



Nederlandse Voedsel- en Warenautoriteit
Ministerie van Landbouw, Visserij,
Voedselzekerheid en Natuur

MALDI-ToF mass spectrometry

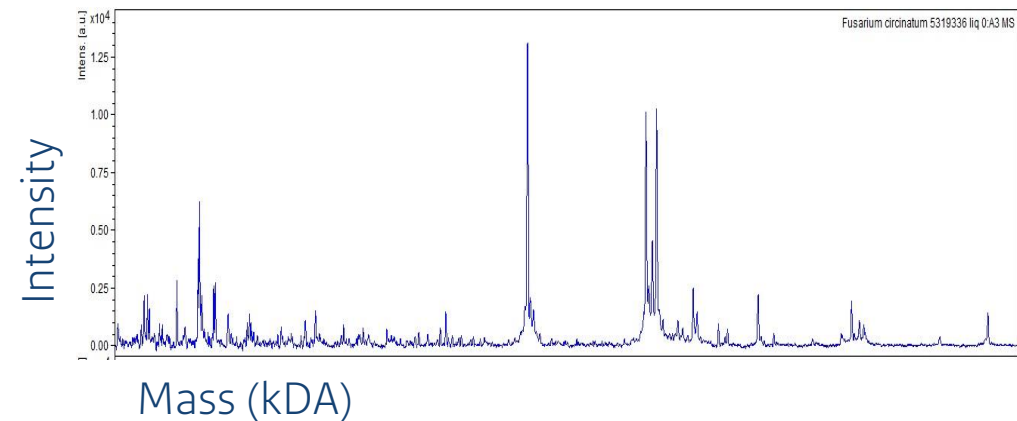
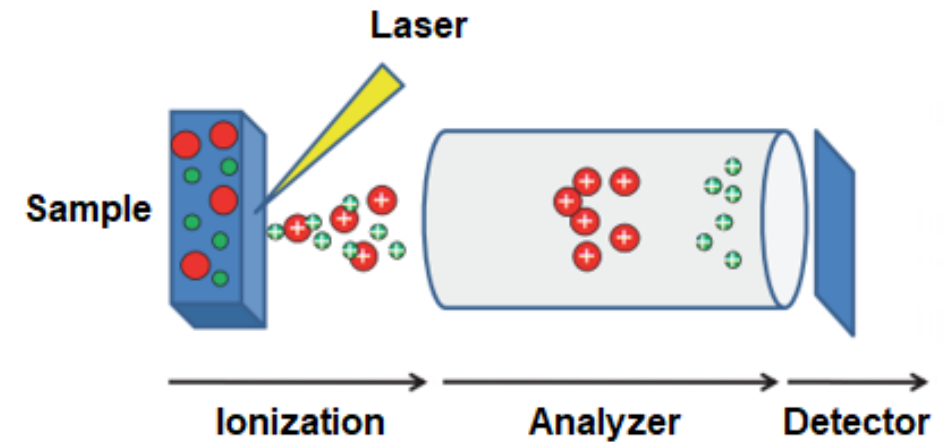
to advance the diagnostics of closely related *Fusarium* species

