LowImpact project seminar

Food safety and soil health – challenges in Chinese and Norwegian agriculture and contributions from the LowImpact project

Time: Thursday 27 May 09:00-12:00 CEST
Location: Zoom-meeting

Current challenges in agricultural production practices include negative impacts on soil health, environmental and food safety. The LowImpact project aim to develop pesticide screening and biochar tools to reduce the impacts of vegetable production in Norwegian and Chinese soil and climate conditions. This seminar will present the results of the LowImpact project so far alongside presentations of the current plans and programs for food safety and soil health in China and Norway respectively. We welcome all interested parties to attend this open zoom seminar.

Program:

09:00: Welcome to the seminar – Per Stålnacke, Research Director, NIBIO
09:05: Short introduction to the LowImpact project – Marianne Stenrød, NIBIO
09:15: Introductory talk from the cooperation department of CAAS - Tianjin Chen, Division of Bilateral Partnership, Department of International Cooperation, CAAS
09:20: Presentation of Chinese Progress and 5-year plan for environmental risk of pesticide - Yanming Zhou, Institute for the Control of Agrochemicals
09:45: Presentation of the Norwegian Soil health program – Rannveig Bø Fløystad, Norwegian Agriculture Agency
10:15: 15 minute break
10:30: Low Impact contributions toward improved food safety and soil health:

- Screening tools for pesticide analysis in soil and produce – Marit Almvik, NIBIO
- Pollution control of herbicides and application of biochar - Xingang Liu, IPP-CAAS
- Environmental toxicity of pesticides – Lizhen Zhu, IPP-CAAS
- Plans for developing recommendations from the project - Jihong Liu Clarke, NIBIO

11:50: Summing up/Closing remarks

Learn more about the LowImpact project on nibio.no (https://nibio.no/en/projects/lowimpact-chinor-solutions-for-low-impact-climate-smart-vegetable-production-with-reduced-pesticide-residues-in-food-soil-and-water-resources).

The project is funded by the Research council of Norway (RCN project 287431) and the National Science Foundation of China (NSFC 国家自然科学基金委员会) and will be finalized during 2022. The project partners include the coordinating institutes Norwegian Institute of Bioeconomy Research (NIBIO) and Institute of Plant Protection at the Chinese Academy of Agricultural Sciences (IPP CAAS), and SINTEF Energy Research, The University of Almeria European Reference Laboratory for pesticide residues in Fruit and Vegetables (EURL-FV), and the French National Institute for Agriculture, Food and Environment (INRAE) UMR Agroecologie, Dijon.

NIBIO
NORSK INSTITUTT FOR BIOØKONOMI

ChiNor solutions for Low Impact climate smart vegetable production with reduced pesticide residues in food, soil and water resources

Marianne Stenrød & Xingang Liu - LowImpact seminar on food safety and soil health 27 May 2021

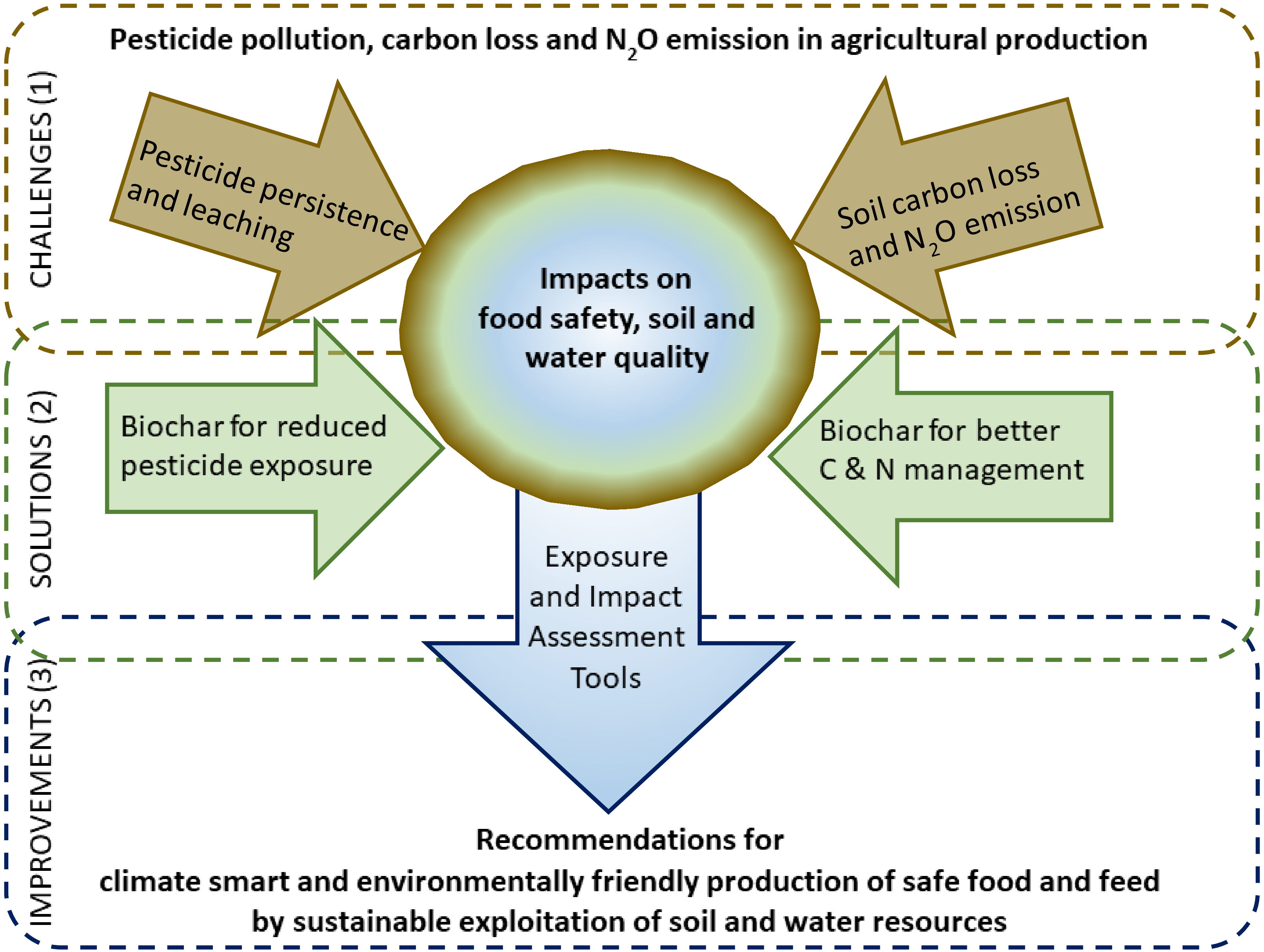
Photo: Marit Almvik

Chinese-Norwegian joint challenges

- The project aims to study and alleviate joint Chinese-Norwegian challenges specific for vegetable production, and extensive use of pesticides, increasing vegetable consumption and potential effects of pesticide residues on human health are the main rationale for this choice.
- The Norwegian and Chinese project partners host comparable national expertise that will allow for a twinning approach with corresponding laboratory and field studies being performed under the different regulatory frameworks and pedoclimatic conditions, hence generating results and solutions that can be extrapolated beyond the limits of each participating country.

The consortium

- Chinese partner:
  - Chinese Academy of Agricultural Sciences – Institute for Plant Protection
    - WP-leads: Xingang Liu, Fengshou Dong, Xiaohu Wu, Yongquan Zheng
- Norwegian partners:
  - NIBIO – Division Biotechnology and plant health, Division Environment and natural resources
    - WP-leads: Marianne Stenrød, Marit Almvik, Christophe Moni, Anders B. Aas, Jihong Liu Clarke
  - SINTEF Energy Research
    - PI: Liang Wang
- European expert partners:
  - University of Almeria, European Reference Laboratory for pesticides in fruit and vegetables
    - PI: Amadeo R. Fernandez-Alba
  - French National Research Institute for Agriculture, Food and Environment (INRAE), UMR Agroecologie - Dijon
    - PI: Fabrice Martin-Laurent
- Funding:
  - Research Council of Norway and National Science Foundation of China
  - LowImpact complement activities in the ongoing Sinograin-II funded by the Norwegian Embassy in Beijing/Norwegian Ministry of Foreign Affairs

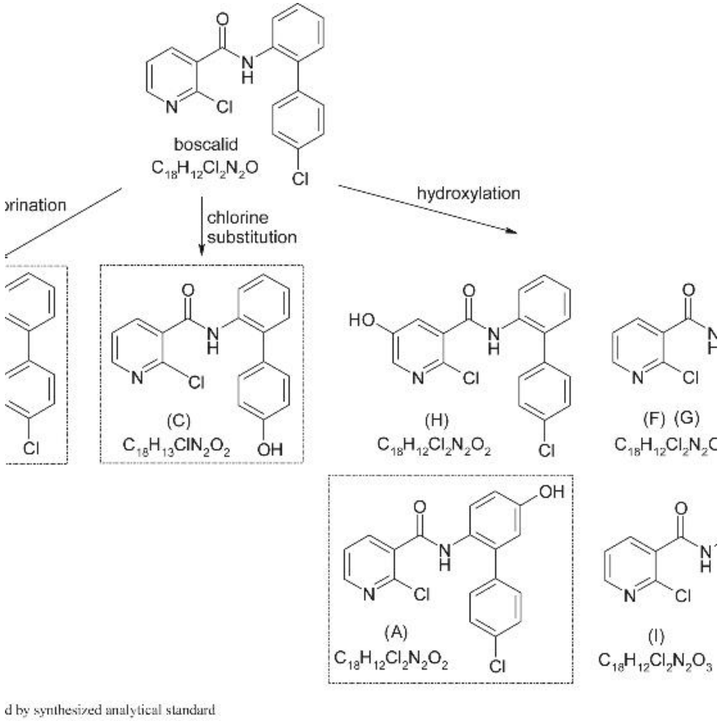


Project concept

- Pesticide exposure assessment tools
- Biochar for improved nutrient management and reduced pesticide exposure
- Impacts on food safety, soil and water quality

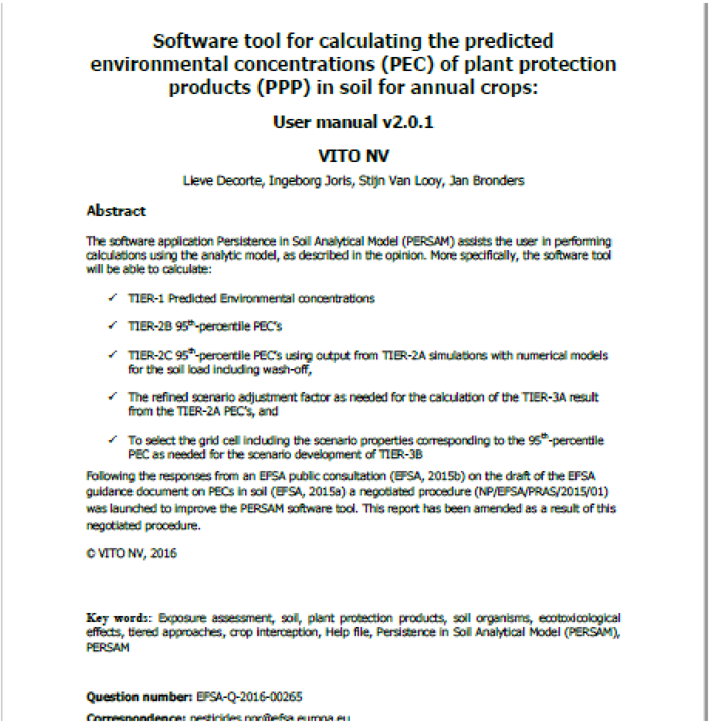
WP2: Pesticide exposure assessment tools

Marit Almvik, NIBIO, Fengshou Dong, IPPCAAS



Optimization of analytical methods for pesticides and their metabolites

Screening of pesticides and metabolites in field sites



Software tool for calculating the predicted environmental concentrations (PEC) of plant protection products (PPP) in soil for annual crops:

User manual v2.0.1

VITO NV

Lieve Decorte, Ingeborg Joris, Stijn Van Looy, Jan Bronders

Abstract

The software application Persistence in Soil Analytical Model (PERSAM) assists the user in performing calculations using the analytic model, as described in the opinion. More specifically, the software tool will be able to calculate:

- ✓ TIER-1 Predicted Environmental concentrations
- ✓ TIER-2B 95th-percentile PEC's
- ✓ TIER-2C 95th-percentile PEC's using output from TIER-2A simulations with numerical models for the soil load including wash-off,
- ✓ The refined scenario adjustment factor as needed for the calculation of the TIER-3A result from the TIER-2A PEC's, and
- ✓ To select the grid cell including the scenario properties corresponding to the 95th-percentile PEC as needed for the scenario development of TIER-3B

Following the responses from an EFSA public consultation (EFSA, 2015b) on the draft of the EFSA guidance document on PECs in soil (EFSA, 2015a) a negotiated procedure (NP/EFSA/PRAS/2015/01) was launched to improve the PERSAM software tool. This report has been amended as a result of this negotiated procedure.

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Key words: Exposure assessment, soil, plant protection products, soil organisms, ecotoxicological effects, tiered approaches, crop interception, Help file, Persistence in Soil Analytical Model (PERSAM), PERSAM

Question number: EFSA-Q-2016-00265

Correspondence: pesticides.ppr@efsa.europa.eu

Monitoring and modelling data

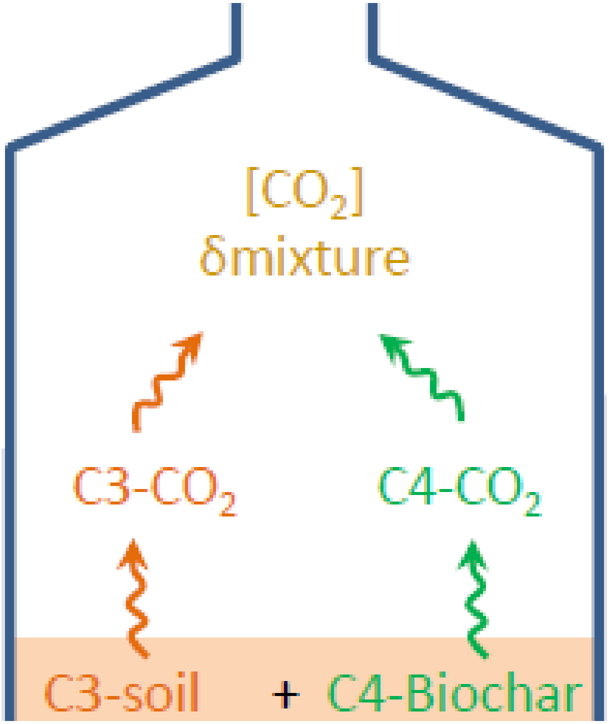
Experimental work in the lab and field at NIBIO and IPP CAAS.
Collaboration with University of Almeria, European Reference laboratory for pesticide residues in fruit and vegetables

