

Dr. Islam El-Awaad

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WORK EXPERIENCE

Group leader 03/2022 – to date

Institute of Pharmaceutical Biology, TU Braunschweig, Germany

- Scientific activity in research and teaching with the goal of habilitation.
- Current research projects:
 1. Identification and functional characterization of xanthone-specific prenyltransferases.
 2. Elucidation of the biosynthetic pathway of polyprenylated acylphloroglucinols (PAPPs) in *Hypericum* species.
 3. Optimized biotechnological production of benzyl glucosinolate in plant cell cultures (with Prof. Dr. Ute Wittstock).
 4. Directed evolution of bacterial sulfotransferases for the biotechnological production of glucosinolates.
- Teaching activity in the field of pharmaceutical biology and pharmaceutical engineering (pharmaceutical process engineering).
- Preparation of grant applications. A research proposal entitled 'Parallel evolution of meroterpenoids biosynthesis' is in preparation.

Wissenschaftlicher Mitarbeiter (Postdoc) 01/2020 – 02/2022

Institute of Pharmaceutical Biology, TU Braunschweig, Germany

- Research to discover new plant aromatic prenyltransferases.
- Teaching activity in the field of pharmaceutical biology.
- Participation in the preparation of grant applications.

Wissenschaftlicher Mitarbeiter (Postdoc) 02/2017 – 12/2019

Institute of Biotechnology, RWTH Aachen University, Germany

- Developing high-throughput screenings assays and performing directed evolution campaigns on bacterial cyclases, and fungal unspecific peroxxygenases.
- Enzyme immobilization in microgels.
- Supervising PhD students and technical assistants.
- Assisting proposal writing for grant applications.

Lecturer 07/2016 – 01.2017

Department of Pharmacognosy, Faculty of Pharmacy Assiut University, Egypt

- Teaching medicinal plants and natural products chemistry courses to undergraduate and postgraduate pharmacy students.

PhD student (DAAD scholarship) 04/2011 – 06/2016

Institute of Pharmaceutical Biology, TU Braunschweig, Braunschweig (Germany)

- Performing research leading to the PhD degree with a focus on plant cytochrome P450 enzymes in xanthone biosynthesis.
- Teaching biochemistry courses to undergraduate pharmacy students.

Teaching assistant / Assistant lecturer 12/2003 – 09/2010

Faculty of Pharmacy, Assiut University, Assiut, Egypt

- Chromatographic isolation and structural elucidation of natural products from *Lepidium virginicum*.
- Teaching practical pharmacognosy and phytochemistry to undergraduate students.

EDUCATION

Doctor of Natural Sciences (Dr. rer. nat.) 04/2011 – 04/2016

Institute of Pharmaceutical Biology, TU Braunschweig, Germany

- Thesis title: Cytochrome P450 enzymes involved in xanthone biosynthesis in *Hypericum* species, supervision: Prof. Dr. Ludger Beerhues
- Grade: Excellent (Summa cum laude)

Master's degree (M.Sc.) in Pharmaceutical Sciences 04/2004 – 06/2009

Faculty of Pharmacy, Assiut University, Egypt

- Thesis title: Pharmacognostical study of *Lepidium virginicum* L., family: Cruciferae (Brassicaceae), growing in Assiut region
- Grade: Excellent

Bachelor's degree (B.Sc.) in Pharmaceutical Sciences 09/1998 – 06/2003

Faculty of Pharmacy, Assiut University, Assiut, Egypt

- Grade: Excellent with honor
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LANGUAGES

Arabic: Mother tongue

English: Listening (C2), Reading (C2), Speaking (C2), Writing (C2) TOEFL iBT score: 105

German: Listening (C1), Reading (C1), Speaking (B2), Writing (B2) TestDaF: TDN 4

RESEARCH EXPERIENCE

Plant Biology

- Plant tissue culture techniques, including *in vitro* propagation, callus induction, and establishment of suspension cultures.
- Generation of plant knockout lines using CRISPR/Cas9 technology.
- Transient gene expression and subcellular localization in *Nicotiana*.

Molecular biology

- Generally applied molecular biological techniques such as isolation of nucleic acids, PCR, gel electrophoresis, cloning, SDS-PAGE, ELISA and Western blot.
- Expression analysis using RT-qPCR.
- Heterologous protein expression and purification from bacteria and yeast (*Saccharomyces cerevisiae* and *Pichia pastoris*).
- Directed evolution-related techniques (assay development and validation, library construction and high-throughput screening).

Biochemistry

- Functional characterization of proteins and determination of the kinetic parameters.
- Development of high-throughput screening assays.
- Feeding experiments using radioactively labeled compounds.

Chemistry and Phytochemistry

- Isolation of natural products using various chromatographic techniques.
- Structure elucidation of natural products using different spectroscopic techniques such as UV, MS, 1D- and 2D-NMR.
- Analysis of natural products using HPLC-DAD, HPLC-MS, GC and CE.

Computer skills

- Handling NGS datasets, transcriptome assembly and analysis
- Protein modeling and substrate/product docking using AlphaFold2 and YASARA.
- Clone Manager, SnapGene, Lasergene DNASTAR, MEGA9, Microcal Origin and GraphPad Prism.

Supervision and project management

- Supervised technical assistants, bachelor, internship, master and doctoral students.
 - Organization of project meetings and presenting project results.
 - Reporting project progress to the funding agencies.
 - Attracting overseas distinguished fellowship students and aiding their applications.
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PRIZES AND AWARDS

Scholarship

- Fully funded PhD scholarship co-funded by the German Academic Exchange Service (DAAD) and the Egyptian Ministry of Higher Education (MoHE).

