

COMMENTARY TO HABILITATION THESIS

Combination of fast, careful and efficient preconcentration of biologically significant substances with highly precise and sensitive quantitation methods is of high importance in the field of plant sciences as well as plant-based food control. Ultra-high performance liquid chromatography coupled to tandem mass spectrometry (UHPLC-MS/MS) is a powerful tool offering a high separation efficiency and highly sensitive detection for naturally occurring compounds formed *de novo* in trace and ultra-trace amounts in tissues. This habilitation thesis presents a commented summary of 16 peer-reviewed papers on the biosynthesis, occurrence and trace analysis of natural substances of terpenoid character, to which the author of this thesis contributed as first author, corresponding author or co-author. The author's contribution to these articles is summarised in the following tables, divided into experimental work, supervision of students, manuscript preparation and research direction. The publications listed below are not ordered by publication date but according to topic and the order in which they are mentioned within the following text. An asterisk denotes that the author of this thesis was corresponding author.

The first part of the thesis is devoted to analysis of diterpenoid and triterpenoid plant hormones. The second part focuses on related natural terpenoid substances that do not belong to the group of plant hormones but play an important role in plant defence and also have significant pharmacological effects on humans. The final part of the work discusses the importance of studying the influence of biological matrices on the success and accuracy of trace substance MS detection.

Article 1 **Tarkowská D.*** *Plants are capable of synthesising animal steroid hormones.* MOLECULES 24(14): 2585 (2019). DOI [10.3390/molecules24142585](https://doi.org/10.3390/molecules24142585). IF²⁰¹⁹ = 3.267; AIS²⁰¹⁹ = 0.599

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	-	100	50

Article 2 **Tarkowská D.***, Strnad M. *Isoprenoid-derived plant signaling molecules: biosynthesis and biological importance.* PLANTA 247: 1051–1066 (2018). DOI [10.1007/s00425-018-2878-x](https://doi.org/10.1007/s00425-018-2878-x). IF²⁰¹⁸ = 3.060; AIS²⁰¹⁸ = 0.879

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	-	50	100

Article 3 **Tarkowská D.***, Novák O., Floková K., Tarkowski P., Turečková V., Grúz J., Rolčík J., Strnad M. *Quo vadis plant hormone analysis?* PLANTA 240(1): 55–76 (2014). DOI [10.1007/s00425-014-2063-9](https://doi.org/10.1007/s00425-014-2063-9). IF²⁰¹⁴ = 3.263; AIS²⁰¹⁴ = 0.955

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	20	75	100

Article 4 Urbanová T. ‡, **Tarkowská D. ‡***, Novák O., Hedden P., Strnad M. *Analysis of gibberellins as free acids by ultra-performance liquid chromatography–tandem mass spectrometry*. TALANTA 112: 85–94 (2013). DOI [10.1016/j.talanta.2013.03.068](https://doi.org/10.1016/j.talanta.2013.03.068). IF²⁰¹³ = 3.511; AIS²⁰¹³ = 0.776

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	100	75	100

‡ First joint authors

Article 5 Shahnejat-Bushehri S., **Tarkowská D.**, Sakuraba Y., Balazadeh S. *Arabidopsis NAC transcription factor JUB1 regulates GA/BR metabolism and signaling*. NATURE PLANTS: article number 16013 (2016). DOI [10.1038/NPLANTS.2016.13](https://doi.org/10.1038/NPLANTS.2016.13). IF²⁰¹⁶ = 10.300; AIS²⁰¹⁶ = 4.382

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	-	25	50

Article 6 Vlčko T., **Tarkowská D.**, Šíroká J., Pěňčík A., Simerský R., Chamrád I., Lenobel R., Novák O., Ohnoutková L. *Hormone profiling and the root proteome analysis of itpk1 mutant seedlings of barley (Hordeum vulgare) during the red-light induced photomorphogenesis*. ENVIRONMENTAL AND EXPERIMENTAL BOTANY 213: 105428 (2023). DOI [10.1016/j.envexpbot.2023.105428](https://doi.org/10.1016/j.envexpbot.2023.105428). IF²⁰²² = 5.700; AIS²⁰²² = 0.891

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	10	25	20

Article 7 Balarynová J., Klčová B., **Tarkowská D.**, Turečková V., Trněný O., Špundová M., Ochatt S., Smýkal P. *Domestication has altered the ABA and gibberellin profiles in developing pea seeds*. PLANTA 258: 25 (2023). DOI [10.1007/s00425-023-04184-2](https://doi.org/10.1007/s00425-023-04184-2). IF²⁰²² = 4.300; AIS²⁰²² = 0.773

