

Part I: CURRICULUM VITAE

1. Personal

Department of Fruit Tree Sciences, Institute of Plant Sciences

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Dates	Description
1966	Born in Moshav Lachish, Israel

2. University Education and Additional Training

Dates	Description
1987 – 1990	B.Sc. in Life Sciences at The Faculty of Life Sciences, Tel Aviv University
1990 – 1992	M.Sc. in Plant Sciences at The Department of Plant Sciences, Faculty of Life Sciences, Tel Aviv University Title of thesis: "Improving the honey bee efficiency of melon pollination in greenhouses" Supervision by: Prof. D. Eisikowitch
1993 – 1999	Ph.D. in Agriculture at The Department of Horticulture, Faculty of Agriculture, The Hebrew University of Jerusalem Title of thesis: "Pollenizers, pollinators and pollination in mango" Supervision by: Prof. S. Gazit and Dr. H. Degani (ARO)
1999 – 2000	Postdoctoral position at The Department of Plant Sciences, Faculty of Life Sciences, Tel Aviv University with Prof. D. Eisikowitch and Prof. R. Stern (MIGAL) Research subject: "Pollination of 'Starking' apple"
2002 – 2003	Postdoctoral position at The B. Triwaks Bee Research Center, Department of Entomology, Faculty of Agriculture, The Hebrew University of Jerusalem with Prof. S. Shafir Research subject: "Pollination in avocado"
2011 – 2012	Sabbatical leave at Plant and Food Research, New Zealand with Dr. Mark Goodwin Research subject: "Kiwifruit and avocado pollination"
2018	Participating in International Visitor Leadership Program (The State Department, US) – Water Resources Management.

3. Positions Held and Academic Status

Dates	Description
1991 – 2003	Extension Specialist; Beekeeping Regional Specialist; Crop Pollination and Bee Foraging Plants, State Specialist, Beekeeping Division, The Extension Service, Israeli Ministry of Agriculture
2000 – 2002	Research Scientist at the ARO, The Volcani Center, Institute of Animal Sciences
2003	Research Scientist at the ARO, The Volcani Center, Institute of Plant Sciences
2005	Promoted to Rank B (equivalent to "Senior Lecturer")
2008	Promoted to Rank A (equivalent to "Associate Professor")
2019	Promoted to Rank A+ (equivalent to "Full Professor")
2008 – 2011	Member of Gilat Research Center directorate
2014 to date	
2014 to date	Member of R&D Lachish directorate
2010– 2017	Scientific Director; R&D South (MOP Darom)

4. Teaching Experience / Guiding Students

A. Academic Contribution:

Dates	Description
1998 to date	Lecturer at the Hebrew University Title of the course "Beekeeping and Hive Products"
2000 to date	Lecturer at the Hebrew University Title of the course "Honeybee Biology"
2005 to date	Lecturer at the Hebrew University Title of the course "Pollination"
2016 – 2020	Lecturer of a full course at the Faculty of Life Sciences, Bar Ilan University Title of the course: "Pollination Ecology"
2016 – 2019	Lecturer and coordinator of a full course (With Dr. U. Yermiyahu) at the Faculty of Life Sciences, Tel Aviv University Title of the course: "Desert Agriculture"

B. Guidance of M.Sc. Students:

Graduation date	Name	Title of thesis	Guidance with
2004	Mr. Alon Bilu	Dissemination of Trichodex (<i>Trichoderma harzianum</i> T39) in strawberry	Prof. S. Shafir and Prof. Y. Elad
2009	*Mr. Avishi Avni	Biennial bearing in olive	Prof. Y. Riov
2009	Mr. Ran Erel	Macro-element nutrition in olive	Prof. A. Schwartz and Dr. U. Yermiyahu
2009	Mr. Luai Bashir	Irrigation effect on olive oil quality	Dr. Z. Kerem
2009	Mr. Yogev Nir	The effect of harvest timing on olive quality	Dr. Z. Kerem
2011	Ms. Sivan Cohen	The effect of salinity of irrigation water on grapevine physiology and wine quality	Dr. Z. Kerem
2011	Mr. Albert Kaminer	Multipurpose management of open landscape: A quantitative assessment of the interactions between cattle and bee forage	Prof. H. Kigel and Dr. Z. Henkin

2012	Mr. Guy Har-Lev	The effect of irrigation water on olive oil quality	Dr. Z. Kerem
2013	Mr. Mohamad Majdop	The influence of irrigation with treated wastewater and saline water on the quality parameters of olive oil	Dr. Z. Kerem
2013	Mr. Shlomi Zarchin	The ability of honey bee foragers (<i>Apis mellifera</i>) to discriminate between pollens according to their nutritional value	Prof. S. Shafir
2015	Ms. Tal Shapira	Multipurpose management of open landscape: A quantitative assessment of the interactions between cattle and bee forage	Dr. Y. Mendelik and Dr. Z. Henkin
2015	*Ms. Hila Duvdevani	Pollination and fruit set of greenhouse tomato	Dr. M. Zaccai and Dr. H. Yasuor
2018	*Mr. Gad Eilon	Leafhoppers as pests in the vineyard	
2017	*Mr. Ian Beiersdorf	Response of olive (<i>Olea europaea</i>) to irrigation water salinity	Dr. A. Ben-Gal and Dr. N. Lazarowich
2018	*Mr. Yehuda Heller	Pomegranate fertilization	Dr. U. Yermiyahu
2017	*Mr. Abd Al Hleem Mobada	Utilization of reclaimed wastewater for olive irrigation in the Middle East: Examining the impact of irrigation on soil, tree and oil quality	Dr. N. Greenbaum
2019	Mr. Aviad Perri	Jojoba (<i>Simmondsia chinensis</i>) physiology	Dr. N. Tel -Zur
2018	Ms. Nevet Zur	The genetic background for peanut shell texture and color	Dr. R. Hovav
2019	Mr. Jonatan Sorek	Chilling requirements and carbohydrates in deciduous trees	Dr. O. Sperling
2017 to date	*Mr. Yotam Ein Gedi	Flowering induction in <i>Opuntia ficus-indica</i>	Dr. E. Raveh
2019	Mr. Uri Eisenbach	Selection of almond varieties with resistance to the Almond wasp	Dr. Doron Holland
2018 to date	Mr. Oded Barzilay	Olive response to drought conditions	Dr. Uri Hochberg
2018 to date	Mr. Gilad Gershman	Avocado response to macro-elements availability	Dr. Ran Erel
2019 to date	Ms. Hagit Kanot	The importance of fatty acids for honey bee nutrition	Prof. S. Shafir
2019 to date	*Mr. Shamir Badichi	Irrigation and fertilization of Jojoba	Dr. Alon Ben-Gal
2019 to date	Ms. Gal Leviush	Assessing growth regulators efficacy	Dr. Liron Clipchan
2020 to date	Ms. Rona Ziskin	Treatments for the remediation of an olive orchard grown on highly sodic soils	Dr. Guy Levy

*under my direct supervision

C. Guidance of Ph.D. Students:

Graduation date	Name	Title of thesis	Guidance with
2012	Ms. Dorit Avni	The effect of pollen protein content and fatty acid composition on honey bee (<i>Apis mellifera</i>) nutrition	Prof. S. Shafir

2015	*Mr. Yzhar Tugendhaft	Assessing pheno- and genetic differentiation of old olive trees in correlation with environmental parameters in Israel	Prof. Z. Kerem
2020	Ms. Yael Arian	The importance of fatty acids for honey bee nutrition	Prof. S. Shafir

*under my direct supervision

D. Post-Docs and Visiting Scientists:

Dates	Name	Research subject
2008 –2010	Dr. Eric Ben-David	Olive oil quality in response to agricultural management
2013	Oliver Mayer	Long-term effects on soil quality of an olive orchard (<i>Olea europaea</i>) after seven years of irrigation with secondary treated wastewater
2013	Zacharias Steinmetz	Persistence of chemical and biological effects of olive mill wastewater seasonally applied to loessial olive orchard soil
2015 – 2016	Dr. Neelam Sodha	Olive tree response to salinity (with Dr. A. Ben-Gal)
2015 – 2016	Dr. Amir Apple	The effect of fruit load and climatic condition on olive tree flowering
2017 – 2018	Dr. Amnon Haberman	The productivity of orchard crops
2017 - 2019	Dr. Lyu Yang	Pomegranate nutrition
2018 to date	Dr. Silit Lazare	Jojoba irrigation and fertilization

E. Organization of Courses

Dates	Duration	Place	Title
1994	3 weeks	Lesotho, South Africa	Beekeeping
1995	2 weeks	Malta	Beekeeping
1996	3 weeks	Eritrea	Beekeeping
1998	2 weeks	Mexico	Crop pollination
2000	2 weeks	Mexico	Crop pollination
2002	2 weeks	Mexico	Crop pollination
2002	2 weeks	Israel	Advanced course in beekeeping
2010	1 week	Jordan	Improving olive oil quality in the Middle East
2013	1 week	Israel	Olive irrigation and oil quality
2016	1 week	Israel	Fruit tree irrigation and cultivation

