Name: Amir Raz **Date: 8.2024**

CURRICULUM VITAE

1. Personal Details

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2. Higher Education

A. Undergraduate and Graduate Studies

Period of Study	Name of Institution and Department	Degree	Year of Approval of Degree
2006 – 2014	The Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture, The faculty of agriculture, The Hebrew University of Jerusalem, Israel	**Doctor of Philosophy (Direct Track) – Horticulture and genetics**	2015
2002 – 2005	The faculty of sciences and technology and, Tel-Hai Academic College, Israel.	. **Bachelor of Science - Biotechnology**	2005

B. Post-Doctoral Studies

Period of Study	Name of Institution, Department and Host	Degree	Year of Completion
2015-2018	Department of Plant science, Weizmann institute of science, Israel. Host: Prof. Avraham Levy	**Post-Doctorate training – genetics**	2018

3. Academic Ranks and Tenure in Institutes of Higher Education

Dates	Name of Institution and Department	Rank/Position
2019- to date	Department of Plant science, MIGAL. Host – Prof. Martin Goldway	Research associate.
2015-2018	Department of Plant science, Weizmann institute of science, Israel. Host: Prof. Avraham Levy	Post-Doctorate training

4. Offices in Academic Administration

2022 - to date - Member at the committee for genomic resources of MIGAL.

5. Scholarly Positions and Activities outside the Institution

6. Participation in Scholarly Conferences

a. **Active Participation**

Date	Name of Conference	Place of Conference	Subject of Lecture/Discussion	Role
2019	ISPS	Sede-boker, Israel	Using VIGS to increase meiotic crossing over in Wheat.	Oral presentation
2016	I-CORE Breaking yield barriers of crop plants	Ein gedi, Israel	Mechanism of the self-incompatibility fertilization system in Rosaceae.	Poster presentation
2014	ILANIT	Eilat, Israel	Involvement of F-Box genes in the self-incompatibility fertilization system in apricot (*Prunus armeniaca*).	Poster presentation
2013	EMBO	Riva del-Garda, Italy	Involvement of F-Box genes in the self-incompatibility fertilization system in apricot (*Prunus armeniaca*).	Poster presentation
2011	ILANIT	Eilat, Israel	Mechanism of the self-incompatibility fertilization system in Rosaceae.	Poster presentation
2007	ILANIT	Eilat, Israel	SFB-based S-haplotyping of Apricot (Prunus armeniaca) with dHPLC.	Poster presentation

7. Invited Lectures\ Colloquium Talks

Date	Place of Lecture	Name of Forum	Presentation/Comments
2022	Webinar	The National Center for Genome Editing	Self-excising T-DNA for genome editing of trees.

		in Agriculture consortium.	

8. Research Grants

a. Grants Awarded

Role in Research	Co-Researchers	Topic	Funded by/ Amount	Year
PI	Martin Goldway, Dani Gamrasni	Improving avocado yields under hot climate conditions by treating the bloom with an ethylene inhibitor.	Ministry of Agriculture 120000 NIS/Year	2023-2025
Co-PI	Michal Akerman-Lavert (PI), Omer Crane, Martin Goldway, Shaul Naschitz	Breeding and acclimation of new sweet cherry cultivars with low chilling requirements and high fruit quality, adapted to climate changes.	Ministry of Agriculture 200,000 NIS /year	2022-2032
PI	Martin Goldway, Dani Gamrasni	Development of ornamentals with delayed senescence.	ICA-MIGAL accelerator 70000 NIS	2023
Co-PI	Martin Goldway (PI), Dani Gamrasni	Increasing yield of Hass Avocado by enhancing self-fertilization due to inhibition of ethylene production by the flower.	Ministry of Agriculture 40,000 $/ year	2020-2023
PI	Avraham Levy, Martin Goldway	Development of self-excising T-DNA cassette using CPF1 for non-transgenic knockout mutation in plants. Under the Genome editing technologies Unit (GetU).	Ministry of Agriculture 15000 NIS /year	2020-2024
PI	Martin Goldway	S-RNase Mediated Target Mutagenesis in Pollen.	MIGAL inner funding 40000 NIS	2020

