

The influence on the food safety by the spreading of the invasive alien plants

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INTRODUCTION

Tropane alkaloids (TAs) are the secondary plants metabolites and more than 300 of them have been discovered so far. The highest number of the TAs is produced by the *Solanaceae* family (genera *Atropa*, *Datura* and *Hyoscyamus*), with the most important being the invasive alien species *D. stramonium*. The best known TAs are the strong antimuscarinic agents atropine and scopolamine, while the effects of the other TAs, including the newly discovered calystegines, are mostly still undiscovered. The Commission Recommendation (EU) 2015/976 established 2 µg/kg as the LOQ for atropine (AT) and scopolamine (SC).

During the two-year monitoring (2020-2021) a total of 128 food products samples were tested for the occurrence of the TAs. The analysis comprised: 35 corn grits, 19 popcorn, 25 corn puffs, 16 corn and 33 tea samples purchased in Belgrade and Novi Sad (Serbia) shops.

Sample 2 g + 10 mL H₂O + 50 µL IS

ACN 40 mL shake 60 min
Centrifugate 5 min/7500 rpm

10 mL of extract + QuEChERS
extract. salts

Vortex 2 min, centrifugation
10 min/7500 rpm

6 mL aliquot + 150 mg MgSO₄
+ 25 mg PSA + 25 mg C₁₈

Vortex 2 min, centrifugation
5 min/16000 rpm

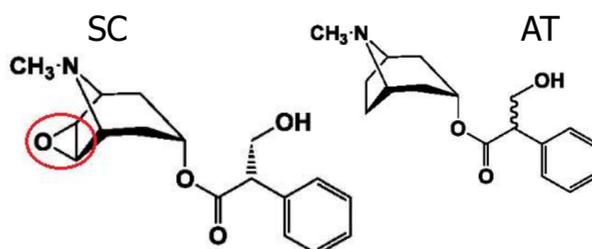
2 mL aliquot evaporated to
dryness, reconstitution in
1 mL of mobile phase

LC-MS/MS

LC ANALYSIS

HPLC Agilent 1290 Infinity II chromatograph equipped with a quaternary pump, multisampler and thermostated column compartment was used for the analysis of atropine and scopolamine. The HPLC system was coupled to an Agilent 6495 LC/TQ triple quadrupole mass spectrometer with AJS ESI. A Zorbax Eclipse Plus C18 column Rapid Resolution HD was used for the chromatographic separation. The column temperature was 35 °C and the injection volume was 2 µL. The chromatographic separation of AT and SC was carried out with the mobile phase consisting of water (A) and methanol (B), both containing formic acid (0.1%, v/v), in a gradient mode and flow rate of 0.25 mL/min in the gradient mode. The detection was performed using the dMRM. The Agilent MassHunter software was used for the optimization and quantification.

TA	Molecular weight (g/mol)	Precursor ion [M+H ⁺](m/z)	Product ion (m/z)	Collision energy (V)	Rt* (min)
AT	289.2	290.2	124.2	24	9.63
			93.2	36	
			77.1	68	
SC	303.2	304.2	156	12	8.42
			138.2	24	
			103.2	44	
Carbofuran-D3	224.1	225.1	165.2	10	12.57
			123.1	22	



RESULTS & DISCUSSION

The samples in which the atropine and scopolamine detections were below the LOD represent 54,69% (70 samples) of the total number of the tested samples. Out of the 128 analyzed samples, 58 (45,31%) had the atropine and/or scopolamine detections, with 34 (26,56%) of them being above the LOQ, which is alarming since the TA concentrations above the LOQ can have a negative impact on the human and animal health. The highest atropine and scopolamine mean concentrations are detected in tea samples, followed by corn grits, corn, then popcorn and corn puffs.

CONCLUSION

The EU should approach the large scale analysis of a large number of different food products samples, which would include not only the samples originating from the Member States, but also the ones from the non-member European countries, in order to assess the annual and regional differences of the TA detections.