5. Activity in Scientific and Agricultural Committees

A. International:

Dates	Description and role
1998	Consultant on almond pollination at Paramount Farming Co., Bakersfield, CA, USA
2005 to date	International Commission for Plant–Pollinators Relationships (ICPPR); Member of the Board
2006 – 2008	MAC OIL, EU project; Council Board Member
2012	Member of the scientific committee of the 7 th ISHS International Symposium on Olive Growing, San Juan, Argentina

2013	Member of the steering committee of 'Soil–Waste–Water Symposium', Landau, Germany
2013	MARD proposal evaluation panel; Member
2014	COST Action – 'Super B'; Member
2016	Member of the scientific committee for the 8 th ISHS International Symposium on Olive Growing, Split, Croatia
2017	Member of the scientific committee for the 8 th ISHS Symposium on Mineral Nutrition of Fruit Crops, Bolzano, Italy
2018	Member of the organizing committee for of Agritech conference, Tel Aviv, Israel
2018	Member of the steering committee of 'Soil–Waste–Water Symposium', Landau, Germany
2018	Member of the scientific committee of the 6 th Int. Conf. on the Olive Tree and Olive Products- OliveBiotecq, Seville, Spain
2018	Member of the scientific committee of the 11 th International Symposium on Pollination, Berlin, Germany
2019	Consultant on olive cultivation in Rajasthan, India

B. National:

Dates	Description and role
1999 to date	The Professional Committee – Ministry of Agriculture – Beekeeping
2000 – 2002	The Professional Committee – Ministry of Agriculture: Cucurbitacea; Member
2003 – 2005	The Professional Committee – Israel Bio-Organic Agriculture; Member
2004 – 2005	The Professional Committee – Israeli Almond Board; Member
2004 to date	The Professional Committee – Ministry of Agriculture: Olive; Member
2008,9,13–15	Member of the Steering Committee of Fruit Trees in the Chief Scientist Office, Ministry of Agriculture
2008 – 2009	Head of the Steering Committee of Honey Bee/CCD for the Chief Scientist, Ministry of Agriculture
2010	Member of the Steering Committee of "Recycled Water Use in Agriculture" for the Chief Scientist's Office, Ministry of Agriculture
2014	Member of the Steering Committee of MARD program in the BARD Office
2015 to date	Member of the directorate of 'MOP Lachish' (Regional R&D Center for Research in Orchards Crops), The Extension Service, Ministry of Agriculture

C. Institutional:

Dates	Description
2012 – 2019	Member of the Gilat Research Center directorate
2020	Deputy Director- Gilat Research Center
2015 – 2017	Head of research group at the Institute of Plant Sciences: Improving yield in crops using genetic, physiological and agrotechnical approaches
2016 – 2019	Member of the Strategic Committee – ARO

6. Contribution to the Scientific Community

A. International:

Dates	Description
2005	Organizer of international workshop on 'The use of pollinators as vectors for crop protection', Wageningen, The Netherlands
2007 – 2009	Coordinator of the EU Program MAC-OILS (Mapping and comparing oil) – Section 'Cultivation – problems and perspectives'
2007	Organizer, Regional USDA–ARS Workshop on 'Dissemination of metrology station information to farmers', Nazareth, Israel
2007	Convener of session 'Pollination and bee flora' at the IBRA International Conference 'Recent Trends in Apicultural Science', Mikkeli, Finland
2008	Organizer; Irrigation Water Management in the Middle East: A Workshop for Jordanian–Palestinian–Israeli Cooperative Research, Antalya, Turkey
2008	Convener of session 'Crop pollination' at the Third European Conference of Apidology – Eurbee, Belfast, UK
2009	Member of the organizing and scientific committee of the ISHS International Symposium on Olive Irrigation and Oil Quality, Nazareth, Israel
2010	Member of the organizing committee for the workshop for Jordanian–Palestinian–Israeli cooperative research 'Improving Olive Oil Quality in the Middle East', Dead Sea, Jordan
2011	Member of the scientific committee and chair of a session on 'Innovation, cultivars and mechanization' at the 2 nd International Symposium, Terra Olivo, Jerusalem, Israel
2013	Co-convener of international workshop on pollination of seed crops ('Limagrain Academy'), Valence, France
2014	Member of the organizing committee of the USDA-ARS 'Seminar on Water and Irrigation, Efficiency and Technology', Ambassador Hotel, Jerusalem, Israel
2016	Co-convener of 'Water Management Strategies for Perennial Crops with Limited and Impaired Water Supplies', Modesto, CA, USA
2016	Member of the organizing committee for the 'Precision Agriculture in the Middle East Workshop', Dead Sea, Jordan
2018	Member of the organizing committee for the 2 nd Soil-Waste-Water Workshop, Landau, Germany
2018	Member of the scientific committee for the 11 th International Symposium on Pollination, Belin, Germany
2018	Member of the scientific committee of the 6th International Conference on the Olive Tree and Olive Products- OliveBioteq'18, Seville, Spain
2018	Member of the organizing committee for the 'Sustainable high vale crop production workshop', Dead Sea, Jordan
2021	Convener of the 9 th International Symposium on Mineral Nutrition of Fruit Crops, Yearim Hotel, Israel
2020	Member of the scientific committee of the Water efficiency and Climate Resilient Agriculture, Chania, Crete, Greece

B. National:

Dates	Description
1992 – 2002	Organizer and chair of the Israeli Annual Conference on Crop Pollination by Bees
2006 to date	Organizer and chair of the Israeli Annual Conference on Research in Olive
2007 – 2018	Member of the organizing committee for The Negev Conference for Agricultural Research and Development
2017 – 2019	Organizer and chair of the Israeli Annual Conference on Research in Jojoba

E. Editorial responsibilities:

Dates	Description
2011	Co-Editor of Acta Horticulturae volume 888: "Irrigation of Olives and Oil Quality"
2011	Co-Editor of Special Issue of Israel Journal of Plant Sciences on Olives (59: 1-92)
2015	Expert Reviewer for the International Intergovernmental Platform of Biodiversity and Ecosystem Services (IPBES) Deliverable 3(a) report – Thematic assessment of pollinators, pollination and food production
2020	Editorial board – Plant

7. Active Participation in Meetings

A. International:

Date	Title of the Meeting	Place	Role
2000	12 th Seminario Americano de Apicultura	Mexico	Keynote presentation
2000	8 th Pollination Symposium	Mosonmagyaróvár, Hungary	Speaker
2001	37 th International Apicultural Congress (Apimondia)	Durban, South Africa	Speaker
2002	Seminar, NCARTT	Amman, Jordan	Invited speaker
2002	14 th Seminario Americano de Apicultura	Tampico, Mexico	Keynote presentation
2003	International course on Improvement of Olive Oil Quality (IOC)	Split, Croatia	Participant
2004	5 th ISHS International Symposium on Olive Growing	Izmir, Turkey	Speaker
2004	1 st European Conference of Apidology	Udine, Italy	Speaker
2005	Ministry of Foreign Affairs mission to promote beekeeping in Jordan	Jordan	Consultant
2005	39 th International Apicultural Congress (Apimondia)	Dublin, Ireland	Speaker
2005	International workshop 'The use of pollinators as vectors for crop protection'	Wageningen, The Netherlands	Speaker
2006	2 nd short course on Pollination of Horticultural Crops	Almeria, Spain	Invited speaker
2006	2 nd European Conference of Apidology	Prague, Czech Republic	Speaker
2006	2 nd International Seminar, Olivebioteq	Marsala, Italy	Speaker
2006-7	1 st , 2 nd meetings for EU Project MAC-OILS	Avellino, Italy	Speaker
2007	Board of Council Meeting for EU Project MAC-OILS	Pessac, France	Participant
2007	IBRA International Conference of Recent Trends in Apicultural Science	Mikkeli, Finland	Speaker, Chaired session
2007	Seminar in Laboratoire de Pollinisation Entomophile, Ecologie des Invertébrés, INRA	Avignon, France	Invited speaker
2008	International seminar on 'Organic olive farming (Organized by CINADCO, Ministry of Agriculture)	Bet Dagan, Israel	Invited speaker
2008	Middle East Irrigation Management Information System Project Joint Cooperation Meeting	Dead Sea, Jordan	Invited speaker
2008	Third European Conference of Apidology – Eurbee	Belfast, UK	Speaker

