**Elena Poverenov**

**Researcher A+ (equivalent of Full Professor)**

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Personal webpage: https://www.agri.gov.il/en/author/elenap

**Research interests:** carbohydrates, supramolecular chemistry, soft materials, glycochemistry, materials chemistry, nanotechnology, advanced biomaterials.

Elena Poverenov is working on the edge of fields, Materials Science and Biochemistry. Her main expertise is carbohydrate biopolymers, polysaccharides, oligosaccharides and glucoside conjugates. Her research is built on a deep understanding of the fundamentals of glycochemistry that allows mechanistic insights and design of advanced materials toward far-reaching scientific and applicative prospects. Elena introduced new fundamental concepts in carbohydrate research that made a high scientific impact worldwide. Elena's laboratory developed new technologies based on carbohydrate materials that were used for numerous applications, among them foliar plant treatment, "in-cell" editing of plant without integration into a host genome, eliciting natural defense mechanisms and biosynthesis of health-promoting compounds in plant, tissue engineering, transdermal drug delivery, and development of new medicines.

Elena has published over 80 articles in leading international journals among them the top journals in her research fields and multidisciplinary journals such as Nature, JACS, ACS Nano, Green Chemistry, Chemistry of Materials, Carbohydrate Polymers, Food hydrocolloids, etc. Since 2011 she has mentored 16 MSc students (12 have already graduated), 10 PhD students (6 have graduated), and 17 postdoctoral fellows. She obtained 42 international and national grants (25 as a PI) with a total budget ~12M$ from EU, BARD, BARD-NIFA, GFI, Israel-China, ICA, Israeli Ministries of Science, Health, Innovation and Agriculture. For introducing new research directions, Elena received 14 awards among them "Awardee for Research in Food and Agriculture" from International Agropolis and Olam Foundation (2017), the prestigious Yigal Alon Prize for contribution to the Israeli Society in the Field of Research (2020) and Researcher of the Year Prize (2022). Elena was selected as national nominee for International Frontiers Planet Prize (2024).

Selected publications

1 **Poverenov E**, Leitus G, Milstein D. (2006). Synthesis and reactivity of the methylene arenium form of a benzyl cation, stabilized by complexation. *J. Am. Chem. Soc*. **IF 16.4**; Chemistry Multidisciplinary 16/179, Q1

2**Poverenov E**, Ben-David Y, Shimon LJW, Leitus G, Martin JML, Konstantinovsky L, Milstein D. (2008). Evidence for a terminal Pt (iv)-oxo complex exhibiting diverse reactivity. *Nature*. **IF 69.5**; Multidisciplinary; Rank 1/175, Q1

3 **PoverenovE\***, ZamochshikN, PatraA, BendikovM. (2014). [Unusual doping of donor-​acceptor-​type conjugated polymers using lewis acids](https://scifinder.cas.org/scifinder/references/answers/A6FBEF42X86F35098X18ED727810A340FF68:A711F295X86F35098X56B1BB8451B6239C94/2.html?nav=eNpb85aBtYSBMbGEQcXR3NDQzcjSNMLCzM3Y1MDSIsLUzMnQycnCxNTQyczI2NLZ0gSoNKm4iEEwK7EsUS8nMS9dzzOvJDU9tUjo0YIl3xvbLZgYGD0ZWMsSc0pTK4oYBBDq_Epzk1KL2tZMleWe8qCbiYGhooCBgYEZaGBGCYO0Y2iIh39QvKdfmKtfCJDh5x_vHuQfGuDp517CwJmZW5BfVAI0obiQoY6BGaiPASianVsQlFqIJspUlI_qPqf8_JzUxLyzCkUNV-f8egd0XxTMfQUg9cXFQPXa-UXpesmJxXr5xcmJRXrFqUVlqUV6Kfm5iZl5esn5ubn5eXrBQCcEF6Qm20xYvUB2-oNTTAxMPgw8uZX-RSmZeYk53qmVJQwaPkCD9IEG6YMN0ocYpA8xSB9ikD5QpbUPA3tuJcjE4hIGSR-Qa_VLSzJz9H0y87JTUzwSizOCU0usKwoKgI4TB3sGJK2HIn0j53rU1LtacqCwhHkZrAoqv8uldeq0HdtNmEFhXc4DDB4BewcGMKgAAC6po0A&key=caplus_2014:387413&title=VW51c3VhbCBEb3Bpbmcgb2YgRG9ub3ItQWNjZXB0b3ItVHlwZSBDb25qdWdhdGVkIFBvbHltZXJzIFVzaW5nIExld2lzIEFjaWRz&launchSrc=reflist&pageNum=1&sortKey=ACCESSION_NUMBER&sortOrder=DESCENDING). In memory of Prof. M. Bendikov *J. Am. Chem. Soc*. **IF 16.4**; Chemistry Multidisciplinary 16/179, Q1.

