

The image shows two large, shelf-like fungi growing on the side of a tree trunk. The fungi have a distinct appearance with a white, porous-looking underside and a top surface that is divided into horizontal bands of color. The uppermost band is a vibrant orange-red, followed by a dark blue or black band, and then a lighter, greenish-grey band. The tree bark is rough and textured, with some green moss or lichen visible. The background is a blurred forest scene with green foliage and brown branches.

# Metabolomics of tree-fungi interactions

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Kean University

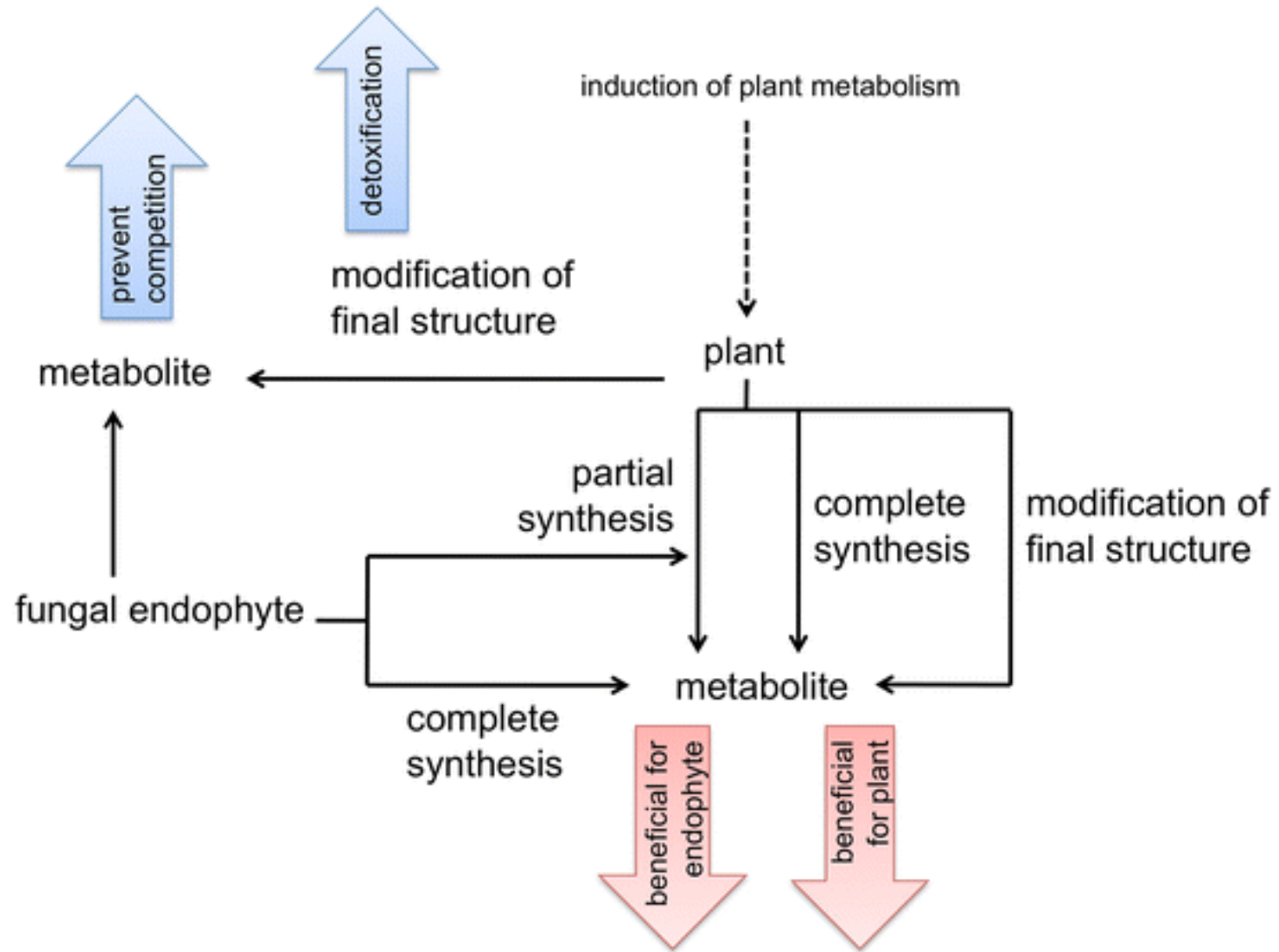
2026



*Porodaedala pini*  
formerly, *Phellinus pini*  
showing poroid hymenium



White heartwood rot  
*Phellinus tremulae*



# Disentangling Host and Fungus Metabolism

Major Questions:

What fungal metabolites are derived or bio-accumulated from plant metabolites?