NIBIO

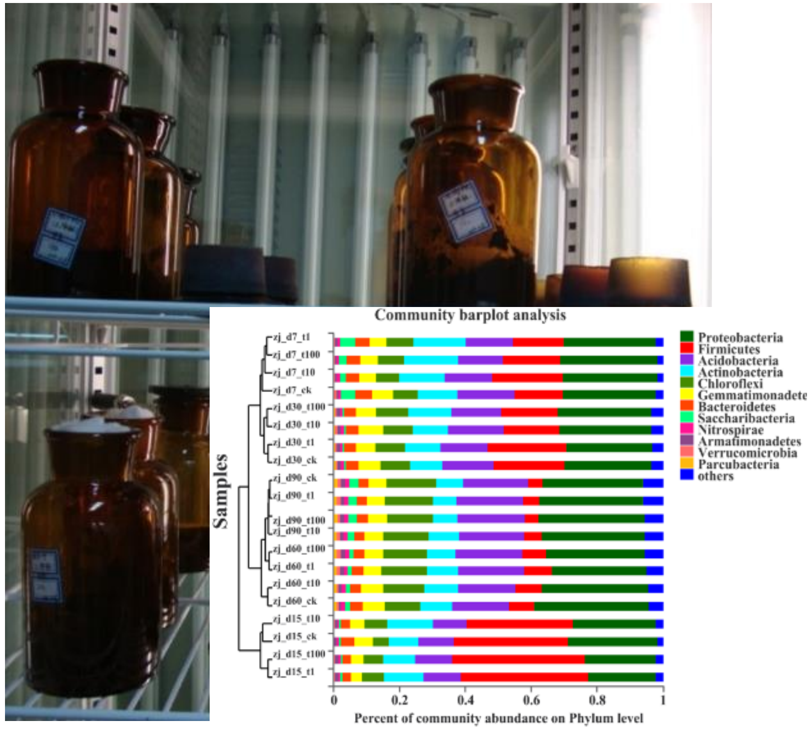
WP3: Biochar for improved nutrient management and reduced pesticide exposure

Christophe Moni, NIBIO, Xingang Liu, IPPCAAS

Biochar production, characterization and analysis



Carbon turnover and N_2O emission response to pesticides and biochar amendments



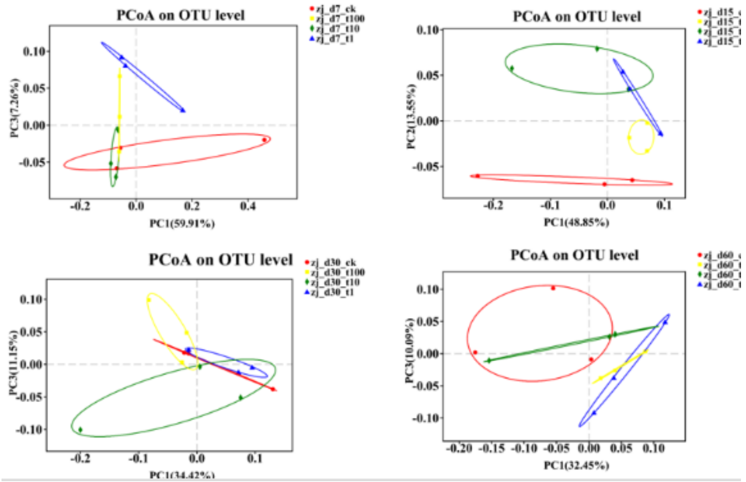
Fate and impacts of pesticides in agricultural soils

Biochar production at SINTEF Energy Research
Lab studies at NIBIO and IPP CAAS

NIBIO

WP4: Impacts on food safety, soil and water quality

Anders B. Aas, NIBIO, Xiaohu Wu, IPPCAAS



Interactive effects of pesticides and biochar on soil microbial diversity and function

Pesticide non-target effects in terrestrial and aquatic ecosystems

Pesticide uptake in plants and impacts on food safety

Experimental work in lab and greenhouse at NIBIO and IPP CAAS.
Collaboration with INRA-Dijon, Agroecology.

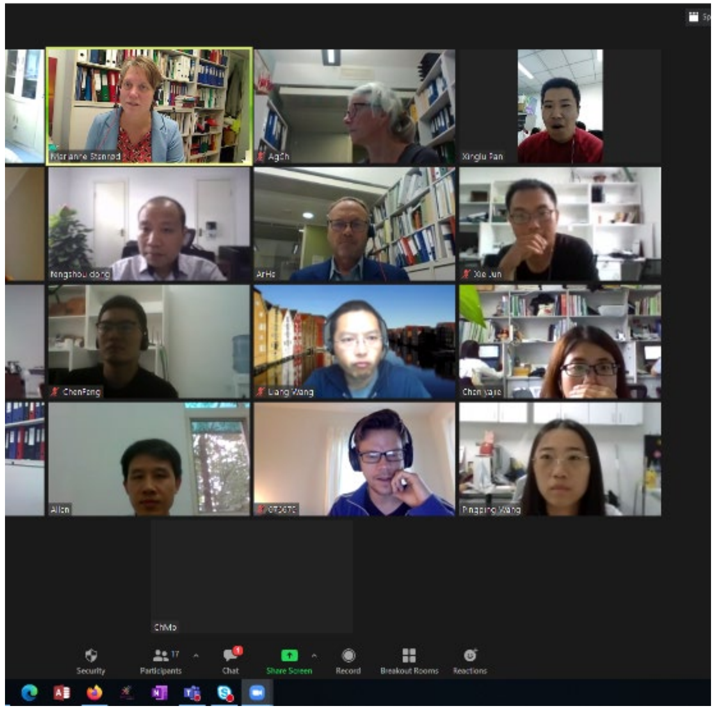
NIBIO

WP5: Recommendations, communication and dissemination

Jihong Liu Clarke, NIBIO, Yongquan Zheng, IPPCAAS

Evaluation and recommendations

Dissemination of project results



Workshops and meetings

Discussions with key stakeholders
Dissemination activities through a range of publications channels

Photos: IPPCAAS and NIBIO

Great opportunities for scientific and cultural exchange & social interactions

Thank you for your attention!

All WP leaders, participants and partners are acknowledged for their contributions.

Funding:

- Research Council of Norway (project 287431)
- 国家自然科学基金委员会 (NFSC)

NIBIO

NORSK INSTITUTT FOR BIOØKONOMI

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www.nibio.no

Environmental risk assessment of pesticide in China

ZHOU Yanming

Environment Division
Institute for the Control of Agrochemicals,
Ministry of Agriculture and Rural Affairs, P.R. China

Environment Division

Content

目录

Data requirements

ERA methods

Scenarios and Models

Post Registration Monitoring

1

Data requirements

ERA methods

Scenarios and Models

Post Registration Monitoring

Data requirements

- Based on chemical properties and intended use
  - Chemical pesticide, Biochemical Pesticides, Microbial Pesticides , Plant Extracts
  - Terrestrial, aquatic, greenhouse, indoor, etc.
  - Plant protect products, public health, rodenticides
  - Spray, seed treatments, granules, etc
- Tiered approach
  - Laboratory studies, semi-field studies
- Conducted in accordance with guidelines

Chemical pesticide TGAI E. FATE

- **Laboratory degradation studies:**
  - Photolysis in water and soil surface
  - Hydrolysis under different pH (and temperature) conditions
- **Laboratory metabolism studies:**
  - Aerobic* and anaerobic transformation in soil
  - Aerobic and transformation in water-sediment system
- **Mobility* :**
  - Absorption(Batch equilibrium*)/ Column leaching*
- **Analytic methods* :**
  - Analytic methods and validation in water
  - Analytic methods and validation in soil

*： Test with major metabolites are also required.

◆Birds (acute oral, dietary and reproduction studies)

Japanese quail
Coturnix japonica

Chemical pesticide TGAI Ecotoxicology

Environment Division

◆Laboratory studies

- Primary producers
  - Algae*
  - Macrophyte
- Invertebrates/Crustaceans
  - Daphnia

  (acute toxicity*, Reproduction)
- Vertebrates
  - Warm water
  - Cold water

  (Acute toxicity*, Early life stage *Full life cycle, Bioconcentration*)

Pseudokirchneriella subcapitata

Lemna gibba

Myriophyllum Spicatum

Daphnia magna

Rainbow trout (*Oncorhynchus mykiss*)

Ricefish (*Oryzias latipes*)

Chemical pesticide TGAI Ecotoxicology

Environment Division

◆Aquatic microcosm/mesocosm

Chemical pesticide TGAI Ecotoxicology

Apis mellifera

- Terrestrial Invertebrates
  - Honey bee

    (Acute oral/ contact, *Larval, semi field*)
  - Silkworm(Acute*, chronic*)
  - Non target arthropods(Beneficial predators and parasites)
  - Earthworm(Acute*, Reproduction*)
- Soil micro-organisms

Bombyx mori

Ladybird beetle

Coccinella septempunctata

Trichogramma ostriniae

Eisenia foetida

CHEMICAL formulation

Environment Division

No.	Environmental Data requirements
1	Bird acute oral toxicity
2	Honeybee acute contact toxicity
3	Honeybee acute oral toxicity
4	Silkworm acute toxicity
5	Terrestrial non-target arthropod toxicity – parasitic
6	Terrestrial non-target arthropod toxicity – predatory
7	Fish acute toxicity
8	Daphnia acute toxicity
9	Freshwater algae growth inhibition
10	Earthworm acute toxicity
11	Other necessary higher tier data
12	Environmental risk assessment report

CHEMICAL formulation – Envrion. DATA

Environment Division

- Data are not required if exposure is limited:
  - Indoor use: no data is required
  - Green house: only earthworm is required
  - Tree injection: no data is required
  - Seed treatment or granules: honey bee, silkworm, non-target arthropods toxicity are not required
    - Dry-land seed treatment or granules apply in small holes: aquatic toxicity is also not required
  - ……

Current guidance documents on testing method

Environment Division

- 21 for e-fate or ecotoxicology study issued by Standardization administration of the PR China, 2014
- 9 for Laboratory ecotoxicology study
- 4 for field dissipation/mesocosm/honeybee semi-field study
- 9 for microbial pesticide
- Validation of analytical method in soil and water
- Evaluation of degradation kinetics

2

Data requirements

ERA methods

Scenarios and Models

Post Registration Monitoring

Current guidance documents on ERA

Environment Division

- General principles
- Aquatic Ecosystems
- Birds
- Honeybee
- Silkworm
- Ground water
- Non-target arthropod
- Soil organisms

NY/T 2882.1-2016~NY/T 2882.7-2016 (issued by MOA in May 23rd, 2016

NY/T 2882.8-2017(issued by MOA in Nov 22nd, 2017

Aquatic Ecosystems
Effect assessment

Effect Assessment

$$PNEC = \frac{EdP}{UF}$$

PNEC = predicted no effect concentration
EdP = end point（eg: LC_{50} , HC_5 , NOEAEC etc）
UF = uncertainty factor

Aquatic Ecosystems UF

Environment Division

End points and uncertainty factor used in 1st tier risk assessment:

	Taxonomic group	Toxicity data	End point selection	UF
Acute	Aquatic vertebrates	<5 acute LC_{50}	Geomean	100
	Invertebrates	<8 acute EC_{50}		100
Chronic	Aquatic vertebrates	<5 chronic NOEC		10
	Invertebrates	<8 chronic NOEC		10
	Primary producers	<8 EC_{50}		10

Aquatic Ecosystems Risk Characterization

- RQ-vertebrate
  - Short term
  - Long term
- RQ-invertebrates
  - Short term
  - Long term
- RQ-producer
  - Long term

$$RQ = \frac{PEC}{PNEC}$$

Environment Division

3

Data requirements

ERA methods

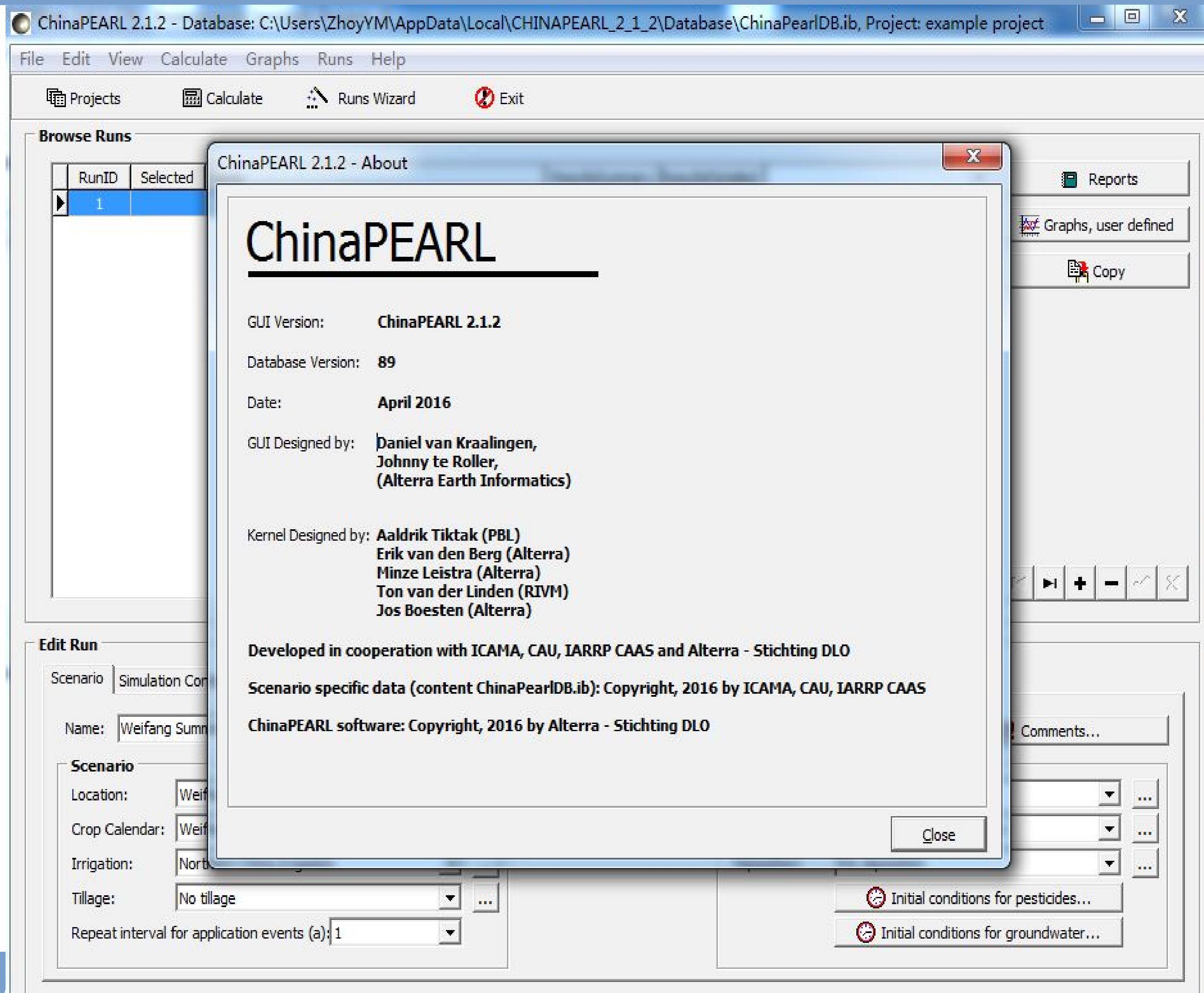
Scenarios and Models

Post Registration Monitoring

Dry land Groundwater model

- ChinaPEARL
  - Base on FOCUS PEARL model
  - 10 Scenarios:
    - Xinmin, Weifang, Shangqiu, Wugong, Urumqi, Tongxin
    - Luzhou, Nanchang, Lianping, Haikou
  - 25 Crops:
    - Apples, Beans(vegetables), Cabbage, Chinese Cabbage, Chinese Chive, Citrus, Cotton, Cucumber, Grass(alfalfa), Hot Pepper, Maize, Oilseed rape, Peanuts, Potatoes, Soybean, Wheat, Strawberries, Sugar beets, Sugarcane, Sunflower, Teatree, Tobacco, Tomatoes, Vines, Watermelon