4KhaskinE, GuliniA, **PoverenovE\*** (2015). A contact active bactericidial stainless steel via a sustainable process utilizing electrodeposition and covalent attachment in water. *Green Chem*. **IF 11.0**; Chemistry, Multidisciplinary; 21/171, Q1

5Rutenberg R, Cohen G, Král P, **PoverenovE\***. (2018) Omniphilic Polysaccharide-Based Nanocarriers for a Modular Molecular Delivery in a Broad Range of Bio-Systems. *ACS Appl. Mat. Interfaces*. **IF 10.4**; NanoScience; 18/103, Q1

6Cohen Y,Yasour H, Tworowski D, **PoverenovE\***. (2021) Stimuli-free transcuticular delivery of Zn microelement using biopolymeric nanovehicles: experimental, theoretical in planta studies. *ACS Nano*. **IF 18.0;** Material Science 19/637, Q1

7Shebis Y,Fallik E, Rodov V, **PoverenovE\*.** (2022). Facile method for preparation of oligo-carboxymethyl cellulose and other oligosaccharides: physicochemical properties and bioactivity. *Food hydrocolloids*. **IF 11.5** Food Science 5/391, Q1

8Sela A, Cohen E, Avram L, Rodov V, **PoverenovE**\*. (2023) Solvent-free synthesis of polysaccharide derivatives via heterogeneous Schiff base chemistry. *Green Chemistry*, 25, 922 **IF 11.0**; Chemistry, Multidisciplinary 21/171, Q1.

9Ischakov R, Tworowski D, Sayas T, Fallik E, Kleiman M, **Poverenov E**. (2023) Nucleoside-Based Cross-linkers for Biocompatible Hydrogels with Tunable Properties. *ACS* *Appl. Mat. Interfaces* 7359. **IF 10.4**; NanoScience 18/103, Q1

10Ischakov R, Eretz-Kdosha N, Silberstein E, Fallik E, CohenG, **PoverenovE\***. (2023) Oligochitosan and oxidized nucleoside-based bioderived hydrogels for wound healing. *Carbohydr. Polym.* 314. **IF 11.2**; Polymer Science; 3/90, Q1

11Sela A, ShkuriN, TishN, RodovV, **PoverenovE\***.(2023) Carboxymethyl chitosan-quercetin conjugate: a sustainable one-step synthesis and use for food preservation. *Carbohydr. Polym.* 316, 121084. **IF 11.2** Polymer Science; 3/90, Q1

12Itzhakov R, Belausov E, Fallik E, Spiegelman Z, Sionov E, **PoverenovE\*** (2023) Nanogel Particles-Based on Modified Nucleosides and Oligosaccharides as Advanced Delivery System. *ACS Nano*. **IF 18.0**; Material Science 19/637, Q1

**Part I: CURRICULUM VITAE**

1. **Personal**

Elena Poverenov

Born in Ukraine at 1979

Repatriation to Israel at 1995.

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Personal site: <https://mirik28.wixsite.com/elenapoverenov>

web–page: <https://www.agri.gov.il/en/author/elenap>

Google Scholar web–site: <https://scholar.google.com/citations?user=TphNh8IAAAAJ&hl=en>

1. **Higher Education**

|  |  |
| --- | --- |
| **Dates** | **Description** |
| 1998-2001 | B.Sc. in Medicinal Chemistry at Bar Ilan University (summa cum laude) |
| 2001-2009 | MSc+PhD Organometallic Chemistry, Weizmann Institute of Science Prof. David Milstein |
| 2009-2011 | Postdoc fellow, Organic Polymers, Weizmann Institute of Science, Prof. Michael Bendikov |

1. **Positions Held and Academic Status**

|  |  |
| --- | --- |
| **Dates** | **Description** |
| 2011-2014 | Rank C (equivalent Senior Lecturer) Food Sciences Department Volcani Institute ARO |
| 2014-2018 | Rank B (equivalent Assistant Professor) Food Sciences Department Volcani Institute ARO |
| 2018-2022 | Rank A (equivalent Associate Professor) Food Sciences Department Volcani Institute ARO |
| 2022-to date | Rank A+ (equivalent Full Professor) Food Sciences Department Volcani Institute ARO |
| 2018-to date | Head of Advanced Materials and Agro-Nanotechnology Research Center, ARO |

1. **Guiding Students and Teaching Experience**
2. **Guidance of MSc students**

|  |  |  |
| --- | --- | --- |
| 2012-2014 | Hadar Arnon | Polysaccharide-based edible coatings **excellent research fellowship** |
| 2012-2014 | Yana Zaitcev | Study of mushroom-sourced chitosan **excellent research fellowship** |
| 2014-2016 | Aviva Buslovich | Antimicrobial surfaces utilizing soft nanoparticles **cum laude** |
| 2015-2017 | Gilad Goldin | Delivery systems for volatiles using dynamic covalent bond **cum laude** |
| 2016-2018 | Elad Matot | Development of active nanoparticles based on biopolymers **cum laude** |
| 2016-2018 | Esti Butbul | Biopolymers based active gels and controlled release systems |
| 2016-2018 | Shani Kehila | Storability prolongation and quality enhancement bell peppers |
| 2017-2019 | Leilah Saidi | Bioactivecoatings, **excellent agro-nanotechnology** **research** |
| 2020-2022 | Adi Samo | Bioacoatings for vegetative reproduction treatment **cum laude** |
| 2021-2023 | Noa Shkuri | Green methods to prolong storability of fresh-cut produce **cum laude** |
| 2022-2024 | Ilan Chertok | Synthesis of biocompatible auxiliary additives for bioplastic for |
| 2022-2024 | Tamar Moyal | Advanced polysaccharides as active gels for drug delivery |
| 2023- to date | Inbal Domb | Biodegradable active films from waste of alternative protein |
| 2024- to date | Sheizaf Stav | New bioactive polysaccharides **excellence Fellowship** |
| 2025- to date | Manuel Weiss | Bioactive coatings of plant. Mutual guidance with Prof Nir Ohad |