Is there existing within-species chemodiversity across geographic scales?

What metabolites are shared or unique between congeners?



# Chemotaxonomy

Employing metabolite profiling to identify marker compounds (both qualitative and quantitative) and recognize species limits

Best performed in conjunction with phylogenetics

Barcoding can be sufficient as confirmation, but phylogenetics is much more informative about taxonomic relationships

Critical to have:

Proper sampling (within species/across species)

-account for plasticity

-within-species variation

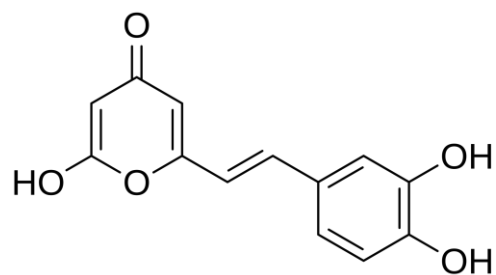
# Distribution of Styrylpyrones in the Basidiocarps of Various Hymenochaetaceae

JEAN-LOUIS FIASSON

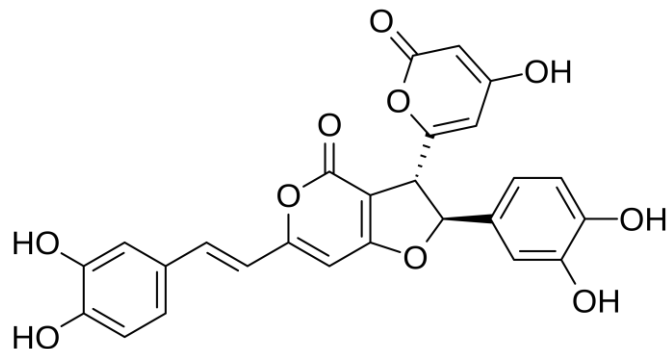
Biochemical Systematics and Ecology, Vol. 10,  
No. 4, pp. 289-296, 1982.