Dry land groundwater model



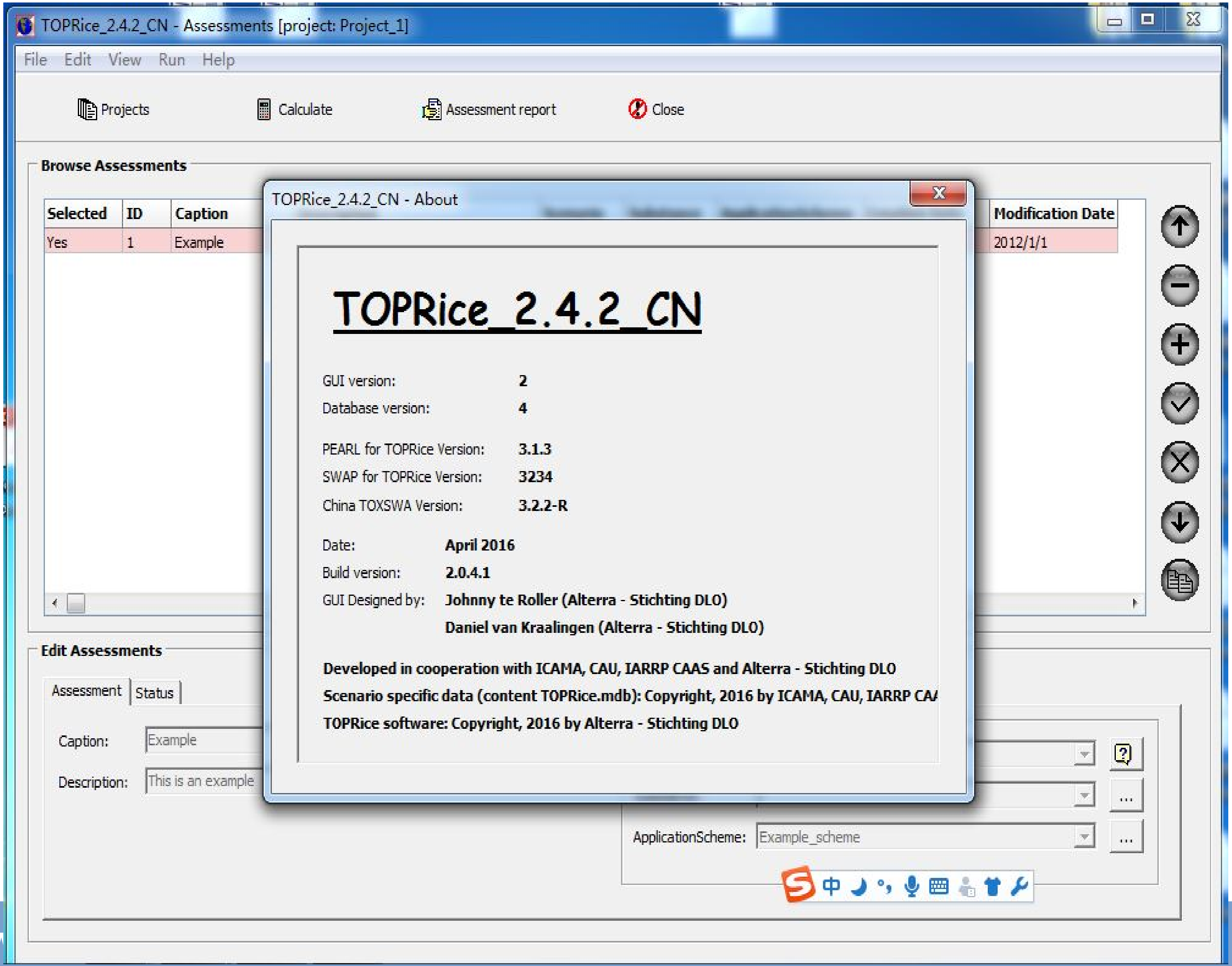
Paddy field groundwater and surface water model

◆TOP-RICE

- Paddy PEARL+TOXSWA
- 2 Scenarios: Nanchang, Lianping

Paddy field groundwater and surface water model

Environment Division



Dry land surface water model

◆ **P**esticide **S**urface water **e**xposure **m**odel, PSEM (Under developing)

- PRZM+VVWM
- 10 Scenarios:
  - Xinmin, Weifang, Shangqiu, Wugong, Urumqi, Tongxin
  - Luzhou, Nanchang, Lianping, Haikou
- 12 Crops:
  - Apples, Cabbage, Citrus, Cotton, Maize, Peanuts, Potatoes, Soybean, Wheat, Teatree, Tobacco, Tomatoes

Environment Division

4

Data requirements

ERA methods

Scenarios and Models

Post Registration Monitoring

Post Registration Monitoring

- Monitoring program within ICAMA.
  - Since 2014
  - 10 Provinces: Hebei, Liaoning, Heilongjiang, Jiangsu, Zhejiang, Jiangxi, Shandong, Hunan, Guangdong, Hainan
  - ~1000 soil, groundwater and surface water samples per year
  - 90 Pesticides and metabolites:
    - 60 insecticide
    - 16 fungicide
    - 14 herbicide

THANKS

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ZHOU yanming
Environ Division, ICAMA

Landbruksdirektoratet
Eanandoallodirektoráhtta

HOW THE NORWEGIAN GOVERNMENT IS WORKING TO ENHANCE SOIL HEALTH

27.05.2021

Rannveig Bø Fløystad,
Norwegian Agriculture Agency

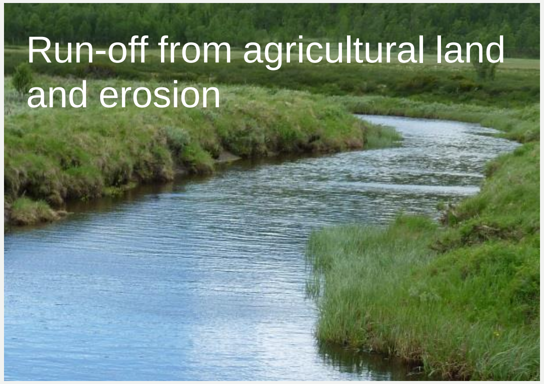
AGENDA

- Established measures related to soil health
- The National Programme of Soil Health
    - What it is
    - The process
    - Outcomes

ESTABLISHED TARGETS AND MEASURES

- National Agri-Environmental Programme
  - States targets and related means for 8 main themes
  - Based on international comitments, agreements and national targets and policies on agriculture and environment
  - Updated every four years

NATIONAL AGRI-ENVIRONMENTAL PROGRAMME THEMES



Photos: E. Fløistad/NIBIO, G. Engan/NIBIO, W. Dramstad/NIBIO, R. Nordrum/N.A. Agency, Colourbox, Geir Harald Strand/NIBIO, Colourbox

FUNDING FOR SPECIFIC PRACTICES

- No tillage in autumn (since 1991) – nearly 50 % of the area used for cereal production
- Cover crops
- Grass on areas exposed to flooding, grassed waterways, buffer strips inside the field and around the field
- Direct drilling
- Mechanical weed control
- Use of draghoses for spreading manure (less compaction)
- Drainage of agricultural land

RESEARCH AND DEVELOPMENT

- Sustainable use of pesticides (Handlingsplan for bærekraftig bruk av plantevernmidler)
- Organic farming (Utviklingsmidler til økologisk landbruk)
- Agri-environment in general (Klima- og miljøprogrammet)
  - run-off, erosion, carbon storage etc.)

NATIONAL PROGRAMME OF SOIL HEALTH - PROCESS

- 2010-2019: Project “Foregangsfylke Levende jord” = “Pioneer county for living soil”
    - An action to increase knowledge on soil health among the farmers and advisors
- National strategy on organic agriculture (2018):
    - a programme on soil health is being established
- Also, The Norwegian Agricultural Extension Service (NLR) is developing their services on soil health

NATIONAL PROGRAMME OF SOIL HEALTH – TARGETS

- Targets
  - Increase interest and knowledge on soil health among farmers in Norway
  - Facilitating the practical implementation of improving soil health
- A scientific basis for further effort on soil health
  - Ensure soil's capacity for food production
  - Make soil more robust to climate change
  - Increase carbon storage in soils
- Suggestions on strategies and measures for enhanced soil health in Norway

NATIONAL PROGRAMME OF SOIL HEALTH - PROCESS

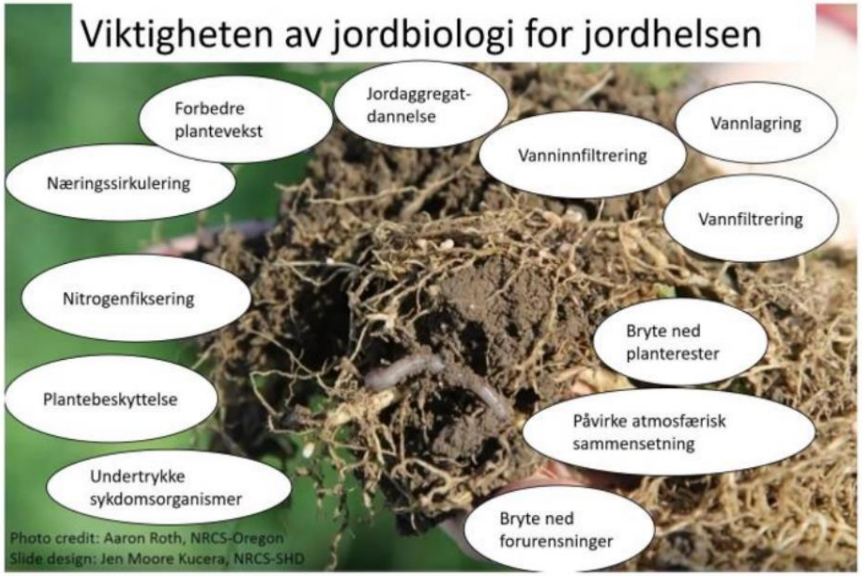
- Collaborating working group:
  - Norsk Bonde- og småbrukarlag
  - Norges Bondelag
  - The County Governor in Oslo and Viken
  - Norwegian Agricultural Extension Service
  - Norwegian University of Life Sciences
  - Norwegian Centre for Organic Agriculture
  - Norwegian Institute of Bioeconomy Research (NIBIO)
- Norwegian Agriculture Agency was secretariat

NATIONAL PROGRAMME OF SOIL HEALTH – CONTENT

- A review on the benefits from and threats against good soil health in Norway
    - Erosion
    - Compaction
    - Loss of organic matter and soil biota

CONTENT CONT.: KEY PROPERTIES

- Soil biodiversity
    - Tillage, fertilization, pesticides and irrigation potential threaths to soil biota
    - More focus on agricultural practices that can stimulate the soil biota, and more research.
- Soil organic matter, carbon storage
    - Strong need for more research on the potential for carbon storage under Norwegian conditions
- Soil structure



Figur 3 Betydning av jordbiologien for jordhelse. Oversatt fra USDA/NRCS

CONTENT CONT.: PRINCIPLES AND PRACTICES FOR ENHANCING SOIL HEALTH

- Support for the four soil health principles (NRCS):

    1. Soil armor
    2. Minimizing soil disturbance
    3. Plant diversity
    4. Continual live plant/root

CONTENT CONT.:
NEED FOR MORE RESEARCH AND DEVELOPMENT

- Increasing interest/knowledge for soil health among farmers and advisors

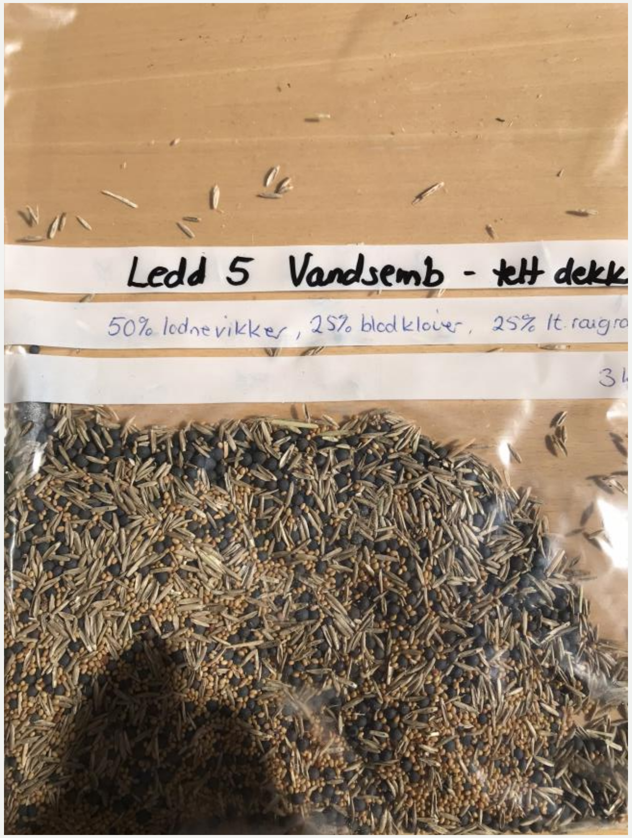
- What management pratices should be considered, and how to perform them under norwegian conditions?

- Need for more research (not complete list)
  - Status for soil health in Norway, indicators for soil health
  - Connections between soil health, soil function and ecosystem services
  - Tillage and compaction
  - Importance of soil biota for nutrient uptake, plant health, animal health and human health
  - Manure, soil improvers…
  - Culture specific measures for enhanced soil health

CONTENT CONT.: SUGGESTIONS FOR FURTHER WORK AND MEASURES

- Suggestions for measures, like reduced tillage, use of biochar, cover crops…

- Suggestions for processes for implementation of the programme



HOW TO FOLLOW UP THE PROGRAMME OUTCOMES

- Soil as a main topic in National agri-environmental programme
  - Targets for the work on soil health
  - New measures for stimulating use of biochar, cover crops and other practices for good soil health, and R&D-activities.

Photos: E. Fløistad/NIBIO, G. Engan/NIBIO, W. Dramstad/NIBIO, R. Nordrum/N.A. Agency, Colourbox, Geir Harald Strand/NIBIO, Colourbox, Jan Kroon/Pexels

OUTCOMES - MEASURES

- Cover crops prioritized - increased financial allocation for measures
- New/enhanced measures for farmers
- A pilot project for increasing the knowledge on practical use of biochar?