2009	Edible oils: Properties and Comparison Conference	Rome, Italy	Speaker
2009	Convegno internazionale finale del progetto 'Ricerca ed innovazione per l'Olivicoltura Meridionale	Rende, Italy	Invited speaker
2009	5 th International Symposium on Pistachio and Almond	Sanliurfa, Turkey	Speaker, Chaired session
2009	The International Conference on The Global Food Crisis: Meeting the Challenge	Tel Aviv, Israel	Invited speaker
2009	ISHS International Symposium for Irrigation of Olive and Oil Quality	Nazareth, Israel	Speaker, Chaired session
2009	COST 870, WG4 Meeting 'The potential of AMF inoculation in semi-arid regions of the Mediterranean basin	Gilat, Israel	Speaker
2010	Middle East Irrigation Management Information System Project. Joint Cooperation Meeting	Dead Sea, Jordan	Invited speaker
2010	International Horticultural Congress	Lisbon, Portugal	Speaker, Poster
2011	Avocado Brainstorming	Waiheke Island, New Zealand	Invited speaker
2011	National Beekeepers Association of NZ, Otago Branch, Field Day	Lawrence, New Zealand	Invited speaker
2011	Expoliva	Jaen, Spain	Poster
2011	Seminar – Plant and Food, Ruakura	Hamilton, New Zealand	Invited speaker
2011	22 nd International Congress on Sexual Plant Reproduction	Melbourne, Australia	Speaker
2012	7 th International Symposium on Olive Growing	San Juan, Argentina	Speaker
2012	1 st Apiflora Symposium	San Marino, Italy	Speaker
2013	Soil Waste Water Workshop: Olive mill wastes and low quality water in agriculture	Landau, Germany	Speaker
2013	11 th Dahlia Greidinger Memorial Symposium: Advanced methods for investigating nutrient dynamics in soil and ecosystems	Haifa, Israel	Speaker
2013	Biohydrology Conference	Landau, Germany	Invited speaker
2014	USDA/ARS MERIMIS Seminar on Water and Irrigation	Jerusalem, Israel	Organizer, Invited lecturer
2014	12 th Asian Apicultural Association Conference	Antalya, Turkey	Speaker
2014	ISHS International Symposium on Physiological Principles and their Application to Fruit Production	Geneva, NY, USA	Speaker
2014	The 5 th Conference on Drylands, Deserts and Desertification	Sde Boqer, Israel	Speaker
2015	2 nd Apiflora Symposium	Rome, Italy	Speaker
2015	Olive Culture – Past, Present, Future. In honor of Professor Shimon Lavee. Scientific conference: Olives from the 20 th century to the 21 st .	Rehovot, Israel	Invited speaker
2015	ISHS Symposium on Irrigation of Horticultural Crops	Lleida, Spain	Speaker
2015	European Conference on Precision Agriculture	Tel Aviv, Israel	Speaker
2015	Annual Meeting of Olive Growers in China	Sichuan, China	Keynote presentation
2015	International workshop on 'Alternate bearing in fruit trees'	Rehovot, Israel	Speaker

2015	Super-B (COST) Conference	Paola, Malta	Speaker
2016	Workshop on Proven Solutions to Drought	Modesto, CA, USA	Invited speaker
2016	MERIMIS Workshop on Precision Agriculture in the Middle East	Dead Sea, Jordan	Invited speaker
2016	8 th ISHS International Symposium on Olive Growing	Split, Croatia	Keynote presentation, Chaired session
2016	7 th Eurbee Conference	Cluj, Romania	Speaker
2016	Super-B (COST) Conference	Cluj, Romania	Speaker
2017	8 th ISHS International Symposium on Mineral Nutrition of Fruit Crops	Bolzano, Italy	Keynote presentation
2018	AIPAC Policy Conference	Washington DC	Invited speaker
2018	11 th International Symposium on Pollination	Berlin, Germany	Speaker, Chaired session
2018	ICL agronomists meeting	Pune, India	Speaker
2018	6 th International Conference on the Olive Tree and Olive Products- OliveBioteq'18,	Seville, Spain	Speaker, Chaired session
2019	9 th International Symposium on Irrigation of Horticultural Crops	Matera, Italy	Keynote presentation
2019	26 th International Congress of Beekeeping	Chihuahua, Mexico	Keynote presentation
2019	USAID Regional meeting	Dead Sea, Jordan	Speaker, Chaired session

B. National:

Date	Title of the Meeting	Role
2008	Annual meeting of the Israeli almond growers	Invited lecture
2012	Annual meeting of the Israeli avocado growers	Invited lecture
2013	Annual meeting of the Israeli mango growers	Invited lecture
2015	Arava R&D open day conference	Invited speaker
2015	Innovation in healthy food (Tel Hai College)	Invited lecture
2015	Annual meeting of Israeli almond growers	Invited lecture
2015	Annual meeting of Israeli beekeepers	Invited lecture
2015	Ben Gurion University seminar	Invited lecture
2016	Annual meeting of Southern Israel field crop growers	Invited lecture
2016	16 th Round table for the future of the rural area in Israel	Invited lecture
2017	Annual meeting of Israeli avocado growers	Invited lecture
2018	The Annual Conference of The Israeli Soil Society	Invited lecture

8. Research Grants

A. International Competitive Grants:

Year	Granting Source	Duration (years)	Role*	Title (short)	Budget (US \$ / year)	
					Total	Researcher
1995	BARD	3	CI	Integrated management of the tracheal mite and varroa mite	100,000	10,000
2002	BARD	3	CI	Enhancement of avocado pollination	100,000	10,000

2004	MERC	4	CI	Improving honey bee colony performance by feeding pollen	130,000	13,500
2005	DIARP	1	LPI	Use of pollinators as vectors for crop protection	12,000	1,000
2006-8	USDA-ARS	3	PI	ET-regulated irrigation scheduling in olive	20,000	20,000
2006	EU (SSA)	2	CI	Mapping and comparing oils	315,000	8,000
2007	MERC	5	PI	Utilization of reclaimed wastewater for olive irrigation	137,000	41,600
2008	DFG	4	CI	Pheno- and genotypic differentiation of old olive trees	65,000	21,000
2008	BMBF	1	CI	Hydrophobization potential of OMWW for soil	4,000	2,000
2009	MARD	1	CI	Genetic characterization of traditional olive cultivars	50,000	8,000
2009	USDA-ARS	3	PI	Irrigation of olives using recycled water	30,000	10,000
2011	MERC	4	CI	Deficit irrigation of olive	105,000	5,000
2011	MERC	4	CI	Impact of spreading olive mill wastewater on olive trees, soil and environment	220,000	8,000
2012	MERC	4	CI	Characterization of traditional olive cultivars	160,000	20,000
2012	USDA-ARS	6	PI	Correction of nutrient deficits in traditional olive orchards	15,000	15,000
2016	BARD	3	CI	Developing advanced chemical and computational methods for assessing organoleptic properties of olive oil	100,000	25,000
2019	MERC	3	CI	Improving Olive-oil quality in Middle Eastern Countries	110,000	27,000

*PI = Principal Investigator; LPI = Local Principal Investigator; CI = Cooperating Investigator

B. National Competitive Grants:

Year	Granting Source	Duration (years)	Role*	Title (short)	Budget (US \$ / year)	
					Total	Researcher
1994	Chief Sci.	3	CI	Improving 'Starking' apple productivity	12,000	3,000
1998	Chief Sci.	3	CI	Imported and local honey bee strains, honey production and resistance for disease	15,000	7,000
1998	Chief Sci.	3	CI	Monitoring varroa mite resistance to fluvalinate	15,000	7,000
2001	Chief Sci.	3	PI	Effectiveness of honey bee for applying 'Trichodex' to strawberry to control gray mold	20,000	7,000
2001	Chief Sci.	2	PI	Pollenizers in almond	7,500	7,500
2002	Chief Sci.	3	CI	Increasing yield of pear by improving cross-pollination and determining genetic compatibility	20,000	2,000

2002	Chief Sci.	3	PI	Selection and breeding of honeybee for avocado pollination	12,000	4,000
2004	ARO Director's grant	3	PI	Integrative program for promoting the olive oil industry in Israel	77,000	31,000
2004	Chief Sci.	3	CI	Deficit irrigation in olive	20,000	5,000
2005	Chief Sci.	3	PI	Treated wastewater for irrigation of olive for oil production	22,000	15,000
2006	ARO Director's grant	1	PI	Laboratorial olive mill	11,000	11,000
2006	Chief Sci.	3	CI	Evaluating the effectiveness of different harvest methods for olive	18,000	4,500
2006	Chief Sci.	3	PI	Developing early apricot for export from Arad Valley	15,000	11,000
2007	Chief Sci.	3	CI	Cultivation of avocado under nets to increase yield and quality	18,000	1,000
2007	Chief Sci.	3	CI	Multi-objective management of open land for foraging of cattle and bees	18,000	1,000
2007	Chief Sci.	3	CI	Transition of rain-fed olive orchard to irrigation	18,000	2,000
2007	Chief Sci.	3	CI	Super intensive olive orchard	12,000	2,400
2007	Chief Sci.	3	PI	Application of sludge compost in olive orchard	30,000	25,000
2007	Chief Sci.	2	PI	Cultivation and breeding of guava for export	42,000	25,000
2007	ARO Director's grant	1	PI	Induce biosynthesis of lipids in fruits	18,700	6,200
2008	Chief Sci.	3	CI	Managing saline irrigation water for high-quality olive oil in Negev Highlands	30,000	10,000
2008	Chief Sci.	3	PI	Irrigation of grapevine with saline water	36,000	13,000
2008	Chief Sci.	3	PI	Optimization of harvest timing in olive oil	16,000	5,300
2008	ICA	1	PI	Laboratory for olive oil extraction and quality evaluation	60,000	60,000
2008	Chief Sci.	3	CI	Optimization of olive crop and oil quality in super high density orchard	25,000	5,000
2009	Chief Sci.	3	CI	Response of irrigated olive to nutrition	50,000	10,000
2009	Chief Sci.	3	CI	Increasing irrigation efficiency in olive oil orchards by the use of different soil mulch	37,000	6,000