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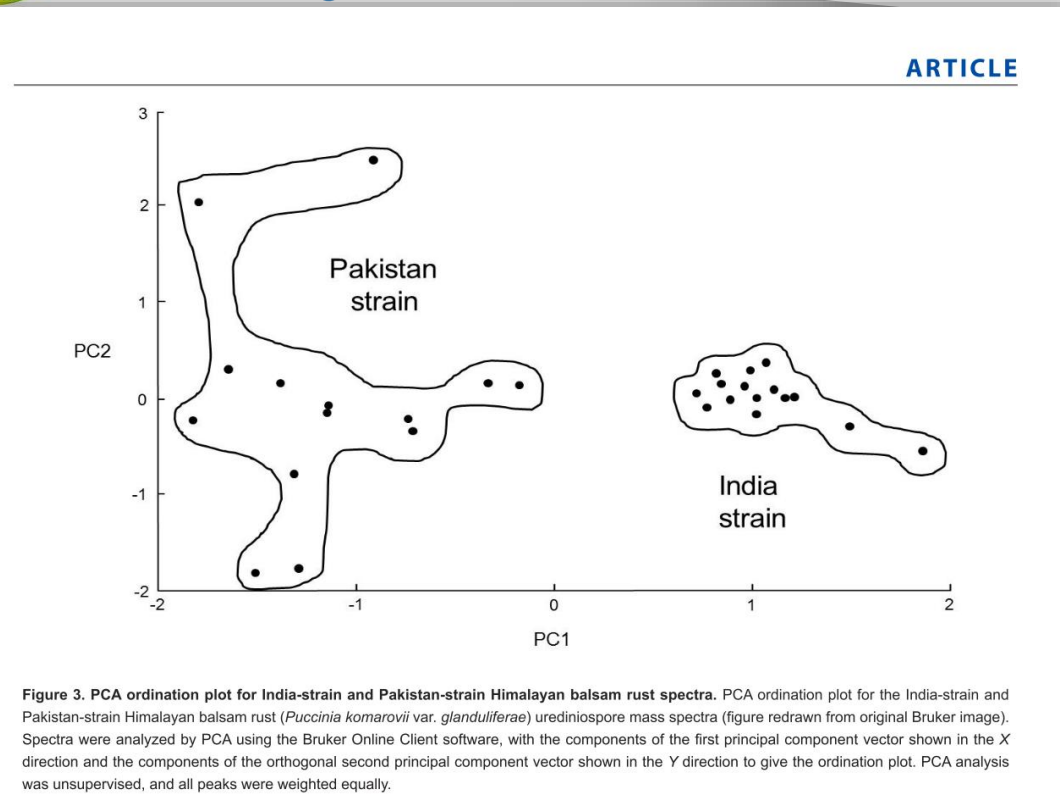
MALDI-ToF MS

- Matrix Assisted Laser Desorption/Ionisation-Time of Flight Mass Spectrometry.
- Characterisation of (typically large and fragile) molecules.
- Broad range of applications
 - Biochemistry
 - Organic chemistry
 - Polymers
 - (Micro)biology
 - Parasitology
 - Medicine
 - etc
- Species identification based on protein profile



MALDI-ToF for diagnostics in phytopathology

- Mainly used for:
 - Bacteria
 - Yeasts
- Requires:
 - Homogeneous sample
 - Reference spectral database
 - MALDI-ToF instrument



Why MALDI-ToF?

- Fast
- Accurate
- Cost effective
- Generic

Few minutes per sample -> 5 min/96 wells
species level
< € 1 per sample
no need for specific assays



Need for a reference spectral database

- Commercial database available
- Build your own and SHARE

295 fungal species/groups including some 16 *Fusarium* species (Bruker; 2026)

Pilot:

Fusarium species	MALDI-ToF result 1 st hit	2 nd hit	Score
<i>F. coeruleum</i>	<i>F. petroliphilum</i>	<i>F. solani</i>	2.26
<i>F. chlamyosporum</i>	<i>F. chlamyosporum</i>	<i>F. equiseti</i>	1.90
<i>F. redolens</i>	<i>F. oxysporum</i>	<i>F. oxysporum</i>	2.24
<i>F. oxysporum</i>	<i>F. oxysporum</i>	<i>F. oxysporum</i>	2.21
<i>F. equiseti</i>	No identification		
<i>F. culmorum</i>	<i>F. cerealis_culmorum_group</i>	<i>F. cerealis_culmorum_group</i>	2.36
<i>F. dimerum</i>	No identification		
<i>F. avenaceum</i>	<i>F. avenaceum</i>	<i>F. avenaceum</i>	2.27
<i>F. solani</i>	<i>F. solani</i>	<i>F. solani</i>	2.07
<i>F. proliferatum</i>	<i>F. proliferatum</i>	<i>F. oxysporum</i>	2.27

Range	Interpretation	Symbols	Color
1.80 - 3.00	High Confidence Identification	(+++)	green
1.60 - 1.79	Low Confidence Identification	(+)	yellow
0.00 - 1.59	No organism identification possible	(-)	red