1. **Guidance of PhD students:**

|  |  |  |
| --- | --- | --- |
| Dates | Name | Title of thesis |
| 2013-2018 | Roi Rutenberg | New biobased delivery systems **six excellence fellowships** |
| 2014-2019 | Hadar Arnon-Rips | Nanotechnological approaches to develop advanced edible coatings |
| 2017-2021 | Yael Cohen | New strategyof polysaccharidemodification **excellence fellowship** |
| 2018-2022 | Yevgenia Shabis | Synthesis and study of oligosaccharides-based elicitors |
| 2019-2023 | Rafael Izhakov | Nucleotide type cross-linkers and biocompatible hydrogels |
| 2019-2023 | Aviad Sela | Nanocomposite materials for delivery of highly sensitive agents |
| 2023- to date | Adi Ticher | Saccharides-based novel material for medicine, food and agriculture |
| 2024- to date | Orit Palti | New chiral materials based on modified biopolymers |
| 2024 - to date | Ilan Chertok | Selective reactivity using soft biomaterial templates |
| 20250 to date | Noa Gabai-Bass | Rationally modified oligosaccharides as signaling molecules |

1. **Postdoctoral fellows**

|  |  |  |
| --- | --- | --- |
| 2012 - 2015 | Dr. Tania Fadida | Development of contact active antimicrobial packages |
| 2013- 2015 | Dr. Eugene Khaskin | Contact active antimicrobial metal surfaces **currently PI** |
| 2013-2014 | Dr. Yulia Krupitski | Antimicrobial surfaces with Prof. Shlomo Sela |
| 2014 - 2016 | Dr. Zhaojun Ban | Active edible coatings from mushroom waste **currently PI** |
| 2016- 2017 | Dr. Pankaj K. Rastorgi | Electrochemical approaches for delivery **currently PI** |
| 2016- 2020 | Dr. Miri Klein | Smart package materials **Excellent research fellowship** |
| 2017- 2019 | Dr. Anat Philosof- Molad | Nano-agrochemicals based on natural polymers |
| 2017- 2020 | Dr. Stella Khil | Contact active non-woven materials |
| 2018- 2021 | Dr. Ilia Shlar | Nano-clays for effective delivery of antifungal dsRNA |
| 2020- 2021 | Dr. Alexander Laskavy | Polysaccharide-supported catalysts |
| 2021- 2022 | Dr. Erez Cohen | Amino-acids modified polysaccharides **applying for PI** |
| 2019- 2023 | Dr. Ainur Imangalaev | Carboxymethylchitosan-based new materials |
| 2020- 2023 | Dr. Sai Sagiri | Covalent organic frames, **currently PI** |
| 2023- to date | Dr. Yana Gurianov | Self-assembled polysaccharide nanogels |
| 2024- today | Dr. Roman Goikhman | Biopolymeric structures for enantioselective extraction |
| 2024- to date | Dr. Elena Serebryannikova | Improved organoleptic of alternative protein-based food |
| 2025-today | Dr. Eswaran Lakshmanan | Modified glycosides as advanced biomaterials |

1. **Teaching of Courses**

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| --- | --- | --- | --- |
| Dates | Duration | Place | Title |
| 2024-today | Semesterly | Tel Aviv University. | Food as medicine. Organizer and Lecturer |
| 2016-2017 | Semesterly | Hebrew University of Jerusalem | Nano in Food. Organizer and Lecturer |
| 2011-2018 | Summer | Volcani Institute, ARO | Biomaterials in Food. Lecturer |
| 2004-2005 | Semesterly | Weizmann Institute of Science. | Organometal chemistry. Assistant |
| 2001-2002 | Semesterly | Hebrew University of Jerusalem | Organic chemistry Lab. Assistant |

1. **Participation in Scientific Meetings (Selected)**

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| --- | --- | --- | --- |
| **Date** | **Title of the Meeting** | **Place** | **Role** |
| 2012 | Conference of Chemical Reactions Food | Prague, Czech | Lecture |
| 2013 | Food Science Congress | Hangzhou, China | Invited Lecture |
| 2014 | Polymer Processing and Characterization | Kerala, India | Invited Lecture |
| 2015 | BIMATE Biopolymer Materials | SG, Slovenia | Invited Lecture |
| 2015 | Israel Society for Biotechnology | Tel Aviv, Israel | Invited Lecture |
| 2015 | AgriTech International Conference | Tel Aviv, Israel | Invited Lecture |
| 2016 | Food Chemistry Conference | Toronto, Canada | Invited Lecture |
| 2016 | Food Innovations Conference | Jerusalem, Israel | Invited Lecture |
| 2016 | Biopolymers and Bioplastics | San Antonio,USA | Invited Lecture |
| 2016 | The Annual Conference Food in New Era | Tel Aviv, Israel | Panel speaker Invited |
| 2016 | International Conference on Food Security | Tel Aviv, Israel | Invited Lecture |
| 2017 | "Nanoscience for Agriculture" Conference | Tel Aviv, Israel | Keynote Lecture |
| 2018 | International "Nano2018" Conference | Jerusalem, Israel | Invited Lecture |
| 2019 | Medicinal Chemistry Conference ICS | Rehovot, Israel | Invited Lecture |
| 2019 | Biopolymer Chemistry Congress | Las Vegas, USA | Invited Lecture |
| 2019 | Medicinal Chemistry Meeting MCS-ICS | Rehovot, Israel | Organizing Committee |
| 2020 | 85th International Conference of ICS | Tel Aviv, Israel | Invited Lecture |
| 2021 | FCT, Conference on Food Chemistry | Paris, France | Invited Lecture |
| 2021 | International Conference Nano 2021 | Jerusalem, Israel | Invited Lecture |
| 2021 | International BatSheva workshop | Acre, Israel | Organizing committee |
| 2021 | Biopolymers Conference | Miami, USA | Invited lecture |
| 2021 | Agricon 2021 | Tel Aviv, Israel | Keynote lecture |
| 2021 | The Food System Dialogues | United Nations | Panel speaker Invited |
| 2022 | FOODTECHMEET 2022 | Edinburg,Scotland | Invited lecture |
| 2022 | 86th International Conference of ICS | Tel Aviv, Israel | Invited lecture |
| 2023 | Good Food Institute Conference | Tel Aviv, Israel | Invited Lecture |
| 2023 | PharmaForum 2023 | Vancouver,Canada | Invited lecture |
| 2024 | Conference of Israeli Polymers Society | Tel Aviv, Israel | Invited Lecture |
| 2024 | ICRS-PAT Advanced Polymers | Herzlia, Israel | Invited lecture |
| 2025 | 88th International Conference of ICS | Tel Aviv, Israel | Organizing session |
| 2025 | Medicinal Chemistry Meeting MCS-ICS | Rehovot, Israel | Invited lecture |

