

# Challenges in Food Safety V

Cutting-edge Solutions in Food Safety



# LEADER IN LAB DESIGN & SOLUTIONS

Today, Malva together with you designs and executes the Lab of the Future based on high-quality solutions





A photograph of a mass spectrometry system on a white cart. The system includes a large vertical column, a detector, and a control panel with a screen. A green component is visible on top of the column. The background is white with decorative circular patterns.

# Mass Spectrometry Leader

With more than 30 installations of advanced Mass Spectrometry Solutions, Malva is the definitive leader. Our new Collaboration with Advion and Perkin Elmer open new horizons for UHPLC-MS in the Balkan Peninsula.

# Most Versatile MS Instrument today

LEADER  
DESIGN  
Today,  
you design  
Lab of the  
high quality



Direct analysis probe (ASAP)



TLC/CMS -  
mass analysis of TLC spots



Detector for (U)HPLC



Cart-based LC/MS



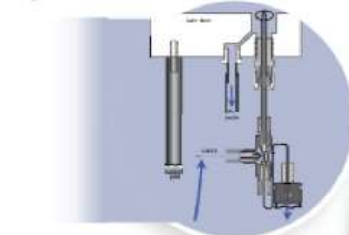
Inert atmospheric solids  
analysis probe (IASAP)



High performance compact mass spec  
designed especially for chemists



Purification by SFC  
or Prep-LC



Open port sampling  
interface (OPSI)



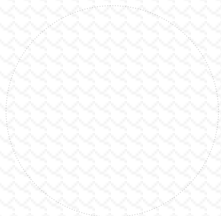
Compound identification  
by direct injection



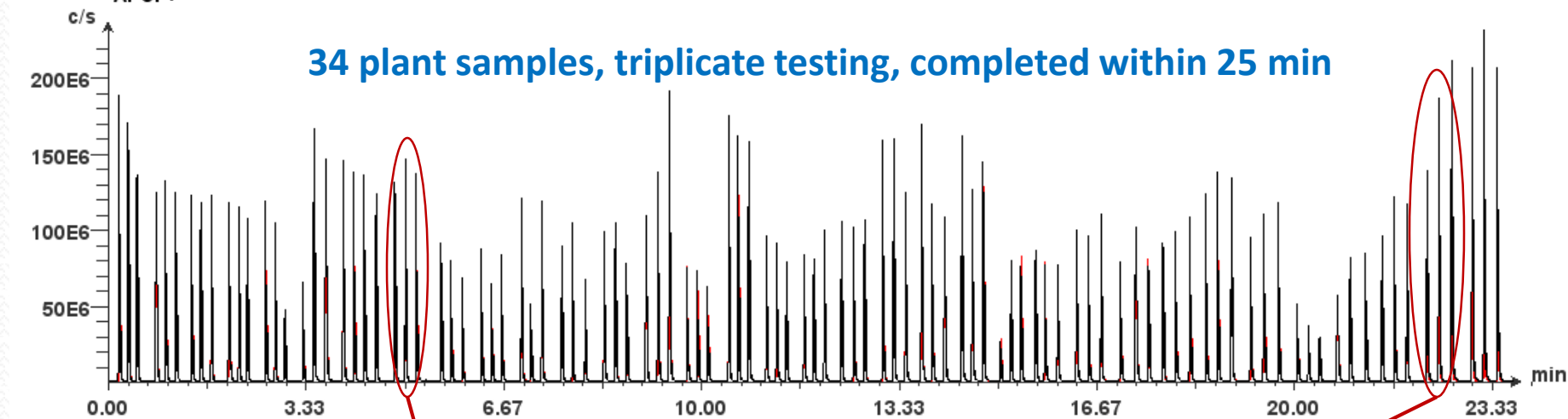
Coupled to Flow Reactors,  
Hydrogenation & Batch Chemistry