b. Submission of Research Proposals – Pending

Role in Research	Co-Researchers	Topic	Funded by	Year

c. Submission of Research Proposals – Not Funded

Role in Research	Co-Researchers	Topic	Funded by	Year	Score
Co_Pi	Ehud Shachar (PI)	Development of autologous attenuated avian reovirus vaccine for poultry	Ministry of Agriculture	2023	7.8
PI	Navot Galpaz, Yori Leshem, Simon Michaeli, Sharona Elgavish	Development of heat tolerant and salinity competent banana plants by genome editing of elite cultivars.	Ministry of Agriculture	2022	7.09
PI	Martin Goldway	Improving avocado yields under hot climate conditions by treating the bloom with an ethylene inhibitor	Ministry of Agriculture	2022	6.37
Co_PI	Samuel Bocobza	Development of ornamentals	Ministry of Agriculture	2022	8.63

	Dani Gamrasni	with delayed senescence			
PI	Michal Liberman	VIGS-induced genome-wide Epigenetic changes as a novel approach for wheat breeding	Ministry of Agriculture	2019	5.05

9. Scholarships, Awards and Prizes

2021 - Best lecturer in the biotechnology program, faculty of sciences, Tel Hai College.

2016 - 2018 - The Sir Charles Clore Postdoctoral fellowship. Weizmann Institute of Science. 27000 $/Year

10. Teaching

a. Courses Taught in Recent Years

Year	**Name of Course**	**Type of Course** **Lecture/Seminar /** **Workshop/High Learn Course/ Introduction Course (Mandatory)**	**Degree**	**Number of Students**
2021 – to date	Modern Agriculture	Lecture	Undergraduate	25-35
2019- to date	Advanced methods in biology research	Laboratory	Graduate	12-23
2019- to date	Introduction to genetics	Lecture	Undergraduate	200-250
2018-2019	Advanced seminar	Seminar	Undergraduate	20
2016- to date	Molecular genetics	Lecture	Undergraduate	100-150

2012- to date	Basic bioinformatics in introduction to breeding	Lecture	Undergraduate	25-35
2006- to date	Molecular genetics lab	Laboratory	Undergraduate	20-60
2006- to date	Microbiology lab	Laboratory	Undergraduate	20-60

b. **Supervision of Graduate Students**

Name of Student	**Title of Thesis**	**Degree**	**Date of Completion /in progress**	**Students' Achievements**
Dr. Prashanti Patel Co-supervision with Dr. Navot Galpaz	Improving abiotic stress resilience in banana by genetic engineering	Post-Doc	In progress	
Danielle Ben-Abu Co-supervision with Prof. Martin Goldway	Self-incompatibility mechanism in Quince.	M.Sc	in Progress	
Dr. Kumaravel Marimuthu	Improving abiotic stress resilience in banana by genetic engineering	Post-Doc	5.2024	
Shai Yifrach Co-supervision with Prof. Martin Goldway	Methylation in wheat and its possible contribution to breeding.	M.Sc	in Progress	Final stage of writing
Ben Sivan Co-supervision with Prof. Martin Goldway	Applying the CRISPR/CAS9 system to trees.	M.Sc	9.2022	

11. Miscellaneous

12. Professional Experience

PUBLICATIONS

Citations: all – 169, 5 years - 120

H-Index: all – 9, 5 years - 6

A. Ph.D. Dissertation

Pollination in apricot (*Prunus armeniaca*): bees' behavior and genetic aspects of the fertilization mechanism. The Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture, The faculty of agriculture, The Hebrew University of Jerusalem, Israel. 7.2016.