MeOH extraction

Identification by Silica gel Thin Layer  
Chromatography (TLC) and standards



hispidin



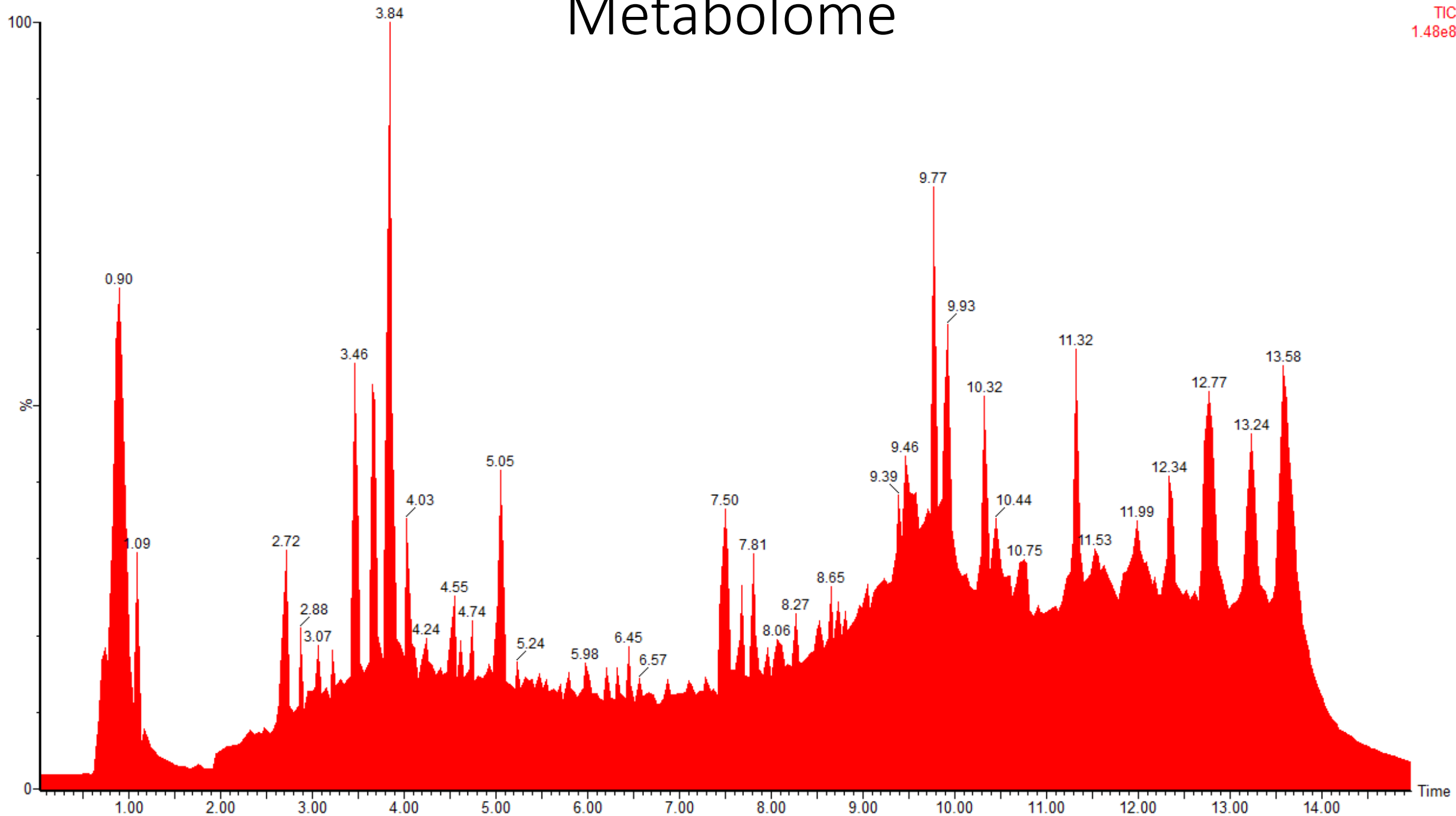
hypoholomine B

TABLE 1. STYRYLPYRONE CONTENT OF HYMENOGHAETACEAE S. S.

Specimens examined	Hymenoquinone	Hispidin	Hypholomin B µg/g	3,14'-Bis hispidinyl	Notes
<b>HYDNOCHAETE</b>					
<i>Hydn. olivaceuma</i>	-	?	?	-	
<i>Hydn. olivaceumb</i>	-	?	?	-	
<b>HYMENOCHAETE</b>					
<i>Hym. cinnamomeis</i> JB 2600	-	-	-	-	
<i>Hym. luteobadia</i> JB 6355	-	+	-	-	a
JB 6958	-	-	-	-	a
<i>Hym. mougeotii</i> JB 3380	1140	560	-	-	
<i>Hym. pinastifida</i> JB 8091	20	4	-	-	
<i>Hym. rubiginosa</i> JB 3028	-	160	-	-	b
FK	-	50	-	-	b
<i>Hym. salei</i> JB 8194	-	-	-	-	a
JB 6374	-	+	-	-	b
<i>Hym. tacabina</i> TN 1287	-	-	-	-	b
FK	-	-	-	-	b
JB 2217	-	-	-	-	b
<b>COLTRICIA</b>					
<i>C. perennis</i> AD 3077	-	-	-	-	
AD 3190	-	-	-	-	
AD 3615	-	-	-	-	
<b>INONOTUS</b>					
<i>I. cuticularis</i> C75	-	-	-	-	
AD 3294	-	-	-	-	
AD 3323	-	-	-	-	
AD 3330	-	-	-	-	
AD 3467	-	-	-	-	
<i>I. dryadeus</i> AD 3415	-	-	-	-	
AD 3457	-	-	-	-	