2010	ISF	3	CI	Nutritional aspects of honey bee floral pollen foraging preference	60,000	13,000
2010	Chief Sci.	3	CI	Aerial thermal imaging for automatic detection of irrigation malfunctioning	100,000	6,000
2010	Chief Sci.	3	PI	Mechanical harvesting of table olives	65,000	50,000
2010	Chief Sci.	3	PI	Improving olive oil quality in irrigated orchards	81,000	46,000
2015	Chief Sci.	3	PI	Pathogen effects on olive oil quality	50,000	30,000
2015	Chief Sci.	5	PI	Pomegranate response to macro elements	30,000	30,000
2016	Chief Sci.	3	PI	Improving the profitability of olive oil production	150,000	45,000
2016	ICA	3	PI	Mechanical harvesting of table olive in the Negev Highlands	22,000	22,000
2016	Chief Sci.	3	CI	Advancement of jojoba in the Negev	200,000	45,000
2017	Chief Sci.	3	CI	Improving avocado productivity and profitability by improving its production protocol	330,000	40,000
2019	Chief Sci.	3	CI	Detecting of drip irrigation malfunctioning using remote-sensing	42,000	15,000
2018	ICA	1	PI	Selection of superior olive cultivars from local traditional; germplasm	15,000	10,000
2019	Chief Sci.	3	PI	Irrigation and fertilization of Jojoba	45,000	30,000

*PI = Principal Investigator; LPI= Local Principal Investigator; CI = Cooperating Investigator

C. Other Funds:

Year	Granting Source	Duration (years)	Role*	Title (short)	Budget (US \$ / year)	
					Total	Researcher
2001	JNF	3	CI	Selection of trees for bee Forage	22,000	6,000
2001	Fruit Board	1	PI	Selecting and breeding of honeybee for apple pollination	7,000	7,000
2001	Vegetable Board	1	PI	Pollination of sweet pepper in enclosures by honeybee	2,500	2,500
2004	R&D Ramat Negev	3	PI	Growth regulator efficacy in suppressing vegetative growth in olive in Ramat Negev	7,000	7,000
2004	Fruit Board	2	PI	The effect of fungicides on pollination and fertilization in almond	3,000	3,000

2005	Syngenta (Switzerland)	2	PI	Overcoming iron deficit in olive	15,000	10,000
2005	Israeli Olive Board	3	PI	The effect of mycorrhizal fungi		
2009	R&D Ramat Negev	4	PI	Super high density olive orchard – spacing and pruning	10,000	10,000
2009	R&D Ramat Negev	4	PI	Olive nutrition under salinity conditions of Ramat Negev area	10,000	10,000
2010	Fruit Board	7	PI	Selection of avocado rootstocks resistance to <i>Verticillium</i>	15,000	10,000
2012	Fruit Board	3	PI	Mechanical harvest of table olives	10,000	10,000
2013	R&D Ramat Negev	3	PI	Plastic mulching to improve olive tree performance	10,000	10,000
2013	R&D Ramat Negev	3	PI	Mechanical harvest of table olive in Ramat Negev	10,000	10,000
2015	Helmsley Trust Fund	3	CI	Crop production under abiotic stress conditions	100,000	30,000
2015	CFPN (ICL)	4	PI	Pomegranate fertilization with potassium and phosphorous	40,000	40,000
2015	CFPN (ICL)	3	PI	Correction of nutrient deficit in rain-fed olive orchards	10,000	10,000
2018	CFPN (ICL)	2	PI	Correction of Boron efficiencies in avocado	10,000	1,000
2019	CFPN (ICL)	3	PI	Developing treatments for the remediation of an olive orchard grown on highly sodic soils	45,000	23,000
2020	CFPN (ICL)	4	PI	Table grapes fertilization with nitrogen (N) potassium (K) and phosphorous (P)	42,500	42,500
2020	CFPN (ICL)	2	PI	Detecting the penetration site of boron into avocado leaves – a step toward foliar application to prevent B deficiency	12,500	12,500
2020	Fruit Board	1	CI	Developing of a cooling system for avocado to reduce heat damages	14,000	4,000

*PI = Principal Investigator; LPI= Local Principal Investigator; CI = Cooperating Investigator

9. [Awards](#)

Dates	Description
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2017	Recipient of the Israeli Plant Production and Marketing Board's Researcher of the Year award
2019	Recipient of Volcani's Researcher of the Year award

Part II: LIST OF PUBLICATIONS

Marks:

Marks (only for first authors):

X*	Equal contribution of first authors
X ^S	Student, technician, research engineer or post-doc <u>under my supervision</u>
X ^T	Technician or research engineer <u>working in my research team</u>
X ^{PD} , X ^{VS}	Post-Doc or Visiting Scientist <u>working in my research team</u>

1. Articles in Reviewed Journals

1. **Dag, A.** and Eisikowitch, D. (1995).
The influence of hive location on honeybee foraging activity and fruit set in melons grown in plastic greenhouses.
Apidologie 26: 511-519. (IF=2.2; Entomology, Rank 7/85)
2. **Dag, A.**, Slabezki, Y., Efrat, H., Kamer, Y., Yakobson, B.A., Mozes-Koch, R. and Gerson, U. (1997).
Control of honey bee tracheal mite infestation with Amitraz fumigation in Israel.
Am. Bee. J. 137: 599-602. (IF=0.1, Entomology, Rank 85/85)
3. **Dag, A.**, Eisenstein, D., Gazit, S., El-Batsri, R. and Degani, C. (1998).
Effect of pollenizer distance and selective fruitlet abscission on outcrossing rate and yield in 'Tommy Atkins' mango.
J. Am. Soc. Hort. Sci. 123: 618-622. (IF=0.9; Horticulture, Rank 11/31)
4. **Dag, A.** and Eisikowitch, D. (1999).
Ventilation of greenhouses increases honeybee foraging activity on muskmelon, *Cucumis melo*.
J. Apic. Res. 38: 169-175. (IF=1.5; Entomology, Rank 26/85)
5. **Dag, A.**, Gazit, S., Eisenstein, D., El-Batsri, R. and Degani, C. (1999).
Effect of the male parent on pericarp and seed weights in several Floridien Mango cultivars.
Scientia Hort. 82: 325-329. (IF=1.5, Horticulture, Rank 8/31)
6. **Dag, A.**, Eisenstein, D. and Gazit, S. (2000).
Effect of temperature regime on pollen and the effective pollination of 'Kent' mango in Israel.
Scientia Hort. 86: 1-11. (IF=1.5, Horticulture, Rank 8/31).
7. **Dag, A.** and Gazit, S. (2000).
Mango pollinators in Israel.
J. Appl. Hort. 2: 39-43.
8. **Dag, A.** and Eisikowitch, D. (2000).
The effect of carbon dioxide enrichment on nectar production in melon under greenhouse conditions.
J. Apic. Res. 39: 88-89. (IF=1.53; Entomology, Rank 26/85)

