

Tel Hai - University of Kiryat Shmona in the Galilee (THU)

1. PERSONAL DETAILS

Identity No: 036883437

Place of birth: Israel

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E-mail: musasan@telhai.ac.il; Sanaa@migal.org.il.

2. ACADEMIC DEGREES

- Mar 2015 - May 2015: Post-Doc Researcher, The Hebrew University of Jerusalem. Supervisor: Prof. Dmitri Gelman.
- Oct 2014 - Feb 2015: Post-Doc Researcher, Max-Planck Institute for Coal Research, Mülheim, Germany. Supervisor: Prof. Dr. Benjamin List (Nobel Prize 2021). Research subject: pincer-type *complexes in enantioselective synthesis*.
- **2010-2014:** Ph.D. (Direct Track) in Organic and Organometallic Chemistry, Department of Organic Chemistry, The Hebrew University of Jerusalem, Israel. Supervisor: Prof. Dmitri Gelman. Dissertation title: "*Ligand-Metal Cooperation in PC(sp³)P Pincer Complexes.*" The PhD research was acknowledged by the Wolf Foundation and the student was awarded the Wolf Prize for an excellent PhD.
- **2005-2009:** B.Sc. in Chemistry, Technion – Israel Institute of Technology, Haifa.

3. ACADEMIC APPOINTMENTS

September 2023 – present: Senior Lecturer, Department of Biotechnology, Tel-Hai Academic College.

October 2021 – August 2023: Lecturer, Department of Biotechnology, Tel-Hai Academic College.

January 2023 – 2026: Principal Investigator, Nutrition and Natural Compounds Department, Migal-Galilee Research Institute, Kiryat Shmona.

4. PROFESSIONAL EXPERIENCE

May 2022 – December 2022: Research Associate, Department of Natural Compounds and Analytical Chemistry, Migal-Galilee Research Institute, Kiryat Shmona.

March 2020 – October 2022: Research and Development Manager, Nuversys, Kiryat Shmona.

June 2019 – February 2020: Senior Research and Development Researcher, StoreDot and MolecuLed, Herzliya, Israel.

May 2019: Research and Development Researcher, Salzman Group and Chilmark Labs, Albuquerque, New Mexico, USA.

2016-2019: Group Leader, Research and Development Department, Salzman Group (SG), Katzrin-Golan Heights, Israel.

2015-2016: Researcher, Research and Development Department, Adama Makhteshim, Beer Sheva, Israel.

5. RESEARCH INTERESTS (briefly)

- Development of nitric oxide (NO) and hydrogen sulfide (H₂S) donor compounds based on natural-product scaffolds, including cannabinoids and psilocin, to investigate their dual activity in neurodegenerative diseases.
- Synthesis of Schiff base–cannabinoid hybrid compounds and evaluation of their biological effects on the melanogenesis process.
- Development of platinum-based hybrid complexes with a particular emphasis on their potential as anti-cancer agents (in collaboration with Prof. Jamal Mahajna).
- Microencapsulation technology for bioactive compounds, focusing on their stability and controlled release to enhance the shelf life of various food products.

6. TEACHING EXPERIENCE

1. **2026 – present**, Structure determination through spectral analysis: From Theory to Application in Metabolomics (graduate). Department of Biotechnology, Tel-Hai Academic College
2. **2021 – present**, Organic Chemistry, Organic Chemistry Laboratory, and General Chemistry (undergraduate), Department of Biotechnology, Tel-Hai Academic College — taught as Lecturer (2021-2023) and Senior Lecturer (2023-present).
3. **2011-2014**, Basic and Advanced Synthetic Organic Chemistry Laboratory A+B, and Organic Chemistry Laboratory for dual-track students (undergraduate), Institute of Chemistry, The Hebrew University of Jerusalem — Teaching Assistant.
4. **2010-2014**, General Chemistry and Organic Chemistry A+B, for Medical, Pharmacy, Biology, Nursing, and Chemistry undergraduate students, Student Union of the Hebrew University of Jerusalem (Agudat Studentim) — Teaching Assistant.

7. CLUSTER (FACULTY) ACTIVITIES

- **2026 – present**, Member, Teaching Committee for the M.Sc. in Biotechnology, Tel-Hai Academic College.
- **2025-2028**, Member/Adjudicator, Disciplinary Committee, Tel-Hai Academic College.
- **2024**, Appointed to a university-wide committee on syllabi, Tel-Hai Academic College.

8. PUBLIC PROFESSIONAL ACTIVITIES

2023-present, peer reviewer for international scientific journals: Nature Chemistry, Chemistry-an Asian journal, European Journal of Organic Chemistry, The European Journal of Pharmacology, ChemistrySelect, Pharmaceuticals, biomolecules, molecules, antioxidants, International Journal of Molecular Sciences.