Online Flash/CMS -  
mass directed fraction collection



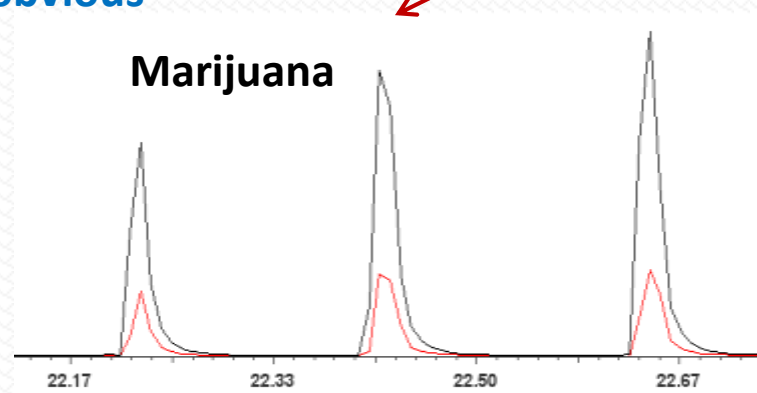
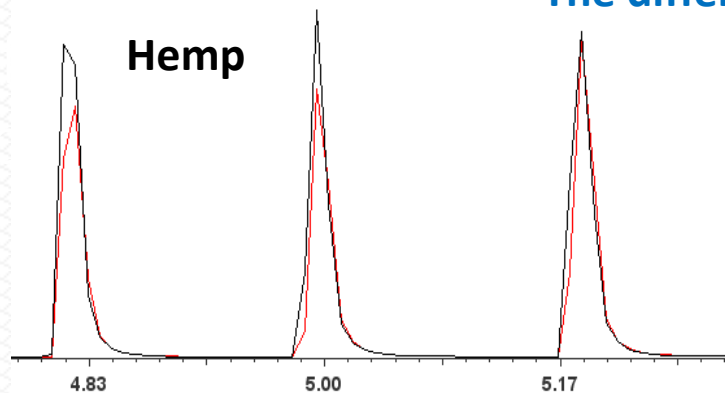
Chromatogram 341.2  
2018\_8\_7\_ASAP\_Cannabis Leaf\_1\_SIM2\_is2.datx 2018.08.07 13:17:10 ;  
APCI +



34 plant samples, triplicate testing, completed within 25 min

your  
Lab of  
high

The difference is obvious



High-throughput screening (**blind**) for 34 different cannabis plants. Using ASAP-CMS to determine the relative composition of CBDA and THCA in the plants.