OUTCOMES - R&D

- Klima- og miljøprogrammet (R&D): soil health as a main topic
- Funding for a specific research project on cover crops (carbon storage) (CAPTURE)
- Soil health projects prioritized through the Agricultural Agreement Research Fund of Norway

HOW TO FOLLOW UP THE PROGRAMME

- Norwegian Agriculture Agency has presented a draft for an action plan
- Further develop link between soil health, climate, sustainable pesticide use etc.
    - Climate agreement between the state and the farmer's organizations
        - Action plan from the farmer's organizations emphasizes biochar and cover crops as measures for carbon storage. Target: uptake approx. 1,3 mill. tonnes CO2-eqv until 2030.
    - Norway has joined the 4‰-initiative

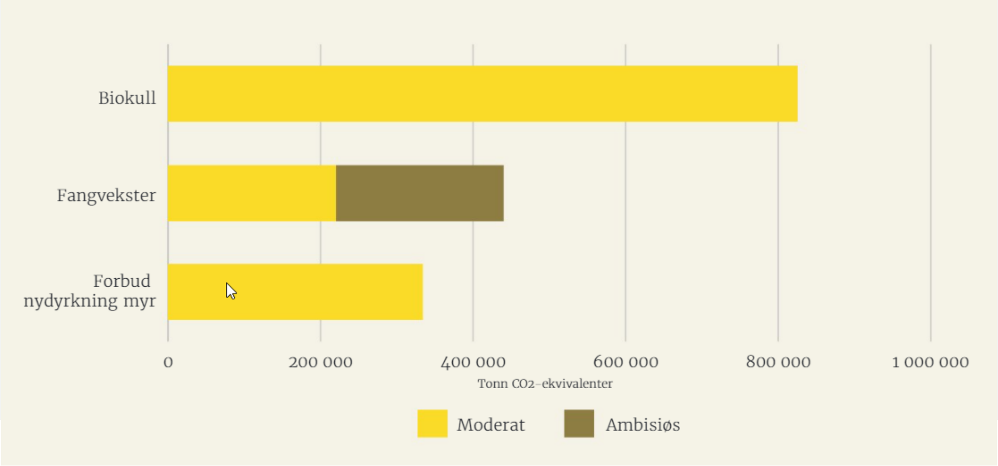


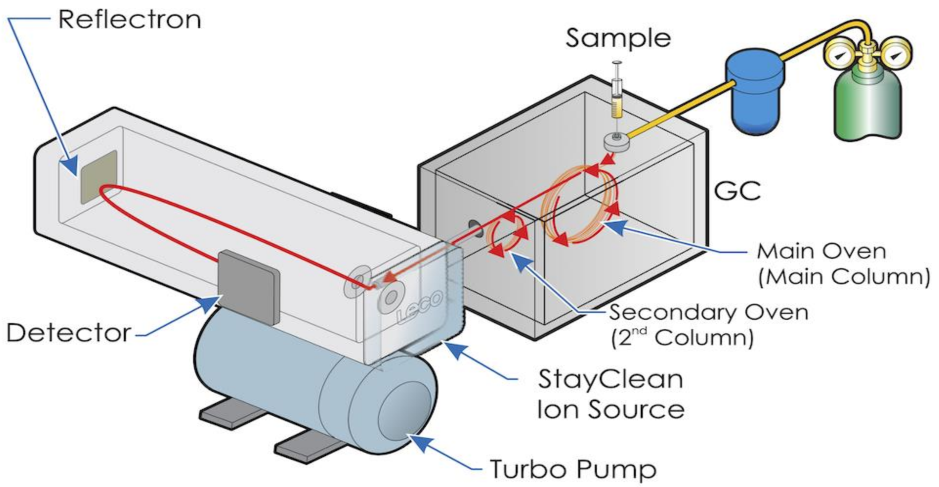
Figure from the climate action plan from the farmer's organizations

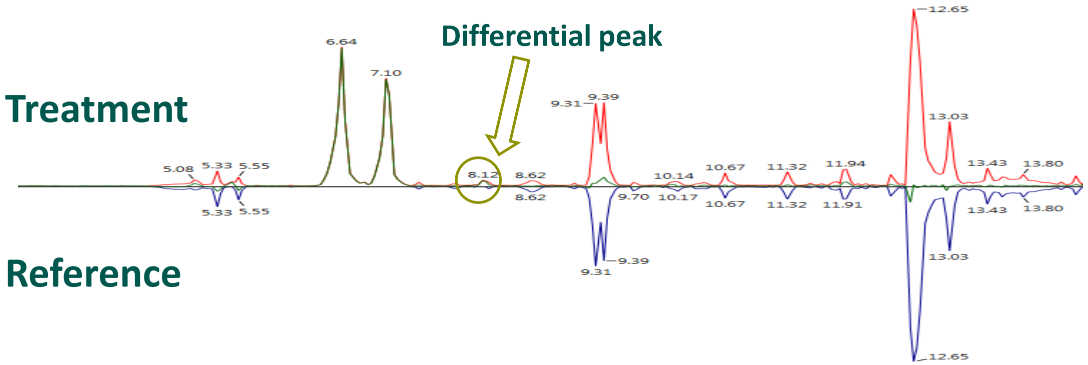
THANK YOU FOR YOUR ATTENTION

WP2 Screening tools for pesticide analysis in soil and produce

NIBIO: Marit Almvik, Roger Holten, Kathinka Lang, Agnethe Christiansen, Ole, Martin Eklo, Marianne Stenrød
IPP-CAAS: Fengshou Dong & Yuanbo Li

NIBIO
NORWEGIAN INSTITUTE OF
BIOECONOMY RESEARCH





Accurate mass ⇨ Formula ⇨ Structure

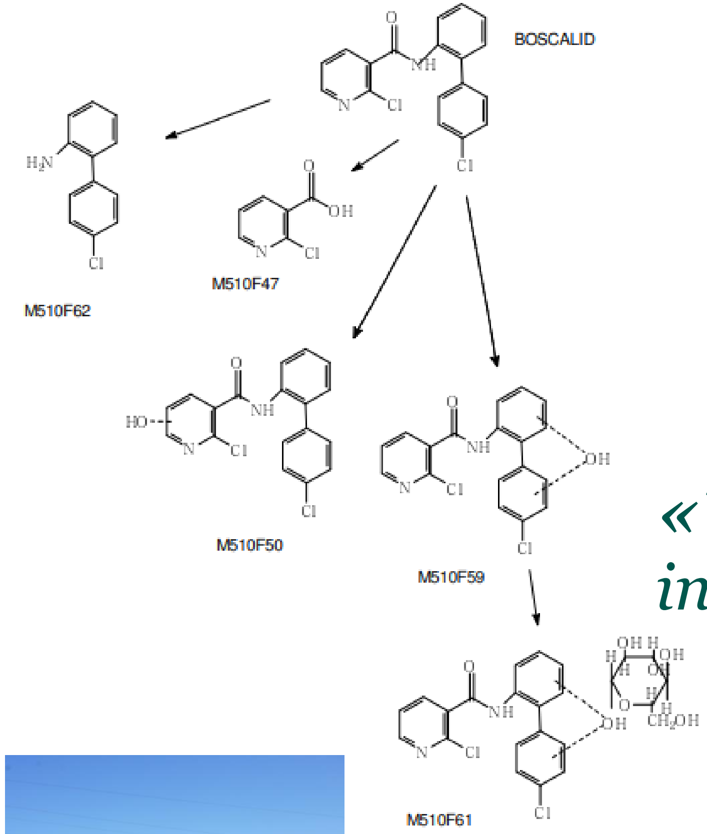
Pesticide residue monitoring is important to ensure environmental and food safety

- Food monitoring is regulated and mandatory
- Soil monitoring is not

Potato fields in Skien, Norway and in Guyuyan, Hebei Province, in 2020

NIBIO

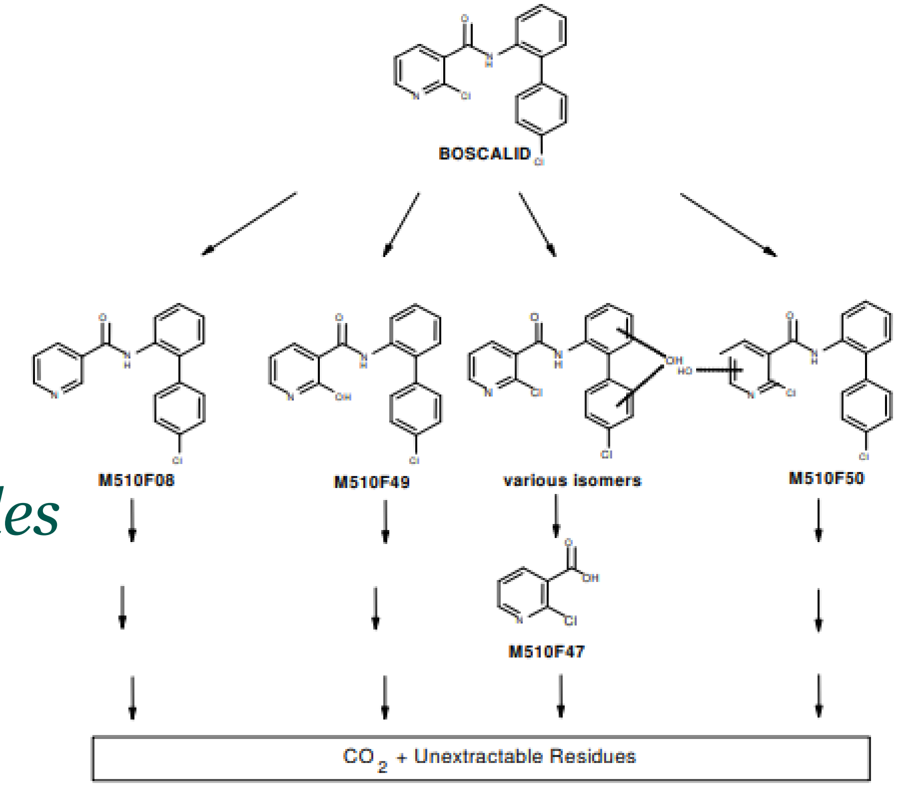
- Less than 0.1% of pesticides applied for pest control reach their target pests
- The rest reach plant, soil, air and may leach to water courses with impacts to:
  - Soil health and species diversity
  - Development of pesticide resistant crop pathogens
  - Food and water safety



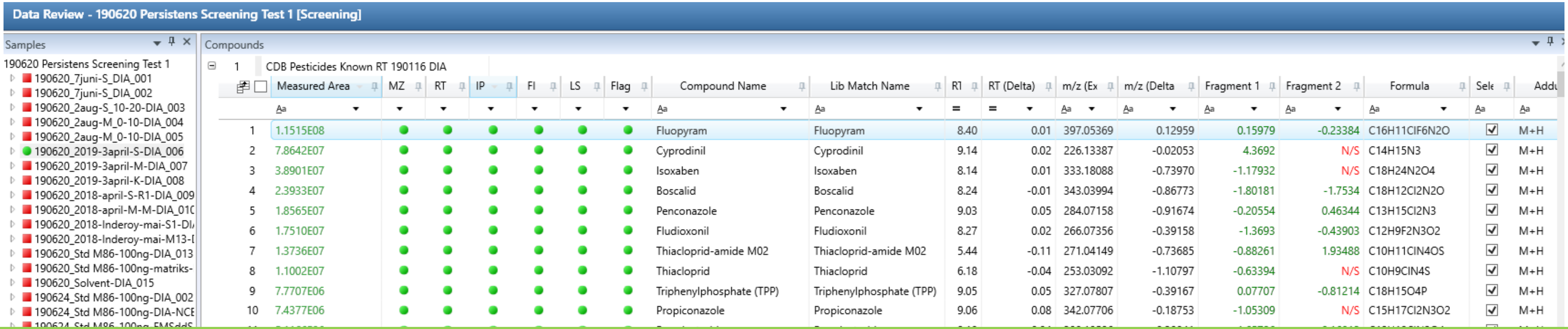
Low Impact WP2

«What's happening to the pesticides in the soil and crops?»

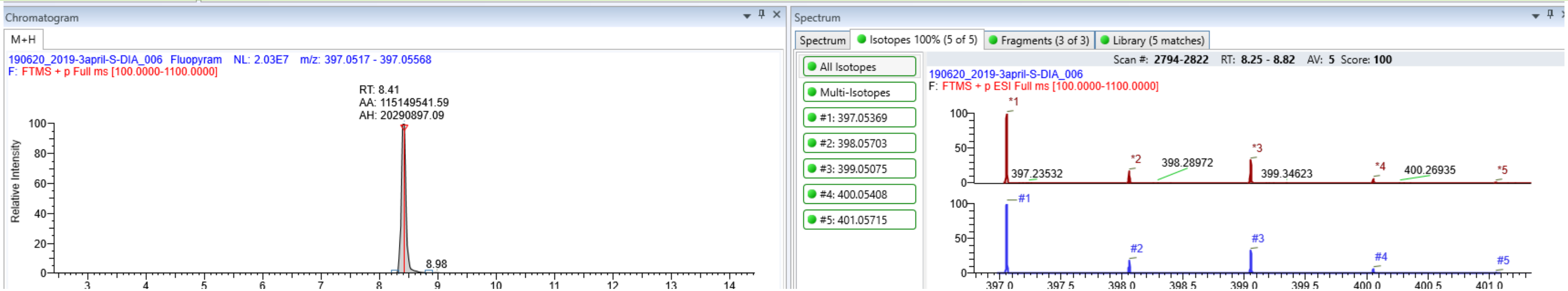
Need for screening tools



NIBIO



Pesticide screening methods at NIBIO, Norway



NIBIO

1. The targeted methods at NIBIO

- Two multi-methods which covers 352 pesticides
  - **GC-MS/MS multi-method for food of plant origin (108 pesticides)**
  - **LC-MS/MS multi-method for food of plant origin (244 pesticides)**
  - Joint sample preparation with QuEChERS extraction
  - **Water and soil/sediment: Similar instrument methods, but the analytical scope is adapted to Norwegian conditions.** The standard mixtures are the same
- Several single residue methods
  - Covers one or several pesticides or groups of pesticides
  - 2018: 13 methods, in total 53 pesticides
- Limit of Quantification **(LOQ) is 10 µg/kg** for food of plant origin
  - Lowest calibration standard: 0.005 µg/mL (GC) and 0.001 µg/mL (LC)
  - **12 methods accredited**, including the large multi-methods

NORWEGIAN
ACCREDITATION
TEST 035

2. New non-targeted screening using LC-HRAM Q-Exactive

800 pesticides

The HRAM-instrument’s outstanding capacity to measure accurate mass (m/z) of the compounds in the samples

EFS Pesticides database

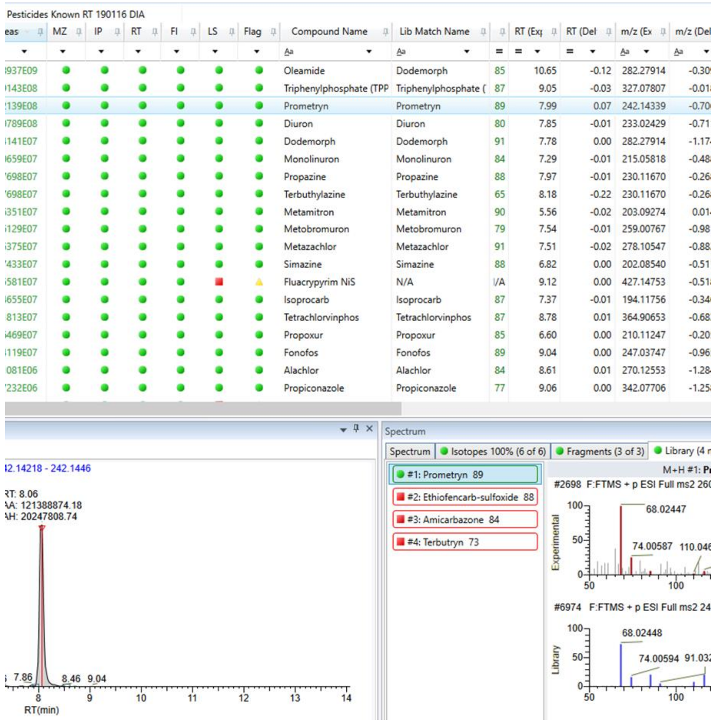
450 Pesticides with unknown RT

CDB database

350 Pesticides with known RT

Spectra Library

MS2 spectra of 800 Pesticides



Extraction with QuEChERS, acetonitrile or acetone
LOQ 0.04 – 20 µg/kg in soil and food of plant origin

Identified: 5 green lights: M/Z IP RT FI LS

Pesticide name

Mass error < 2 ppm

Thermo TraceFinder EFS LC

File View Tools Help

Real time status | User: Qexactive |

Batch View

Samples

Data Review

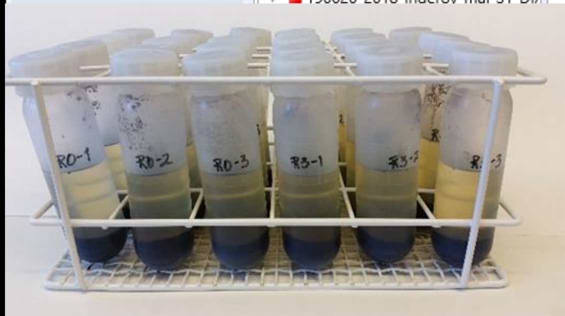
Target Screening

Report View

Local Method

Samples

190620 Persistens Screening Test 1
- 190620_7juni-S_DIA_001
- 190620_7juni-S_DIA_002
- 190620_2aug-S_10-20-DIA_003
- 190620_2aug-M_0-10-DIA_004
- 190620_2aug-M_0-10-DIA_005
- 190620_2019-3april-S-DIA_006
- 190620_2019-3april-M-DIA_007
- 190620_2019-3april-K-DIA_008
- 190620_2018-april-S-R1-DIA_009
- 190620_2018-april-M-M-DIA_010
- 190620_2018-Inderoy-mai-S1-DI