9. **Dag, A.**, Weinbaum, S.A., Thorp, R. and Eisikowitch, D. (2000).
Evaluation of pollen dispensers ('inserts') effect on fruit set and yield in almond.
J. Apic. Res. 39: 117-123. (IF=1.5; Entomology, Rank 26/85)
10. Mozes-Koch, R., Slabezki, Y., Efrat, H., Kamer, Y., Kalev, H., Yakobson, B.A. and **Dag, A.** (2000).
First detection in Israel of fluvalinate resistance in the varroa mite using bioassay and biochemical methods.
Exp. Appl. Acarol. 24: 25-33. (IF=1.5; Entomology, Rank 17/85)
11. Slabezki, Y., Efrat, H., **Dag, A.**, Kamer, Y., Yakobson, B.A., Mozes-Koch, R. and Gerson, U. (2000).
The effect of honey bee tracheal mite infestation on colony development and honey yield of Buckfast and Italian honey bee strains in Israel.
Am. Bee J. 140: 231-234. (IF=0.1, Entomology, Rank 85/85)
12. Stern, R.A., Eisikowitch, D. and **Dag, A.** (2001).
Sequential introduction of honeybee colonies and doubling their density increase cross-pollination, fruit set and yield in 'Red Delicious' apple.
J. Hort. Sci. Biotechnol. 76: 17-23. (IF=0.6; Horticulture, Rank 18/31)
13. **Dag, A.** and Kamer, Y. (2001).
Comparison between the effectiveness of honeybee (*Apis mellifera*) and bumblebee (*Bombus terrestris*) as pollinators of greenhouse sweet pepper (*Capsicum annuum*).
Am. Bee. J. 141: 447-448. (IF=0.08, Entomology, Rank 85/85)
14. **Dag, A.**, Lior, E. and Afik, O. (2002).
Pollination of confection sunflowers (*Helianthus annuus* L.) by honey bees (*Apis mellifera* L.).
Am. Bee. J. 142: 443-445. (IF=0.1, Entomology, Rank 85/85)
15. Devash, L., Afik, O., Shafir, S., Schaffer, A., Yeselson, Y., **Dag, A.** and Landau, S. (2002).
Determination by near-infrared spectroscopy of perseitol used as a marker for the botanical origin of avocado (*Persea americana* Mill.) honey.
J. Agric. Food Chem. 50: 5283-5287. (IF=2.8; Agriculture- Multidisiplinary, Rank 3/75)
16. **Dag, A.**, Fetscher, A.E., Afik, O., Yeselson, Y., Schaffer, A., Kammer, Y., Waser, N.M., Madore, M.A., Arpaia, M.L., Hofshi, R. and Shafir, S. (2003).
Honeybee (*Apis mellifera*) strains differ in avocado (*Persea americana*) nectar foraging preferences.
Apidologie 34: 299-309. (IF=2.2; Entomology, Rank 7/85)
17. Kalev, H., **Dag, A.** and Shafir, S. (2002).
Feeding pollen supplements to honey bee colonies during pollination of sweet pepper in enclosures.
Am. Bee J. 142: 672-678. (IF=0.1, Entomology, Rank 85/85)

18. Freeman, S., Minz, D., Kolesnik, I., Barbul, O., Zveibil, A., Maymon, M., Nitzani, Y., Kirshner, B., Rav-David, D., Bilu, A^S., **Dag, A.**, Shafir, S. and Elad, Y. (2004). Trichoderma biocontrol of *Colletotrichum acutatum* and *Botrytis cinerea* in strawberry, population survival, and identification of biocontrol isolates according to ITS sequence analysis.
Eur. J. Plant Pathol. 110: 361-370. (IF=1.4; Horticulture, Rank 9/31)
19. Bilu, A^S., **Dag, A.**, Elad, Y. and Shafir, S. (2004). Honey bee dispersal of biocontrol agents: an evaluation and improvement of dispensing devices.
Biocontrol Sci. Technol. 14: 607-617. (IF=0.9; Entomology, Rank 41/85)
20. Stern, R., Goldway, M., Zisovich, A., Shafir, S. and **Dag, A.** (2004). Sequential introduction of honeybee colonies increase cross-pollination, fruit- set and yield of 'Spadona' pear (*Pyrus communis* L.).
J. Hort. Sci. Biotech. 79: 652-658. (IF=0.6; Horticulture, Rank 18/31)
21. **Dag, A.**, Stern, R. and Shafir, S. (2005). Honey bee (*Apis mellifera*) strains differ in apple (*Malus domestica*) pollen foraging preference.
J. Apic. Res. 44: 15-20. (IF=1.5; Entomology, Rank 26/85)
22. **Dag, A.**, Afik, O., Yeselson, Y., Schaffer, A. and Shafir, S. (2006). Physical, chemical and palynological characterization of avocado (*Persea americana* Mill) honey in Israel.
Int. J. Food. Sci. Technol. 41: 387-394. (IF=1.3; Food Science and Technology, Rank 58/128)
23. **Dag, A.** and Mizrahi, Y. (2005). Effect of pollination methods on fruit set and fruit characteristics of the vine cactus *Selenicereus megalanthus* ('yellow pitaya').
J. Hort. Sci. Biotechnol. 80: 618-622. (IF=0.6; Horticulture, Rank 18/31)
24. Afik, O., **Dag, A.** and Shafir, S. (2006). The effect of avocado (*Persea americana*) nectar composition on its attractiveness to honey bees.
Apidologie 37: 317-325. (IF=2.2; Entomology, Rank 7/85)
25. Afik, O., **Dag, A.**, Kerem, Z. and Shafir, S. (2006). Analysis of avocado (*Persea americana*) nectar properties and their perception by honeybees (*Apis mellifera*).
J. Chem. Ecol. 32: 1949-1963. (IF=2.66; Ecology, Rank 51/131)
26. Shafir, S., **Dag, A.**, Bilu, A^S., Abu-Toamy, M. and Elad, Y. (2006). Honey bee dispersal of the biological agent *Trichoderma harzianum* T39: effectiveness in suppressing *Botrytis cinerea* on strawberry under field conditions.
J. Eur. Plant Pathol. 116: 119-128. (IF=1.4; Horticulture, Rank 9/31)
27. **Dag, A.**, Zipori, I. and Pleser, Y. (2006). Using bumblebees to improve almond pollination by the honeybee.
J. Apic. Res. 54: 215-216. (IF=1.5; Entomology, Rank 26/85)

28. Afik, O., **Dag, A.** and Shafir, S. (2007).
Perception of avocado bloom (Lauraceae: *Persea americana*) by the honey bee (Hymenoptera: Apidae: *Apis mellifera*).
Entomol. Generalis 30: 135-153. (IF=0.3; Entomology, Rank 78/85)
29. Stern, R.A., Sapir, G., Shafir, S., **Dag, A.** and Goldway, M. (2007).
The appropriate management of honey bee colonies for pollination of Rosacea fruit trees in warm climates.
Middle Eastern Russ. J. Plant Sci. Biotechnol. 1: 13-19.
30. Afik, O., **Dag, A.** and Shafir, S. (2008).
Honey bee (*Apis mellifera*) round dance is influenced by trace components of floral nectar.
Anim. Behav. 75: 371-377. (IF=3.5; Behavioral Sciences, Rank 9/47)
31. **Dag, A.**, Zvieli, Y., Afik, O. and Elkind, Y. (2007).
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Int. J. Veg. Sci. 13: 45-59
32. **Dag, A.** (2008).
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J. Apic. Res. 47: 162-165. (IF=1.53; Entomology, Rank 26/85)
33. **Dag, A.**, Ben-Gal, A., Yermiyahu, U., Basheer, L^S., Yogev, N^S. and Kerem, Z. (2008).
The effect of irrigation level and harvest mechanization on virgin olive oil quality in a traditional rain-fed 'Souri' olive orchard converted to irrigation.
J. Sci. Food Agric. 88: 1524-1528. (IF=1.4; Agriculture- Multidisiplinary Rank 10/75)
34. Barazani, O., **Dag, A.**, Kerem, Z., Lavee, S. and Kadereit, J.W. (2008).
Local old olive landrace varieties in Israel – valuable plant genetic resources in olive cultivation.
Isr. J. Plant Sci. 56: 265-272. (IF=0.3; Plant Sciences, Rank 172/190)
35. Erel, R^S., **Dag, A.**, Ben Gal, A., Schwartz, A. and Yermiyahu, U. (2008).
Flowering and fruit set of olive trees in response to nitrogen, phosphorus and potassium.
J. Am. Soc. Hort. Sci. 133: 639-647. (IF=0.9; Horticulture, Rank 11/31)
36. Avni, D^S., **Dag, A.** and Shafir, S. (2008).
The effect of surface area of pollen patties fed to honey bee (*Apis mellifera*) colonies on their consumption, brood production and honey yields.
J. Apic. Res. 48: 23-28. (IF=1.5; Entomology, Rank 26/85)
37. **Dag, A.** (2009).
Interaction between pollinators and crop plants: the Israeli experience.
Isr. J. Plant Sci. 57: 231-242. (IF=0.3; Plant Sciences, Rank 172/190)
38. **Dag, A.**, Yermiyahu, U., Ben-Gal, A., Zipori, I. and Kapulnik, Y. (2009).
Nursery and post-transplant field response of olive trees to arbuscular mycorrhizal fungi in an arid region.
Crop Pasture Sci. 60: 427-433. (IF=1.4; Agriculture Multidisciplinary, Rank 11/57)