# Region covered

**THE BALKANS**

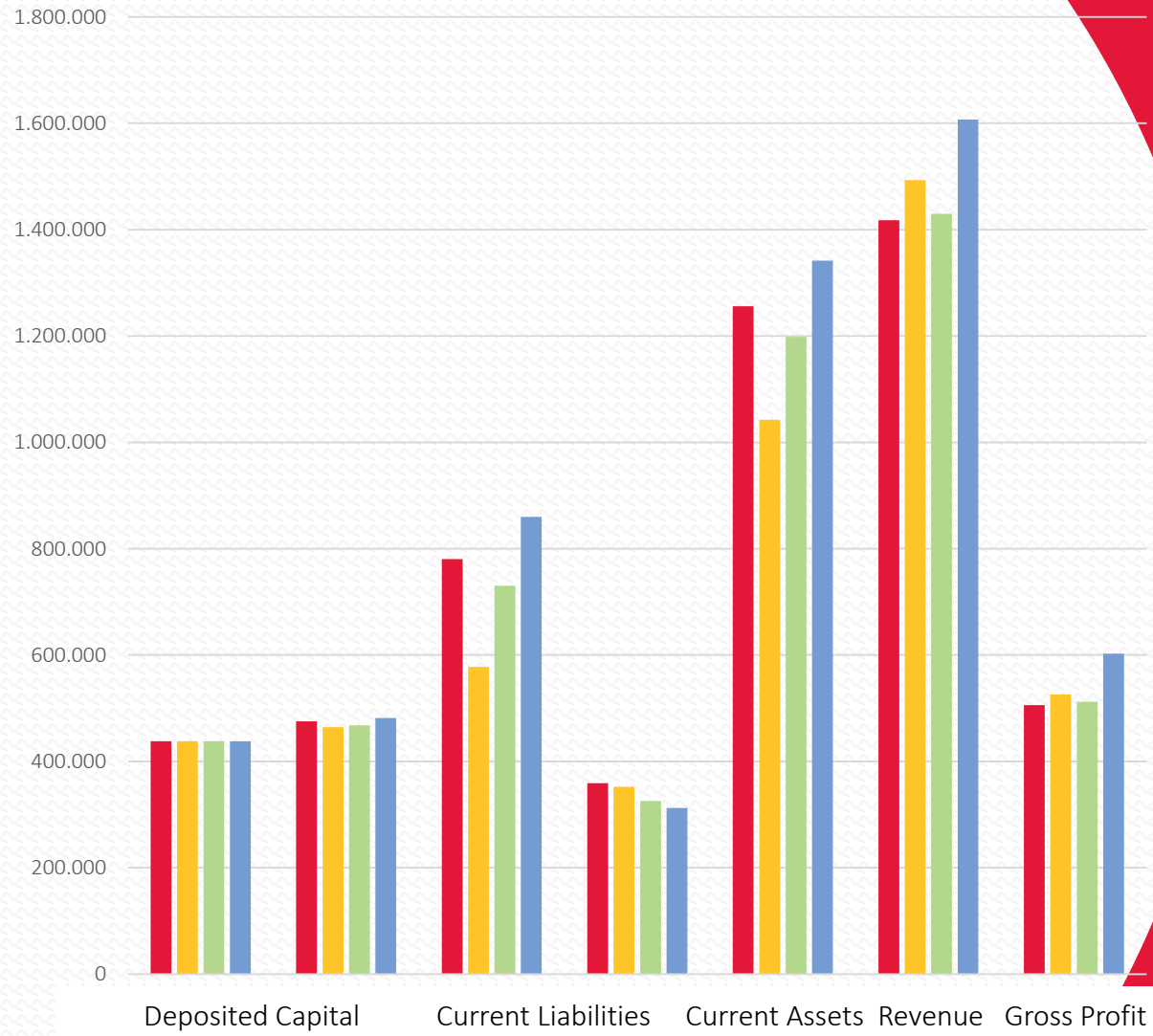


★ National capital  
— International boundary

- ALBANIA**  
Area: 28,748 km<sup>2</sup>  
Population: 3,581,655
- BOSNIA & H.**  
Area: 51,129 km<sup>2</sup>  
Population: 3,907,000
- BULGARIA**  
Area: 111,001.9 km<sup>2</sup>  
Population: 7,726,000
- CROATIA**  
Area: 56,542 km<sup>2</sup>  
Population: 4,551,000
- F.Y.R.O.M.**  
Area: 25,333 km<sup>2</sup>  
Population: 2,034,000
- GREECE**  
Area: 131,945 km<sup>2</sup>  
Population: 11,244,118
- MONTENEGRO**  
Area: 13,812 km<sup>2</sup>  
Population: 620,145
- ROMANIA**  
Area: 238,391 km<sup>2</sup>  
Population: 21,711,000
- SERBIA**  
Area: 88,361 km<sup>2</sup>  
Population: 9,400,000
- SLOVENIA**  
Area: 20,273 km<sup>2</sup>  
Population: 1,967,000







■ 2014 ■ 2015 ■ 2016 ■ 2017



# OUR STRENGTH IS IN OUR NUMBERS

MALVA S.A. has weathered the 2015 capital controls situation in Greece by being profitable and even growing, by taking market-share from competition that has not been able to finance its activities.

In 2018 MALVA has invested over 250k in own equipment, ranging from the first fully automated CE-IVD Next Generation Sequencing Platform to LC-MS, GC-UCS and other technologies.

Malva has also received 150k worth of commissions in 2018.



## **Challenge Number Five:**

Optimization of Sample Preparation Method



# Cannabis Extracts with Solvent Extraction

- Complex method
- Time consuming
- Poor recoveries
- Costs increasing

QuEChERS	Solvent Extraction
Complex-multiple steps	Simple
Low recoveries for polar compounds (daminozide)	Good recoveries for all compounds
Low recoveries for pH and heat sensitive compounds	Good recoveries for all compounds
dSPE step results in low recovery for some compounds (spiroxamine, spinosad, and others)	dSPE step not performed or required