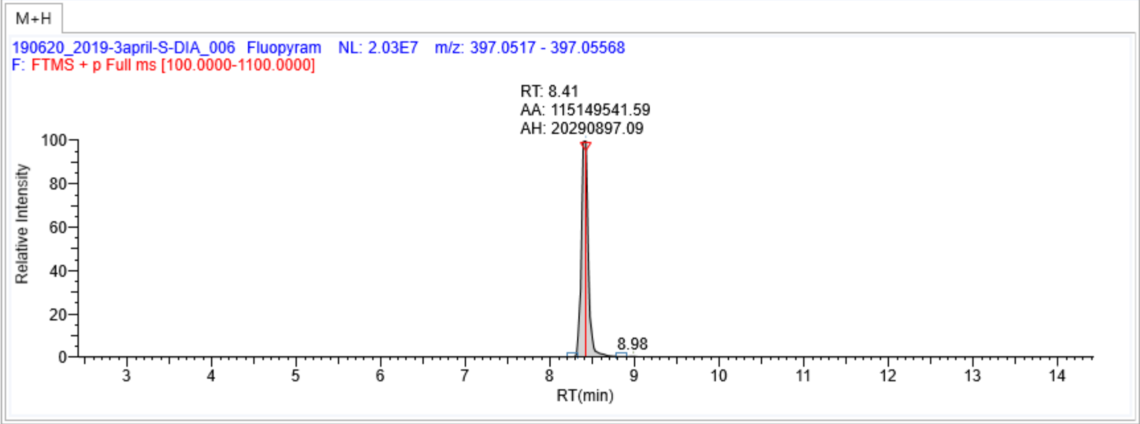
Compounds

1 CDB Pesticides Known RT 190116 DIA

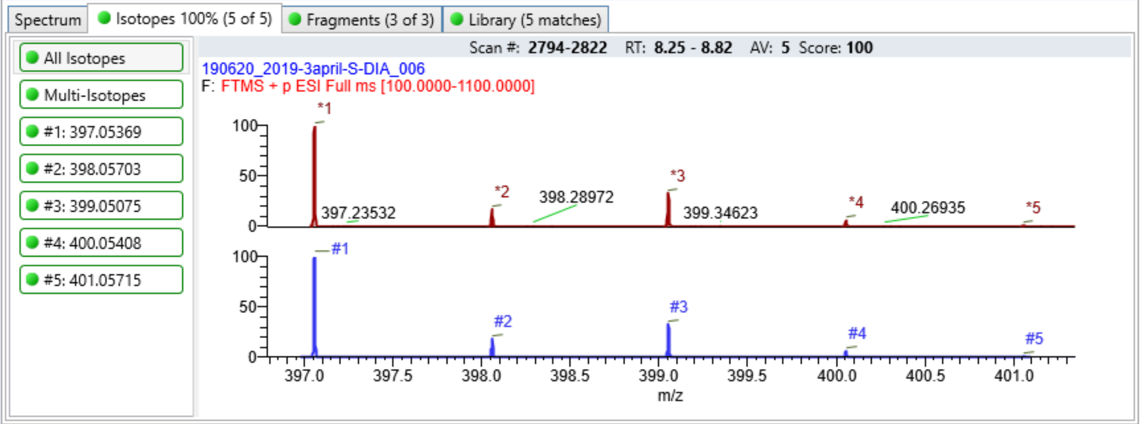
#	Measured Area	MZ	RT	IP	FI	LS	Flag	Compound Name	Lib Match Name	RI	RT (Delta)	m/z (Ex	m/z (Delta	Fragment 1	Fragment 2	Formula	Sele	Addu
1	1.1515E08	●	●	●	●	●	●	Fluopyram	Fluopyram	8.40	0.01	397.05369	0.12959	0.15979	-0.23384	C16H11ClF6N2O	☑	M+H
2	7.8642E07	●	●	●	●	●	●	Cyprodinil	Cyprodinil	9.14	0.02	226.13387	-0.02053	4.3692	N/S	C14H15N3	☑	M+H
3	3.8901E07	●	●	●	●	●	●	Isoxaben	Isoxaben	8.14	0.01	333.18088	-0.73970	-1.17932	N/S	C18H24N2O4	☑	M+H
4	2.3933E07	●	●	●	●	●	●	Boscalid	Boscalid	8.24	-0.01	343.03994	-0.86773	-1.80181	-1.7534	C18H12Cl2N2O	☑	M+H
5	1.8565E07	●	●	●	●	●	●	Penconazole	Penconazole	9.03	0.05	284.07158	-0.91674	-0.20554	0.46344	C13H15Cl2N3	☑	M+H
6	1.7510E07	●	●	●	●	●	●	Fludioxonil	Fludioxonil	8.27	0.02	266.07356	-0.39158	-1.3693	-0.43903	C12H9F2N3O2	☑	M+H
7	1.3736E07	●	●	●	●	●	●	Thiacloprid-amide M02	Thiacloprid-amide M02	5.44	-0.11	271.04149	-0.73685	-0.88261	1.93488	C10H11ClN4OS	☑	M+H
8	1.1002E07	●	●	●	●	●	●	Thiacloprid	Thiacloprid	6.18	-0.04	253.03092	-1.10797	-0.63394	N/S	C10H9ClN4S	☑	M+H
9	7.7707E06	●	●	●	●	●	●	Triphenylphosphate (TPP)	Triphenylphosphate (TPP)	9.05	0.05	327.07807	-0.39167	0.07707	-0.81214	C18H15O4P	☑	M+H
10	7.4377E06	●	●	●	●	●	●	Propiconazole	Propiconazole	9.06	0.08	342.07706	-0.18753	-1.05309	N/S	C15H17Cl2N3O2	☑	M+H
11	5.1166E06	●	●	●	●	●	●	Pyraclostrobin	Pyraclostrobin	9.10	0.04	388.10586	-0.30041	1.65796	-0.16812	C19H18ClN3O4	☑	M+H
12	3.7634E06	●	●	●	●	●	●	Phenmedipham	Phenmedipham	7.80	0.00	318.14483	-0.74719	-0.741	-0.64761	C16H16N2O4	☑	M+NH4
13	3.1197E06	●	●	●	●	●	●	Trifloxystrobin acid CGA321113	Trifloxystrobin acid CGA32	8.89	-0.11	395.12132	-0.34090	-2.75138	-1.95638	C19H17F3N2O4	☑	M+H
14	2.8266E06	●	●	●	●	●	●	Azoxystrobin	Azoxystrobin	8.0[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M+H
15	1.6554E06	●	●	●	●	●	●	Metamitron	Metamitron	5.5[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M+H
16	1.5624E06	●	●	●	●	●	●	Phoxim	Phoxim	9.1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M+H
17	1.5624E06	●	●	●	●	●	●	Quinalphos	Quinalphos	8.9[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	M+H
18	1.0960E06	●	●	●	●	●	●	Carboxin	Carboxin	7.06	0.02	236.07398	-0.02283	N/S	3.35737	C12H13NO2S	☑	M+H
19	N/A	■	■				■	1-Naphthylacetamide	N/A	6.62	N/A	186.09134	N/A	N/A	N/A	C12H11NO	☐	M+H
20	N/A	■	■				■	2,6-dichlorbenzamide (BAM)	N/A	4.32	N/A	189.98210	N/A	N/A	N/A	C7H5Cl2NO	☐	M+H
21	N/A	■	■				■	2-Trifluoromethyl-pyridine	N/A	6.54	N/A	148.03686	N/A	N/A	N/A	C6H4F3N	☐	M+H

17 pesticides and metabolites detected in this soil sample extract

Chromatogram



Spectrum



Acquisition

Analysis

Method Development

Commodity	Our reference methods	Pesticide detected with reference method ≥0.01 mg/kg	Detected with LC-HRAM Screening method ≥0.01 mg/kg
Aubergine	LC-MS/MS	Fludioxonil Formetanate Kresoxim-methyl	✓ ✓ ✓
	GC-MS/MS	Boscalid Cyprodinil Pyrimethanil	✓ ✓ ✓
Green beans	GC-MS/MS	Cyprodinil Etofenprox Triazophos Carbendazim	Not detected ✓ ✓ ✓
Chilipepper	LC-MS/MS	Acetamiprid Bifenazate Clothianidin Emamectin benzoate Indoxacarb Thiamethoxam	✓ ✓ ✓ ✓ ✓ ✓
Drumsticks	LC-MS/MS	Carbendazim	✓
Apple	LC-MS/MS	Acetamiprid	✓
Ginger	LC-MS/MS	Clothianidin	✓
Clementine	LC-MS/MS	Acetamiprid Difenoconazole Hexythiazox Imazalil Propiconazole Thiabendazole	✓ ✓ ✓ ✓ ✓ ✓
	GC-MS/MS	Chlorpyrifos Cypermethrin	✓ ✓
Coriander	LC-MS/MS	Dimethomorph	✓
	GC-MS/MS	Chlorpyrifos Cypermethrin	✓ ✓

We have screened food samples from Asia and successfully compared the non-targeted screening method to our targeted methods

Commodity	Our reference methods	Pesticide detected with reference method ≥0.01 mg/kg	Detected with LC-HRAM Screening method ≥0.01 mg/kg
Mango	LC-MS/MS	Thiamethoxam Fipronil (> 0.002 mg/kg)	✓ Also detected: ✓ chlorpyrifos & carbendazim
Mint	LC-MS/MS	Carbendazim Dinotefuran Imidacloprid	✓ ✓ ✓
	GC-MS/MS	Chlorpyrifos Metalaxyl	✓ ✓
Bell pepper	LC-MS/MS	Fluopyram	✓
Rice	LC-MS/MS	Isoprothiolane Tebuconazole	✓ thiamethoxam (0.010 mg/kg) ✓
Lemon	LC-MS/MS	Buprofezin Imazalil Pyridaben Sulfoxaflor Tebuconazole Thiabendazole	✓ pirimphos-methyl (0.010 mg/kg) ✓ ✓ ✓ ✓ ✓
	GC-MS/MS	Pyrimethanil Pyriproxyfen	✓ ✓
Table grapes	LC-MS/MS	Clothianidin Difenoconazole Mandipropamide	✓ ✓ ✓
Star fruit	LC-MS/MS	Azoxystrobin	✓
	GC-MS/MS	Cypermethrin	✓
Tea	LC-MS/MS	Thiamethoxam	✓
	GC-MS/MS	Bifenthrin Chlorpyrifos	✓ ✓
Scallions	LC-MS/MS	Carbendazim Methoxyfenozide Prochloraz	✓ ✓ ✓
	GC-MS/MS	Procymidone	Not detected

Conclusion:
All pesticides detected with LC-MS/MS and GC-MS/MS in the Asia samples were detected with LC-QExactive - with two exceptions. Many pesticides < 0.01 mg/kg were also detected (not shown)

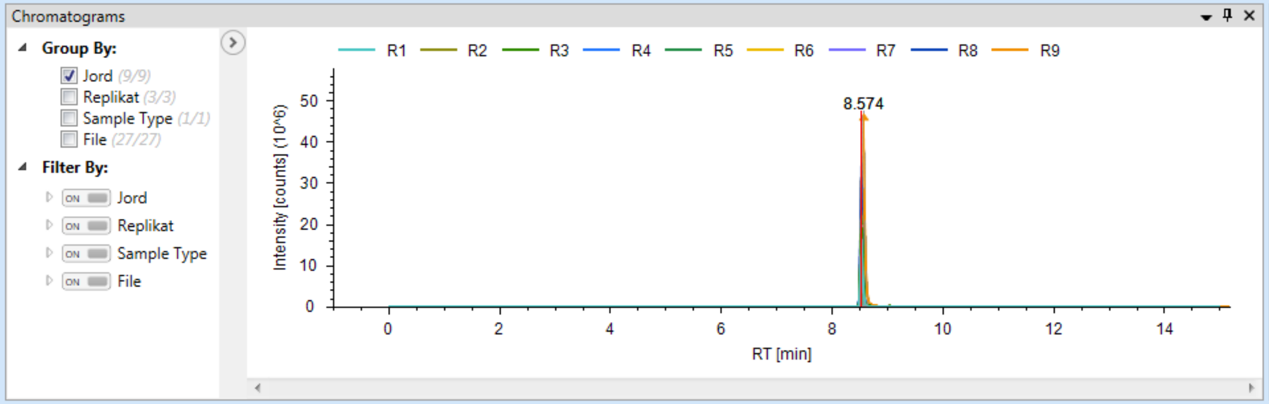
Verification by proficiency tests

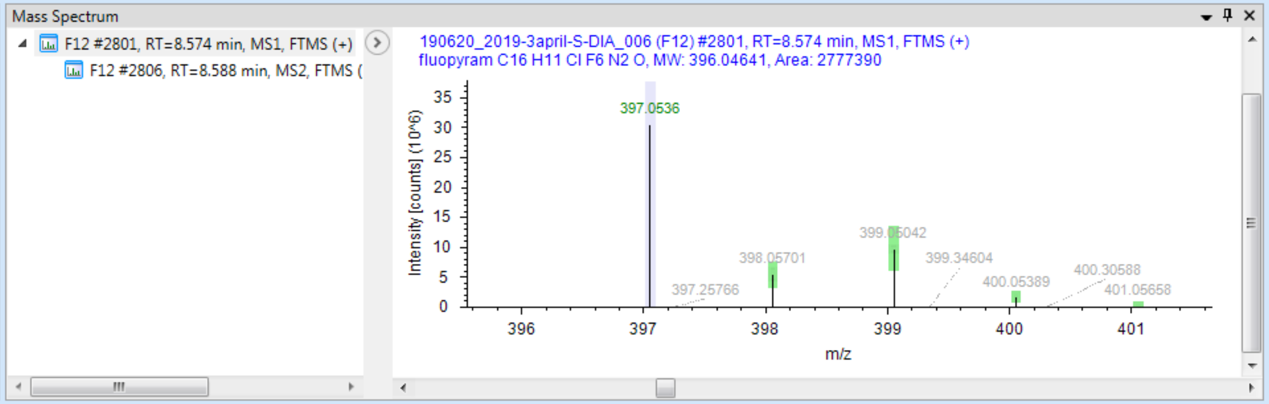
- We have used the screening method with success in several proficiency tests for pesticides in fruit and vegetables
- We detect pesticides that are not included in our targeted methods

European Union Proficiency Test for Pesticide Residues in Fruits and Vegetables Screening Methods 12 Preliminary Report

