University Academic Curriculum Vitae

Raphael Tiziani

Personal information

Name: **Raphael Tiziani**
E-mail: **raphael.tiziani2@unibz.it**

Education since leaving school

- **2015** Bachelor's degree in Agricultural and Environmental Sciences, Free University of Bolzano, Italy (107/110)
- **2017** Master's degree in Agri-Food Biotechnology, University of Verona, Italy (110/110)
- **2021** Ph.D. in "Food Engineering and Biotechnology", Faculty of Science and Technology, Free University of Bolzano, Italy

Present appointment

- **2022-present Research assistant** in the project "Nutrient dynamics in the rhizosphere to elucidate nutrient mobilization and uptake processes in crop plants", Faculty of Science and Technology, Free University of Bolzano, Italy
  Co-supervisor of Bachelor and Master students for their thesis, Faculty of Science and Technology, Free University of Bolzano, Italy

Professional experience

Chronological list of all previous employments (each with job title, starting and finishing dates, level, employer, responsibilities)

In Italy

From - to	Job title	Name of academic Institution	Academic level	responsibilities
08.2014 - 09.2014	Internship	Laimburg research center	-	Chemical analysis of soil and plant tissue
07.2016 – 09.2016	Internship	Laimburg research center	Bachelor Degree	Research in Agricultural Chemistry – Metabolomics Lab
02.2017 – 05.2017	Internship	Free University of Bolzano	Bachelor Degree	Research in Agricultural Chemistry – molecular biology, transcriptomics, plant analysis, grape chemical

				characterization
11.2017-12.2020	Ph.D-student	Free University of Bolzano	Master Degree	Root exudates research, rhizosphere sampling and research, soilless growing systems, DGT development, chemical physical soil analysis, RT-qPCR, ^{13}C fractionation, targeted metabolomics
Since 02.2021	Research assistant	Free University of Bolzano	PhD	Root exudates sampling and research, rhizosphere sampling and research, rhizobox growing systems, soilless growing systems, DGT development, chemical physical soil analysis, ^{13}C research, targeted metabolomics
Since 07.2022	Research assistant	Free University of Bolzano	PhD	Root exudates sampling and research, rhizosphere sampling and research, rhizobox growing systems, soilless growing systems, DGT development, chemical physical soil analysis, ^{13}C research, targeted metabolomics

Abroad

From - to	**Job title**	**Name of academic Institution**	**Academic level**	**responsibilities**
03.2019 – 10.2019	Visiting Ph.D student within Ph.D. course	BOKU-University of Natural resources and Life Sciences, Department of Crop Sciences, Institute of Agronomy	Master Degree	DGT development, root exudates sampling and research, rhizobox growing system, targeted metabolomics

Schools and professional training

- "International PhD Winter School of the Società Italiana di Chimica Agraria (SICA), 2018 Palermo", Palermo (Italy), 12.02-15.02.18
- "Spettrometria di massa isotopica: attualità sui recenti sviluppi tecnologici ed applicazioni in Italia", Pisa (Italy),19-20.04.18
- "Solute imaging summer school 2019", BOKU, Tulln an der Donau (Austria), 12-18.09.19

Experience in academic teaching

- **AY 2021/2022 Teaching assistant (8 hours, teaching language: German**) of *Analytical Chemistry* (6 ECTS) held by Prof. Tanja Mimmo at the Free University of Bolzano in the Bachelor for Agricultural, Food and Mountain Environmental Sciences
- **AY 2021/2022 Teaching assistant (52 hours, teaching language: German**) of *Soil chemistry and fertility* (6 ECTS) held by Prof. Tanja Mimmo at the Free University of Bolzano in the Bachelor for Agricultural, Food and Mountain Environmental Sciences
- **AY 2020/2021 Teaching assistant (52 hours, teaching language: German**) of *Soil chemistry and fertility* (6 ECTS) held by Prof. Tanja Mimmo at the Free University of Bolzano in the Bachelor for Agricultural, Food and Mountain Environmental Sciences
- **AY 2019/2020 Teaching assistant (30 hours, teaching language: English)** of *Biochemistry and physiology of agricultural plants* (6 ECTS) held by Prof. Stefano Cesco at the Free University of Bolzano in the Bachelor for Agricultural, Food and Mountain Environmental Sciences
- **Bachelor and Master thesis supervision:**

  at the Free University of Bolzano

  Co- supervisor (L-25):

  AY 2019/20

  Greta Fichter, title: "Effect of single and combined nutrient deficiency on cultivated plants"

  Letizia Bernardi, title: "The role of Brassinosteroids in nutrient acquisition in plants"

  AY 2020/21

  David Heiss, title**:** "Copper extraction potential of citrate and malate in vineyard soils"