Fusarium circinatum

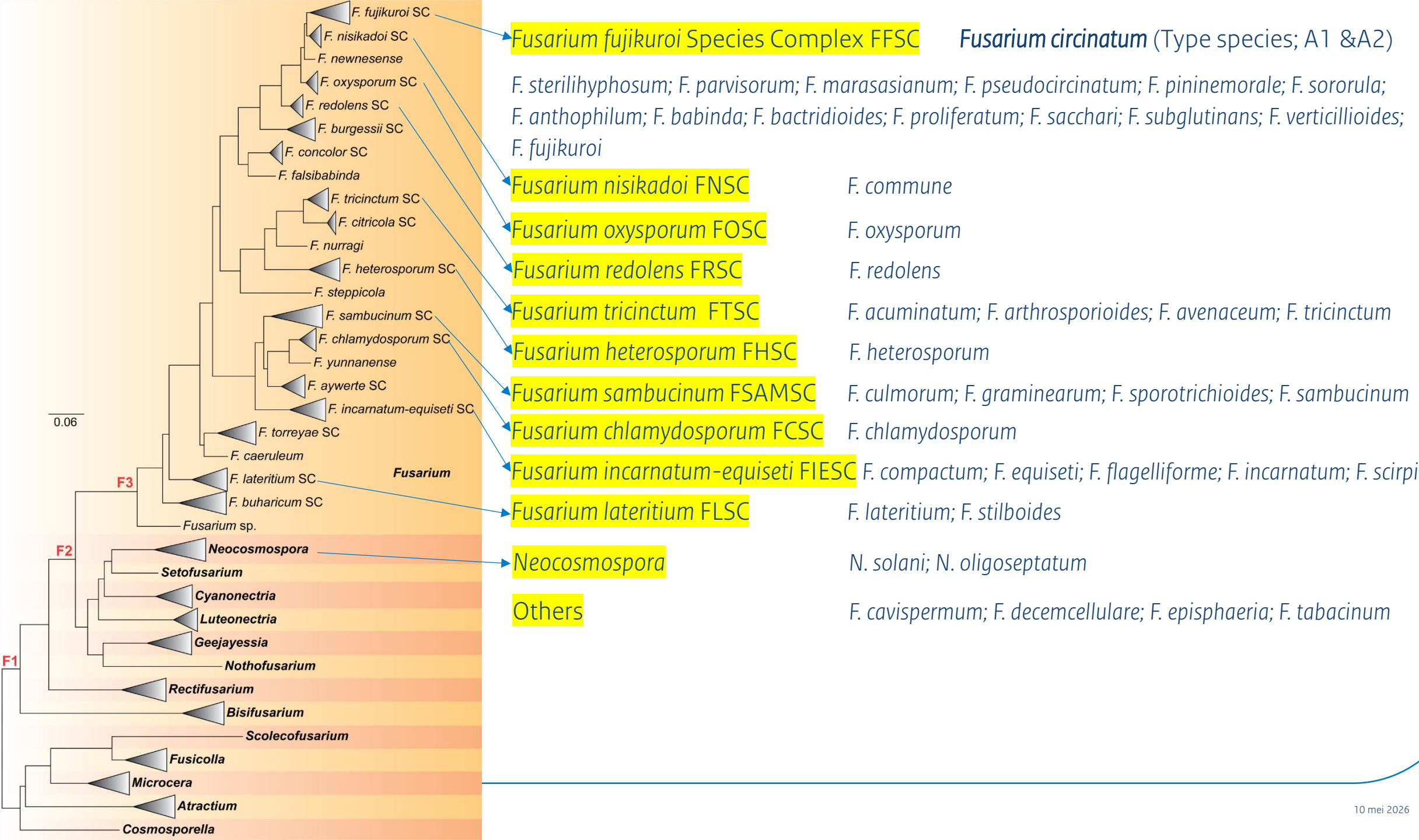
- Pine Pitch Canker
- EU-quarantine fungus
- Host: *Pinus* spp.
 - Range of grasses/weeds, other coniferous spp.