1. **Research Grants**

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| --- | --- | --- | --- | --- |
| **Year** | **Granting Source** | **Period** | **Role** | **Title (short)** |
| 2011 | EU Horizon | 3 | CI | Comprehensive approach to safe ready-to-eat food |
| 2012 | Ministry of Agriculture | 3 | PI | Covalent linkage of QAS to antimicrobial packaging |
| 2012 | Ministry of Agriculture | 3 | PI | New approaches toward advanced edible coatings |
| 2013 | BARD | 3 | CI | Antimicrobial nanoparticles for food |
| 2013 | Ministry of Agriculture | 3 | PI | Systems for controlled release of antifungal agents |
| 2014 | BARD | 3 | PI | Waste to Worth: from fungal byproduct |
| 2014 | Ministry of Agriculture | 3 | CI | Ecosafety alternatives for insect pest control |
| 2015 | "Kandel" | 3 | CI | Biological pesticides |
| 2016 | Ministry of Health | 2 | PI | Natural agents-based bioactive films for food |
| 2016 | KFCN (CIL) | 1 | PI | Modified polysaccharide for delivery of fertilizers |
| 2016 | Ministry of Agriculture | 3 | CI | Edible coatings for *Capsicum Annum L* pepper fruit |
| 2016 | Nizan, Food | 3 | CI | Bioactive Coating for Postharvest Fresh Produce |
| 2017 | Magnet Consortium | 3 | PI | Smart non-woven materials (SNOW) |
| 2017 | Nizan Nano | 3 | PI | Nanocapsules for directed delivery of plant nutrients |
| 2017 | Nizan Nano | 3 | PI | Agronanochemicals from agroindustrial wastes |
| 2017 | Ministry of Science | 3 | PI | Anti-adhesive materials |
| 2018 | Ministry of Agriculture | 3 | PI | Facilitation delivery of bioactive agents (Nanotech) |
| 2018 | Nizan Food | 3 | PI | Enriching cruciferous with health-promoting agents |
| 2018 | ICA | 3 | PI | Improve quality and storability of fresh produce |
| 2018 | BARD | 3 | PI | Nature inspired nanosanitizers for ready-to-eat fruits |
| 2018 | Ministry of Science | 3 | CI | Nano- Acoustic-Visual Robotic Manipulator |
| 2019 | Nizan, Agriculture | 3 | CI | Encapsulation of phenylalanine for flower treatment |
| 2019 | Nizan, Agriculture | 3 | CI | New delivery systems for biopesticides |
| 2020 | Nizan-China | 3 | PI | Development of edible coatings for fresh-cut |
| 2020 | Magnet Consortium | 3 | PI | Polysaccharides for plant vegetation (SMART) |
| 2021 | Ministry of Agriculture | 3 | PI | Improvement of fish feeding by biodelivery |
| 2022 | ICA | 1 | PI | Improve transportation storability of avocado |
| 2022 | Good Food Institute | 2 | PI | New tailored biomaterials to plant protein products |
| 2022 | Ministry of Innovation | 2 | CI | Green coatings of seeds from seed waste |
| 2022 | Magnet Consortium | 3 | PI | Black Fly Soldier as alternative protein source (BSF) |
| 2022 | Ministry of Agriculture | 2 | PI | Edible coatings for Israeli fruits |
| 2023 | NIFA-BARD-IIA | 2 | PI | Novel Packaging from waste of alternative protein |
| 2023 | Magnet Consortium | 3 | PI | Nature sourced additives for biomaterials (BioPlast) |
| 2024 | EU PRIMA | 3 | CI | Innovative active packaging for Mediterranean food |
| 2024 | Ministry of Innovation | 1 | CI | dsRNA against pathogenic fungi on crops |
| 2024 | FCS Israel-India | 3 | CI | Multi-functional biopolymer composite formulations |
| 2025 | Ministry of Science | 3 | CI | From dirty plastic to new biomaterials |
| 2025 | ICA foundation | 1 | CI | Nanovesicles to enhance plant defense mechanism |
| 2025 | National initiative | 5 | CI | Advanced treatment of tomatoes using biopolymers |
| 2025 | Ministry of Science | 3 | PI | Bio-preserving coatings |
| 2025 | Israel-China | 3 | PI | Inducing biosynthesis of nutraceutic agents in plants |
| 2025 | NIFA-BARD | 2 | coPI | Enhance health-promoting properties of galotannins |
| 2025 | ERA-NET | 3 | coPI | Biocompatible materials on nature-sourced polymers |