  AY 2021/2022

  Andreas Montagner, title: "Optimization of fertilization of soilless growing system"

Franz Waschgler, title**:** "Impact of plant development status on the reacquisition of root exudates"

at the Università degli Studi di Udine
Co-supervisor (LM-69):
AY 2019/20
Maria Niedrist, title**: "**Copper extraction potential of selected root exudates in vineyard soils"
at Wageningen University and Research
Co-supervisor (Master in Plant Sciences):
AY 2020/21
Fabio Trevisan, title: "Carbon isotope fractionation in C4 and C3 plants subjected to nutrient deficiencies"

Research and scholarships

Raphael Tiziani is part of the Agricultural Chemistry Research group (SSD AGR/13) of the Free University of Bolzano, which is composed by 2 Full Professor (Stefano Cesco, Tanja Mimmo), 1 Associate Professor (Youry Pii), 2 RTD Junior (Luigimaria Borruso, responsible: Tanja Mimmo and Simon Unterholzner: responsible Stefano Cesco) and several PhD students as well as master and bachelor students which conduct the thesis with this group.

Raphael Tiziani is in charge for the following research projects:

Date granted	**Award Holder(s)**	**Funding Body**	**Title**	**Amount received**
2017-2020	Raphael Tiziani (coordinator)*	Stiftung Südtiroler Sparkasse	Methoden zur Bestimmung der Nährstoffverfügbarkeit in der Rhizosphäre, um Synergien und Antagonismen zwischen Elementen vorherzusehen	60000€

**research grant for the PhD Scholarship at the Free University of Bolzano*

Raphael Tiziani is involved in the following research projects:

Date granted	**Award Holder(s)**	**Funding Body**	**Title**	**Amount received**
2018-2021	Tanja Mimmo (coordinator)	Free University of Bolzano	Spatial and temporal nutrient dynamics in the rhizosphere to unravel nutrient	97000€

			mobilization and uptake processes in cultivated plants - NUMICS	
2017-2020	Tanja Mimmo (coordinator)	Free University of Bolzano	Rhizosphere processes affect copper bioavailability in vineyard soils - RHIZOPRO-	70000€
2018-2021	Stefano Cesco (coordinator)	FESR 2014-2020	Hydrothermal carbonization of Biogas digestate for hydroPonics: an innovative concept of bio-refinery – HB Ponics	237150€

Scientific collaborations

At national level

1. Prof. Roberto Terzano – University of Bari (heavy metal remediation)
2. Prof. Gianpiero Vigani – University of Turin (crop physiology)
3. Dr. Luigi Lucini – University Cattolica del Sacro Cuore (metabolomics)
4. Prof. Sorgonà – Università Mediterranea di Reggio Calabria (root exudation, abiotic stress)
5. Prof. Buzzini – University of Perugia (biogeochemical cycles in soil)

At international level

1. Prof. Jakob Santner – BOKU, Vienna (rhizosphere processes)
2. Prof. Markus Puschenreiter – BOKU, Vienna (rhizosphere processes)
3. Prof. Eric Smolders – KU Leuven, Leuven (rhizosphere processes)
4. Prof. Ciadamidaro – Université de Bourgogne Franche-Comté (heavy metal pollution and root exudation)
5. Prof. Wolfram Weckwerth – University of Vienna (plant physiology)

Organization of events

at international level

Member of the organizing committee of "Solute Imaging Summer School 2019", University of Natural Resources and Life Sciences, Vienna in Tulln, 12-17 September 2019

Technical skills

Raphael Tiziani possesses a wide range of skills used in analytical-agricultural chemistry and molecular biology laboratories. Such skills include the use of soil solute imaging techniques (e.g. diffusive gradient in thin films, see Tiziani et al. 2021 etc.) image processing, analytical/molecular analysis of soil and plant tissue (ionomics, targeted and untargeted metabolomics, PCR based techniques,

see Cesco et al. 2021, Feil et al. 2020; Tiziani et al. 2021). Additionally, he has a vast experience with High Performance Liquid Chromatography (HPLC; see Tiziani et al. 2020, 2021), Ion Chromatography (IC, see Tiziani et al. 2021), spectrophotometry and Inductively Coupled Plasma Mass Spectrometry (see Tiziani et al. 2020; Mimmo et al. 2017, Hullot et al. 2021). He performed a vast amount of research activities using hydroponic and rhizobox/rhizotron growing systems coupled with complex rhizosphere sampling methods (see Tiziani et al. 2021, 2020, 2020; Mimmo et al. 2017; Celletti et al. 2020, Cesco et al. 2021). He is an expert on root exudate sampling (see Tiziani et al. 2020, 2021, 2020, Hullot et al. 2021)