ACN extracted Solution



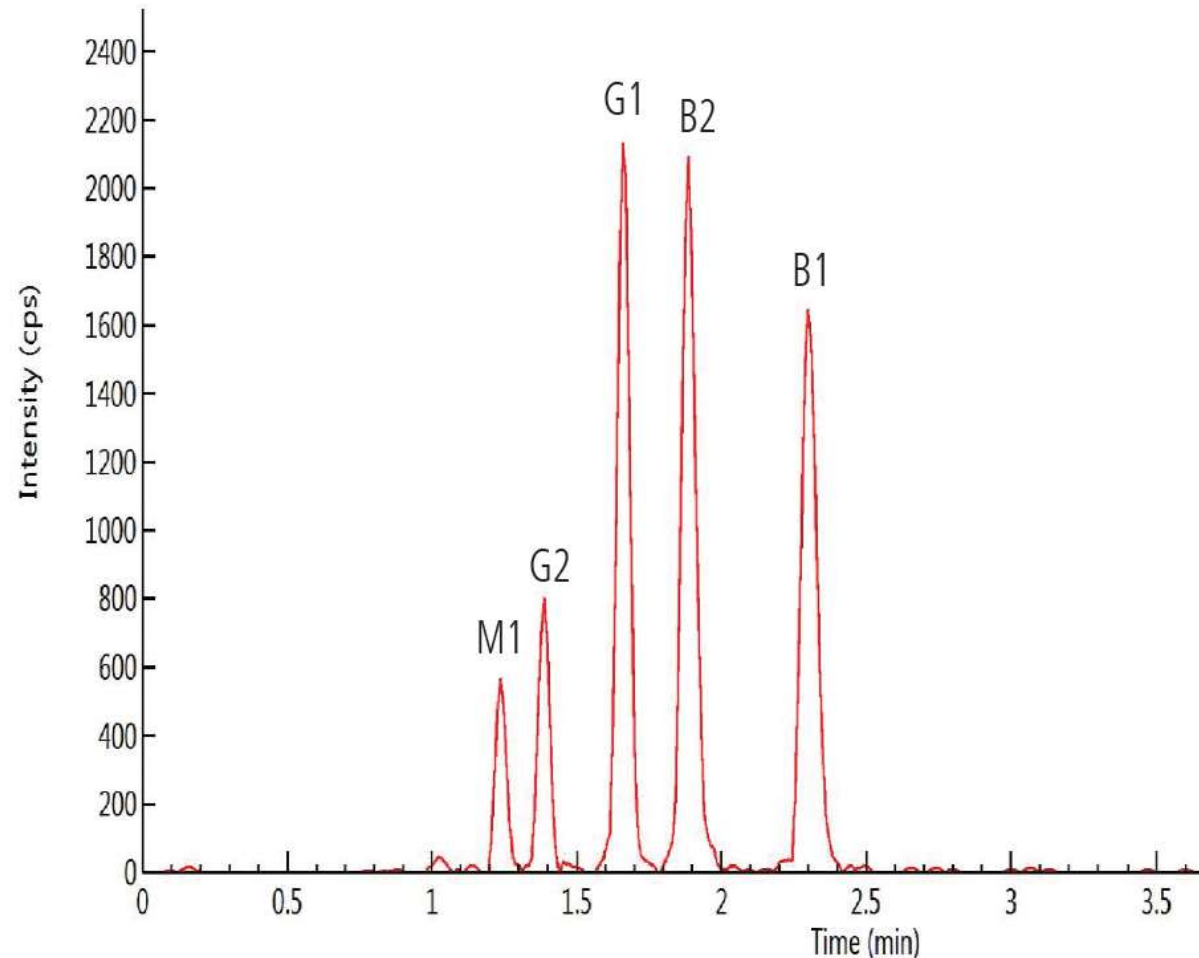
- Direct solvent extraction in vortex mixer
- Filtration
- Dilution if necessary

# Selected Pesticide Recovery Data with Acetonitrile Extraction Method

S.No.	Selected Residual Pesticide	Low Level 0.1 ppm		High Level 1 ppm	
		Recovery, %	RSD, % (n=5)	Recovery, %	RSD, % (n=5)
1	Abamectin	85	10	89	9
2	Acephate	93	16	91	9
3	Acequinocyl	90	11	86	6
4	Azoxystrobin	87	12	92	8
5	Bifenazate	88	8	88	7
6	Boscalid	87	10	89	5
7	Chlorantraniliprole	88	13	90	8
8	Cypermethrin	98	18	85	13
9	Daminozide	82	15	80	14
10	Fenhexamid	87	12	87	7
11	Fludioxonil	94	13	93	8
12	Naled	87	10	91	7
13	Oxamyl	93	16	94	9
14	Pentachloronitrobenzene	80	16	88	8
15	Permethrin	87	17	92	9
16	Propiconazole	90	14	95	11
17	Pyridaben	84	13	92	9
18	Spinosad	88	14	90	10
19	Spirotetramat	97	10	90	7
20	Spiroxamine	88	9	89	9

# Mycotoxins and Pesticides on a single instrument

In addition to pesticides, the growth of various molds and fungi during the growing process can produce carcinogenic mycotoxins including Ochratoxin A and Aflatoxins.