Laboratory Code Total No of Reporting Laboratories =64	Evaluated Pesticides (17)								R: Reported Pesticide									Reported Pesticides by Laboratory	% Reported Pesticides
	Alachlor	Cyanofenphos	Diuron	Dodemorph	Endrin	Fluacrypirim	Fonofos	Isoprocarb	Metamitron	Metazachlor	Metobromuron	Monolinuron	Prometryne	Propazine	Propoxur	Simazine	Tetrachlorvinphos		
Lab001			R		R	R	R	R	R	R	R	R	R	R	R	R	R	14	8
Lab002	R	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	16	9
Lab003	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9
Lab004			R	R	R		R	R	R	R	R	R	R	R	R	R	R	14	8
Lab005	R	R	R	R	R		R	R		R	R	R	R	R	R	R	R	15	8
Lab006	R		R		R		R	R		R	R	R	R		R		R	11	6
Lab007	R						R								R			3	1
Lab008		R	R	R	R	R	R	R	R	R	R				R		R	12	7
Lab009	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab010	R		R	R	R		R	R	R	R	R	R	R	R	R	R	R	15	8
Lab011			R		R		R	R	R	R	R	R	R	R	R	R	R	13	7
Lab012	NO RESULTS REPORTED																		
Lab013	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9
Lab014		R	R		R	R	R	R	R	R	R	R	R		R	R	R	14	8
Lab015	R	R	R	R	R	R	R		R	R	R	R	R	R	R	R	R	16	9
Lab016	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9
Lab017	R	R	R	R	R		R		R	R	R	R	R	R	R	R	R	15	8
Lab018	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab019				**R**	**R**		**R**								**R**	**R**	**R**	6	3
Lab020	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab021	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9
Lab022			R		R		R	R	R	R	R	R	R	R	R	R	R	13	7
Lab023	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab024	R		R		R		R			R	R	R	R		R	R	R	11	6
Lab025	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab026			R		R		R	R	R	R	R		R	R	R	R	R	12	7
Lab027															R			1	6
Lab028			R		R		R	R	R	R	R	R	R	R	R	R	R	13	7
Lab029	R		R		R		R	R	R	R	R	R	R	R	R	R	R	14	8
Lab030	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9
Lab031				R		R				R				R	R		R	6	3
Lab032	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	17	10
Lab033	R		R				R	R	R	R	R	R	R	R	R	R	R	13	7
Lab034	R	R	R	R	R		R	R	R	R	R	R	R	R	R	R	R	16	9

We use Compound Discoverer 3.1 to predict and detect pesticide metabolites: A list of predicted and detected metabolites in the soil samples is produced, based on Phase I and II Transformation modes

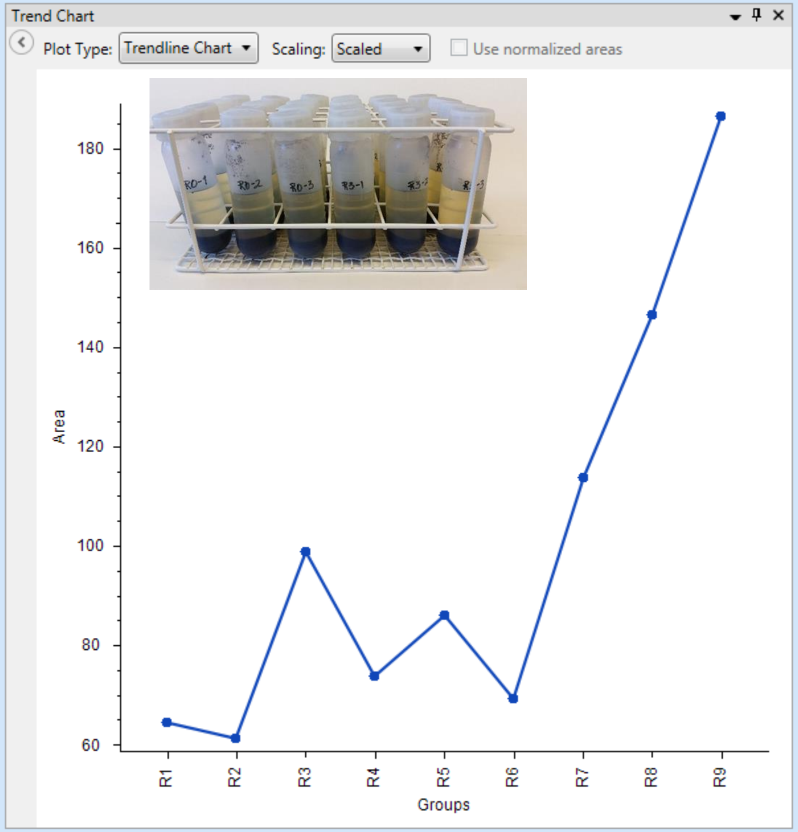




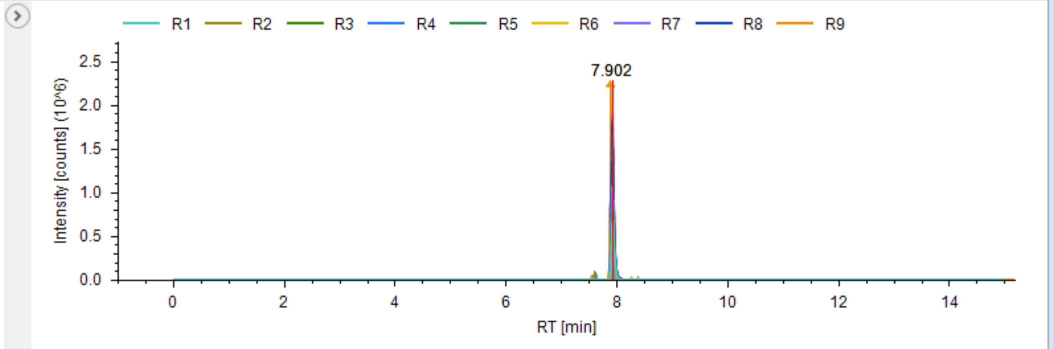
Expected Features | mzVault Results | mzCloud Results | ChemSpider Results | Mass List Search Results | FISh Trace Fragments | Input Files | Specialized Traces
Compounds | Compounds per File | Expected Compounds | Expected Compounds per File | Expected Formulas | Merged Features | Features

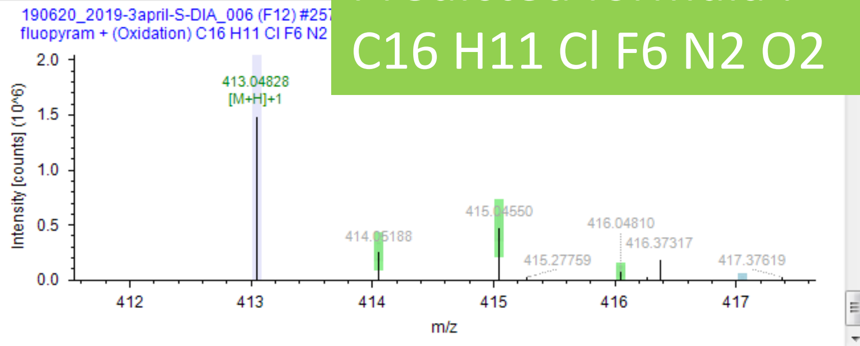
	Check	Name	Parent Compound	Formula	Molecular Weight	RT [min]	Area (Max.)	Transformations	Composition Chai
120	☐		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.504	15672	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
121	☐		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.525	29817	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
122	☐		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.554	37569	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
123	☐		Pyraclostrobin	C19 H14 N2 O5	350.09027	9.401	322258	Dehydration, Oxidative Deamination to Ketone, Oxidative Dechlorination	-(H4 Cl N) +(O)
124	☐		fluopyram	C16 H14 Cl F3 N2 O	342.07468	9.283	8962	Reductive Defluorination, Reductive Defluorination, Reductive Defluorinati	-(F3) +(H3)
125	☐		fluopyram	C16 H14 Cl F3 N2 O	342.07468	9.166	13542	Reductive Defluorination, Reductive Defluorination, Reductive Defluorinati	-(F3) +(H3)
126	☐		fluopyram	C16 H11 F5 N2	326.08424	9.121	28300	Dehydration, Reductive Dechlorination, Reductive Defluorination	-(Cl F O)
127	☐		Pyraclostrobin	C19 H14 N2 O5	350.09027	9.580	214750	Dehydration, Oxidative Deamination to Ketone, Oxidative Dechlorination	-(H4 Cl N) +(O)
128	☐		fluopyram	C16 H11 Cl F5 N	347.05002	8.375	8738	Nitro Reduction, Oxidative Deamination to Ketone, Reductive Defluorinati	-(F N O)
129	☐		fluopyram	C16 H11 Cl F4 N2	342.05469	8.429	6026	Dehydration, Reductive Defluorination, Reductive Defluorination	-(F2 O)
130	☐		fluopyram	C16 H11 Cl F4 N2	342.05469	8.246	8571	Dehydration, Reductive Defluorination, Reductive Defluorination	-(F2 O)
131	☐		fluopyram	C16 H11 Cl F4 N2	342.05469	8.363	21142	Dehydration, Reductive Defluorination, Reductive Defluorination	-(F2 O)
132	☐		fluopyram	C16 H11 Cl F6 N2 O	396.04641	9.040	11724		
133	☐		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.608	22307	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
134	☐		fluopyram	C22 H24 F6 N2 O6	526.15386	10.057	12364	Reduction, Reductive Dechlorination, Glucoside Conjugation	-(Cl) +(C6 H13 O
135	☑		fluopyram	C21 H15 Cl F6 N4 O2	504.07877	10.296	62677	Dehydration, Desaturation, Glutamine Conjugation	+(C5 H4 N2 O)
136	☑		fluopyram	C16 H14 F6 N2 O4	412.08578	9.688	4390	Hydration, Oxidation, Oxidative Dechlorination	-(Cl) +(H3 O3)
137	☑		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.759	46356	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
138	☑	FLUOPYRAM-7-OH	fluopyram	C16 H11 Cl F6 N2 O2	412.04132	7.929	145211	Oxidation	+(O)
139	☑		fluopyram	C21 H15 Cl F6 N4 O2	504.07877	10.652	183068	Dehydration, Desaturation, Glutamine Conjugation	+(C5 H4 N2 O)
140	☑	FLUOPYRAM	fluopyram	C16 H11 Cl F6 N2 O	396.04641	8.546	2777390		

Show Related Tables



Predicted formula : C16 H11 Cl F6 N2 O2





	Check	Name	Parent Compound	Formula	Molecular Weight	RT [min]	Area (Max.)	Transformations	Composition Change
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121	☐		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.525	29817	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
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125	☐		fluopyram	C16 H14 Cl F3 N2 O	342.07468	9.166	13542	Reductive Defluorination, Reductive Defluorination, Reductive Defluorinati	-(F3) +(H3)
126	☐		fluopyram	C16 H11 F5 N2	326.08424	9.121	28300	Dehydration, Reductive Dechlorination, Reductive Defluorination	-(Cl F O)
127	☐		Pyraclostrobin	C19 H14 N2 O5	350.09027	9.580	214750	Dehydration, Oxidative Deamination to Ketone, Oxidative Dechlorination	-(H4 Cl N) +(O)
128	☐		fluopyram	C16 H11 Cl F5 N	347.05002	8.375	8738	Nitro Reduction, Oxidative Deamination to Ketone, Reductive Defluorinati	-(F N O)
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131	☐		fluopyram	C16 H11 Cl F4 N2	342.05469	8.363	21142	Dehydration, Reductive Defluorination, Reductive Defluorination	-(F2 O)
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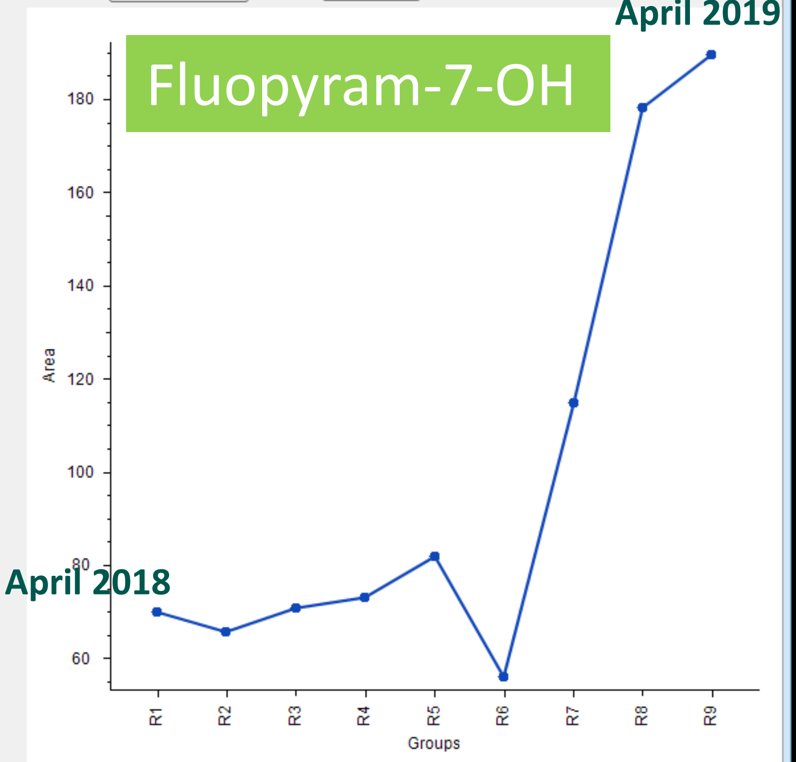
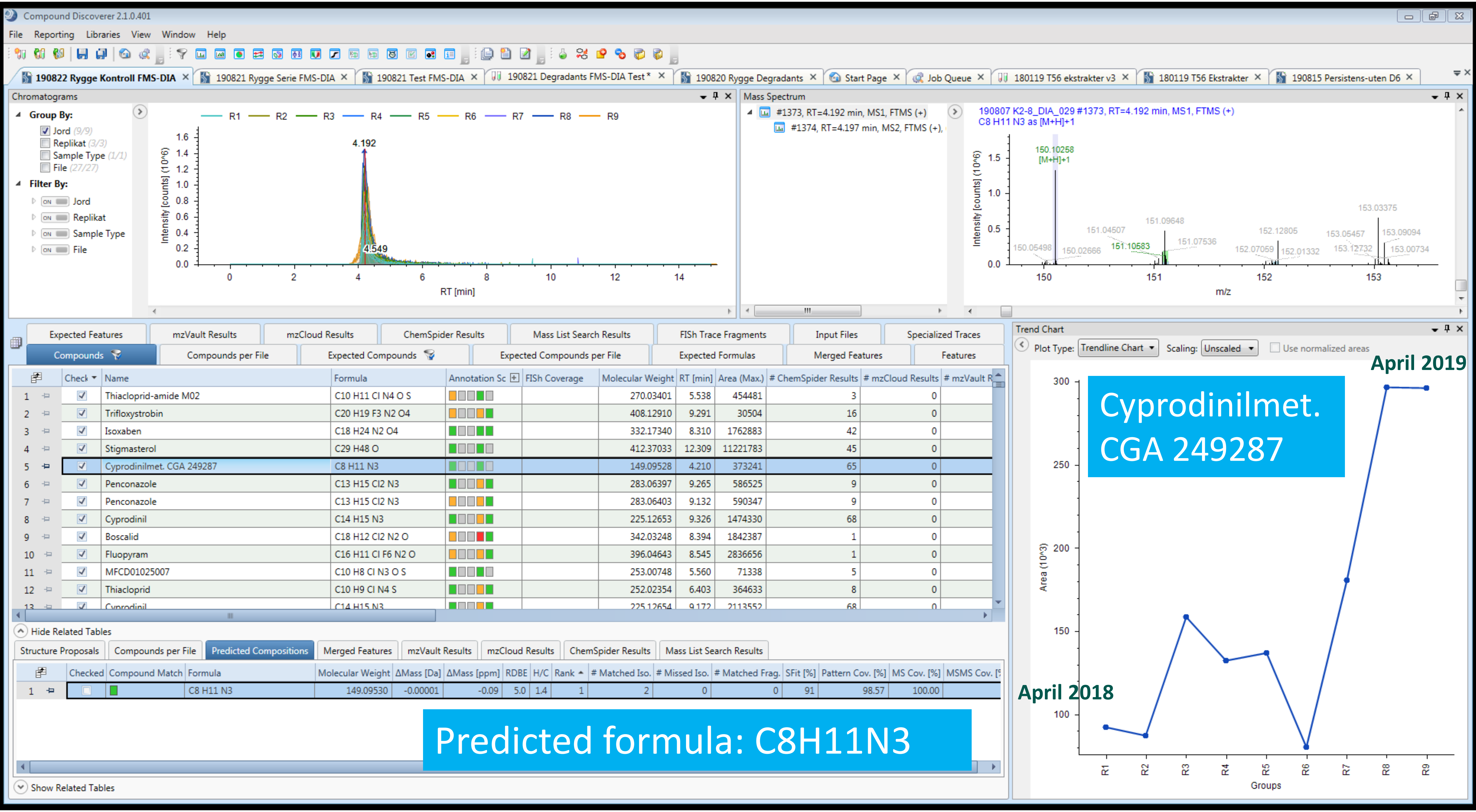
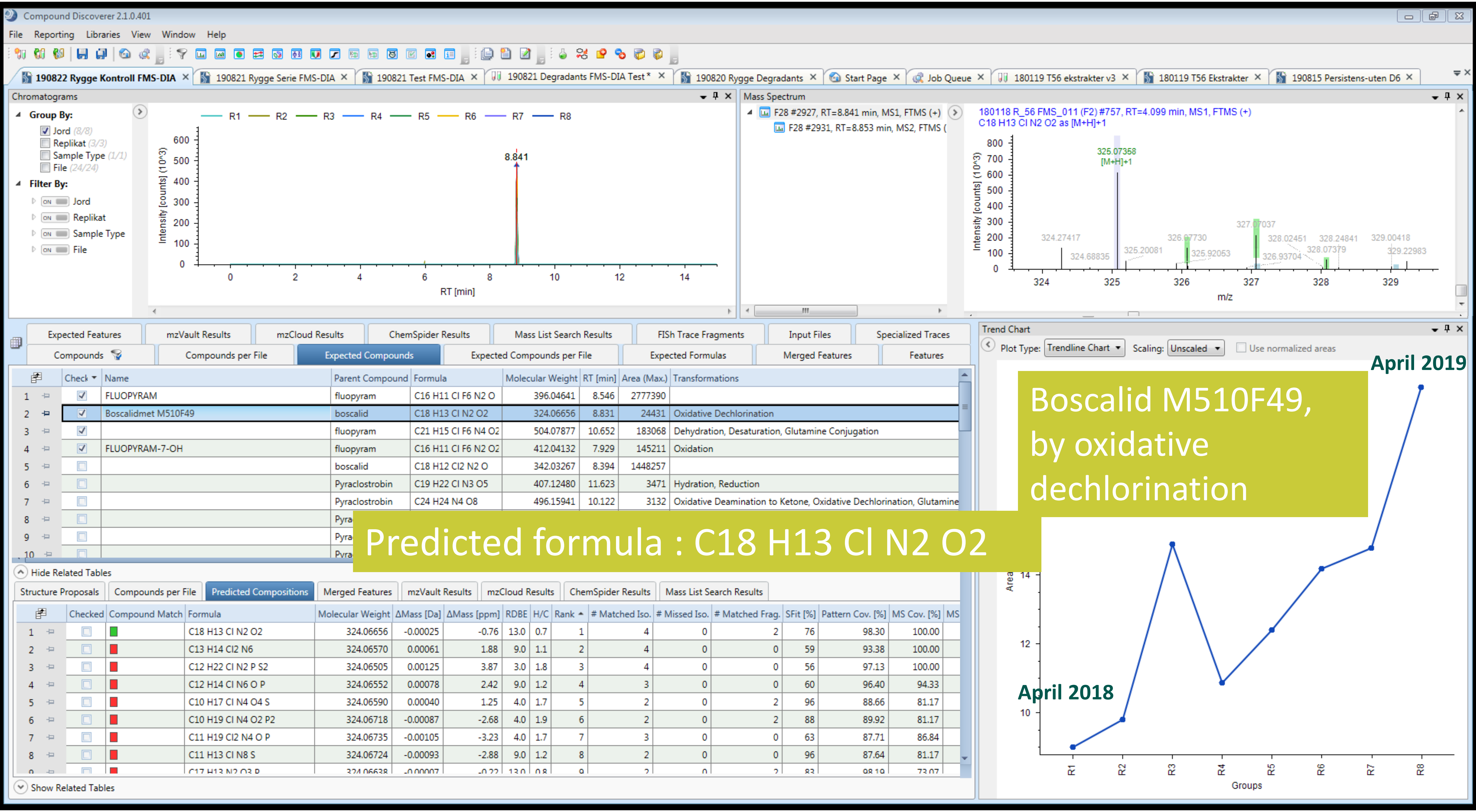
135	☑		fluopyram	C21 H15 Cl F6 N4 O2	504.07877	10.296	62677	Dehydration, Desaturation, Glutamine Conjugation	+(C5 H4 N2 O)
136	☑		fluopyram	C16 H14 F6 N2 O4	412.08578	9.688	4390	Hydration, Oxidation, Oxidative Dechlorination	-(Cl) +(H3 O3)
137	☑		fluopyram	C16 H14 Cl F5 N2 O4	428.05623	9.759	46356	Hydration, Oxidation, Oxidative Defluorination	-(F) +(H3 O3)
138	☑	FLUOPYRAM-7-OH	fluopyram	C16 H11 Cl F6 N2 O2	412.04132	7.929	145211	Oxidation	+(O)
139	☑		fluopyram	C21 H15 Cl F6 N4 O2	504.07877	10.652	183068	Dehydration, Desaturation, Glutamine Conjugation	+(C5 H4 N2 O)
140	☑	FLUOPYRAM	fluopyram	C16 H11 Cl F6 N2 O	396.04641	8.546	2777390		