AD 3458	-	-	-	-	
AD 3729	-	-	-	-	
<i>I. dryophilus</i> AD 3047	-	+	2	-	c
AD 3414	-	+	+	-	c
<i>I. hispidus</i> K76	-	72,000	8500	22,000	
AD 3616	-	40,000	9000	16,500	
<i>I. nidus-pici</i> AD 3416	-	+	+	-	
<i>I. nodulosus</i> C75	-	1	0.5	-	
AD 3144	-	+	4	-	
<i>I. obliquus</i> AD 3482	-	-	-	-	
<i>I. radiatus</i> TN 1289	-	+	64	-	
AD 3319	-	640	410	-	
AD 3331	-	540	890	-	
AD 4045	-	150	520	-	
<i>I. rheades</i> AD 3410a	-	6	6	-	c
AD 3410c	-	40	28	?	c
AD 3468	-	2	2	-	c
<i>I. sarnicus</i> AD 3413	-	1	1	-	c
AD 3485	-	1	2	-	c
AD 3525	-	9	3	-	c
<b>ONNIA</b>					
<i>O. tomentosa</i> AD 809	-	+	10	-	
<i>O. riqueteri</i> AD 3071	-	27	51	-	
AD 3368	-	60	180	-	
AD 3491	-	12	34	-	
<b>PHAEOLUS</b>					
<i>P. schweinitzii</i> AD 3059	-	19,160	-	-	
<b>PHELLINUS</b>					
<i>Ph. chrysosoma</i> TN 1277	-	605	233	100	
AD 3125	-	344	80	140	
AD 3556	-	630	215	110	
<i>Ph. conchatus</i> C75	-	80	120	-	
TN 1270	-	10	30	-	
TN 1275	-	47	110	-	
AD 3385	-	40	54	-	
AD 3407	-	32	44	-	
<i>Ph. contiguus</i> AD 3381	-	+	+	-	
AD 3394	-	+	+	-	
AD 3405	-	+	+	-	
AD 3421	-	+	+	-	