Supervisors: Prof. Martin Goldway, Prof. Refael A. Stern, Prof. Sharon Shafir

B. Articles in Refereed Journals

Published

1. **Raz A**, Goldway M, Sapir G, Stern RA. (2022). "Hong Long" Lychee (Litchi chinensis Sonn.) Is the Optimal Pollinizer for the Main Lychee Cultivars in Israel. *Plants*. 31;11(15):1996. I.F – 4.8, Cited – 4. Cite Score Rank. Quartile – Q1.
2. Tadmor Y, **Raz A**, Reikin-Barak S, Ambastha V, Shemesh E, Leshem Y, Crane O, Stern RA, Goldway M, Tchernov D, Liran O. (2021). Metamitron, a Photosynthetic Electron Transport Chain Inhibitor, Modulates the Photoprotective Mechanism of Apple Trees. *Plants*. 17;10(12):2803. I.F – 4.8, Cited – 1 . Cite Score Rank. Quartile – Q1.
3. **Raz, A.,** Dahan-Meir, T., Melamed-Bessudo, C., Leshkowitz, D., and Levy, A.A. (2021). Redistribution of Meiotic Crossovers Along Wheat Chromosomes by Virus-Induced Gene Silencing. *Frontiers in Plant Science*. 11:2332. I.F – 4.4, Cited – 29 . Cite Score Rank Plant science 20/431. Quartile – Q1.
4. Gamrasni, D., Erov, M., Saar, L., **Raz, A.,** Glikman, M., Sonawane, P.D., Aharoni, A., and Goldway, M. (2020). The isocitrate dehydrogenase 1 gene is associated with the climacteric response in tomato fruit ripening. *Postharvest Biology and Technology*. 166:111219. I.F – 4.3, Cited – 13 . Cite Score Rank Horticulture 1/84. Quartile – Q1
5. Gamrasni, D., Feldmesser, E., Ben-Arie, R., **Raz, A**., Asiag, A.T., Glikman, M., Aharoni, A., and Goldway, M. (2020). Gene expression in 1-methylcyclopropene (1-MCP) treated tomatoes during pre-climacteric ripening suggests shared regulation of methionine biosynthesis, ethylene

production and respiration. *Agronomy*. 10(11):1669. I.F – 2.6, Cited – 13. Cite Score Rank Agronomy 18/91. Quartile – Q1.

6. **Raz, A**., Stern, R. A., Shafir, S., & Goldway, M. (2014). Reduced yields of 'Earlicot' apricot (*Prunus armeniaca*) grown in a relatively hot climate and methods to improve flowering intensity and yield. *Journal of Horticultural Science & Biotechnology*, *89*(5): 495–500. I.F – 0.64, Cited – 2. Cite Score Rank Horticulture 28/76. Quartile – Q2.
7. Stern, R. a., Doron, I., Redel, G., **Raz, A**., Goldway, M., & Holland, D. (2013). Lavi 1-A new Pyrus betulifolia rootstock for "Coscia" pear (*Pyrus communis*) in the hot climate of Israel. *Scientia Horticulturae*, *161*: 293–299. I.F – 1.96, Cited – 18. Cite Score Rank Horticulture 6/76. Quartile – Q1.
8. Nyska, R., **Raz, A**., Baras, Z., Shafir, S., Goldway, M., & Schneider, D. (2013). Self-compatibility in loquat (*Eriobotrya japonica L*.) is possibly due to S6-RNase mutation. *Scientia Horticulturae*, *161*: 43–48. I.F – 1.96, Cited – 12. Cite Score Rank Horticulture 6/76. Quartile – Q1.
9. **Raz, A**., Goldway, M., & Stern, R. A. (2010). Uniconazole reduces fruit set and hand-thinning, and increases fruit size in "Canino" apricot (*Prunus armeniaca L*.). *Journal of Horticultural Science and Biotechnology*, *85*(1): 30–34. I.F – 0.64. Cited – 1. Cite Score Rank Horticulture 28/76. Quartile – Q2.
10. Zisovich, A. H., **Raz, A**., Stern, R. A., & Goldway, M. (2010). Syrian pear (Pyrus syriaca) as a pollinator for European pear (*Pyrus communis*) cultivars. *Scientia Horticulturae*, *125*(3): 256–262. I.F – 1.96, Cited – 13. Cite Score Rank Horticulture 6/76. Quartile – Q1.
11. Stern, R. A., **Raz, A**., Applebaum, S., Meiri, A., & Goldway, M. (2009). Uniconazole is an effective blossom thinner for "Bing" cherry (*Prunus avium*). *Scientia Horticulturae*, *122*(3): 417–420. I.F – 1.96, Cited – 10. Cite Score Rank Horticulture 6/76. Quartile – Q1
12. **Raz, A**., Stern, R. A., Bercovich, D., & Goldway, M. (2009). SFB-based S-haplotyping of apricot (*Prunus armeniaca*) with DHPLC. *Plant Breeding*, *128*(6): 707–711. I.F – 1.66, Cited – 10. Cite Score Rank Plant Sciences 110/234. Quartile – Q2.
13. Marimuthu, K., Patel, P., Weil, A., Kozin, L., Barak, S. R., Gortikov, M., Kozin, L., Raikin-Barak, S., Gortikov, M., Peres, M., Or, G., Bakhshian, O., Elingold, I., Tsarfaty, A., **Raz, A**., Galpaz, N. (2024). Seasonal impact on embryogenic callus induction under subtropical conditions in banana (Musa spp. cv. Grand Naine [AAA]). *Plant Cell, Tissue and Organ Culture*, 158(1): 1-11. I.F – 2.3, Cited – . Cite Score Rank Horticulture 14/115. Quartile – Q1.
14.