9. MEMBERSHIP IN PROFESSIONAL SOCIETIES

2023-present, member, Israeli Chemical Society.

10. AWARDS AND HONORS

- **2023-2026**, Ma'of Fellowship for Arab Society in Israeli Academic Institutions, The Council for Higher Education, Israel.
- **2022**, Excellent lecturer, Tel-Hai Academic College.
- **2015-2016**, Minerva Fellowship for post-doctoral studies.
- **2014-2015**, Post-doctoral fellowship for women in science for an excellent student, The Hebrew University of Jerusalem, Israel.
- **2014**, Wolf Foundation Prize.
- **2013** and 2014, Fellowship of the Council for Higher Education for excellent students from the Arab sector.
- **2013**, Fellowship for Women in Science, Ministry of Science (declined).
- **2012**, Casali Scholarship for Applied Research, The Hebrew University of Jerusalem, Israel.
- **2011**, Excellent poster award, 77th Annual Meeting of the Israel Chemical Society.

11. GRADUATE STUDENTS

Completed MSc Theses

- Eliav Peretz, 2026, Design, synthesis, and characterization of Schiff-base cannabidiol compounds, Dr. Sanaa Musa.
- Nor Amara, 2026, Development of novel platinum derivatives with anti-cancer action and the ability to overcome resistance in ovarian cancer cells, Prof. Jamal Mahajna and Dr. Sanaa Musa.

MSc Theses in progress

- Oriyan Cohen, 2024-2026 (expected), Design, synthesis, and characterization of thiosemicarbazone derivatives of olivetol, Dr. Sanaa Musa

- Gil Dinnar, 2025-2027 (expected), From cannabinoid conversion byproducts to bioactive scaffolds: structural elucidation and stereochemistry-dependent anti-inflammatory activity of alkoxy cannabinoids, Dr. Sanaa Musa and Dr. Idan Pereman.
- Yulia Sivan, 2025-2027 (expected), Development of NO-donating cannabidiol hybrid molecules: synthesis and chemical characterization, Dr. Sanaa Musa.

PhD Theses in progress

- Eden Noyman, 2026-2029 (expected), Cannabidiol-gasotransmitter hybrid prodrugs: an integrated chemical and biological approach to neuroprotection, Dr. Sanaa Musa and Prof. Avraham Samson (Bar-Ilan University).

Review Committees

M.Sc. Thesis

12. RESEARCH GRANTS

1. **2025**, AI-guided optimization of Basic Substance mixtures for avocado decay control, ICA-Israel, 60K \$, with Dr. Dani Gamrasni and Prof. Ofir Shir. (Co-PI)
2. **2025-2027**, an innovative approach to developing a coating for maintaining the quality of citrus fruits during marketing without the development of off-flavors, research proposal for the citrus industry, Israel, 100K NIS/year, with Dr. Dani Gamrasni and Prof. Ofir Shir. (Co-PI).
3. **2025**, Development of Synergistic Multi-Targeted Therapies: Cannabidiol and Psilocin Analogues for Mental Health Treatment via Endocannabinoid and Serotonin Pathways, Migal-Tel-Hai joint grant, 50K NIS, with Dr. Idan Pereman, Dr. Karen Jackson, and Dr. Paula Pitashni.
4. **2023**, Using click-chemistry to identify the potential receptor of a polyketide lactone, patulin, in *P. expansum* towards the development of disruption strategies interfering with patulin binding as anti-fungal treatments against post-harvest diseases, ICA-Israel, 70K NIS, with Dr. Livnat Jurnou. (Co-PI)
5. **2023-2024**, Synthesis of natural lipids which attenuate atherosclerosis via improving HDL functions, Migal Institute, 250,000NIS, with Prof. Soliman Khatib and Dr. Roee Gottman. (Co-PI)