1. **Membership in Scientific Societies and Committees**

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| --- | --- |
| 2011- to date | American Chemical Society; Member |
| 2011- to date | Israel Chemical Society; Member |
| 2012 -to date | Israel Society of Crop and Vegetable Sciences; Member |
| 2014- to date | Israel Society for Biotechnology Engineering; Member |
| 2014 - 2018 | A European COST Network For Nano- and bio-colloidal materials; Member |
| 2014 - 2018 | A European COST Domain for Chemistry and Technologies; Member |
| 2016- to date | A European COST Domain for Active and Intelligent Food Package; Member |
| 2012 -2016 | [A European COST for Bacterial Colonization on Foods](http://www.cost.eu/domains_actions/fa/Actions/FA1202); Member |
| 2020-to date | A European Green Deal Consortium, from Farm to Fork; Invited Member |
| 2021-to date | United Nations, The Food system dialogues; Invited Member |
| 2022-to date | European COST, Bench to bed transitions Pharmacology; Invited Member |

1. **Editorial and Evaluation responsibilities**

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| --- | --- |
| 2017- to date | Editorial Board, Journal of Food Science and Nutrition Research (publisher: Fortune) |
| 2018- to date | The Chief Scientist Ministry of Agriculture, Nanotechnology Evaluation Committee |
| 2019 | International Olam and Agropolis Foundation, Evaluation Committee |
| 2021- to date | Editorial Board "Food Hydrocolloids" (publisher: Elsevier) |
| 2021- to date | Editorial Board "Coatings" (publisher: MDPI) |
| 2022 | Guest Editor in Special Issue of Sustainable Food Technology (publisher: RSC) |
| 2022 | Guest Editor of Thematic Collection (publisher: RSC) |
| 2023- to date | The tenure-track committee, ARO |
| 2023-to date | Israeli Ministry of Science; Research Proposal Evaluation Committee |

**Awards**

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| --- | --- |
| 2000 | Chemistry department Prize of Excellence, Bar-Ilan University |
| 2001 | Dean’s List of Excellence, Bar-Ilan University |
| 2002 | The Hias Fellowship for Outstanding students |
| 2007 | The OttoSchwarz Foundation Excellence Award |
| 2007 | The Dean’s Excellence List, The Weizmann Institute of Science |
| 2008 | John F. Kennedy Excellence Award |
| 2009 | Dean's Postdos Award for excellence, The Weizmann Institute of Science |
| 2010 | The Clore Fellowship, The Weizmann Institute of Science |
| 2015 | The New Researcher Prize, Agricultural Research Organization |
| 2017 | Awardee for Research in Food and Agriculture, Agropolis and Olam Prizes |
| 2019 | Excellent Scientist in Agriculture Award, AgroMashov, Israel |
| 2020 | Yigal Alon Prize for Contributions to the Community in the Field of Agriculture, Israel |
| 2022 | Excellent Researcher Prize, Agricultural Research Organization |
| 2024 | National Nominee for International Frontiers Planet Prize |