# Metabolome

1: TOF MS ES-  
TIC  
1.48e8



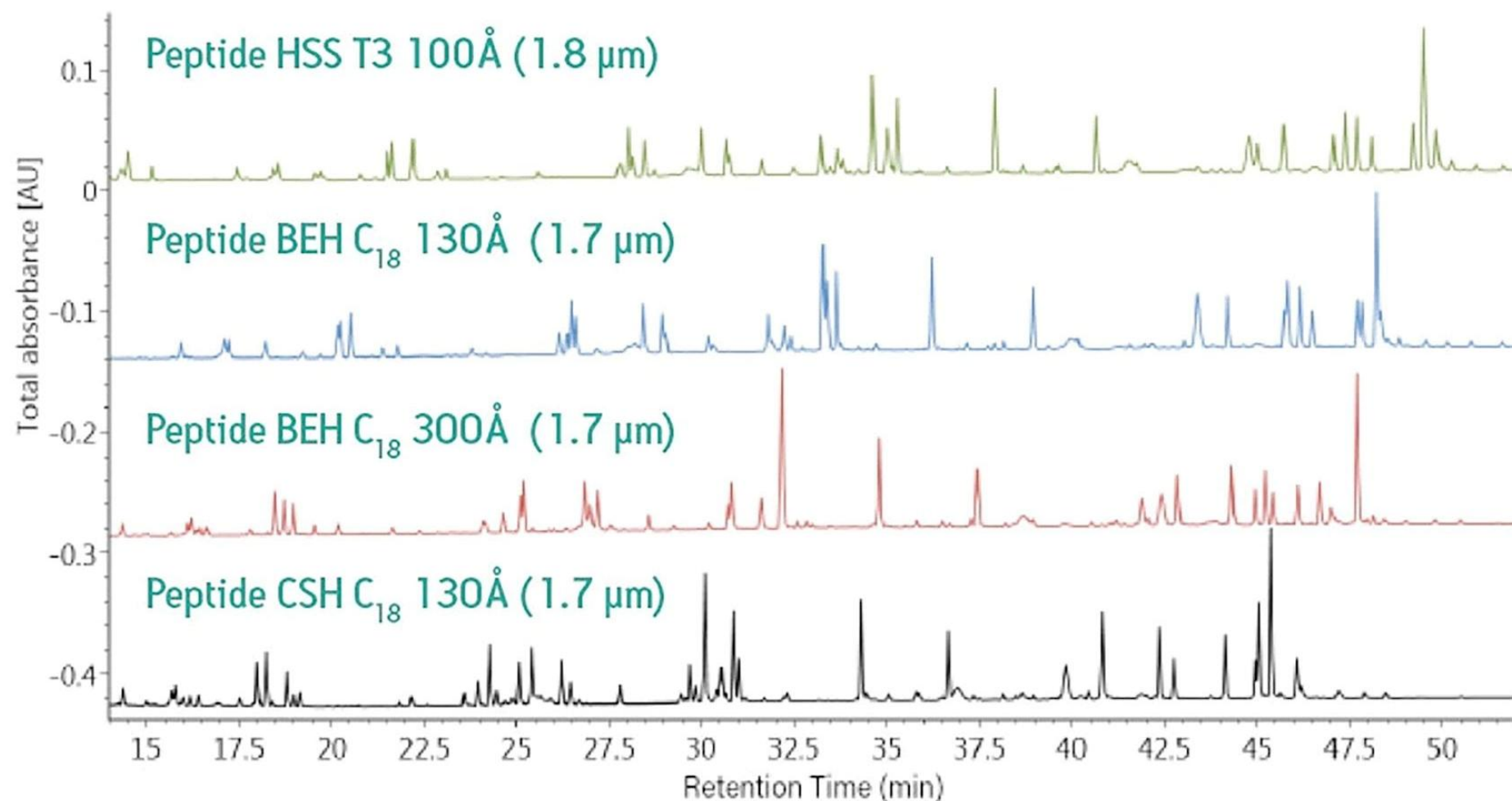
# LC-qToF-MS

Mass Spectrometry:  
Waters G2-XS qToF  
Quadrupole Time-of-Flight Mass Spectrometer