Accepted for Publication

14.

E. Articles or Chapters in Scientific Books

Published

1. Goldway, M., **Raz, A**., Stern, R.A. 2019. An updated view on fertilization and pollination in European pears (Pyrus communis). In: A.R.Luz (Ed.) Pear: Cultivars production and harvest. Nova Science Publishers Inc., New York, USA.

F. Articles in Conference Proceedings

Published

1. Flaishman, M.A., Peer, R., **Raz, A**., Cohen, O., Izhaki, K., Bocobza, S., Lama, K., Pliner, M., and Levy, A. (2020). Advanced molecular tools for breeding in Mediterranean fruit trees: genome editing approach of Ficus carica L. *Acta Horticulturae*, 1280:1–10. I.F – 0.23, Cited – 5 . Quartile – Q4.
2. Zisovich, A. H., **Raz, A**., Stern, R. A., & Goldway, M. (2012). S -Genotyping of syrian pears (*Pyrus syriaca*) for the purpose of finding new potent pollinators of the european pear (*Pyrus communis*). *Acta Horticulturae*, *967*: 181–190. I.F – 0.23, Cited – 5. Quartile – Q4.
3. Goldway, M., Zisovich, A., **Raz, A**., & Stern, R. A. (2008). Understanding the gametophytic self-incompatibility system and its impact on European pear (*Pyrus communis L.*) cultivation. *Acta Horticulturae*, *800*: 109–117. I.F – 0.23, Cited – 8. Quartile – Q4.

I. Other Publications

1. Goldway, M., Stern, A. R. Schneider, D., **Raz, A**., and Zisovich, A. (2014). Improving fertilization efficiency leads to increased yields and fruit quality of orchards in the Galilee. Israel Agriculture 18-19 (Hebrew)
2. Zisovich, A., **Raz, A**., Goldway, M., Sapir, G. Doron, I. Ravid, Z.and Stern, R.A., (2010). Identification of an optimal pollinator for Spadona and Coscia pears to improve fertility and fruit size. Alon Hanotea 63:924-927 (Hebrew)
3. **Raz, A**., Goldway, M., Shafir, S. and Stern, M (2008). The importance of fertilization for the impruvment of the apricot cultivar 'Early cot'. Alon Hanotea 62:152-155 (Hebrew).
4. **Raz, A**., Goldway, M., Shafir, S. and Stern, M (2008). Fertility problems in the apricot cultivar 'Goldrich'. Alon Hanotea 62:156-159 (Hebrew).

K. Submitted Publications

Submited

1. Asiag-Tabatznik, A., Shlomovich, T., Gamrasni, D., Harpaz-Saad, S., Goldway, M., **Raz, A**. (2024). Increasing avocado (Persea Americana) yield by applying 1-MCP an ethylene inhibitor during the flowering period and at the early stages of fruitlet development. Scientia horticulturae.

2. Dahan-Meir, T., Ellis, T.J., Mafessoni, F., Sela, H., Manisterski, J., Avivi-Ragolsky, N., **Raz, A.**, Feldman, M., Anikster, Y., Nordborg, M., Levy, A.A. (2023). Stability of the genetic structure of a wild wheat population across microhabitats over 36 years. *Molecular Ecology*.