##### **Part II: PUBLICATIONS**

**1) Research articles**

1. **Poverenov, E**.,Gandelman,M., Shimon, LJW.,Rozenberg, H.,Ben-David, Y.,and Milstein, D.Nucleophilic De‐coordination and Electrophilic Regeneration of “Hemilabile” Pincer‐Type Complexes: Formation of Anionic Dialkyl, Diaryl, and Dihydride PtII Complexes Bearing No Stabilizing π‐Acceptors. Chemistry A European Journal. 2004, September; 10, pp 4673-4684. [Chemistry Multidisciplinary, IF: 5.0, 18/152 (Q1), cited 107.]
2. **Poverenov, E**., Gandelman, M., Shimon, LJW., Rozenberg, H., Ben-David, Y., and Milstein, D. [Pincer "hemilabile" effect. PCN platinum (II) complexes with different amine "arm length"](http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=3&SID=D5maa7pgZHFbGSgYJwp&page=1&doc=2). Organometallics. 2005, February; 24, pp. 1082-1090. [Chemistry Inorganic, IF: 3.9, 6/44 (Q1), cited 140].
3. **Poverenov, E**., Leitus, G., Shimon, LJW.,and Milstein, D.C-Metalated diazoalkane complexes of platinum based on PCP-and PCN-type ligands. Organometallics. 2005, October,24, pp. 5937-5944. [Chemistry Inorganic 3.9, 6/44 (Q1), cited 79.]
4. Gandelman, M., Naing, K.,Rybtchinski, B.,**Poverenov**, **E**.,Ben-David, Y., Ashkenazi, N.,Gauvin, RM.,and Milstein, D. A general method for preparation of metal carbenes via solution- and polymer-based approaches. Journal of American Chemical Society*.* 2005, October; 127, pp.15265-15272. [Chemistry Multidisciplinary; **IF:** **16.4**; 16/179 (Q1), cited 64.]
5. **Poverenov**, **E**.,Leitus, G.,and Milstein, D. Synthesis and reactivity of the methylene arenium form of a benzyl cation, stabilized by complexation. Journal of American Chemical Society. 2006, December; 128, pp. 16450-16451. [Chemistry Multidisciplinary; IF: **16.4**; 16/179 (Q1), cited 16.]
6. **Poverenov**, **E**.,and Milstein, D.Formation of transition metal carbenes using haloalkylzinc reagents.ChemComm*.*2007, January; 30, pp3189-3191. [Chemistry Multidisciplinary IF: 6.2 17/152 (Q1) cited 12.
7. **Poverenov**, **E**.,Shimon, LJW,and Milstein, D. Quinone methide generation based on a cis-(N, N) platinum complex. Organometallics. 2007, March; 26, pp. 2178-2182. [Chemistry Inorganic, IF: 3.9, 6/44(Q1), cited 7.]
8. Schwartsburd, L.,**Poverenov, E**. Shimon, L. J. W., and Milstein, D. Naphthyl-based PCP platinum complexes. Nucleophilic activation of coordinated CO and synthesis of a Pt (II) formyl complex. Organometallics. 2007 April; 26, pp. 2931-2936. [Chemistry Inorganic, IF: 3.9; 6/44 (Q1) cited 36.]
9. Vuzman, D., **Poverenov, E.**, Diskin-posner, Y.,Leitus, G., Shimon, LJW.,and Milstein, D. Reactivity and stability of platinum (II) formyl complexes based on PCP-type ligands. The significance of sterics. DaltonTransactions*.* 2007, October; 48, pp 5692-5700. [Chemistry Inorganic, IF: 4.4; 7/44 (Q1), cited 25].
10. **Poverenov**, **E**., Efremenko, I., Frenkel, A., Ben-David, Y., Shimon, LJW., Leitus, G.,Martin, JML,Konstantinovsky, L., andMilstein, D. Evidence for a terminal Pt (iv)-oxo complex exhibiting diverse reactivity.Nature. 2008, October; 455, pp1093-1096. [Multidisciplinary**, IF: 69.5**; 1/73 (Q1), cited 219].
11. Vuzman, D., **Poverenov, E**.,Shimon, LJW,Diskin-Posner, Y.,and Milstein, D. Cationic, neutral, and anionic platinum (II) complexes based on an electron-rich PNN ligand. New models of reactivity based on pincer hemilability and dearomatization. Organometallics. 2008 May; 27, pp 2627-2634. [Chemistry Inorganic, IF: 3.9, 6/44 (Q1), cited 78.]
12. **Poverenov**, **E**.**,**Iron, MA,Gandelman, M.,Ben-David, Y.,and Milstein, D. Anionic d (8) Alkyl Hydrides - Selective formation and reactivity of cis-Pt (II) methyl hydride. European Journal of Inorganic Chemistry. 2010, April; 13, pp. 1991-1999. [Chemistry Inorganic, IF: 2.5, 11/44 (Q1), cited 5.]
13. **Poverenov**, **E**.,Efremenko, I.,Leitus, G.,Martin, JML, and Milstein, D.Benzyl Cation Stabilized by Metal Complexation. Relative Stability of Coordinated Methylene Arenium, π-Benzylic, and σ-Benzylic Structures. Organometallics.2013, August; 32, pp. 4813-4819. [Chemistry Inorganic, IF: 3.9, 6/44 (Q1), cited 9].
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**2) Review articles**

1. Arnon-Rips, H.and **Poverenov, E**.\* [Improving food products' quality and storability by using Layer by Layer edible coatings](https://www.sciencedirect.com/science/article/pii/S0924224416301753). Invited Review. Trends in Food Science and Technology, 2018, May; 75, pp. 81-92. [Food Science and Technology, **IF:** **16.0,** 2/143 (Q1), cited 176.]
2. Yana, J., Ban, Z., Lu, H.,Li, D.,**Poverenov, E.**,Li, L.,and Luo, Z\*. The aroma volatile repertoire in strawberry fruit: a review. The Journal of the Science of Food and Agriculture, 2018, September; 98*,* pp.4395-4402*.* [Agriculture Multidisciplinary, IF: 4.1; 12/59 (Q1), cited 185.]
3. **Poverenov, E.**\*and Klein M.Formation of contact active antimicrobial surfaces by covalent grafting of quaternary ammonium compounds.Invited Review. Colloids & Surfaces B. 2018, September; 169, pp.195-205. [Biophysics, IF: 6.0, 11/72 (Q1), cited 138.]
4. Klein, M. and **Poverenov, E.**\*Natural biopolymer-based hydrogels for use in food and agriculture. The Journal of the Science of Food and Agriculture, 2020, April; 100, pp. 2337. [Agriculture Multidisciplinary, IF: 4.1; 12/59 (Q1), cited 261.]
5. Cohen, E., and **Poverenov, E**.\* Hydrophilic chitosan derivatives: Synthesis and applications. Chemistry A European Journal, 2022, September; 28. pp. e202202156. [Chemistry Multidisciplinary, IF: 5.0, 18/152 (Q1), cited 68.]

**3) Books and book chapters**

1. **Poverenov**, **E**. Milstein, D.\* Quinone methide stabilization by metal complexation. In Reactive Intermediates Chemistry and Biology (Rokita S.E. ed.) 2009, Publisher John Wiley & Sons, NJ, USA.

