruit leathers based on traditional and commercial preparation methods

Sample number	*Type of fruit leather*	*Patulin concentration (ng/mL) or (µg/kg)*	*Preparation method*
1	Peach	0/00	Traditional
2	Sour cherry	0/00	Traditional
3	Barberry-pomegranate	0/00	Traditional
4	Sour cherry	0/00	Traditional
5	Apricot	0/00	Traditional
6	Apple	0/00	Traditional
7	Apple-apricot	0/00	Traditional
8	Green apple	0/00	Traditional
9	Apricot	0/00	Traditional
10	Raspberry	0/00	Traditional
11	Pomegranate	0/00	Traditional
12	Mixture of sour cherry, apricot, cornelian cherry and greengage.	0/00	Traditional
13	Eight fruit	0/00	Traditional
14	Apple- sour cherry	0/00	Traditional
15	pomegranate	0/00	Traditional
16	Apricot	0/00	Traditional
17	kiwi	0/00	Traditional
18	Apple-plum	0/00	Traditional
19	Raspberry	0/00	Traditional
20	Cornelian cherry	0/00	Traditional
21	Plum	0/00	Traditional
22	Red plum- sour cherry	1.47	Traditional
23	Barberry	1.99	Commercial
24	Red plum	2.20	Commercial
25	Aapricot	2.55	Commercial
26	Sour cherry	3.62	Commercial
27	Kiwi	4.01	Commercial
28	Barberry	4.08	Commercial
29	Apple-apricot	4.19	Commercial
30	Plum	4.30	Commercial
31	Orange	4.41	Commercial
32	Combination of fruits	4.85	Commercial
33	Orange	5.24	Traditional
34	Pomegranate	5.78	Commercial
35	Apple	5.99	Commercial
36	Greengage	8.19	Commercial
37	Sole	8.83	Commercial
38	Strawberry	10.56	Commercial
39	Greengage	10.57	Commercial
40	Cherry	11.28	Commercial
41	Cornelian cherry	18.59	Commercial
42	Apple-pomegranate	22.73	Commercial
43	Apricot	23.37	Commercial
44	Cornelian cherry	27.31	Commercial
45	Plum	32.22	Commercial
46	Kiwi	32.62	Commercial

The high incidence of patulin in kiwi leathers could be due to the use of moldy or rotten kiwifruits, which are lower in price and might be used in fruit leather processing. Kiwi leather con-

tains fruit flesh and if rotten tissues enter into the product, the level of patulin increases dramatically. In comparison with the traditional fruit leathers, the level of contamination with patulin in commercial fruit leathers was significantly higher (*P*-value = 0.024). In commercial preparation methods, fruit leather is made by heat drying of a thin layer of fruit puree. Patulin is remarkably temperature stable and the commercially employed techniques to reduce the concentration of this mycotoxin in fruit leathers are unable to significantly reduce its levels.

Furthermore, in this study, among fruit leathers made by traditional methods, patulin contamination only was reported from orange leathers (5.24 ng/mL) and in other types of fruit leathers prepared by traditional methods the level of patulin contamination was zero (0 ng/mL). Therefore, it seems that traditional fruit leathers are safer than commercial fruit leathers for consumers.

Acknowledgements

The authors wish to thank the financial support of Tehran University of Medical Sciences.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Liu BH, Yu FY, Wu TS, et al (2003). Evaluation of genotoxic risk and oxidative DNA damage in mammalian cells exposed to mycotoxins, patulin and citrinin. *Toxicol Appl Pharmacol*, 191(3):255-263.
2. Magan N, Olsen M (2004). *Mycotoxins in food: detection and control*: Woodhead Publishing.
3. Sharma RP (1993). Immunotoxicity of mycotoxins. *J Dairy Sci*, 76(3): 892-897.
4. Beretta B, Gaiaschi A, Galli CL, et al (2000). Patulin in apple-based foods: occurrence and safety evaluation. *Food Addit Contam*, 17(5):399-406.
5. Alimentarius C (2003). Code of practice for the prevention and reduction of patulin contamination in apple juice and apple juice ingredients in other beverages (CAC/RCP 50–2003). Rome: Joint FAO. WHO Food Standards Program, FAO.