Residue findings in paprika – a spice with some spicy extras

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Introduction

Mild, medium or hot – the different grades of pungency satisfy every taste. No wonder, paprika powder is highly popular all over the world and used in a wide variety of dishes and processed products. Controls of paprika powder at CVUA Stuttgart, however, revealed that apart from spicing up dishes; paprika spice also contains a quite spicy cocktail of pesticides.

Analysis and Results

Between June 2018 and October 2019 CVUA Stuttgart analyzed 20 paprika samples (18 conventional and two organic) for the presence of pesticide residues using the QuEChERS and QuPPe method [1,2]. As paprika powder is a processed food, there are no specific MRLs and no legally binding processing factors set. A drying factor of 10 was applied, disregarding any losses during the drying process, in favor of the producer.

- More than 50 pesticide-relevant compounds were encountered.
- 40 exceedances of the MRLs overall in 19 out of 20 samples (95%).
- Merely one sample (an organic product from Spain) complied with the legal thresholds.

Frequently Occurring Pesticides

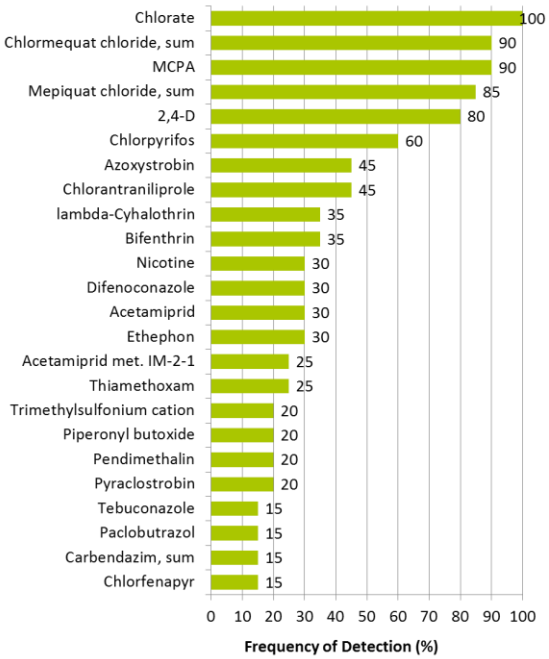

Figure I: Detection frequency > 15 % of pesticides in 20 samples of paprika powder, June 2018-October 2019

The five most frequently encountered compounds in paprika powder were herbicides or growth regulators.

- Chlorate:
  - levels between 0.084 and 15.6 mg/kg (median 1.65 mg/kg)
  - 19 out of 20 cases (95%) exceeded the MRL
- Chlormequat chloride:
  - levels between 0.093 and 4.5 mg/kg (median 0.86 mg/kg)
  - 17 out of 20 cases (85%) exceeded the MRL
- MCPA
- Mepiquat chloride
- 2,4-D

Re-analysis by a method releasing conjugated residues revealed a high share of conjugated residues, that in the case of 2,4-D varied from 8 to 75% of the total residue (average 35%).

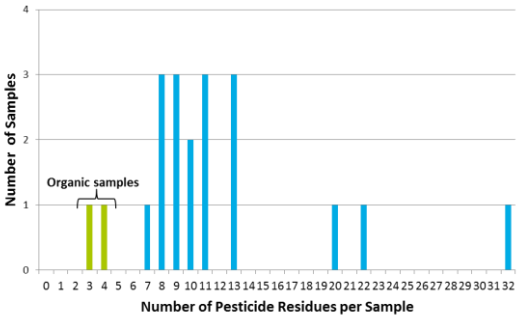

Figure II: Number of compounds detected per sample in paprika powder, June 2018-October 2019

Exceedances of the MRLs

Table I: Number of samples exceeding the MRL

Origin	No. of Samples	With Residues (%)*	>MRL (%)	Substances >MRL**
Unknown	17	17 (100 %)	17 (100 %)	Chlorate (17x); Chlormequat chloride (17x); Ethephon; Mepiquat chloride
Spain	2***	2	1	Chlorate, Biphenyl
Hungary	1	1	1	Chlorate, Nicotine
Total	**20**	**20 (100 %)**	**19 (95 %)**	

**no percentage calculated for less than 5 samples*
***some samples contained more than one substance exceeding the MRL*
****both samples came from organic production*

Chlorate mainly originates from irrigation and cleaning water, but it is technically considered a herbicide. All chlormequat chloride findings concerned samples with unstated origins. Within the EU, chlormequat chloride is only authorized for use in the cultivation of cereals, but not when growing fruit and vegetables. Countries outside of the EU may have local authorizations in place; still, any foods imported into the EU must comply with EU MRL-regulations.

Summary

With violation rates of 95 % and a total of 40 MRL exceedances among the 20 samples, the residue situation in paprika powder proved very unsatisfactory, but the detected residue levels still remained below the toxicologically established reference values and were therefore formally of no health concern.

Reference

[1] ASU L00.00-115; Foods of plant origin - Determination of pesticide residues using GC-MS and/or LC-MS/MS following acetonitrile extraction/partitioning and cleanup by dispersive SPE (QuEChERS modular), October 2018
[2] Quick Method for the Analysis of numerous Highly Polar Pesticides in Foods of Plant Origin via LC-MS/MS involving Simultaneous Extraction with Methanol (QuPPe-Method), Version 11, February 2020

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