L. Summary of my Activities and Future Plans

I chose to study topics that are relevant to the Israeli agriculture and could provide, in addition to new basic knowledge also solutions with a broad impact on agricultural problems. My research is focused on two main topics. The first is the fertilization mechanisms of fruit trees. Since my PhD, I am involved in studying the self-incompatibility mechanism that controls fertilization capability in trees of the Rosaceae family, including apple, pear, apricot and Quince. The Rosaceae have an S-RNase-based self-incompatible (SI) fertilization system. SI is a reproductive barrier that prevents inbreeding and promotes outcrossing (resulting in increased genetic variation among the progeny). Therefore, these orchards contain at least two cultivars that are planted adjacently and pollinate each other. However, despite synchronous flowering of the cultivars and intense honeybee activity on the trees, farmers have reported that in some orchards the yield was low. Using a molecular genetic approach, which was uncommon for fruit trees at the time, first in apples and then in pears, we were able to determine that the low yields were due to genetic-driven partial incompatibility between cultivars. Our goal is to understand the molecular basis of this mechanism at a fundamental level and to assist farmers in improving their crops through genotyping. We genotyped all cultivars of all commercial Rosaceae species in Israel to advise farmers of the right cultivar combination in the orchard. In addition, we are engaged in an effort to develop a self-fertile apple cultivar by target mutagenesis of the S-RNase gene using CRISPR technology. In parallel, we started investigating quince – a Rosaceae specie close to apple - which is known to be self-fertile, but genetic reason for this phenotype was not known. We sequenced the whole genome of two quince cultivar and found a large deletion in the S-locus, including the S-RNase gene. The quince genomic data will allow us to further investigate different treats of quince, including aspects of rootstocks since quince is widely used as rootstock for pears.

In the last five years, we have been studying also the flowering mechanism of avocado. Avocado is among the most important fruits worldwide and has become very important to Israeli agriculture producing over 220 tons a year (50% are exported) and new orchard are being planted each year. Increasing the yield of avocado is an essential challenge. We are investigating the molecular basis of the flowering system and examining new approaches to increase avocado fruit set and yield. We have developed markers so that we can detect self and cross-fertilization, and recent results, from experiments investigating the role of ethylene in the system, indicate that applying an ethylene inhibitor at anthesis extends the female phase thereby increasing the fertilization duration leading to a significant rise in fruit-set and yield.

The second main topic of my research is genetic editing of fruit trees. To address future food supply challenges, we need to accelerate breeding abilities particularly for fruit trees. Tree breeding is very slow and moreover there are no advanced means for improving

existing elite cultivars. This issue can be achieved only through genetic engineering. Hence, our focus is on the two main bottlenecks of genetic engineering in trees: plant regeneration from tissue culture and transgene-free editing. We are developing new cutting-edge technologies for these goals in fruit trees.

The ability to regenerate a whole plant from transformed tissue is fundamental to all genetic engineering of plants. However, in trees, this process is highly inefficient, time-consuming, and existing protocols are usually cultivar specific. To address this problem, we are incorporating different Developmental Regulator genes (DRs) that have been shown to improve regeneration in model plants. Additionally, we are working on an "in-planta" transformation approach, where transformation and regeneration are applied to mature plant organs. This approach could significantly reduce the time required by bypassing the tissue culture stage.

Another challenge in genetic editing is the presence of the transgene in the plant genome, which classifies the plant as a Genetically Modified Organism (GMO). GMOs are not permitted for cultivation in many countries. To overcome this issue, we are developing methods such as self-excising DNA cassettes, long-distance mobile RNA, and pollen transfection. These methods are combined with various CRISPR systems for gene-specific editing.

These advancements will enable us to introduce new traits such as stress resilience, disease resistance, improved yields, and reduced costs into elite cultivars efficiently and robustly. For example, in the last few years, in cooperation with Dr. Navot Galpaz, we mange to develop a banana cultivar which shows high resistance to the Panma disease – a fungus disease that destroys banana orchards worldwide – by applying genetic engineer tools.

Future plans

Our goal is to become a leading hub of genetic solutions for agriculture and environmental challenges in fruit trees. Our research is motivated by real problems arising from the field, such as abiotic stress due to climate change, new diseases, fertilization barriers, and fruit quality issues. We will address these challenges by combining field experiments with cutting-edge genetic and genomic approaches to understand the molecular basis of each problem and possible ways to resolve it. This will allow us to apply our unique gene editing and genome engineering tools in developing improved, better-adjusted new cultivars to cope with the challenging future needs of Israel and global food supply.