13. PUBLICATIONS

1. **Musa, S.**; Masaphy, S.*; Dinnar, G.; Smith, M.E.; Bontino, G. and Healy, R. (2026) Chemotyping volatiles of ectomycorrhizal and saprotrophic Pezizales. Under review.
2. Shabat-Simon, M., Cohen, O., Yaval L., Hujeirat S., Adriana-Pitashny, P., Jackson, K., **Musa, S.** (2026) Cannabidiol-thiosemicarbazone exhibits dual tyrosinase inhibition and antioxidant activity in human skin-derived cells, *Bioorg. Med. Chem. Lett.*, 139, 130707.
3. Abzach, A.; Ben-Adiva, R.; Gruzdev, N.; **Musa, S.**, and Yadid, I. (2026). Engineering of *Escherichia coli* for D-tagatose production from lactose and whey permeate via the tagatose-6-phosphate pathway, *Current Research in Food Science*, 12, 101370.
4. Benchar, O.; **Musa, S.**; Fichtman, B.; Matityahu, I. and Leshem, Y. (2026) Chemical and Ultrastructural Changes in the Cuticle Observed in RabA2b Overexpressing Plants, *Plants*, 15(3), 408.
5. **Musa, S.** and Dayan, L. (2025) Recent Development of Plant-Derived and Synthetic Cannabinoids as Novel Antimicrobial Agents, *Future Medicinal Chemistry*, 17(23), 2881–2894. (Invited article)
6. Dinnar, G.; Cohen, O.; Jagtap, P. and **Musa, S.** (2025) Sustainable synthesis of cannabinoids via metal-free aromatic deformylation, *Tetrahedron*, 184, 134789.
7. Peretz, E.; Ashkenazi, N. and **Musa, S.** (2025) Cannabidiol-Based Thiosemicarbazones: A Preliminary Study Evaluating Their Anti-Tyrosinase Properties, *Molecules*, 30, 1291.
8. Wang, J.; Beghelli, D.; Amici, A.; Sut, S.; Dall'Acqua, S.; Lupidi, G.; Dal Ben, D; Bistoni, O.; Tomassoni, D.; Belletti, B.; **Musa, S.**; Mahajna, J.; Pucciarelli, S. and Marchini, C. (2024) Chaga Mushroom Triterpenoids Inhibit Dihydrofolate Reductase and Act Synergistically with Conventional Therapies in Breast Cancer, *Biomolecules*, 14, 1454.
9. **Musa, S.**; Peretz, Y. and Dinnar G. (2024), Advances in Chiral Pincer Complexes: Insights and Applications in Catalytic Asymmetric Reactions, *Int. J. Mol. Sci.*, 25(19), 10344.
10. Peretz, E. and **Musa, S.** (2024) Design, Synthesis, and Characterization of Novel Cannabidiol-Based Derivatives with Potent Antioxidant Activities, *Int. J. Mol. Sci.*, 25(17), 9579.
11. **Musa, S.**; Amara, N.; Selawi, A.; Wang, J.; Marchini, C.; Agbaray, A. and Mahajna, J. (2024) Overcoming Chemoresistance in Cancer: The Promise of Crizotinib, *Cancers*, 16(13), 2479.
12. Kostanda, E; **Musa, S.** and Pereman, I (2024) Unveiling the Chemical Composition and Biofunctionality of *Hericium* spp. Fungi: A Comprehensive Overview, *Int. J. Mol. Sci.*, 25(11), 5949.
13. Degani, G.; Peretz E. and **Musa, S.** (2023) Skin mucus metabolites in *Salamandra infraimmaculata* from various habitats, *Endocrinol. Metab. Nutr.*, 2(1), 1.
14. Ashkar, R.; Khatib, A.; **Musa, S.**; Goldberg, D. and Khatib, S. (2023) PON1 has palmitoyl-protein thioesterase (PPT) activity, and can affect the presence of SR-B1 on the endothelial cell membrane. *Biofactors*, 50(3), 608.
15. Degani, G.; Ish-Am G.; Yatom N.; Khatib, S. and **Musa, S.** (2023) Eastern Fire Salamander (*Salamandra infraimmaculata*) Skin Mucus Metabolites – LC-MS/MS Analysis *Environ Anal Eco Stud.*, 000747, 10(5).