Liquid Chromatography:  
Waters ACQUITY UPLC Peptide HSS 100 Å  
column (2.1 x 150 mm, 1.8 μm)



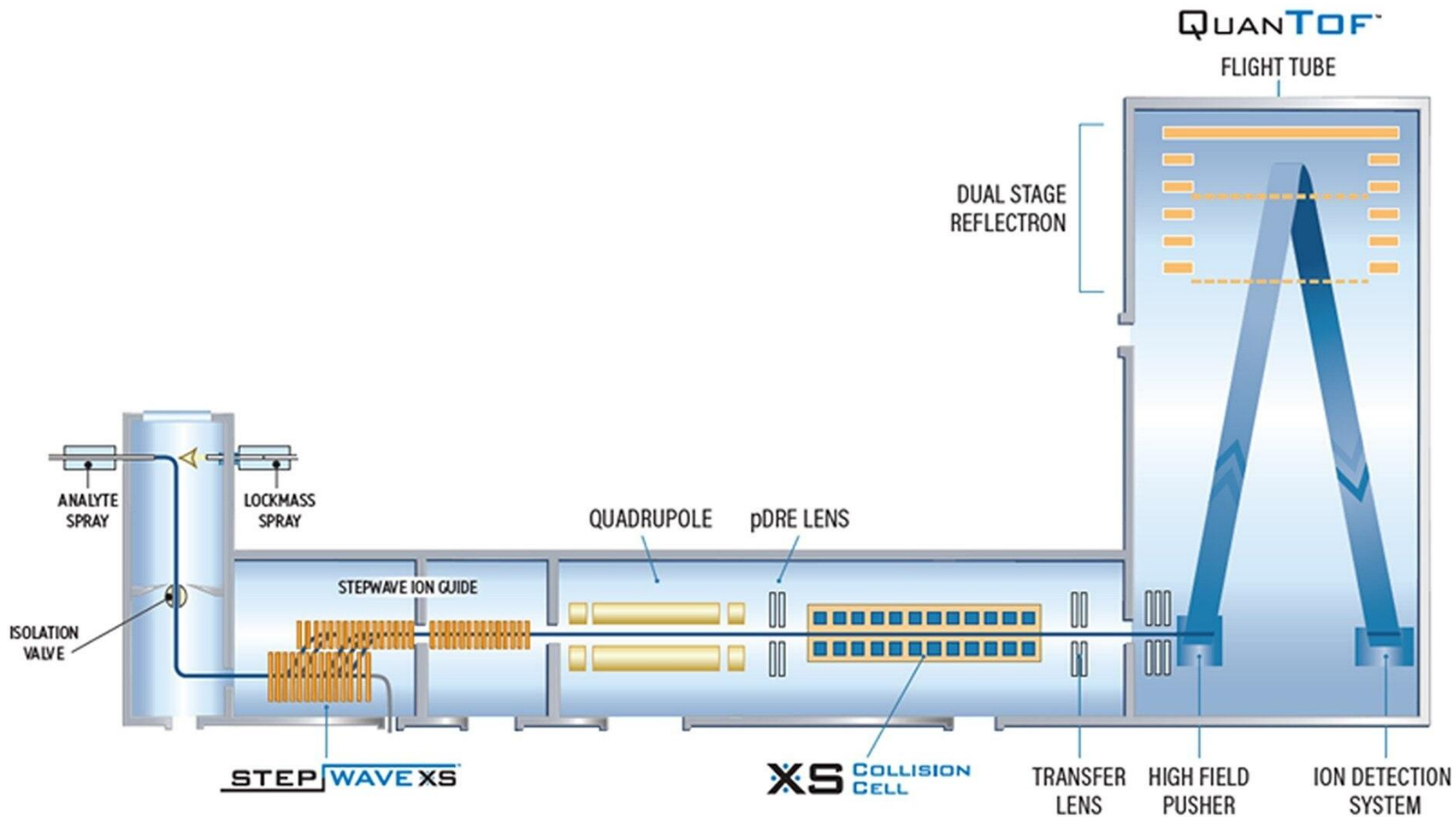
## Example: Columns and Chromatographic separation