Compound Discoverer 2.1.0.401
File Reporting Libraries View Window Help
190822 Rygge Kontroll FMS-DIA
190821 Rygge Serie FMS-DIA
190821 Test FMS-DIA
190821 Degradants FMS-DIA Test*
190820 Rygge Degradants
Start Page
Job Queue
180119 T56 ekstrakter v3
180119 T56 Ekstrakter
190815 Persistens-uten D6
Chromatograms
Group By:
Jord (9/9)
Replikat (3/3)
Sample Type (1/1)
File (27/27)
Filter By:
Jord
Replikat
Sample Type
File
R1 R2 R3 R4 R5 R6 R7 R8 R9
4.192
4.549
Intensity [counts] (10^6)
RT [min]
Mass Spectrum
#1373, RT=4.192 min, MS1, FTMS (+)
#1374, RT=4.197 min, MS2, FTMS (+),
190807 K2-8_DIA_029 #1373, RT=4.192 min, MS1, FTMS (+)
C8 H11 N3 as [M+H]+1
150.10258
[M+H]+1
m/z
Expected Features
mzVault Results
mzCloud Results
ChemSpider Results
Mass List Search Results
FISh Trace Fragments
Input Files
Specialized Traces
Compounds
Compounds per File
Expected Compounds
Expected Compounds per File
Expected Formulas
Merged Features
Features
Check | Name | Formula | Annotation Sc | FISh Coverage | Molecular Weight | RT [min] | Area (Max.) | # ChemSpider Results | # mzCloud Results | # mzVault R
1 | Thiacloprid-amide M02 | C10 H11 Cl N4 O S | 270.03401 | 5.538 | 454481 | 3 | 0
2 | Trifloxystrobin | C20 H19 F3 N2 O4 | 408.12910 | 9.291 | 30504 | 16 | 0
3 | Isoxaben | C18 H24 N2 O4 | 332.17340 | 8.310 | 1762883 | 42 | 0
4 | Stigmasterol | C29 H48 O | 412.37033 | 12.309 | 11221783 | 45 | 0
5 | Cyprodinilmet. CGA 249287 | C8 H11 N3 | 149.09528 | 4.210 | 373241 | 65 | 0
6 | Penconazole | C13 H15 Cl2 N3 | 283.06397 | 9.265 | 586525 | 9 | 0
7 | Penconazole | C13 H15 Cl2 N3 | 283.06403 | 9.132 | 590347 | 9 | 0
8 | Cyprodinil | C14 H15 N3 | 225.12653 | 9.326 | 1474330 | 68 | 0
9 | Boscalid | C18 H12 Cl2 N2 O | 342.03248 | 8.394 | 1842387 | 1 | 0
10 | Fluopyram | C16 H11 Cl F6 N2 O | 396.04643 | 8.545 | 2836656 | 1 | 0
11 | MFCD01025007 | C10 H8 Cl N3 O S | 253.00748 | 5.560 | 71338 | 5 | 0
12 | Thiacloprid | C10 H9 Cl N4 S | 252.02354 | 6.403 | 364633 | 8 | 0
Hide Related Tables
Structure Proposals
Compounds per File
Predicted Compositions
Merged Features
mzVault Results
mzCloud Results
ChemSpider Results
Mass List Search Results
Checked | Compound Match | Formula | Molecular Weight | ΔMass [Da] | ΔMass [ppm] | RDBE | H/C | Rank | # Matched Iso. | # Missed Iso. | # Matched Frag. | SFit [%] | Pattern Cov. [%] | MS Cov. [%] | MSMS Cov.
1 | C8 H11 N3 | 149.09530 | -0.00001 | -0.09 | 5.0 | 1.4 | 1 | 2 | 0 | 0 | 91 | 98.57 | 100.00
Predicted formula: C8H11N3
Show Related Tables
Trend Chart
Plot Type: Trendline Chart
Scaling: Unscaled
Use normalized areas
April 2019
Cyprodinilmet.
CGA 249287
April 2018
Area (10^3)
Groups
R1 R2 R3 R4 R5 R6 R7 R8 R9

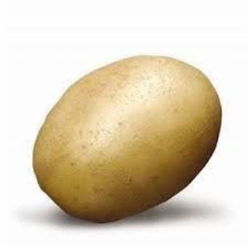


Compound Discoverer 2.1.0.401
Chromatograms
Mass Spectrum
Trend Chart
April 2019
Boscalid M510F49,
by oxidative
dechlorination
Predicted formula : C18 H13 Cl N2 O2
April 2018

Pesticides and metabolites studied in LowImpact so far

Carrot

- Boscalid and M510F49
- Pyraclostrobin and BF 500-6 & BF500-3
- Cyprodinil and CGA 249287
- Metribuzin and metribuzin-desamino
- Thiacloprid and thiacloprid-amide M02



Potato

- Mandipropamid
- Difenoconazole and CGA 205375
- Azoxystrobin
- Cyazofamid and CCIM
- Prosulfocarb
- Pencycuron
- Rimsulfuron and IN-70941

Reference standards of fluopyram-7-OH, M510F49, BF500-6, BF500-3 and CGA 249287 were kindly donated by Bayer and BASF

Target and Non-target screening methods of pesticide &metabolites in soil and produce

Fengshou Dong
Institute of Plant Protection
Chinese Academy of Agricultural Sciences
2021.05.26

Purpose and Significance

- **Challenges from monitoring parent compounds**

  Over 1000 pesticides Complexity of matrix Trace level

- **Solutions**

  Two Target screening methods with high throughput, accuracy and sensitivity

  GCxGC-TOF and APGC-Q-TOF

- **Challenges from monitoring metabolites**

  Structure identification of unknown metabolites

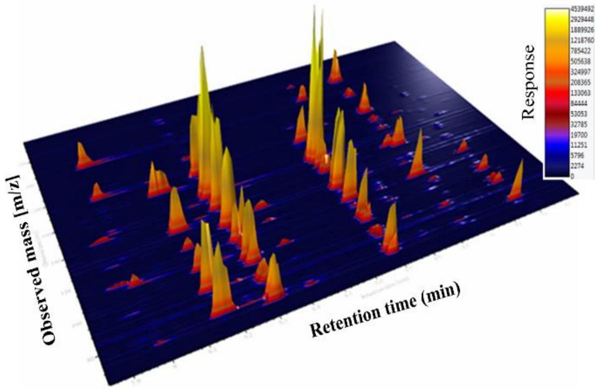
- **Solutions**

  One Non-Target screening method to identify known structures of metabolites

  UPLC-Q-TOF

Target Screening method 1 GCxGC-TOF

77 Organophosphorus and 23 organochlorine pesticides in food and soil
QuEChERS extraction method with PSA or PSA/C18 cleanup



➢ Advantages

GCxGC

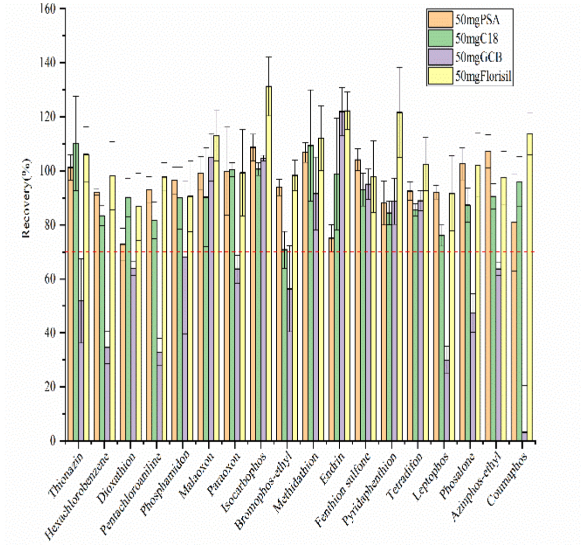
- High separation performance
- Co-eluents interference will be reduced

EI

- Can use comprehensive NIST databases

TOF

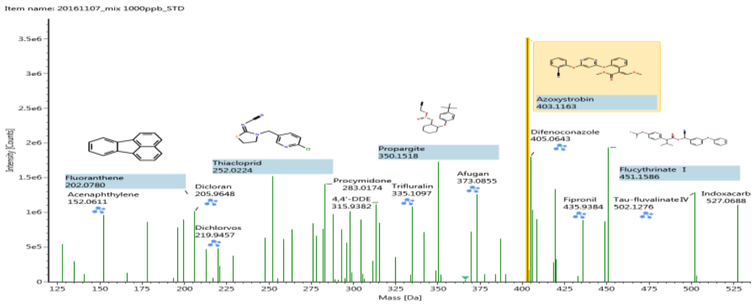
- Fast acquisition speed
- Not limited by number of pesticides

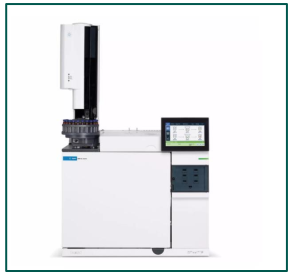
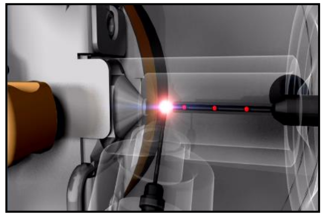
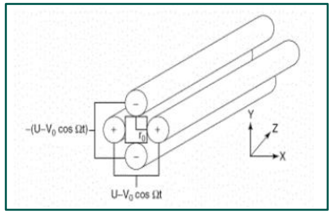
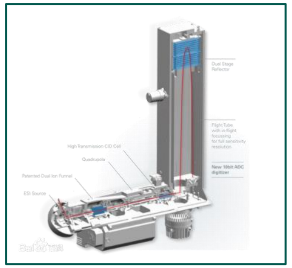


➢ **Target screening method of 100 pesticides in soil and produce, at LOQ 10-50 μg/kg**

Target Screening method 2 APGC-Q-TOF

- Screening method of 110 pesticides in fruits and vegetables
- QuEChERS extraction with acidic AcN, and PSA cleanup
- LOQ between 0.002-6 μg/kg

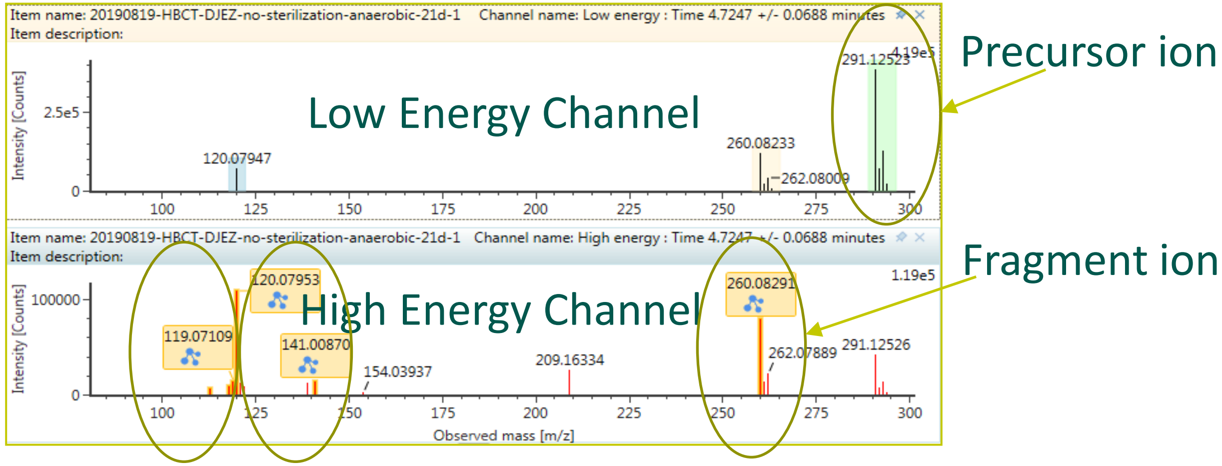


Gas Chromatography → **APGC ionization source** → single quadrupole → Time of flight mass

23 of 42 samples from 9 districts of China contained pesticides. **Difenoconazole, dimethomorph, plifenate were the most frequently detected pesticides.**

Acquisition mode is MS^E:
It can acquire precursor ion and fragment ion at the same time through low energy channel and high energy channel.



