Dariusz Kruszka, PhD.

curriculum vitae

Personal information

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Education

2010/2011 Biotechnology, Poznań University of Life Science

2011/2017 Pharmacy, Poznań University of Medical Science:

- Master thesis title.: *"Assessment of the ability of Lychnis flos-cuculi cell cultures to secondary metabolites biosynthesis"*
- Supervisor: prof. dr hab. Barbara Thiem

2017/2018 Environmental Doctoral Studies at IBCH PAS

2018/2022 International Doctoral Studies of the Institute of Plant Genetics, Polish Academy of Science - PhD in Agriculture.

- Doctoral thesis title.: *"Changes in the Arabidopsis thaliana and Hypericum perforatum metabolome in response to treatment with the metal nanoparticles"*
- Supervisor: prof. dr hab. Piotr Kachlicki
- Defense of the doctoral thesis - 30.11.2022

Work experience

01-31.08.2015 Biofarm, Quality Control Laboratory – apprenticeship:

- laboratory work in accordance with GMP and GLP requirements,
- sample preparation, UV-VIS, FTIR analyses, dissolution tests, stability tests.

2016/2017 Galenica, Pharmacy – obligatory internship

1.11.2020 - 30.04.2021 *Network Analysis and Modelling Team*, Leibniz Institute of Plant Genetics and Crop Plant Research – internship (supervisor: dr J. Szymański):

- R – programming, XCMS, data analysis, statistics, modelling,
- plant lipidomics and transcriptomics integration.

1.10.2022-1.01.2024 *Biometry and Bioinformatics Team*, Institute of Plant Genetics, Polish Academy of Science – research assistant and secretary of the scientific council:

- sample preparation for untargeted and targeted analysis,
- untargeted and targeted metabolomics and lipidomics based UPLC-orbitrapMS platform,
- analysis of secondary and primary metabolites of plants and fungi,
- preparation of reports and manuscripts.

1.01.2024 – now *Biometry and Bioinformatics Team,* Institute of Plant Genetics, Polish Academy of Science – adjunct:

- development of metabolomics platform in Multiomics Laboratory (research supervisor),
- sample preparation for untargeted and targeted analysis,
- untargeted and targeted metabolomics and lipidomics – UPLC-orbitrapMS platform,
- analysis of secondary and primary metabolites of plants and fungi,
- preparation of reports and manuscripts,
- preparation of grant proposals.

Skills & techniques

- High (Orbitrap and QTof) and low resolution mass spectrometry (Ion traps);
- Ultraperformance liquid chromatography with UV-Vis and fluorescence;
- Untargeted and targeted metabolomics and lipidomics analysis;
- Sample preparation techniques (extraction, purification and separation methods);
- MS data processing for metabolomics/lipidomics (MS-DIAL, mzMine);
- Chemometrics and statistical analysis R scripts.

Training & workshops

18.-21.12.2017 *QExactive mass spectrometry service and maintenance training* (ANCHEM):
- service and maintenance of high resolution mass spectrometer,
- calibration of mass spectrometer,
- LC-MS, nanoLC-MS and direct infusion analysis.

22.-23.04.2018 *Mass spectrometry training* in 6th Mass Spectrometry Conference, Warsaw:
- mass spectrometry analyzers and ionization techniques,
- combining techniques in the targeted and untargeted analysis,
- mass spectrometry in metabolomics and proteomics.

6.-8.03.2019 *Workshop on the practical use of chemometric methods (basic course)*, 7th Conference "Chemometrics and Metrology in Analytics", Poznań:
- data preprocessing,
- univariate and multivariate analysis,
- supervised and unsupervised method of data analysis.

26.-28.07.2019 *Gas chromatography and mass spectrometry* Ekotechlab, Gdańsk:
- sample preparation for GC-MS: head space, solid phase microextraction (SPME),
- creation and validation of new analytical methods,
- identification of compounds using NIST data base.

09.2019 Institute of Plant Physiology Polish Academy of Science:
- phytohormone extraction using solid phase extraction,
- HPLC-ESI-MS/MS – MRM methods for plant hormone analysis.

03.2020 *RNA-seq data analysis*, Xenstats, Poznań:
- RNA-seq data analysis using R,
- statistics and visualization for transcriptomic data.

22.-24.03.2021 2nd de.NBI/ELIXIR-DE metaRbolomics hackathon (online).

20-22.04.2021 Tools for Systems biology modelling and data exchange 2021 (online):
- CellNetAnalyzer (CNApy) – stoichiometric metabolic networks and constraint-based models,
- COPASI – kinetic modelling and simulations,
- FAIR principles in network modelling.

05-09.07.2021 13 Poznań Summer School of Bioinformatics (online):
- bioinformatics tools for genomics, transcriptomics and metabolomics.

1-28.02.2023 Institute of Bioorganic Chemistry, Laboratory of Mass Spectrometry:
- preparation of samples for proteomics analysis,
- ion mobility mass spectrometry in metabolomics using TIMS-Tof system.

