

Ahmed Saeed Sotohi Arafa

Hannover, Germany

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PROFESSIONAL SUMMARY

Dr. rer. nat. (summa cum laude, awarded July 2026) specializing in biosynthetic pathway engineering and enzymology of natural products. Experienced in reconstructing and optimizing biosynthetic pathways across fungal, plant, and microbial systems. Proven ability to design screening assays, engineer metabolic pathways, and generate novel metabolites through the integration of biological and analytical workflows. Strong background in metabolite isolation, NMR-based structural elucidation, and solving complex biochemical problems. Track record of high-impact publications in leading journals, including *JACS* and *Nature Communications*.

CORE EXPERTISE

Biosynthesis (fungal & plant systems) | Enzymology (P450s, terpene synthases, PKS)

Metabolic engineering & pathway reconstruction | Chemoenzymatic synthesis

Assay development & screening | LCMS / GCMS / NMR

Fungal culture & metabolite extraction

RESEARCH EXPERIENCE

PhD Researcher – Leibniz Universität Hannover – Institute of Organic Chemistry

May 2021 – July 2026

- Integrated workflows spanning gene discovery, pathway engineering, metabolite production, and structural elucidation.
- Reconstructed and engineered biosynthetic pathways across fungal, plant, and microbial systems for the production of structurally diverse natural products.
- Developed *in planta* biosynthesis platforms in *Nicotiana benthamiana*, including pathway reconstruction and rapid gene combination testing via *Agrobacterium*-mediated expression.

- Engineered fungal production systems for diterpenoid biosynthesis, including *ent*-kaurene and gibberellin pathways, and optimized pathway flux to improve metabolite titers.
- Expressed fungal, plant, and bacterial enzymes across heterologous systems to enable cross-kingdom biosynthesis and generation of novel metabolites.
- Identified efficient precursor routes for kauralexin biosynthesis, demonstrating >100-fold improvement in pathway productivity between alternative biosynthetic routes.
- Performed 200+ enzyme assays, generating >60 metabolites including rare and previously inaccessible natural products.
- Conducted fungal cultivation, metabolite extraction, and analytical characterization using LCMS, GCMS, and NMR spectroscopy.
- Performed fungal genome mining and identified multiple diterpene biosynthetic gene clusters (BGCs).
- Performed chromatographic isolation, purification, and structural characterization of >80 natural products using flash chromatography, LCMS, and NMR spectroscopy.

MSc Researcher – Tanta University, Egypt

- Performed molecular cloning of plant biosynthetic genes into *E. coli* expression systems.
- Conducted recombinant protein expression, enzymatic validation assays, and protein analysis using SDS-PAGE.
- Gained early experience in molecular biology, enzymology, and heterologous expression workflows.
- First author on peer-reviewed publications related to plant biosynthetic enzymes and molecular cloning.

TECHNICAL SKILLS

Molecular biology (cloning, expression in *E. coli*, yeast, *Aspergillus*, *N. benthamiana*)

Analytical: LCMS, GCMS, NMR

Biochemistry: enzyme assays, SDS-PAGE, CRISPR-Cas9 gene editing in yeast.

Teaching & Mentoring Experience

Institute of Organic Chemistry, Leibniz University Hannover, Germany

Teaching Assistant and Practical Course Instructor

2021–2025

- Conducted weekly Organic Chemistry tutorials (Übungen) for undergraduate students over multiple semesters.
- Supervised Organic Chemistry practical laboratory courses for undergraduate students over four years.
- Taught Chromatography practical courses, including LCMS and GCMS applications and data interpretation, for Master's students.
- Supervised several Master's and Bachelor's theses.

Institute of Botany, Leibniz University Hannover, Germany

August 2025

- Taught a metabolic engineering course, including CRISPR-Cas9-mediated gene insertion in yeast systems to enable β -carotene production, for Master's students.

Department of Pharmacognosy, Faculty of Pharmacy, Tanta University, Egypt

Teaching and Research Assistant

2013–2021

- Conducted extensive practical teaching for undergraduate pharmacy students in pharmacognosy, phytotherapy, natural product chemistry, and related courses.
- Supervised laboratory practical sessions and assisted students in experimental and analytical techniques.

Work experience

May 2021–July 2026

Ph.D. researcher, Institute of Organic Chemistry,
Gottfried Wilhelm Leibniz University of Hannover,
Germany

Nov 2018–May 2021

Assistant lecturer
Faculty of Pharmacy, Tanta University, Egypt

March 2013–Nov 2018

Teaching assistant
Faculty of Pharmacy, Tanta University, Egypt

Education

May 2021–July 2026	Ph.D. candidate (Dr. rer. nat.), Institute of Organic Chemistry, Gottfried Wilhelm Leibniz University of Hannover, Germany
Oct 2012–Nov 2018	Master in Pharmacy (Pharmacognosy) Faculty of Pharmacy, Tanta University, Egypt
Aug 2007–May 2012	B.Sc. in Pharmaceutical Sciences Faculty of Pharmacy, Tanta University, Egypt

List of Publications

1. Arafa A, Gerke J, Cox R, Franke J. Chemoenzymatic Synthesis with Plant Oxidases and Metabolic Engineering Enable Rapid Access to Rare Gibberellins. *J Am Chem Soc* **2026**; 147(18): 19436–46.
2. Arafa A, Jiang Y, Gerke J, Franke J, Cox R. *ent*-Kaurene, *ent*-Kauran-16-ol, and Shunted Diterpenoids from an Engineered Strain of *Aspergillus oryzae* **2026**. Available from: URL: <https://chemrxiv.org/doi/full/10.26434/chemrxiv.15004688/v1>.
3. Hakim SE, Choudhary N, Malhotra K, Peng J, Bültemeier A, Arafa A *et al.* Phylogenomics and Metabolic Engineering Reveal a Conserved Gene Cluster in Solanaceae Plants for Withanolide Biosynthesis. *Nat Commun* **2025**; 16(1):6367.
4. Hakim SE, Liu S, Herzog R, Arafa A, Vries J de, Dräger G *et al.* Expansion of the Stereochemical Space of Triterpenes by Mining Noncanonical Oxidosqualene Cyclases Across the Diversity of Green Plants. *J Am Chem Soc* **2025**; 147(12):10320–30.
5. Arafa AS, Ragab AE, Ibrahim A-RS, Abdel-Mageed WS, Nasr ME. Cloning and Overexpression of Strictosidine β -D-Glucosidase Gene Short Sequence from *Catharanthus roseus* in *Escherichia coli*. *Adv Pharm Bull* **2019**; 9(4):655–61.
6. Arafa AS, Ragab AE, Ibrahim ARS, Mageed WSA, Nasr ME. PCR Amplification of Tabersonine 16-Hydroxylase Gene From the Leaves of *Catharanthus roseus*. *Int. Res. J. Pharm.* **2018**; 9(8):53–6