APPLICATION NOTE

Food Safety - Lateral Flow

Authors

Alina Dykman, MS

Nicolas Kosa, Ph.D

PerkinElmer, Inc.
Austin, TX

Contributors

Alexandra Maples

Madhavi Vemuganti, MS

PerkinElmer, Inc.
Austin, TX

Rapid Quantification of Ochratoxin A Residues in Wheat Using the AuroFlow AQ OTA Strip Test

Introduction

Ochratoxin A is a mycotoxin that primarily afflicts grains, coffee beans, wine and grape juice, and spices due to contamination with several species of *Aspergillus* and *Penicillium* molds. Ochratoxin contamination in food and feed threatens human and animal health, thereby requiring close monitoring by governmental agencies such as the USDA[1].

The AuroFlow™ AQ OTA Strip Test is a quantitative (0–100 ppb) and rapid (five-minute) lateral flow test kit designed to detect Ochratoxin for field or laboratory use. This kit utilizes an environmentally friendly water-based extraction method and has received a USDA-FGIS certificate of conformance (#FGIS 2020-140) for its high performance in wheat samples[2, 3].

PerkinElmer®
For the Better

Experimental

Materials and Methods

The AuroFlow AQ OTA Strip Test reagent kit was evaluated according to published USDA-FGIS Test Kit Instructions in conjunction with a portable and user-friendly QuickSTAR™ Horizon™ Strip Reader (PerkinElmer, CAT# FOOD-6006-01)[2, 4].

Reference materials produced from naturally contaminated wheat were prepared at various Ochratoxin contamination levels, certified using LC-MS/MS reference methods, and sourced from Trilogy Analytical Laboratory (Washington, MO, USA). Wheat reference materials tested included 4.8 ± 1.0 ppb, 20.4 ± 3.5 ppb, and 94.7 ± 21.5 ppb OTA. Certified reference standards for commodity subtype testing were sourced from Trilogy.

Results and Discussion

Accuracy and Precision

63 total samples of wheat at concentrations from 4.8 – 94.7 ppb were aliquoted into individual portions of 50 ± 0.2 g using an analytical balance (Sartorius MFR# ENTRIS224-1SUS) and subsequently tested by three operators (Table 1).

Table 1. Wheat sample test results using the AuroFlow AQ OTA Strip Test.

Accuracy & Precision Evaluation – Wheat (n=21 per conc)					
CRM Expected Concentration (ppm)	Observed Range (ppb)		Mean (ppb)	Standard Deviation (ppb)	Relative Standard Deviation
	Lowest	Highest			
4.8	4.4	7.0	5.5	0.7	13%
20.4	19	27	21.7	2.1	10%
94.7	66	117	88.0	12.2	14%

Overall, the results obtained from the AuroFlow AQ OTA Strip Test are excellent and compare well to the certified reference values that were obtained from Trilogy Analytical Laboratory. All results meet the USDA Design Criteria and Test Performance Specifications for Quantitative Ochratoxin A Test Kits[3].

Sample Variability

Representative samples for each commodity subtype were confirmed as uncontaminated by Trilogy Analytical Laboratory (Washington, MO, USA) and subsequently processed and tested. A single extraction was performed for each commodity subtype in accordance with the AuroFlow AQ OTA Strip Test and the associated USDA-FGIS Test Kit Instructions. An Ochratoxin reference standard was then spiked into the ND liquid sample extract to simulate a representative 5 and 20 ppb sample for each commodity subtype. The results depict consistent good performance across commodities and concentrations (Table 2). We observe lower recovery of naturally contaminated Ochratoxin A at higher sample concentrations (>5 ppb). Since the kit is calibrated to naturally contaminated wheat this produces higher reported concentration of Ochratoxin in sample spikes.

Table 2. Sample variability assessment of common commodity subtypes for wheat using the AuroFlow AQ OTA Strip Test. While there was some variation in the reported mean for ND samples, all samples reported well below the LOD.

Commodity Sample Variability - Wheat				
Contamination Level (Spike)	Commodity Subtype	AuroFlow AQ OTA Strip Test, Reported Values (n=10)		
		Mean (ppb)	Standard Deviation (ppb)	% Match*
N/A	Flour	0.3	0.3	N/A
	Whole Wheat Flour	1.0	0.4	30%
	Whole wheat, ground	1.4	0.4	21%
5 ppb	Flour	5.7	1.0	N/A
	Whole Wheat Flour	4.6	0.9	81%
	Whole wheat, ground	3.9	0.8	68%
20 ppb	Flour	36.0	2.4	N/A
	Whole Wheat Flour	30.0	1.6	83%
	Whole wheat, ground	32.4	3.1	90%

*Note: % Match was computed against the wheat 'Flour' with respect to each additional commodity subtype.

Conclusion

In summary, the AuroFlow AQ OTA Strip Test is an accurate, precise, user-friendly, and stable product for detection of ochratoxin A. The kit performance correlates well to LC-MS/MS reference methods and can determine ochratoxin A concentrations in wheat and its respective derivative commodities using an aqueous extraction method. Conformance of this product to USDA-FGIS ochratoxin test kit criteria in both internal and external testing (USDA Certificate of Conformance.

References

1. Pereira, C. S., Cunha, S. C., and Fernandes, J. O. Prevalent Mycotoxins in Animal Feed: Occurrence and Analytical Methods. *Toxins* 11, 5, 290, doi: 10.3390/toxins11050290 (2019).
2. USDA Agricultural Marketing Service - Federal Grain Inspection Service. FGIS Performance Verified & Approved Mycotoxin Test Kits – Effective 3/15/2021. Retrieved from https://www.ams.usda.gov/sites/default/files/media/FGISApprovedMycotoxinRapidTestKits.pdf (2021, March 26).
3. USDA Agricultural Marketing Service - Federal Grain Inspection Service. Criteria & Specifications: Design Criteria and Test Performance Specifications for Quantitative Ochratoxin Test Kits. Retrieved from https://apps.ams.usda.gov/elearning/TestKits/Ochratoxin_criteria.pdf (2018, June 01).
4. USDA Agricultural Marketing Service - Federal Grain Inspection Service. *Test Kit Instruction - PerkinElmer: AuroFlow AQ OTA Strip Test Using the QuickStar Horizon Strip Reader.* Retrieved from https://www.ams.usda.gov/sites/default/files/media/FOOD-1417-01-Effective-10-14-2020.pdf (2020, Oct. 14).

PerkinElmer, Inc.
940 Winter Street
Waltham, MA 02451 USA
P: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

PerkinElmer®

For a complete listing of our global offices, visit www.perkinelmer.com/ContactUs

FOOD APP_20210521_1.1 PKI