Prizes

- Best PhD award from the friends of the Helmholtz Centre for Infection Research (HZI) in Braunschweig 2017.
 - PHOENIX Pharmazie Wissenschaftspreis in Pharmaceutical Biology 2017.
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List of publications

* Corresponding author(s)

Peer-reviewed articles and reviews:

1. Ernst, L.; Sayed, H.M.B.; Hassanin, A.; Moegenburg, R.; Meents, T.; Lyu, H.; Kaufholdt, D.; Davari, M.D.; Beerhues, L.; Liu, B.*; **El-Awaad, I.***, Reverse prenylation of xanthenes by non-canonical aromatic prenyltransferase in *Hypericum*, submitted (2024).
2. Ernst, L.*; Lyu, H.; Liu, P.; Paetz, C.; Sayed, H.M.B.; Ma, H.; Beerhues, L.; **El-Awaad, I.***; Liu, B.*, Regiodivergent biosynthesis of bridged bicyclononanes, *Nature Communications* 15, 4525 (2024).
DOI: <https://doi.org/10.1038/s41467-024-48879-w>
3. Sayed, H.M.B.; Nassar, S.; Kaufholdt, D.; Beerhues, L.; Liu, B.*; **El-Awaad, I.***, Biosynthesis of polyprenylated xanthenes in *Hypericum perforatum* roots involves 4-prenyltransferase, *Plant Physiology* 192, 2971-88 (2023).
DOI: <https://doi.org/10.1093/plphys/kiad219>
4. Garay-Sarmiento, M.; Witzdam, L.; Vorobii, M.; Simons, C.; Herrmann, N.; Pereira, A.; Heine, E.; **El-Awaad, I.**; Lütticken, R.; Jakob, F.; Schwaneberg, U.*; Rodriguez-Emmenegger, C.*; Kill&Repel coatings: The marriage of antifouling and bactericidal properties to mitigate and treat wound infections, *Advanced Functional Materials* 32, 2106656 (2022).
DOI: <https://doi.org/10.1002/adfm.202106656>
5. Nöth, M.; Zou, Z.; **El-Awaad, I.**; Novaes, L.; Dilarri, G.; Davari, M.D.; Ferreira, H.; Jakob, F.; Schwaneberg, U.*; A peptide-based coating toolbox to enable click chemistry on polymers, metals, and silicon through sortagging, *Biotechnology and Bioengineering* 118, 1520-30 (2021).
DOI: <https://doi.org/10.1002/bit.27666>
6. Nöth, M.; Hussmann, L.; Belthle, T.; **El-Awaad, I.**; Davari, M.D.; Jakob, F.; Pich, A.*; Schwaneberg, U.*; MicroGelzymes: pH-independent immobilization of cytochrome P450 BM3 in microgels, *Biomacromolecules* 21, 5128-38 (2020).
DOI: <https://doi.org/10.1021/acs.biomac.0c01262>
7. Nöth, M.; Gau, E.; Davari, M.D.; **El-Awaad, I.***; Pich, A.*; Schwaneberg, U.*; Biocatalytic microgels (μ -Gelzymes): concepts, synthesis and emerging applications, *Green Chemistry* 22, 8183-209 (2020).
DOI: <https://doi.org/10.1039/D0GC03229H>
8. Mertens, S.M.A.; Thomas, F.; Nöth, M.; Moegling, J.; **El-Awaad, I.**; Sauer, D.F.; Dhoke, G.V.; Xu, W.; Pich, A.*; Herres-Pawlis, S.*; Schwaneberg, U.*; One-pot two-step chemoenzymatic cascade for the synthesis of a bis-benzofuran derivative, *European Journal of Organic Chemistry* 2019, 6341-46 (2019).
DOI: <https://doi.org/10.1002/ejoc.201900904>
9. Zou, Z.; Gau, E.; **El-Awaad, I.**; Jakob, F.; Pich, A.*; Schwaneberg, U.*; Selective and universal decoration of microgels with enzymes by sortagging, *Bioconjugate Chemistry* 30, 2859-69 (2019).
DOI: <https://doi.org/10.1021/acs.bioconjchem.9b00568>
10. Nagia, M.; Gaid, M.; Biedermann, E.; Fiesel, T.; **El-Awaad, I.**; Hänsch, R.; Wittstock, U.; Beerhues, L.*; Sequential regiospecific *gem*-diprenylation of tetrahydroxyxanthone by prenyltransferases from *Hypericum sp.*, *New Phytologist* 222, 318-34 (2019).
DOI: <https://doi.org/10.1111/nph.15611>

11. **El-Awaad, I.**; Bocola, M.; Beuerle, T.; Liu, B.; Beerhues, L.*; Bifunctional CYP81AA proteins catalyse identical hydroxylations but alternative regioselective phenol couplings in plant xanthone biosynthesis. *Nature Communications* 7, 11472 (2016).
DOI: <https://doi.org/10.1038/ncomms11472>
12. Fiesel, T.; Gaid, M.; Müller, A.; Bartels, J.; **El-Awaad, I.**; Beuerle, T.; Ernst, L.; Behrends, S.; Beerhues, L.*; Molecular Cloning and Characterization of a Xanthone Prenyltransferase from *Hypericum calycinum* Cell Cultures, *Molecules* 20, 15616-30 (2015).
DOI: <https://doi.org/10.3390/molecules200915616>

Book Chapter

13. Gaid, M.*; Singh, P.; **El-Awaad, I.**; Nagia, M.; Beerhues, L.*; Biotechnological production of prenylated xanthenes for pharmaceutical use, In: Pharmaceutical biocatalysis: Chemoenzymatic synthesis of active pharmaceutical ingredients, Ed. Grunwald, P., Jenny Stanford Publishing (2019).
DOI: <https://doi.org/10.1201/9780429353116>