1. **Poverenov, E.,** Milstein, D.\* Noninnocent Behavior of PCP and PCN Pincer Ligands of Late Metal Complexes. In Organometallic Pincer Chemistry. Topics in Organometallic Chemistry (van Koten, G., Milstein, D. eds). 2013, Publisher Springer, Berlin,Germany.(cited 48)
2. Arnon-Rips, H., Porat, R., **Poverenov, E**.**\*** Biopolymers-embeded nanoemulsions and other nanotechnological approaches for safety, quality and storability enhancement of food products: active edible coatings and films.In Emulsions.(Grumezescu, A.M. ed.). 2016, Publisher Elsevier Academic Press. Cambridge, Massachusetts, USA. (cited 32)

**4) Patents**

1. **Poverenov, E**., Rutenberg, R., Cohen, Y. (2019) Omniphilic nano-vesicles based on modified polysaccharides for delivery of active agents. PCT/IL2019/050329 National
2. **Poverenov, E**., Klein, M., Khil, S. (2020) Methods of merging cyclodextrin hosts with nonwoven finishing to form smart fabrics containing various beneficial agents and products made from the methods PCT/IL2020/051199
3. **Poverenov, E**., Arnon-Rips, H., Porat, R., Eshel, D., Tepper-Bamnolker, (2020) Emulsified film compositions and methods to suppress sprouting of potato tubers. PCT/IL2020/051282.
4. **Poverenov, E**. (2021) Protected plants and methods of obtaining them. PCT/IL2021/050293.
5. **Poverenov E**. Alkan. N. (2021) Edible Coatings for Maintaining Fruit Quality. PCT/IL2021/050956
6. **Poverenov E**, Cohen G (2022) Biocompatible systems for effective transdermal delivery of insulin based on flexible nanocarriers. PCT/IL2022/42923
7. **Poverenov, E.** Itzhakov, R (2023) Hydrogel compositions and uses thereof.PCT/CA2020/050927
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**PART III: RESEARCH ACHIEVEMENTS**

**Elena Poverenov’s research agenda** is to introduce advanced approaches from materials chemistry and nanotechnology into the fields of plant science, food, biomedicine, and agriculture. Her lab operates at the intersection of materials science and biology. Elena's primary expertise lies in biopolymers, particularly carbohydrate materials such as polysaccharides, oligosaccharides, and glucoside conjugates. A deep understanding of the fundamentals of carbohydrate chemistry enables their rational modification to design advanced materials with significant scientific and practical potential. Her group has introduced fundamental new concepts in carbohydrate research that have made a significant global scientific impact. These discoveries have led to a wide array of applications, including foliar plant treatment, activation of natural plant defense mechanisms, *in plant* biosynthesis of health-promoting compounds, genome-free plant editing, food quality and safety improvement, valorization of agri-food waste, transdermal drug delivery and tissue engineering.

Below are examples from the three major directions of Elena Poverenov’s research: (1) advanced biocompatible delivery systems, (2) new biomaterials with advanced functionality; (2) active coatings.

### *1) Advanced Delivery Systems for Food, Agriculture, and Biomedical Applications*

Poverenov’s lab is developing carbohydrates-based delivery systems with advanced features such as stimuli-responsive activity, auto-adjustment, and site-specific targeting. These systems increase the effectiveness of active agents while reducing their required quantities, resulting in greener/safer protocols and reduced production costs. Below are several key examples:

**(a)** The lab developed a strategy for modifying polysaccharides that leads to the spontaneous formation of nanocarriers capable of encapsulating both hydrophilic and hydrophobic payloads in aqueous and lipid environments. These soft biocarriers demonstrated remarkable self-adjustment and the ability to cross biological barriers such as plant cuticula, plant cell wall and human skin (41, 42, Patent 1). For instance, foliar delivery of nutrients and protectants is more effective than root-based delivery but is limited by the cuticle's lipid barrier. The developed carriers enabled transcuticular transport of hydrophilic nutrients (49, 77, 78) and proved efficient for transdermal drug delivery (46, 59, Patent 6).

**(b)** The team discovered a new non-classical encapsulation mode in β-cyclodextrin that enables hosting small polar molecules (28). This was applied in developing host-guest delivery systems based on oligosaccharides (29, Patent 2), such as solid-state propionic acid delivery for grains and silage, solving volatility issues of this effective antifungal agent (30, 34).

**(c)** The lab synthesized a new delivery platform based on dynamic covalent linkages, which are only activated by specific triggers, thus preventing spontaneous release of active agents. This was successfully applied for the precise release of volatile antimicrobials for the protection of perishable and dry produce (26, 50).

**(d)** Composite delivery systems were also developed, such as combining biopolymers with layered double hydroxide nanoclays to deliver sensitive agents like dsRNA (54, 60, 67, 81, Patent 8).

**(e)** A recent direction includes developing novel biocompatible crosslinkers for gels and nanogels via rational modification of oxidized saccharides and nucleosides. These gels demonstrate advanced delivery capabilities, including intracellular delivery for gene editing in plants. Such delivery allows transient expression without integration into the host genome. The nanogels offer high encapsulation capacity, payload protection, and the ability to co-deliver different compounds (72, 73, 77, Patent 7).