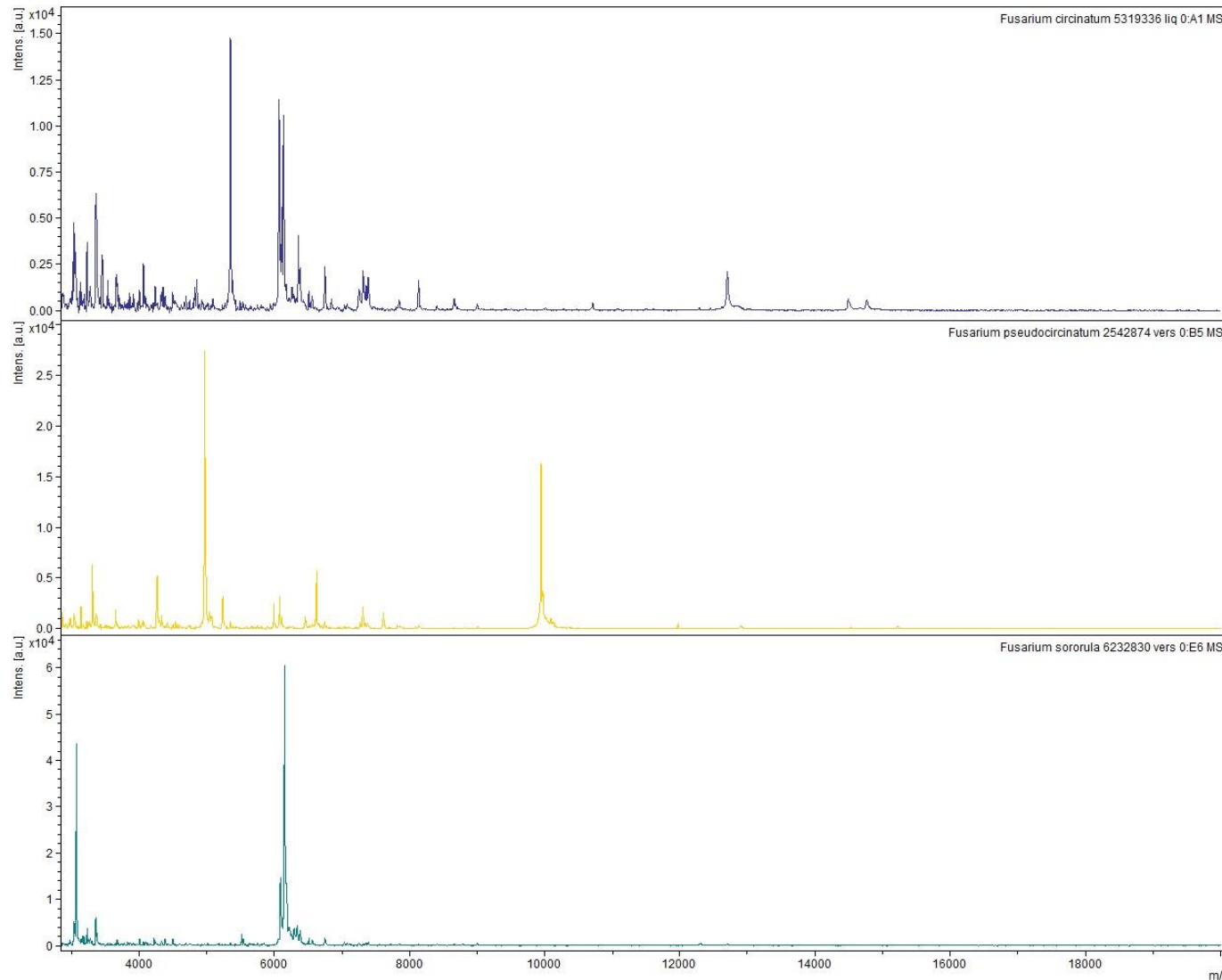
Fusarium circinatum

- Pine Pitch Canker
- EU-quarantine fungus
- Host: *Pinus* spp.
 - Range of grasses/weeds, other coniferous spp.
- Morphology
- Molecular methods (real-time PCR) available: PM7/91 (2)





Some mass spectral examples:



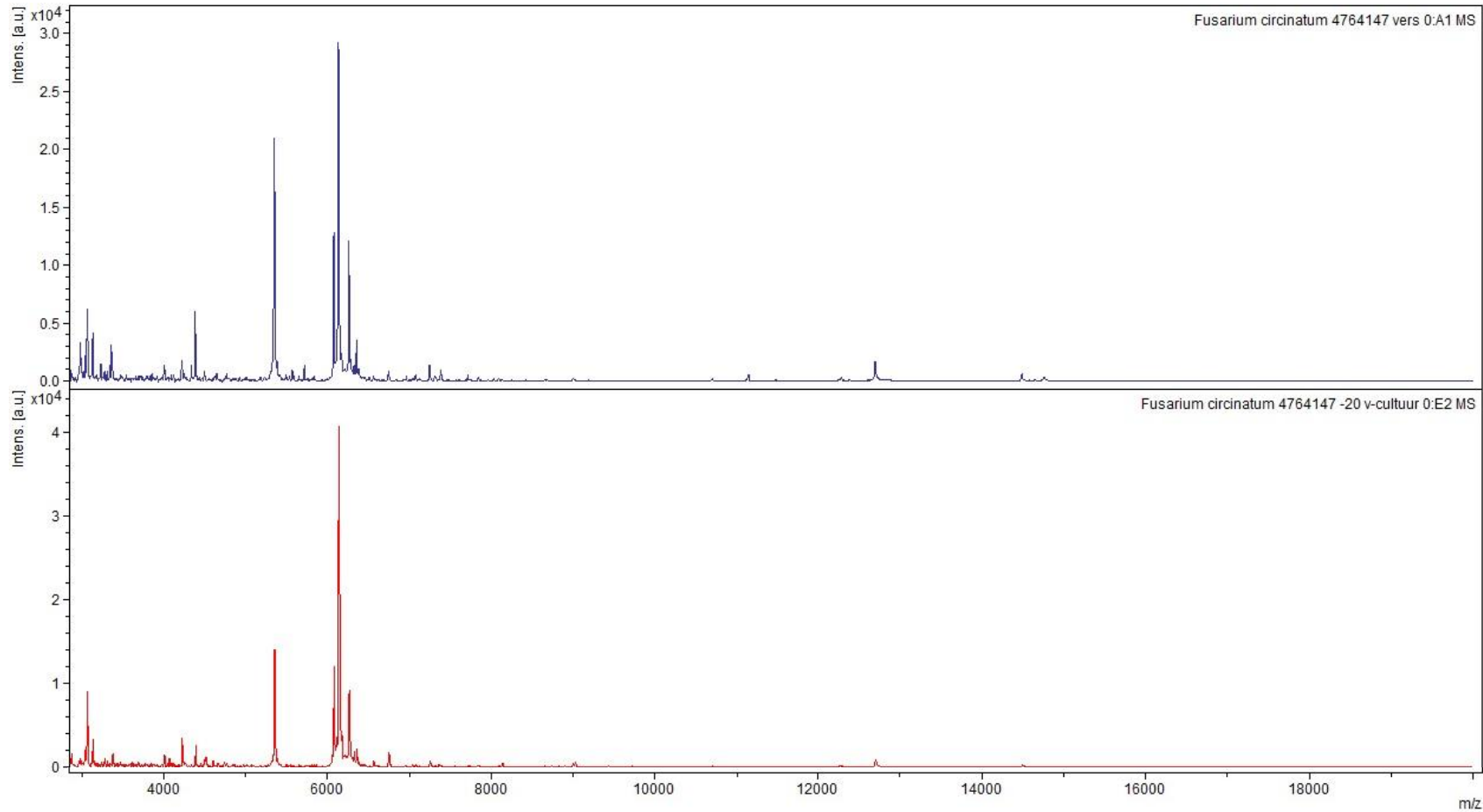
Fusarium circinatum

Fusarium pseudocircinatum

Fusarium sororula

All in the *Fusarium fujikuroi* Species Complex

Some spectral examples:



Fusarium circinatum
Fresh single spore liquid culture

Fusarium circinatum
Frozen single spore liquid culture



Conclusions

- It works!
- It would be nice to do this together
- Use liquid cultures for reference library

Thank you!