LC system: ACQUITY UPLC® H-Class Bio  
Sample: Tryptic Digest of NIST mAb  
reference material  
Columns: 2.1 x 150 mm

Eluent A: Water with 0.1% TFA  
Eluent B: Acetonitrile with 0.1% TFA  
Gradient: 0.5% - 50% B in 60 min, linear  
Flow rate: 0.20 mL/min  
Column temp.: 60 °C

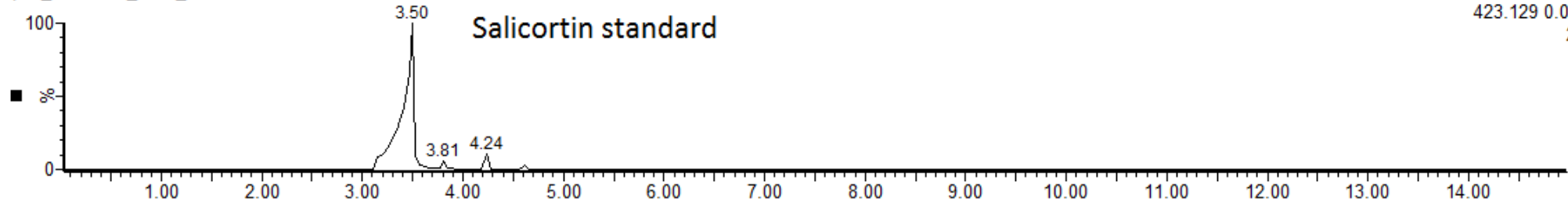
# Ion path



# LC-MS Compound identification

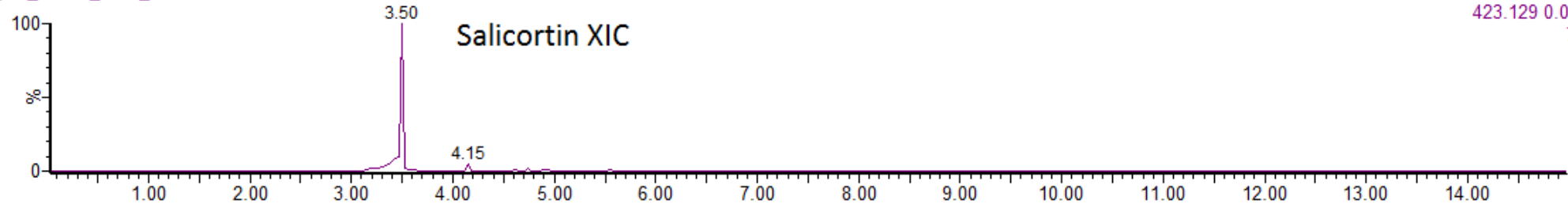
p6b Salicortin diluted 10x

p6b\_Salicortin\_NEG\_v2



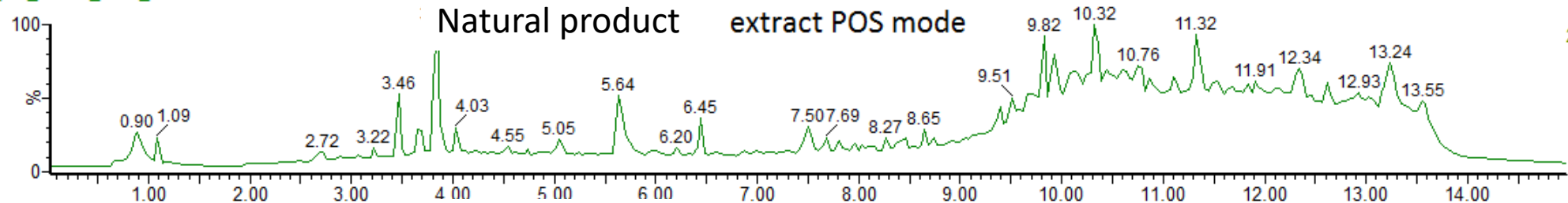
1: TOF MS ES-  
423.129 0.0200Da  
2.93e7

p6b\_PF11s\_NEG\_v3



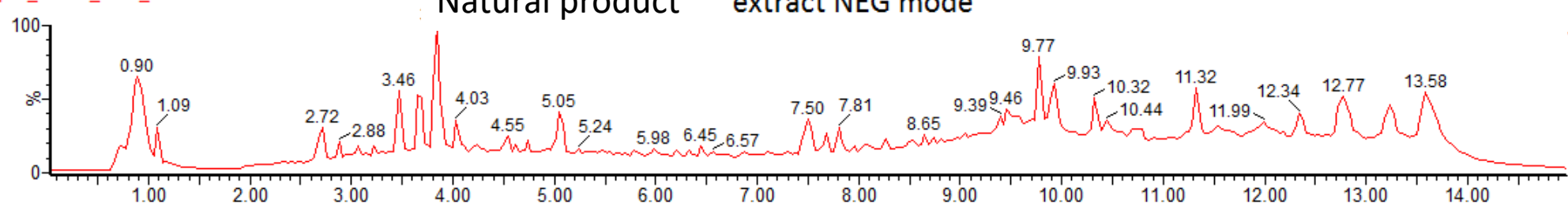
1: TOF MS ES-  
423.129 0.0200Da  
7.66e6

p6b\_PF11s\_POS\_v1



1: TOF MS ES+  
TIC  
2.04e8

p6b\_PF11s\_NEG\_v3



1: TOF MS ES-  
TIC  
1.48e8

# Natural Product Chemistry

- Benefit from previous isolation and identification due to commercial interests for medicine and pharmaceutical applications
- Time consuming
- LC-MS not enough... isolation, NMR, circular dichroism for optical isomerism



*Phellinus linteus*



Meshimakobu



# Future Experiments: Metabolomics of species with different hosts

Table 2. Known range, host genera and host families of *Phellinus* s.s. species.

<i>Phellinus</i> Species	Known Range	Known Host Genera	Known Host Families
<i>P. alni</i>	Holarctic	<i>Acer, Alnus, Betula, Carpinus, Corylus, Fagus, Fraxinus, Juglans, Laburnum, Malus, Padus, Prunus</i> and <i>Sorbus</i>	Betulaceae, Fagaceae, Juglandaceae, Oleaceae, Rosaceae, Sapindaceae & Ulmaceae
<i>P. lundellii</i>	Holarctic	<i>Betula</i>	Betulaceae
<i>P. nigricans</i>	Holarctic	<i>Betula</i>	Betulaceae
<i>P. tremulae</i>	Holarctic	<i>Populus</i>	Salicaceae
<i>P. arctostaphyli</i>	North America	<i>Arctostaphylos</i>	Ericaceae
<i>P. betulinus</i>	North America	<i>Betula</i>	Betulaceae
<i>P. NA1</i>	North America	<i>Populus</i>	Salicaceae
<i>P. NA2</i>	North America	<i>Prunus</i>	Rosaceae
<i>P. igniarius</i> s.s.	Europe	<i>Populus, Salix</i> and <i>Malus</i>	Salicaceae and Rosaceae
<i>P. populicola</i>	Europe & Asia	<i>Populus</i>	Salicaceae
<i>P. tuberculosus</i>	Europe & Asia	<i>Prunus</i>	Rosaceae
<i>P. laevigatus</i> s.s.	Europe & West Asia	<i>Betula</i>	Betulaceae
<i>P. orienticus</i>	East Asia	<i>Betula</i>	Betulaceae

(Brazeo, 2015)



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Aspen clone

SWK