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	25	45	50

Article 8 Ptošková K., Szecówka M., Jaworek P., **Tarkowská D.**, Petřík I., Pavlović I., Novák O., Thomas S.G., Phillis A.L., Hedden P. *Changes in the concentrations and transcripts for gibberellins and other hormones in a growing leaf and roots of wheat seedlings in response to water restriction*. BMC PLANT BIOLOGY 22: 284 (2022). DOI [10.1186/s12870-022-03667-w](https://doi.org/10.1186/s12870-022-03667-w). IF²⁰²² = 5.300; AIS²⁰²² = 0.877

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
40	40	20	50

Article 9 **Tarkowská D.***, Novák O., Oklešťková J., Strnad M. *The determination of 22 natural brassinosteroids in a minute sample of plant tissue by UHPLC–ESI–MS/MS*. ANALYTICAL AND BIOANALYTICAL CHEMISTRY 408: 6799–6812 (2016). DOI [10.1007/s00216-016-9807-2](https://doi.org/10.1007/s00216-016-9807-2). IF²⁰¹⁶ = 3.431; AIS²⁰¹⁶ = 0.797

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
100	-	100	100

Article 10 Okleštkova J., **Tarkowská D.**, Eyer L., Elbert T., Marek A., Smržová Z., Novák O., Fránek M., Zhabinski V.N., Strnad M. *Immunoaffinity chromatography combined with tandem mass spectrometry: a new tool for the selective capture and analysis of brassinosteroid plant hormones*. TALANTA 170: 432–440 (2017). DOI [10.1016/j.talanta.2017.04.044](https://doi.org/10.1016/j.talanta.2017.04.044). IF²⁰¹⁷ = 4.244; AIS²⁰¹⁷ = 0.738

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
70	-	65	100

Article 11 Wei Y., Zuan T., **Tarkowská D.**, Kim J., Nam H.G., Novák O., He K., Gou X., Li J. *Brassinosteroid biosynthesis is modulated via a transcription factor cascade of COG1, PIF4, and PIF5*. PLANT PHYSIOLOGY 174: 1260-1273 (2017). DOI [10.1104/pp.1601.778](https://doi.org/10.1104/pp.1601.778). IF²⁰¹⁷ = 5.949; AIS²⁰¹⁷ = 2.137

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	-	25	10

Article 12 Tůmová L., **Tarkowská D.**, Řehořová K., Marková H., Kočová M., Rothová O., Čečetka P., Holá D. *Drought-tolerant and drought-sensitive genotypes of maize (Zea mays L.) differ in contents of endogenous brassinosteroids and their drought-induced changes*. PLOS ONE 13(5): e0197870 (2018). DOI [10.1371/journal.pone.0197870](https://doi.org/10.1371/journal.pone.0197870). IF²⁰¹⁸ = 2.776; AIS²⁰¹⁸ = 0.978

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	10	25	10

Article 13 Marková H., **Tarkowská D.**, Čečetka P., Kočová M., Rothová O., Holá D. *Contents of endogenous brassinosteroids and the response to drought and/or exogenously applied 24-epibrassinolide in two different maize leaves*. FRONTIERS IN PLANT SCIENCES 14:1139162 (2023). DOI [10.3389/fpls.2023.1139162](https://doi.org/10.3389/fpls.2023.1139162). IF²⁰²² = 5.600; AIS²⁰²² = 1.073

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
50	10	25	10

Article 14 **Tarkowská D.***, Strnad M. *Plant ecdysteroids: plant sterols with intriguing distributions, biological effects and relations to plant hormones*. PLANTA 244: 245–555 (2016). DOI [10.1007/s00425-016-2561-z](https://doi.org/10.1007/s00425-016-2561-z). IF²⁰¹⁶ = 3.361; AIS²⁰¹⁶ = 0.974

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
-	100	95	100

Article 15 **Tarkowská D.***, Krampolová E., Strnad M. *Plant triterpenoid crosstalk: the interaction of brassinosteroids and phytoecdysteroids in Lepidium sativum*. PLANTS 9(10): 1325 (2020). DOI [10.3390/plants9101325](https://doi.org/10.3390/plants9101325). IF²⁰²⁰ = 3.935; AIS²⁰²⁰ = 0.759

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
20	100	95	100

Article 16 **Tarkowská D.*** *A fast and reliable UHPLC-MS/MS-based method for screening selected pharmacologically significant natural plant indole alkaloids.* MOLECULES 25(14): 3274 (2020). DOI [10.3390/molecules25143274](https://doi.org/10.3390/molecules25143274). IF²⁰²⁰ = 4.412; AIS²⁰²⁰ = 0.694

Experimental work (%)	Supervision (%)	Manuscript (%)	Research direction (%)
75	100	100	10