Non-Target Screening method 3 UPLC-Q-TOF

➢ Pesticide metabolites identification in soil

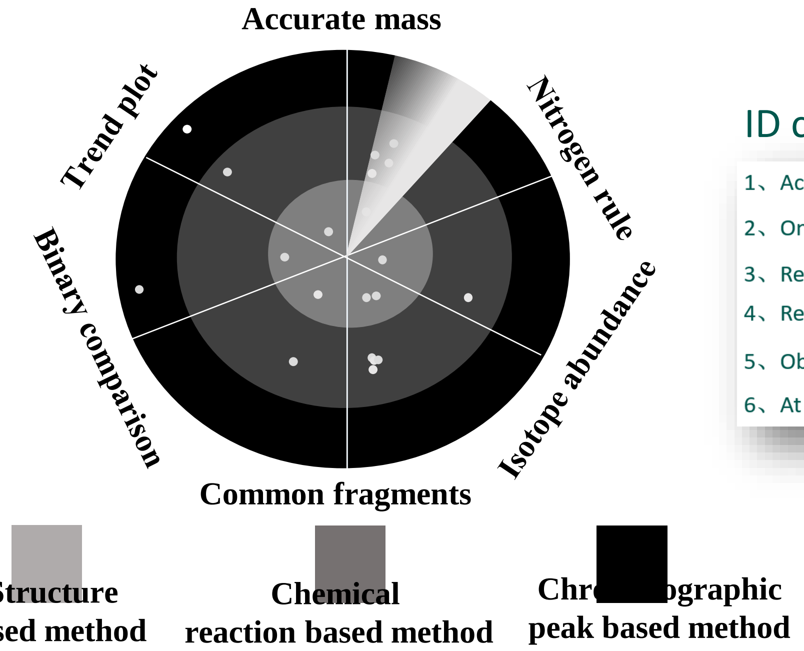
Typical soil samples spiked with pesticides were cultivated under aerobic and anaerobic conditions

Analyzed by
Waters UPLC-Q-TOF
at MS^E acquisition mode.

Metabolites were identified by the UNIFI platform

We use EnviPath database to predict the pesticide metabolite structures

EnviPath is a database and prediction system for the microbial biotransformation of organic environmental contaminants.



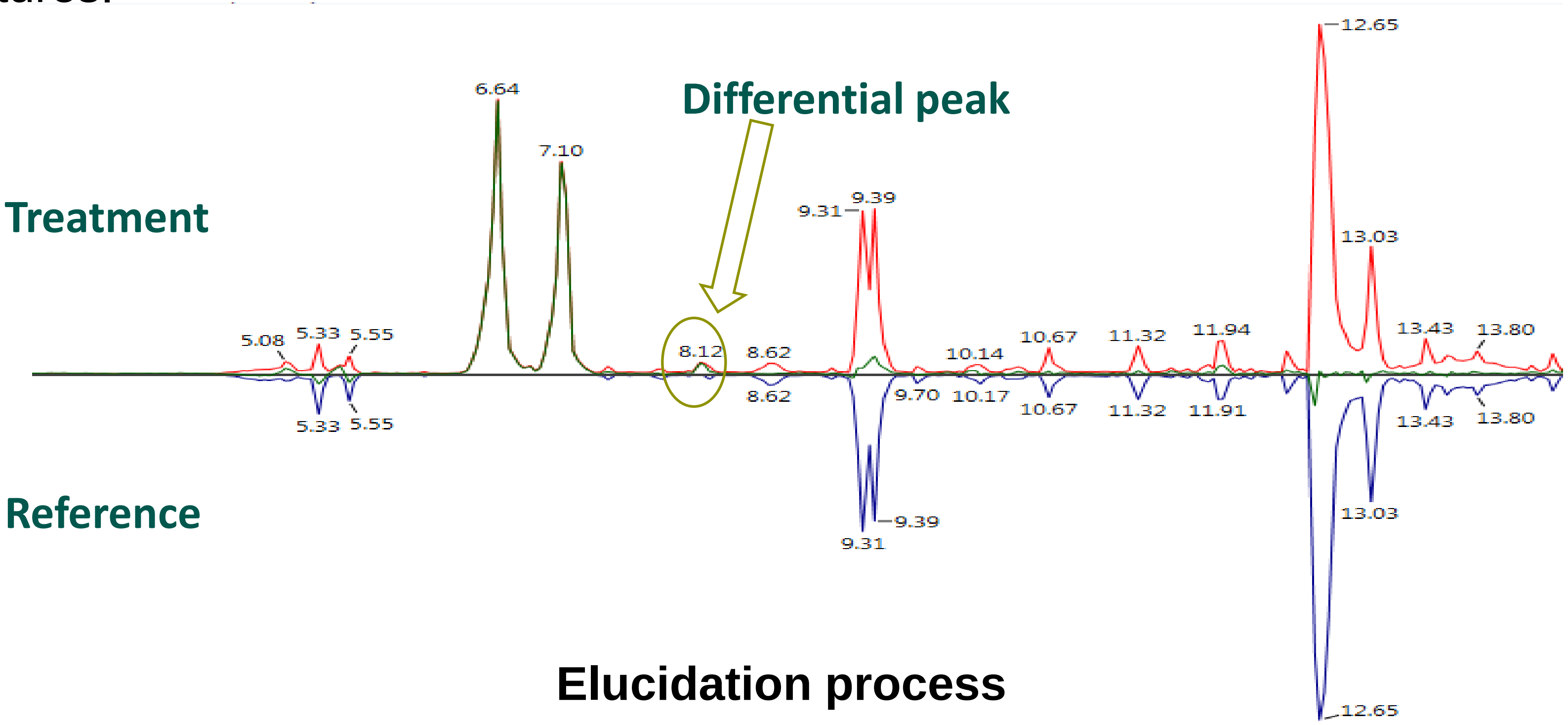
ID criteria:

1、Accurate mass error ≤ 5 mDa
2、Only appeared in treatment
3、Reasonable Time trend ↗ or ↗↘
4、Reasonable isotopic ratio (one Cl atom= 3:1)
5、Obeying nitrogen rule
6、At least two fragments were found

Non-Target Screening method 3 UPLC-Q-TOF

Chromatographic peak based identification:

By comparing the chromatographic peak of Treatment and Reference, differential peak that only appeared in the treatment were found out and elucidated into possible structures.



Elucidation process

Non-Target Screening method 3 UPLC-Q-TOF

The non-target screening method performed efficiently in identifying metabolites of the fungicide pyrisoxazole in soil

Soil: Red, Black, Paddy, Fluvo-aquic, Cinnamon

NO.	Metabolites	Accurate mass	M+H	Retention time	Mass Error (mDa)	Fragments	Trend
1	M-304-A	304.10	305.10	4.80/5.01	-1.0/-1.3	2	↗↘
2	M-304-C	304.10	305.10	7.61/8.15	-1.3/-1.9	3	↗↘
3	M-302-A	302.09	303.09	5.32	-1.2	5	↗↘
4	M-302-B	302.12	303.12	6.31/7.46	-0.8	6	↗
5	M-290	290.12	291.12	4.71	-0.6	6	↗↘
6	M-277	277.09	278.09	5.05/5.12	0	1	↗↘
7	M-275-A	275.08	276.08	5.45	-0.7	2	↗↘
8	M-275-B	275.08	276.08	7.89	-1.1	4	↗↘
9	M-274-B	274.09	275.09	5.66/6.00	-1.3	2	↗↘
10	M-273	273.06	274.06	8.35	-1.1	2	↗↘
11	M-259	259.08	260.08	6.42	-1.1	2	↗↘
12	M-257	257.07	258.07	6.86/8.13	-0.8/-1.0	4	↗↘

WP2.3 Modelling tool

- PERSAM modelling to *predict* pesticide concentrations (PEC) in soil
- A new version of the PERSAM model was launched in May 2021.
- We have tested the model briefly on data from the field trial.
- Most of the modelling work with PERSAM postponed a year.
- Main working period will be in 2021 and the first quarter of 2022.

Some **input** values for modelling:

Crop, field	Plant Protection Product (PPP)	Active substance (a.s.)	Amount a.s. in PPP, g/kg or g/L	Fraction a.s. in PPP	Sowing date	Application dates	Fraction of appl. rate to soil	Appl. rate, kg a.s./ha	DissDT50f, days, EU (PPDB)	DissDT50f, days, NO	Kfoc (PPDB)	Mol. Mass
Carrots, HV	Sencor WG 70	Metribuzin	705	0.7	29 May	3.june	0.7	0.021	19	19.6	48	214.29
						18.june	0.2	0.014				
						29.june	0.2	0.028				

Modelling – example results – metribuzin EU North

- **Output:** Concentrations in total soil are estimated at different depths and at different time points post application
- A plateau concentration is calculated to assess the potential for accumulation.

concentration in total soil C_T (mg/kg)

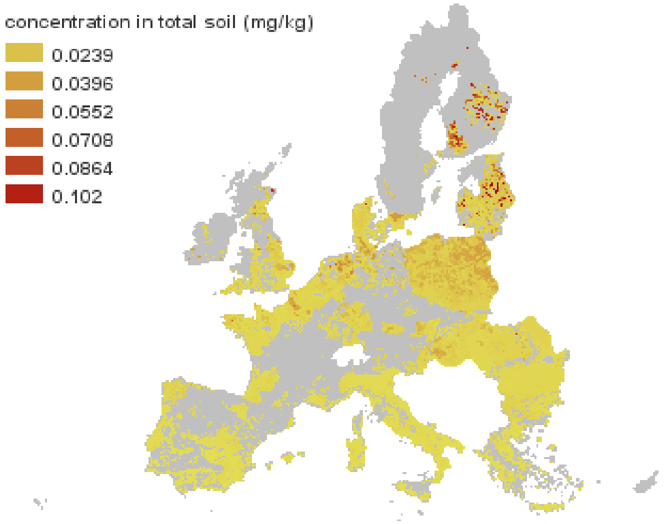
t_{avg} (d)	z_{eco} (cm)			
	1	2.5	5	20
0	0.4391	0.1762	0.0886	0.0228
7	0.4261	0.171	0.0859	0.022
14	0.4131	0.1657	0.0832	0.0213
21	0.4003	0.1605	0.0806	0.0207
28	0.3878	0.1556	0.0781	0.0201
56	0.3439	0.1379	0.0693	0.0178

Tier-2 results

Plateau and peak concentrations

z_{eco}

	default (5.0 cm)	user (20.0 cm)
$C_{T,plateau}$	1.931E-4	0.001010
C_{peak}	0.4523	0.1140



Thank you!

Photo credits:
Erling Fløistad (NIBIO)
Marit Almvik (NIBIO)
Fengshou Dong (IPP-CAAS)
Fredrik Bøe (NIBIO)

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WP5

Communication, Dissemination and **Recommendations**

Jihong Liu Clarke and Siri Elise Dybdal (NIBIO)
Yongquan Zheng and Xinglu Pan (IPP CAAS)

https://www.nibio.no/en/projects/lowimpact-chinor-solutions-for-low-impact-climate-smart-vegetable-production-with-reduced-pesticide-residues-in-food-soil-and-water-resources

LowImpact seminar May 27, 2021

WP5: Recommendations, Communication and dissemination (Lead: J.L. Clarke NIBIO, Yongquan Zheng, IPPCAAS)

This WP aims to make and communicate recommendations based on an evaluation of the results from WPs 2-4. This will be achieved by topical workshops with key stakeholders and by establishing dissemination and communication channels to reach and interact with major stakeholders and policy makers in China and Norway, the scientific community and the general public.

Task 5.1 Evaluation and recommendations

Results from WPs 2-4 will be evaluated and discussed with stakeholders to formulate recommendations climate smart and environmentally friendly production of safe food and feed by sustainable exploitation of soil and water resources. This work will be combined with the annual meetings to be organized in Task 5.3.

Task 5.2 dissemination of project results through web site, social media channels e.g. Wechat and publications

a) Create an interactive website (English/Chinese), establish social media channels and link the project to e.g research gate to reach stakeholders, the public and the research community. **b)** Publish results in peer-reviewed journals throughout the project period. **c)** Media release and popular science publications. **d)** Annual project newsletter sent to key stakeholders and published through partners' websites and communication channels

Task 5.3 Workshops and meetings

Organize annual meetings/workshops and a final meeting with key stakeholders to discuss research results with scientific community, health authority, food safety authority, governmental organizations incl. RCN, NSFC and the Ministry of Agriculture and Food in Norway and China, NGOs and the public.

LowImpact: WP5 Workplan 2021 and progress to date

Task 5.1

A meeting before or after the LowImpact annual meeting to discuss Task 5.1 Evaluation and recommendations outline. *Completed*
Key focus for “Recommendations ” is ready for discussion

Task 5.2

Wechat communication tool has been very useful for effective project discussion and timely update of project progress from both sides. In particular during the pandemic. *Completed and ongoing*

WeChat

A podcast or short video film about food safety and the importance to human health, the powerful methods to detect harmful compounds in food (including water). *Have to be postponed due to the covid-19 pandemic*

Task 5.3

- A news about the workshop and China-Norway collaboration on food safety
  After this seminar

Suggestions for T5.1

Task 5.1 Evaluation and recommendations
Results from WPs 2-4 will be evaluated and discussed with stakeholders to formulate recommendations climate smart and environmentally friendly production of safe food and feed by sustainable exploitation of soil and water resources.

- Capacity building on safe use and management of pesticides in vegetable production in selected provinces in China (e.g. 5-10 provinces)

1) Short training course (3 days) including: lectures (Day 1), attendees' discussion and Q&A (Day 2), Laboratory visit/demonstration (Day 3)
2) Follow up after the training course (Implementation of the analytical methodologies). Feedbacks (using questionaire)
3) Impact measurement (scale 1-10)

- Managing soil and water to secure food safety (using biochar)
    1) Training course
    2) Follow up the implementation
    3) Impact and sustainability

- Application of sequencing tools and analytic methodologies to tackle the heavy metal and AMR in soil and water
    1) Short training course
    2) Apply «One Health» strategy
    3) Follow up the implementation
    4) Impact and feasibility

Thank you

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