39. Ben-Gal, A., Agam, N., Alchanatis, V., Cohen, Y., Yeriya, U., Zipori, Y., Presnov, E. and **Dag, A.** (2009).
Evaluating water stress in irrigated olives: correlation of soil water status, tree water status and thermal imagery.
Irrig. Sci. 27: 367-376. (IF=1.7; Agronomy, Ranked Q2 21/79)
40. Porat, R., Weiss, B., Zipori, I. and **Dag, A.** (2009).
Postharvest longevity and responsiveness of guava fruit with distinctive climacteric behaviors to 1-methylcyclopropene.
HortTechnology 19: 580-585. (IF=0.4; Horticulture, Rank Q3 20/30)
41. Afik, O., Hallel, T., **Dag, A.** and Shafir, S. (2009).
The components that determine honey bee (*Apis mellifera*) preference between Israeli unifloral honeys and the implications for nectar attractiveness.
Isr. J. Plant Sci. 57: 253-261. (IF=0.31; Plant Sciences, Rank Q4 172/190)
42. **Dag, A.**, Ben-David, E^S., Kerem, Z., Ben-Gal, A., Erel, R^S., Basheer, L^S. and Yermiyahu, U. (2009).
Olive oil composition as a function of nitrogen, phosphorus and potassium plant nutrition.
J. Sci. Food Agric. 89: 1871-1878. (IF=1.4; Agriculture- Multidisciplinary, Rank Q1 10/57)
43. Avni, D^S., **Dag, A.** and Shafir, S. (2009).
Pollen sources for honey bees in Israel: Source, periods of shortage and influence on population growth.
Isr. J. Plant Sci. 57: 263-275. (IF=0.31; Plant Sciences, Rank Q4 172/190)
44. **Dag, A.**, Bustan, A., Avni, A^S., Lavee, S. and Riov, J. (2009).
Fruit thinning using NAA shows potential for reducing biennial bearing of 'Barnea' and 'Picual' oil olive trees.
Crop Pasture Sci. 60: 1124-1130. (IF=1.2; Agriculture Multidisciplinary, Rank 11/55)
45. Afik, O., **Dag, A.**, Yeselson, Y., Schaffer, A. and Shafir, S. (2009).
Selection and breeding of honey bees for higher or lower collection of avocado nectar.
J. Econ. Entomol. 103: 228-233. (IF=1.3; Entomology, Rank Q2 26/74)
46. **Dag, A.**, Bustan, A., Avni, A^S., Zipori, I., Lavee, S. and Riov, J. (2010).
Timing of fruit removal affects concurrent vegetative growth and subsequent return bloom and yield in olive (*Olea europaea* L.).
Scientia Hort. 123: 469-472. (IF=1.5, Horticulture, Rank 8/32)
47. Zion, B., Bechar, A., Regev, R., Shamir, N., Weissblum, A., Zipori, Y. and **Dag, A.** (2011).
Mechanical harvesting of olives – operation study.
Isr. J. Plant Sci. 59: 71-84. (IF=0.3; Plant Sciences, Rank Q4 172/190)
48. Ben-David, E^S., Kerem, Z., Zipori, I., Weissbein, S., Basheer, L^S., Bustan, A. and **Dag, A.** (2010).
Optimization of the Abencor system to extract olive oil from irrigated orchards.

- Eur. J. Lipid Sci. Technol.* 112: 1158-1165. (IF=1.5; Food Sciences and Technology, Rank Q2 44/128)
49. Ben-Gal, A., Kool, D., Agam, N., van Halsema, G.H., Yermiyahu, U., Yafe, A., Presnov, E., Erel^S, R., Majdop^S, A., Zipori, I., Segal, E., Ruger, S., Zimmermann, U., Cohen, Y., Alchanatis, V. and **Dag, A.** (2010).
Whole-tree water balance and indicators for short-term drought stress in non-bearing 'Barnea' olives.
Agric. Water Manage. 98: 124-133. (IF=1.8; Agronomy Rank Q2 19/75).
50. Ben-Gal, A., Yermiyahu, U., Zipori, I., Presnov, E., Hanoch, E. and **Dag, A.** (2011).
The influence of bearing cycles on olive oil production response to irrigation.
Irrig. Sci. 29: 253-263. (IF=1.6; Agronomy, Ranked Q2 21/80)
51. Kapulnik, Y., Tsrer (Lahkim), L., Zipori, I., Hazanovsky, M., Wininger, S. and **Dag, A.** (2010).
Effect of AMF application on growth, productivity and susceptibility to *Verticillium* wilt of olive grown under desert conditions.
Symbiosis 52: 103-111. (IF=1.4; Microbiology, Q3 Rank 78/107)
52. **Dag, A.**, Kerem, Z., Yogev, N^S., Zipori, N., Lavee, S. and Ben-David, E^S. (2011).
Influence of time of harvest and maturity index on olive oil yield and quality.
Scientia Hort. 127: 358-366. (IF=1.5, Horticulture, Rank 8/32)
53. Segal, E., **Dag, A.**, Ben-Gal, A., Zipori, I., Suryano, S. and Yermiyahu, U. (2011).
Olive irrigation with reclaimed wastewater: agronomic and environmental considerations.
Agric. Ecosyst. Environ. 140: 454-461. (IF=3.0; Agriculture, Multidisciplinary, Rank 1/57)
54. Tietel, Z., Porat, R., Zipori, I. and **Dag A.** (2011).
Aroma volatile compositions of high- and low- aromatic guava varieties.
J. Sci. Food Agric. 91: 2794-2798. (IF=1.4; Agriculture- Multidisciplinary, Rank Q1 10/57)
55. Bustan, A^S., Avni, A^S., Lavee, S., Zipori, I., Yeselson, Y., Schaffer, A.A., Riov, Y. and **Dag, A.** (2011).
Role of carbohydrate reserves in yield production of intensively cultivated oil olive (*Olea europaea* L.) trees.
Tree Physiol. 31: 519-530. (IF=2.9; Forestry, Q1 Rank 2/59)
56. Ben-Gal, A., **Dag, A.**, Basheer, L^S., Yermiyahu, U., Zipori, I. and Kerem, Z. (2011).
The influence of bearing cycles on olive oil quality response to irrigation.
J. Agric. Food Chem. 59: 11667-11675. (IF=2.8; Agriculture- Multidisciplinary, Rank Q1 3/57)
57. Aviani, I., Raviv, M., Hadar, I., Saadi, M., **Dag, A.**, Ben-Gal, A., Yermiyahu, U., Zipori, I. and Laor, Y. (2012).
Effect of harvest date, irrigation level, cultivar type, and fruit water content on olive mill wastewater generated by a laboratory scale 'Abencor' milling system.
Bioresource Technol. 107: 87-96. (IF=4.7; Agricultural Engineering, Rank Q1 1/12)

58. **Dag, A.**, Erel, R^S., Ben-Gal, A., Zipori, I. and Yermiyahu, U. (2012).
The effect of olive tree stock plant nutritional status on propagation rates.
HortScience 47: 307-310. (IF=0.9; Horticulture, Rank Q2 12/32)
59. Naor, A., Schneider, D., Ben-Gal, A., Zipori, I., **Dag, A.**, Kerem, Z., Birger, R., Peres, M. and Gal, Y. (2013).
The effects of crop load and irrigation rate in the oil accumulation stage on oil yield and water relations of 'Koroneiki' olives.
Irrig. Sci. 31: 781-791. (IF=2.8; Agronomy, Ranked Q1 9/79)
60. **Dag, A.**, Boim, S^S., Sobotin, Y. and Zipori, I. (2012).
Effect of mechanically harvested olive storage temperature and duration on oil quality.
HortTechnology 22: 528-533. (IF=0.6; Horticulture, Rank Q3 19/32)
61. Rotbart, N., Schmilovitch, Z., Choen, Y., Alcahantis, V., Erel, R^S., Ignat, T., Shenderay, C., **Dag, A.** and Yermiyahu, U. (2013).
Estimating olive leaf nitrogen concentration using VIS-NIR spectral reflectance.
Biosystems Eng. 114: 426-434. (IF=1.4; Agricultural Engineering, Rank Q2 4/12)
62. Agam, N., Cohen, Y., Berni, J.A.J., Alchanatis, V., Kool, D., **Dag, A.**, Yermiyahu, U. and Ben-Gal, A. (2013).
An insight to the performance of Crop Water Stress Index for olive trees.
Agric. Water Manage. 118: 79-86. (IF = 2.3; Agronomy, Rank Q1 16/79)
63. Bustan, A^S., Avni, A^S., Yermiyahu, U., Ben-Gal, A., Riov, J., Erel, R., Zipori, R. and **Dag, A.** (2013).
Interaction between fruit load and macrolelement concentrations in fertigated olive (*Olea europaea* L.) trees under arid saline conditions.
Scientia Hort. 152: 44-55. (IF = 1.5, Horticulture, Rank Q2 9/33)
64. Erel, R^S., Yermiyahu, U., Van Opstal, J., Ben-Gal, A., Schwartz, A. and **Dag, A.** (2013).
The importance of olive (*Olea europaea* L.) tree nutritional status on its productivity.
Scientia Hort. 159: 8-18. (IF = 1.5, Horticulture, Rank Q2 9/33)
65. Agam, N., Segal, E., Peeters, A., Levi, A., **Dag, A.**, Yermiyahu, U. and Ben-Gal, A. (2013).
Spatial distribution of water status in irrigated olive orchards by thermal imaging.
Precision Agric. 15: 346-359. (IF = 2.0, Agriculture, Multidisciplinary, Rank Q1 5/56)
66. Delaplane, K.S., **Dag, A.**, Danka, R.G., Freitas, B.M., Garibaldi, L.A., Goodwin, R.M. and Hormaza, J.I. (2012).
Pollination research methods with *Apis mellifera*.
J. Apic. Res. 52: 1-28. (IF = 1.9, Entomology, Rank Q1 19/87)
67. Erel, R^S., Kerem, Z., Ben-Gal, A., **Dag, A.**, Schwartz, A., Zipori, I., Basheer, L^S. and Yermiyahu, U. (2013).
Olive (*Olea europaea* L.) tree N status is a key factor for olive oil quality.
J. Agric. Food Chem. 61: 11261-11272. (IF = 3.1, Agriculture, Multidisciplinary, Rank Q1 2/56)