16. Khattib, A.; **Musa, S.**; Halabi, M.; Hayek T. and Khatib, S. (2022) Lyso-DGTS Lipid Derivatives Enhance PON1 Activities and Prevent Oxidation of LDL: A Structure–Activity Relationship Study Antioxidants 2022, 11(10), 2058. (IF 7.675, Q1)
17. Hajouj, H.; Khattib, A.; Atrahimovich, D.; **Musa, S.** and Khatib, Soliman (2022) S-Nitrosylation of Paraxonase 1 (PON1) Elevates Its Hydrolytic and Antioxidant Activities Biomolecules 12(3), 414. (IF 6.064, Q1)
18. Radchenko, Y.; Mujahed, Sh.; **Musa, S.** and Gelman. D (2021) Synthesis and characterization of chiral enantiopure PC(sp³)P and their complexes Inoorganica Chimica Acta, 521, 120350. (IF 3.118, Q2)
19. Cohen, S.; Borin, V.; Schapiro, I.; **Musa, S.**; De-Botton, S. and Gelman. D (2017) Ir(III)-PC(sp³)P Bifunctional Catalysts for Production of H₂ by Dehydrogenation of Formic Acid: Experimental and Theoretical Study ACS Catal.: 7(12), 8139-8146. (IF 13.700, Q1)
20. De-Botton, S.; Romm, R.; Bensoussan, G.; Hitrik, M.; **Musa, S.** and Gelman D. (2016) Coordination versatility of p-hydroquinone-functionalized dibenzobarrelene-based PC(sp³)P pincer ligands. Dalton Trans.: 45(40), 16040-16046. (IF 4.569, Q1)
21. **Musa, S.**; Ghosh, A.; Vaccaro, L.; Ackermann, L. and Gelman. D (2015) Efficient E-Selective Transfer Semihydrogenation of Alkynes by Means of Ligand-Metal Cooperating Ruthenium catalyst Adv. Synth. Catal.: 357, 2351–2357. (IF 5.981, Q1)
22. Silantyev, G. A.; Filippov, O. A.; **Musa, S.**; Gelman, D.; Belkova, N. V.; Weisz, K.; Epstein, L. M.; Shubina E. S. (2014) Conformational Flexibility of Dibenzobarrelene-Based PC(sp³)P Pincer Iridium Hydride Complexes: The Role of Hemilabile Functional Groups and External Coordinating Solvents Organometallics: 33, 5964–5973. (IF 3.837, Q1)
23. **Musa, S.**; Filippov, O. A.; Belkova N. V.; Shubina, E. S.; Silantyev, G. A.; Ackermann, L. and Gelman, D. (2013) Ligand-Metal Cooperating PC(sp³)P Pincer Complexes as Catalysts in Olefin Hydroformylation Chem. – Eur. J. 19: 16906-16909. (IF 5.020, Q2)
24. **Musa, S.**; Ackermann, L. and Gelman. D (2013) Dehydrogenative Cross-Coupling of Primary and Secondary Alcohols Adv. Synth. Catal. 355: 3077–3080. (IF 5.981, Q1)
25. Levy, O.; **Musa, S.**; Bino, A. (2013) Formation of alkyne during degradation of Metal-Alkylidyne complexes. Dalton Trans. 42: 12248-12251. (IF 4.569, Q1)
26. **Musa, S.**; Fronton, S.; Vaccaro, L. and Gelman. D (2013) Bifunctional Ru(II) PCP Pincer Complexes and Their Catalytic Activity in Acceptorless Dehydrogenative Reactions Organometallics 32: 3069-3073. (IF 3.837, Q1)
27. Gelman, D. and **Musa, S.** (2012) Coordination Versatility of sp³-Hybridized Pincer Ligands toward Ligand-Metal Cooperative Catalysis ACS Catalysis 2: 2456-2466. Invited perspective. (IF 13.700, Q1)
28. Oded, K.; **Musa, S.**; Gelman, D. and Blum, J. (2012) Dehydrogenation of Alcohols under Ambient Atmosphere by a Recyclable Sol-Gel Encaged Iridium Pincer Catalyst Catalysis Commun. 20: 68-70. (IF 3.510, Q3)

29. **Musa, S.**; Shpruhman, A. and Gelman, D. (2012) New PC(sp³)P Pincer Complexes of Platinum J. Organomet. Chem. 699: 92-95. (IF 2.345, Q3)
30. **Musa, S.**; Shaposhnikov, I.; Cohen, S. and Gelman, D. (2011) Ligand-Metal Cooperation in PCP Pincer Complexes: Rational Design and Catalytic Activity in Acceptorless Dehydrogenation of Alcohols. Angew. Chem., Int. Ed. 50: 3533-3537. (IF 16.823, Q1)
31. **Musa, S.**; Romm, R.; Kozuch, S. and Gelman, D. (2011) New Possible Mode of Metal-Ligand Cooperation in PCP Pincer Complexes. Dalton Trans. 40: 8760-8763. Invited manuscript. (IF 4.569, Q1)

Patents (granted)

1. A stable food-grade microcapsule for the delivery of unstable and food-incompatible active ingredients to food products, Nuversys Ltd. WO 2021176445A1.
2. Electrolyte additives for fast charging lithium-ion batteries, StoreDot Ltd. WO 20210234197.
3. Assistant dyes for color conversion in LCD displays, MolecuLED Ltd. WO 20210191198.
4. Methods for synthesis of cannabinoids compounds, Beetlebung Pharma Ltd. WO 2020031179A1.
5. Synthesis of 5-amino-1-(2,6-dichloro-4-trifluoromethyl-phenyl)-4-ethylsulfanyl-1H-pyrazole-3-carbonitrile and related compounds, Adama Makhteshim Ltd. WO 2019097306.
6. Synthesis of cannabidiol prodrugs for treating various disorders, Salzman Group Ltd. WO 2018096504 A1.
7. Process of preparation of indoxacarb and its intermediates, Adama Makhteshim Ltd.