Publications

Publication list

1. Mimmo, T., **Tiziani,** R., Valentinuzzi, F., Lucini, L., Nicoletto, C., Sambo, P., et al. (2017). Selenium Biofortification in Fragaria × ananassa: Implications on Strawberry Fruits Quality, Content of Bioactive Health Beneficial Compounds and Metabolomic Profile. Front. Plant Sci. 8, 1–12. doi:10.3389/fpls.2017.01887

2. Valentinuzzi, F., Maver, M., Fontanari, S., Mott, D., Savini, G., **Tiziani**, R., Pii, Y., Mimmo, T. and Cesco, S. (2018). Foliar application of potassium-based fertilizer improves strawberry fruit quality. Acta Hortic. 1217, 379-384, DOI: 10.17660/ActaHortic.2018.1217.48

3. Celletti, S., Pii, Y., Valentinuzzi, F., **Tiziani**, R., Fontanella, M. C., Beone, G. M., et al. (2020). Physiological responses to Fe deficiency in split-root tomato plants: Possible roles of auxin and ethylene? Agronomy 10. doi:10.3390/agronomy10071000.

4. **Tiziani**, R., Mimmo, T., Valentinuzzi, F., Pii, Y., Celletti, S., and Cesco, S. (2020). Root Handling Affects Carboxylates Exudation and Phosphate Uptake of White Lupin Roots. Front. Plant Sci. 11, 1403. Available at: https://www.frontiersin.org/article/10.3389/fpls.2020.584568.

5. **Tiziani**, R., Pii, Y., Celletti, S., Cesco, S., and Mimmo, T. (2020). Phosphorus deficiency changes carbon isotope fractionation and triggers exudate reacquisition in tomato plants. Sci. Rep. 10. doi:10.1038/s41598-020-72904-9.

6. Feil, S. B., Pii, Y., Valentinuzzi, F., **Tiziani**, R., Mimmo, T., and Cesco, S. (2020). Copper toxicity affects phosphorus uptake mechanisms at molecular and physiological levels in Cucumis sativus plants. Plant Physiol. Biochem. 157, 138–147. doi: https://doi.org/10.1016/j.plaphy.2020.10.023.

7. **Tiziani**, R., Puschenreiter, M., Smolders, E., Mimmo, T., Herrera, J. C., Cesco, S., et al. (2021). Millimetre-resolution mapping of citrate exuded

from soil-grown roots using a novel, low-invasive sampling technique. J. Exp. Bot. 72, 3513–3525. doi:10.1093/jxb/erab123.

8. Cesco, S., Lucini, L., Miras-Moreno, B., Borruso, L., Mimmo, T., Pii, Y., Puglisi, E., Spini, G., Taskin, E., **Tiziani**, R., Zangrillo, S., Trevisan, M. (2021). The hidden effects of agrochemicals on plant metabolism and root-associated microorganisms doi: https://doi.org/10.1101/2021.03.14.435313
9. Alzate Zuluaga M.Y., De Oliveira M, Valentinuzzi F., **Tiziani** R., Mimmo T., Cesco S, Pii Y.; Can the Inoculation with Bacterial Biostimulant Enterobacter sp. Strain 15S be an approach for a smarter P fertilization of maize and cucumber plants? Frontiers in Plant Science; doi: 10.3389/fpls.2021.719873
10. Hullot O., Lamy I., **Tiziani** R., Mimmo T., Ciadamidaro L., The effect of earthworms on plant response in metal contaminated soil focusing on belowground-aboveground relationships; Environmental Pollution, https://doi.org/10.1016/j.envpol.2021.116499
11. "Kupfer in Böden", Spezial of Südtiroler Landwirt Nr. 12, 10.07.2020
12. „Next-Generation Biomonitoring", Spezial of Südtiroler Landwirt Nr. 4, 04.03.2022
13. Bouaicha, O., Mimmo, T., **Tiziani, R.,** Praeg, N., Polidori, C., Lucini, L., et al. (2022a). Microplastics make their way into the soil and rhizosphere: A review of the ecological consequences. Rhizosphere 22, 100542. doi:https://doi.org/10.1016/j.rhisph.2022.100542.
14. Bouaicha, O., **Tiziani, R**., Maver, M., Lucini, L., Miras-Moreno, B., Zhang, L., et al. (2022b). Plant species-specific impact of polyethylene microspheres on seedling growth and the metabolome. Sci. Total Environ. 840, 156678. doi:https://doi.org/10.1016/j.scitotenv.2022.156678.