68. **Dag, A.**, Harlev, G^S., Lavee, S., Zipori, I. and Kerem, Z. (2013).
Optimizing olive harvest time under hot climatic conditions of Jordan Valley, Israel.
Eur. J. Lipid Sci. Technol. 116: 169-176. (IF = 2.0, Food Science and Technology, Rank Q2 36/123)
69. Zipori, I^S., **Dag, A.**, Tugendhaft, Y^S. and Birger, R. (2013).
Mechanical harvesting of table olives: harvest efficiency and fruit quality.
HortScience 49: 55-58. (IF = 0.9, Horticulture, Rank Q2 12/33)
70. Barazani, O., Westberg, E., Hanin, N., **Dag, A.**, Kerem, Z., Tugendhaft, Y^S., Hamid, M., Hijawi, T. and Kadereit, J.W. (2014).
A comparative analysis of genetic variation in rootstocks and scions of old olive trees – a window into the history of olive cultivation practices and past genetic variation.
BMC Plant Biol. 14: 146. (IF = 3.8, Plant Sciences, Rank Q1 22/204)
71. Avni, D^S., Hendriksma, H.P., **Dag, A.**, Uni, Z. and Shafir, S. (2014).
Nutritional aspects of bee-collected pollen and constraints on honey bee colony development in the eastern Mediterranean.
J. Insect. Physiol. 69: 65-73. (IF = 2.5, Entomology, Rank Q1 10/92)
72. Bustan, A^S., Kerem, Z., Yermiyahu, U., Ben-Gal, A., Lichter, A., Droby, S., Zchori-Fein, E., Orbach, D., Zipori, I. and **Dag, A.** (2014).
Preharvest circumstances leading to elevated oil acidity in 'Barnea' olives.
Scientia Hort. 176: 11-21. (IF = 1.6, Horticulture, Rank Q1 8/36)
73. Buchmann, C., Felten, A., Peikert, B., Munoz, K., Bandow, N., **Dag, A.** and Schaumann, G.E. (2014).
Development of phytotoxicity and composition of soil treated with olive mill wastewater (OMW): an incubation study.
Plant Soil 386: 99-112. (IF = 3.0, Agronomy, Rank Q1 8/81)
74. Erel, R., Ben-Gal, A., **Dag, A.**, Schwartz, A. and Yermiyahu U. (2014).
Sodium replacement of potassium in physiological processes of olive trees (var. Barnea) as affected by drought.
Tree Physiol. 34: 1102-1117. (IF = 3.7, Forestry, Rank Q1 3/65)
75. **Dag, A.**, Naor, A., Ben-Gal, A., Harlev, G^S., Zipori, I., Schneider, D., Birger, R., Peres, M., Gal, Y. and Kerem, Z. (2014).
The effect of water stress on super-high density 'Koroneiki' olive oil quality.
J. Sci. Food Agric. 95: 2016-2020. (IF = 1.7, Agriculture, Multidisciplinary, Rank Q1 7/56)
76. **Dag, A.**, Ben-Gal, A., Goldberger, S^S., Yermiyahu, U., Zipori, I., Or, E., David, I., Netzer, Y. and Kerem, Z. (2015).
Sodium chloride distribution in grapevines as a function of rootstock and irrigation water salinity.
Am. J. Enol. Vitic. 66: 80-84. (IF = 1.5, Horticulture, Rank Q1 7/34)
77. Peikert, B., Schaumann, G.E., Keren, Y., Bukhanovsky, N., Borisover, M., Garfha, M., Shoqeir, J.H. and **Dag, A.** (2014).

Characterization of topsoils subjected to poorly controlled olive oil mill wastewater pollution in West Bank and Israel.

Agric. Ecosyst. Environ. 199: 176-189. (IF = 3.4, Agriculture, Multidisciplinary, Rank Q1 1/56)

78. Erel, R., Yermiyahu, U., Ben-Gal, A., **Dag, A.**, Shapira, O. and Schwartz, A. (2015).
Modification of non-stomatal limitation and photoprotection due to K and Na nutrition of olive trees.
J. Plant Physiol. 177: 1-10. (IF = 3, Plant Sciences, Rank Q1 38/209)
79. Zipori, I^S., Yermiyahu, U., Erel, R., Presnov, E., Faingold, I., Ben-Gal, A. and **Dag, A.** (2015).
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7. **Allowed Patents and Registered Cultivars**

1. Guava variety 'Yuval' (patent ID 4194-00)
2. Guava variety 'Gili' (patent ID 4195-00)
3. Guava variety 'Iddo' (patent ID 4196-00)
4. Guava variety 'Zohar' (patent ID 4197-00)

Part III: DESCRIPTION OF MAJOR ACHIEVEMENTS

As a "fruit tree physiologist" focusing on olive physiology and cultivation, I coordinate and lead multidisciplinary research that bridges scientific and practical interests. My list of contributions to science and applied agriculture include achievements related to: utilization of recycled water, brackish water and olive mill wastewater, understanding tree responses to stressful conditions, investigations into irrigation and fertilization management, and water–soil–tree interactions and associated physiological responses. Another aspect of my research addresses the physiological response of trees to fruit load and its implications on biennial bearing behavior. The study of "fruit tree cultivation and physiology" is interdisciplinary in nature, and I have therefore worked and published with many collaborators. I believe that through cooperation with experts in the relevant disciplines connected to tree behavior, my research can achieve maximal impact and significance. Another discipline in which I have focused and led is plant–pollinator interactions; specifically, crop pollination and bee nutrition. I have served as Israel's leading representative regarding this topic in international forums, first during my 10 years serving as an extension officer, and for the last 15 years as a researcher. I frequently find myself serving as the "agricultural systems expert" for many of the research projects and scientific collaborations in which I am involved, ensuring that the crop, farm and regional scales and aspects are appropriately dealt with. I believe that this role has been made possible by a wide perspective, including an understanding of, and experience in applied practical agriculture.

1. Contribution to Agricultural and/or Environmental Sciences

Plant–pollinator interactions. For the last 25 years, I have been working continuously on plant–pollinator interactions. My research focuses dually on the pollination demands of horticultural crops (Publications 1, 4, 8 [melon], 3, 5, 6, 7 [mango], 9, 27 [almond], 12 [apple], 13, 31 [sweet pepper], 14 [sunflower], 16 [avocado], 20 [pear], 23 [yellow pitaya]) and on the nutritional demands of pollinators (Publications 15, 17, 36, 43, 71, 83). One of the outcomes of my wide experience in crop pollination was a review paper on pollination research methods with honeybee (Publication 66) published in collaboration with world leaders in pollination research. Researchers have long questioned the low preference of honeybees for avocado flowers. We excluded the possibility that this phenomenon is related to the sugar composition and phenols in the nectar and proved that it is, instead, a result of high mineral (especially potassium) content (Publications 24, 25, 28, 30, 41). As regards bee nutrition, we performed a mass balance

between fatty acids and proteins taken up in the pollen and those in the bee's total body mass (Publication 71). This study indicated a substantial role for essential fatty acids (omega-3 and omega-6) in bee nutrition in diverse natural landscapes. We found that, in general, honeybee colonies collect from several pollen sources (six on average) (Publication 43), probably to avoid deficiencies in specific nutrients that might occur when foraging on only one pollen source. However, under monoculture conditions (as is frequently present in modern agriculture), often only a single source of pollen is available to the bees, and omega-3 might be deficient. Another of our papers on the importance of omega-3 for honeybee learning, which was recently published in PNAS, is the first to indicate the importance of this fatty acid for cognitive abilities in insects (Publication 83).

Fruit tree physiology. I conduct full tree horticultural studies on important local commercial species, focusing on olive, and the environment and stress causing factors they are exposed to, mainly the abiotic stressors drought, salinity and plant nutrition.

Olive biennial bearing. Although biennial bearing is a typical characteristic of olive trees, not much is known about its physiological basis. We demonstrated relationships between fruit load and vegetative growth, and between vegetative growth and flowering. Moreover, we showed that the point of no return for tree flowering and fruiting occurs in September (Publication 46). We found that carbohydrate depletion following an 'on' year is not the main cause for this phenomenon (Publication 55), nor is nutrient depletion (Publication 63). The high demand for carbohydrates in 'on' years is supplied by a higher photosynthesis rate and higher stomatal opening (Publication 59), which cause higher water consumption by the trees (Publication 84) and a reduction in stem water potential (Publication 56). We developed a curve describing the effect of elevated NAA (synthetic auxin) response on fruitlet thinning and the consequent yield in the following year, providing growers with a tool to control biennial bearing (Publication 44).