14. CONFERENCES

Oral Presentation

- International

1. August 2026, International conference on medicinal chemistry and drug discovery, Dual antioxidant and anti-tyrosinase effects of cannabidiol-thiosemicarbazone, Venice, Italy, oral presentation.
2. September 2025, International Conference on Chemistry of Natural Compounds, Sustainable synthesis of cannabinoids via metal-free aromatic deformylation, Naples, Italy, oral presentation (Excellent presentation talk award).
3. September 2014, Max-Planck Institute for Coal Research, Ligand-Metal Cooperation in PC(sp³)P Pincer Complexes, Mülheim, Germany (invited).

4. January 2014, Global Young Scientists Summit@one-north, Singapore, an invited conference for excellent PhD students (invited).

- National

1. November 2026, Annual Scientific Conference, Galilee Society, Design and Development of Novel Hybrid Bioactive Compounds for Therapeutic Applications. (Invited talk)

Poster presentation

- International

1. July 2026, 60th International Conference on Medicinal Chemistry- RICT, Design, synthesis, and characterization of olivetol-based thiosemicarbazone derivatives as anti-tyrosinase agents, Paris, France.
2. July 2026, 60th International Conference on Medicinal Chemistry- RICT, Dual Antioxidant and Anti-Tyrosinase Effects of Cannabidiol-Thiosemicarbazone Demonstrated in Human Melanocytes and Zebrafish Models, Paris, France.
3. July 2025, 59th International Conference on Medicinal Chemistry - RICT, "Cannabidiol Based-Thiosemicarbazones: A Preliminary Study Evaluating Their Anti-Tyrosinase Properties," Orleans, France, poster presentation.
4. July 2024, 58th International Conference on Medicinal Chemistry - RICT, "Design, Synthesis, and Characterization of Novel Cannabidiol-Based Derivatives with Potent Antioxidant Activities," Bordeaux, France, poster presentation.
5. August 2012, 4th EuChemMS Chemistry Congress, "Chiral Bifunctional Catalysts Based on C(sp³)-Metalated Pincer Complexes," Prague, Czech Republic, poster presentation.
6. October 2011, 9th International Congress of Young Chemists "YoungChem 2011," "Novel Bifunctional Catalysts Based on C(sp³)-Metalated Pincer Complexes," Cracow, Poland, poster presentation.

- National

1. August 2025, 21st Medicinal Chemistry Section of the Israel Chemical Society (MCS-ICS), "Evaluating Anti-Tyrosinase Potential of Cannabidiol-Based Thiosemicarbazones," Weizmann Institute of Science, Israel, poster presentation.

2. July 2024, 20th Medicinal Chemistry Section of the Israel Chemical Society (MCS-ICS), "Design, Synthesis, and Characterization of Novel Cannabidiol-Based Derivatives with Potent Antioxidant Activities," Weizmann Institute of Science, Israel, poster presentation.
3. April 2024, 87th Annual Meeting of the Israel Chemical Society, "Design, Synthesis, and Characterization of Carbazone Based Cannabidiol Derivatives: A Highly Potent Agent Toward AAPH and Cu²⁺-Induced LDL Oxidation," Tel-Aviv, Israel, poster presentation.
4. May 2014, The Hebrew University of Jerusalem, "Ligand-Metal Cooperating PC(sp³)P Pincer Complexes," Jerusalem, Israel, poster presentation (Excellent Poster award).
5. February 2014, 79th Annual Meeting of the Israel Chemical Society, "Ligand-Metal Cooperating PC(sp³)P Pincer Complexes and New Catalytic Applications," Tel-Aviv, Israel, poster presentation.
6. February 2012, 77th Annual Meeting of the Israel Chemical Society, "Chiral Bifunctional Catalysts Based on C(sp³)-Metalated Pincer Complexes," Tel-Aviv, Israel, poster presentation (Excellent Poster award).
7. February 2011, 76th Annual Meeting of the Israel Chemical Society, "Novel Bifunctional Catalysts Based on C(sp³)-Metalated Pincer Complexes," Tel-Aviv, Israel, poster presentation.
8. May 2011, The Hebrew University of Jerusalem, "Novel Bifunctional Catalysts Based on C(sp³)-Metalated Pincer Complexes," Jerusalem, Israel, poster presentation.