Proceedings in national and international conferences

1. R. **Tiziani,** F. Valentinuzzi, Y. Pii, L. Lucini, T. Mimmo and S. Cesco; Selenium biofortification in strawberry fruits and its effect on the bioactive health beneficial compound content; Poster presented at the International PhD Winter School of the Societá Italiana di Chimica Agraria (SICA) 2018 Palermo (12.02-15.02.18)
2. Sebastian Feil, Youry Pii, Fabio Valentinuzzi, Raphael **Tiziani**, Tanja Mimmo, Stefano Cesco; Influenza della tossicitá da rame sui meccanismi di assorbimento del fosforo in piante di cetriolo; In: Proceedings of the

national conference of the Societá Italiana di Chimica Agraria (SICA), pp. 81, (24.09.18-26.09.18, Reggio Calabria)

3. R. **Tiziani**, M. Puschenreiter, E. Smolders, T. Mimmo, J. C. Herrera, S. Cesco, J. Santner; Development of a technique for localizing citrate exudation in soil-grown plant root systems; In: Proceedings of the the Diffusive Gradients in Thin Film 2019 Conference, pp. 93, (18.09.2019-20.09.2019; Vienna)
4. Raphael **Tiziani**, Markus Puschenreiter, Erik Smolders, Tanja Mimmo, José Carlos Herrera, Stefano Cesco, and Jakob Santner; Quantifying and mapping citrate exudation in soil-grown root systems, In: Proceedings of EGU general Assembly 2020 (4-8 May 2020, Vienna), https://doi.org/10.5194/egusphere-egu2020-14587
5. Raphael **Tiziani**, Fabio Trevisan, Youry Pii, Silvia Celletti, Stefano Cesco, and Tanja Mimmo; Tomato plants reuptake root exudates and alter carbon isotope fractionation under phosphorus deficiency; In: Proceedings of vEGU general Assembly 2021(https://meetingorganizer.copernicus.org/EGU21/EGU21-9459.html) 19-30 April 2021.
6. **Tiziani** R., Trevisan F., Pii Y., Celletti S., Cesco S., Mimmo T., Root exudates reuptake and alteration of carbon isotope fractionation by tomatoes under P deficiency; In: Proceedings of "Second Joint Meeting on Soil and Plant System Sciences 2021", 20-23 Sept. Turin, 2021

Oral presentations at scientific conferences presented by Raphael Tiziani:

1. Raphael **Tiziani**, Markus Puschenreiter, Erik Smolders, Tanja Mimmo, José Carlos Herrera, Stefano Cesco, and Jakob Santner; Quantifying and mapping citrate exudation in soil-grown root systems, In: Proceedings of EGU general Assembly 2020 (4-8 may 2020, Vienna), https://doi.org/10.5194/egusphere-egu2020-14587
2. Raphael **Tiziani**, Markus Puschenreiter, Erik Smolders, Tanja Mimmo, José Carlos Herrera, Stefano Cesco and Jakob Santner; Quantificazione in-situ del rilascio di citrato da piante di lupino bianco; In: Proceedings of Conferenza della societa italiana di chimica agraria 2020, Piacenza 7-8 September 2020
3. Raphael **Tiziani**, Fabio Trevisan, Youry Pii, Silvia Celletti, Stefano Cesco, and Tanja Mimmo; Tomato plants reuptake root exudates and alter carbon isotope fractionation under phosphorus deficiency; In: Proceedings of vEGU general Assembly 2021 (https://meetingorganizer.copernicus.org/EGU21/EGU21-9459.html) 19-30 April 2021.
4. **Tiziani** R., Trevisan F., Pii Y., Celletti S., Cesco S., Mimmo T., Root

exudates reuptake and alteration of carbon isotope fractionation by tomatoes under P deficiency; In: Proceedings of "Second Joint Meeting on Soil and Plant System Sciences 2021", 20-23 Sept. Turin, 2021

Further data

Reviewer in the following international peer reviewed journals:
Plos One
Rhizosphere
Chemosphere
Physiologia Plantarum
Frontiers in Plant Science
Acta Horticolturae
Journal of Plant Nutrition and Soil Science
Plant and Soil
Plant Molecular Biology

Awards

Winner of the **award "Michele Stanca" for the best Ph.D** thesis of the "Associazione Italiana Societá Scientifiche Agrarie" 2022

Bibliometry

SCOPUS (08.03.2022)
11 published and accepted original papers in international SCOPUS-ranked journals. Sum of citations 69, average/item 6.3; H-index: 3

Language competences

German: Mother tongue, perfect in speaking and writing
Italian: C1; perfect in speaking and writing (Patentino di Bilinguismo della Provincia di Bolzano, 2016)
English: C1; perfect in speaking and writing (certificate of the Free University of Bolzano, 2020)

Bolzano, 18.07.2022

Signature

Raphael Tiziani