Water stress. We demonstrated increasing water stress in olive trees during the summer (with constant evapotranspiration returns) (Publication 50). We further showed that the drought response in olive is cultivar-dependent: there are varieties that continue functioning and assimilating carbohydrates under very low water availability, whereas others with generally high rates of photosynthesis are not tolerant to drought, as reflected by cessation of photosynthesis under those conditions (Publication 86). Interestingly, once a severe drought was over, even the sensitive variety Barnea recovered and returned to full functionality (Publication 49).

Salinity stress in olives. Using a novel lysimeter system, we produced the first physiological response curve to salinity in adult fruit-bearing olive trees (induced by water salinity or the

leaching fraction) (Publications 87, 88); we further described a mechanism underlying tolerance to high salinity in olive trees which is based on accumulation of salts in thin roots, consequently shortening their life span. We also demonstrated the positive aspect of sodium to olive tree; that it can replace, to some extent, potassium in olive tree functioning (Publication 74).

Salinity stress in grapevines. We also described grapevines' response to salinity, based on the rootstock to which they are grafted. One of our main findings (in addition to the variable tolerance of different rootstocks to salinity) was that while chlorine is accumulated in leaves and consequently, the plant eliminates it via while leaf drop, sodium continuously accumulates in the trunk until it reaches a certain threshold and the vine dies (Publication 76).

Genetic characterization of local traditional olives. Israel and its immediate neighbors are geographically considered to have the longest tradition of olive cultivation (Publication 34). Nevertheless, a negligible amount of work has been invested in characterizing and preserving the local genetic material. In addition to being a food source, olive oil was used for lighting purposes in ancient times (Publication 92). We characterized several wild populations of olive in Israel, and others that were suspected of being wild, but are actual feral (i.e., originating from cultivated trees) (Publication 90). We reported, for the first time in the east Mediterranean Basin, that almost all of the old olive trees are grafted (Publication 70). Furthermore, the vast majority of scions belong to a single cultivar ('Souri'), whereas the rootstocks present a great deal of variation, indicating that a substantial proportion of the rootstocks are seedlings (Publication 70). One of the rootstocks (MLL7) was found in different trees and locations, indicating vegetative propagation. This rootstock seems to provide some advantage with respect to oil quality, which might be why it was selected (Publication 91).

2. Achievements in Applied Research

Plant–pollinator interactions

Our approach of introducing hives several times in Rosacea fruit tree orchards to improve bee activity and pollinator efficiency was widely adopted by growers and led to substantial improvement in orchard productivity (Publications 12, 20, 29). With the shift of crop cultivation from open fields to enclosures (net houses and greenhouses), special emphasis was given to using (and comparing) honeybees and bumblebees for pollination of those crops. I believe that I am among the leading researchers worldwide with this expertise (using pollinators to pollinate in

enclosures; see Publications 1, 4, 8, 13, 17, 23, 31 and Review Paper 32). Another innovative approach in the field of crop pollination was to select and breed unique honeybee strains with strong preference for target crops, as accomplished in apple (Publication 21) and avocado (Publications 16, 45). We also developed systems to artificially disseminate pollen (using pollen dispensers; Publication 9) and biological agents to control crop disease using 'inserts' at the hive entrance (Publications 18, 19, 26).

Promotion of olive oil quality through cultivation practices

In the last decade, there has been an increase in consumer awareness of olive oil quality; in general, people look for extra virgin olive oil—the highest quality level. However, there is not much science-based knowledge regarding the effect of cultivation practice on olive oil quality. I established an olive oil laboratory (including NIR oil content analyzer, a laboratory mill, a large Soxhlet system, GC–MS, a Rancimat to assess oil stability and other components) which allows my group, other olive researchers, as well as commercial farmers in Israel, to relate specific treatments or conditions received by the tree to oil content and quality. The laboratory is the best equipped in the Middle East region and many delegations (local and from abroad) have visited it. As a result of my extensive experience in olive oil research, I was nominated to coordinate a large working group in an EU-funded project (MAC-OILS) regarding aspects of oil crop cultivation and their effects on oil quality.

As part of this intensive research activity, we evaluated the effect of mill operation procedure on oil quality parameters (Publication 48) and olive storage conditions prior to extraction on olive oil quality (Publication 60), as well as the effects of mechanical harvesting on oil quality (Publication 33). We determine the optimal ripeness index for olive harvesting (which maximize oil yield and quality), as a function of variety and fruit load, for Mediterranean conditions (Publication 52) and for hot climatic conditions (Publication 68). We demonstrated the negative effect of excess irrigation on olive oil quality in a traditional orchard (Publication 33), an intensive orchard (Publication 56) and a super-intensive orchard (Publication 75). We also examined the effect of macroelement availability on oil quality and proved that excess nitrogen increases olive oil free acidity and reduces polyphenol content, and that the saturation level of the fatty acids decreases with fruit nitrogen level (Publications 42, 67). Furthermore, we developed an innovative model to optimize harvest time according to the fruit's oil content on a dry weight basis (Publication 85). To evaluate the relative importance of different physiological, cultivation and environmental conditions, we performed a large survey across Israel and discovered that olive fruit from 'off' trees, with high ripening index and substantial fungal infestation, are the

main cause for high free fatty acid content (Publication 77). Our findings, at the local and international levels, have provided the growers with a 'tool box' for improving their olive oil quality.

Olive orchard management

The use of mycorrhiza. We demonstrated the beneficial effects of inoculating young olive trees with mycorrhiza on their mineral uptake, growth and establishment in the orchard, especially under desert conditions (Publications 38, 51). As a consequence, commercial olive nurseries in Israel have started to use mycorrhiza in their standard production protocol.

Mechanical harvesting of table olives. Table olives require a substantial amount of labor for picking (amounting to ca. 60% of expenses), jeopardizing the existence of this industry in Israel. We showed the feasibility of mechanical harvesting to obtain high-quality fruit along with high fruit removal rates by selecting the right combination of cultivars and harvesting technology (Publications 47, 69). Pursuant to our study, there has been a substantial shift toward mechanical harvesting of table olives in Israel.

Olive mill wastewater (OMW). OMW is a byproduct of the olive oil production process. One of the most common methods of treating OMW is to spread it back into the olive orchard. We have shown that olive cultivar, harvest timing, irrigation level and fruit water content all have substantial effects on OMW content, influencing the olive horticultural conditions that need to be considered in future OMW management (Publication 52). A survey of soils in the West Bank and Israel which were exposed to uncontrolled OMW application showed that polluted soils exhibited stronger water repellency and higher sorption capacity for agrochemicals (Publication 77), emphasizing the importance of controlled OMW application. In an incubation study, we identified the environmental conditions during and after OMW disposal on soil that favor fast degradation of the OMW, minimizing its physical immobilization and phytotoxic effects (Publication 73). Hence, adjusting the application timing of the OMW may reduce its negative effect on the soil and crop. These results were later confirmed under field conditions (Publication 80).

Olive irrigation control. The olive sector has undergone a dramatic change in the last few decades with the introduction of irrigation, leading to a substantial increase in oil yield and the ability to grow olives in arid areas. Nevertheless, due to water scarcity and the effect of irrigation level on oil quality (Publications 33, 56, 75), it is essential to monitor the tree water stress. We established the first crop factor in the eastern Mediterranean basin for intensive olive orchards (Publication 50). We also determined the optimal stem water potential (SWP) for

super-intensive olive orchards (Publications 59, 75). We further developed and calibrated advanced methods for assessing water stress in olive trees (thermal and visible imagery, stomatal opening, clamp pressure probe, dendrometers and SWP), (Publications 39, 49, 62, 65). Some of these methods are now in commercial use.

Olive fertilization. The major findings of our research in this area are that: a) high nitrogen input decreases both yield and oil quality; b) phosphorus fertilization has a significant effect on plant growth and olive yield and a moderate effect on olive oil quality; c) there is no considerable effect of potassium nutrition on growth, fruit production or oil quality, even when its levels are below the commonly acknowledged deficiency threshold value of 0.4% in leaves; d) there is an interaction between fruit load and macroelement concentrations in fertigated olive trees. Due to the expansion of intensive olive farming in Israel and around the world, this information was used to design new fertilization protocols for olive growers. The outcomes for Israeli growers who applied the protocols were a 30–40% decrease in nitrogen and potassium application rates and increased phosphorus application, resulting in improved yields and quality and greater cost effectiveness (Publications 42, 49, 63, 64, 67, 74, 89).

A long-term experiment of olive irrigation with effluent demonstrated the positive effect of minerals arriving with the water. These results have inspired olive growers to consider the amount of nutrients in effluent prior to applying chemical fertilizers (Publication 53). These novel findings and resulting innovative recommendations have been implemented throughout the country and by growers around the world.

The studies on olive irrigation and fertilization have led to more efficient water and fertilizer regimes, which have been adopted and are being practiced by growers in Israel and abroad. They have also become a flagship example for multidisciplinary research and collaboration designed to efficiently promote specific crops.