18-22.08.2025 4th International summer school on non-target metabolomics for exposomics and natural products research:
- analytical hardware and acquisition strategies,
- data (pre)processing for non-targeted mass spectrometry-based metabolomics (mzMine),
- metabolite annotation (using SIRIUS, GNPS2 and FERMO).

Projects

NAWA Iwanowska fellowship program (2020/2021): *Closing the gap between predicted and observed complexity of rapeseed lipidome - integration of metabolic modelling into mass-spectrometry data analysis* – internship in *Network Analysis and Modelling Team*, Leibniz Institute of Plant Genetics and Crop Plant Research

FENG Project (2025/2026): *Integrative multi-omics platform based on high-resolution mass spectrometry for metabolome and microbiome research with machine learning*

Participation in selected projects (contractor)

- *HyperNano - Investigation of changes in secondary metabolism in Hypericum perforatum under the influence of nanoparticles through the use of an integrated 'omics' approach and technology.* OPUS 11– PhD student:
  - metabolites extraction
  - UPLC-HRMS and HPLC-IT-MS analysis
- *Origins and spread of the capacity towards synthesis of bioactive macrolactones in higher fungi.* OPUS 11
  - Analysis of macrolactones and mycotoxins using UPLC-HRMS/MS

- *The common wheat (Triticum aestivum L.) endosphere mycobiome dynamics and its impact on the growth and fitness of plant.* OPUS 14
    - Untargeted analysis of wheat extracts and data analysis
- *The effect of changes in the expression profile of gene coding CesA, PAL and WAK proteins during cold stress on the composition and structure of Miscanthus sinensis cell wall.* PRELUDIUM 15
    - Analysis of cell wall carbohydrates
    - Untargeted metabolomics
- *Molecular and physiological mechanisms of seasonal transport and phytoextraction of different forms of arsenic in perennial grasses in the example of giant miscanthus (Miscanthus x giganteus).* OPUS 21
    - Lipidomics analysis
    - Extraction and quantification of phytochelatins
    - Detaction of As-carbohydrates
- *Dynamic phenological changes in epidermal structures of spring barley (Hordeum vulgare L.) in response to combination of biotic and abiotic stresses.* OPUS 21 – Analysis of wax esters.
- *MicroRNA – important coordinators of barley leaf response to drought via modulation of phytohormones crosstalk.* OPUS 21 – Quantification of phytohormones (brassinosteroids and strigolactones).

Selected publications

Total number of articles – 27 PROFILE

- O. Zakerska-Banaszak, K. Lodziak, **D. Kruszka** et al., *New potential biomarkers of ulcerative colitis and disease course — integrated metagenomic and metabolomic analysis among Polish patients*. J Gastroenterol 2025, Jul 4; doi: 10.1007/s00535-025-02280-6
- **D. Kruszka**, K. Selvakesavan, P. Kachlicki, F. Gregory, *Untargeted metabolomics analysis reveals the elicitation of important secondary metabolites upon treatment with various metal and metal oxide nanoparticles in Hypericum perforatum L. cell suspension cultures*, Industrial Crops and Products 2022, 178, 114561
- R.D. Hall, J.C. D'Auria, A.C. Ferreira, Y. Gibon, **D. Kruszka**, P. Mishra, R. van de Zeede, *High-throughput plant phenotyping: a role for metabolomics?*, Trends in Plant Science 2022, 27 (6), pp. 549-563
- M. Pradeep, **D. Kruszka**, P. Kachlicki, D. Mondal, F. Gregory, *Uncovering the Phytochemical Basis and the Mechanism of Plant Extract-Mediated Eco-Friendly Synthesis of Silver Nanoparticles Using Ultra-Performance Liquid Chromatography Coupled with a Photodiode Array and High-Resolution Mass Spectrometry*, ACS Sustainable Chemistry & Engineering 2021, 10(1), pp. 562-571
- **D. Kruszka**, A. Sawikowska, R. K. Selvakesavan, P. Krajewski, P. Kachlicki, F. Gregory, *Silver nanoparticles affect phenolic and phytoalexin composition of Arabidopsis thaliana,* Science of the Total Environment 2020, 716, 135361

Selected conferences

- *Arabidopsis thaliana plant secondary metabolism in response to silver nanoparticles,* 3rd ISN2A 2018 - Caparica – Portugal 22-25.01.2018
- *Integration of lipidome and transcriptome response to abiotic stress conditions at Arabidopsis thaliana,* EMBL Symposium: Multiomnics to Mechanisms: Challenges in Data Integration, Heidelberg 15-17.08.2021
- *Engineered nanoparticles interferes with primary metabolism of Hypericum perforatum L. cell cultures,* NanoTech Poland 2023, Poznań 14-16.06.2023

Membership

- Polish Society of Metabolomics
- Polish Society of Mass Spectrometry

I consent to the processing of my personal data for the purposes necessary to carry out the recruitment process (in accordance with the Act of 10 May 2018 on the Protection of Personal Data (Journal of Laws of 2018, item 1000) and in accordance with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (GDPR).