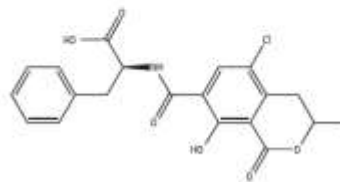
# Qsight LOQ for Mycotoxins in Cannabis

Category II Mycotoxin	LOQ		Action Level (µg/g)	Action Level/P KI
	Qsight (µg/g)	%CV (n=7)		
Ochratoxin A	0.010	18	0.020	2.0
Aflatoxin B1	0.001	18	NA	NA
Aflatoxin B2	0.0015	14	NA	NA
Aflatoxin G1	0.010	18	NA	NA
Aflatoxin G2	0.0015	19	NA	NA
Aflatoxin (B1+B2+G1+G2)	0.005	NA	0.020	4.0

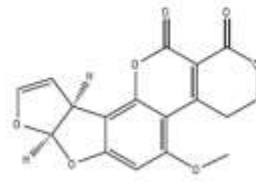


Qsight® Pesticide Analyzer

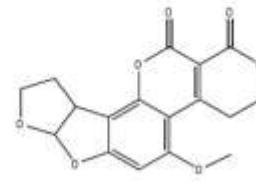
As with potency, the Qsight comes with an SOP that outlines a method to test challenging matrices presented by mycotoxins.



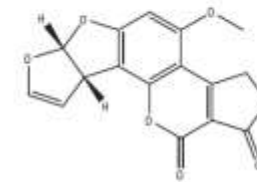
Ochratoxin A



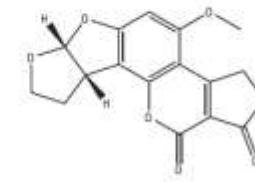
Aflatoxin G1



Aflatoxin G2



Aflatoxin B1



Aflatoxin B2

Our mycotoxins method allows laboratories to quantitate at low levels (**0.005 to 0.25 µg/g**), which is well below the actions limits set by the state of California, with good precision.

# Conclusions:

- **One Instrument Solution** for Pesticides Analysis in cannabis flower extract
- Method quantitates **both GC and LC amenable pesticides**
- **Good Recoveries** in the range of 75-110 %
- QSight LC/MS/MS StayClean™ **HSID™ inlet is a significant advantage for dirty matrices**, like cannabis, that increases instrument uptime by reducing the need for frequent MS cleaning
- **Robust and Stable APCI/ESI** method with minimal prep and cleanup required
- Validated method that **meets all action limits (LOQ) required** for pesticides and mycotoxins



# 'Plug-In' Ready Cannabis Pesticide/ Mycotoxins SOP

- Sample Prep Details
- Instrument, Standards and Consumable Requirements
- Instrument Setup
- Instrument Method/Calibration
- Internal Standard Selection
- Reporting Templates
- Training & App Support

## Practical Approach to Analysis of Pesticides in Cannabis for California and Oregon States

### Objective

To ensure that PerkinElmer Field Application Scientist or designated personnel responsible for post-installation service is capable of performing analytical methods herein described for the analysis of pesticides in cannabis for California and Oregon States, and to attain the respective limit of quantitation specified for a known pesticide below action limits.

### Introduction

Demands for accurate quantitation of pesticides in cannabis have gained significant prominence in recent times among cannabis industry stakeholders and government regulatory institutions among others. This in part may be due to the complexity and difficulty in treatment of the cannabis matrix for pesticide analysis. In addition, the more stringent pesticides limits in cannabis products in certain states within the United States have also broadened the analytical challenge.

Herein, this document prepared by PerkinElmer provides detailed analytical procedures for effective, reliable and accurate quantitation of all listed pesticides by the Bureau of Cannabis Control; proposed text of regulations, within the state of California and Oregon. The analytical method(s) described target(s) pesticides in cannabis for the project and uses the PerkinElmer LX50, an ultra-high performance liquid chromatograph for effective separation and the Q/Sight 220 tandem mass spectrometer for accurate quantitation.

### List of Materials and Standards:

#### Materials

Column			
Item	Description	Company	Catalog Number
Quasar SP Pesticides	100 x 4.6 mm; 2.7 µm	PerkinElmer	N9306880

Item	Description	Company	Part Number
Amber Vials	2mL Amber vials PK/1000	PerkinElmer	4971687
Nylon Syringe Filter	Filter-Nylon Syringe 30mm 0.22 µm PK 100	PerkinElmer	2542920
Centrifuge Tube	Centrifuge Tube - 50mL Polypropylene	PerkinElmer	9904867

Confidential - Do Not Distribute



Patent Pending



Some of our Partners



A group of people in a meeting room looking at computer monitors. A large red overlay covers the center of the image, with the text "THANK YOU" in white. There are dark blue rectangular shapes in the top and bottom center of the image.

**THANK YOU**