### *2) New Biomaterials with Advanced Functionality*

Poverenov’s lab utilizes carbohydrates and active agents derived from agri-food waste to develop sustainable alternatives for food packaging, agricultural films, and new biomaterials (37, 38, 40, 43).

**(a)** The lab recently initiated the development of oligosaccharide-based treatments that trigger natural biochemical processes in plants (63, 65). Oligosaccharides act as signaling molecules to activate plant self-defense mechanisms and promote *in plant* synthesis of beneficials compounds for producing agricultural produce rich with nutraceuticals. For instance, in plant-derived polyphenols have antioxidative and anti-aging properties and were found to protect against cancer, cardiovascular disease, diabetes, osteoporosis, and neurodegenerative disorders.

**(b)** Biocompatible active gels were developed for agricultural and biomedical use, including crosslinked gels with tunable structures serving as growth media for agriculture and skin-healing materials in medicine (72, 73, 77, 80, 83).

**(c)** The team also develop active packaging materials combining polysaccharides and natural bioactive agents that enhance food safety and extend shelf life (17, 23, 27, 31, 36, 39, 44, 53, 56, 61, 62, 66, 75).

For instance, they developed polysaccharide patches for the controlled release of protectants that can be added at various stages, from storage facilities to household packaging, to extend food freshness (35, 45, 70, 80, Patent 3).

**(d)** New synthetic routes for modifying polysaccharides, oligosaccharides, and glucoside conjugates compatible with agriculture, food, and medicine have been developed. These tailored biomaterials exhibit specific activities for various applications (55, 64, 68, 71, 76, 82).

### *3) Active Coatings*

Reducing food loss via safe, sustainable, and commercially is a global priority. Poverenov’s lab developed active edible coatings by applying carbohydrate materials science and nanotechnology:

**(a)** Edible coatings based on dietary fiber polysaccharides that significantly extend the shelf life of fresh produce (by 240% for bell peppers, 350% for avocados, and 700% for fresh-cut fruit) and reduce microbial counts by up to 6 logs were developed (19, 20, 21, 22, 24, 57, Patent 5). Probiotic coatings are also being developed to stimulate plant immunity and natural protection mechanisms (55, 64, 65).

**(b)** A novel direction involves "skin-like" coatings to protect plants during early growth stages (74, 79). Seedlings and sprouts are vulnerable to phytotoxicity, and current treatments are either ineffective or absent. The elastic biopolymer coatings developed were found to efficiently deliver and distribute active agents, protect young plants from phytotoxic effects and provide passive protection against micro-wounds, dehydration, and thermal stress (Patent 4)

**General Achievements**

***Pioneering Research Field***

Elena Poverenov established the new research field in Volcani Institute "Advanced Materials and Nanotechnology for Plant, Agriculture, and Food". Due to numerous scientific and applicative achievements and successes, this field become one of the main strategic directions in Volcani and a bunch of new researchers who expanded this field to a wide range of topics has been recruited hired.

At 2018, along with other scientists and a help of administration, Elena initiated and established a first Israeli Center for Agro-Nanotechnology and Advanced Materials, ANAV that brings together researches from different disciplines. Thanks to this center`s activity, new ideas, collaborations and achievements in the field of agro-nanotechnology arose in Israel and abroad.

***Scientific Recognition***

Poverenov’s group has introduced several impactful concepts that have influenced material and agricultural sciences worldwide. She has published over 80 articles in top-tier international journals, among them ACS Nano, Green Chemistry, ACS Applied Materials and Interfaces, Food Chemistry, Food Hydrocolloids, Carbohydrate Polymers, invited reviews and book chapters. Poverenov's papers are actively cited (about 5,000 citations) and highlighted as milestones. The papers are published in journals ranked in the Q1 level of high impact factors in their respective disciplines. She has presented at ~50 conferences (34 invited/keynote talks) and organized 7 international and 4 local conferences.

For outstanding research achievements, Elena Poverenov received numerous prizes and awards, among them Agropolis and Olam International Prize (2017), AgroMashov Award (2019), Yigal Alon Prize for Community Impact in the Field of Agriculture (2020), Researcher of the Year Prize of ARO (2022). At 2024 Elena was selected as a national nominee for International Frontiers Planet Prize.

***Team Leadership***

Elena Poverenov attracts excellent students from Israel and abroad managing a successful, highly motivated professional team. Elena mentored 16 MSc students (12 have already graduated), 10 PhD students (6 graduated), 17 postdoctoral fellows. Her students received 11 prizes for excellent research. Most of her alumni graduated "cum laude" and all her PhD students graduated with "Papers-based Thesis." Four of her former postdocs have received independent academic positions and fifth is currently applying for PI position.

***Research Funding***

Elena won 42 national and international research grants (25 as principal investigator), totaling approximately $12 million from numerous funding agencies among them BARD, BARD-NIFA, EU, ICA, Israel-China, and Israeli ministries of Health, Science, Innovation and Agriculture.

***Collaborations***   
Elena is integrated in numerous multidisciplinary research programs in Israel and worldwide and have fruitful collaborations with experts in chemistry, physics, biology, medicine, plant science and food science.

***Impact*** *to industry*

She actively strives to implement her discoveries and maintain tight contacts with industry to be updated about actual problems in the field, present her work at industrial/farmers' meetings and participate in industrial consortia. Elena is managing several initiatives with industrial companies on postharvest treatment, plant nutrition, protection of early-growth-plants, promotion of phytonutrient production in crops and valorization of agrifood waste.